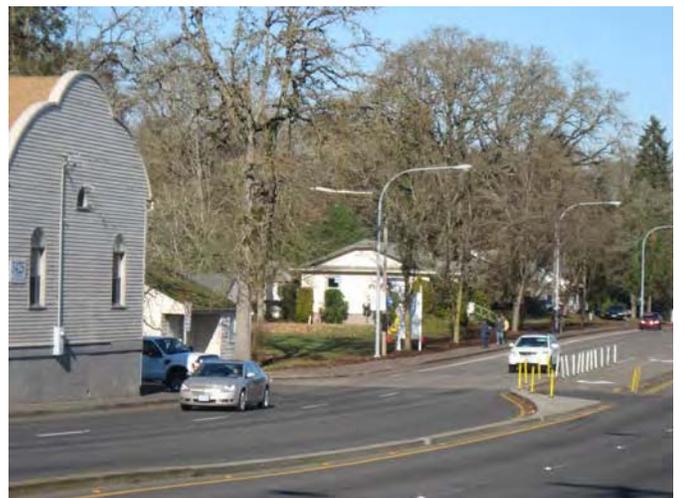




## OR-8 ROAD SAFETY AUDIT Tualatin Valley Highway at SW 185<sup>th</sup> Avenue

Mile Point 6.45 – 6.73

Audit Date: December 5-7, 2011



Road Safety Audit (RSA)

**Tualatin Valley Highway  
Mile Point 6.45 – 6.73**

Prepared For:  
**Oregon Department of Transportation (ODOT)**  
123 NW Flanders Street  
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January 31, 2012

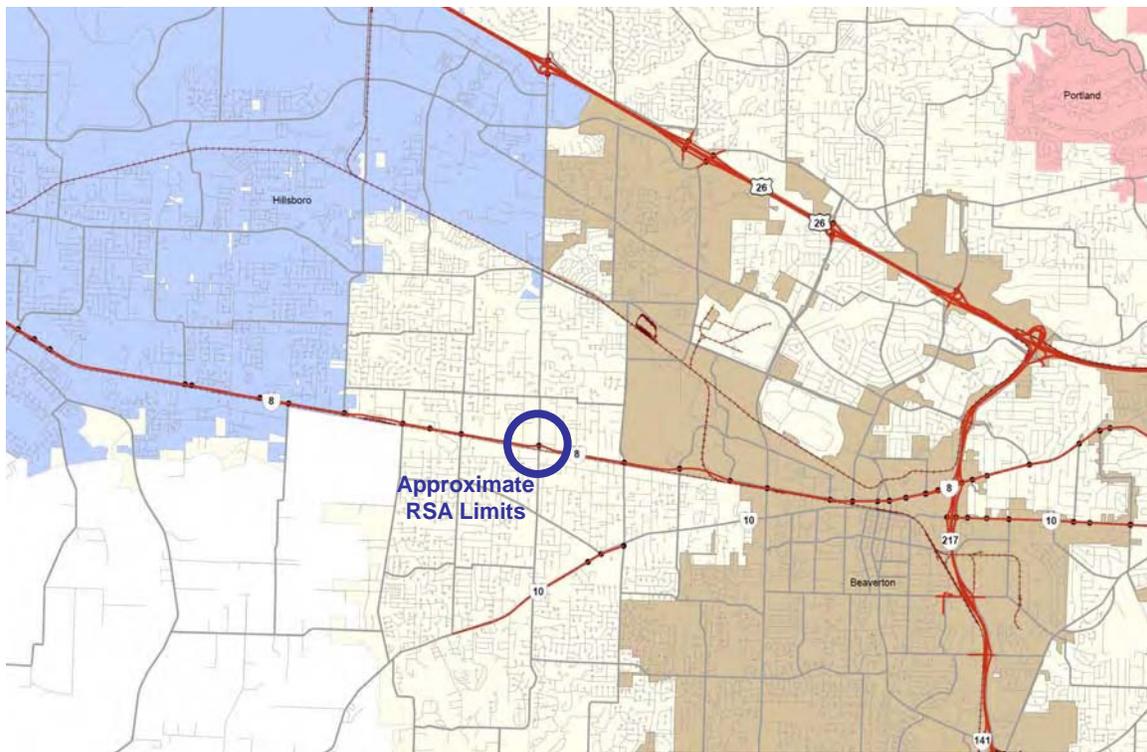
# DRAFT Road Safety Audit Report

## Introduction

A Road Safety Audit (RSA) was conducted for OR-8 (Tualatin Valley Highway) at the intersection of SW 185<sup>th</sup> Avenue. It is a formal safety evaluation of the intersection influence area, considering the safety of all road users. The objective of the RSA is to identify potential safety issues that contribute to crashes, to qualitatively assess the safety risk for the issues and to recommend treatments that eliminate or mitigate those risks.

## Background

The subject intersection is located in Aloha, an unincorporated, urbanized portion of Washington County, Oregon between Beaverton and Hillsboro. It is located approximately three miles south of US26 and four miles west of OR-217. The intersection is signalized at all four approaches with a northbound yielding right-turn lane. SW 185<sup>th</sup> Ave is a north-south Washington County facility that provides a key connection between OR-8 and US-26. Average daily traffic (ADT) is approximately 40,020 on OR-8. The ADT on SW 185<sup>th</sup> Ave is approximately 22,907 and 15,815 north and south of the intersection, respectively. Posted speeds are 35 miles per hour (mph) on OR-8 through the study area, and 45 mph on SW 185<sup>th</sup> Ave. Morning travel patterns are greatest to the north and east. Evening travel patterns are greatest to the south and west, with notable volumes from north to east.



Location Map

Many pedestrians use the intersection to access public transit. TriMet's Bus Line #57 travels along OR-8 in the study area, and has the eighth highest transit ridership in their system. TriMet's Bus Line #52 travels along SW 185<sup>th</sup> Ave. Ridership numbers are shown in the table below. Passengers board (get on) and alight (get off) the bus on three quadrants of the intersection. Wheelchair lifts are

# DRAFT Road Safety Audit Report

used at each bus stop. The number of monthly lifts indicates a significant amount of people with disabilities use the intersection.

| Street & Direction               | Daily Boardings | Daily Alightings | Monthly Lifts |
|----------------------------------|-----------------|------------------|---------------|
| OR-8 Eastbound                   | 105             | 164              | 29            |
| OR-8 Westbound                   | 140             | 95               | 29            |
| 185 <sup>th</sup> Ave Northbound | 91              | 59               | 55            |
| 185 <sup>th</sup> Ave Southbound | 41              | 65               | 49            |
| <b>Intersection Total</b>        | <b>760</b>      |                  | <b>162</b>    |

In addition to heavy TriMet bus traffic, many school buses travel through the intersection due to the close proximity of several schools. The International School of Beaverton, Aloha-Huber School, Aloha High School, and Mountain View Junior High School are all located less than 1.5 miles south of the intersection. Portland Community College (PCC) Willow Creek Center is approximately two miles to the north.

The vicinity map of the audit location shows the surrounding commercial, institutional (schools, US Post Office) and residential areas.



**Vicinity Map**

The intersection has been a top 5% Safety Priority Index System (SPIS) site for over ten years. ODOT Region 1 has identified funding to improve safety and operations at the intersection, to be used during the 2013-2014 construction season. The RSA is expected to aid in the scoping for this Safety project. Since January 2006, there were two severe injury crashes and no fatalities. The majority of crash types are rear-end/sideswipe-overtaking (66%) and angle/turning crashes (29%).

# DRAFT Road Safety Audit Report

## RSA Process

A team of six transportation professionals from different backgrounds and disciplines was assembled to participate in the RSA. Three staff members from ODOT Region 1 also participated in the RSA as resources for the audit team.

### Audit Team

Chris Bores – Senior Roadway Designer, ODOT  
Rodger Gutierrez – Bicycle & Pedestrian Facility Specialist, ODOT  
Wayne Kwong – Right-of-Way Project Manager, ODOT  
Gary Obery – Alternate Mode Traffic Engineer, ODOT  
Sarah Owens – Engineering Associate, Washington County  
Robert Rake – District 10 Transportation Maintenance Coordinator, ODOT

### Team Resources

Katherine Carlos – Traffic Analyst, ODOT  
Robert Hopewell – Traffic Investigator, ODOT  
Jeff Moss – Project Leader, ODOT

The RSA Team initiated work on Monday, December 5, 2011 with a morning kick-off meeting at the ODOT Region 1 Headquarters. Attending this meeting was the RSA Audit Team, the Team Resource members, Region 1 Metro-West Area Manager (David Kim), ODOT Region 1 Traffic Manager (Susanne D’Agnese), Region 1 Planning Manager (Kirsten Pennington) and other invitees. The following observations were provided during the meeting:

- A large portion of the crashes are rear-ending, possibly attributed to the over-capacity conditions during peak hours.
- TV Highway has frequent TriMet bus service, and many transit users access the system near this intersection.
- Some of the crashes near this intersection appear to be related to the nearby driveways and side street accesses.

The RSA Audit Team (Team) was advised to keep an open mind and not factor in costs when making recommendations.

After the kick-off meeting, the Team discussed the schedule and prepared for the first site visit. The conference rooms at ODOT Region 1 Headquarters served as a base location for the field reviews and RSA analysis activities, culminating in a findings presentation on Wednesday, December 7, 2011.

The RSA analysis included a detailed review of the crash data from January 2006 to April 2011. Review of the crash data allowed the Team to identify specific locations and safety concerns before the peak field reviews were conducted. The following principal crash information was discerned:

- There were 153 crashes during the report period. The years 2006 and 2007 had the highest number of crashes.
- Approximately 43% of all the reported crashes involved injuries.
- Rear-end/sideswipe-overtaking crashes are the highest crash types observed, which represent approximately 66% of the crashes.
- The time of day with the highest number of crashes is 3 pm to 6 pm (approximately 27% of all crashes). There were still a large amount of crashes occurring before and after this time period.

