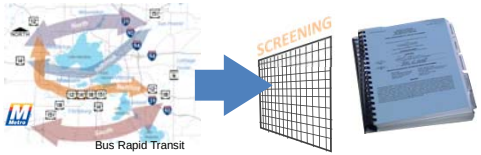
Station - Alternatives

Overview of stand-alone strategies

PEL process

The process began with the collaborative development of the problem statement, goals, and objectives. Screening criteria was developed that directly links to the PEL objectives. The screening criteria was used to evaluate strategies that may meet the goals and objectives. Strategies were then developed that look at transportation needs at a system-level. Because of the breadth of the Beltline PEL goal and objectives, strategies and strategy packages need to include many components to address objectives dealing with motor vehicle, transit, bicycle, and pedestrian travel.

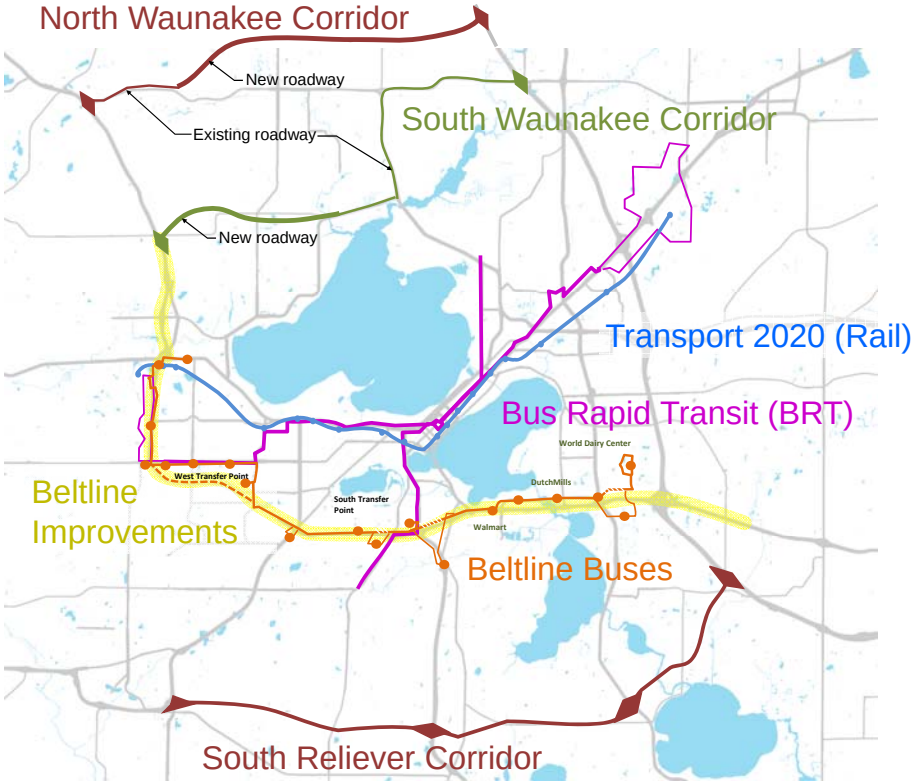


Strategy development process

The strategy development process consists of:

- Developing and testing stand-alone strategies to see whether improvements to any single mode has the ability to satisfy core PEL objectives. Stand-alone strategies are strategies that have the ability of transporting large numbers of people, such as Bus Rapid Transit, and alternate roadway corridors.
- Developing and testing individual improvement components to see whether they have the ability to partially or completely satisfy specific PEL objectives. Examples of improvement components include adding grade-separated crossings of the Beltline or extending bike accommodations on routes parallel to the Beltline.
- Assembling individual improvement components into Strategy packages. These Strategy packages, taken as a whole, have the potential to address all Beltline PEL objectives.

Stand-alone strategies investigated



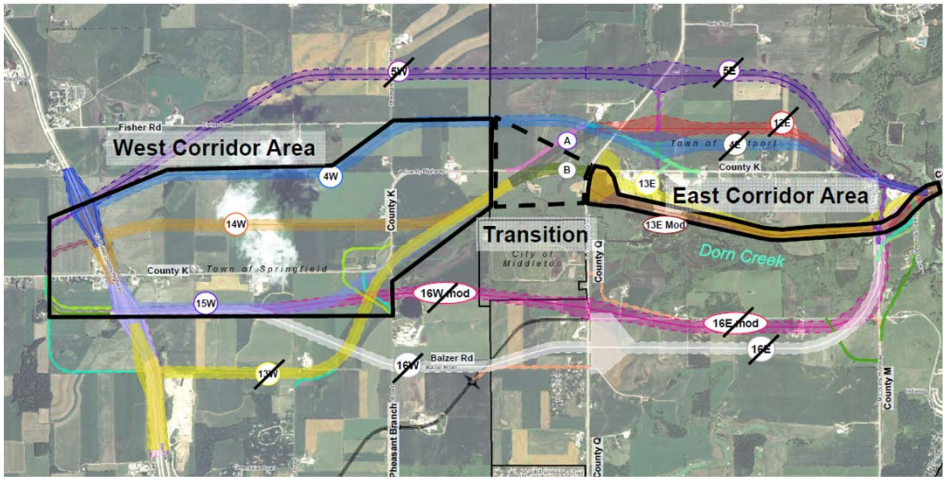
Many stand-alone strategies were investigated to see whether they, by themselves, could satisfy Dane County's need for east-west mobility. These strategies included motor vehicle options north of Lake Mendota, south of the urban area, and on the Beltline. The strategies also included various transit options, including Bus Rapid Transit (BRT), rail, as well as routing buses on the Beltline.

North Mendota corridors

Background

The potential for a high mobility corridor on the north side of Lake Mendota has been discussed for almost three decades. It began with a 1992 Dane 2020 Task Force recommendation to conduct a broad study of alternatives for what was then known as the North Ring Corridor Area.

From 2000 to 2002 local governments conducted a North Mendota Parkway Study that looked at locations and types of roadways that could meet the needs on the north side of Lake Mendota. From 2006 to 2009 Dane County sponsored a subsequent study of potential environmental and transportation corridors. In May of 2010 the Dane County Board passed a resolution adopting a recommended alignment area. The resolution asked communities to officially map the corridor east of County Q and urged WisDOT to design and locate the corridor west of County Q. Official mapping is a way local governments and WisDOT can preserve land that might be needed for future transportation improvements. The figure below shows the area where many communities have official mapping.



