PACTS High Crash Locations Study

Desktop Assessments

PREPARED FOR

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July 7, 2020
 SOUTH PORTLAND: Intersections of Route 9 and Broadway, 295 SB Off Ramp

Overview map of HCLs reviewed in this assessment.

Assessment
This area is a major interchange for traffic entering/exiting I-295 and the only non-highway connection for accessing the South Portland’s west end neighborhood, the Maine Mall, and surrounding commercial areas. Westbrook Street (Route 9), in particular, is a school route and a longstanding concern for pedestrians and bicyclists navigating the two large, high traffic intersections and highway underpass. This assessment includes the following high crash locations (HCLs):

A. Route 9 (Westbrook St.) and Broadway: The intersection at Route 9 and Broadway is a signalized four-way intersection.
B. Route 9 (Westbrook St.) and 295 SB Off Ramp: The intersection of Route 9 and the 295 SB Off Ramp is a three-way signalized intersection.
C. 295 SB Off Ramp: This road segment is the 295 southbound off ramp just prior to the intersection with Route 9.

Pending Projects
- There is a pedestrian/shared use path approved on Route 9 (Westbrook Street) through locations A and B.
- A traffic signal is planned for the intersection of Broadway and Sokokis St.

Municipal Input
Noted concerns by the city, include the following:
- The need for safe pedestrian crossings, particularly with the construction of the following:
  o The consolidated middle school on Wescott Road.
  o The shared use path on Westbrook Street between the school and the Redbank neighborhood.
- The City will be installing a traffic signal at the intersection of Broadway and Sokokis St. (adjacent to the Route 9 and Broadway intersection).
SOUTH PORTLAND: Intersections of Route 9 and Broadway, 295 SB Off Ramp

Safety Issues
In the three HCLs that comprise the study area, there were 91 crashes between 2015-2017. This section outlines safety issues for each HCL as identified through a review of crash data and aerial/street imagery.

A. Route 9 (Westbrook St.) and Broadway intersection:
At this intersection, 22 of the 38 crashes were rear-end collisions. These included vehicles traveling south on Route 9 turning right onto Broadway traveling west, and vehicles traveling east on Broadway. Another eight crashes were left turns from Broadway traveling west to Route 9 south failing to yield.

(B) Route 9 (Westbrook St.) and 295 SB Off Ramp intersection

In the westbound direction on Broadway the primary crash type is angle and involves vehicles turning left onto southbound Route 9. In the westbound direction on Broadway, drivers have a permissive left-turn phase onto southbound Route 9, from a shared left-through lane, and it may be difficult for them to judge an adequate gap due to the multiple on-coming lanes of traffic from the eastbound direction.

B. Route 9 (Westbrook St.) and 295 SB Off Ramp intersection:
This intersection includes 33 rear-end collisions, out of a total 45 crashes, and occurring in every leg of the intersection. Another three crashes are vehicles running the red light on Route 9 traveling south.

For both southbound travel on Route 9 and eastbound travel on Broadway, the primary crash types were rear-end collisions. Traveling south on Route 9, the speed, and yield condition of right turning vehicles onto Broadway, along with the free-flow ramp located immediately adjacent to the lane, may be creating conditions where the vehicles are not expecting to stop. In the eastbound direction on Broadway, sight distance appears to be sufficient so speed and congestion may be factors.

The primary crash type for vehicles on the ramp approaching the intersection were rear-end collisions, many of which involved vehicles turning right onto northbound Route 9. The dual right turn lane includes two signalized lanes that are physically separated from the dual left-turn lanes at the intersection. The traffic signals for these dual right-turn lanes are angled and difficult to see for vehicles approaching the intersection from the off ramp and may be contributing to the rear-end collisions at this location.
The primary crash types for vehicles traveling southbound on Route 9 were rear-end and angle crashes. There are two through lanes that are immediately adjacent to a separated/protected access lane to the 295 NB On Ramp that travels through the intersection, uncontrolled by the signal. The angle crashes involved drivers turning left during a protected left-turn green phase from the 295 SB Off Ramp and vehicles traveling straight, oftentimes running the red light, on Route 9 south. At least half of these crashes involved southbound drivers on Route 9 running the red light.

C. 295 SB Off Ramp road segment:
Four of the eight total crashes on this road segment were rear-end collisions and another three were failure to stay in the lane. It appears many of the safety issues for this HCL are related to those described for the Route 9 and 295 SB Off Ramp intersection.

(C) 295 SB Off Ramp road segment and Route 9 (Westbrook St.) intersection
**SOUTH PORTLAND:** Intersections of Route 9 and Broadway, 295 SB Off Ramp

**Recommendations**
This section includes potential countermeasures to consider for addressing identified safety issues. Some of these countermeasures could be combined or considered as individual options. Also, it is worth noting the crash summary and initial recommendations are based on experienced crashes from 2015-2017.

While pedestrian safety was a noted concern by the city, no pedestrian crashes were recorded during this time period. That is not surprising since pedestrian crashes are often under-reported. Given the complexity of the site, the amount of crashes at this location, and the pedestrian safety concerns, a full Road Safety Audit (RSA) is recommended to better understand the safety concerns at this site. (An RSA is a formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users).

The following are recommendations for each of the high crash locations.

**A. Route 9 (Westbrook St.) and Broadway intersection:**
On the Route 9 southbound approach:
- Improve right-turn lane yield signage and pavement markings.
- Control the right slip lane through signalization.
- Install advance detection.
- Remove the right slip lane and move the right turn lane so that it is immediately adjacent to the through lanes.

On the Broadway eastbound approach:
- Provide advanced signal warning.
- Apply high friction surface treatment on intersection approach.

