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## MEMORANDUM

DATE: June 20, 2013  
TO: Matilda Deas, City of Canby  
FROM: Chris Maciejewski, PE, PTOE  
Tegan Enloe, PE  
Steve Boice, PE  
Brad Coy, PE



SUBJECT: Canby Southeast 13<sup>th</sup> Avenue Pedestrian Study

P# 11010-017

The Canby Southeast 13<sup>th</sup> Avenue Pedestrian Study was identified as a Financially-Constrained project in Canby's 2010 Transportation System Plan (TSP). The purpose of this study is to evaluate existing pedestrian safety conditions along Southeast 13<sup>th</sup> Avenue and identify traffic calming and other pedestrian safety improvements that may benefit the facility prior to constructing the Sequoia Parkway Extension to Southeast 13<sup>th</sup> Avenue.

This memorandum describes the project study area, project background, methodology, stakeholder feedback, review of crash and traffic data, pedestrian safety findings, additional findings, and recommendations.

### Project Background

During the City's 2010 TSP update process, residents in southern Canby expressed concerns about truck traffic and other safety needs on Southeast 13<sup>th</sup> Avenue, which is a residential area that has nearby schools and parks. Additional concerns were also expressed that future development of the Canby Pioneer Industrial Area may increase truck traffic on the section of Southeast 13<sup>th</sup> Avenue east of South Ivy Street, especially if Sequoia Parkway is extended to connect to Southeast 13<sup>th</sup> Avenue.<sup>1</sup>

Travel demand modeling performed in conjunction with the 2010 TSP (see the Canby Pioneer Industrial Area Connectivity Analysis included as Attachment A) indicated that the Sequoia Parkway Extension would primarily result in only minor changes to local circulation (i.e., traffic reductions on Redwood Street between South Township Road and Southeast 13<sup>th</sup> Avenue). Figures are provided in Attachment B

<sup>1</sup> The Sequoia Parkway Extension (Township Road to Southeast 13<sup>th</sup> Avenue) was identified in the 2010 TSP as part of the "Preferred Package," meaning that insufficient City revenues would be available to construct the project over the 2030 planning horizon unless additional funds were obtained.



showing projected impacts to truck routing. However, in response to residents' concerns, the 2010 TSP identified a project for Southeast 13<sup>th</sup> Avenue (Project N3) that included additional safety analysis as well as the associated traffic calming and other safety improvements that would result from the study. This project was included in the "Financially-Constrained Package" with a note that it should be performed prior to constructing the Sequoia Parkway Extension (which was part of the "Preferred Package") to improve safety on Southeast 13<sup>th</sup> Avenue. In addition, TSP Policy 2.h indicates that "prior to completing an extension of Sequoia Parkway to Southeast 13<sup>th</sup> Avenue, [the City should] complete a traffic safety study and construct improvements along Southeast 13<sup>th</sup> Avenue to manage vehicle speeds (improving compliance with the 25 mph speed zone) and to improve safety for pedestrians."

## **Methodology**

The following steps were completed as part of this safety evaluation in order to better understand the citizen's safety concerns and address the traffic calming and pedestrian safety needs of the corridor:

- Development of a citizen survey questionnaire and synthesis of results
- Outreach to the Canby Police Department and school bus service with routes on Southeast 13<sup>th</sup> Avenue
- Review of count, vehicle classification, and speed data collected on Southeast 13<sup>th</sup> Avenue
- Review of crash data recorded between 2007 and 2011
- Field visit to observe existing conditions
- Summary of findings and recommended pedestrian safety improvements to address pedestrian safety issues

The results of these activities are described in the remainder of this memorandum.

## Project Study Area

The project study area includes Southeast 13<sup>th</sup> Avenue in Canby, Oregon, between South Aspen Way and South Forest Road (see Figure 1). The following sections summarize the current roadway users and surrounding land uses while Figure 2 shows existing features within the study area.

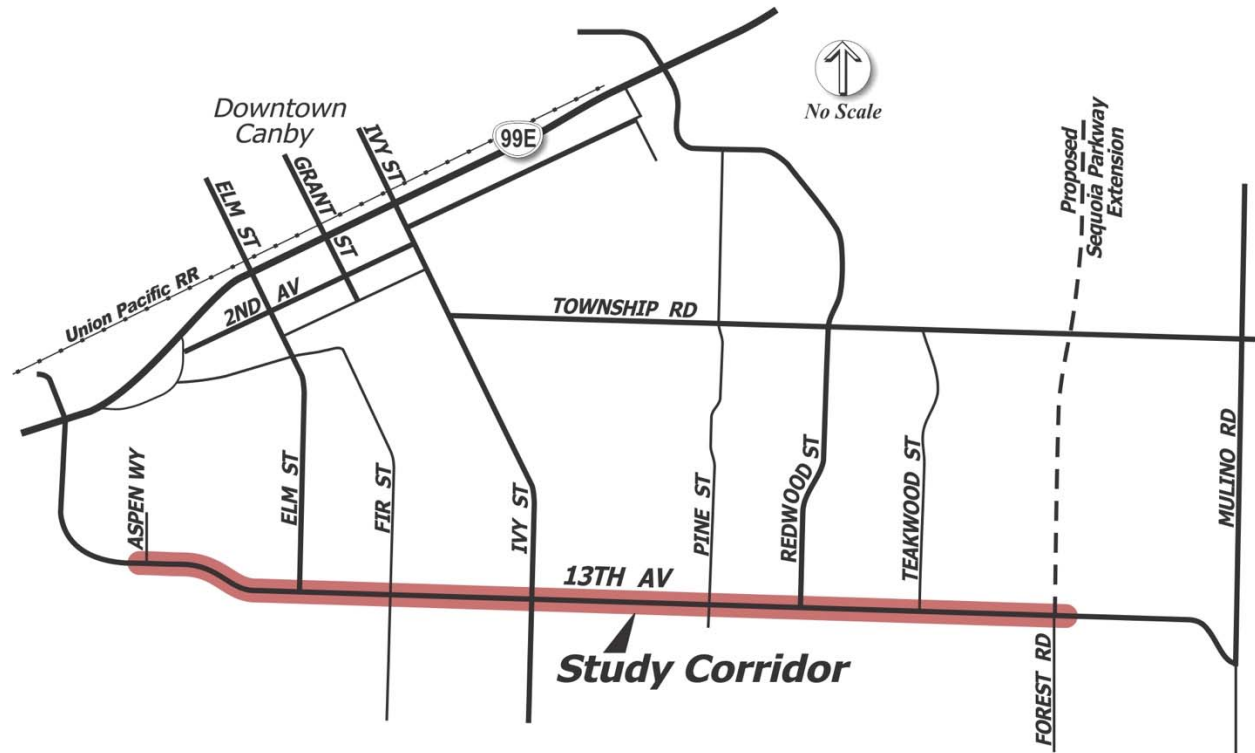


Figure 1: Project Study Area

## Motorized Vehicles

Southeast 13<sup>th</sup> Avenue is classified as an arterial roadway by the City and has a posted speed limit of 25 mph between Highway 99E and South Teakwood Street. There is no posted speed east of South Teakwood Street. The roadway has a two-lane cross-section (one in each direction) with turn lanes provided at key intersections. Parking is provided on the north side of the street in some areas and prohibited on the south side (see Figure 2). Intersections within the study area are stop controlled on the minor approach, with the exception of two. The intersection with South Ivy Street is a signalized intersection, and the intersection with South Elm Street is an all-way stop controlled intersection. Roadway lighting is provided along the corridor.

## Pedestrians and Bicycles

Continuous sidewalk is provided on the north side of Southeast 13<sup>th</sup> Avenue from the west project limit to South Teakwood Street. Intermittent sidewalk is provided on the south side, with a gap between South Ivy Street and South Lupine Street, and none provided east of South Ponderosa Street. Striped bike lanes are provided on both sides of the roadway between Highway 99E and South Teakwood Street.

Marked crosswalks are provided at some intersections along the corridor, as indicated in Figure 2. Pedestrian refuge median islands are provided at the intersections of South Birch Court, South Elm Street, South Lupine Street, and South Pine Street.

## Surrounding Uses

Two school zones are present on Southeast 13<sup>th</sup> Avenue within the study area. The school zone provided for Canby High School starts east of South Aspen Way and stops east of South Elm Street. Its reduced 20 miles-per-hour (mph) speed limit is active between 7:00 AM – 5:00 PM. The second school zone extends between South Ivy Street and South Pine Street and is provided for Ackerman Junior High School.

The reduced 20 mph speed limit is in effect when the flashing beacons are in use between 7:00 AM – 10:30 AM and 2:30 PM – 4:00 PM<sup>2</sup>.

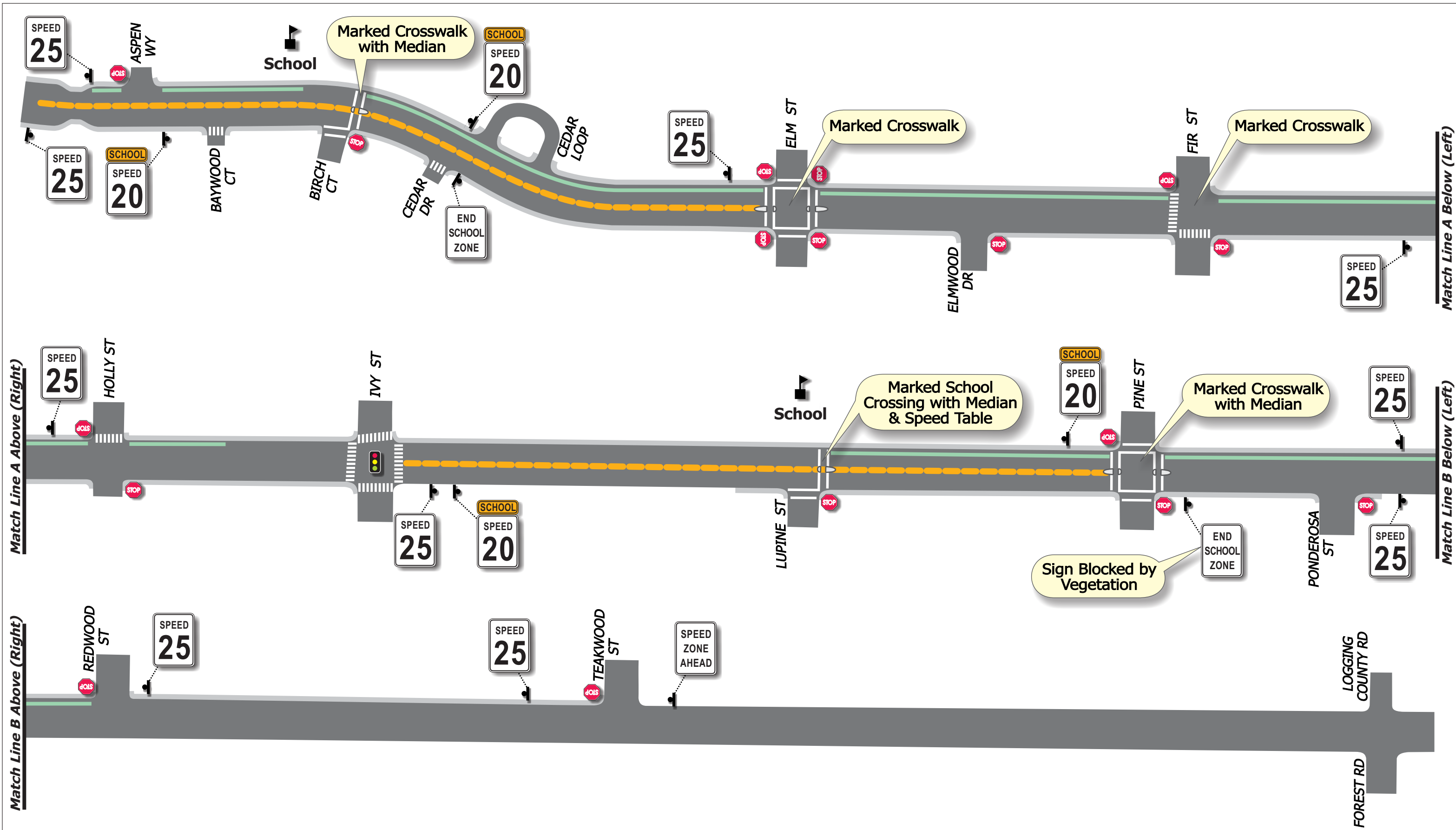


*After School Crossing at S Lupine Street with Crossing Guard*

Southeast 13<sup>th</sup> Avenue is surrounded primarily by residential land use, with farmland on the eastern boundaries of the study area. In addition to the two schools and parks, the Canby Adult Center is located in the northeast corner of the intersection of Southeast 13<sup>th</sup> Avenue/South Ivy Street. The combination of the schools and adult center attracts both younger and older roadway users as drivers and pedestrians. During field visits school children were observed using and crossing Southeast 13<sup>th</sup> Avenue to walk to/from the school, as well as for use by the High School track/cross-country team for training.

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<sup>2</sup> Email from Matilda Deas, City of Canby, March 18, 2013.



**LEGEND**

- Traffic Signal
- Stop Sign
- Sign/Post
- School Zone
- Parking
- Sidewalk

**DKS**

No Scale

**Figure 2**

**EXISTING FEATURES**





## Stakeholder Feedback

Stakeholder feedback was collected as part of the study from the citizens of the project area, the Canby Police Department, and First Student School Bus service.

### Citizen Survey

A citizen survey was developed as part of this project and provided to citizens by the City of Canby. A copy of the survey is provided as Attachment C.

Citizens were identified and asked to complete the survey based on their involvement in neighborhood associations, living arrangements in proximity to the study area, and involvement in activities generated by the school and/or events center. A total of 20 completed surveys were received and used to identify key pedestrian crossing locations, crossing behaviors, and solicit feedback on observed driving trends that may impact or contribute to pedestrian safety. A summary of the survey findings are provided in Figure 3. A more detailed summary is provided as Attachment D.

Input from the citizens showed driver speeding concerns near Canby High School and east of Ackerman Junior High School. Citizens also requested enhanced crossing treatments at South Fir Street, South Ivy Street, South Lupine Street, and South Pine Street. This information was used to help establish locations for volume and speed data collection. In addition, citizens indicated that drivers occasionally run the stop sign at South Elm Street.

### Canby Police Department

The Canby Police Department was contacted as part of this study to solicit feedback on observed driver behaviors. The police department did not identify any specific areas of concern, but did provide a record of speeding citations issued on Southeast 13<sup>th</sup> Avenue within the project study area. Between 2007 and January of 2013 a total of 413 citations were issued.

