

# Bishop Area Access and Circulation Study (BAACS) Paramics Model Report December 28, 2005



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# Introduction

## Study Background

US 395, one of the four major north south interregional routes in the State of California is also the City of Bishop's Main Street. The Bishop Area Access and Circulation Study (BAACS) project was initiated in response to a request from the City of Bishop and Inyo County, as expressed in a letter from the Executive Director of the Inyo County Local Transportation Commission (LTC) dated September 9, 2002 and a letter from the City of Bishop dated March 12, 2002. The requests were prompted by concerns about congestion in the Central Business District (CBD) and the perception that through commercial vehicle traffic had increased.

In order to promote business use in the Bishop downtown district the City of Bishop strongly desires to make the Bishop CBD a more walkable and livable area. Increasing levels of truck traffic in the Bishop area along US 395 have resulted in perceived traffic congestion, a sense of hazard to pedestrians and bicyclists, and an increase in noise and air pollution. These factors have combined to give the impression of a decrease in the sense of a livable walkable downtown district. In addition, the most direct route to the Eastern Sierra Regional Airport, the intersection of Line Street and US 395 does not accommodate a large commercial vehicle turning radius. This deficiency results in large commercial vehicles taking indirect routes along Bishop City streets in order to access the Bishop airport.

Some of the major goals expressed for this project are:

- The alternate route provides better access to the Bishop Airport (especially for trucks)
- The alternate route removes or reduces the perceived increasing amount of trucks on Bishop's Main Street
- The alternate route will not affect typical tourist traffic that uses Bishop for goods and services

### The anticipated product:

- Existing and future projected traffic conditions in and around the Bishop area
- Various alternate routes around the Bishop CBD to view the effect on traffic conditions
- Various alternatives of extending, modifying, changing existing surface streets and the resulting affect on traffic conditions
- With the prior three in mind, a product that can be shown to: Caltrans, Inyo County, the City of Bishop and public to help make decisions for improving traffic circulation in and around the Bishop area.