**B. Route 9 (Westbrook St.) and 295 SB Off Ramp intersection:**
On the Route 9 southbound approach:
- Install advance detection.
- Evaluate the red and yellow change interval and retime if warranted.

On the Broadway westbound approach:
- Install flashing yellow arrow or provide a protected left-turn phase.
- Evaluate the red and yellow change interval and retime if warranted.

On the 295 SB Off Ramp approach:
- Remove the right slip lane and move the right turn lanes immediately adjacent to the left-turn lanes so that the signal is visible farther up the ramp.
- Add a traffic signal within the porkchop island facing the approaching dual right-turn lanes to improve visibility.
- Provide advanced dynamic signal warning.

**C. 295 SB Off Ramp road segment:**
- Begin the right-turn lanes farther up the ramp to provide additional queue storage.
- Provide advanced dynamic signal warning.
Crash Data

The crash data used for this assessment was based on 2015-2017 crash data. The following table summarizes the crash data for all three locations and also shows additional crashes from 2018. The crash diagrams for all three locations are shown on the following pages.

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<tbody>
<tr>
<td>Route 9 and Broadway</td>
<td>15541</td>
<td>16</td>
<td>8</td>
<td>14</td>
<td>27</td>
<td>65</td>
<td>26.3%</td>
<td>1.13</td>
<td>2</td>
<td>30-35 mph</td>
<td>4,000-16,000</td>
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<td>13</td>
<td>11</td>
<td>21</td>
<td>15</td>
<td>60</td>
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<td>1.06</td>
<td>1/2</td>
<td>30 mph</td>
<td>3,000-12,000</td>
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<td>66122-19251</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>10</td>
<td>25.0%</td>
<td>1.25</td>
<td>1</td>
<td>Unposted</td>
<td>12,000</td>
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*See the abbreviations and definitions section at the beginning of this report for more information about each data point.

The legend below will aid in understanding the crash diagrams that follow.
SOUTH PORTLAND: Intersections of Route 9 and Broadway, 295 SB Off Ramp

A. Route 9 and Broadway Intersection
SOUTH PORTLAND: Intersections of Route 9 and Broadway, 295 SB Off Ramp

B. Route 9 and 295 SB Off Ramp Intersection
SOUTH PORTLAND: Intersections of Route 9 and Broadway, 295 SB Off Ramp

C. 295 SB Off Ramp Road Segment
SOUTH PORTLAND: Intersection of Philbrook Ave and Turnpike Approach Off-Ramp

Overview Map of HCLs reviewed in this assessment.

Assessment
This intersection is one of the main entrances to the Maine Mall. It is a four way stop. The Turnpike Approach Off-Ramp is one way, and the opposite leg is a part of the Maine Mall parking lot.

Recent or Pending Projects
No major MaineDOT recent or pending projects.

Municipal Input
City staff have not had a chance to review crash data for this intersection and had no local observations to report.

Safety Issues
Of the 16 crashes, 13 resulted from a failure to yield or running the stop sign. The other three were rear end collisions. The majority of crashes involved vehicles traveling west on Philbrook Ave. Philbrook Ave runs along the perimeter of the Maine Mall, with numerous access points to parking lots. Many of these access points are not stop-controlled on the major
SOUTH PORTLAND: Intersection of Philbrook Ave and Turnpike Approach Off-Ramp

street (Philbrook Avenue), and so drivers may not expect a stop sign at this intersection. There are stop ahead warning signs on the eastbound approach of Philbrook Avenue and on the Turnpike Approach Off-Ramp.

**Recommendations**

This section includes potential countermeasures to consider for addressing the identified safety issues. Some of these potential countermeasures could be combined or considered as individual options. Also, it is worth noting that the crash summary and initial recommendations are based on experienced crashes from 2015-2017. The recommendations for this site are targeted at increasing stop sign conspicuity to alert drivers of the approaching stop-controlled intersection.

**All approaches:**

- Apply “STOP” pavement marking just before the stop bar.
- Increase stop sign visibility using oversized signs, LED-embedded signs, or flashing beacons.
- Add “All Way” plaque beneath stop sign.
- Consider modifying intersection control/design to roundabout, which would maintain traffic flow while eliminating the potential for angle crashes, which oftentimes result in more serious injuries.

**Turnpike Off-Ramp Northbound Approach:**

- Apply arrow pavement markings and lane use sign indicating lane use for turn and through movements.
- Install transverse rumble strips to alert drivers to the upcoming stop.

**Philbrook Ave. Westbound Approach:**

- Install advanced stop ahead warning sign.
- Install transverse rumble strips to alert drivers to the upcoming stop.
- Install high friction surface treatment on intersection approaches.

**Philbrook Ave. Eastbound Approach:**

- Apply “STOP” pavement marking just before the stop bar.
SOUTH PORTLAND: Intersection of Philbrook Ave and Turnpike Approach Off-Ramp

Aerial view of Philbrook Ave and Maine Turnpike Approach Off-Ramp
SOUTH PORTLAND: Intersection of Philbrook Ave and Turnpike Approach Off-Ramp

Crash Data
The crash data used for this assessment was based on 2015-2017 crash data. The following table summarizes the crash data for this location and also shows additional crashes from 2018. The crash diagram is shown on the following pages.

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<tbody>
<tr>
<td>Philbrook Ave and Off-Ramp</td>
<td>18350</td>
<td>7 7 2 7</td>
<td>23</td>
<td>37.5%</td>
<td>3.02</td>
<td>1/6</td>
<td>25 mph</td>
<td>5,000-10,500</td>
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*See the abbreviations and definitions section at the beginning of this report for more information about each data point.