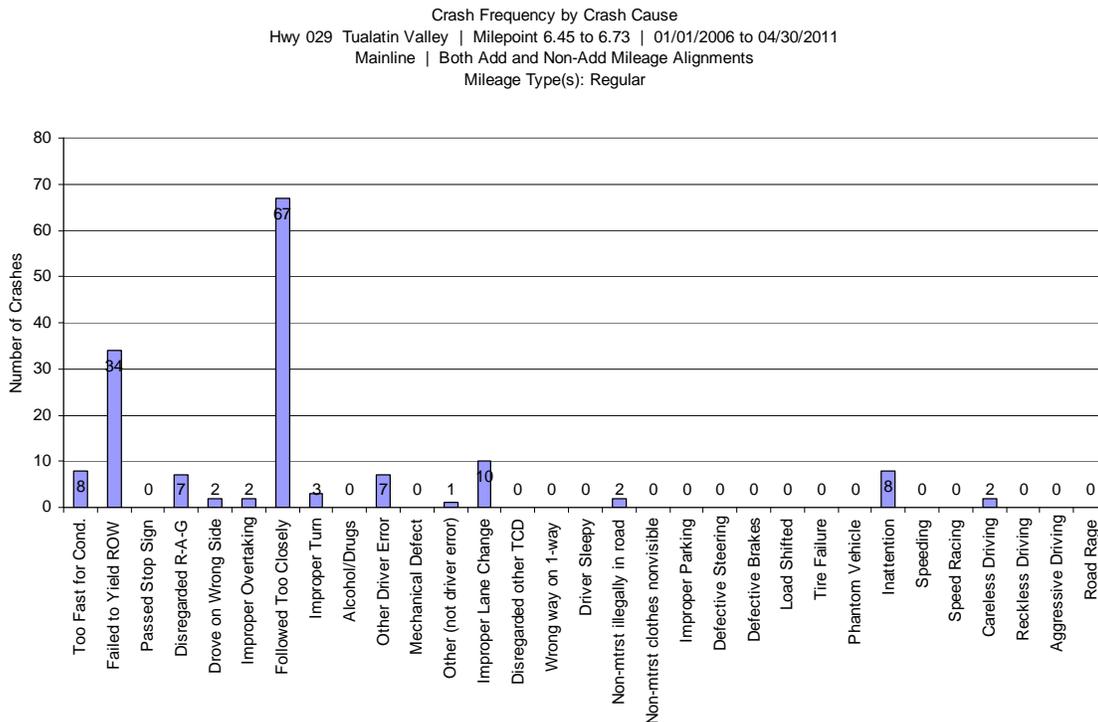
# DRAFT Road Safety Audit Report

- Fridays have the highest share of crashes (approximately 24% of all crashes).
- Approximately 22% of all crashes occur after between dusk and dawn.
- Approximately 77% of crashes occur during dry roadway conditions.
- Fifteen crashes were associated with left turns out of driveways near the intersection.
- There were three collisions with pedestrians (two SB right turns, one EB thru).
- Six crashes were pedestrian-related (3 WB thru rear-end, 1 WB right turn rear-end, 1 NB left turn rear-end, 1 EB thru rear-end).

The reported crash rate for this section is 6.79, much higher than the statewide average of 1.39. Even with this high rate, the number of crashes is likely under-reported. Although the section's crash rate is very high, most crashes are generally lower in severity. As such, the damage generated by many collisions may fall below Law Enforcement or Driver and Motor Vehicle Services (DMV) Accident Reporting Requirements.

Based on the information above, the Team ruled out focusing on specific crashes. The number of crashes at this intersection is very high, especially considering unreported crashes. Because of this, the Team concentrated on reducing the number of conflicts by looking for trends in the causes of crashes. Congestion mitigation was not a focus. Although the intersection is over capacity, the number of crashes that occur during the peak period is proportional to the increased traffic volumes.

Exhibit A shows the causes for crashes in the project area. The Team found the 44% of crashes resulting from a driver following too closely to be particularly significant. This cause usually translates to rear-end crashes. The second highest crash cause shown is failure to yield right-of-way, accounting for 22% of crashes. This cause cannot be directly translated to one specific crash type. Field observation was necessary to surmise why drivers are not yielding right-of-way.



**Exhibit A – Crash Frequency by Crash Cause**

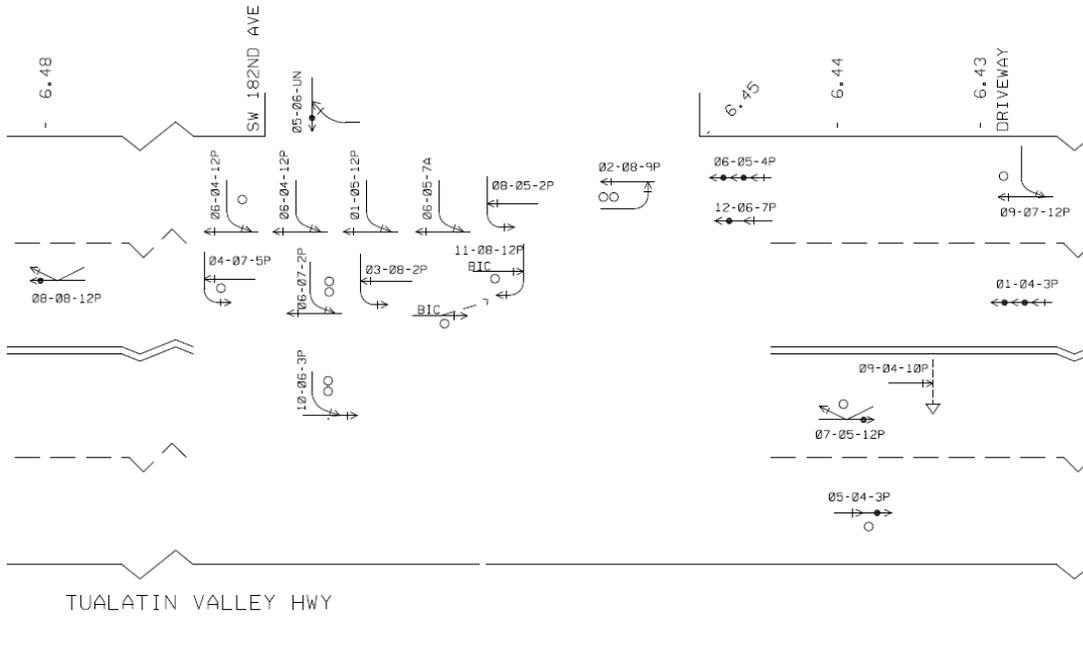
# DRAFT Road Safety Audit Report

The crash diagram of the corridor was also reviewed. Focus was given to the intersection of OR-8 and SW 182<sup>nd</sup> Ave, where many serious crashes occurred (see Exhibit B below). This T-intersection is within the influence area of the signalized SW 185<sup>th</sup> Ave intersection to the west. The entire crash diagram for the section is included in Appendix A.

The Team drove, walked and biked each movement of the intersection, crosswalk, sidewalk, and bike lane during non-peak traffic conditions. Vehicle speeds were measured using a radar gun and noted to be within reasonable values for the corresponding speed limits. During peak and non-peak traffic conditions, traffic behavior was observed at the SW 185<sup>th</sup> Ave intersection, at all approaches to the intersection, and at nearby driveways and intersections. During the morning and afternoon peak traffic conditions, the Team divided up for individual observations. Some of the significant issues noted were visibility problems, high conflict potential, pronounced pedestrian and transit activity, and distressed intersection capacity during peak periods. A complete listing of field observations is included in Appendix B.

Representatives from the Tualatin Valley Fire and Rescue (TVF&R) and the Washington County Sheriff's Office shared the following information during the morning peak period site visit:

- Heavily congested intersection
- The most serious crashes occurred at SW 182<sup>nd</sup> Ave and SW 187<sup>th</sup> Ave from left-turn movements
- Many incidents due to left-turn conflicts at accesses
- Not many crashes within the SW 185<sup>th</sup> Ave intersection
- Number of crashes probably under reported
- Most pedestrians on SW 185<sup>th</sup> Ave
- Many jaywalkers
- Likely increased driver frustration/agitation due to proximity of schools



**Exhibit B – Crash Diagram (OR-8 & SW 182<sup>nd</sup> Ave)**

Note: Crash Diagram reflects data from 1/2003 through 12/2005

# DRAFT Road Safety Audit Report

## RSA Findings

The RSA team discussed their field observations to determine potential safety risks. Appendix B sorts field observations into four categories: visibility, operations and capacity, mode conflict, and street network. The team assessed each field observation for its potential safety risk and found that many observations had common safety issues. The team then suggested treatments that eliminate or mitigate the safety issues.

The most significant safety concerns were related to the high number of rear-end crashes on the OR-8 approaches to SW 185<sup>th</sup> Ave, the high-severity crashes related to nearby accesses, and the crashes associated with the non-standard northbound slip lane. As discussions progressed, the team recognized that although some of the rear-end crashes may be related to the over-capacity conditions, many rear-end crashes are happening outside the peak hours when the intersection is not over capacity. The team surmised that many of the rear-end crashes are likely related to drivers' expectations and the abrupt change in roadway conditions. Most of OR-8 is a higher-speed suburban highway with a linear alignment that affords drivers a relatively clear view of traffic conditions ahead of them. Between SW 182<sup>nd</sup> Ave and SW 187<sup>th</sup> Ave, however, the road abruptly curves and the character more resembles a business district with increased building and access density. This places additional, and sometimes unexpected, demands on drivers as they enter from the east and the west. Rather than recommend expensive and impactful capacity-increasing concepts, the team suggests measures that minimize vehicle conflicts and alert drivers to the changing nature of OR-8 as it passes through the Aloha area.

The RSA team also discussed some longer-term concepts for improving safety in this area. These discussions resulted in recommendations for improved sidewalks, a comprehensive access management plan, and consideration for geometric improvements to the roadway alignment and cross-section when the highway is reconstructed in the future. The team further discussed how the area-wide street network has limited connections to the south across the railroad tracks, focusing large volumes of traffic through the intersection. The new signal planned for the intersection of SW 178<sup>th</sup> Ave and OR-8 is expected to shift some traffic away from the SW 185<sup>th</sup> Ave intersection. A new connection south across the railroad at this location would be needed to provide significant operational benefits for SW 185<sup>th</sup> Ave.

The team identified nine key issues and qualitatively rated them (high, medium, low) by exposure, probability and consequence. They were assessed on how often users are subjected to them (exposure), how likely each exposure would result in a crash or injuries (probability), and how severe the crash or injuries would likely be if they occurred (consequence). The sum of the three assessments resulted in an overall qualitative road safety risk for each issue.

The next section describes each of the issues in detail. Issues are organized into two categories; immediate tasks and project recommendations. Immediate tasks are to be considered as ongoing operational and maintenance improvements. Project recommendations should be considered for implementation with the planned Statewide Transportation Improvement Program (STIP) Safety Project. The issues are further organized by overall safety risk rating within each category.

A summary of these issues with their corresponding suggested mitigation treatments is included in Appendix C for agency response.