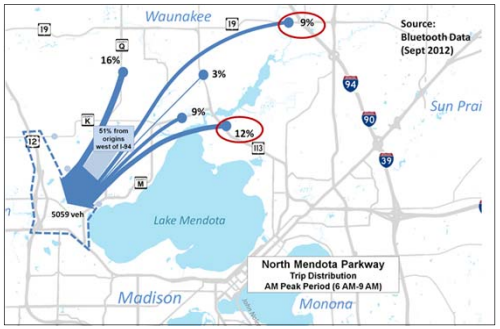
Travel Patterns

In order for a North Mendota corridor to satisfy core PEL objectives, the corridor would need to capture a large portion of the east-west travel within the metropolitan area. This capture would need to relieve the Beltline of current travel demand, improving operations.

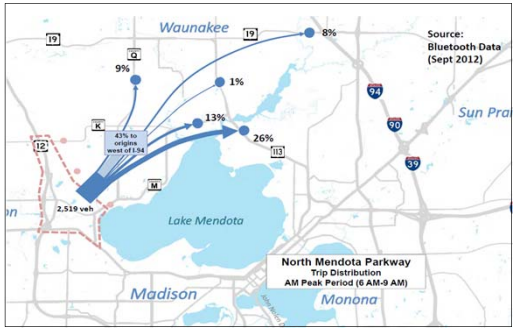
WisDOT used Bluetooth detection to understand regional travel patterns. Electronic devices on individuals and motor vehicles, such as phones and electronic tire pressure sensors, emit anonymous Bluetooth signals that are unique. Detecting this unique Bluetooth "MAC" address at various locations provided origin-destination information for the North Mendota area.

The PEL study conducted an analysis to understand the origins and destinations of all trips that pass through Middleton to get to their destinations. The following figures show the results of this analysis for the morning peak period from 6 to 9 am.

The relatively large percentage of trips that originate west of I-39 are not as likely to use the Beltline for east-west travel, making a North Mendota corridor less likely to provide Beltline relief. These trips would, however, be attracted to a high-mobility corridor on the north side of Lake Mendota.



Trips to or through Middleton analysis area

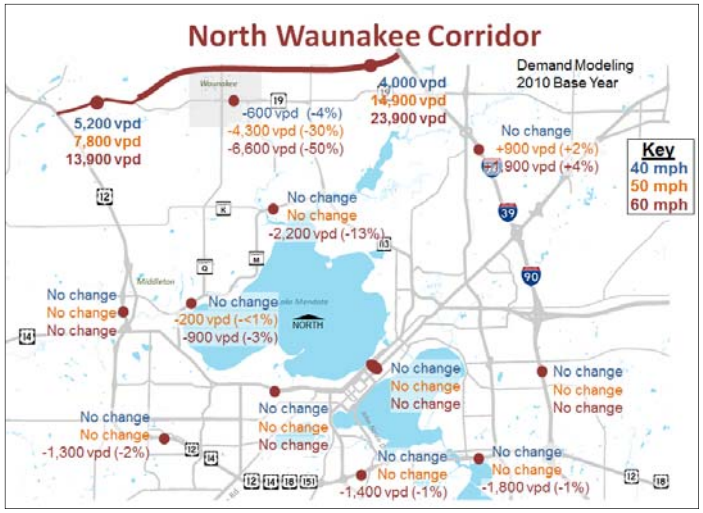


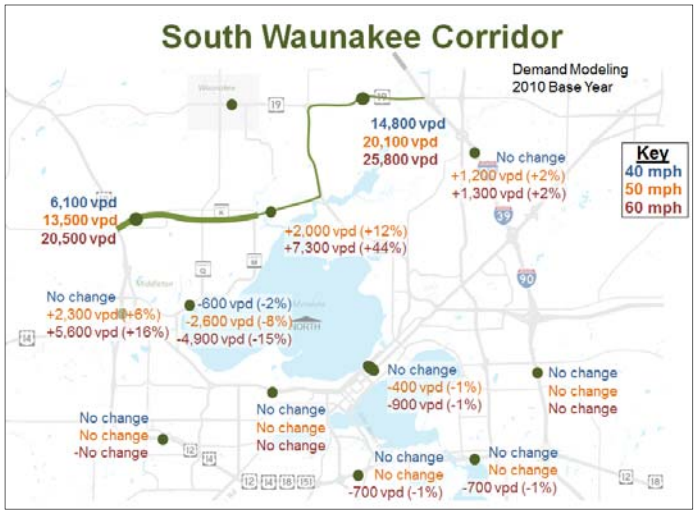
Trips from or through Middleton analysis area

North Mendota corridors

The PEL study uses the Madison Area Metropolitan Area's travel demand model to understand area traffic patterns and volumes. The computerized travel demand model is based on the current metropolitan land uses and existing roadway network, as well as projected land uses based on current comprehensive land use plans.

With a travel demand model, different roadway and land use scenarios can be tested to understand how they would change area travel patterns. For example, a new roadway can be added to the network and the travel demand model will predict how much traffic the new roadway would attract, and how traffic patterns would change with the new roadway link. The two North Mendota strategy alignments were modeled in the travel demand model with three speeds, 40 mph, 50 mph, and 60 mph. Higher speed roadways attract more traffic because they decrease travel time. The travel demand model is able to model this behavior.





- The North Waunakee Corridor captures less traffic at 40 mph (4,000 to 5,200 vpd) than it does at 60 mph (13,900 to 23,900 vpd).
- If built, the North Waunakee Corridor would attract a large amount of traffic, with up to 23,900 vpd desiring to use it in the 2010 base year.
- The North Waunakee Corridor decreases traffic on WIS 19 through Waunakee by up to 50 percent.
- The North Waunakee Corridor has modest effect on County M (east of K) and Century Avenue traffic volumes.
- The North Waunakee Corridor has no effect on Isthmus traffic.
- The North Waunakee Corridor has essentially no effect on Beltline traffic volumes and therefore cannot satisfy PEL objectives as a stand-alone solution.

- As with the North Waunakee Corridor, higher speeds draw greater traffic volumes.
- The South Waunakee Corridor captures up to 50 percent greater traffic volumes than the North Waunakee Corridor.
- The South Waunakee Corridor reduces Century Avenue traffic volumes up to 15 percent.
- The South Waunakee Corridor increases County M (east of K) traffic volumes by up to 45 percent.
- The South Waunakee Corridor has essentially no effect on Isthmus traffic.
- The South Waunakee Corridor has essentially no effect on south Beltline traffic volumes and increases west Beltline traffic volumes. therefore cannot satisfy PEL objectives as a stand-alone solution.