The legend below will aid in understanding the crash diagram that follows.

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**LEGEND**

- MOVING VEHICLE
- VEHICLE BACKING
- OVERTURNED
- OUT OF CONTROL
- REAR END COLLISION
- SIDESWIPE COLLISION
- HEAD ON COLLISION
- ANGLE COLLISION

- FIXED OBJECT
- PARKED VEHICLE
- FATAL
- INJURY TYPE

- PATH OF: P PEDESTRIAN E BICYCLE A ANIMAL S SLED

- PAVEMENT: D - DRY, I - ICY, W - WET, S - SNOW

- WEATHER: C - CLEAR, F - FOG, R - RAIN, SL - SLEET, S - SNOW, CL - CLOUDY

- TIME: A - AM, P - PM

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SOUTH PORTLAND: Intersection of Philbrook Ave and Turnpike Approach Off-Ramp

Intersection of Philbrook Ave and Maine Turnpike Approach Off-Ramp

South Portland
18350
Study Period 2015-2017
# of Crashes: 16/CRF = 3.02

Prepared by Office of Safety
LJAI 12/18/18
SOUTH PORTLAND: Intersection of Maine Mall Rd and Turnpike On-Ramp

Assessment
This site is one of several major intersections in the vicinity of the Maine Mall. In addition to serving through traffic on Maine Mall Road it is an on-ramp to I-95 and off-ramp from I-295 and the Maine Turnpike Approach. It is a four way signalized intersection. On the south side of the intersection the Maine Mall Road is six lanes across, four traveling north and two traveling south. North of the intersection Maine Mall Road is seven lanes across, three traveling north and four traveling south with two of those four being left only turning lanes onto the on-ramp. Traveling west on the ramp there are three lanes, one left only, one left through, and one right only. The fourth leg is the Days Inn entrance.

Recent or Pending Projects
No major MaineDOT recent or pending projects.

Municipal Input
City staff have not had a chance to review crash data for this intersection and had no local observations to report.
SOUTH PORTLAND: Intersection of Maine Mall Rd and Turnpike On-Ramp

Safety Issues
Of the 38 crashes in the intersection during the 2015-2017 period, 24 were rear-end collisions, with an even split between the northbound and southbound approaches and two on the Turnpike Off-Ramp approach. Nine crashes were related to turning movements in the intersection:
- Four (and possibly five) involved vehicles turning left from the southbound Maine Mall Road approach onto the Turnpike On-Ramp.
- Four involved vehicles from the Turnpike Off-Ramp approach, three of which involved northbound Maine Mall Road vehicles.

There were seven crashes involving vehicles running a red light. Six of those resulted in an angle crash and one a rear-end crash. The crashes involved the following movements:
- Two (and possibly three) involved vehicles turning left from Maine Mall Road onto the Turnpike On-Ramp and vehicles traveling straight on northbound Maine Mall Road.
- Four involved vehicles on the Turnpike Off-Ramp approach, three of which included a vehicle traveling northbound on Maine Mall Road.

Recommendations
This section includes potential countermeasures to consider for addressing the identified safety issues. Some of these potential countermeasures could be combined or considered as individual options. Also, it is worth noting that the crash summary and initial recommendations are based on experienced crashes from 2015-2017. Because the majority of the crashes (63 percent) are rear-end crashes, the recommendations for Maine Mall Road include increasing pavement friction and potentially retiming/coordinating adjacent signals.

Maine Mall Road Northbound:
- Install high friction surface treatment on downhill approach.
- If the angle crashes involved vehicles turning right onto the Turnpike On-Ramp, consider restricting right-turns on red.
- Install advance detection.
- Evaluate red and yellow change interval and retime if necessary.

Maine Mall Road Southbound:
- Add dotted pavement marking line to guide the left-turn movement through the intersection.
- Review timing and signal coordination so that it is coordinated with the intersection of Maine Mall Road and Philbrook Avenue to prevent rear-end crashes due to the close proximity of these intersections.
- Evaluate red and yellow change interval and retime if necessary.
- Install advance detection.
- Install high friction surface treatment on approach.

Turnpike On/Off-Ramp Westbound:
- Add dotted pavement marking line to guide left turn movement through the intersection.
- If the angle crashes involved vehicles turning right from the Turnpike Off-Ramp onto northbound Maine Mall Road, consider restricting right turns on red.
SOUTH PORTLAND: Intersection of Maine Mall Rd and Turnpike On-Ramp

Aerial view of Maine Mall Road and Maine Turnpike On-Ramp, from Google Maps.
Crash Data

The crash data used for this assessment was based on 2015-2017 crash data. The following table summarizes the crash data for this location and also shows additional crashes from 2018. The crash diagram is shown on the following pages.

**Legend**

- MOVING VEHICLE
- VEHICLE BACKING
- OVERTURNED
- OUT OF CONTROL
- REAR END COLLISION
- SIDESWEEP COLLISION
- HEAD ON COLLISION
- ANGLE COLLISION

**Path of:**
- PEDESTRIAN
- BICYCLE
- ANIMAL
- SLED

**Pavement:**
- D - DRY
- I - ICY
- W - WET
- S - SNOW

**Weather:**
- C - CLEAR
- F - FOG
- R - RAIN
- S - SLEET
- SH - SHOW
- CL - CLOUDY

**Time:**
- A - AM
- P - PM

*See the abbreviations and definitions section at the beginning of this report for more information about each data point.*
SOUTH PORTLAND: Intersection of Maine Mall Rd and Turnpike On-Ramp

Intersection of Maine Mall Rd and Turnpike On-Ramp

South Portland
Node: 15531
Study period 2015-2017
# of Crashes: 38 / CRF: 1.33

Prepared by Office of Safety
(207) 781-2851

PACTS High Crash Location Desktop Assessments
**SOUTH PORTLAND: Intersection of Skillings Street and Route 1**

**Assessment**
The intersection of Route 1 and Skillings Street is an angled intersection with through traffic on Route 1 that does not stop. There is a stop sign on Skillings Street where it meets Route 1. Opposite Skillings Street is the entrance to Irving Gas.