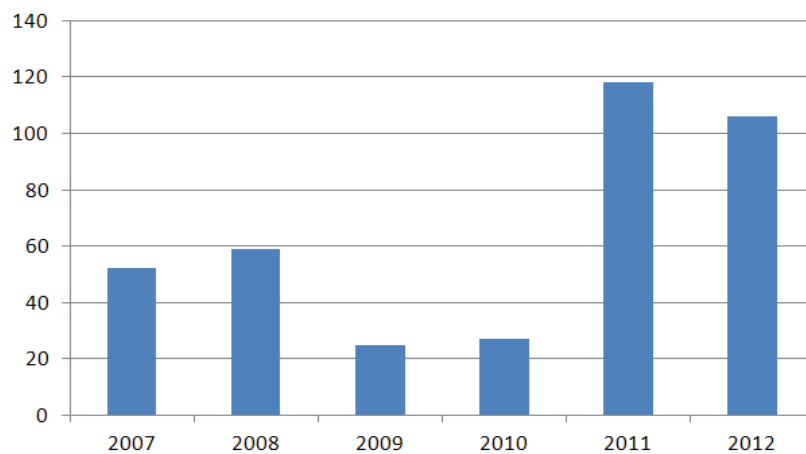
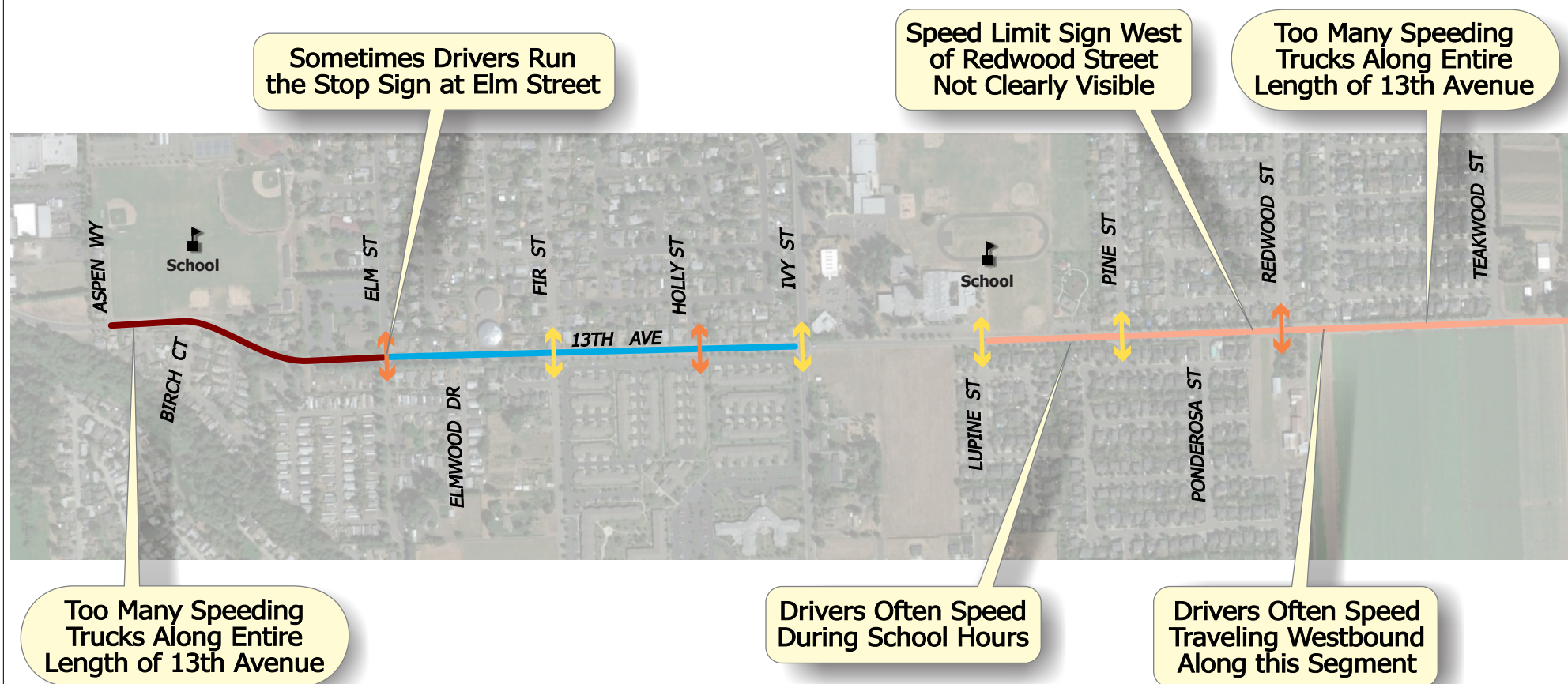


Figure 4: Speeding Citations Issued on SE 13th Avenue

Figure 4 shows the trend of citation issued over the past six years. The figure shows a large increase starting in 2011 and 2012, with the number of citations more than tripling from 2010. This could either be the result of increased speeding related behavior or increased patrol by officers. The majority of these citations (46 percent between 2007-2012) were issued near the intersections of South Fir Street and South Holly Street. These intersections lie between the two school zones.



**LEGEND (Based on Citizen Questionnaire)**

**13th Avenue - Pedestrian Crossing**

- Key Crossing Point
- Key Crossing Point (In Need of Crossing Enhancements)

**13th Avenue - Vehicle Speeding**

- West of Elm Street
- Between Elm & Ivy Streets
- East of Ackerman Middle School

**DKS**



No Scale

**Figure 3**

**CITIZEN SURVEY RESULTS**



## **First Student School Bus**

First Student School Bus Service was contacted to inquire about school bus drop off behavior observed during the site visit. It was noted that the buses were stopping shy of intersections along Southeast 13<sup>th</sup> Avenue that had enhanced crossing features, such as median islands, to allow the students to cross. The company detailed that their policy is to stop before intersections so they are able to use the flashing red and “STOP” sign on the bus to stop two-way travel on a roadway segment. They are not, however, able to control all movements at an intersection.

During discussions with the school bus company, they stated that, if given the opportunity, they would support the addition of sidewalks along Southeast 13<sup>th</sup> Avenue to South Forest Road. Buses currently serve a student drop off near this location and students are forced to walk on the roadway shoulder.

## **Study Focus Areas**

Based on stakeholder feedback, the following focus areas were established for further evaluation:

- Evaluate truck usage on Southeast 13<sup>th</sup> Avenue and how that relates to pedestrian safety
- Investigate vehicle speeds, and if appropriate, recommend ways to reduce
- Review existing pedestrian crash records for trends
- Recommend any necessary pedestrian crossing enhancements at key locations identified in the corridor

## **Data Review**

A combination of safety and traffic data were collected as part of this safety evaluation. The results are presented in the following sections.

### **Crash Data**

Crash records along Southeast 13<sup>th</sup> Avenue were collected for 2007 – 2011 for a total of five years. Records for a full year of 2012 were not available from the ODOT Crash Analysis and Reporting Unit at the time of this study, but the Canby Police Department confirmed that no pedestrian related incidents were recorded on the facility between January 1<sup>st</sup>, 2012, and February 25<sup>th</sup>, 2013 (the date of the field visit). Three pedestrian crashes were recorded in the study area, all of which occurred at intersections.



### Southeast 13<sup>th</sup> Avenue/South Ivy Street

Two pedestrian crashes were recorded at the intersection of Southeast 13<sup>th</sup> Avenue and South Ivy Street as illustrated in Figure 5. The intersection is signal controlled with pedestrian signals and marked crossings on all intersection legs. Both collisions involved left turning vehicles from Southeast 13<sup>th</sup> Avenue that failed to yield to pedestrians located in the crosswalks. This left turn movement is currently a permitted left turn, which relies on the drivers to yield to pedestrians when they are in the crosswalks.

The first crash occurred October 22, 2008 between 3:00 and 3:59 PM. Environmental conditions included clear skies, dry pavement, and daylight hours. The second crash occurred October 12, 2011 between 9:00 -9:59 AM. The environmental conditions were cloudy skies, wet pavement, and daylight hours. The vehicle in this collision was a school bus.

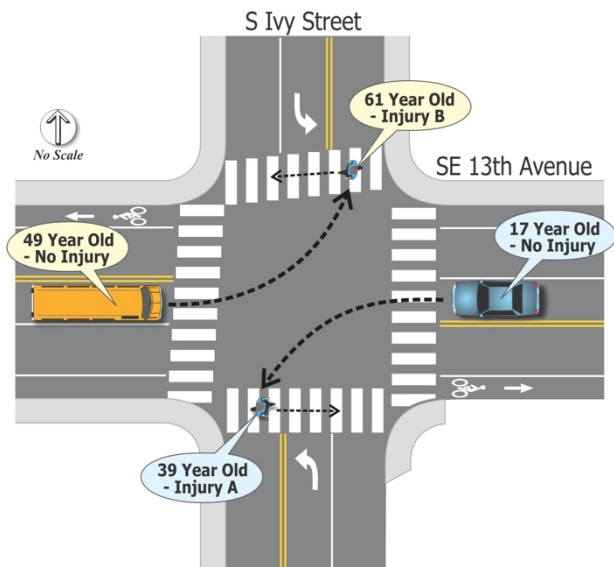


Figure 5: Collision Diagram for SE 13th Ave/S Ivy Street

### Southeast 13<sup>th</sup> Avenue/South Lupine Street

One pedestrian crash was recorded at the intersection of Southeast 13<sup>th</sup> Avenue and South Lupine Street on February 15, 2011 between 7:00 - 7:59 AM. This is illustrated in Figure 6. Environmental conditions were rain, wet roadway, and dawn light conditions. The record indicates the pedestrian was crossing the east leg of the intersection towards Ackerman Junior High School and a 'special pedestrian signal' was in use. During the project field visit, it was observed that a crossing guard is present during school hours to stop oncoming traffic (which could be the "special pedestrian signal"). It is not known whether this was active during the crash. However, the pedestrian hit was 13 years old at the time of the collision, which aligns with the age group of the students of the school.

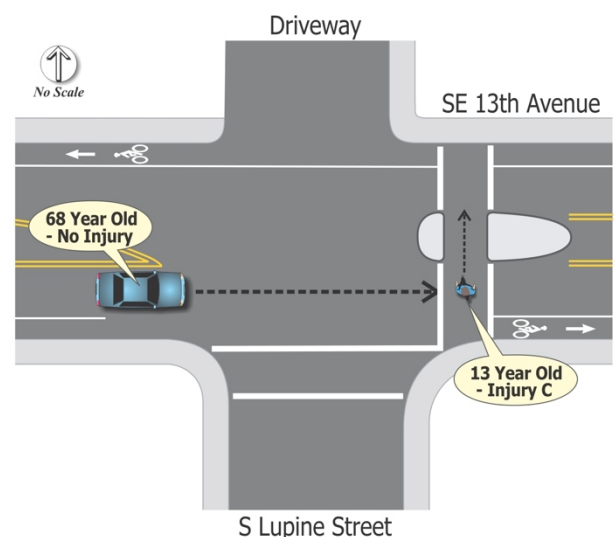


Figure 6: Collision Diagram for SE 13th Ave/S Lupine St

## Traffic Data

Five locations were selected to collect traffic data as part of this study based on the feedback provided in the citizen surveys. Traffic data collected included volume, speed, and vehicle classification data. The results are summarized in Figures 7 – 9. The speed and vehicle classification data is described based on weekday morning (12:00 AM – 6:59 AM), school zone hours (7:00 AM – 5:00 PM), weekday evenings (5:01 PM – midnight), and weekend (all day). This was done to help differentiate whether driving trends differ between weekday and weekend, as well as school zone and non-school zone hours.

Volume trends were evaluated looking at 24-hour profiles for Thursday, February 2, 2013 and Saturday, February 23, 2013. Volumes were averaged across different collection points (shown in Figure 7), divided into “West of Pine” and “East of Pine” categories. Count data indicated a split in volume trends at South Pine Street, with Southeast 13<sup>th</sup> Avenue experiencing high volumes to the west of South Pine Street. Figure 7 shows AM travel peaks occurring both east and west of South Pine Street around 7:00 AM. Afternoon volumes begin to increase around noon, with PM peaks at 4:00 PM east of South Pine Street and 5:00 PM west of South Pine Street. Weekend trends show a mid-day peak on both segments. Average Daily Traffic (ADT) volumes for each portion of Southeast 13<sup>th</sup> Avenue are 3,230 near South Birch Court, 3,650 near South Holly Street, 3,370 between South Lupine Street and South Pine Street, 1,750 near South Redwood Street, and 1,350 near South Teakwood Street.

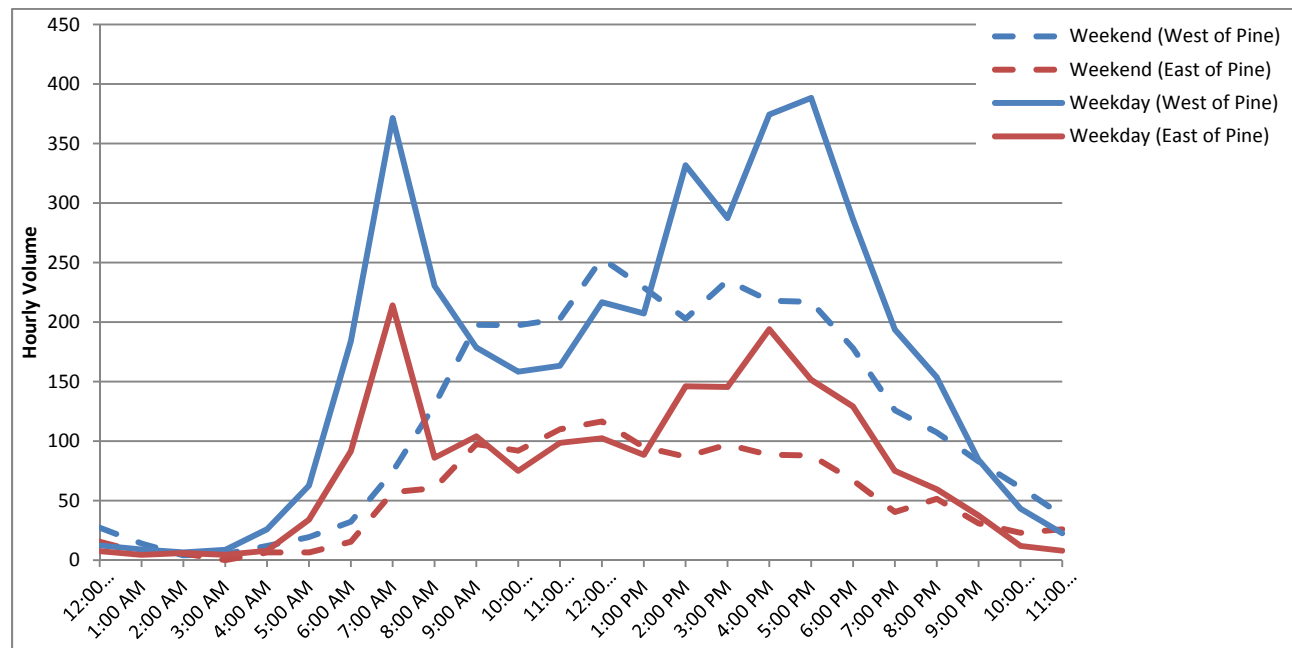


Figure 7: Volume Plots (combined direction of travel) for Thursday (2/21/13) and Saturday (2/23/13)

Speed survey results are provided in Figure 8 for the 85th percentile speed (which is commonly used to set posted speed limits) and for the percent travelling greater than 5 mph or 10 mph above the posted speed limit (10 mph above the posted speed is shown to indicate the amount of "excessive" speeding). On Southeast 13th Street, the speed data indicates that drivers in the school zones generally drive less



than 5 mph over the speed limit (i.e., 30 mph) during non-school hours, and then reduce to 25 mph during school hours when the 20 mph speed limit is in effect. Speed measurements near South Holly Street also indicate that drivers generally travel at less than 30 mph. Further east near South Redwood Street, vehicle speeds significantly increase for the +5 mph and +10 mph categories. Near South Teakwood Street, over half of the observed vehicles were exceeding 35 mph.