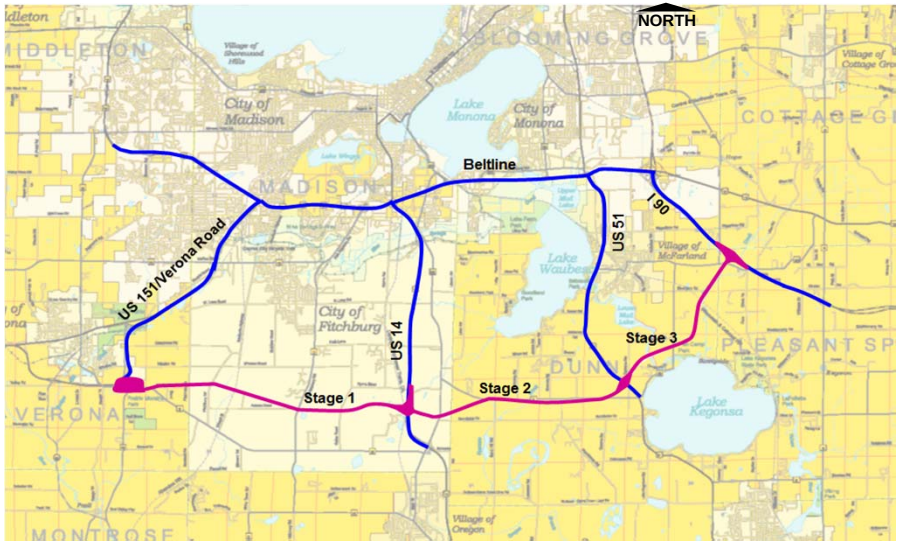
South Reliever corridor

Background

The potential for a high mobility corridor on the south side of the Madison metropolitan area was suggested as stakeholder feedback during the Verona Road Environmental Impact Study in 2002. This resulted in a 2002 WisDOT analysis of the viability of a South Reliever and a subsequent 2008 update to the study. The study was included in the Verona Road Environmental Impact Statement as Appendix L. The document analyzed the South Reliever in three distinct stages. Although it was predicted to attract a substantial volume of traffic, this alignment was eliminated from further consideration in the 2011 Verona Road FEIS because it:

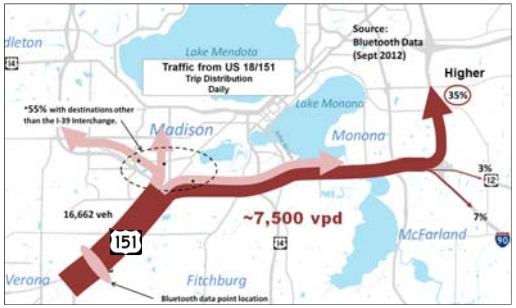
- Did not provide substantial traffic volume relief to the Verona Road corridor.
- Was not likely to reduce congestion-related crashes on Verona Road.
- Did not address other components of the purpose and need, including neighborhood connectivity and improving metropolitan traffic movements.

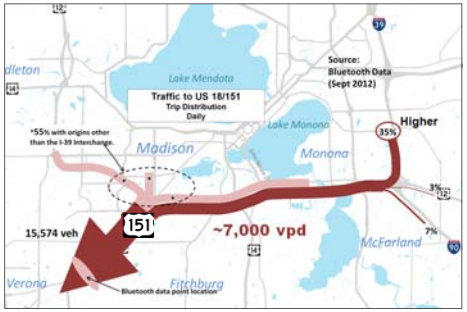
The figure below shows the South Reliever alignment that was evaluated as part of that study.



Travel patterns

A county-wide origin-destination study using both time-lapse aerial photography and Bluetooth detection analyzed travel patterns in the south metropolitan area. Understanding the number of daily trips traveling from US 18/151 in Verona to I-39 provides an indication of the amount of traffic that wants to bypass Madison in favor of destinations east of the Madison metropolitan area. The graphics below show the amount of daily traffic that travels from and to US 18/151 in Verona and I-39 near Madison. The graphics show that about 55 percent of the traffic on US 18/151 near Verona has origins/destinations other than I-39.



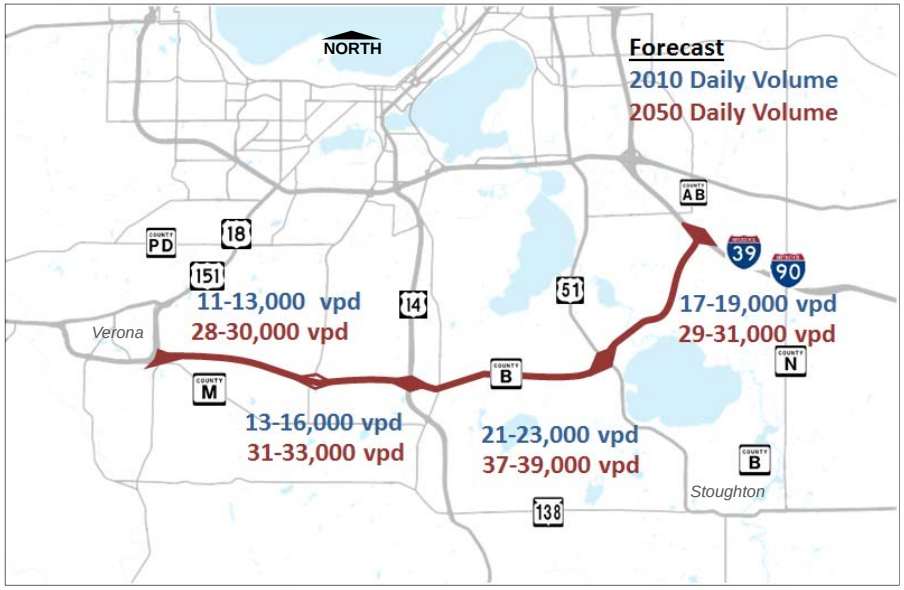


The daily US 18/151 volumes going east to I-39 are about 7,500 vpd and the volumes going west from I-39 are about 7,000 vpd . Both directions total about 14,500 trips that could be attracted to a South Reliever corridor. Almost 80 percent of the US 18/151 traffic originating from or destined to I-39 is coming from/to the north. A South Reliever provides a less direct route to/from I-39 for this traffic than the current US 18/151/Beltline routes do, so it may not capture this full demand.

