Gibson Hill Road and Crocker Lane

Intersection Alternatives Analysis Memorandum

Prepared for:
City of Albany, Oregon

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Introduction
The Gibson Hill Road and Crocker Lane intersection is a three-leg “T” intersection with stop-control on the Crocker Lane approach. The intersection is located in North Albany, and connects residential areas to the north to an east-west connection between rural lands and an urban center. Crittenden Loop intersects Gibson Hill Road 160 ft to the east of the intersection with Crocker Lane. As development continues in the area, traffic volumes at the intersection with Crocker Lane are anticipated to grow leaving residents concerned with increasing delays and worsening conditions for bike and pedestrian crossings of Gibson Hill Road. These concerns have prompted the City of Albany to consider traffic control improvement alternatives at this intersection. The City of Albany and Benton County Transportation System Plans both recommend the improvement of Gibson Hill Road to an urban minor arterial with improved traffic control at the intersection with Crocker Lane.

Purpose
The purpose of this memorandum is to provide the City of Albany and Benton County with a summary evaluation of the performance, cost, safety considerations, and impacts of each intersection concept design alternative.

Existing Conditions
The existing intersection is controlled by a stop sign on the southbound approach of Crocker Lane. The speed on Gibson Hill Road is 40 mph to the east and 45 mph to the west. Crocker Lane is posted at 35 mph. Bike and pedestrian crossings of Gibson Hill Road are currently accommodated by a Rectangular Rapid Flash Beacon (RRFB) and striped crosswalk.

City of Albany Minimum Performance Standards
The City of Albany defines the minimum performance standards for intersections with different traffic control in their Traffic Impact Study Guidelines.

<table>
<thead>
<tr>
<th>Traffic Control</th>
<th>Minimum Performance Standard</th>
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<tr>
<td>Traffic Signal and All-Way Stop</td>
<td>Level of Service (LOS): D</td>
</tr>
<tr>
<td>Uncontrolled and Two-Way Stop (worst case movement)</td>
<td>Volume-to-Capacity (V/C): 0.85</td>
</tr>
</tbody>
</table>

2040 Traffic Operations
If the existing intersection configuration is left in place until 2040 (future analysis year) the intersection can be expected to operate over minimum standards for two-way stop controlled intersections with a volume-to-capacity ratio greater than 0.85 for the southbound approach in the morning and afternoon peak period. Delays on Crocker Lane can be expected to increase as volumes through the intersection continue to grow.
Crash Analysis
Five years of the most recent crash data available (January 1, 2010 to December 31, 2014) was obtained from the Oregon Department of Transportation for a review of existing crash history. In total there were four crashes recorded at the intersection between Gibson Hill Road and Crocker Lane and 3 crashes recorded on the approaches of Gibson Hill Road within 250 ft of the intersection. Of the crashes at the intersection, all four were turning movement crashes involving a vehicle making a left turn from Crocker Lane. One of these crashes involved a bicycle and resulted in serious injuries. The crashes on the Gibson Hill Road approaches included one rear-end crash, one crash involving an animal, and one turning movement crash involving a vehicle turning from the nearby intersection with Crittenden Loop.

All-Way Stop Control
Conditions for installing an all-way stop controlled intersection are established by the 2009 Manual of Uniform Traffic Control Devices (MUTCD). The criteria for all-way stop control include an analysis of eight-hour intersection volumes, crash history, delay, and speed. In general, the conditions at the intersection of Gibson Hill Road and Crocker Lane are expected to satisfy the requirements for installation of all-way stop control, as proposed by Alternative 1.

Signal Warrants
There are eight signal warrants established by the MUTCD that are used to evaluate the need for a traffic signal at a given intersection. Three of these warrants are based solely on traffic volumes: Warrant 1 – 8-hour Traffic Volumes, Warrant 2 – 4-hour Traffic Volumes, and Warrant 3 – Peak Hour Traffic Volumes.

After comparing existing (2016) turning movement volumes on the Gibson Hill Road and Crocker Lane it was determined that two of the volume-based warrants are currently met by 2016 volumes. The 4-hour traffic volume warrant and peak hour warrant are satisfied based on 2016 volumes assuming typical travel speeds on Gibson Hill Road are in excess of 40 mph. Volume thresholds for traffic signal warrants increase where typical travel speeds do not exceed 40 mph; therefore, should travel speeds on Gibson Hill Road not exceed 40 mph current 2016 traffic volumes would not meet volume warrants. Traffic signal warrant spreadsheets are attached to this report.