Vehicle classification data was evaluated looking at the percent of buses and trucks that comprise the vehicle usage on Southeast 13<sup>th</sup> Avenue in response to citizen concerns regarding truck usage. Buses were grouped separately to differentiate the truck traffic associated with the industrial area from bus traffic associated with the school district. Trucks were further classified as medium vehicles (i.e. single unit trucks with 2-4 axles) and heavy vehicles (i.e. tractor-trailer trucks). Medium vehicle percentages near South Birch Court are generally around 6% (about 200 vehicles per day). Medium vehicle percentages measured near South Holly Street and between South Lupine Street and South Pine Street are closer to 11% (about 350-420 vehicles per day). Between South Redwood Street and South Teakwood Street, medium vehicle percentages increase to 13% (about 170-220 vehicles per day). While medium vehicles represent a significant portion of the daily volume, few heavy vehicles were observed using this facility (averaging about 1 heavy vehicle per day). Since truck counts were completed in February, there is a possibility that truck volumes may be higher in the summer months when agricultural activity is at its peak. Truck percentages by count location for this study are shown in Figure 9.

Limit: 25 mph 13th Avenue East of Holly Street				
← WB				
WB	85th% Speed	+6 mph	+11 mph	
AM	28 mph	5%	1%	
School	28 mph	8%	1%	
PM	29 mph	13%	2%	
Wkend		20%	2%	

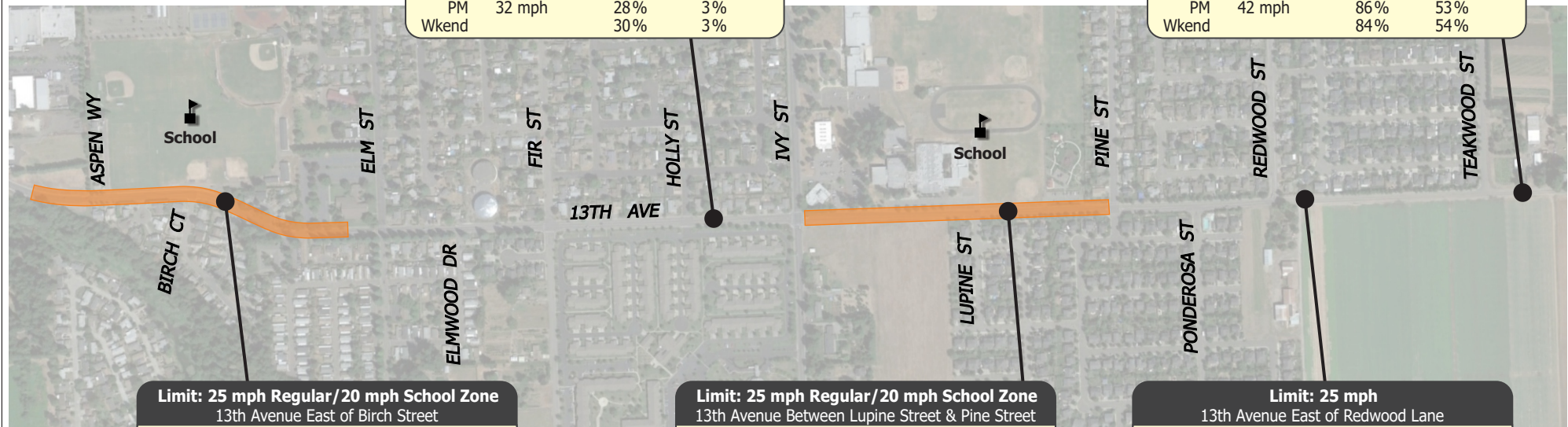
  

EB →				
EB	85th% Speed	+6 mph	+11 mph	
AM	30 mph	21%	2%	
School	29 mph	17%	2%	
PM	32 mph	28%	3%	
Wkend		30%	3%	

Limit: 25 mph 13th Avenue East of Teakwood Street				
← WB				
WB	85th% Speed	+6 mph	+11 mph	
AM	42 mph	73%	50%	
School	40 mph	78%	46%	
PM	39 mph	77%	42%	
Wkend		82%	56%	

EB →				
EB	85th% Speed	+6 mph	+11 mph	
AM	44 mph	87%	69%	
School	41 mph	81%	50%	
PM	42 mph	86%	53%	
Wkend		84%	54%	



Limit: 25 mph Regular/20 mph School Zone 13th Avenue East of Birch Street				
← WB				
WB	85th% Speed	+6 mph	+11 mph	
AM	28 mph	4%	0%	
School	26 mph	19%	2%	
PM	28 mph	4%	0%	
Wkend		5%	0%	

EB →				
EB	85th% Speed	+6 mph	+11 mph	
AM	29 mph	5%	0%	
School	25 mph	25%	2%	
PM	28 mph	4%	0%	
Wkend		7%	0%	

Limit: 25 mph Regular/20 mph School Zone 13th Avenue Between Lupine Street & Pine Street				
← WB				
WB	85th% Speed	+6 mph	+11 mph	
AM	28 mph	7%	0%	
School	25 mph	19%	1%	
PM	28 mph	6%	0%	
Wkend		7%	1%	

EB →				
EB	85th% Speed	+6 mph	+11 mph	
AM	29 mph	15%	2%	
School	25 mph	21%	2%	
PM	28 mph	5%	0%	
Wkend		8%	1%	

Limit: 25 mph 13th Avenue East of Redwood Lane				
← WB				
WB	85th% Speed	+6 mph	+11 mph	
AM	33 mph	29%	8%	
School	31 mph	23%	6%	
PM	32 mph	30%	6%	
Wkend		34%	10%	

EB →				
EB	85th% Speed	+6 mph	+11 mph	
AM	36 mph	54%	20%	
School	33 mph	37%	8%	
PM	34 mph	52%	14%	
Wkend		52%	16%	

#### LEGEND

- - Count Location
- - School Zone

DKS

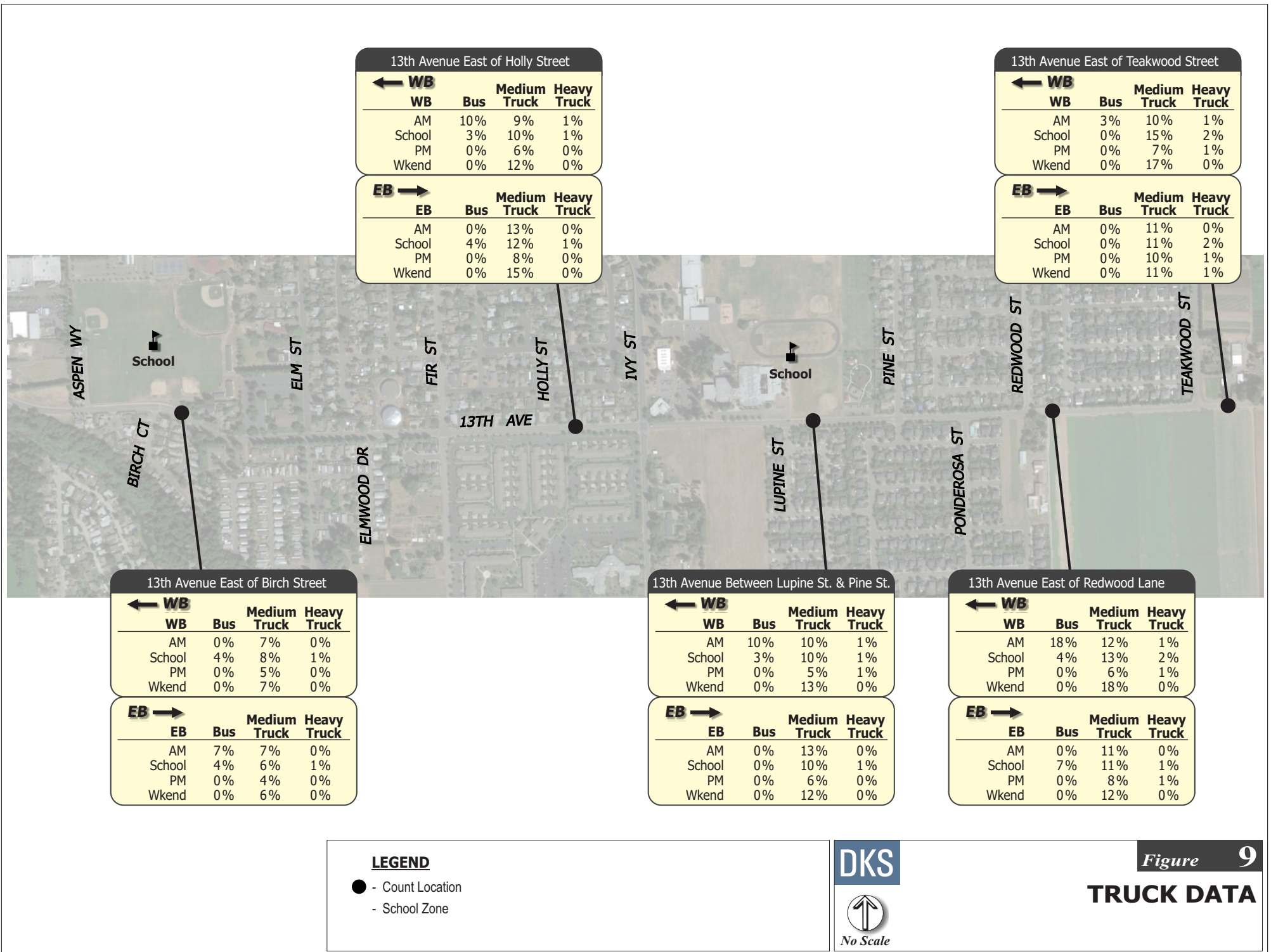


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Figure 8

**SPEED DATA**









## **Pedestrian Safety Findings**

A field visit was conducted on Friday, February 24, 2013 as part of the safety evaluation study between 2:30 – 4:30 PM. Weather conditions were cloudy with rain and wet pavement surface. The field visit reviewed the entire study area corridor, with focus at locations with recorded pedestrian crashes and areas of concern identified through the stakeholder feedback. The following observations and recommendations, which are summarized in Figure 10, are grouped based on the following overall trends:

- Intersection operations
- Corridor speeds
- Crossing enhancements
- Corridor design

### **Intersection Operations**

Intersection operation based mitigations are recommended at South Ivy Street to reduce the likelihood of future pedestrian crashes.

#### **Traffic Signal Phasing at South Ivy Street**

Crash data analysis showed two recorded pedestrian crashes at the intersection of Southeast 13<sup>th</sup> Avenue and South Ivy Street that resulted from vehicles making permitted left turns (from Southeast 13<sup>th</sup> Avenue to South Ivy Street) that failed to yield to pedestrians. One pedestrian involved received an incapacitating injury (Injury A). In response to this, it is recommended that the permitted only left turn signal phasing at South Ivy Street be modified to remove this potential conflict. This can be accomplished by installing left turn flashing yellow arrows (FYA) with pedestrian friendly logic or protected only left turn phasing.

The installation of the FYA with pedestrian friendly logic would provide protected/permitted left turn phasing. Although the existing permitted left turns would be maintained, the pedestrian friendly logic would restrict the permitted left turn (flashing yellow left turn arrow) in instances when there is an active pedestrian call to cross South Ivy Street. Once the pedestrian interval has been served, a protected or permitted left turn phase could be provided within the same signal cycle if there is sufficient time or on the following signal cycle. Although protected only left turn phasing is not warranted based on traffic volumes, this option would ensure that pedestrian movements and left turn movements do not occur simultaneously.

Analysis files from the Canby TSP were used to review the proposed left turn phasing options and their impacts to future queuing. Queuing results indicate that both options would provide acceptable intersection operations; however protected/permitted left turn phasing would result in the least amount of queuing and existing left turn pockets would be sufficient to accommodate 95<sup>th</sup> percentile queues. Therefore, it is the preferred option.

Importantly, this option would require reconstruction of the traffic signal (signal poles, wiring, and controller) in order to add the necessary signal heads to support the phasing upgrades. It is also recommended that pedestrian countdown timers be installed at the intersection to inform pedestrians how much time is left in the pedestrian interval. This would allow them to make better decisions about when to cross the street.

## Corridor Speeds

The following findings are associated with travel speeds along Southeast 13 Avenue.

### Posted Speed

Speeding was an expressed concern by citizens who completed the citizen survey. The Canby Police Department data shows an increase in citations over the past two years, and the speed data collected as part of this study shows a large portion of drivers exceeding the posted speed limit by 10 mph or more east of South Pine Street. Observations in the field showed inconsistent sizing and formatting of speed limit signs based on national standards. Existing signs are 18"x24", and should be increased to 24"x30" to be compliant with the Manual on Uniform Traffic Control Devices (MUTCD). In addition, signs should be formatted to include the word "LIMIT" on the signs (MUTCD R2-1). These improvements are identified in Figure 10.



*Speed Limit Sign on North Side of SE 13th Avenue Near S Ivy Street*

### School Zones

Driver compliance of school speed zone speeds in the study area is essential to support pedestrian safety. Although the speed data indicated drivers reduce their speed in the school zones (but still drive 5 mph over the 20 mph speed), there is benefit in providing uniformity in the school zone signing between the two locations, particularly because of their close proximity (approximately 2,200 feet apart). The Canby High school 20 mph speed zone is active during the hours of 7:00 AM – 5:00 PM, while the Ackerman Junior High school zone 20 mph speed is active when its flashing beacons are on. It is recommended that the school zone signing at Canby High School be upgraded to include flashing beacons as identified in Figure 10. Existing signs which show 20 mph applicability as a footnote of time can be difficult for approaching drivers to read. Flashing beacons provide a clear sign to drivers on when to comply with slower speeds. Coordination with the school will be required to determine the appropriate times when the flashing beacons are to be active.



*School Zone Signing at Canby High School*

In addition, it was noted in the field that the westbound travel direction does not include “END SCHOOL ZONE” signs (MUTCD S5-2). It is recommended that these signs be added to indicate where the reduced 20 mph speed zone ends. It was also observed that the existing “END SCHOOL ZONE” sign for the Ackerman Junior High school in the eastbound direction of travel is currently blocked by vegetation. It is recommended that the vegetation be trimmed to enhance the visibility of the sign. The City should also consider upgrading all school zone related signs to florescent yellow-green to increase visibility and conformance to the MUTCD.