**Recent or Pending Projects**
A mill and fill on Route 1 was completed in 2016. Signal upgrades are being planned for the Route 1/Rumery Street intersection to facilitate pedestrian movements.

**Municipal Input**
Noted concerns by the city include:
- Trailer truck traffic missing the turn for Rumery Street (Hannaford’s distribution center) then attempting to make the hard right onto Skillings Street and hitting and damaging the utility pole at the corner.

**Safety Issues**
The crash types at this intersection are complex and varied. Four of the 18 crashes were improper turns from Route 1 onto Skillings Street. Seven crashes were related to vehicle movements coming from Skillings Street or the Irving Gas Station and failing to yield to through traffic on Route 1.

Skillings Street is a skewed two-way stop-controlled intersection between two signalized intersections. If queuing occurs at the left-turn lane pockets of these intersections, it can block the line of sight for a northbound vehicle turning left from Skillings Street onto Route 1.

**Recommendations**
This section includes potential countermeasures to consider for addressing the identified safety issues. Some of these potential countermeasures could be combined or considered as individual options. Also, it is worth noting
SOUTH PORTLAND: Intersection of Skillings Street and Route 1

that the crash summary and initial recommendations are based on experienced crashes from 2015-2017. Because the majority of crashes are related to accessing Skillings Street from Route 1, restricting access should be considered. The following are recommended safety improvements for the intersection:

Skillings Street Northbound:

- Restrict left turns with a raised concrete median or a series of post mounted barriers. Vehicles that want to turn left should use the signalized intersection at Rumery Street instead. A potential negative impact would be that it would prohibit northeast bound vehicles on Route 1 from turning left into the gas station and restrict vehicles to only turning right at the Skillings Street intersection. The use of right-in, right-out porkchop islands could be used to clearly define the left-turn restriction from driveways and intersections.
  - A possible alternative would be to restrict left turns at peak hours of the day through signage but that may be easily overlooked or disregarded by drivers.
  - Another alternative would be to install a two-way left-turn lane between the signalized intersections of Rumery Street and Broadway. This would at least give turning vehicles a lane to be separated from through vehicles and the ability to perform a two-stage crossing.

Route 1 Eastbound:

- Restrict right turns onto Skillings Street with signage and potentially a concrete pork chop island. Trucks that miss the right turn at Rumery Street should find a safe place to make a U-turn or turn right at Broadway and access the Hannaford Distribution Center via the Lincoln Street Extension. There is currently a sign prohibiting thru trucks, however, that is only visible once drivers are already on Skillings Street. A similar sign should be installed facing eastbound drivers on Route 1, approaching Skillings Street.

Route 1 Westbound:

- Restrict left turns into Skillings Street with a concrete median or a series of post mounted barriers. Vehicles that want to turn left should use the signalized intersection at Rumery Street instead. Additional analysis could be performed to determine if it would be possible to allow U-turns at the intersection for those drivers that want to access Skillings Street.

Skillings Street Southbound (Irving Gas driveway):

- Restrict left turns with a concrete median or a series of post mounted barriers. Vehicle wanting to turn left should exit the gas station at the northern exit on Broadway.
  - Or consider the two-way, left-turn lane alternative.
SOUTH PORTLAND: Intersection of Skillings Street and Route 1

Aerial view of Route 1 (Main Street) and Skillings Street, from Google Maps
SOUTH PORTLAND: Intersection of Skillings Street and Route 1

Crash Data
The crash data used for this assessment was based on 2015-2017 crash data. The following table summarizes the crash data for this location and also shows additional crashes from 2018. The crash diagram is shown on the following pages.

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<tbody>
<tr>
<td>Skillings St and Main St</td>
<td>16738</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>21</td>
<td>5.6%</td>
<td>3.30</td>
<td>1/6</td>
<td>30 mph</td>
<td>500-12,500</td>
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</table>

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The legend below will aid in understanding the crash diagram that follows.

**LEGEND**
- MOVING VEHICLE
- REAR END COLLISION
- FIXED OBJECT
- VEHICLE BACKING
- SIDESWIPE COLLISION
- PARKED VEHICLE
- OVERTURNED
- HEAD ON COLLISION
- FIRENICAL
- OUT OF CONTROL
- ANGLE COLLISION
- INJURY TYPE

- PATH OF: F - PEDESTRIAN, B - BICYCLE, A - ANIMAL, S - SLED
- PAVEMENT: D - DRY, I - ICY, W - WET, S - SNOW
- WEATHER: C - CLEAR, F - FOG, R - RAIN, SL - SLEET, S - SHOW, CL - CLOUDY
- TIME: A - AM, P - PM
SOUTH PORTLAND: Intersection of Skillings Street and Route 1

Intersection of Skillings St and Route 1/Main St

Stop & Shoppe
Irving Gas

South Portland
Node # 16738
Study Period 2015-2017
# of Crashes: 18 / CRF: 3.26
Prepared by Office of Safety
(LW 1/18/18)
PORTLAND: Morrill’s Corner

Assessment
Morrill’s Corner is a major chokepoint for commuter track on Route 302 to and from Portland. This assessment considers the primary intersection and adjacent roadway south of the intersection on Forest Avenue.