# IMMEDIATE TASKS (Operations & Maintenance)

## **Issue: Sight Distance**

### **Description of Safety Issue:**

Visibility for roadway users is limited or compromised in several locations. Views are diminished by vegetation near the northbound slip lane on SW 185<sup>th</sup> Ave and at the Aloha Mall accesses on the north side of the highway to the west of SW 185<sup>th</sup> Ave. At least one business was observed to have a portable sign near a driveway that limited the view of exiting motorists. Large parked vehicles in the Aloha Mall parking lot limit intersection sight lines at SW 187<sup>th</sup> Ave.

| Safety Risk Assessment      |        |
|-----------------------------|--------|
| Exposure                    | Medium |
| Probability                 | Medium |
| Consequence                 | Medium |
| Resulting Road Safety Risk: | MEDIUM |



Examples of sight distance restrictions in study area.



Restricted sight distance at SW 187<sup>th</sup> Ave.

### **Suggestions:**

- Consider relocating portable signs and maintaining vegetation to improve sight triangles consistent with county ordinances or state highway access permits. RSA team recommends addressing in an ongoing fashion.

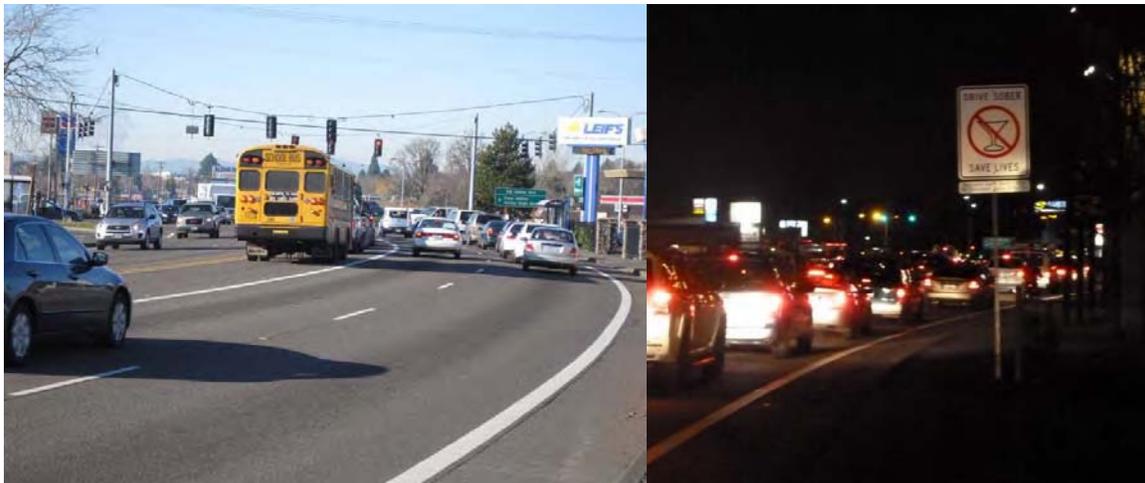
# PROJECT RECOMMENDATIONS (STIP Safety Project)

## Issue: Visibility of Intersection Control and Signage

### Description of Safety Issue:

The horizontal curvature of the highway through the Aloha area limits the visibility of the traffic signal heads and street name signs. Nearby buildings, utilities, large vehicles and other traffic signal heads can momentarily shield the signal heads and/or street name signs from the view of approaching motorists. Vehicle queues often extend beyond clear visibility of the signal indications, which may contribute to the rear-end crash rate. A truck or bus could obscure the view of the directional signing that includes the SW 185<sup>th</sup> Avenue name. A view of the traffic signal from a distance is shown below.

| Safety Risk Assessment      |        |
|-----------------------------|--------|
| Exposure                    | High   |
| Probability                 | Medium |
| Consequence                 | Medium |
| Resulting Road Safety Risk: | HIGH   |



Westbound approach at SW 185<sup>th</sup> Ave noting limited visibility of signal heads.

### Suggestions:

- Consider upgrading the traffic signal at SW 185<sup>th</sup> Ave with advance or supplemental signal heads.
  - As part of signal upgrade, consider installing countdown pedestrian signal heads and upgrading all push buttons with APS-type devices due to significant pedestrian use.
- Consider improving the visibility of street name signs, possibly overhead interior illuminated signs for enhanced evening visibility.

# PROJECT RECOMMENDATIONS (STIP Safety Project)

## **Issue: Illumination**

### **Description of Safety Issue:**

The approaches and intersection of SW 185<sup>th</sup> Ave and TV Highway are currently not illuminated. There are numerous conflicts created by driveways, bus stops, pedestrian crossings, and the traffic signal operation. The conflicts may not be as readily apparent under ambient light or vehicle headlights. Drivers may have reduced time to react to conflicts. The lack of illumination may contribute to a failure by drivers to recognize the changing roadside character of the area.

| Safety Risk Assessment      |      |
|-----------------------------|------|
| Exposure                    | High |
| Probability                 | Low  |
| Consequence                 | High |
| Resulting Road Safety Risk: | HIGH |



South crosswalk at SW 185<sup>th</sup> Ave.



South crosswalk of SW 185<sup>th</sup> Ave  
Left turning vehicle crossing pedestrian path.  
Note: picture brightened to show conflicts

### **Suggestion:**

- Consider installing illumination along TV Highway from SW 182<sup>nd</sup> Ave to SW 187<sup>th</sup> Ave.

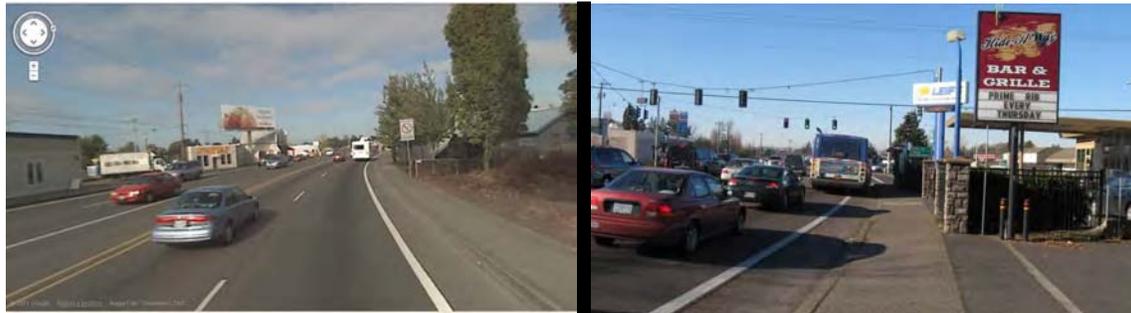
# PROJECT RECOMMENDATIONS (STIP Safety Project)

## **Issue: Short Transition to Urban Area**

### **Description of Safety Issue:**

The Aloha area, centered at the intersection of TV Highway and SW 185<sup>th</sup> Ave, is characterized by commercial land uses, frequent bus service, and numerous accesses to both SW 185<sup>th</sup> Ave and TV Highway. There are many more conflicts to vehicular flow in this area than just a quarter of a mile away. The difference is especially significant along TV Highway. Drivers may not be recognizing the increased chances of needing to stop for a bus, a red light, or a vehicle pulling out of a driveway. The out-of-character curvature of TV Highway through this congested area exacerbates the situation. The high number of rear-end crashes suggests that drivers are not preparing to stop for conflicts as well as they should be. The pictures below illustrate the transition from a low-conflict to a high-conflict environment on TV Highway, all within about 600 feet. This issue arises in both the eastbound and westbound approaches to the Aloha area.

| <b>Safety Risk Assessment</b> |      |
|-------------------------------|------|
| Exposure                      | High |
| Probability                   | High |
| Consequence                   | Low  |
| Resulting Road Safety Risk:   | HIGH |



(Left) TV Highway at mile point 6.47 noting lower density of conflicts and suburban character.  
(Right) TV Highway at mile point 6.58 noting higher density of conflicts and urban character.

### **Suggestions:**

Consider improvements that enhance the urban nature of the area and give more advance notice to motorists of the changing character of the highway. Some suggestions are:

- Consider installing raised median islands on TV highway prior to entering the Aloha area to create a gateway effect.
- Consider pavement marking enhancements to delineate and emphasize road curvature at night.
- Consider reviewing the 35 mph speed zone and extending further west of the intersection.
- Consider adding pedestrian-scale illumination from SW 182<sup>nd</sup> Ave to SW 187<sup>th</sup> Ave to emphasize urban character.

# PROJECT RECOMMENDATIONS (STIP Safety Project)

## Issue: Uncontrolled Left-Turn Movements

### Description of Safety Issue:

Traffic conditions are complex in the subject area. During off-peak conditions, vehicles exiting driveways and cross streets were observed to accept narrow gaps in traffic to execute left turns. The density of driveways causes gaps in traffic flow to be filled and drivers' wait times may be longer than anticipated. Eventually, drivers become impatient and accept narrower gaps that may result in mainline traffic needing to slow down to avoid a crash. Traffic speeds during mid-day conditions may result in serious injury crashes. During peak conditions, vehicles cut between stopped cars to execute turns. However, even when one lane of traffic is stopped, the other may be moving. The RSA team concluded that the left-turn movements at SW 182<sup>nd</sup> Ave have a particularly high safety risk due to the severity typically associated with these crashes.

| Safety Risk Assessment      |        |
|-----------------------------|--------|
| Exposure                    | Medium |
| Probability                 | Medium |
| Consequence                 | High   |
| Resulting Road Safety Risk: | HIGH   |



Vehicle cuts between stopped cars to execute turn.



Vehicle waits for gap in traffic to execute left turn.



Vehicles execute left turns in front of stopped traffic.

### Suggestions:

- Consider installing islands/traffic separator from SW 182<sup>nd</sup> Ave to SW 187<sup>th</sup> Ave to restrict left-out movements at SW 187<sup>th</sup> Ave and left-in/left-out movements at SW 182<sup>nd</sup> Ave and access driveways. An illustration of suggested improvements is shown in Appendix D.

# PROJECT RECOMMENDATIONS (STIP Safety Project)

## Issue: Geometry of Northbound Right Turn Slip Lane

### Description of Safety Issue:

Current geometry of the northbound right turn slip lane results in diminished scanning behavior and varying points where motorists stop before entering TV Highway. The design of the slip lane encourages higher speeds and unpredictable driver behavior that presents additional safety concerns related to pedestrian movements across the slip lane. Numerous crashes (especially rear-ends) have been linked to the operation of the northbound right turn slip lane.

| Safety Risk Assessment      |        |
|-----------------------------|--------|
| Exposure                    | High   |
| Probability                 | Medium |
| Consequence                 | Medium |
| Resulting Road Safety Risk: | MEDIUM |



Northbound right turn slip lane.

