



Intersection Traffic Operational Evaluation Approach

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Based on the *Travel Forecasting Documentation* (HNTB, June 2015), 23 ramp intersections and 11 secondary intersections were identified to assess potential traffic operational impacts associated with tolling the Brent Spence Bridge (BSB). The purpose of this document is to outline an approach for evaluating operations at these locations. The approach is illustrated in Figure 1 below and discussed in the following sections.

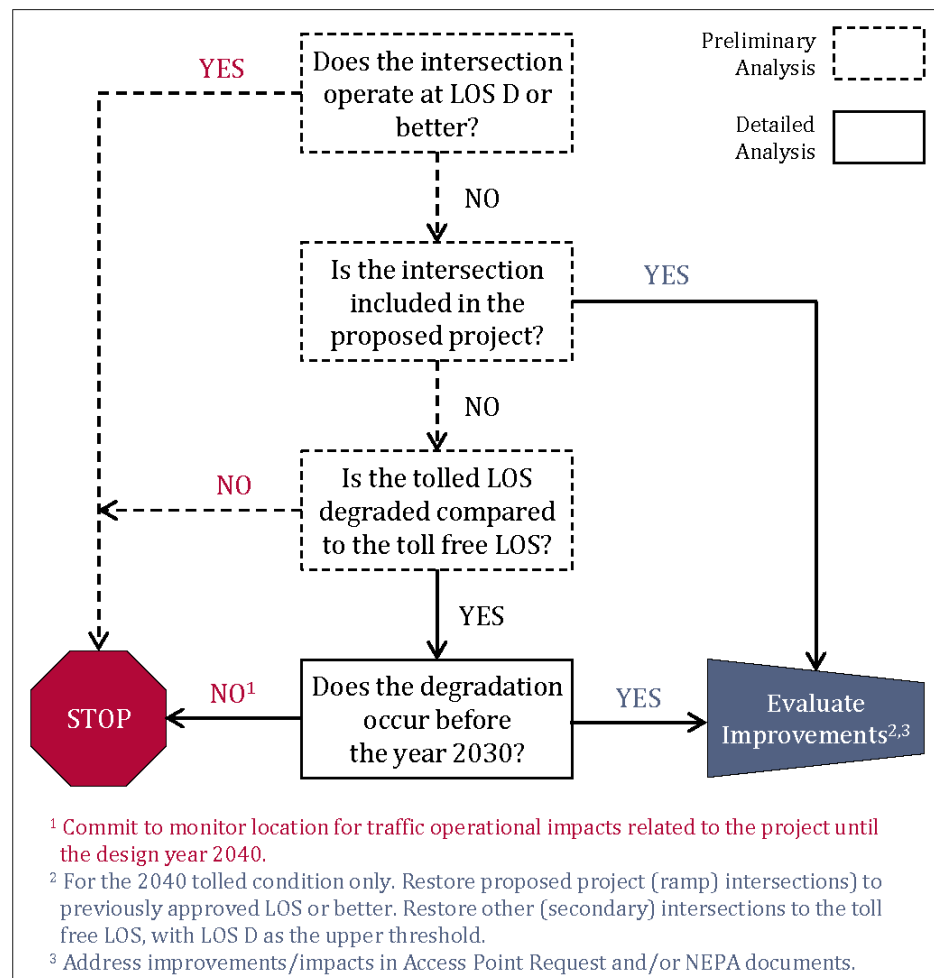


Figure 1: Traffic Operational Analysis Flowchart



Preliminary Analysis (Completed)

Intersection operations were analyzed using 2040 certified AM, PM and Midday traffic volumes and the HCS 2010 module in Synchro. At four locations, site-specific lane use and/or phasing could not be modeled in Synchro. Highway Capacity Software (HCS) was utilized to supplement the operational analyses at these locations. The following parameters were applied:

- Existing lane use, No Turn on Red (NTOR) locations, speed limits and phasing were utilized (verified through on-line mapping and field visits.
- For ramp intersections included in the proposed project, lane use from the approved preferred Alternative I (from the *Access Point Request Document Addendum* dated September 2012) was utilized.
- Closely spaced signals were coordinated. Common cycle lengths were utilized for coordinated signals.
- Appropriate pedestrian timings were included based on crossing distance scaled from aerial mapping.
- Planning-level signal interval times were used.

The analyses identified fourteen (14) intersections for further evaluation for one or both of the following reasons (see Figure 1, page 1):

- Projected (2040) operations below LOS D
- Projected (2040) operations for the tolled condition that were degraded when compared to the toll free condition

Five (5) of the locations flagged for further evaluation are ramp intersections included in the proposed project (see attached *Intersections Identified for Further Analysis - Footnote 2*). Four (4) of the ramp intersections had operations below LOS D in both the toll free and the tolled conditions, while one (1) showed concerns for the tolled condition only. These locations will be evaluated further as described below and in Figure 1, page 1.