A. Intersection of Route 302, Allen Avenue, and McDonald’s: This intersection is a four-way signalized intersection. Both the right turn from Route 302 onto Allen Avenue and the right turn from Allen Avenue onto Route 302 have offset right turn lanes.

B. Forest Avenue Roadway Segment: This roadway segment of Forest Avenue starts at the above intersection and ends at Bishop St. Traveling north, there is one through right and one through left lane. Traveling south, there is one through lane and one right turn only lane. In the middle of this segment is the ScrubaDub Exit.

Recent or Pending Projects
- MaineDOT has a project in preliminary design on Forest Avenue that begins at the Morrill’s Corner intersection and extends 0.08 miles to the north.
- The City of Portland installed smart traffic signals that use artificial intelligence to predict and respond to road conditions in real time. Following a few months of use, data shows a 20-percent reduction in wait times at the Morrill’s Corner intersection.¹

Municipal Input
Noted concerns by the city include the following:
- The Morrill’s Corner area has one of Portland’s highest concentrations of High Crash Locations, with two intersections and six segments of concern.
- The proximity of full-access, high-volume intersections and lack of adequate access management are likely contributors.
- Although MaineDOT has indicated they will be looking at significant updates and changes to this area, the frequency of crashes warrants short-term actions for quick implementation.
  - A review of the collision diagrams should be completed with a determination of the top three immediate or short-term interventions that may make a difference. This could include restriping, movement restrictions, or changes to site access (if relatively straightforward).

¹ https://www.portlandmaine.gov/2546/Smart-Traffic-Signals

PACTS High Crash Location Desktop Assessments
PORTLAND: Morrill’s Corner

Safety Issues
Thirty-eight of the 58 crashes at the intersection of Route 302, Allens Avenue, and McDonald’s were rear end collisions. The other 20 crashes were a mix of drivers moving at an unsafe speed, lack of attention, and improper passes and lane changes.

On the Forest Avenue segment, six of the 16 crashes included vehicles exiting the ScrubaDub Car Wash and failing to yield to through traffic. The other 10 crashes were a split between rear end collisions, improper passing, and failure to stay in lane. In the peak hours, traffic from intersection (A) can spill southbound to the next intersection of Forest Avenue/Stevens Avenue/Bishop Street; however, there is no evidence of safety issues stemming from this close promity.
PORTLAND: Morrill’s Corner

Aerial photo of Morrill’s Corner and Forest Avenue roadway segment, from Google Maps

Recommendations
This section includes potential countermeasures to consider for addressing the identified safety issues. Some of these potential countermeasures could be combined or considered as individual options. Also, it is worth noting that the crash summary and initial recommendations are based on experienced crashes from 2015-2017.

A. Intersection of Route 302, Allen Avenue, and McDonald’s:

Throughout the site:
- Consider enhanced access management to better define driveway entrances and exits.
- Review signal timing to ensure coordination with the signalized intersection of Route 302 and Stevens Avenue.
- Evaluate red and yellow clearance interval and retime if necessary.
- Evaluate signal timing of adjacent southbound intersection of Forest Avenue/Stevens Avenue/Bishop Street to alleviate any queue spill back.
- Install advance detection, especially on Route 302 approaches.

On the McDonald’s Driveway approach:
- Restrict right-turn-on-red movement. This may decrease eastbound rear-end crashes on Forest Avenue caused by vehicles hitting the brakes after coming around the curve. Would also increase pedestrian and bicyclist safety traveling along Forest Avenue.
- Extend the median around the signal pole to provide a pedestrian refuge and reduce their exposure on the long crossing.

On the Forest Avenue eastbound approach:
- After moving eastbound through the intersection of Allen Road, the lane configuration changes from two thru lanes to one thru lane and one right-turn lane. Install signs or pavement markings closer to the intersection to mitigate abrupt lane changes.
- To alleviate rear-end crashes, consider installing high friction surface treatment at the intersection approach and install retroreflective signal backplates.

On the Allen Avenue southbound approach:
- Consider either realigning the right-turn lane so that drivers are aligned with the through lane and it feels less like a right slip lane, or adding a porkchop island to better define and separate the right-turn lanes.
  - Realigning the right-turn lane so that it is aligned with the through lane (removing the slip-lane feel) would reduce the feel of a free-flow right turn and would reduce the crossing distance for pedestrians.
  - Reconfiguring channelizing islands (indicated by blue in the images below) would better define the lane designations and also decrease pedestrian crossing distances, but may exacerbate conflicts between through vehicles and those making a right-turn-on-red as it would feel more like a free flow right turn.
  - With the porkchop island option, this would provide the option for moving the stop bar up fo the right turn lane and
PORTLAND: Morrill’s Corner

moving crosswalk away from main travel way of Forest Avenue. Install signage and possibly yield marking (sharks teeth) to indicate a pedestrian crossing.

*On the Forest Avenue northbound approach:*
  - Move the stop bar up to increase queuing capacity for right-turning vehicles on Allen Avenue.
  - To alleviate rear-end crashes, consider installing high friction surface treatment at the intersection approach and install retroreflective signal backplates.

*B. Forest Avenue Roadway Segment:*

*Throughout the site:*
  - Consider enhanced access management to better define driveway entrances and exits.