### Suggestions:

- Consider reconstructing the northbound right turn slip lane with improved geometry:
  - Consider a 2:1 length to width ratio for the island, consistent with guidance in the Oregon Bicycle and Pedestrian Design Guide and the ODOT striping manual.
  - Alternatively, consider replacing the slip lane with a traditional right-turn lane.
- Consider enhancing crosswalk with continental-style markings.
- Consider improving geometry of southbound left turn. The operation of the slip lane could likely be improved by pulling back the stop bar for the westbound left turn. This would better facilitate southbound left-turning motorists using the inside lane as they complete their turns.

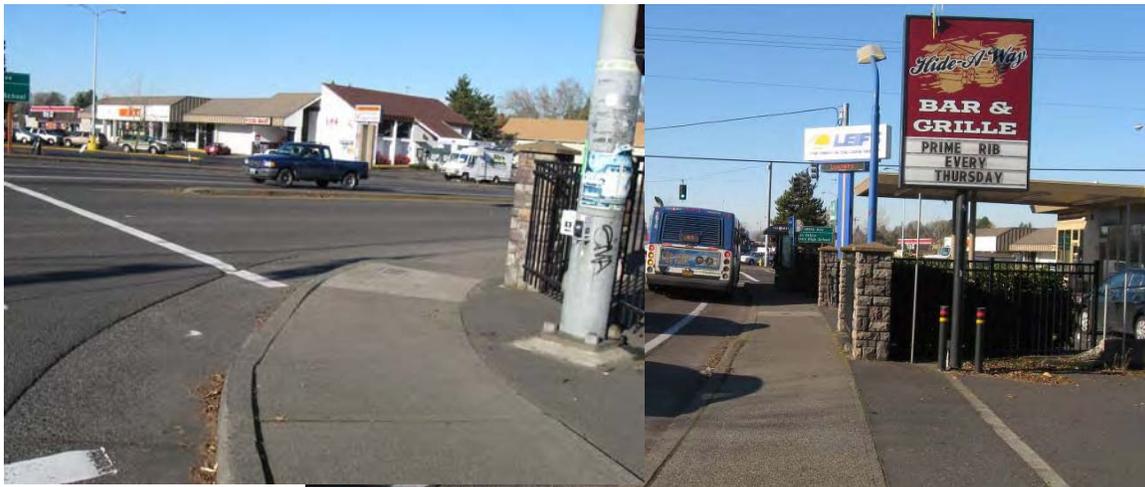
# PROJECT RECOMMENDATIONS (STIP Safety Project)

## Issue: Pedestrian Visibility in Northeast Quadrant

### Description of Safety Issue:

The intersection design and nearby obstructions limit motorists' ability to see pedestrians waiting to cross the northern crosswalk. The primary hazard is for westbound TV Highway traffic turning right. The near-side bus stop shelter and tall fence on Leif's property limit drivers' view of pedestrians in the crosswalk. The result is drivers stopping suddenly when pedestrians are present. There has been one pedestrian crash reported at this location, but an employee at the nearby auto-repair shop reported seeing numerous near-misses and minor incidents.

| Safety Risk Assessment      |        |
|-----------------------------|--------|
| Exposure                    | Medium |
| Probability                 | Medium |
| Consequence                 | High   |
| Resulting Road Safety Risk: | MEDIUM |



Limited visibility of crosswalk in NE corner.

### Suggestions:

- Consider reconstructing the curb return with a smaller radius to improve visibility of pedestrians, shorten crosswalk and encourage slower vehicle turning speeds.
- Consider removing sight obstructions:
  - Suggest negotiating with abutting land owner to move fence away from intersection.
  - Consider relocating bus shelter or modifying to eliminate sight obstruction of pedestrians.

# PROJECT RECOMMENDATIONS (STIP Safety Project)

## **Issue: Turbulence Associated with Near-side Bus Stop Operations**

### **Description of Safety Issue:**

The interactions between motorists and buses at near-side bus stops on TV Highway at SW 185<sup>th</sup> Ave create unpredictable traffic flow. Both stops are very active with an average of 269 and 235 boardings and alightings per day on the eastbound stop and westbound stop, respectively. The stops are serviced every 16 minutes in the peak hours and every 20 minutes in the off-peak daytime hours. Eight of the 34 crashes reported on the eastbound approach were sideswipes; some of those were likely related to the near-side bus stop.

| Safety Risk Assessment      |        |
|-----------------------------|--------|
| Exposure                    | High   |
| Probability                 | Medium |
| Consequence                 | Medium |
| Resulting Road Safety Risk: | MEDIUM |



Near-side bus stop (eastbound) at SW 185<sup>th</sup> Ave.



Lane changes due to near-side bus stop.

### **Suggestion:**

- Consider relocating the near-side bus stops on TV Highway to new bus pullouts on the far side of the signalized intersection.

This modification would reduce the interruptions to traffic flow on the highway associated with the existing near-side bus stops. The flow interruptions combined with the roadway curvature (and associated reduction in visibility), contribute to side-swipe and rear-end crashes. There are some potential negative consequences such as additional delay to the buses and additional walking distance for passengers. The impacts to transit service should be reviewed in light of the improvement to traffic flow on the highway.

The provision of far-side bus stops on TV Highway would have the additional benefit of increasing the capacity of the intersection (1% to 2%) and reducing queue lengths.

# PROJECT RECOMMENDATIONS (STIP Safety Project)

## **Issue: Bike Lanes on SW 185<sup>th</sup> Avenue**

### **Description of Safety Issue:**

People on bicycles are required to share the general travel lanes (or ride on the sidewalks) with heavy motorized vehicular traffic. Under these conditions, riders may be unpredictable and may not be as visible if they are riding on the sidewalks. There are bike lanes on SW 185<sup>th</sup> Ave both north and south of the intersection, but the bike lanes are missing in the immediate vicinity of the intersection. SW 185<sup>th</sup> Ave is the only place to cross the adjacent railroad tracks between SW 170<sup>th</sup> Ave and SW 198<sup>th</sup> Ave, creating a high need for bicycle facilities at this location. Additionally, this intersection is a vital crossing for students that bike to nearby Aloha High School, less than one mile to the south. Many high school students currently ride on the sidewalks and cross this intersection, riding their bikes in the crosswalk.

| <b>Safety Risk Assessment</b> |        |
|-------------------------------|--------|
| Exposure                      | Low    |
| Probability                   | Medium |
| Consequence                   | High   |
| Resulting Road Safety Risk:   | MEDIUM |



**Bicyclists traveling on SW 185<sup>th</sup> Ave through intersection.**

### **Suggestions:**

- Consider connecting bike lanes across SW 185<sup>th</sup> Ave.
- Consider a shared southbound bicycle/pedestrian facility on the south side of the intersection located behind the existing railroad crossing gate.

# DRAFT Road Safety Audit Report

## Executive Summary of Recommendations

To minimize the safety risks through this section of OR-8 (TV Highway), the Team offers the following recommendations for consideration:

### Immediate Tasks

- Consider adjusting signal timing at TV Highway & SW 185<sup>th</sup> Ave
  - Consider lengthening pedestrian walk time
  - Investigate adding all-red clearance interval
- Suggest clearing shrubbery to improve pedestrian visibility
-  Suggest enforcing County ordinances and ODOT District access requirements to improve sight distance

### Project Recommendations

- Consider replacing traffic signal at TV Highway & SW 185<sup>th</sup> Ave
  - Consider upgrading pedestrian pushbuttons with APS on all pedestals
  - Consider adding countdown pedestrian signals
  - Suggest re-orienting and adding advanced or near-side signal heads
  - Suggest offsetting stop bar for westbound left-turn lane
  -  Consider installing visible street name signs and reviewing signs for visibility improvement
- Consider relocating TV Highway near-side bus stops with far-side pullout 
- Consider improving pedestrian visibility to westbound right turn (fence, bus shelter obstruction)
- Consider installing traffic separator/median island on TV Highway
  - Suggest restricting lefts at SW 182<sup>nd</sup> Ave and other access driveways
  -  Consider constructing median island with vertical elements to calm traffic and define change in corridor
- Consider adding illumination from SW 182<sup>nd</sup> Ave to SW 187<sup>th</sup> Ave
- Consider adding striping/delineation through curves to enhance visibility
- Suggest improving NB SW 185<sup>th</sup> Ave island geometry or changing to right-turn lane
- Investigate feasibility of completing bike lanes on SW 185<sup>th</sup> Ave

Should there be a recommendation here related to the speed zone on TV? It was mentioned in the report under short transition to urban area.  
Is there a suggestion related to the posted speed on 185th, which is 45 mph? It is noted in the report.