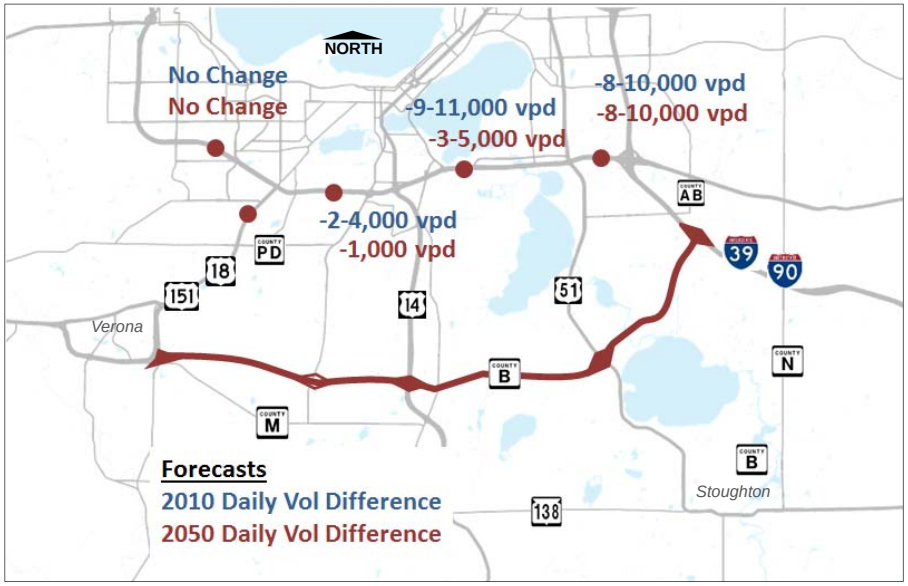
South Reliever corridor

The PEL study uses the Madison Area Metropolitan Area's travel demand model to understand area traffic patterns and volumes. The computerized travel demand model is based on the current metropolitan land uses and existing roadway network, as well as projected land uses based on current comprehensive land use plans and committed transportation improvements.

With a travel demand model, different roadway and land use scenarios can be tested to understand how they would change area travel patterns. For example, a new roadway can be added to the network and the travel demand model will predict how much traffic the new roadway would attract and how traffic patterns would change with the new roadway link. With the travel demand model, the South Reliever was tested to determine how much traffic would use the South Reliever and how much traffic would be removed from the unimproved Beltline.



Projected Traffic Volumes on South Reliever



Projected Traffic Volume Reductions on Beltline with South Reliever

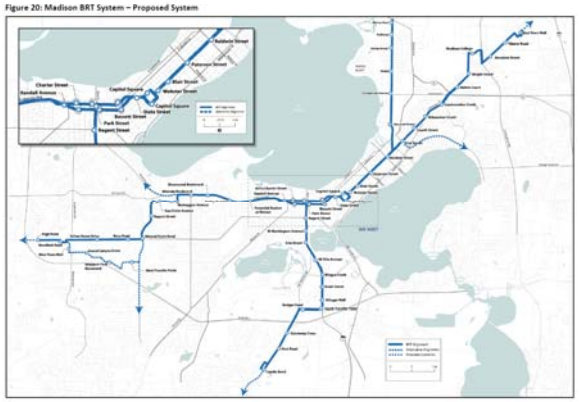
The South Reliever has the potential to attract a considerable amount of traffic ranging from 11,000 to 23,000 vpd in 2010 and 28,000 to 39,000 vpd in 2050. Despite this large traffic attraction there are several reasons why the South Reliever does not reduce Beltline traffic volumes to the same degree. As regional traffic is drawn off the Beltline to the South Reliever, the extra capacity on the Beltline is filled up with local traffic that are currently using local routes that would rather use the Beltline. Additionally, much of the planned job growth between 2010 and 2050 is projected for planned business centers that are most easily served by the Beltline. Because the South Reliever does not remove enough traffic from the Beltline to substantially affect traffic operations, it does not fulfill the PEL objectives as a stand-alone solution.

Bus Rapid Transit (BRT)

Background

With the withdrawal of the Transport 2020 New Starts Application, government entities within the Madison Metropolitan Area began exploring other high-mobility transit alternatives. In February 2013, the Madison Area Metropolitan Planning Organization released a report analyzing the feasibility of Bus Rapid Transit (BRT) for the Madison Area and laying out several corridors with the greatest potential for ridership. Based on the results of the study and observations from other communities where BRT has been implemented, the Madison Transportation Board thinks there is good potential for the successful implementation of BRT. That study estimated the construction cost of the BRT would be approximately $107 to $162 million (this cost excludes the cost of a bus maintenance facility that is necessary regardless of whether BRT is implemented).

The MPO is currently pursuing additional study funding. The following graphic shows the recommended alignments and illustrates what a BRT vehicle could look like.

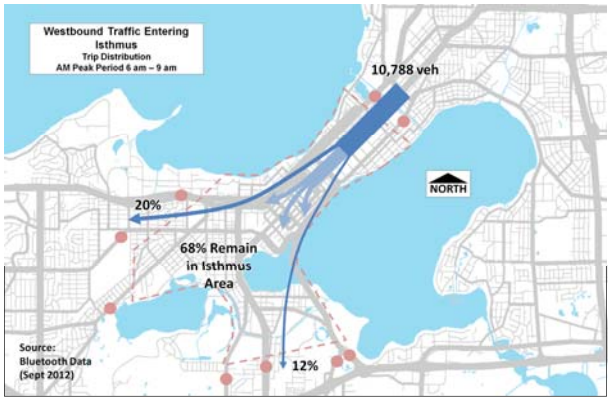


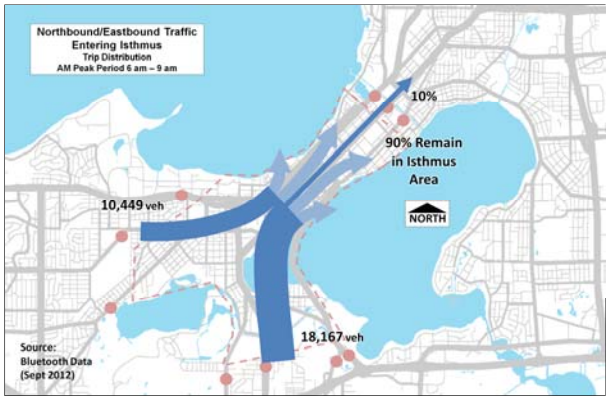
BRT is a corridor-based transit improvement designed to provide fast, frequent, reliable and comfortable service. Key design components that can affect the overall performance of BRT are:

- Service frequency as well as time advantage
- Routing (e.g., on dedicated or shared lanes.)
- Station location and design
- The types of vehicles and their amenities
- The amount of connecting and parallel local bus service
- Off-board fare collection
- The "branding" of the service to differentiate it from regular bus service

Travel Patterns

As mentioned in the North Mendota corridor discussion, WisDOT performed a county-wide origin-destination study to understand regional travel patterns using time-lapse aerial photography and Bluetooth detection. The analysis of travel patterns through the Isthmus during the morning peak period from 6 to 9 A.M. provides a good representation of work trip origins and destinations. The following graphics show that of traffic coming from the east, almost 70 percent want to remain downtown. Of traffic coming from the west, which is three times greater, 90 percent remain within the isthmus area. The fact that most traffic traveling downtown is going *to* the Isthmus and not *through* the Isthmus influences the effect of BRT would have on the Beltline traffic volumes.





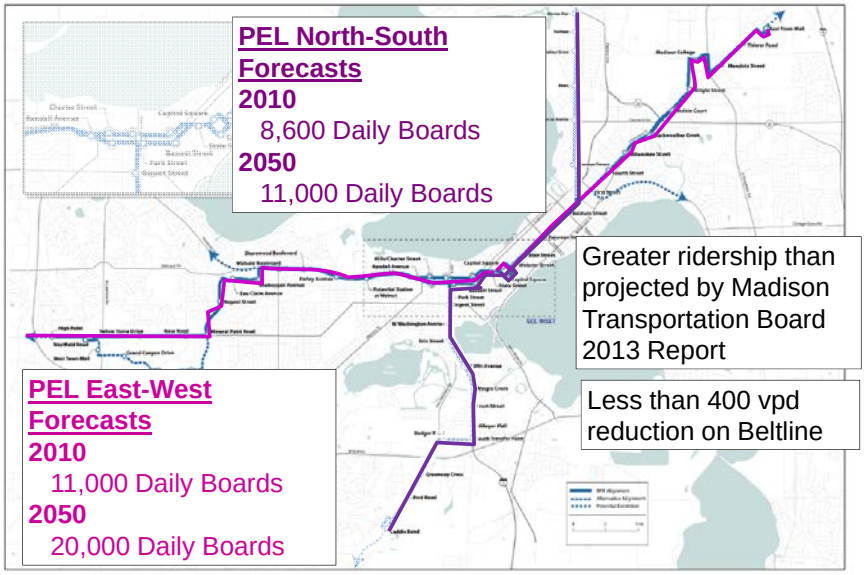
Bus Rapid Transit (BRT)

Potential Ridership

The PEL study uses the Madison Area Metropolitan Area's travel demand model to understand area travel patterns and volumes. The computerized travel demand model is based on the current metropolitan land uses and existing roadway network, as well as projected land uses based on current comprehensive land use plans.

Using a travel demand model, different transportation alternatives can be tested to understand how they would change area travel patterns. The PEL study tested the recommended BRT routing to see how many riders it would draw and how it would affect the Beltline. The analysis indicated that BRT would draw even more riders than estimated by the Madison Transportation Board's 2013 report. But BRT had a very modest effect on reducing traffic volumes on the Beltline. The origin-destination data (see alternate board) indicates that most central Madison travelers are traveling to the Isthmus, rather than through it. The potential BRT user, therefore, has the Isthmus as a destination. Few of the potential BRT riders are likely to be traveling on the Beltline.

Figure 20: Madison BRT System – Proposed System



Possible Modifications/Enhancements

Factors

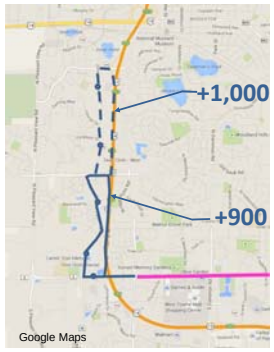
The PEL study performed a sensitivity analysis to see how modifying different factors would affect ridership of the BRT. The table illustrates the effect of these changes. One modification factor that had the greatest effect was treating the BRT route as just another bus route, which decreased ridership by almost half. The modeling indicates that in order for BRT to capture maximum ridership, it must have key BRT characteristics, such as distinct buses, branding, boarding stations, and a time advantage. The second greatest effect on ridership was changing the BRT frequency from 10 to 15 minutes in the peak and 15 to 30 minutes in the off-peak, which decreased ridership by a quarter.

Factor	% Change in ridership
Treat BRT as a regular bus	-49%
Decrease fare $0.25 (or -20%)	+5%
Change frequency from 10 to 15 minutes in peak and from 15 to 30 minutes in off-peak	-27%
Decrease travel time advantage	-3% to -14%

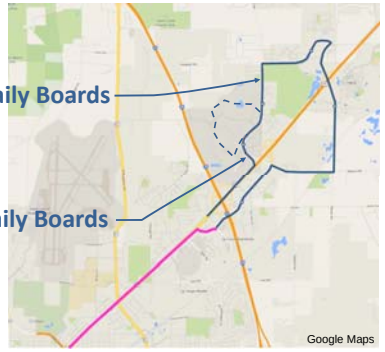
Extensions

The PEL study performed an analysis to see whether extending BRT service farther to the west and east would affect ridership. The maps show the extensions that were modeled and about how many more daily boards they would attract.