*On the ScrubaDub Car Wash exit:*
  - Restrict left-turn movements with signage from the ScrubaDub Car Wash exit to Forest Avenue.
  - Further define the access management through a concrete median on the centerline and an angled exit to prevent vehicles from turning left.
PORTLAND: Morrill’s Corner

Crash Data

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<td>Route 302, Allen Avenue, McDonald’s</td>
<td>16872</td>
<td>17 13 28 21</td>
<td>80</td>
<td>20.7%</td>
<td>1.38</td>
<td>1/2</td>
<td>30-35 mph</td>
<td>2,000-30,000</td>
</tr>
<tr>
<td>Forest Avenue</td>
<td>16870-71535</td>
<td>8 6 2 7</td>
<td>23</td>
<td>12.5%</td>
<td>2.02</td>
<td>1</td>
<td>30 mph</td>
<td>32,500</td>
</tr>
</tbody>
</table>

*See the abbreviations and definitions section at the beginning of this report for more information about each data point.

The legend below will aid in understanding the crash diagrams that follow.

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**PACTS High Crash Location Desktop Assessments**
A. Intersection of Route 302, Allen Avenue, and McDonald’s
PORTLAND: Morrill’s Corner

B. Forest Avenue Roadway Segment

Rte. 302/100/Forest Ave.

Portland
Link: 16870-71535
Element: 4047225
Study Period: 2015-2017
* of Crashes: 16 / CRF: 2.02

Prepared by Office of Safety

RFR3 2-9-18 16870
**PORTLAND:** Intersections of Congress Street and 295 NB On and Off Ramps

**Assessment**
This assessment considers two intersections on Congress Street providing access to or from I-295 via exit 5:

A. **Congress Street and I-295 NB Off-Ramp:** The intersection with the Off-Ramp is an angled intersection with a yield sign. This ramp merges directly into the two lanes of through traffic on Congress Street and crosses a bike lane.

B. **Congress Street:** The segment between the I-295 Off-Ramp and On-Ramp. This is a two-lane segment in the southbound direction and bike lane.

**Pending Projects**
No major MaineDOT recent or pending projects.

**Municipal Input**
Noted concerns by the city include the following:
PORTLAND: Intersections of Congress Street and 295 NB On and Off Ramps

- This intersection is part of a series of locations associated with Exit 5 along Congress Street and Park Avenue that are exacerbated by high-speed movements and the Congress-Park one-way pair.
- The updated Libbytown circulation study recommends making Congress and Park two-way in this area.
  - The City remains focused on geometric and/or ramp consolidation measures to further reduce speeding and conflicts.
  - Lessons from the recent geometric changes at I-295 Exit 6 and a review of those subsequent crash patterns/rates may be informative to Exit 5.

There were 11 crashes on the Congress Street link (site B), 4 of which were rear-end crashes with left-turning vehicles into the Denny’s parking lot and another 4 crashes were sideswipes. With the various ramps and driveways, there is potential for abrupt lane changes (leading to sideswipes) and slowing and stopping for turning vehicles (leading to rear-ends).

Overview of site showing both I-295 NB Ramp intersections

Recommendations

This section includes potential countermeasures to consider for addressing the identified safety issues. Some of these potential countermeasures could be combined or considered as individual options. Also, it is worth noting that the crash summary and initial recommendations are based on experienced crashes from 2015-2017.

**Both Locations:**

- Use green pavement markings through the intersections of the On- and Off-Ramps to indicate the bike lanes.
- Ensure there is adequate lighting of the crossing as pedestrians and bicyclists are harder to see in dark conditions.

Safety Issues

The majority of crashes (21 of 23 crashes) at the intersection of Congress Street and I-295 NB Off-Ramp (site A) were rear end collisions. One additional crash resulted from a car hitting the guardrail in an attempt to avoid the vehicle in front of them, and another a failure to yield to oncoming traffic on Congress Street.
PORTLAND: Intersections of Congress Street and 295 NB On and Off Ramps

A. Congress Street and I-295 NB Off-Ramp:
   - Reconfigure to stop-control, instead of yield control. This will also potentially reduce the rear-end crashes on Congress Street (site B).
     - Install stop sign and stop bar.
     - Install advance stop sign warning sign.
     - Restripe pavement markings so that the approach is closer to a 90-degree angle.
     - Add high friction surface treatment.
     - Add a high visibility crosswalk.
   - Consider adding transverse rumble strips in advance of the yield/stop.

B. Congress Street Link
   - Increase the visibility of the driveway to alleviate rear-ends on turning vehicles.
     - Trim tree limbs.
     - Add high visibility crosswalk marking to better define the driveway.
     - Ensure pavement markings are maintained to show where driveways exist – potentially use skip marks across driveway openings and merge/diverge ramps for I-295.
PORTLAND: Intersections of Congress Street and 295 NB On and Off Ramps
Crash Data

The crash data used for this assessment was based on 2015-2017 crash data. The following table summarizes the crash data for both locations and also shows additional crashes from 2018. The crash diagrams for both locations are shown on the following pages.

<table>
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</thead>
<tbody>
<tr>
<td>Congress St and I-295 Off-Ramp</td>
<td>19183</td>
<td>8 6 9 7</td>
<td>30</td>
<td>30.4%</td>
<td>5.04</td>
<td>1/2</td>
<td>Unposted</td>
<td>5,000-14,000</td>
</tr>
<tr>
<td>Congress Street</td>
<td>59422-19186</td>
<td>2 1 4 4</td>
<td>11</td>
<td>(9.1%)</td>
<td>(2.81)</td>
<td>1/2</td>
<td>Unposted</td>
<td>10,000</td>
</tr>
</tbody>
</table>

*See the abbreviations and definitions section at the beginning of this report for more information about each data point.*

The legend below will aid in understanding the crash diagrams that follow.