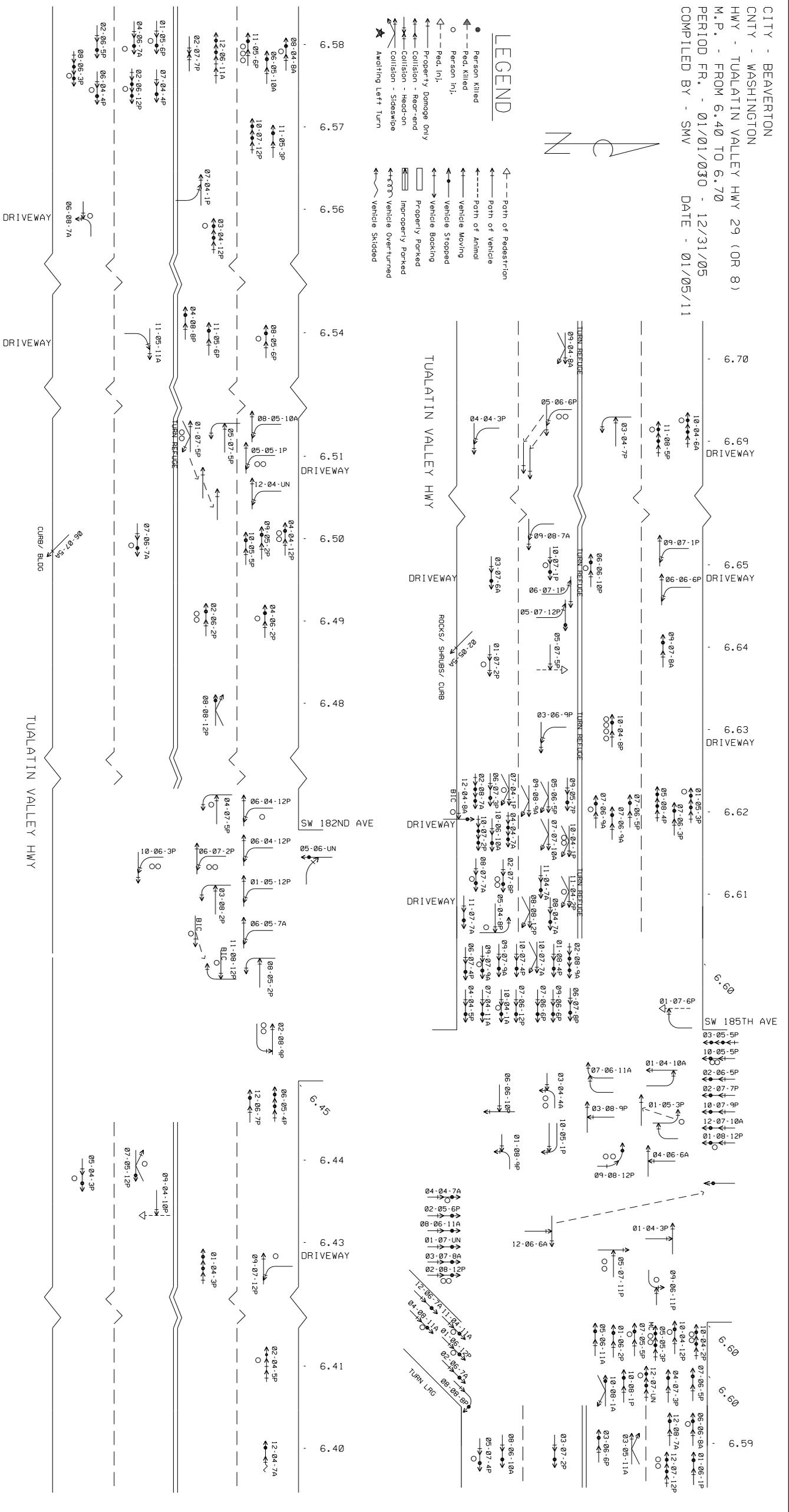
**Appendix "A"**  
**Crash Diagram**

CITY - BEAVERTON  
 CNTY - WASHINGTON  
 HWY - TUALATIN VALLEY HWY 29 (OR 8)  
 M.P. - FROM 6.40 TO 6.70  
 PERIOD FR. - 01/01/030 - 12/31/05  
 COMPILED BY - SMV DATE - 01/05/11



LEGEND

- Person Killed
- Ped. Killed
- Person Inj.
- Ped. Inj.
- Property Damage Only
- Collision - Rear-end
- Collision - Head-on
- Collision - Sideswipe
- Collision - Vehicle Overturned
- Collision - Left Turn
- Path of Pedestrian
- Path of Vehicle
- Path of Animal
- Vehicle Moving
- Vehicle Stopped
- Vehicle Backing
- Property Parked
- Improperly Parked
- Vehicle Skidded
- Vehicle Awaiting Left Turn



## **Appendix "B"**

### **Road Safety Audit (RSA) Field Observations**

## Appendix “B” – RSA Field Observations

The table below provides all the field observations identified during the RSA.

| Field Observation  | Risk Potential  | Suggestion   | Suggested Time Frame |
|--|---|--|----------------------|
| <b>CATEGORY 1: VISIBILITY</b>  |   |  |                      |
| The intersection is dark during fall and winter peak hours. Activity in the intersection area is difficult to see.   | Conflicts are less apparent in poor light. Drivers may have reduced time to react to conflicts. The lack of illumination may contribute to a failure by drivers to recognize the changing roadside character of the area.   | Add illumination at the intersection and extended east and west of the intersection.   | Project              |
| The traffic signal heads are not visible soon enough for drivers to react properly to the signal indication.   | Horizontal curvature, nearby buildings, utilities, large vehicles and other traffic signal heads can momentarily shield the signal heads and/or street name signs from the view of approaching motorists. Vehicle queues often extend beyond clear visibility of the signal indications which may contribute to rear-end crash rate. A truck or bus could obscure the view of the directional signing (includes the street name). | Re-orient and add advance or near-side signal heads.   | Project              |
| Street name signs are difficult to see due to their mounting location, size, and roadway factors that limit drivers' opportunity to look in the correct direction.   |   | Relocate street signs to new mast arms.<br>Option: install internally illuminated street name signs.   | Project              |
| The horizontal alignment affects visibility.   |   | Add new striping delineation through the curves, possible reflectors.  | Project              |
| The vertical alignment affects visibility.   |   | Flatten curves, consider intersection geometry changes.  | Long Term            |
|  |   | Possible changes to crown and superelevation.  | Long Term            |
| Roadside “clutter” including private signs, taco trucks, vegetation, advertisements, buildings close to right-of-way, sandwich board signs, and advertising representatives in costume (Little Caesar) contribute to poor visibility at driveways. | Roadside “clutter” contributes to distracted drivers. Distracted drivers are more likely to be involved in a crash. Also, roadside clutter blocks drivers' view of traffic, which may result in drivers misjudging gaps and causing crashes.  | Remove existing sandwich board signs.  | Immediate            |
|  |   | Enforce County ordinances and ODOT district requirements if applicable. Community outreach, business outreach. Convey the message of needed safety to business owners. | Ongoing              |
| Many of the driveways have poor sight distance. Drivers unable to assess safe gaps when pulling out into traffic.  | Drivers pull into traffic unexpectedly. This is a crash risk for both the drivers on the road and those pulling out.  | Create a sign buffer zone behind sidewalk.   | Project              |
| There are too many traffic signs for drivers to be able to decipher relevant information.  | Excessive traffic signs contribute to distracted drivers. Distracted drivers are more likely to be involved in a crash.   | Review current signing standards and sign accordingly.   | Project              |

## Appendix “B” – RSA Field Observations

| Field Observation   | Risk Potential  | Suggestion  | Suggested Time Frame |
|---|---|---|----------------------|
| Westbound TV Highway traffic turning right to northbound 185th has limited visibility of pedestrians because of the bus shelter and a tall fence on the Leif's property. Drivers stop suddenly.   | Sudden stops may contribute to rear-end crashes.  | Improve pedestrian visibility by removing fence and bus shelter.  | Project              |
| Northbound 185th traffic turning right has a skewed channelized right-turn lane, resulting in poor sight distance for drivers scanning for a gap and high speeds on green. Improper use of stop bar and lack of crosswalk striping.   | Current geometry of the northbound right turn slip lane results in poor scanning behavior and varying points where motorists stop before entering TV Highway. The design of the slip lane encourages higher speeds and unpredictable driver behavior that presents additional safety concerns related to pedestrian movements across the slip lane. | Improve the island geometry or install a typical right turn lane.   | Project              |
| Shrubs obscure view of pedestrians crossing to the right turn island refuge.  |   | Clear shrubbery to improve pedestrian visibility.   | Ongoing              |
| <b>CATEGORY 2: OPERATIONS &amp; CAPACITY</b>  |   |   |                      |
| Congestion during the peak period is not isolated to the subject intersection. Many drivers entering the subject area have already been in traffic and exhibit frustration and impatience. For example, drivers “cut” into the shoulder and sidewalk to enter the southbound right-turn lane.   | The traffic data confirms that the intersection is over-capacity. When an intersection is over-capacity, people do unexpected things, including unsafe behavior that may result in crashes.   | The RSA team considered the addition of a variety of turn lanes and changes to existing lane configurations, but does not advance any suggestions. See comprehensive solutions in Category 4. | Not Advanced         |
| During the peak hours, the queue of vehicles extends indefinitely on all approaches. On the east side, the queue extends to the signal at 170th. By the time that vehicles are stopping at the end of the queue, the front of the queue is moving again. Vehicles stop more than once for the same traffic signal, especially if they are in a turn lane. | Vehicles reach a high speed before being required to stop again. The stop locations are not predictable and often result in sharp braking maneuvers, which could result in crashes.   | Option: ITS solution (i.e. stopped vehicles ahead when flashing).   | Project              |
| Vehicles stopping as a result of the 185 <sup>th</sup> /TV Highway signal are too far from the signal to see it. The effective length of the queue is also longer than the 35 mph speed zone.   | Vehicles in a 45 mph speed zone are stopping for a traffic signal that is in a 35 mph speed zone.   | Extend the 35 mph speed zone further west.  | Project              |

## Appendix “B” – RSA Field Observations

| Field Observation   | Risk Potential  | Suggestion   | Suggested Time Frame |
|---|---|--|----------------------|
| Vehicles on southbound 185 <sup>th</sup> , turning left to eastbound TV Highway, pull into the curbside lane rather than the inside lane.   | Westbound left-turning vehicles pull up to the crosswalk, causing entering vehicles to shy away from the inside lane and conflict with northbound right-turning vehicles.                                     | Move back the stop bar in the left turn lane for westbound TV Highway to southbound 185 <sup>th</sup> .  | Project              |
| The storage length of the 185 <sup>th</sup> southbound left-turn bay for eastbound TV Highway is over capacity at peak periods. Immediately upstream is mandatory left-turn bay for Alexander that may “trap” drivers intending to turn left at TV Highway.                                   | Southbound drivers heading to TV Highway eastbound may be encouraged to access TV Highway via Alexander and 182 <sup>nd</sup> due to mandatory left-turn geometry for Alexander and over-capacity conditions. | Coordinate with Washington County to improve signage and delineation of left-turn lane for Alexander. Consider installing directional signage for “trapped” drivers to use signal at 178 <sup>th</sup> & TV Highway (to be constructed). | Immediate            |
| Stopped buses prevent movement in one lane of traffic. As a result, the vehicles behind the bus move into the left lane. This reduces the flow to both lanes.   | Three of the four bus stops are on the near-side of the intersection.<br>The interactions between motorists and buses at near-side bus stops on TV Highway at 185th Street create unpredictable traffic flow. | Construct far-side bus pullouts and co-locate bus stops where possible.  | Project              |
| School buses stop and open their doors at railroad tracks before proceeding. Southbound transit buses on 185th have a stop before the railroad tracks in the traffic lane. In both cases, vehicles behind the buses get caught in the intersection when the signal indication changes to red. | The far-side bus stop blocks traffic.   | Build bus pullout (if possible).   | Project              |
| <b>CATEGORY 3: MODE CONFLICT</b>  |   |  |                      |
| The traffic signal cycle length translates to long wait times for pedestrians.  | Increases impatience of pedestrians and may contribute to unsafe/illegal ped crossings.   | Evaluate signal timing and adjust as needed.   | Immediate            |
| Pedestrian walk times were not long enough for team members to cross the street.  | Disabled (slower) pedestrians in the area cannot make it all the way across in the current Walk + Flashing Don't Walk interval.   | Evaluate need for increased WALK time.   | Immediate            |
|   |   | Install countdown ped heads.   | Project              |