West Side BRT Extension



East Side BRT Extension



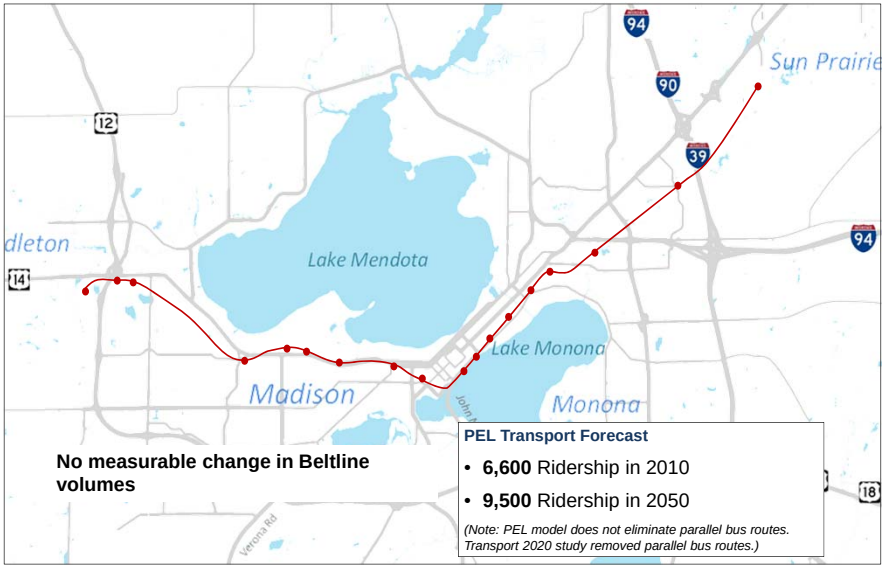
Transport 2020 (Rail)

Since 1993, several studies have investigated the possible implementation of rail service in the Madison area. The most recent initiative is Transport 2020, which proposed east-west rail service running along an existing rail corridor from Middleton to Reiner Road near Sun Prairie through Madison's Isthmus. The proposal would use Diesel Multiple Unit Vehicles (DMU - see picture below). With DMUs, the passenger cars would have their own motors and no locomotive would be necessary. In 2008, local governments submitted a New Starts application to the Federal Transit Authority in which the proposed system would cost $255 million in 2007 dollars and would draw up to 11,000 ridership in 2030. In 2009, the New Starts Application was withdrawn because of the lack of a local funding mechanism (Regional Transit Authority).

The PEL study uses the Madison Area Metropolitan Area's travel demand model to understand area travel patterns and volumes. The computerized travel demand model is based on the current metropolitan land uses and existing roadway network, as well as projected land uses based on current comprehensive land use plans.

With a travel demand model, different transportation alternatives can be tested to understand how they would change area travel patterns. The PEL study tested the recommended Transport 2020 routing to see how many riders it would draw and how it would affect the Beltline. The analysis indicated that Transport 2020 would draw 6,600 riders a day in 2010 and 9,500 riders a day in 2050 if all bus routes were to remain in place.

Implementation of Transport 2020 would have almost no effect on Beltline traffic volumes. Origin-destination analysis indicates that most central Madison travelers are traveling to the Isthmus, rather than through it. The potential Transport 2020 riders, therefore, have the Isthmus as a destination. Few of the potential Transport 2020 riders are likely to be traveling on the Beltline.



No measurable change in Beltline volumes

PEL Transport Forecast

- **6,600** Ridership in 2010
- **9,500** Ridership in 2050

(Note: PEL model does not eliminate parallel bus routes. Transport 2020 study removed parallel bus routes.)

Beltline buses

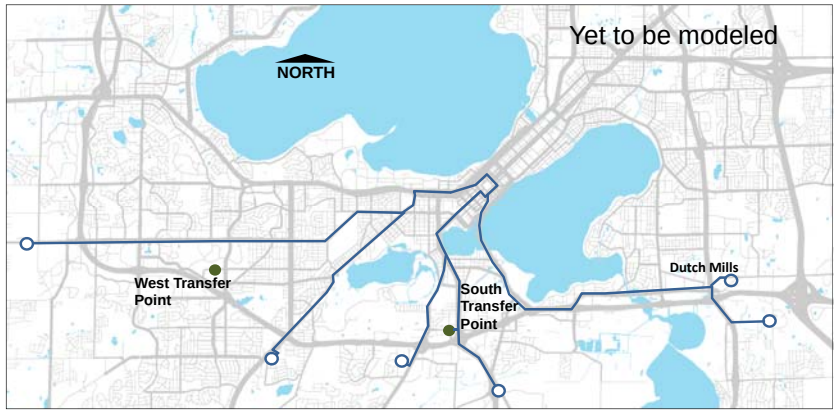
Background

Currently only 5 Metro bus routes travel on the Beltline and these routes travel for only short distances (see graphic). This is partially due to the limited number of potential riders (limited residential land uses) and the variability of travel times on the Beltline.

Madison Metro routes currently on the Beltline

Future analysis – additional park and ride lots

Because much of the traffic on the Beltline is destined for employment centers near the Isthmus, end-to-end bus routes on the Beltline have difficulty attracting trips. A subsequent analysis will review how strategically located park and ride lots, with bus service destined for the Isthmus, would affect Beltline traffic volumes. These park and rides would have the opportunity to intercept potential Beltline travelers before they get to the Beltline.

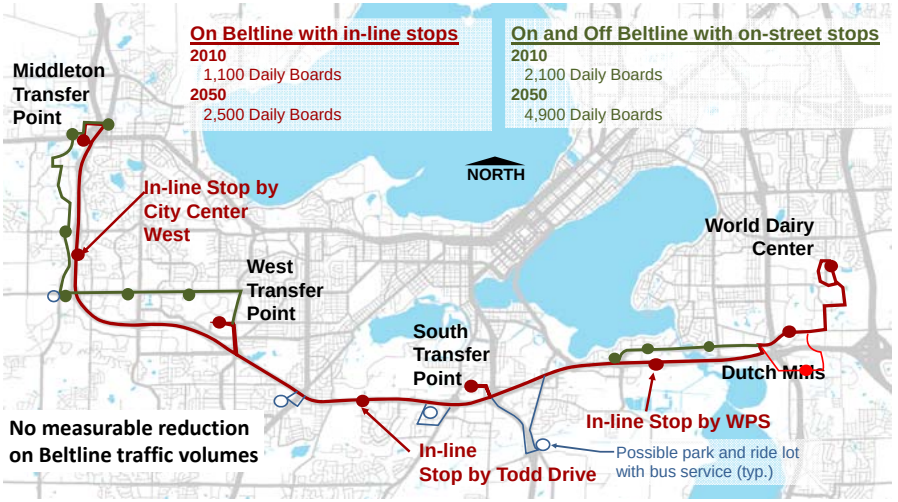


Analysis

The Beltline PEL study modeled the traffic effects of routing buses on the Beltline for its full length. Two options were investigated. One option would start at the Middleton transfer point and run to the World Dairy Center on the east side, stopping at every transfer point and making one in-line stop between transfer points. The in-line stop would be at employment centers along the Beltline (WPS, Todd Drive, City Center West) and bus patrons would be able to get to both sides of the Beltline with some type of bridge system.