### Create the Feel of a Narrower Cross Section

During the field visit a large roadway width of Southeast 13<sup>th</sup> Avenue in areas with on-street parking was noted. This area includes 11 foot travel lanes, 5 foot bike lanes in each direction as well as 8 feet of parking on the north side. When the parking is in use the roadway may feel narrower, which helps to manage vehicle speeds. However, the narrowing effect of on-street parking is only anticipated during school or event center activities. The feeling of open space is associated with higher speed facilities. Creating the feeling of a narrower cross section within this area could help promote lower travel speeds. Based on citation reports, this area would benefit from reduced speeds.



*School Zone Signs at Ackerman Junior High School*



*Cross-Section Near Ackerman Junior High School*

Measures to effectively narrow cross-sections include:

- **Mark individual parking stalls:** The open parking area creates the feel of an additional lane on the roadway. Marking individual parking stalls will visually break up the parking area and create a narrower feel.
- **Add parking caps and islands:** Extend curb work at beginning and end points of parking areas to physically narrow overall cross-section and visually identify parking areas. Also consider adding islands intermittently along parking area to break up open space. The islands can be used to plant trees, which would also work to calm traffic through the area.
- **Install bulb outs:** Install bulb outs or pedestrian refuge medians at the intersections of South Fir Street and South Holly Street. This will work to create a narrower feeling on the roadway. It will also create a space for pedestrians to dwell that will increase visibility. Installation of bulb outs at these key locations works to reduce vehicle turning speed by tightening the curb radii, reduce pedestrian crossing distances/exposure, and place pedestrians at a more visible position at the intersection. Another option would be to install pedestrian medians, similar to other intersection locations in along Southeast 13<sup>th</sup> Avenue. However, bulb outs are recommended at these locations for the previously mentioned benefits.

### Establish Transition Speeds

The Canby Transportation System Plan identifies Southeast 13<sup>th</sup> Avenue as a 25 mph facility between Highway 99 and South Teakwood Street. East of South Teakwood Street, the basic rule applies to the intersection of South Mulino Road (a distance of approximately 1,400 feet). The basic rule states that a motorist must drive at a speed that is reasonable when considering other traffic, roadway, and weather conditions. For drivers traveling westbound on the corridor, a deceleration from 55 mph to 25 mph is an abrupt change. Although a speed zone ahead sign is currently provided in advance of the first 25 mph speed sign, it is recommended that this sign be upgraded to the speed reduction sign (MUTCD W3-5) to allow for appropriate deceleration into the 25 mph speed zone.



*Speed Reduction Sign*

It is also recommended that appropriate speed zone signing be provided for eastbound drivers as they exit the 25 mph speed zone and transition to the basic rule. It is recommended that an “end speed zone” (OR2-6a) sign be provided at the transition point to the basic rule.

### Speed Feedback Signs

It is recommended that radar based speed feedback signs be installed at strategic points within the study corridor to reinforce driver compliance with posted speeds. Speed feedback signs have been shown by FHWA to reduce driver speeds<sup>3</sup>. Recommended sign locations include near South Holly Street in both travel directions and in advance of South Teakwood Street for the westbound travel direction as shown in Figure 10. The signs located between the school zones target where the majority of speeding is occurring based on police citation records. The sign in advance of South Teakwood Street would assist drivers in knowing their travel speed as they transition from the basic rule to the 25 mph speed zone.



*Speed Feedback Sign*

### Pedestrian Crossing Enhancements

Several pedestrian crossing enhancements are recommended at pedestrian crossing locations to enhance the visibility of the crossing and are discussed in the following sections.

#### Paint Median Islands

Pedestrian refuge medians are provided at the intersections of South Birch Court, South Elm Street, South Lupine Street and South Pine Street. These allow for a two staged crossing in that pedestrians are required to only cross a single lane of traffic at time. Although the median noses currently have raised pavement markers and keep right signs, the medians do not have high levels of



*Pedestrian Median at Lupine Street*

visibility for approaching motorists during the day time. Visibility can be increased by painting the curb work surrounding the medians in yellow reflective paint. For any future installations, it is recommended to use a non-mountable curb type to create a buffer between pedestrians and vehicles that is more difficult to cross.

<sup>3</sup> Based on FHWA publication "Engineering Countermeasures for Reducing Speeds", May 2009, [http://safety.fhwa.dot.gov/speedmgt/ref\\_mats/eng\\_count/](http://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/).



### **Pedestrian Crossing Markings and Signing**

Most intersections within the study area (see Figure 2 for specific locations and marking types) feature marked crosswalks across Southeast 13<sup>th</sup> Avenue. The existing crosswalk markings are faded and difficult to see, and inconsistent throughout the corridor. Many crosswalks feature typical one-foot bars spaced ten feet apart with stamped concrete in the center of the markings that do not contrast with roadway surface colors enough at night. It is recommended that crosswalk markings be restriped/maintained to improve visibility and made consistent along the corridor for drivers. Restriping the crosswalks and increasing maintenance over the upcoming years will improve visibility of the crossings for motorists, particularly at night. Providing consistent markings works to create the feel of a more uniform pedestrian focused corridor.



*Pedestrian Crossing Signing at South Lupine Street*

Currently, the only signed crossing is at South Lupine Street for the school crossing. The existing marked crosswalks at the intersections of South Birch Court, South Elm Street, South Fir Street, South Holly Street, and South Pine Street could be enhanced by providing pedestrian crossing signs (MUTCD W11-2) with downward arrows (MUTCD W16-9P). Signing could be provided along the right side of each approach as well as in the existing median to identify the pedestrian crossing locations and increase the visibility of the crossing. If the pedestrian crossing at South Birch Court is identified as a school route for the Canby High School, this crossing should be supplemented with the fluorescent yellow-green school crossing assembly (MUTCD S1-1) and downward arrow (MUTCD W16-9P) similar to those located at South Lupine Street.

### Rectangular Rapid Flashing Beacons

Rectangular Rapid Flashing Beacons (RRFB) could supplement pedestrian crossing signs to provide increased visibility for pedestrian crossing movements. These beacons are activated by pedestrians waiting to cross the facility and provide additional warning to drivers of pedestrian crossing activity. Candidates for RRFB installation include South Birch Court and South Lupine Street (where a pedestrian crash occurred). These locations are identified on Figure 10 and are adjacent to schools where high pedestrian crossing activity is likely to occur.

### Lighting Analysis

Existing street lighting conditions were observed the evening of March 14<sup>th</sup>, 2013. Although corridor and lighting at some intersections (South Elm Street, South Fir Street, and South Ivy Street) is provided, it does not appear to provide the necessary level of lighting to assist motorists in detecting pedestrians crossing Southeast 13<sup>th</sup> Avenue at marked crosswalk locations. It is recommended that a lighting analysis be completed to confirm whether applicable lighting levels are met for high pedestrian use areas at the corridor intersections and marked crossing locations. If existing lighting is found to not be adequate it is recommended that the lighting be upgraded at the intersections, with consideration to upgrading the corridor lighting as well. Increased lighting at intersections can increase visibility of roadway features like pavement markings and signs. This may help respond to concerns by citizens of stop signs being run.



*Rapid Rectangular  
Flashing Beacon*

### Corridor Design

The following recommendations were identified to enhance the corridor related to pedestrian safety.

#### Complete Sidewalks

Sidewalks throughout the corridor are partially complete and do not extend far enough east to accommodate pedestrian activity resulting from school bus stops. Incomplete sidewalks force pedestrians to walk along shoulders. To promote safety, it is recommended that the City provide complete sidewalks on both north and south sides of Southeast 13<sup>th</sup> Avenue. Upgrades would be necessary along Southeast 13<sup>th</sup> Avenue between South Ivy Street and South Lupine Street and South Ponderosa Street to South Forest Road. These improvements are not identified in the City's TSP financially constrained pedestrian improvements.



*Incomplete Sidewalks along the south side of SE 13<sup>th</sup> Avenue  
near Ivy Street*

## Additional Findings

Additional issues were noted in the field that do not directly relate to pedestrian safety. As this study focuses on pedestrian safety, no mitigations are recommended at this time. However, the City may elect in the future to take these into consideration as they deem necessary.

### Roadway Chicane

The study corridor includes a roadway chicane (or narrowing on the cross-section) near South Aspen Way. This removes the bicycle lane for a small section at this location and creates an unnecessary conflict between bicycles and vehicles. It is recommended the City consider removal of the chicane.



*Roadway Chicane Near S Aspen Way*

### Street Name Signs

Several intersection street name signs were noted to be based on outdated standards. In addition, signs are worn and difficult to read. It is recommended that the City consider upgrading these signs to current MUTCD standards in combination with other signing maintenance or intersection upgrade efforts.



*Street Name sign on the North Leg of South Elm Street is worn and difficult to read.*



## Curb Ramps and Dwell Area

Curb ramps within the study area were noted to have various objects in the pedestrian dwell area. This includes street signs, mailboxes, utility boxes, and utility poles.

These objects effectively narrow the usable area of the sidewalk and make it difficult for pedestrians (particularly those in wheel chairs) to navigate the area. No pedestrian visibility issues were noted, so no immediate action is recommended at this time.

However, it is recommended that the City consider ways to remove street corner clutter.

Additionally, many of the curb ramps themselves are out of date and not aligned with crosswalk movements. Intersection upgrade projects should look for ways to provide upgraded curb ramp design to comply with ADA standards.



*Utilities and Signs reduce pedestrian dwell area*

## Maintenance of Vegetation

Several sidewalk areas experience an overgrowth of vegetation that has not been maintained. This effectively narrows the sidewalk width and makes it difficult to serve larger volumes of pedestrians. Crash data does not indicate this contributed to any crashes, but maintenance of the vegetation would provide more room for pedestrians and increased quality of travel.



*Vegetation narrows sidewalk width*

## Intersection Sight Distance

The intersections of South Lupine Street, South Pine Street, and South Ponderosa Street are bordered by brick walls on the south side of Southeast 13<sup>th</sup> Avenue. These brick walls restrict sight distance for vehicles trying to enter Southeast 13<sup>th</sup> Avenue when stopping in advance of the crosswalks. In order to gain improved sight distance, drivers must creep into the crosswalk prior entering the intersection. This results in a conflict point between vehicles and pedestrians

both needing to occupy the same space. Field measurements consistent with the 2011 AASHTO Greenbook<sup>4</sup>, which detail sight distance is measured 14 feet back from the edge of travel way, confirm this currently meets industry design standards for sight distance. However, in future designs, it is recommended sight distance be accommodated from vehicle positions in advance of the crosswalks. In addition, should the intersection undergo modifications in the future, consider options to increase sight distance.



*Sight Distance at S Lupine Street Positioned Behind the Crosswalk*



*Sight Distance at S Lupine Street Positioned In the Crosswalk*

<sup>4</sup> A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, 2011.



Match Line Above (Right)



Match Line Below (Left)



### Intersection Treatments

- 1** Install Rectangular Rapid Flashing Beacons
- 3** Install Bulb-outs or pedestrian refuge island
- 7** Install Pedestrian Friendly Flashing Yellow Arrow & Pedestrian Countdown Timers
- 9** Paint Medians with Yellow Paint
- 11** Verify Intersection Lighting
- 12** Restripe Crosswalk & Install Pedestrian Crossing Signs
- 15** Restripe Crosswalk & Install School Crossing Signs

### Segment Treatments

- 2** Surround Parking Areas with Extended Curb Work & Paint Individual Parking Stalls
- 4** Install Speed Signs with Increased Signs (approx. locations)
- 5** Install School Zone Flashing Beacons (approx. locations)
- 8** Install Speed Radar Feedback Signs
- 10** Install Speed Reduction Sign
- 11** Install New Speed Limit Sign
- 13** Install Sidewalk Connection
- 14** Install "End School Zone" Signs
- 16** Upgrade School Zone Signing to Fluorescent Yellow-Green
- 17** Install End of Speed Zone Sign



**Figure 10**  
**RECOMMENDATIONS**



## Recommendations

Based on citizen feedback, conversations with City staff, and field observations documented in this report, the recommended mitigations are listed in Table 1. Cost estimates include both construction and preliminary engineering costs. Intersection improvements at the intersection of Southeast 13<sup>th</sup> Avenue/South Ivy Street are proposed by Clackamas County as part of the Statewide Transportation Improvement Program (this signal is owned and maintained by Clackamas County).

**Table 1: Prioritized Recommendations**

Treatment Group	Treatment No. (See Fig. 10)	Countermeasure	Location	Targeted Safety Impact	Cost Estimate
Intersection Operations	7	Modify left turn signal phasing on SE 13 <sup>th</sup> Avenue to include flashing yellow arrow with pedestrian friendly logic.	SE 13 <sup>th</sup> Avenue/S Ivy Street	Remove conflict of left turn vehicles not yielding to pedestrians	\$350,000
		Install pedestrian countdown timers for all signalized crossings.	SE 13 <sup>th</sup> Avenue/S Ivy Street	Reduce pedestrian collisions by better informing crossing decisions	
Pedestrian Crossing Enhancements	1	Install rectangular rapid flashing beacons at school crossings	Crossing of SE 13 <sup>th</sup> Avenue at S Birch Street	Enhance crossing visibility	\$30,000
			Crossing of SE 13 <sup>th</sup> Avenue at S Lupine Street	Enhance crossing visibility	\$30,000
	3	Install intersection bulb out or pedestrian refuge islands	S Fir Street and S Holly Street	Reduce vehicle speeds, reduce pedestrian crossing distance, reduce vehicle turning speeds, increase pedestrian visibility	\$30,000





	9	Paint crossing medians	S Birch Street, S Elm Street, S Lupine Street, and S Pine Street	Enhance crossing visibility	\$1,000
	11	Conduct intersection and corridor lighting analysis	Multiple locations along SE 13 <sup>th</sup> Avenue (see Figure 10).	Enhance crossing visibility	\$10,000
			All of SE 13 <sup>th</sup> Avenue study corridor	Enhance crossing and pedestrian visibility	
	12/15	Restripe crosswalks and install pedestrian crossing signs at marked crosswalks	Multiple locations along SE 13 <sup>th</sup> Avenue (see Figure 10).	Enhance pedestrian visibility	\$40,000
Corridor Speed	2	Mark individual parking stalls	Multiple locations along SE 13 <sup>th</sup> Avenue (see Figure 10).	Reduce vehicle speeds	\$2,000
	2	Add parking caps and islands	Multiple locations along SE 13 <sup>th</sup> Avenue (see Figure 10).	Reduce vehicle speeds	\$15,000
	4	Increase existing speed limit sign size to "24x30", include the word "LIMIT", and include additional installations.	Multiple locations along SE 13 <sup>th</sup> Avenue (see Figure 10).	Enhance compliance with posted speed	\$12,000
	5	Install flashing beacons at Canby High School zone and modify school signs to fluorescent yellow-green per MUTCD	SE 13 <sup>th</sup> Avenue near S Aspen Way and S Elm Street	Reduce vehicle speeds within school zones	\$15,000
	8	Install radar speed feedback signs	SE 13 <sup>th</sup> Avenue near S Holly Street and S Teakwood Street	Reduce vehicle speeds and enhance compliance with posted speed	\$25,000
	10	Install Speed Reduction Signing	SE 13 <sup>th</sup> Avenue east of S Teakwood Street	Reduce vehicle speeds	\$1,000
	14	Install "END SCHOOL ZONE" signs where not present	Canby High School and Ackerman Junior High (westbound)	Enhance compliance with school speed zone	\$3,000



	16	Modify school signs at Ackerman Middle School to fluorescent yellow-green per MUTCD	SE 13 <sup>th</sup> Avenue near S Ivy Street and S Lupine Street	Reduce vehicle speeds within school zone	\$2,000
Corridor Design	13	Complete sidewalk connections	Between S Ivy Street and S Lupine Street and between S Ponderosa Street to S Teakwood Street	Create facilities to support pedestrian uses	\$120,000

These recommendations were presented to the public by means of an Open House on May 29. Several residents and local neighborhood association representatives provided input on the findings and recommendations. For the most part the public was most interested in the implementation of corridor speed and pedestrian crossing enhancement type projects. Preferred corridor speed enhancements included school flashing beacons at Canby High School (treatment 5) and speed radar feedback signs (treatment 8). The public's preferred pedestrian crossing enhancements included RRFB's at the school crossings (treatment 1) and painting the existing raised medians at multiple intersections (treatment 9) to make them more visible, particularly at night.