[Diagram of crash symbols and definitions]
PORTLAND: Intersections of Congress Street and 295 NB On and Off Ramps

A. Intersection of Congress Street and I-295 NB Off-Ramp
PORTLAND: Intersections of Congress Street and 295 NB On and Off Ramps

B. Congress Street (2015-2018)

Portland
Link: 59422-19186
Element: 3118414
Study Period: 2015-2018
# of Crashes: 11 / CRF: 2.81

Prepared by Office of Safety 6/30/20
**PORTLAND**: Intersection of Forest Avenue and Walton Street, Forest Avenue

**Overview map of HCLs reviewed in this assessment.**

**Assessment**
Site A intersection of Forest Avenue (Route 302) and Walton Street is a signalized four-way intersection with a skewed approach angle on Walton Street. Site B is the segment of Forest Avenue (Route 302) north of Site A, between Walton Street and Tremaine Street. This segment is 3 lanes with the middle lane being a two-way left-turn lane (TWLTL).

**Recent or Pending Projects**
No major MaineDOT recent or pending projects.

**Municipal Input**
Noted concerns by the city include the following:
- This intersection has a relatively isolated signal along Forest Avenue and a skewed approach angle for Walton Street, which may be contributing factors in crashes.
- The lane assignments for the Walton Street approaches should be assessed.
- City is installing an adaptive system here, which hopefully will help with red-light running and overall vehicle congestion.

**Safety Issues**

*A. Forest Avenue (Route 302) and Walton Street intersection:*
Many of the crashes at this intersection were rear end collisions (about 31 of the 40 total crashes). These accounted for most of the injury crashes and occurred primarily on Forest Avenue in both directions. Eight of the crashes involved turning vehicles and three of those involved vehicles running a red light. There were 13 crashes that resulted in injury, all but one were rear-end crashes that occurred on both Forest Avenue intersection approaches.

*B. Forest Avenue (Route 302):*
Almost all crashes on this segment were rear-end crashes. Out of the 12 total crashes, 11 were rear-ends and 8 were in the southbound direction approaching site A. The presence of driveways, the TWLTL, and the signal approach in the southbound direction may be the cause of the rear-ends.

**Street view of Forest Avenue and Walton Street traveling North on Forest Avenue, from Google Maps**
PORTLAND: Intersection of Forest Avenue and Walton Street, Forest Avenue

Recommendations
This section includes potential countermeasures to consider for addressing the identified safety issues. Some of these potential countermeasures could be combined or considered as individual options. Also, it is worth noting that the crash summary and initial recommendations are based on experienced crashes from 2015-2017.

A. Forest Avenue (Route 302) and Walton Street intersection:
All intersection approaches:
- Install retroreflective backplates to enhance signal conspicuity.
  There is one backplate currently present, on the eastern leg of the intersection, and to that, a retroreflective border can be added.

Forest Avenue, North and Southbound:
- Use green pavement markings on what appears to be bike lanes, at intersections and through major driveway entrances. This will help to visually narrow the roadway. Also, add bike lane markings and signage to help communicate the intended use of those lanes.

- Consider access management. The wide open roadway and large driveway entrances can visually distract drivers. Reducing and better defining the access points can help to limit unexpected entries into the roadway and visually confine drivers to their lanes. Access management could take the form of better driveway definition and more narrow entries and exits, combining driveways, modifying the TWLTL into a physical or painted median with defined turning vehicle lanes.
- Evaluate red and yellow clearance interval and retim if necessary.
- Install advance detection.
- Install high friction surface treatment to alleviate rear-end crashes.

Walton Street, Eastbound:
- Trim tree limbs on intersection approach to ensure that the signal is visible to approaching drivers.

Walton Street, Westbound:
- Trim tree limbs on intersection approach to ensure that the signal is visible to approaching drivers.
- Consider possibly reassigning the lanes so that there is a through-right lane and a left-turn only lane. While there appears to be one crash involving a left-turning vehicle crash from this direction, local input indicates that this is a concern. With the lane reassigment, the left-turn lane can have a fully or partially protected phase to remove the potential conflict with oncoming traffic.

B. Forest Avenue (Route 302):
- Consider access management. Multiple driveway entrances can visually distract drivers and increase rear-end crashes. Reducing and better defining the access points can help to limit unexpected entries into the roadway and visually confine drivers to their lanes. Access management could take the form of better driveway definition and more narrow entries and exits, combining driveways, modifying the TWLTL into a physical or painted median with defined turning vehicle lanes.
PORTLAND: Intersection of Forest Avenue and Walton Street, Forest Avenue

Aerial view of Forest Avenue and Walton Street, from Google Maps
PORTLAND: Intersection of Forest Avenue and Walton Street, Forest Avenue

Crash Data

The crash data used for this assessment was based on 2015-2017 crash data. The following table summarizes the crash data for this location and also shows additional crashes from 2018. The crash diagram for this location is shown on the following pages.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Forest Ave. and Walton St.</td>
<td>16860</td>
<td>15</td>
<td>10</td>
<td>15</td>
<td>14</td>
<td>54</td>
<td>30.0%</td>
<td>1.37</td>
<td>1/6</td>
<td>25/30 mph</td>
<td>3,000-20,500</td>
</tr>
<tr>
<td>Forest Ave. Segment</td>
<td>16860-16862</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td></td>
<td>12</td>
<td>33.3%</td>
<td>1.10</td>
<td></td>
<td>30 mph</td>
<td>20,500</td>
</tr>
</tbody>
</table>

*See the abbreviations and definitions section at the beginning of this report for more information about each data point.

The legend below will aid in understanding the crash diagrams that follow.