The other routing system would be similar to the On-Beltline system, except that it would use local streets for a portion of the routes in order to collect more riders. This On- and Off-Beltline route would use Broadway instead of the Beltline on the east side and would use Whitney Way, Mineral Point Road, Junction Road, and John Q Hammons Drive on the west side-

Two Options – 30 minute day-long service

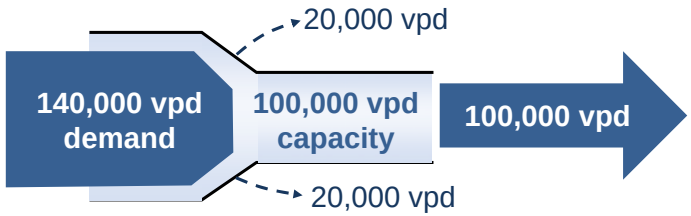


The On- and Off-Beltline with on-street stops captured more riders, with 2,100 daily boards in 2010 and up to 4,900 daily boards in 2050. Both options had no measureable effect on Beltline traffic volumes. A subsequent analysis, which included service to park and ride lots at strategic locations along the Beltline, provided only modest increases (200 riders) in daily boards.

Beltline 2010

Constrained vs. Unconstrained

Currently the Beltline is capacity constrained. This means that more travelers would like to use the Beltline, but because of Beltline congestion they find other routes to their destination. For example, 140,000 vehicles per day may want to use the Beltline, but there may only be capacity for 100,000 vehicles per day in a certain section. Those 40,000 vehicles then find other routes, times, or modes to avoid the Beltline congestion. The following figure illustrates this phenomena.

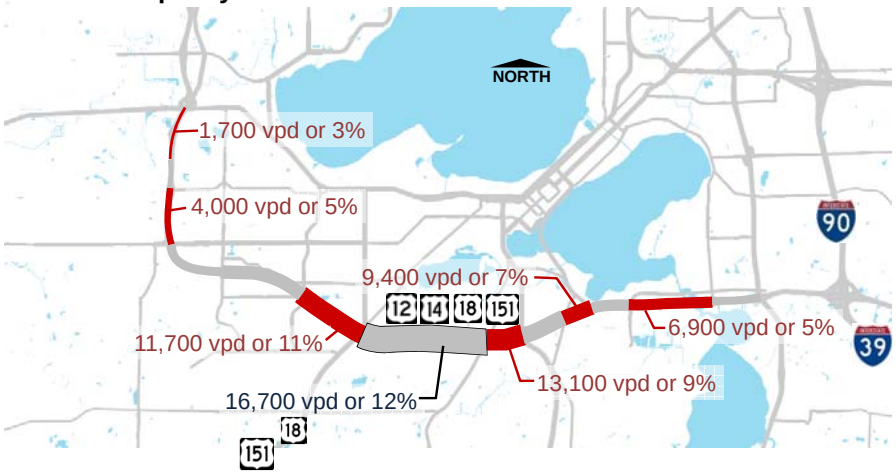


Some Beltline traffic must find other routes
vpd = vehicles per day

What would happen if the Beltline could handle all the traffic that wants to use it? (2010)

With the Madison Area Metropolitan Area's travel demand model, the PEL study removed capacity constraints from the Beltline to see how many travelers would use it if there were no congestion. The adjacent figure illustrates the results of the analysis. Predictably, Beltline sections that currently have the greatest congestion levels also see the greatest increase in traffic volumes if capacity constraints (e.g. congestion) were removed.

Amount of new traffic that would use the Beltline in 2010 if there were no capacity constraints



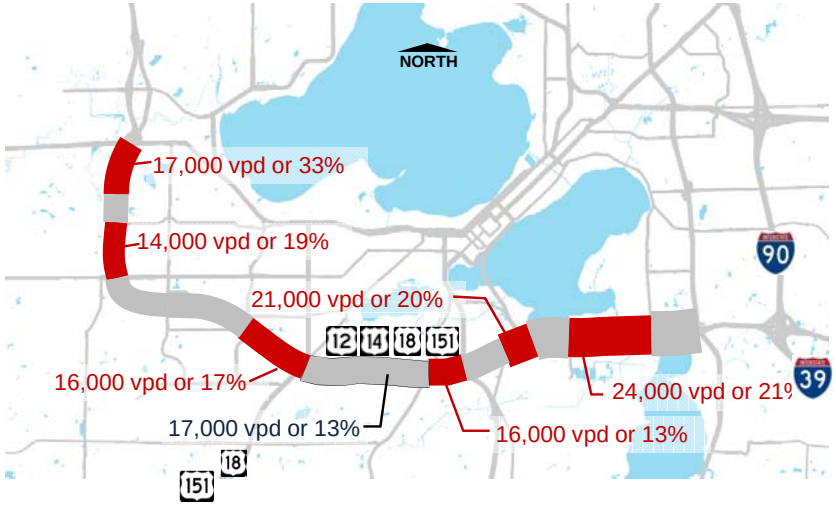
Beltline 2050

Metropolitan Growth

Dane County is projected to grow by over 150,000 residents between 2010 and 2050. Several exhibits at this public involvement meeting show where that growth might occur based on current land use plans. The graphic shows how much traffic would increase by 2050, even without any capacity expansion. The new residents, households, and employment in 2050 all create a travel demand on the Beltline, even in its congested state.

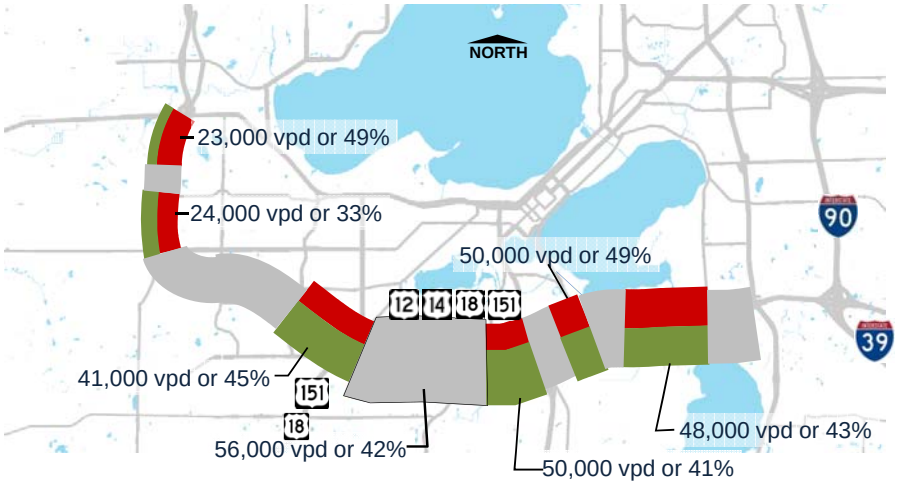
While the Beltline would see substantial traffic growth from 2010 to 2050 even without any capacity expansion, future growth projections will produce an even greater demand for Beltline use in 2050. More traffic desires to use the Beltline in 2050 but cannot because of the lack of capacity and prevalent congestion. With the Madison Area Metropolitan Area's travel demand model, the PEL study removed capacity constraints from the Beltline in 2050 to see how many travelers would use the Beltline if there were no congestion. The graphic illustrates the results of the analysis. The red band width represents the traffic growth that will occur if no changes to the Beltline were made. The green band width represents the additional traffic that would use the Beltline in 2050 if there were enough capacity.