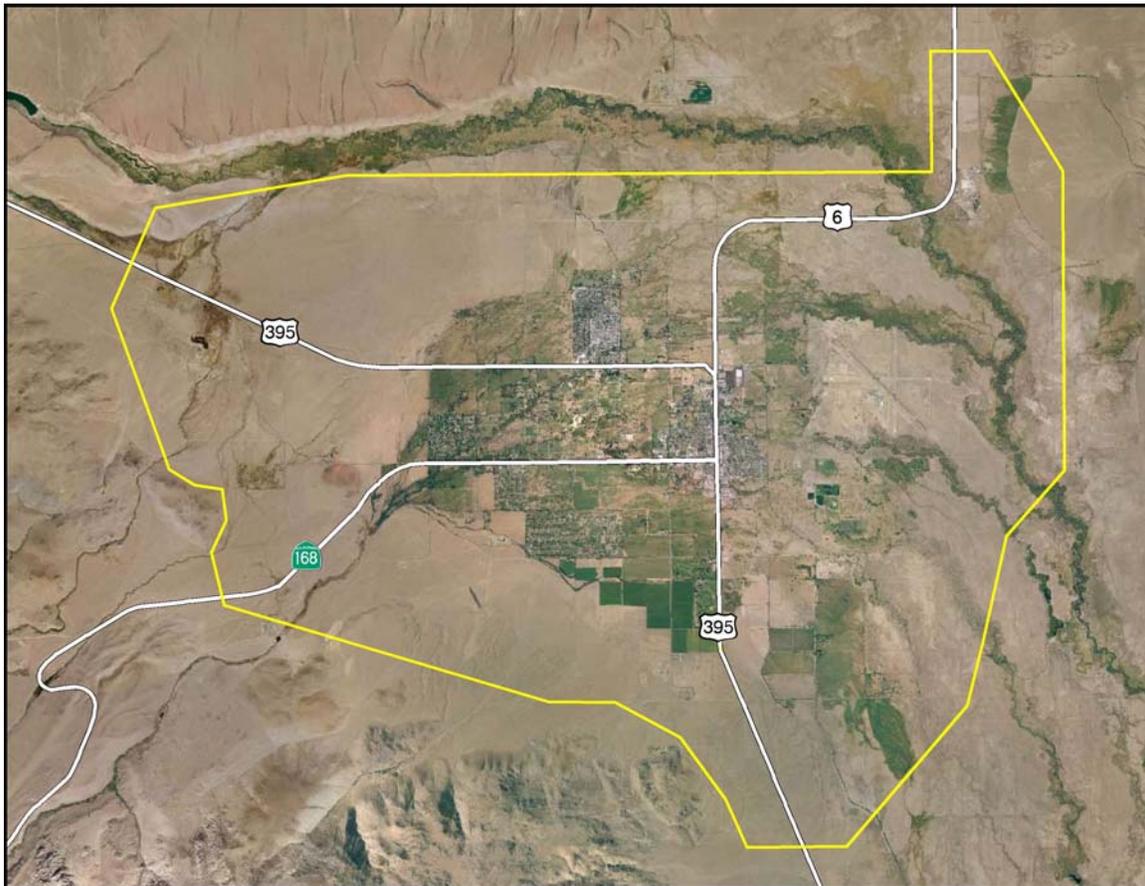
## Study Area

The City of Bishop and surrounding unincorporated area is a community of approximately 10,000 nestled in the Owens Valley on the Eastern Slopes of the Sierra

Nevada Mountain Range. US 395 is the main street through the community, as well as a major interregional transportation corridor connecting the four states of California, Nevada, Oregon, and Washington. Outside the City of Bishop, US 395 is a four-lane high-speed rural principal arterial. US 6 connects with US 395 at the north end of the City of Bishop and has become an increasingly favored route for interregional truck traffic to connect the port facilities of Los Angeles with the warehousing industry in Northern Nevada. Recently, a 130,000-acre warehousing business park has been approved in the Northern Nevada area making it one of the largest business parks in the world and is expected to increase truck traffic in the study corridor. Locally, Bishop is not expected to grow due to the large amount of public land holdings around the community. However, interregional traffic is expected to increase throughout the study corridor.

Peak periods of travel occur on Friday afternoon as travelers from the Los Angeles area are traveling to Mammoth Mountain, Yosemite National Park, or other destinations in the area. Likewise, peak periods occur again on Sunday afternoon as these travelers make the return trip home.

**Figure 1 Aerial Photograph of the Bishop Model Study Area**



# Paramics Model Network

## Modeled Period and Network Coding

The model was built to include conditions over a 1 hour period between 14:00-15:00 covering the Friday PM period when Bishop schools, local, and interregional traffic are all on the system during the same time period.

A Geographical Information System roads layer was used and subsequent conversion program to build the Paramics network. The zoning system was derived based on an overview of the area and known and estimated trip origination and destination areas within the study area.

Detailed observations from field surveys and the Caltrans Digital Highway Inventory Photography Program (DHIPP) were utilized to obtain the following information:

- Intersection configurations; and
- Lane definitions including link speeds

## Road Hierarchy/Classifications

The road hierarchy utilized within the model was developed by District 9 Traffic Operations and Planning during the initial network development. Some refinement of these classifications was conducted throughout the model development stage for calibration purposes.

## Routing

Base cost for links with Paramics is calculated using the following generalized cost equations:

$$\text{Cost} = aT + bD + cP, \text{ where}$$

T = travel time for trip/travel time link

D = distance of trip/length of link

P = monetary cost of trip or link

The model includes multiple routes between origin and destinations and the methodology used to assess the sensitivity of different proportions influencing the formula for route choice decisions. Familiarity with the routes in the City has an impact on route choice and for the model was set at 65%. The assumption of 65% was based on traffic counts within the study area and determining the difference in interregional and local traffic. Cost factors for Home and Hanby Street were set at 1.2 to allow for the dips on these routes that cause some delays for motorists. In town local roads such as side streets were set at 2.0, while main routes such as US 395, US 6, SR 168 and East Line street were set at 1.0. Cost coefficients were refined throughout the calibration process to calibrate the model with observed traffic counts.

## Vehicle Types

The two trip matrices developed were into the following 10 vehicle types where passenger vehicles were in matrix 1, while trucks were coded into matrix 2:

**Table 1 Vehicle types**

Vehicle Type	Matrix	Proportion %
Compact	1	10
Sub-Compact	1	15
Full Size Sedan	1	20
Mini-Van	1	15
SUV	1	30
Full Size Pickup	1	10
Delivery Truck	2	3
California Design Truck	2	50
STAA Design Truck	2	47

## Trip Matrix Development

### Zoning

Due to large area being modeled, a total of 54 zones were developed. The Zones were applied as origin and destination points throughout the City of Bishop, as well as on the interregional routes.