## **Attachments**





## **Attachment A: Canby Pioneer Industrial Area Connectivity Analysis**

## **TECHNICAL MEMORANDUM #6**

**TO:** Matilda Deas, City of Canby  
Sonya Kazen, ODOT Region 1

**FROM:** Chris Maciejewski, P.E., DKS Associates  
Brad Coy, E.I.T., DKS Associates

**DATE:** June 19, 2010

**SUBJECT: Canby Pioneer Industrial Area Connectivity Analysis**

P09042-002-003

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This memorandum summarizes an analysis of connectivity options for the Canby Pioneer Industrial Park. Connectivity was reviewed to determine if on-site circulation and connections to the surrounding network can provide reasonable access for development while protecting surrounding neighborhoods from freight and cut-through traffic impacts. The following sections describe the background conditions assumed for the analysis, evaluation of the connectivity options, and recommendations for integrating the Canby Pioneer Industrial Park into the TSP Update.

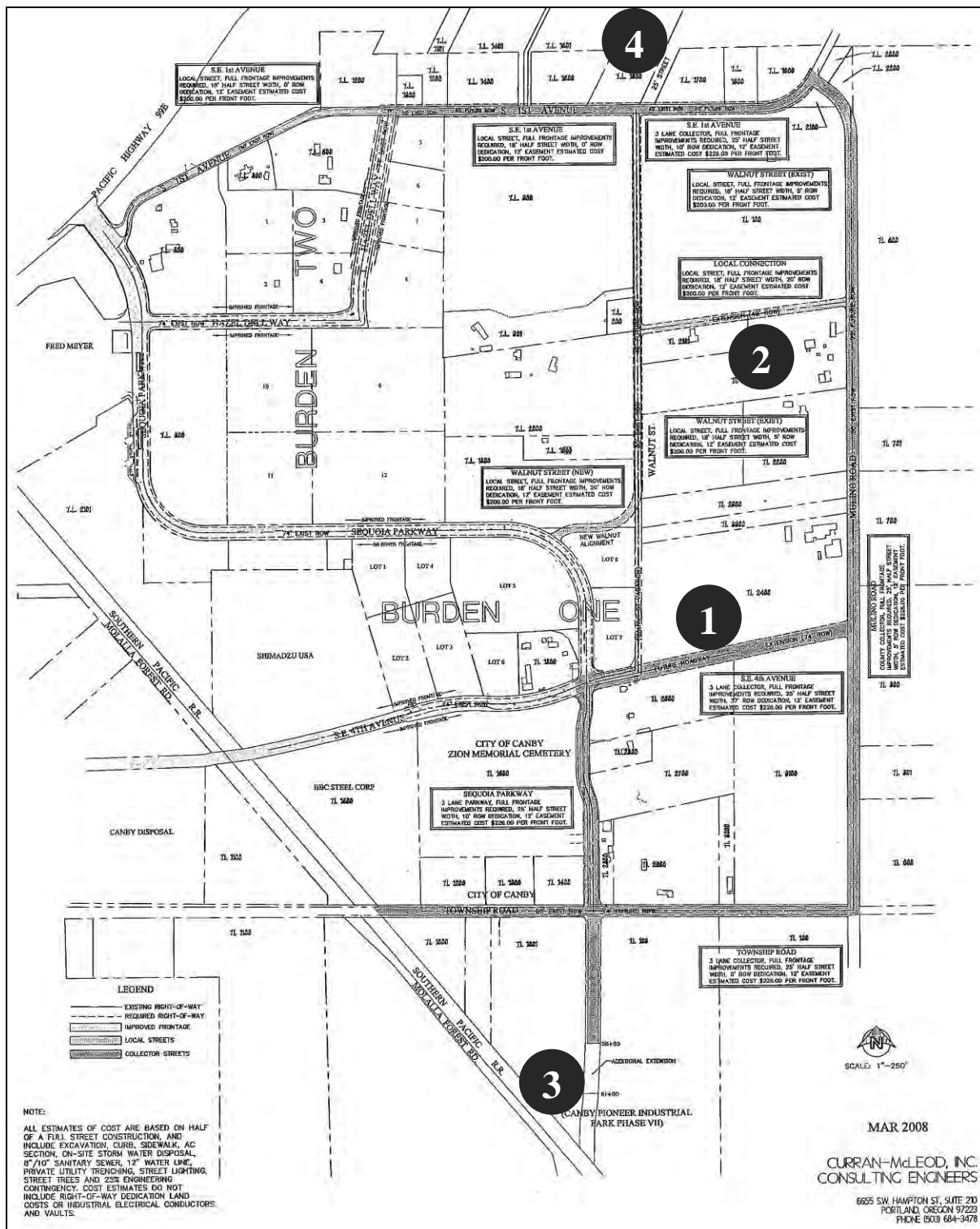
### **Background Information**

The internal roadway network that is currently planned for the Canby Pioneer Industrial Park is shown in Figure 1. This figure identifies the internal roadway network planned to provide motor vehicle access to developable parcels, including two new internal roadway connections:

1. SE 4<sup>th</sup> Avenue Extension from Sequoia Parkway to Mulino Road
2. East-west connection in northeast quadrant between Walnut Street and Mulino Road

In addition to the internal roadway network, external connections also play an important role in providing efficient access to the industrial area while limiting impacts to adjacent neighborhoods. As a major industrial area, access to OR 99E is the most important external consideration. Sequoia Parkway has been designed as the primary gateway to the industrial area from OR 99E; however, capacity constraints at the OR 99E/Sequoia Parkway intersection are expected in the future (see Draft TSP Chapter 4: Future Needs). Therefore, vehicles accessing the industrial area would divert to Haines Road and Township Road-Ivy Street to access OR 99E. Neither of these roadways are ideal routes for industrial traffic without significant upgrades to serve freight traffic or minimize impact on residential areas.

# Canby Transportation System Plan Update



**Figure 1: Currently Planned Roadway Network for Canby Pioneer Industrial Park<sup>1</sup>**

<sup>1</sup> Figure (excluding number labels) prepared for City of Canby by Curran-McLeod Consulting Engineers, March 2008.

## Canby Transportation System Plan Update

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There are two new external connections that have been identified through the TSP Update as potential solutions (the locations where these would connect to the Canby Pioneer Industrial Park are labeled in Figure 1):

3. Sequoia Parkway Extension to SE 13<sup>th</sup> Avenue
4. Otto Road Connection between OR 99E and SE 1<sup>st</sup> Avenue

The Sequoia Parkway Extension would extend south from the existing Sequoia Parkway roadway to the SE 13<sup>th</sup> Avenue/Molalla Forest Road intersection. It would require a bridge over the Oregon Pacific Railroad tracks and the Molalla Forest Road multi-use trail. This extension has been previously identified as an option to serve the Canby Pioneer Industrial Park, but residents in southeast Canby have expressed concerns that this connection would increase truck traffic along SE 13<sup>th</sup> Avenue and impact pedestrian safety and neighborhood livability.

Based on preliminary TSP Update analysis, Otto Road is a promising location for a new connection between the Canby Pioneer Industrial Park and OR 99E. It is currently a driveway providing access to a few residences and farmland, but is identified within the NE Canby Master Plan area as a new major roadway. While the NE Canby Master Plan has identified the installation of a traffic signal as a desired improvement to the OR 99E/Otto Road intersection, it does not assume that Otto Road would be used as a connection to the industrial area.<sup>2</sup> Therefore, changes would be needed to the preliminary circulation plan provided in the NE Canby Master Plan.

## Connectivity Evaluation

The connectivity analysis for the Canby Pioneer Industrial Park was performed using the travel forecasting tool developed for the current Canby Transportation Systems Plan (TSP) update. Volume-difference plots (showing shifts in PM peak hour traffic with the connectivity options) were prepared to illustrate how each alternative would affect traffic volumes on study area roadways relative to the 2030 baseline scenario. Flow bundle plots were also generated to show which roadways would be used by vehicles traveling to and from the industrial area (as a basis for comparison, the flow bundle plot for the baseline scenario is provided in Figure 2).

The following connection alternatives were analyzed:

- SE 4<sup>th</sup> Avenue Extension from Sequoia Parkway to Mulino Road
- Additional East-West Connection between Walnut Street and Mulino Road
- Sequoia Parkway Extension south to SE 13<sup>th</sup> Avenue
- Otto Road Connection between OR 99E and SE 1<sup>st</sup> Avenue

The SE 4<sup>th</sup> Avenue Extension, which was a primary connection in the Canby Pioneer Industrial Park plan, was found to carry a significant amount of traffic and, therefore, was included with each of the other alternatives. The analysis of each scenario is presented in the following sections.





### ***SE 4<sup>th</sup> Avenue Extension from Sequoia Parkway to Mulino Road***

The SE 4<sup>th</sup> Avenue Extension from Sequoia Parkway to Mulino Road provides an important east-west connection within the industrial area resulting in less out-of-direction travel and more flexible travel choices, which benefit user access and result in improved use of nearby roadway capacity. The flow bundle and volume-difference plots for this alternative are provided in Figure 3 and Figure 4, respectively.

As shown in Figure 3, Sequoia Parkway is still the major gateway to the industrial area (especially for traffic to/from southwest OR 99E). Township Road and Haines Road still have significant use and Berg Parkway has minor use. Key findings of the effects of this extension include:

- **Industrial Area Roadways** – the SE 4<sup>th</sup> Avenue Extension not only provides access to developable parcels, but also reduces out-of-direction travel on Walnut Street and Township Road. The roadway would also carry traffic not generated by the industrial area, suggesting it is a key system connection for southeast Canby as an alternate to Township Road.
- **Access to OR 99E** - the improved connectivity within the industrial area does not significantly improve access to OR 99E. However, by providing a new system connection that provides an alternate route for traffic using Township Road and Ivy Street reduces the impact that developing the industrial area has on those roadways.
- **Surrounding Neighborhood Impacts** – the SE 4<sup>th</sup> Avenue Extension reduces traffic volumes on portions of Township Road and SE Ivy Street by improving access to Redwood Street and Sequoia Parkway. This connection was not found to significantly impact surrounding residential areas.

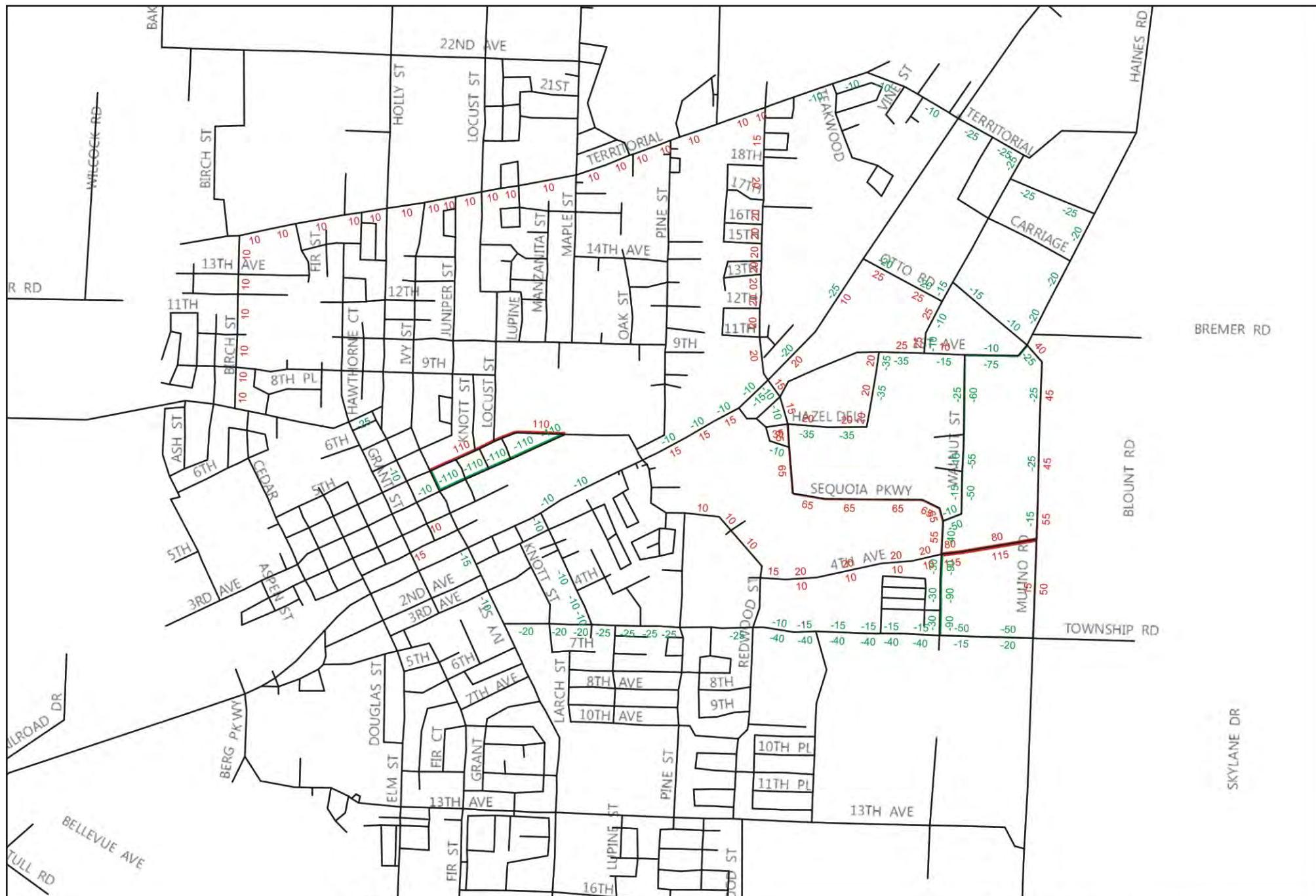
### ***Additional East-West Connection between Walnut Street and Mulino Road***

The additional east-west connection between Walnut Street and Mulino Road in the northeast quadrant of the Canby Pioneer Industrial Area was analyzed assuming that the SE 4<sup>th</sup> Avenue Extension from Sequoia Parkway to Mulino Road (which was previously discussed) is also provided. The flow bundle and volume-difference plots for this alternative are provided in Figure 5 and Figure 6, respectively.