Deliverables:

- Preliminary Traffic Operational Summary memorandum (*completed*)
- Table of Intersections Identified for Further Analysis (*completed*)

Detailed Analysis – Ramp Intersections

Because they are included in the footprint for the proposed project and were addressed in the approved *Access Point Request Document Addendum* (September, 2012), the ramp intersections will be further evaluated in HCS to determine the



measures to restore operations to the previously approved design year (2040) LOS or better. The HCS analyses will be conducted by balancing the critical approach delays and incorporating incremental improvements, beginning with timing/phasing adjustments and progressing to capital improvements as necessary. Further coordination will be necessary to determine specific evaluation parameters, including appropriate cycle lengths, signal coordination requirements and pedestrian timings. Following the HCS analyses, potential capital improvements will be evaluated to determine geometric requirements, physical and environmental impacts, and costs.

Based on the detailed evaluation, proposed improvements at the ramp intersections will be incorporated into an updated Access Point Request Document and ultimately into the scope of work for the BSB project. Additional physical and environmental impacts that may result from the improvements will be addressed in the BSB NEPA document.

Deliverables:

- Coordination to determine HCS analysis parameters
- Memorandum summarizing operational analyses, results and recommendations, including:
 - Tabular summary of 2040 HCS results
 - Schematic/stick figure diagrams of recommended improvements (including geometric improvements)
 - HCS reports for the 2040 tolled condition
- Evaluate need for planning-level geometric layouts
- Planning-level geometric layouts (as needed)
- Cost estimates (as needed)
- Environmental evaluation and/or field studies (as needed)

Detailed Analysis – Secondary Intersections

Because they are not directly within the footprint for the proposed project, operational impacts at the remaining nine (9) intersections will be indirect and further removed in time and geographic location. These intersections are designated as secondary intersections.

The first step in evaluating traffic operational impacts at the secondary intersections will be to screen them based on when the degradation is expected to occur. Based on previous experience, a typical intersection improvement project involving right-of-way acquisition requires four to five years from planning to construction. Therefore, intersections that will experience traffic operational



impacts within 5-years of the opening day (2020) should be incorporated into the BSB project to allow impacts to be addressed in a timely manner. An additional 5-year cushion will allow for a certain degree of variability and uncertainty inherent in traffic projections. Therefore, the year 2030 represents a conservative screening threshold that will allow the analysis to focus on mitigating impacts that could be certain.

Straight-line interpolation will be utilized to estimate traffic volumes in the year 2030. Then, the preliminary analysis will be repeated using the 2030 volumes. If the degradation is predicted to occur beyond the year 2030, then the NEPA document will include a commitment to monitor the location until the design year of the project (2040). The monitoring activities will include actions such as collecting current traffic counts, conducting routine operational and signal timing analyses and soliciting feedback from the maintaining agency. The specific monitoring strategy will be established by each state in consultation with the local agencies (i.e. Cities of Cincinnati and Covington). The BSB NEPA document will fully disclose the potential 20 year operational impacts associated with the project. While no detailed traffic operational, geometric or environmental impact analyses will be conducted beyond 2030, the NEPA document will provide a qualitative discussion of potential impacts (i.e. Improvements at this location could result in right-of-way acquisition within a historic district).

If project-related degradation is observed before 2040, appropriate mitigation measures will be evaluated and implemented. The applicable state will initiate a separate project (and NEPA process) for improvements at that location. In accordance with standard practice, the design year for any improvement project resulting from the monitoring activities will be 20 years.

Deliverables:

- Tabular summary of interpolated 2030 volumes
- 2030 Traffic Operational Summary memorandum
- Table of Intersections for Further Detailed Analysis and Monitoring

The second step of the detailed analysis will be to use HCS to evaluate only those locations where degradation is predicted to occur before the year 2030. Because the goal will be to address the effects of tolling, these analyses will focus on measures to restore operations to those predicted for the 2040 toll free condition, with LOS D as the upper threshold. As a result, the target operations at some locations will be LOS E or F.



The HCS analyses will be conducted according to the same methodology agreed upon for the ramp intersections. Following the HCS analyses, potential capital improvements will be evaluated to determine geometric requirements, physical and environmental impacts, and costs.

Based on the detailed evaluation, proposed improvements at the secondary intersections will be incorporated into an updated Access Point Request Document and ultimately into the scope of work for the BSB project, if deemed appropriate.. Additional physical and environmental impacts that may result from the improvements will be addressed in the BSB NEPA document.

Deliverables:

- Coordination to determine HCS analysis parameters
- Memorandum summarizing operational analyses, results and recommendations, including:
 - Tabular summary of 2040 HCS results
 - Schematic/stick figure diagrams of recommended improvements (including geometric improvements)
 - HCS reports for the 2040 tolled condition
- Evaluate need for planning-level geometric layouts
- Planning-level geometric layouts (as needed)
- Cost estimates (as needed)
- Environmental evaluation and/or field studies (as needed)