## Appendix “B” – RSA Field Observations

| Field Observation   | Risk Potential  | Suggestion  | Suggested Time Frame |
|---|---|---|----------------------|
| A high number of pedestrians were observed to cross against the “don’t walk” indication on the south leg of the intersection. During the AM peak observation period, litter blocked the pushbutton arrow (RSA team removed).  | The pedestrian pushbutton is in a counter-intuitive location, which evidently causes confusion to pedestrians.  | Upgrade ped push buttons with APS and install in correct locations.   | Project              |
| The intersection approach curves and superelevation make it feel like driving on a racetrack.   | When drivers expect a high level of mobility, due caution is not observed.  | Construct islands and traffic separators as a transitional visual cue.  | Project              |
| Various modes of traffic share the same intersection: trains on the railroad tracks, transit buses, school buses, passenger cars, freight trucks, bicycles and pedestrians.   | After measuring vehicle speeds, the 85th percentile speed is at or below the posted speeds during non-peak conditions. Note that the speed zone changes from 35 mph to 45 mph west of the intersection. Vehicular speeds increase with the speed zone change. | Extend the 35 mph speed zone further west.  | Project              |
| Most ramps are not ADA-compliant.   | Disabled pedestrians who are not able to use the ramps will be in the street, rather than the sidewalk.<br>No evidence suggests that the non-compliant ramps are directly correlated with pedestrian crashes at this intersection.                            | Replace non-compliant ramps.  | Project              |
| Sections of sidewalk are missing.   | Disabled pedestrians who are not able to use the ramps will be in the street, rather than the sidewalk.<br>No evidence suggests that the missing sidewalks are directly correlated with pedestrian crashes at this intersection.                              | Bring existing north-side sidewalk up to standards.   | Long Term            |
| <b>CATEGORY 4: STREET NETWORK</b>   |   |   |                      |
| The street network in the vicinity of the intersection of 185th & TV Highway relies heavily upon arterial routes including both 185th and TV Highway. The nearby parallel routes, such as Shaw and Alexander, have access restrictions that force longer trips onto 185 <sup>th</sup> and TV Highway. This creates a "super block" grid system at locations with full-turn functionality. | Intersection capacity is related to the forced use of TV Highway.   | Connect 178 <sup>th</sup> to the south across the railroad tracks.  | Long Term            |
|   |   | Access Management Plan, combine accesses, right in/right out (RIRO) with traffic separator, alignment of access. Approach styles (radius versus dustpan). | Long Term            |

## Appendix “B” – RSA Field Observations

| Field Observation   | Risk Potential   | Suggestion  | Suggested Time Frame   |
|---|--|---|--|
| <p>Since there is no crossing of 185th at Shaw Street, numerous vehicles detour by cutting through the post office parking lot to execute a U-turn maneuver.</p>  | <p>Limited vehicle connectivity, RIRO. No place for U-turns. Vehicles are using the post office or Alexander to bypass access-medians.</p> | <p>Allow more U-turns.</p>  | <p>Long Term</p>   |
| <p>Southbound traffic diverts to Alexander and 182nd to access TV Highway eastbound.<br/>Median configuration at 185<sup>th</sup> &amp; Alexander may unintentionally force drivers to divert at peak periods when storage bay is full at TV Highway.</p> | <p>Diverted traffic moves conflicts from 185<sup>th</sup> to 182<sup>nd</sup> intersection instead.</p>                                    | <p>Restrict lefts in and out at 182<sup>nd</sup> with a raised concrete median. A signal at 178<sup>th</sup> should alleviate some left-turn pressure. Consider future coordinated traffic signal at 182<sup>nd</sup>.</p>  | <p>Project</p>   |
| <p>Bike lane on 185th ends 400' north of TV Highway (at Alexander Street) and re-emerges 600' south of TV Highway (at Blanton Street).</p>  | <p>No bike lanes on 185<sup>th</sup> about 200 feet leading up to the intersection.</p>  | <p>Add bike lanes where possible. Take width from right-turn lane to add in southbound bike lane.<br/>Consider 5' easement along back side of gas station for bike/ped path.<br/>Consider additional bike options for northbound 185th if island is reconstructed. Consider adding receiving bike lane for northbound 185<sup>th</sup>.</p> | <p>Project (assessment and construction where possible)<br/><br/>Long Term (completion of bike lane gap)</p> |

**Appendix "C"**

**Road Safety Audit (RSA) Findings Summary**

Appendix “C” – RSA Findings Summary

|                         | Issue  | Suggestion  | Agency Response/Comment |
|-------------------------|--|---|-------------------------|
| Immediate Tasks         | <p><u>Sight distance</u></p> <ul style="list-style-type: none"> <li>• Motorists’ views are limited by vegetation near the northbound slip lane on SW 185<sup>th</sup> Ave and at the Aloha Mall accesses on the north side of the highway to the west of SW 185th Ave.</li> <li>• At least one business was observed to have a portable sign near a driveway that limited the view of exiting motorists.</li> <li>• Large vehicles parked in the Aloha Mall parking lot block sight lines at SW 187<sup>th</sup> Ave.</li> </ul> | <ul style="list-style-type: none"> <li>• <i>Trim vegetation:</i> Consider trimming or removing vegetation within ROW that restrict views.</li> <li>• <i>Access management:</i> Consider maintaining vegetation, relocating portable signs and other obstructions to improve sight triangles consistent with county ordinances or state highway access permits.</li> </ul>   |                         |
| Project Recommendations | <p><u>Visibility of intersection control and signage</u></p> <ul style="list-style-type: none"> <li>• Horizontal curvature of the highway through the Aloha area limits the visibility of the traffic signal heads and street name signs.</li> <li>• Nearby buildings, utilities, large vehicles and other traffic signal heads can momentarily shield the signal heads and/or street name signs from the view of approaching motorists.</li> </ul>  | <ul style="list-style-type: none"> <li>• <i>Rebuild Traffic Signal:</i> Consider installing a new traffic signal at SW 185<sup>th</sup> Ave that utilizes advance or supplemental signal heads.</li> <li>• Consider installing countdown pedestrian signal heads.</li> <li>• Consider upgrading all pedestrian pushbuttons with APS devices.</li> <li>• <i>Improve visibility of street name signs:</i> Consider improving the visibility of street name signs, possibly utilizing overhead illuminated signs for enhanced evening visibility.</li> </ul> |                         |

Appendix “C” – RSA Findings Summary

|                         | Issue  | Suggestion   | Agency Response/Comment |
|-------------------------|--|--|-------------------------|
| Project Recommendations | <p><u>Illumination</u></p> <ul style="list-style-type: none"> <li>• The numerous conflicts created by driveways, bus stops, pedestrian crossings, and the traffic signal operation may not be as readily apparent under ambient light or vehicle headlights.</li> <li>• Lack of illumination may contribute to failure of drivers to recognize the changing roadside character of the area.</li> </ul> | <ul style="list-style-type: none"> <li>• <i>Add illumination:</i> Consider installing illumination along TV Highway from SW 182<sup>nd</sup> Ave to SW 187<sup>th</sup> Ave.</li> </ul>  |                         |
| Project Recommendations | <p><u>Short transition to urban area</u></p> <ul style="list-style-type: none"> <li>• The bus stops, traffic signal, and density of driveways in this area create more conflicts than immediately to the east and west.</li> <li>• Drivers may not be prepared to respond to conflicts.</li> <li>• Horizontal curvature may add to demand on drivers' attention.</li> </ul>                            | <ul style="list-style-type: none"> <li>• <i>Install raised median islands:</i> Consider constructing raised medians on TV highway prior to entering the Aloha area to create a gateway effect and limit potential conflicts.</li> <li>• <i>Pavement markings:</i> Consider installing enhanced striping/reflectors through curves for emphasis at night.</li> <li>• <i>Review the 35 mph speed zone:</i> Consider extending 35 mph zone further west of the intersection.</li> <li>• <i>Add pedestrian-scale illumination:</i> Consider adding pedestrian-scale illumination from SW 182<sup>nd</sup> Ave to SW 187<sup>th</sup> Ave to emphasize urban character through area.</li> </ul> |                         |

Appendix “C” – RSA Findings Summary

|                                | <b>Issue</b>  | <b>Suggestion</b>   | <b>Agency Response/Comment</b> |
|--------------------------------|---|---|--------------------------------|
| <b>Project Recommendations</b> | <p><u>Uncontrolled left-turn movements</u></p> <ul style="list-style-type: none"> <li>• During off-peak conditions, vehicles exiting driveways and cross streets were observed to accept narrow gaps in traffic to execute left turns.</li> <li>• During peak conditions, vehicles cut between stopped cars to execute turns. However, sometimes when one lane of traffic is stopped, the other may be moving.</li> </ul>   | <ul style="list-style-type: none"> <li>• <i>Install traffic separator:</i> Consider constructing islands/traffic separator to restrict left-out movements at SW 187th Ave, and left-in/left-out movements at SW 182nd Ave and access driveways.</li> </ul>  |                                |
| <b>Project Recommendations</b> | <p><u>Geometry of northbound right turn slip lane</u></p> <ul style="list-style-type: none"> <li>• The flat entrance angle of the northbound right turn slip lane results in poor scanning behavior and varying points where motorists stop before entering TV Highway.</li> <li>• The design of the slip lane encourages higher speeds across the pedestrian crosswalk.</li> <li>• Southbound left turn vehicles have a tendency to pull into the curbside lane which then conflicts with the operation of the northbound right turn slip lane.</li> </ul> | <ul style="list-style-type: none"> <li>• <i>Revise the northbound right turn slip lane geometry:</i> Consider changing the geometry of the slip lane with a steeper entrance angle and smaller radius.                             <ul style="list-style-type: none"> <li>• Alternatively: Consider replacing the slip lane with a traditional right-turn lane while retaining an island for better signal pole placement and shorter crosswalks.</li> </ul> </li> <li>• <i>Enhance crosswalk markings:</i> Consider marking the crosswalk with continental-style markings.</li> <li>• <i>Improve turning geometry of southbound left turn:</i> Consider improving the operation of the unsignalized northbound slip lane by moving the stop bar of the westbound left turn lane further back.</li> </ul> |                                |