### Matrix Estimation

The matrix estimation process involved two inputs; a travel pattern (pattern matrix), And surveyed traffic flow data. Since the City of Bishop has never had a model developed, this model was developed from scratch, without any prior pattern matrix to assist in model development.

Two matrices were developed, one for trucks and one for cars, for the one hour modeled period between 14:00 and 15:00.

Matrix Number	Vehicle Type	Modelled Period 14:00 to 15:00
1	Cars	4692
2	Trucks	45
Total		4737

## **Profiles**

Surveyed traffic data for most locations was conducted prior to model development and were based on hourly data. This information was utilized for pattern matrix development as well as calibration of the demand matrix.

## **Model Calibration and Validation**

### **Calibration Process**

The calibration process includes tasks undertaken to achieve a satisfactory representation of the traffic flows and conditions within the base year model. The calibration of the City of Bishop traffic model included the following:

- Stoptline position refinement,
- 'Next lanes' to improve merging and intersection movement,
- Signposting,
- Lane choices to improve driver decision points,
- Matrix Calibration,
- Matrix estimation,
- Manual matrix manipulation.

### **Validation Process**

Given the magnitude of this model, validation goals were set that were deemed appropriate for the model size. The Mean GEH statistics used for model development was a threshold of a  $GEH < 5$  with regard to simulated and observed data comparisons. Visual audits of the network occurred, as well as travel times and hourly flows comparing observed to simulated outputs.

### **Model Assumptions**

The following assumptions were incorporated in the development of this model.

- Numbers close to the 30<sup>th</sup> highest hour for the State Highway system were used in the development of this model.
- The Model time period is a typical Ski Weekend Friday and the period analyzed is from 14:00 to 15:00.
- The Caltrans District 9 Growth Rate of 1% from the year 2000 was applied to the 2004 counts.
- Truck traffic is based on actual truck counts for the Fish Springs Weigh in Motion Station for the year 2004.
- Locally generated Bishop traffic is not expected to increase significantly due to the low amount of development in the Bishop area, however minor increases due to development in the Tri Valley area of Mono County is assumed in this model.
- Driveways in the Bishop area are not included in the model and may impact congestion.

## **Model Scenarios/Results**

The project team requested that various scenarios be analyzed in the Bishop Paramics model. Both a base year model for existing traffic volumes for the year 2004 and future 2025-year models were developed. These two models contain no improvements to the existing network. Simulated on-screen traffic runs were compared in the Paramics modeler program while three measurement parameters were developed from Paramics analyzer reports, which include Link Speed, Percent Time Delay, and Link Counts.

More scenarios were developed as a result of suggestions from the Project Development Team, the Project Technical Team, as well as public recommendations and input from the various public meetings for this project.

The following model results indicate notable changes that occur on various streets and highways throughout the network for the modeled hour of 14:00 to 15:00. Figure 15 illustrates the difference in link counts for each scenario. It should be noted that every effort has been made to reflect reality to the extent possible, however no model can ever predict exact, real world conditions. Real world influences such as specific route choice, weather, or other behaviors that affect driving habits may not be fully incorporated into the results.

**Figure 2 Bishop Base 2004 and Projected 2025 Model**



**Existing Base year and 2025 Projection – Friday 14:00 to 15:00**

- Minor increases in locally generated traffic expected for the Bishop area, mainly from projected development in the Tri-Valley area of Mono County.
- Interregional traffic is expected to increase for the modeled hour by approximately 200 (20%) vehicles for US 395.
- More signal green time required to service travelers on US 395.
- Side street delay and congestion for travelers crossing and entering US 395 from streets such as West and East Line, Grove, Yaney, Park and Highway 6 will increase.

**Figure 3 Bishop Jay Street extension in combination with the B Street alignment**



**Bishop Jay Street extension in combination with the B Street alignment –  
Friday 14:00 to 15:00**

- US 395 experiences approximately a 250-vehicle (25%) reduction below projected year 2025 volumes with the Jay and B Street alignments.
- The intersection of Wye Road and US 6 experiences an approximate 70-vehicle (77%) increase when this alignment is modeled, due to an increase in motorists using this junction.
- US 395 experiences approximately a 150-vehicle (19%) reduction below projected 2025 volumes for Northbound Traffic at Rocking W.
- US 395 experiences approximately a 180-vehicle (24%) reduction below projected 2025 volumes for Southbound Traffic at Rocking W.