Alternatives Analysis Methodology
Each proposed alternative was evaluated to understand the impacts, performance and costs of the proposed intersection configurations. Concept-level designs were created to estimate the potential right-of-way impacts, constraints, and planning-level cost opinions (does not include costs of ROW, utility relocations, hazmat, environmental mitigation, etc.). Traffic analysis was completed to identify the expected operations of each configuration based on projected future year (2040) traffic volumes provided by the City of Albany. Qualitative evaluation of geometric safety considerations, bike and pedestrian facilities, and fatal flaws is also presented. A summary of findings is presented in the matrix below. Specific findings for each alternative are presented by alternative later in this memorandum. The findings of this evaluation are summarized within this report by Alternative.
## Alternatives Analysis and Evaluation Summary

<table>
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<tr>
<th>Alternative</th>
<th>Cost*</th>
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<th>2040 Traffic Operations</th>
<th>Safety</th>
<th>Bike/ Ped Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td></td>
</tr>
<tr>
<td>Alternative 1: All-Way Stop Control</td>
<td>$11,000</td>
<td>+</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Alternative 2: Single Lane Traffic Signal</td>
<td>$538,000</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Alternative 3: Traffic Signal with Turn Lanes</td>
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<td>✓</td>
<td>+</td>
<td>+</td>
<td>✓</td>
</tr>
<tr>
<td>Alternative 4: Modern Roundabout</td>
<td>$1,463,000</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Alternative 5: Mini Roundabout</td>
<td>$273,000</td>
<td>✓</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

*Costs do not include ROW, utilities, hazmat or environmental mitigation

- ✓ Acceptable Performance/Minimal Impact
- + Above Average Performance/Little to no impact
- - Below Average Performance/Significant impact
Alternative 1:

All-Way Stop Control

Conceptual Design
- Re-strip the intersection to include stop-bars and stop-signs at each roadway approach.
- Remove the existing Rectangular Rapid Flash Beacon (RRFB).
- More detailed design information is included in the concept design sheet attached to this memorandum.

Right-Of-Way Impacts
The all-way stop control intersection alternative requires no additional right-of-way.

2040 Traffic Operations
In 2040, the all-way stop controlled intersection does not meet operational standards during the afternoon peak hour with a volume-to-capacity ratio of 1.10 for the westbound approach. It is likely that operations would only fail to meet minimum standards during the peak hour and would operate sufficiently for the rest of the day.

Geometric Safety Evaluation
Installation of all-way stop-control may reduce the frequency of turning movement and angle collisions at the intersection. Sight distance evaluation should be completed to ensure final intersection configuration meets standards.

Bike and Pedestrian Considerations
Bikes would continue to use the striped bike lane/shoulders. The striped crosswalk at all-way stop intersections provide some level of protection; however, the stop-signs at the all-way stop control may not provide the same level of driver warning as the existing RRFB.

Cost Estimate
- Construction: $6,000
- Contingency: $3,000
- Preliminary Engineering: $2,000
- TOTAL: $11,000

2040 Traffic Operations
- Meets standards in the AM peak hour
- Does not meet standards in the PM peak hour

Worst Queuing:
Minimal queuing expected in the AM and PM peak hours

Future Considerations
- Potential as an interim, low-cost alternative until ultimate corridor design configuration is decided (roundabouts vs. signals, etc.)
Alternative 2: Single Lane Traffic Signal

Conceptual Design
✓ Install a traffic signal and maintain single lane approaches.
✓ New ADA pedestrian ramps on the northeast and northwest corners of the intersection.
✓ Striped crosswalks on the north and east legs of the intersection.
✓ Pavement widening to accommodate the turning radius for a large semitrailer (WB-50 design vehicle).
✓ Remove the existing RRFB.
✓ Existing bus pullout on the south side of Gibson Hill Road remains.
✓ More detailed design information is included in the concept design sheet attached to this memorandum.

Right-Of-Way Impacts
The right-of-way impacts for a single lane traffic signal are minimal. The only right-of-way impacts are at the northwest and northeast corners of the intersection (illustrated by red hatching above) for the ADA pedestrian ramps.