The analysis indicates that this additional east-west connection has very little impact to the roadway network. Therefore, this connection would be considered a local access roadway and is not critical to overall transportation network unless it is needed to serve non-auto modes.



## SE 4TH AVENUE EXTENSION TO MULINO INDUSTRIAL AREA FLOW BUNDLE PLOT



# LEGEND

Total Model Volume Differences\* (2030 30th Highest Hour)

- 000 - Volume Increase
- 000 - Volume Decrease

\* Compared to 2030 Baseline Scenario.

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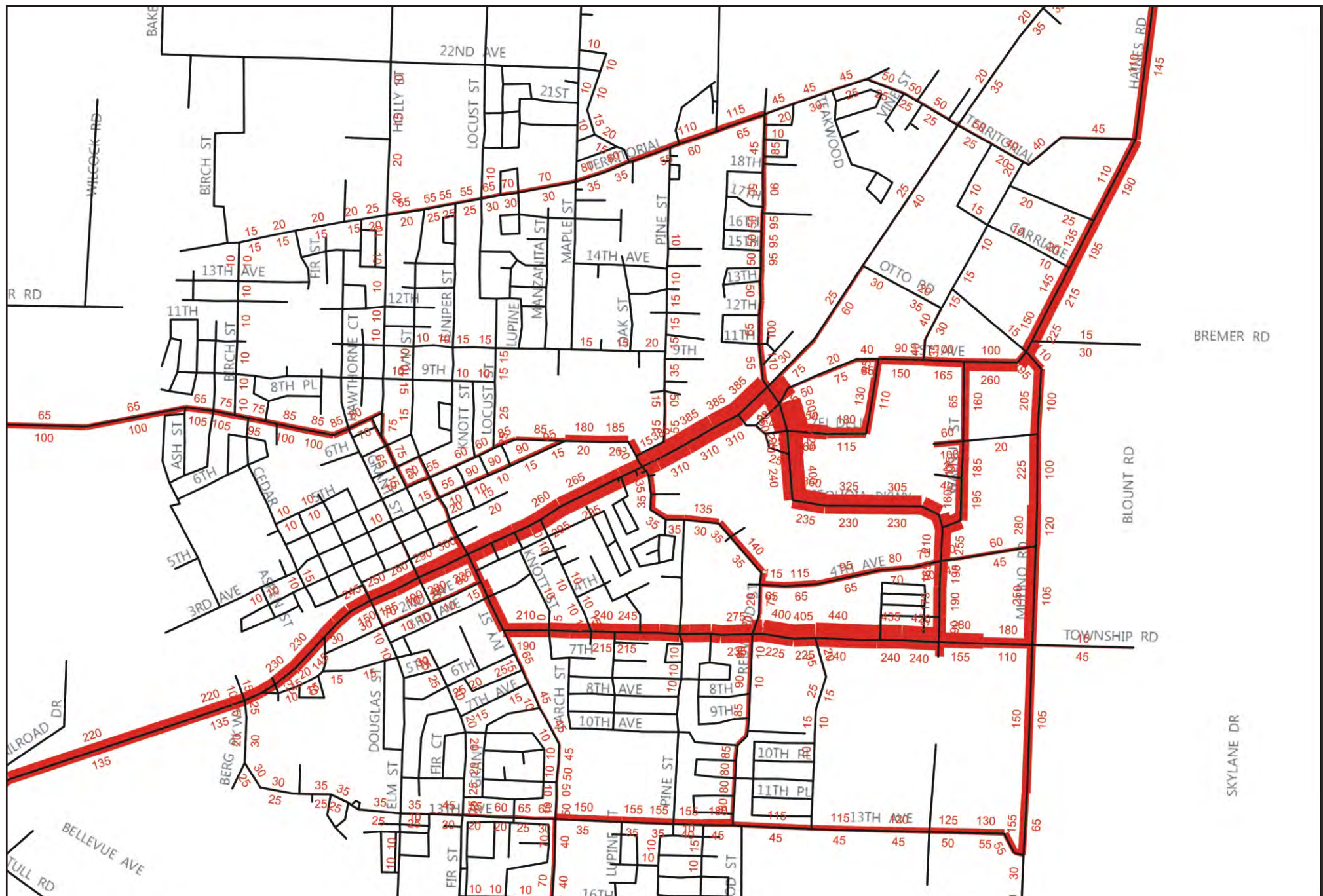


NO SCALE

**Figure 4**

**SE 4TH AVENUE EXTENSION TO MULINO  
VOLUME-DIFFERENCE\* PLOT**





#### LEGEND

— - 2030 30th Highest Hour Industrial Area Model Volumes

**DKS Associates**  
TRANSPORTATION SOLUTIONS



**Figure 5**

**ADDITIONAL EAST-WEST CONNECTION  
INDUSTRIAL AREA FLOW BUNDLE PLOT**





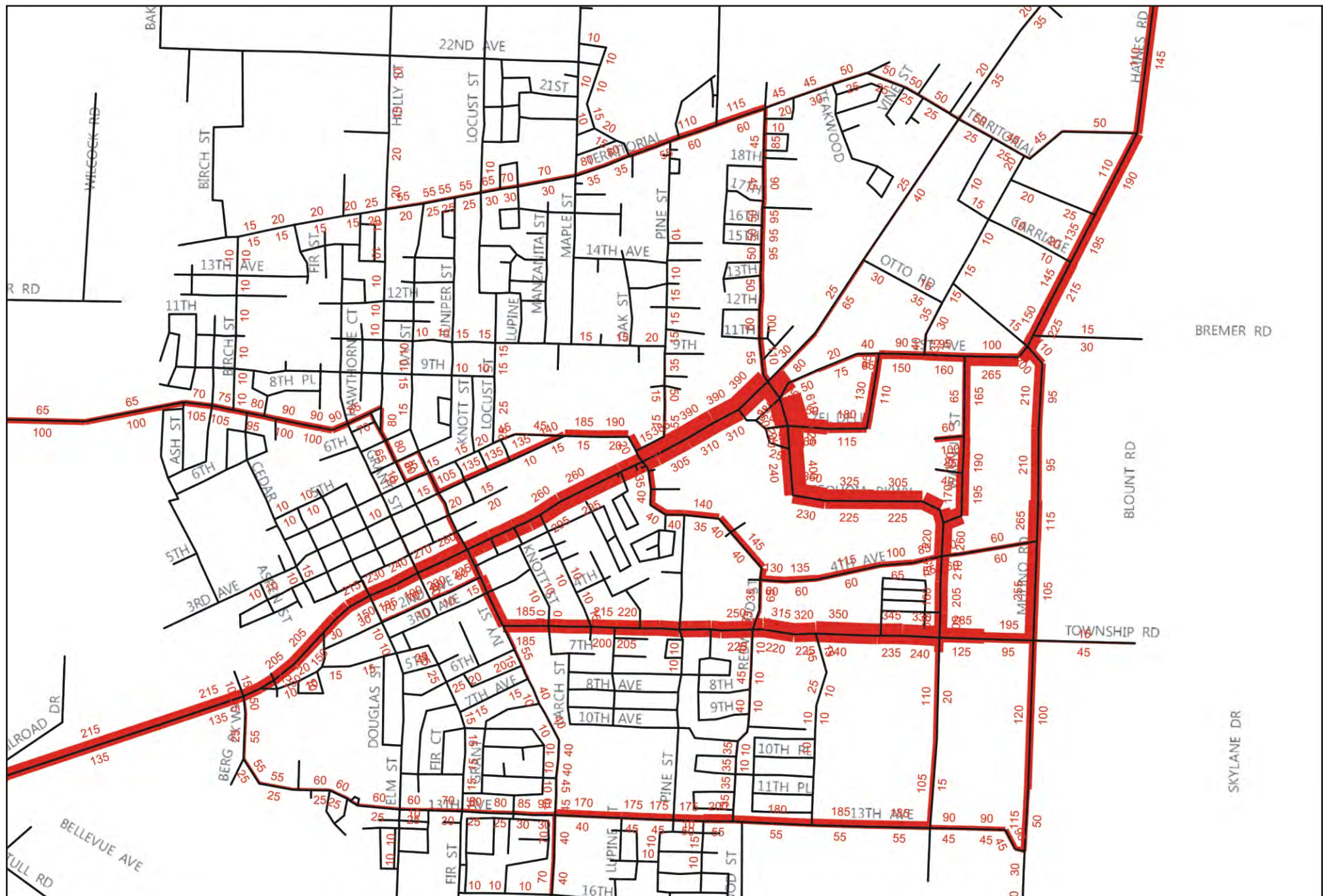
### ***Sequoia Parkway Extension South to SE 13<sup>th</sup> Avenue***

The southern Sequoia Parkway Extension to SE 13<sup>th</sup> Avenue (i.e., with a bridge over the Oregon Pacific Railroad tracks) was also analyzed assuming that the SE 4<sup>th</sup> Avenue Extension from Sequoia Parkway to Mulino Road (which was previously discussed) is provided. The flow bundle and volume-difference plots for this alternative are provided in Figure 7 and Figure 8, respectively.

Key findings of adding this additional connection to the south include:

- **Industrial Area Roadways** – the Sequoia Parkway Extension would provide a new internal site connection that would provide an access across the railroad and multi-use trail for all modes. However, providing the new connection was not found to significantly shift volumes on other internal roadways compared to the base network.
- **Access to OR 99E** - the improved connectivity within the industrial area does not significantly improve access to OR 99E. Minor reductions would be experienced on roadways connecting OR 99E to Ivy Street (e.g., 4<sup>th</sup> Street, Grant Street, and 6<sup>th</sup> Street). Minor increases would be experienced on SE 13<sup>th</sup> Avenue connection to OR 99E, on the order of 20 vehicles per hour. However, the new connection would not significantly relieve the congested Sequoia Parkway connection to OR 99E.
- **Surrounding Neighborhood Impacts** – the Sequoia Parkway Extension provides a new access from the industrial site to 13<sup>th</sup> Avenue. This connection was found to have minor impacts on industrial traffic using 13<sup>th</sup> Avenue to access OR 99E (increase of 20 vehicles per hour), which had been a major concern for residents of SE Canby. The most significant change in traffic circulation associated with the extension is the reduction of traffic on Redwood Street between Township Road and 13<sup>th</sup> Avenue. This change is primarily a change in local circulation and does not represent a significant travel pattern change for industrial area traffic.





# **LEGEND**

000 - 2030 30th Highest Hour Industrial Area Model Volumes

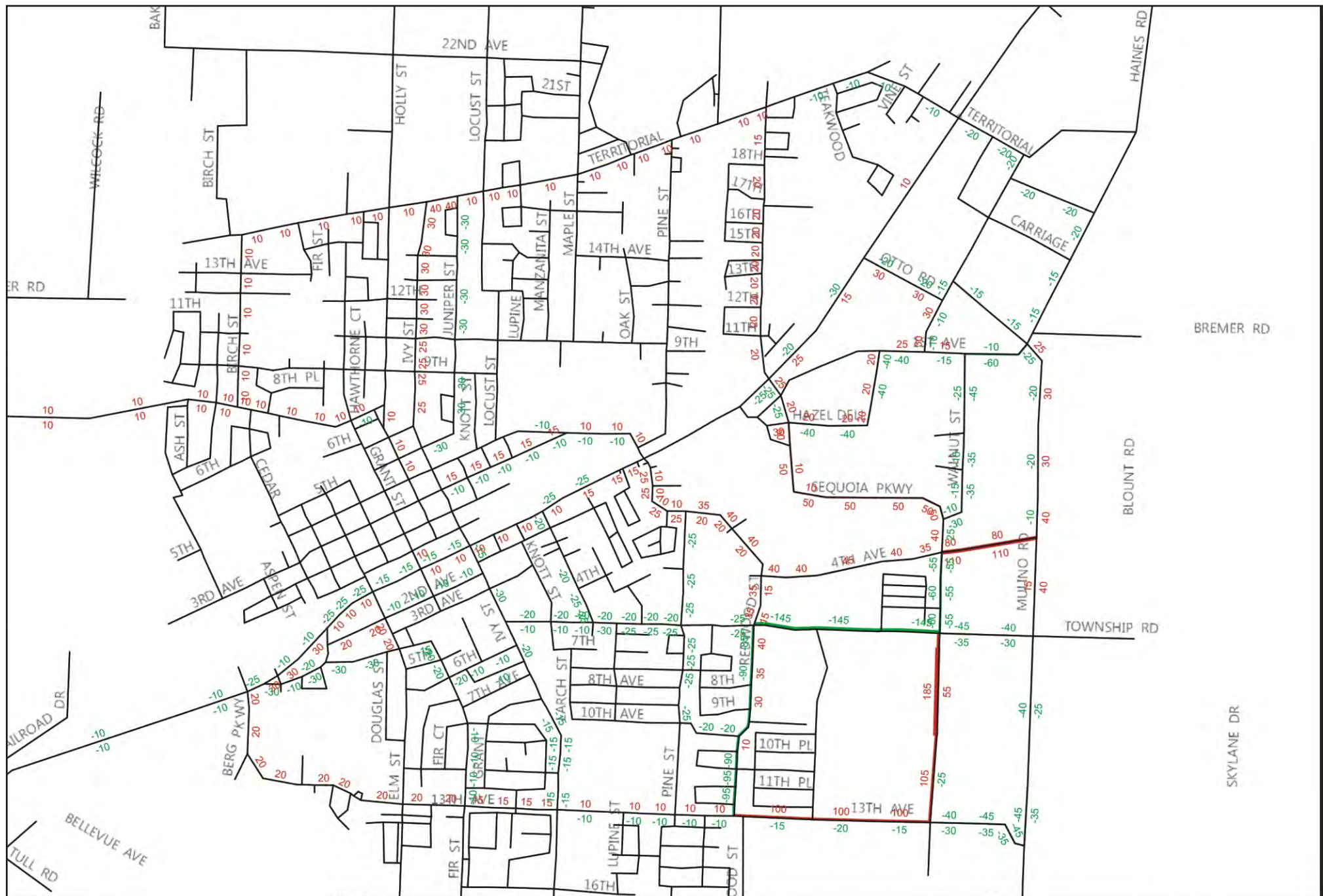
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**SEQUOIA PARKWAY EXTENSION TO THE SOUTH  
INDUSTRIAL AREA FLOW BUNDLE PLOT**

**Figure 7**





# LEGEND

Total Model Volume Differences\* (2030 30th Highest Hour)

- 000 - Volume Increase
- 000 - Volume Decrease

\* Compared to 2030 Baseline Scenario.