**Figure 4 East Truck Route Tie in at Gerkin Road**



**East Truck Route Tie in at Gerkin Road – Friday 14:00 to 15:00**

- US 395 experiences approximately a 500-vehicle (50%) reduction below projected 2025 volumes for Northbound Traffic at Church Street.
- US 395 experiences approximately a 350-vehicle (42%) reduction below projected 2025 volumes for Southbound Traffic at Church Street.
- Westbound Wye Road experiences a 300-vehicle (21%) increase with this alternative.
- US 395 experiences approximately a 150-vehicle (19%) increase above projected 2025 volumes for Northbound Traffic at Rocking W.
- US 395 experiences no significant change for projected 2025 volumes for Southbound Traffic at Rocking W.



**Figure 6 See Vee Extension with Sierra Street Extension**



**See Vee Extension with Sierra Street Extension – Friday 14:00 to 15:00**

- US 395 experiences a 75 vehicle (8%) reduction for northbound traffic at Church Street.
- US 395 experiences a 150 vehicle (18%) reduction for southbound traffic at Church Street.
- US 395 experiences approximately a 100-vehicle (12%) decrease below projected 2025 volumes for Northbound and Southbound Traffic at Rocking W.
- Wye Road volumes are reduced by approximately 100 vehicles (43%).
- West Line street volumes are reduced by approximately 100 vehicles (27%) at the junction of US 395 and Line Street.
- West Line Street Volumes are reduced by approximately 150 vehicles (37%) at the junction of West Line and Fowler Streets.

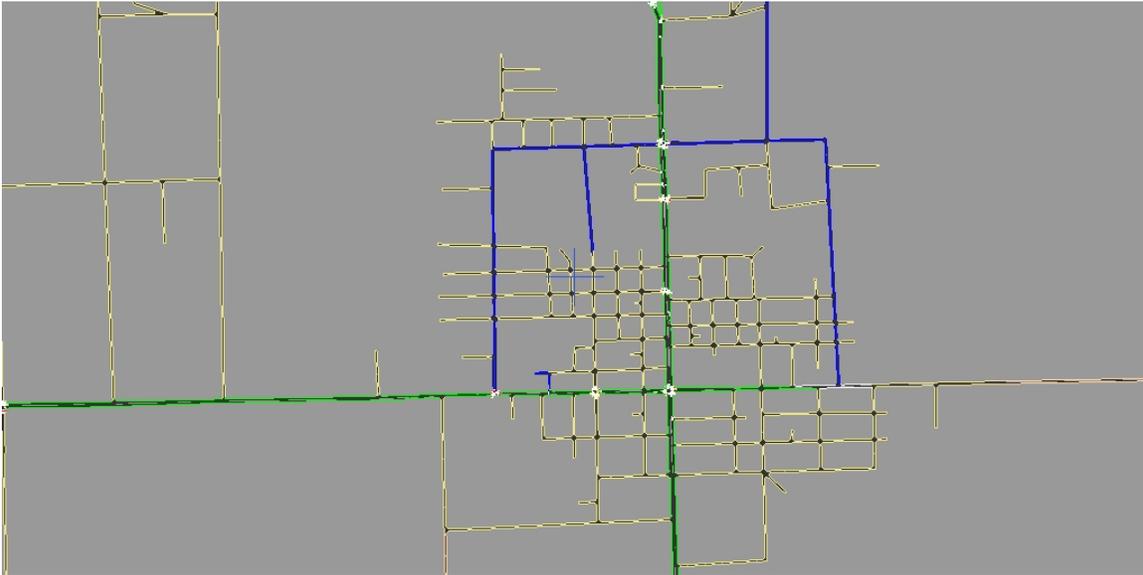
**Figure 7 West Truck Route**



**West Truck Route – Friday 14:00 to 15:00**

- US 395 experiences approximately a 500-vehicle (50%) reduction below projected 2025 volumes for Northbound Traffic at Church Street.
- US 395 experiences approximately a 400-vehicle (48%) reduction below projected 2025 volumes for Southbound Traffic at Church Street.
- US 395 experiences approximately a 300-vehicle (37%) reduction below projected 2025 volumes for Northbound Traffic at Rocking W.
- US 395 experiences approximately a 400-vehicle (53%) reduction below projected 2025 volumes for Southbound Traffic at Rocking W.