2040 Traffic Operations
In 2040, the single lane traffic signal operates under adopted standards with a LOS B in the morning and afternoon peak periods. Queuing in the westbound direction is expected to back up well past the intersection with Crittenden Loop. Access restriction on Gibson Hill Road should be considered at this location.

Geometric Safety Evaluation
Traffic signals are generally recognized as reducing the frequency of specific crash types, primarily angle and turning movement crashes. However, the introduction of traffic signals can also increase the frequency of other types of crashes, most notably rear-ends.

Bike and Pedestrian Considerations
Bikes will continue to use striped bike lane/shoulders. Pedestrians will benefit from striped crosswalks and pedestrian push buttons for controlled pedestrian crossings. Maintaining single lane approaches means that the pedestrian crossing distance is shorter than at a traffic signal with turn lanes.
Alternative 3:

Traffic Signal with Turn Lanes

Conceptual Design

✓ Install a traffic signal with left-turn lanes in the eastbound and southbound directions and a right-turn lane in the westbound direction.
✓ Remove the existing RRFB and relocate existing overhead utilities.
✓ ADA pedestrian ramps with striped crosswalks.
✓ Reconfigure the existing bus pullout on the south side of Gibson Hill Road.
✓ Restrict access to Crittenden Loop as it’s located within the taper for the westbound right-turn lane.
✓ Lane widths include: 11’ travel lanes, 12’ turn lanes, 5’ bike lanes/shoulders, and right-of-way for 6 ft sidewalks.
✓ Designed to accommodate the turning radius of a large semitrailer (WB-50 design vehicle).
✓ More detailed design information is included in the concept design sheet attached to this memorandum.

Right-Of-Way Impacts

The right-of-way impacts for this alternative are localized to the north side of Gibson Hill Road (illustrated by red hatching above).

2040 Traffic Operations

In 2040, the signalized intersection with turn lanes operates under adopted standards with an overall LOS A during the morning and afternoon peak hours. While traffic signals may decrease side street delay during peak periods, it’s possible that Crocker Lane may experience additional delay during off peak hours, where acceptable gaps in oncoming traffic are more frequent and signalization isn’t needed. Turn lanes improve vehicular operations and reduce queuing when compared to Alternative 2.

Geometric Safety Evaluation

Traffic signals are generally recognized as reducing the frequency of specific crash types, specifically angle and turning movement crashes. However, the introduction of traffic signals can also increase the frequency of other types of crashes, most notably rear-ends.

Bike and Pedestrian Considerations

Bikes will continue to use striped bike lane/shoulders. Pedestrians will benefit from crosswalks and pedestrian push buttons for controlled pedestrian crossings. Right-turn lanes result in increased pedestrian crossing distance/exposure and create potential conflicts with bicyclists along Gibson Hill Road.

Cost Estimate

Construction: $1,084,000
Contingency: $542,000
Preliminary Engineering: $244,000
TOTAL: $1,870,000

2040 Traffic Operations

✓ Meets standards in the AM and PM peak hours

Worst Queuing:
Eastbound: 200 ft (AM)
Westbound: 150 ft (PM)
Southbound: 100 ft (AM)

Future Considerations

✓ Consider future plans for Gibson Hill Rd corridor (roundabouts vs. signals)
✓ Access control at Crittenden Loop
✓ Right-turn lane conflict with bike lanes
✓ Potential for increased delay to side-street volumes in off-peak hours
Alternative 4: Modern Roundabout

Conceptual Design
- Install a modern roundabout with an inscribed diameter of 115 ft, a 50 ft diameter raised island and 12 ft mountable truck apron.
- Existing bike lanes would be routed up on to 10’ multi-use sidewalks around the perimeter of the roundabout.
- Designed to accommodate a large semitrailer (WB-50 design vehicle).
- Remove or relocated existing RRFB.
- Relocate existing utility poles.
- Relocate existing bus pullout on the south side of Gibson Hill Road.
- Restrict access on Gibson Hill Road to Crittenden Loop.
- A speed study should be completed to inform final design of traffic calming features for a full roundabout.
- More detailed design information is included in the concept design sheet attached to this memorandum.

Right-Of-Way Impacts
Additional right-of-way is needed on the north and south side of Gibson Hill Road in order to avoid property building takes at the north side of the intersection.