**LEGEND**

- MOVING VEHICLE
- VEHICLE BACKING
- OVERTURNED
- OUT OF CONTROL
- REAR END COLLISION
- SIDESWIPES COLLISION
- HEAD ON COLLISION
- ANGLE COLLISION
- FIXED OBJECT
- PARKED VEHICLE
- FATAL
- INJURY TYPE

**PATH OF:  P - PEDESTRIAN E - BICYCLE A - ANIMAL S - SLED**

**PAVEMENT:  D - DRY, I - ICY, W - WET, S - SNOW**

**WEATHER:  C - CLEAR, F - FOG, R - RAIN, S - SLEET, S - SNOW, CL - CLOUDDY**

**TIME:  A - AM, P - PM**
PORTLAND: Intersection of Forest Avenue and Walton Street, Forest Avenue

Intersection of Forest Avenue and Walton Street:

[Diagram of the intersection with markings and annotations]

Portland
Node: I6860
Study period 2015-2017
# of Crashes: 40  CRF=1.37
Prepared by Office of Safety
G.J.M. 1-2-19

= Overhead Signal

PACTS High Crash Location Desktop Assessments
PORTLAND: Intersection of Forest Avenue and Walton Street, Forest Avenue

Forest Avenue:
PORTLAND: Intersection of Washington Avenue and Allen Avenue

There was a mill and fill project completed in 2018 through the intersection and to the north. There is one mill and fill project pending in 2020 on Washington Avenue located approximately 0.5 mile north of the intersection.

Municipal Input
- Allen's Corner is a large complex intersection with high levels of traffic and numerous curb cuts immediately adjacent to all approaches.
- Short of access management outcomes, the crash rate here may remain high.
  - While addition of an adaptive traffic control system here may aid in overall consistency in vehicle flow and reduce red light running, ultimately, access-management recommendations may be needed to reduce crashes.

Assessment
Allen’s Corner is a major intersection for local traffic and commuter traffic to/from Portland along Route 26/100. This assessment includes information for three HCL roadway segments that meet at the intersection.

A. Allen Avenue south of intersection: This roadway segment runs along Allen Avenue to the northeast toward the intersection. It includes three driveway entrances.

B. Washington Avenue south of intersection: This segment runs northwest along Washington Avenue toward the intersection and includes 10 driveway entrances and exits.

C. Allen Avenue north of intersection: This roadway segment runs southwest along Allen Avenue toward the intersection and includes six entrances.

Recent or Pending Projects

A. Allen Avenue south of intersection:
For this roadway segment there were nine total crashes, six of which were vehicles failing to yield moving into and out of the driveways. Four of these six crashes occurred at the Dunkin Donuts driveway. At the exit of Bangor

Safety Issues

A. Allen Avenue south of intersection:
PORTLAND: Intersection of Washington Avenue and Allen Avenue

Savings there was a crash involving a bicycle. Two additional crashes were related to lane changes.

B. Washington Avenue south of intersection:
For the roadway segment on Washington Avenue, 20 of the 29 crashes were related to cars attempting turning movements into or out of the driveways on either side of the road. Six of these crashes were because of the same turning movement (which appears to be drivers pulling out of the Portland House of Pizza driveway). One of the crashes was due to a pedestrian crossing mid-block.

C. Allen Avenue north of intersection:
For the roadway segment on Allen Avenue north of the intersection, many of the crashes were due to vehicles turning into or out of driveways and failing to yield to through traffic. Of the 17 crashes, 14 involved drivers exiting from driveways.

Recommendations
For each of the three segments, consider the following access management strategies. The open roadway and large driveway entrances can visually distract drivers. Reducing and better defining the access points can help to limit unexpected entries into the roadway and visually confine drivers to their lane:

- Restrict left turns exiting driveways with a physical barrier like a pork chop island and raised median curbing.
- Work with property owners to consolidate and narrow driveway entrances, particularly for those properties immediately adjacent to the intersection.

Street view of roadway segment along Washington Avenue traveling north (B), from Google Maps

Aerial view of Allen’s Corner.
PORTLAND: Intersection of Washington Avenue and Allen Avenue

Crash Data
The crash data used for this assessment was based on 2015-2017 crash data. The following table summarizes the crash data for all three locations and also shows additional crashes from 2018. The crash diagrams for all three locations are shown on the following pages.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen Ave (South)</td>
<td>17035-17061</td>
<td>1, 4, 4, 5</td>
<td>14</td>
<td>22.2%</td>
<td>1.47</td>
<td>2</td>
<td>35 mph</td>
<td>15,000</td>
</tr>
<tr>
<td>Washington Ave</td>
<td>17060-17061</td>
<td>7, 9, 13, 14</td>
<td>43</td>
<td>27.6%</td>
<td>3.37</td>
<td>2</td>
<td>30 mph</td>
<td>16,500</td>
</tr>
<tr>
<td>Allen Ave (North)</td>
<td>17061-13351</td>
<td>7, 5, 5, 3</td>
<td>20</td>
<td>29.4%</td>
<td>2.81</td>
<td>3</td>
<td>30 mph</td>
<td>8,000</td>
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</tbody>
</table>

*See the abbreviations and definitions section at the beginning of this report for more information about each data point.

The legend below will aid in understanding the crash diagrams that follow.
PORTLAND: Intersection of Washington Avenue and Allen Avenue

A. Allen Avenue South of intersection

Portland
Link # 17035-17061
Element # 312272
Study Period: 2015-2017
# of Crashes - 9 / CRF = 1.47

Allen Ave. (Route 100)
PORTLAND: Intersection of Washington Avenue and Allen Avenue

B. Washington Avenue South of intersection
PORTLAND: Intersection of Washington Avenue and Allen Avenue

C. Allen Avenue North of intersection