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NO SCALE

**SEQUOIA PARKWAY EXTENSION TO THE SOUTH  
VOLUME-DIFFERENCE\* PLOT**

**Figure 8**

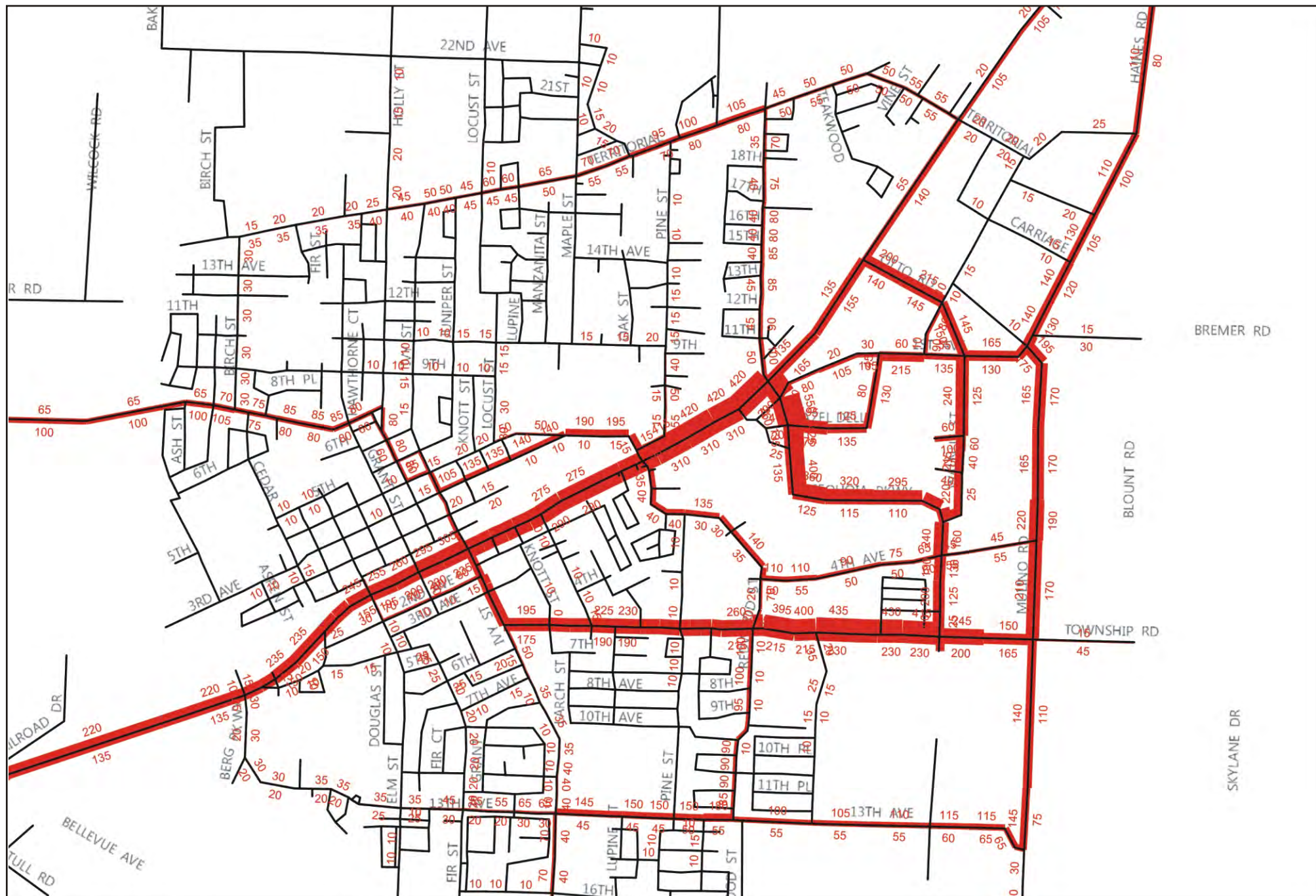
### ***Otto Road Connection between OR 99E and SE 1<sup>st</sup> Avenue***

An Otto Road connection between OR 99E and SE 1<sup>st</sup> Avenue was also analyzed assuming that the SE 4<sup>th</sup> Avenue Extension from Sequoia Parkway to Mulino Road (which was previously discussed) is provided. The flow bundle and volume-difference plots for this alternative are provided in Figure 9 and Figure 10, respectively.

The Otto Road connection was analyzed assuming a traffic signal at the OR 99E/Otto Road intersection on the northwest end and a roundabout at the SE 1<sup>st</sup> Avenue/Otto Road/Walnut Street intersection on the southeast end. This alternative provides an additional connection to OR 99E that significantly benefits inbound and outbound industrial area traffic on OR 99E from both the northeast and southwest. The following key findings of this roadway connection include:

- **Industrial Area Roadways** – the Otto Road connection would significantly shift traffic volumes of industrial area roadways away from Sequoia Parkway, Hazel Dell Way, and 1<sup>st</sup> Avenue. The Otto Road connection would become a primary access point into the industrial park, probably warranting a collector designation.
- **Access to OR 99E** - the new direct access to OR 99E via Otto Road would significantly relieve both the Sequoia Parkway and Haines Road gateways into the industrial area, which would reduce the need for capital improvements on these roadways.
- **Surrounding Neighborhood Impacts** – the Otto Road connection would reduce the reliance of the industrial area on Township Road and other roadways through existing residential areas that connect to OR 99E. However, Otto Road itself is planned to serve the NE Canby Master Plan area, which is primarily residential. Therefore, modifications to the NE Canby Master Plan should be considered that would better integrate the upgraded function of Otto Road with the surrounding land uses.





# **LEGEND**

000 - 2030 30th Highest Hour Industrial Area Model Volumes

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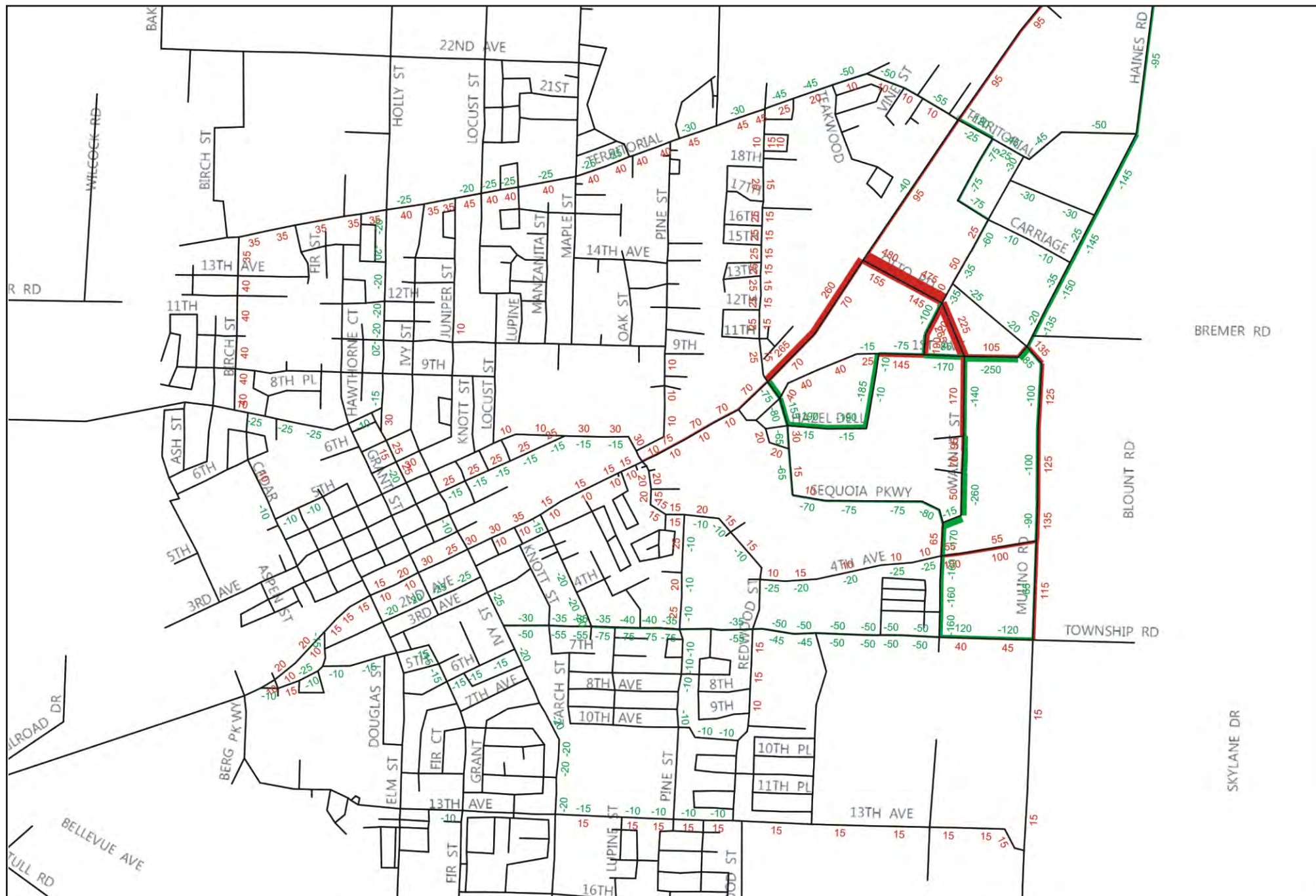


NO SCALE

**Figure 9**

**OTTO ROAD CONNECTION TO OR 99E  
INDUSTRIAL AREA FLOW BUNDLE PLOT**





# **LEGEND**

**Total Model Volume Differences\* (2030 30th Highest Hour)**

- - Volume Increase
- - Volume Decrease

\* Compared to 2030 Baseline Scenario.

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TRANSPORTATION SOLUTIONS



NO SCALE

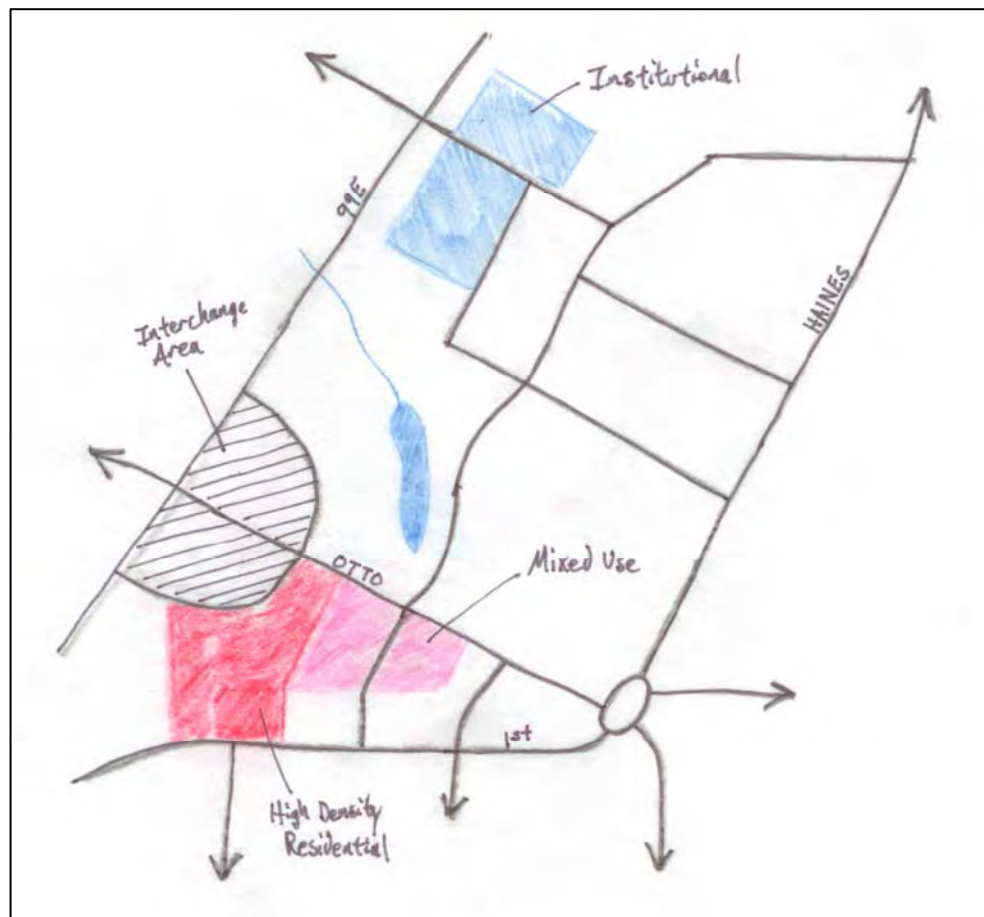
**Figure 10**

**OTTO ROAD CONNECTION TO OR 99E  
VOLUME-DIFFERENCE\* PLOT**

### Recommendations

The connectivity analysis conducted for the Canby Pioneer Industrial Park reviewed site circulation, access to OR 99E, and impacts to surrounding neighborhoods. Based on the findings of the analysis, the following considerations should be integrated into the Canby TSP update process:

- Include the extension of SE 4<sup>th</sup> Avenue to Mulino Road as planned.
- Consider the local street connection between Walnut Street and Mulino Road as an optional facility to provide multi-modal access.
- The potential extension of Sequoia Parkway to SE 13<sup>th</sup> Avenue was not found to significantly improve access of the industrial area to OR 99E. Therefore, this connection should not be considered necessary.
- Include the extension of Otto Road to Mulino Road (with a connection to Walnut Street) as a primary access point into the industrial area. Consider updating the NE Canby Master Plan street layout and land-use plans to reflect the industrial traffic that would utilize the roadway. As example of how this might be achieved is shown below.