Appendix “C” – RSA Findings Summary

|                                | <b>Issue</b>  | <b>Suggestion</b>  | <b>Agency Response/Comment</b> |
|--------------------------------|---|--|--------------------------------|
| <b>Project Recommendations</b> | <p><u>Pedestrian visibility in northeast quadrant</u></p> <ul style="list-style-type: none"> <li>• The combination of sight obstructions and the large radius limit westbound motorists’ ability to see pedestrians waiting to cross the northern crosswalk.</li> <li>• The near-side bus stop shelter and tall fence on Leif’s property limit drivers’ view of pedestrians about to enter the crosswalk.</li> </ul>  | <ul style="list-style-type: none"> <li>• <i>Remove sight obstructions:</i> Consider relocating or modifying bus shelter to provide better visibility of crosswalk. Suggest negotiating with abutting land owner to move fence away from intersection.</li> <li>• <i>Revise curb return:</i> Consider reconstructing the curb return with a smaller radius to improve visibility of pedestrians, shorten crosswalk, and encourage slower vehicle speeds.</li> </ul>   |                                |
| <b>Project Recommendations</b> | <p><u>Turbulence associated with near-side bus stop operations</u></p> <ul style="list-style-type: none"> <li>• The bus stops along TV Highway near SW 185<sup>th</sup> Ave have frequent service and heavy usage.</li> <li>• When a bus stops at these near-side stops, signal operation and traffic flow is affected.</li> </ul>  | <ul style="list-style-type: none"> <li>• <i>Move bus stops to far-side locations:</i> Consider relocating near-side bus stops to new far-side bus pullouts.</li> <li>• Note: need to evaluate impacts to transit operations, impact to transit users, and benefit to traffic operations and safety.</li> </ul>   |                                |
| <b>Project Recommendations</b> | <p><u>Bike lanes on SW 185<sup>th</sup> Avenue</u></p> <ul style="list-style-type: none"> <li>• Bicyclists observed riding on sidewalks.</li> <li>• Bike lanes are missing in the immediate vicinity of TV Highway but are available to the north and the south on 185<sup>th</sup> Avenue.</li> <li>• SW 185<sup>th</sup> Avenue is a critical link in the area’s bike network. Aloha High School is located less than one mile south of TV Highway and there is significant commercial development to the north.</li> </ul> | <ul style="list-style-type: none"> <li>• <i>Connect bicycle network:</i> Consider providing bike lanes or other separated facility on SW 185<sup>th</sup> Avenue in the vicinity of TV Highway.</li> <li>• Consider a shared southbound bicycle/pedestrian facility on the south side of the intersection located behind the railroad crossing gate.</li> <li>• Consider reducing motor vehicle lane widths on southern leg of SW 185<sup>th</sup> Ave to fit northbound bike lane within existing curbs.</li> </ul> |                                |

## **Appendix "D"**

### **Illustration of Suggested Improvements**

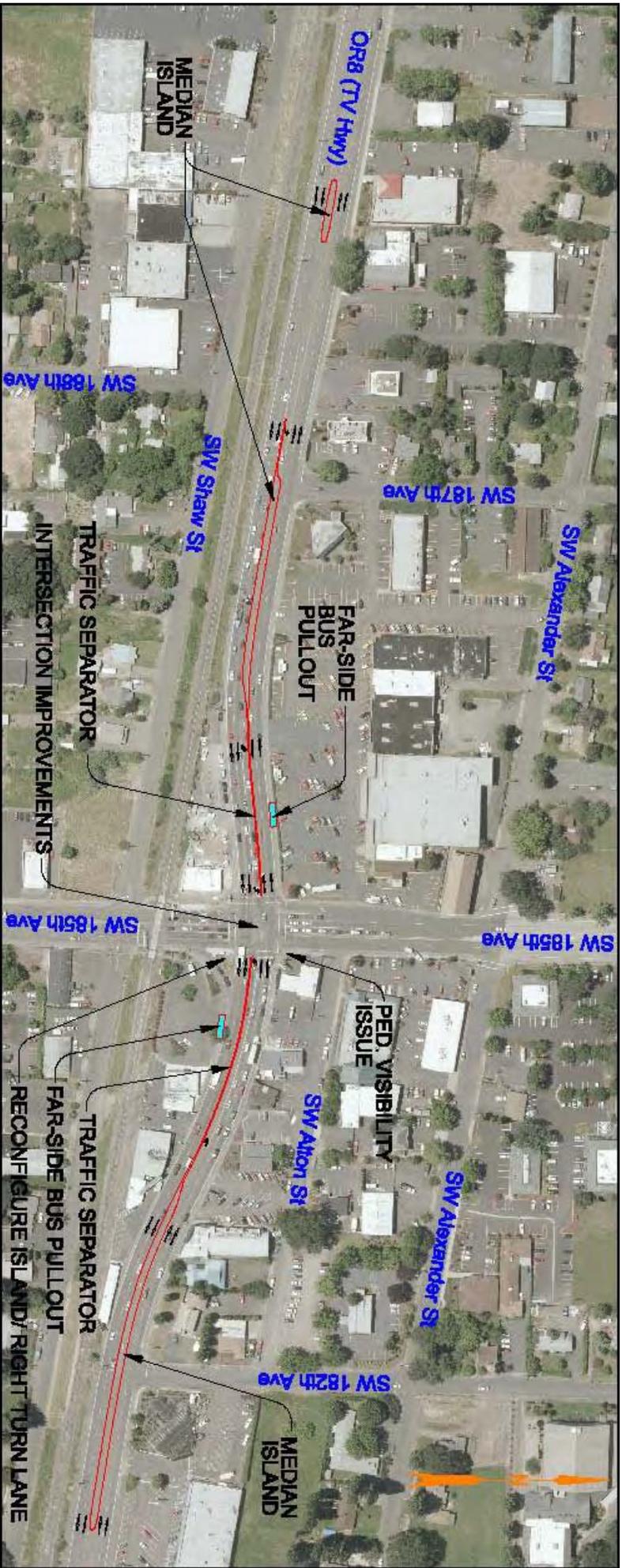


Illustration of Suggested Improvements

**Appendix "E"**

**Road Safety Audit Findings Presentation**



# ROAD SAFETY AUDIT

## Tualatin Valley Highway (OR 8) & SW 185<sup>th</sup>

### RSA FINDINGS PRESENTATION

Tualatin Valley Highway  
Mile Point 6.45 to 6.73

ODOT Region 1

December 5<sup>th</sup> – 7<sup>th</sup>, 2011



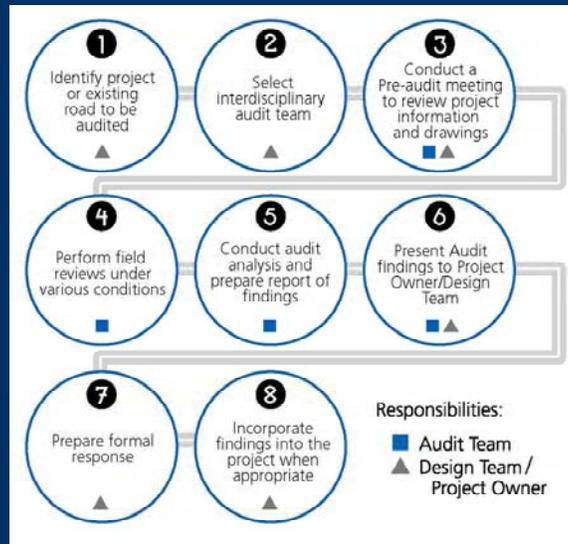
## Tualatin Valley Highway (OR 8) & SW 185<sup>th</sup>



- The general objective is for the audit team, as selected by ODOT, to execute a Road Safety Audit.
- Elements of the audit shall include safety of roadway infrastructure, intersections, signing, pavement markings, traffic operations, and all necessary incidental items for a complete audit.



## RSA Process:

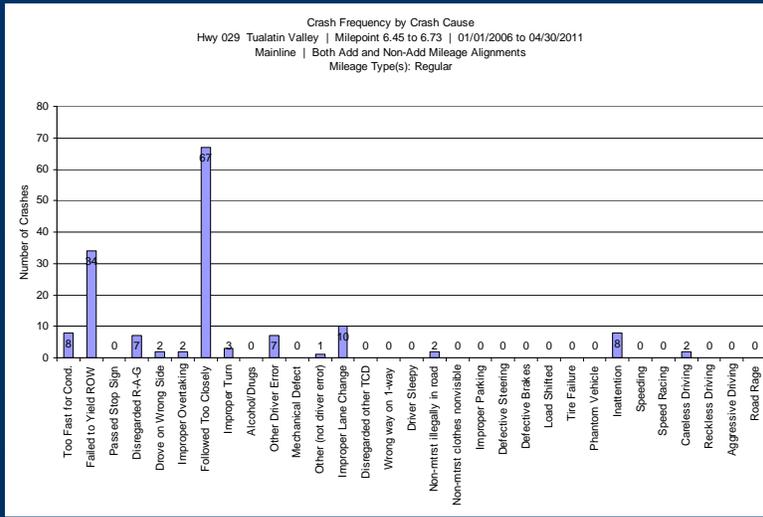


## RSA Team Members

- Chris Bores Senior Roadway Designer, ODOT Region 1
- Rodger Gutierrez Bicycle & Pedestrian Facility Specialist, ODOT Tech Services
- Wayne Kwong Right-of-Way Project Manager, ODOT Region 1
- Gary Obery Alternate Modes Traffic Engineer, ODOT Tech Services
- Sarah Owens Engineering Associate, Washington County
- Robert Rake Transportation Maintenance Coordinator, ODOT District 2B

## Team Resources

- Katherine Carlos Transportation Analyst, ODOT Region 1
- Robert Hopewell Traffic Investigator, ODOT Region 1
- Jeff Moss Project Leader, ODOT Region 1



- 153 Total Crashes from 2006 through April 2011
- 44% Follow Too Close
- 22% Failure to Yield ROW