Amount of new traffic that would use the Beltline in 2050 if the Beltline <u>remains as it is</u>.



vpd = vehicles per day

Amount of new traffic that would use the Beltline in 2050 if there were no capacity constraints (e.g., extra lanes).



vpd = vehicles per day

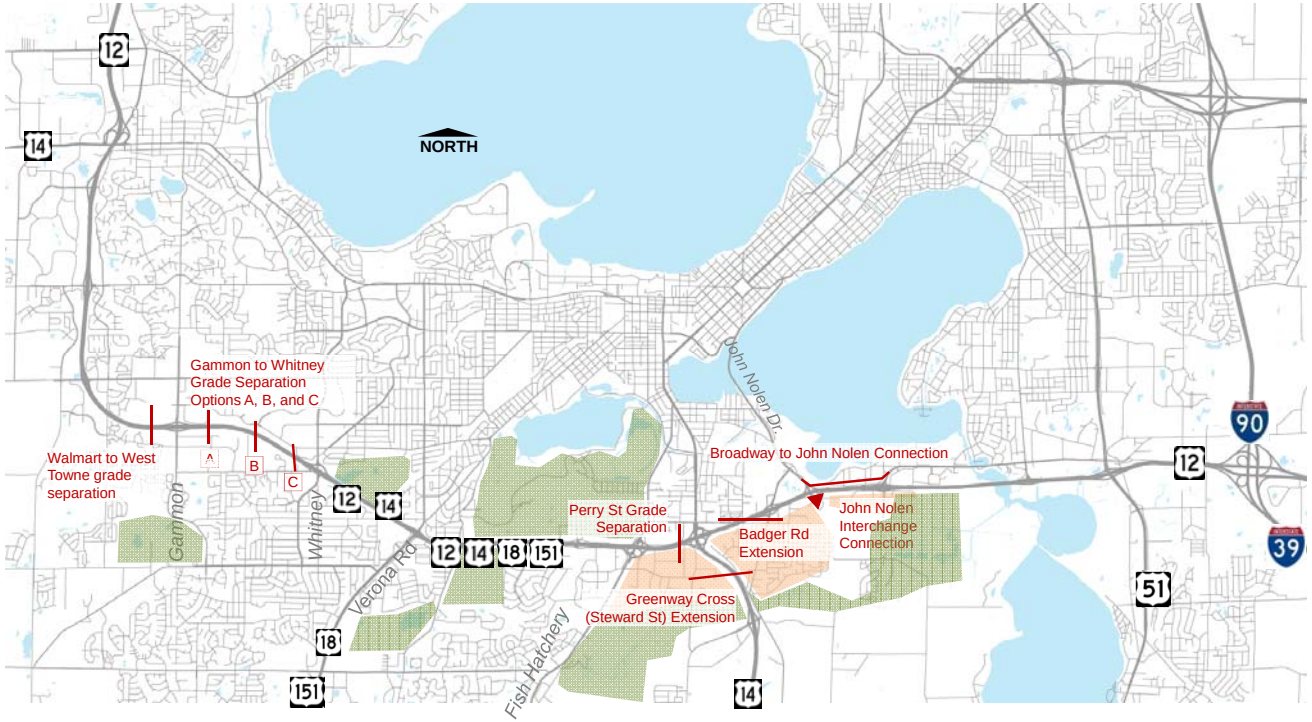
Future Analysis

Beltline crossing and connections

The following PEL objectives focus on increasing connections.

6. *Improve connections across and adjacent to the Beltline for all travel modes.*
9. *Enhance transit ridership and routing opportunities*
10. *Improve pedestrian and bicycle accommodations*

The PEL study is beginning to evaluate potential connections and how they might affect regional traffic patterns, aid transit routing, and provide more connections for bicycles and pedestrians. These connections could become components of strategies that are recommended for further evaluation in the future NEPA (Environmental Impact Statement) that is expected to follow the PEL. Future PEL public meetings will discuss the results of this evaluation in more detail.



Station – Next Steps

Next steps

The PEL study is now developing and evaluating individual improvement components which have the ability to satisfy some of the PEL objectives. Examples of improvement components include adding grade separated crossings of the Beltline, or extending bike accommodations on routes parallel to the Beltline. These improvement components, while not able to fully satisfy all PEL objectives, may be effective at addressing a specific objective and have individual merit.

The Beltline PEL objectives address a variety of transportation modes and no one improvement concept will be able to fully address all PEL objectives. Therefore multiple improvement components will be assembled into one, multi-faceted, strategy package. Typically a strategy package will have a major people-moving measure with complementary improvements that address multi-modal and connection objectives. These strategy packages will be evaluated against the PEL screening criteria to determine how well they meet all of the objectives of the PEL study. Those showing promise will be recommended for further more detailed study in a subsequent environmental document.

Strategy development process

Develop and Test Stand-alone Strategies

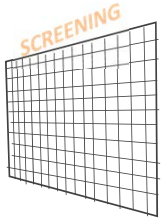
Examples:
- Bus Rapid Transit
- Transport 2020 (Rail)
- Beltline Buses
- North Mendota Corridors
- South Reliever
- Beltline Improvements

Develop and Test Individual Improvement Components

Examples:
- Transit lane additions
- Extra grade separations of Beltline
- Parallel bike accommodations
- Park & Rides with bus service

Assemble Improvement Components into Strategy Packages

Examples:
- Some type of major roadway/transit improvement with accommodations for local road connections, new bike accommodations, extra transit facilities/ accommodations



Screen

Identify Strategies to Bring Forward into NEPA