2040 Traffic Operations
In 2040, the modern roundabout operates under adopted standards with a LOS B in the morning and afternoon peaks. Queuing in the westbound direction is expected to extend back past the intersection with Crittenden Loop during the afternoon peak. Access control on Gibson Hill Road at this location may be required.

Geometric Safety Evaluation
Roundabouts reduce the number of crossing conflicts at an intersection which may result in a reduced frequency of severe turning movement conflicts. In general, traffic calming measures can be incorporated into the geometric design of roundabouts which may also help reduce excessive vehicular speeds along Gibson Hill Road.

Bike and Pedestrian Considerations
A 10 ft multi-use sidewalk around the perimeter of the roundabout would accommodate bikes and pedestrians. Crosswalks at each approach should be separated by medians to facilitate two-stage pedestrian crossings. The existing RRFB can be relocated in combination with a roundabout.

Cost Estimate

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
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</thead>
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<tr>
<td>Construction</td>
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<td>Contingency</td>
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<tr>
<td>Preliminary Engineering</td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$1,463,000</strong></td>
</tr>
</tbody>
</table>

2040 Traffic Operations
- Meets standards in the AM and PM peak hours

Worst Queuing:
- Eastbound: 250 ft (AM)
- Westbound: 250 ft (PM)
- Southbound: 100 ft (AM)

Future Considerations
- Speed study to inform design of roundabout with potential, supplemental traffic calming measures to consider pedestrian safety
- Access control at Crittenden Loop
- Intersection re-alignment to avoid property building take
- Consider future plans for Gibson Hill Rd corridor (roundabouts vs. signals)
Alternative 5: Mini Roundabout

Conceptual Design
- Install a mini roundabout with an inscribed diameter of 60 ft and a 14 ft diameter mountable center island.
- Striped or mountable splitter island needed to accommodate a large semitrailer (WB-50 design vehicle).
- Remove or relocate the existing RRFB.
- Relocate existing utilities on the north and south sides of the intersection.
- Bikes to navigate through the roundabout with shared lanes.
- 6 ft sidewalks along the perimeter for pedestrians.
- Existing bus pullout is not affected; consider relocating with mini roundabout.
- More detailed design information is included in the concept design sheet attached to this memorandum.

Right-Of-Way Impacts
Right-of-way impacts for the mini roundabout are localized to the northwest and northeast corner of the intersection, as shown by the red hatching above.

2040 Traffic Operations
In 2040, the mini roundabout operates below adopted standards with a LOS C in the morning peak hour and LOS B in the afternoon peak hour. Queueing in the eastbound direction is expected to extend back approximately 350 ft during the morning peak hour while queuing in the westbound direction will back up past the intersection with Crittenden Loop during the afternoon peak hour. Access restrictions may be required at this location.

Geometric Safety Evaluation
Mini roundabouts are typically recommended for corridors with posted speeds of 30 mph or less, with a maximum design speed of 35 mph. Since posted speeds on Gibson Hill Road and Crocker Lane are in excess of these recommended design speeds, a speed study would be required to evaluate the potential for reducing posted speeds through the corridor.

Bike and Pedestrian Considerations
A 6 ft sidewalk around the perimeter of the roundabout would accommodate pedestrians with crosswalks and splitter islands at each approach to facilitate two-stage pedestrian crossings. Based on design guidance for mini roundabouts, bicyclists would share the travel lanes with vehicles through the mini roundabout. Speeds on Gibson Hill Road would need to be lowered to achieve recommended travel speeds in order to create a safe environment for bikes and pedestrians. The existing RRFB can be relocated in combination with a mini roundabout.
Summary
In general, each of the five intersection alternatives provide a feasible alternative for addressing current safety and operational concerns as they relate to the current intersection configuration of Gibson Hill Road and Crocker Lane. The all-way stop controlled alternative is the only alternative that fails to meet operational standards in 2040; however, the implementation of an all-way stop controlled intersection could be a low-cost, interim solution to address current concerns while maintaining maximum flexibility for the ultimate configuration of the corridor. Signalization and roundabout alternatives provide varying benefits, as outlined within this report. The detailed technical information used to summarize performance within this memorandum can be found within the technical attachments included with this report.

Technical Attachments
- Existing and Future Traffic Volumes
- Concept Design Sheets
- Preliminary Cost Estimates
- Traffic Operations Output
- Crash History