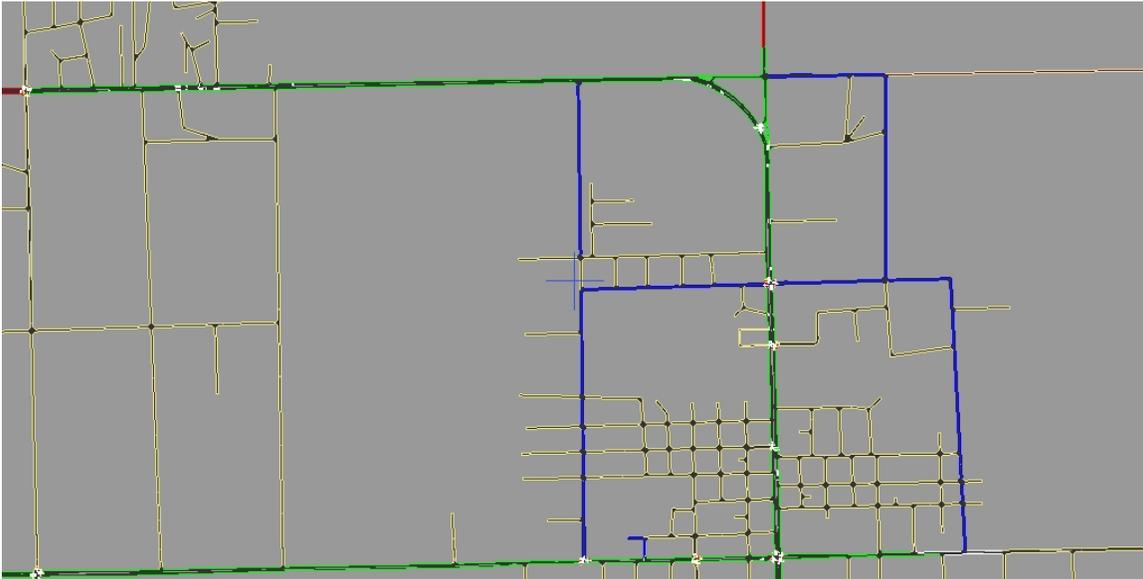
**Figure 8 Fowler Extension**



**Fowler Extension – Friday 14:00 to 15:00**

- Approximate 50 Vehicle increase on West Line Street

**Figure 9 Home Street Extension**



**Home Street Extension – Friday 14:00 to 15:00**

- No significant changes to projected volumes.

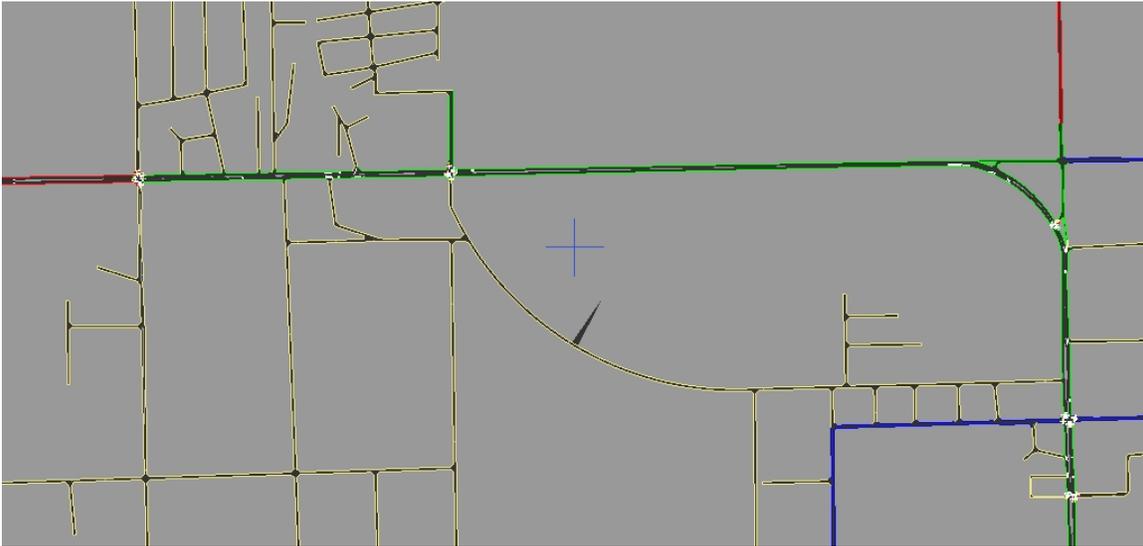
**Figure 10 East Truck Route with North Sierra Connector**