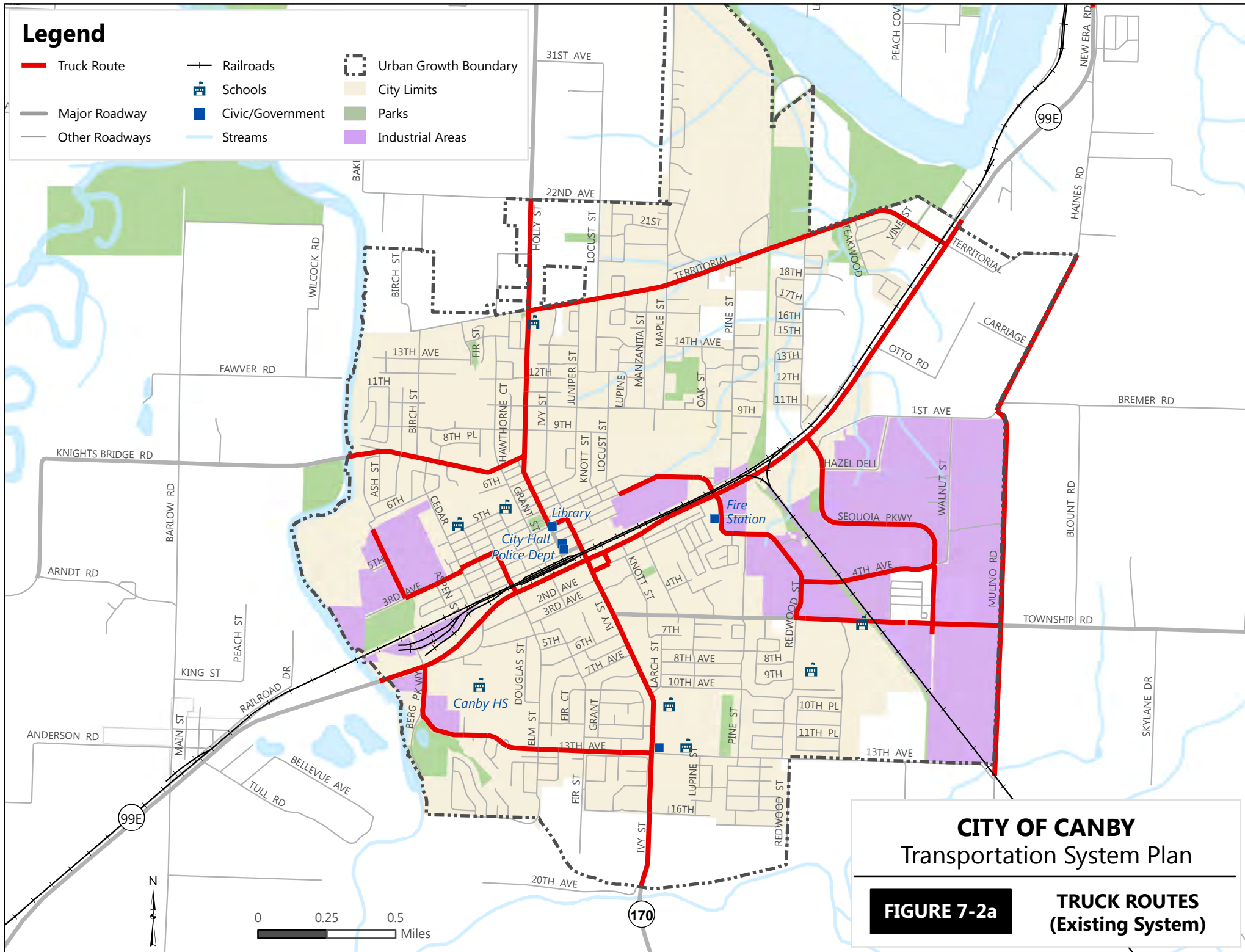




## **Attachment B: Canby TSP Truck Route Figures**

# Legend













- Truck Route
- Major Roadway
- Other Roadways
- Railroads
- Schools
- Civic/Government
- Streams
- Urban Growth Boundary
- City Limits
- Parks
- Industrial Areas

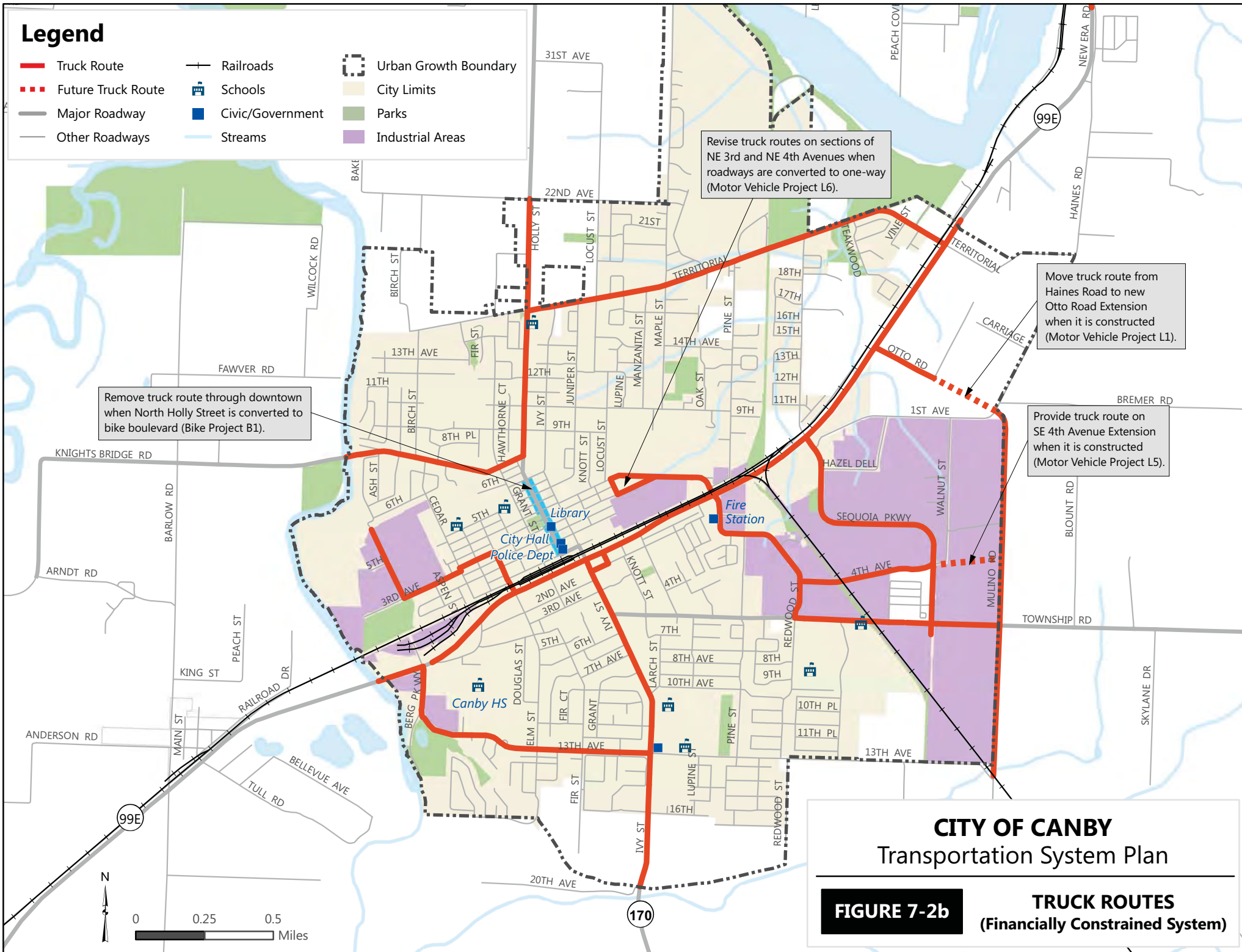


## CITY OF CANBY Transportation System Plan

**FIGURE 7-2a** TRUCK ROUTES  
(Existing System)

## Legend

- |   |                    |   |                  |   |                       |
|---|--------------------|---|------------------|---|-----------------------|
|  | Truck Route        |  | Railroads        |  | Urban Growth Boundary |
|  | Future Truck Route |  | Schools          |  | City Limits           |
|  | Major Roadway      |  | Civic/Government |  | Parks                 |
|  | Other Roadways     |  | Streams          |  | Industrial Areas      |



**FIGURE 7-2b**

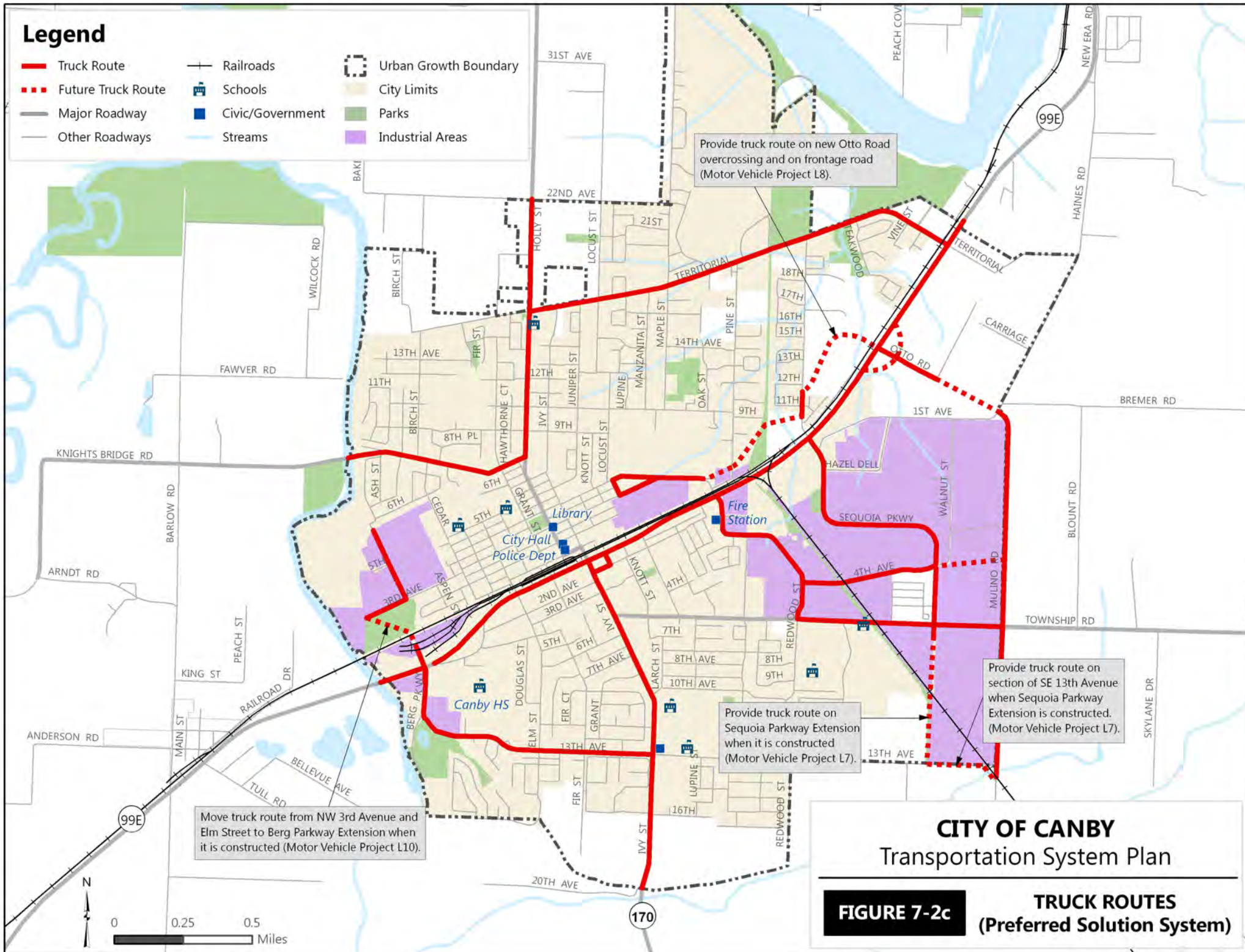
### TRUCK ROUTES

(Financially Constrained System)



# Legend

- Truck Route
- Future Truck Route
- Major Roadway
- Other Roadways
- Railroads
- Schools
- Civic/Government
- Streams
- Urban Growth Boundary
- City Limits
- Parks
- Industrial Areas



## CITY OF CANBY Transportation System Plan

FIGURE 7-2c

**TRUCK ROUTES**  
(Preferred Solution System)



## **Attachment C: Citizen Survey**



## Canby SW/SE 13<sup>th</sup> Ave. Safety Study

### Citizen Questionnaire

The City of Canby is reviewing SW/SE 13<sup>th</sup> Ave. to evaluate the potential need for safety enhancements. By completing this questionnaire, you will be helping the City better understand how the local community uses this road.

When completing this questionnaire, please consider the study area identified in the Figure below.



Figure 1: SW/SE 13<sup>th</sup> Ave. Safety Study Area

- 1) Are you comfortable with the travel speed of vehicles on SW/SE 13<sup>th</sup> Ave. when trying to cross?  
Are there locations on the corridor where vehicle speeds seem higher than others?
- 2) How many times per day do you normally cross SW/SE 13<sup>th</sup> Ave.?
- 3) What type of activities cause you to cross SW/SE 13<sup>th</sup> St?
  - a. High school athletic events
  - b. Use of public parks
  - c. I cross SE 13<sup>th</sup> as part of my week day commute
  - d. Other: \_\_\_\_\_
- 4) When crossing SW/SE 13<sup>th</sup> Ave, where are you most commonly heading to/from? (select up to 3)
  - a. Canby High School
  - b. Canby Swim Center/Canby Adult Center/Ackerman Middle School
  - c. 13<sup>th</sup> Ave. City Park
  - d. Neighborhoods Accessible by:
    - i. S. Elm St.
    - ii. S. Fir St.
    - iii. S. Ivy St.
    - iv. S. Pine St.
    - v. S. Redwood St.
    - vi. S. Teakwood St.
  - e. Other: \_\_\_\_\_
- 5) Please mark on the map on the first page (Figure 1) where you most commonly cross SW/SE 13<sup>th</sup> Ave. and/or where you commonly see others cross.

- 6) Please indicate in the table below with an “X” during which times you are normally crossing SW/SE 13<sup>th</sup>: (you may select more than one)

Time	Weekday (Mon – Fri)	Weekend (Sat & Sun)
12:00 AM – 3:00 AM		
3:00 AM – 6:00 AM		
6:00 AM – 9:00 AM		
9:00 AM – 12:00 PM		
12:00 PM – 3:00 PM		
3:00 PM – 6:00 PM		
6:00 PM – 9:00 PM		
9:00 PM – 12:00 AM		

- 7) What time of the year are you most likely to be crossing SW/SE 13<sup>th</sup>: (you may select more than one)
- a. Fall (September – November)
  - b. Winter (December – February)
  - c. Spring (March – May)
  - d. Summer (June – August)
- 8) If the City elects to provide enhanced crossings on SW/SE 13<sup>th</sup> Ave., where would you most likely to see them placed?
- 9) Is there anything else you think would be helpful for us to know?



## **Attachment D: Citizen Survey Results**



## SE 13th Ave Pedestrian Safety Study

### Survey Response Summary

Locations with Speeding Concerns	
W of Elm	1
Elm to Ivy	6
Ackerman east	4
W of Teakwood	2
Users Heading to/from	
Canby Swin Center	6
S. Elm	5
S. Fir	6
S. Ivy	7
Pine	4
S. Redwood	2
Teakwood	2
Canby High School	3
S Lupine	6
Lee Elem	6
Legacy Park	7
Trost Elem	1
Ponderosa	4
Requests for Enhanced Crossings (SE 13th @)	
Fir	5
Cedar	1
Ivy	3
Pine	4
Redwood	2
Lupine	7
Other Comments	
Too many speeding trucks/buses on 13th	7
Spend money on other things	2
No more speed humps	1
4 way stops	1
People run stop sign at Elm	1
Hard to see at night	1
Speeding during school hours	1
Speed sign west of Redwood is not clearly visible	1
More visual signage to alert drivers (speed feedback)	1