### East Leg (TV Highway) Problems





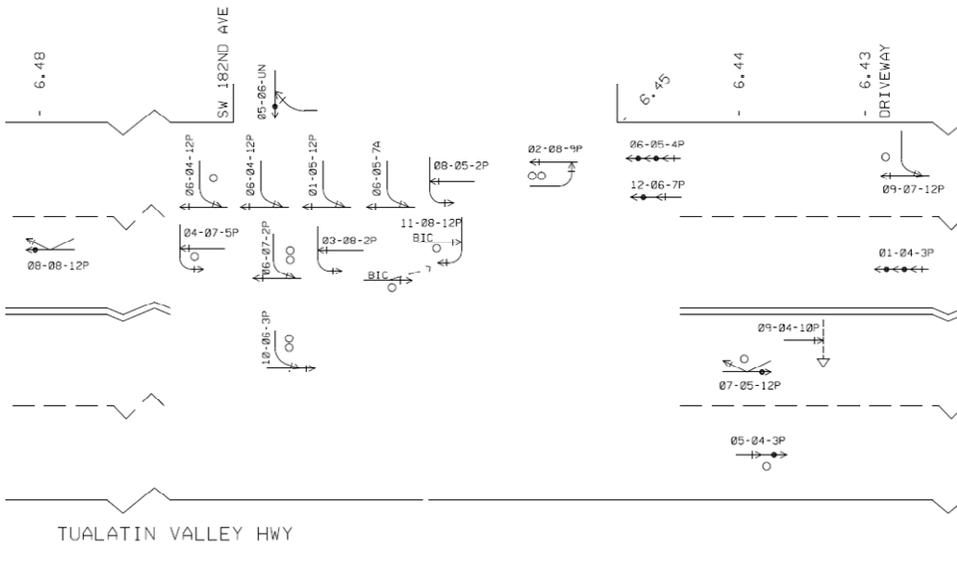
## East Leg (TV Highway) Problems

- Alignment & Visibility of Traffic Signal
- Queuing in excess of sight distance, in excess of speed zone also.
- Shockwave, moving end of queue
- Over Capacity



## East Leg (TV Highway) Problems





### 182<sup>nd</sup> Avenue Left Turns





# 182<sup>nd</sup> Avenue Right Turns



# West Leg (TV Highway) Problems





## West Leg (TV Highway) Problems

- Queuing
- Over Capacity
- Vehicles pulling out of driveways



## North Leg (185<sup>th</sup>) Problems:





# NB Right Turn Lane



# NB Right Turn Lane





## Left Turns onto TV Highway



## North Leg (185<sup>th</sup>) Problems:

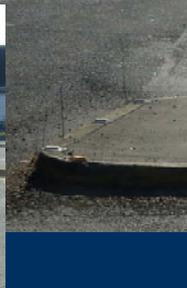
- Access to Left turn lane onto EB TV Highway
- Capacity issues
- Bike lane on 185<sup>th</sup> ends 400' north of TV Highway (at Alexander Ave), and reemerges 600' south of TV Highway (at Blanton Street)
- Over Capacity



### South Leg (185<sup>th</sup>) Problems:



### South Leg (185<sup>th</sup>) Problems:





## South Leg (185<sup>th</sup>) Problems:

- Railroad Crossing, buses stopping at Railroad tracks
- Right Turn Lane to EB TV Highway
- No Crossing at Shaw Street, detour through Post Office
- Bike lane on 185<sup>th</sup> ends 600' south of TV Highway (at Blanton), and reemerges 400' north of TV Highway (at Alexander Street)



## NE Corner Problems:





## SW Corner Problems:



## Pedestrians Cross Slower Than 4 fps





# 185<sup>th</sup> Ave Sidewalk



# Speed Zone Change





### Speed Zone:



### Curvature Problems:





## Vertical and Horizontal Alignment



## Vertical and Horizontal Alignment





## Intersection Blockage / RR & Bus Stop



## Truck Traffic

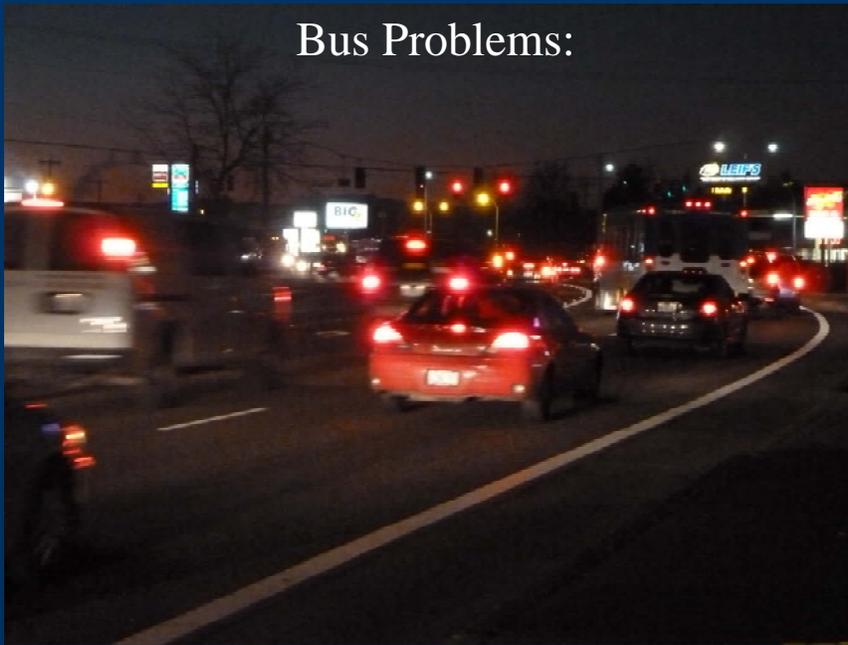




## Truck Traffic / Curvature



## Bus Problems:





## School Buses



## Access Sight Distance





# Access Sight Distance



# Access Sight Distance





## Access Sight Distance



## Access Sight Distance





## Access Sight Distance



## Access Sight Distance

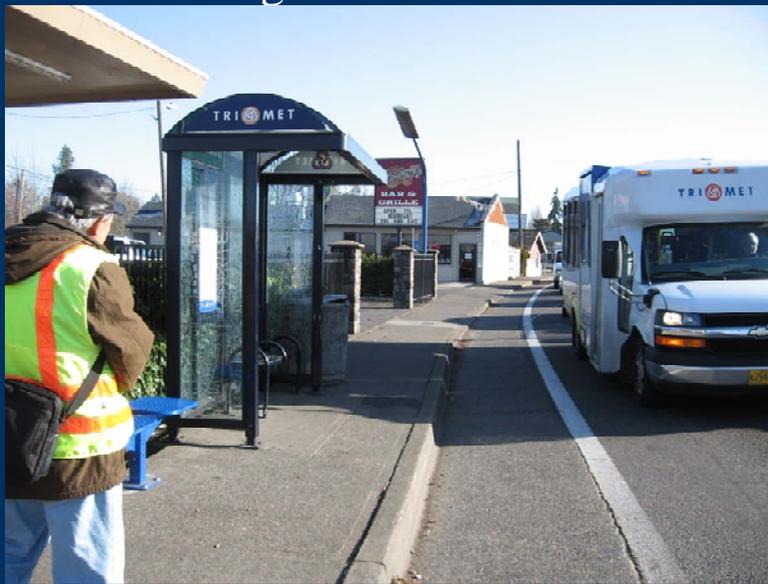




## Access Sight Distance



## Access Sight Distance / Sidewalk





# Access Sight Distance / Sidewalk



# Access Sight Distance / Sidewalk

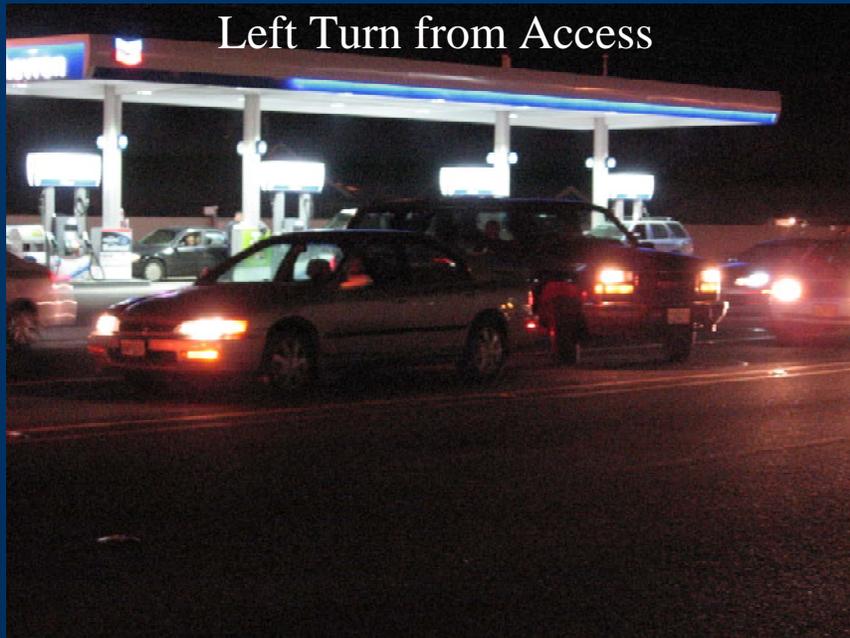




## Access at Chevron



## Left Turn from Access





## Problems:



## RSA FINDINGS:

- When an intersection is over capacity, people do unexpected things.



## Immediate Tasks

- Adjust signal timing
  - Lengthen pedestrian walk time
  - Investigate adding all-red clearance
- Clear shrubbery to improve pedestrian visibility
- Enforce County ordinance and ODOT district requirements to improve sight distance



## Project Recommendations

- High Priority
  - Replace traffic signal
    - Upgrade pedestrian pushbuttons with APS on all pedestals
    - Countdown pedestrian signals
    - Re-orient and add advanced or near side signal heads
    - Offset stop bar for westbound left turn lane
    - Visible street name signs
  - Relocate TV Highway bus stops with far-side pull-outs
  - Improve pedestrian visibility to westbound right turn (fence, bus shelter)



## Project Recommendations

- High Priority
  - Traffic separator/median island on TV Highway
    - Restrict lefts at 182<sup>nd</sup> and other access driveways
    - Median Island with vertical elements to calm traffic
  - Add illumination 182<sup>nd</sup> to 187<sup>th</sup>
  - Striping/delineation through curves or possible reflectors to enhance visibility
  - Review signs to improve visibility
  - Improve NB 185<sup>th</sup> island geometry or change to right turn lane
  - Investigate feasibility of completing bike lanes on 185<sup>th</sup>



## Project Recommendations

- Possible Additions
  - Internally illuminated street name signs
  - ITS improvements
    - Flashing beacons
    - VMS sign, e.g. “Vehicles stopped when flashing”
    - Travel time information



## Long Term (Corridor) Recommendations:

- Corridor Plan (TV Highway)
  - Comprehensive access management plan
  - Address “super blocks”
    - 178<sup>th</sup> Street release valve
    - Study viability of u-turns
  - Speed Zone Change
  - Geometric Improvements
    - Install WB right turn lane
    - Straighten horizontal curves and flatten vertical curve
    - Flatten crown and superelevation
    - Bring sidewalk up to standard
      - Consider buffered sidewalk with signs in buffer area
- SW 185<sup>th</sup> Ave
  - Improve sidewalks
  - Complete bike lanes



## Any Questions?