**East Truck Route with North Sierra Connector – Friday 14:00 to 15:00**

- US 395 experiences approximately a 560-vehicle (56%) reduction below projected 2025 volumes for Northbound Traffic at Church Street.
- US 395 experiences approximately a 600-vehicle (71%) reduction below projected 2025 volumes for Southbound Traffic at Church Street
- US 395 experiences approximately a 300-vehicle (37%) reduction below projected 2025 volumes for Northbound Traffic at Rocking W.
- US 395 experiences approximately a 400-vehicle (53%) reduction below projected 2025 volumes for Southbound Traffic at Rocking W.
- Westbound Wye Road volumes increase by approximately 50 (61%) vehicles.
- East Line Street volumes decrease by approximately 50 vehicles (68%).

**Figure 11 Sierra Street Extension**



**Sierra Street Extension Including See Vee Extension – Friday 14:00 to 15:00**

- US 395 experiences no significant change for projected 2025 volumes for Northbound Traffic at Church Street.
- US 395 experiences approximately a 50-vehicle (6%) increase above projected 2025 volumes for Southbound Traffic at Church Street
- Eastbound Wye Road experiences a 100 vehicle (43%) reduction below projected 2025 volumes.

**Figure 12 Spruce Street Extension**

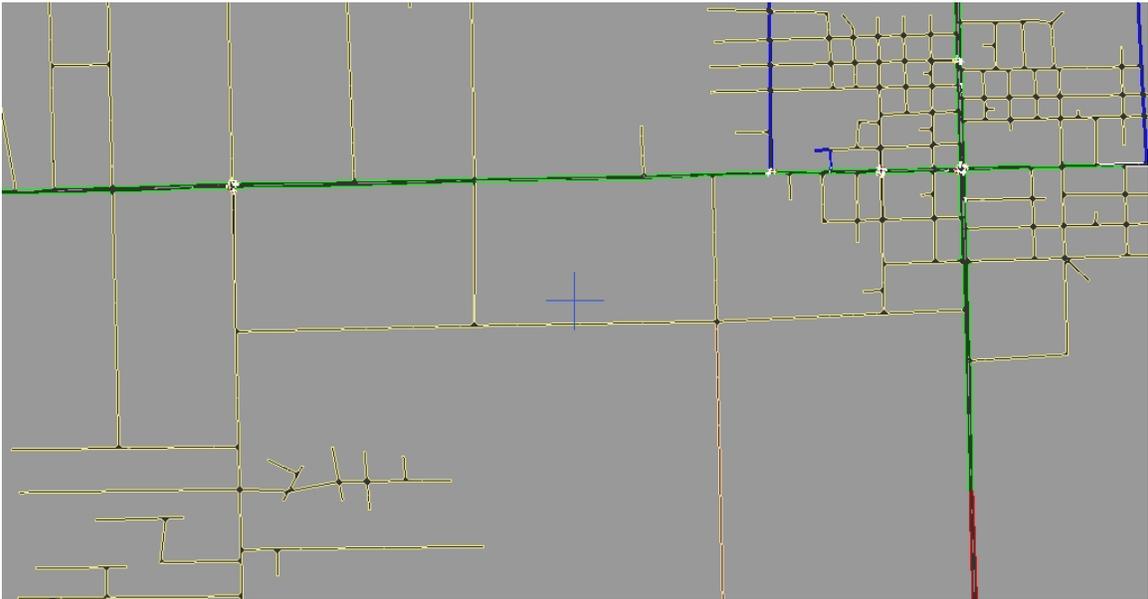


**Spruce Street Extension**

- Eastbound Wye road experiences a 100 vehicle (37%) reduction below projected 2025 volumes



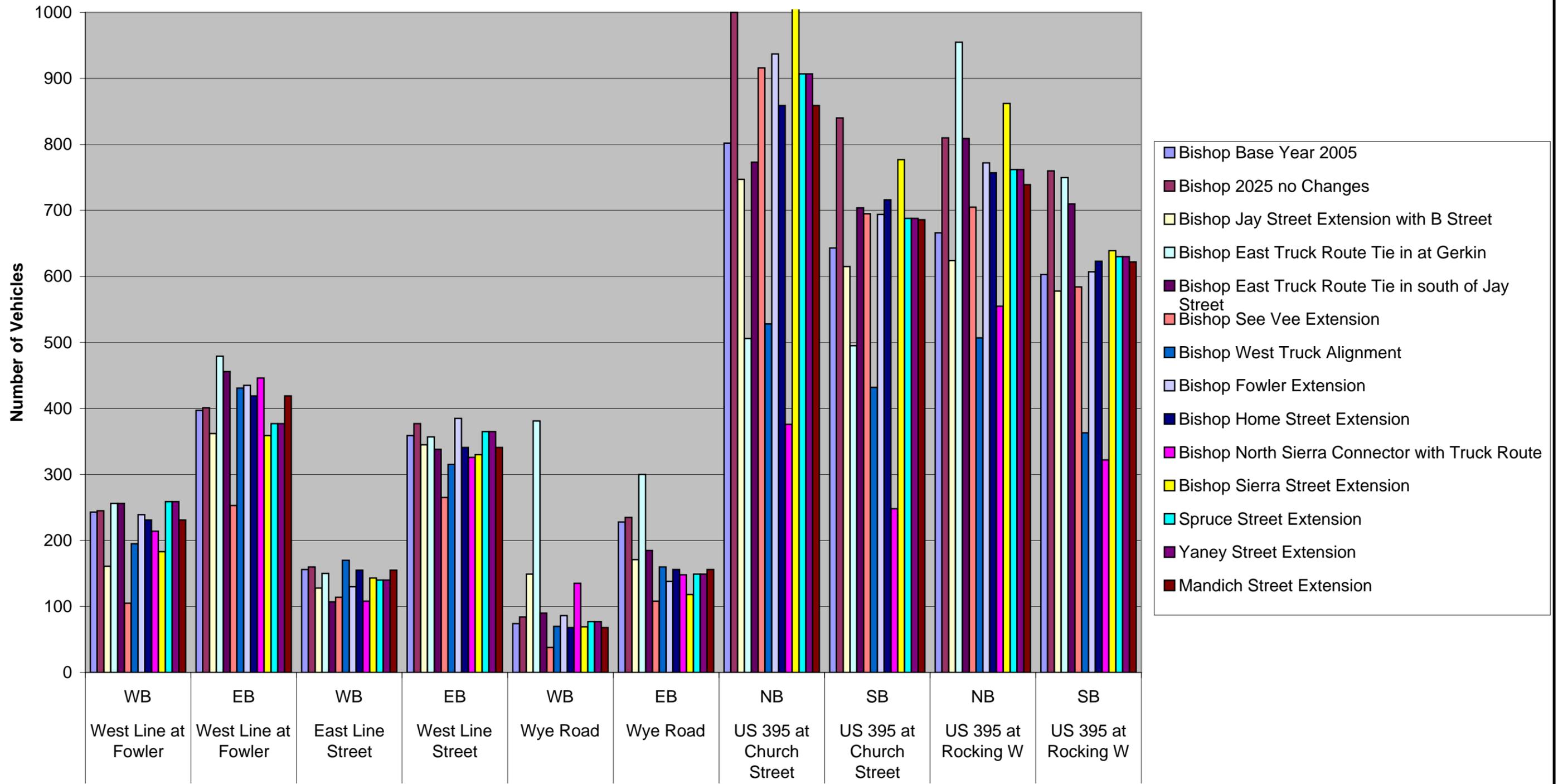
**Figure 14 Mandich Extension**



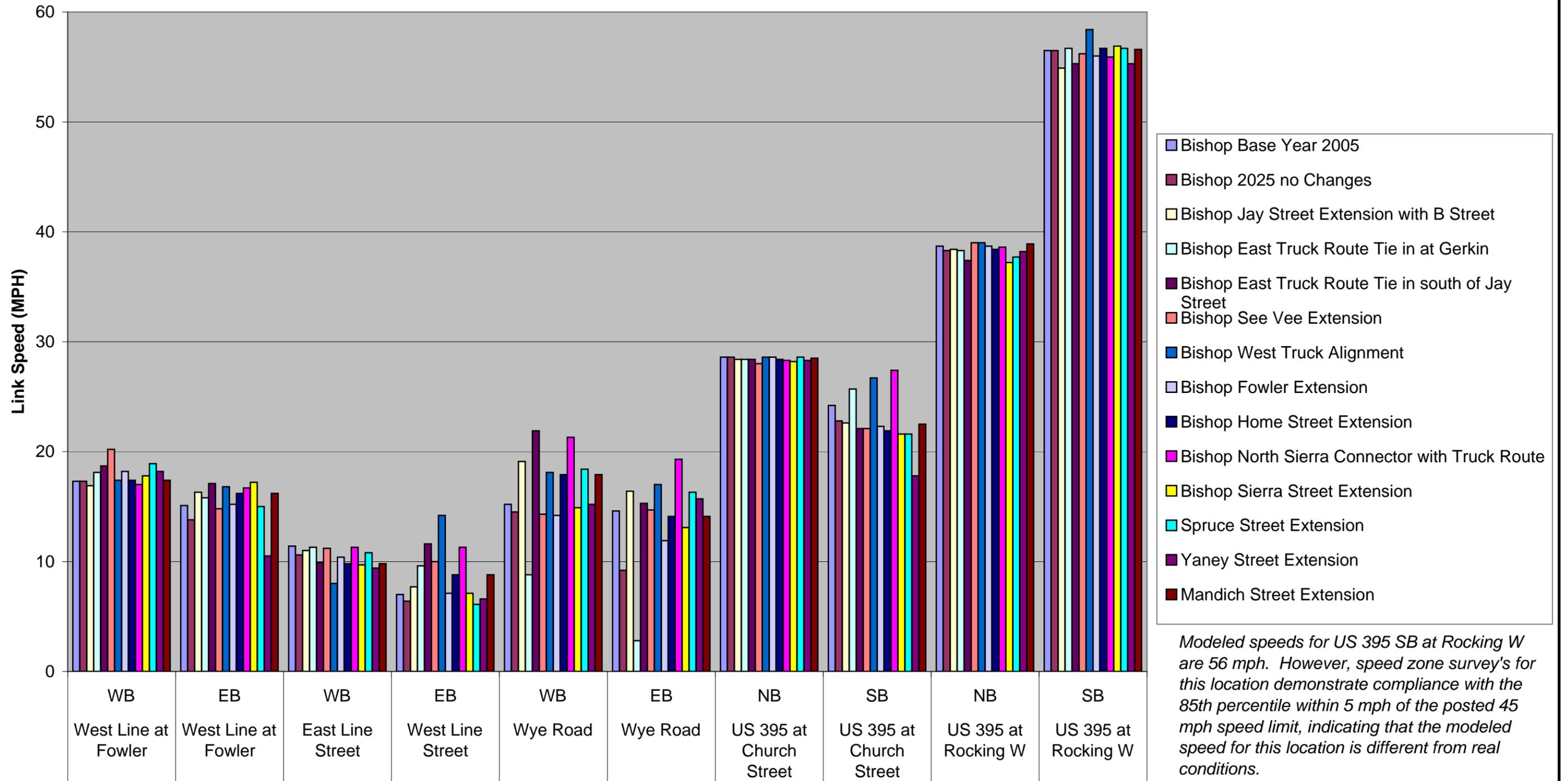
**Mandich Extension**

- US 395 experiences approximately a 150-vehicle (14%) reduction below projected 2025 volumes for Northbound Traffic at Church Street.
- US 395 experiences approximately a 150-vehicle (82%) reduction below projected 2025 volumes for Southbound Traffic at Church Street
- US 395 experiences approximately a 70-vehicle (9%) reduction below projected 2025 volumes for Northbound Traffic at Rocking W.
- Eastbound Wye road experiences a 80 vehicle (34%) reduction below projected 2025 volumes

# Link Counts



# Model Link Speed





# Zone Boundary Maps

