

### Johnson Lane Interchange Critical Failures

- Inadequate vertical clearance @ I-90 bridge over Johnson Lane [existing]
- Inadequate capacity @ Johnson Lane / I-90 ramps, requiring roadway / bridge widening for additional turn lanes [long term]

## 4.0 POTENTIAL SOLUTIONS

This section provides a discussion of potential solutions to correct the major deficiencies identified in previous sections.

Many of the deficiencies identified in this report are relatively minor and either do not warrant correction efforts (based on a limited availability of funding and manpower resources to address them) or can be corrected by MDT crews or contractors without individual project design and funding. Deficiencies such as short taper lengths, narrow lane widths, and truck turn overlaps are common and do not warrant correction unless there is a documented safety problem which exists. Based on the accident analysis in this report, the majority of minor deficiencies are not causing problems and we have not recommended allotting resources to these *potential* problems. The majority of these minor deficiencies are related to traffic control (signing and marking), while some involve pedestrian facilities, safety, and/or geometry. Such improvements do not need “alternatives analysis”, and are not discussed further in this section. These improvements are summarized as “O&M Improvements” in Section 5.0.

The majority of the capacity-related deficiencies and “critical failures” can be addressed with several alternatives. Potential capacity improvement alternatives for each interchange are depicted graphically in **Figures H-1 thru H-5** and in tabular format (along timing and related notes) in **Tables H-1 thru H-5**.

At each interchange, roundabouts and loop ramps were considered along with signalized intersections and auxiliary lane improvements to increase capacity through these corridors. While not all of the potential capacity deficiencies are anticipated to be realized with 2023 projected traffic volumes, improvement options have been included for consideration if growth is greater than anticipated and these capacity issues are realized.

## 5.0 RECOMMENDED IMPROVEMENTS

### 5.1 Recommended Operational & Maintenance Improvements

These improvements include traffic control (signing and marking) and minor geometric, pedestrian, and safety improvements which can be

accomplished by MDT crews or contractors without requiring individual project funding and process.

**Figures 8 thru 12** and **Tables 19 thru 23** summarize the recommended O&M improvements for each interchange. These improvements are based on an existing need and should be accomplished as resources allow.

## 5.2 Recommended Project/STIP Improvements

These improvements include capacity, traffic control, geometric, safety, lighting, and pedestrian projects which will require individual or combined project funding as part of the State Transportation Improvements Project (STIP) program.

**Figures 13 thru 17** and **Tables 24 thru 28** summarize the recommended Project/STIP improvements for each interchange. **Table 34** summarizes all of the Project/STIP improvements for all interchanges. Projects in these tables are further categorized as either “safety related” or “capacity related” improvements.

“Safety related” improvements in these tables refer to improvements that remedy both documented safety problems identified through the accident analysis and addressed in the “Safety” section of the Deficiency Analysis for each interchange; and also potential safety problems that could occur as a result of inadequate or non-existent bike or pedestrian facilities, inadequate lighting, or other factors. “Capacity related” improvements are those needed to remedy LOS problems or eliminate choke points.

Estimated costs, anticipated timing, and potential funding sources are also provided.

Timing for Project/STIP improvements is based on the existing, short term, and long term traffic forecasts and growth assumptions in each interchange area. The anticipated timing is given in 5 or 10-year increments to provide a general prediction of when the need for such improvements will be realized. Since traffic forecasting is inherently speculative, the timing for projects may be accelerated or delayed over the next 20 years.

Potential platoon deficiencies related to the recommended improvements are not anticipated to be realized due to relatively low mainline I-90 volumes. This determination is based on merge/diverge analysis at each interchange included in this study and the projected 20-year traffic volumes compared to other interchanges with greater volumes and similar laneage/configurations which operate efficiently.

Recommended improvements were designed and analyzed to accommodate the WB-20 design vehicle. However, no retrofit or

interchange reconstructions are recommended to correct the truck overlap deficiencies identified in Section 3.0 since there is not a documented safety problem and such overlaps are common. However, as opportunities arise to redesign these facilities to accommodate these vehicles, they should be taken. This may be accomplished as development and/or redevelopment occurs in the interchange areas.

**Tables 29 thru 33** summarize the peak hour intersection Levels of Service for long-term conditions with each of the recommended Project/STIP improvements in place. These analyses include roundabout Levels of Service calculated using Rodel software.

### 5.3 Estimated Project Costs and Methodology

Cost estimates were developed for each of the recommended Project/STIP improvements to aid in planning for future projects and securing funding. These planning-level costs represent the estimated project construction costs (including ROW if needed) and do not include additional studies (EA studies for example) and design that may be required.

Cost estimates were developed base on the following methodology:

#### Auxiliary Lanes

- Right turn deceleration lane, \$50,000
- Left turn deceleration lane, \$150,000
- Acceleration lane, \$100,000
- Classification Factors; Urban 1.6, Rural 1.0
- Terrain Factor: 1.0 for level ground, 1.5 for non-level ground
- Speed limit factor: 65mph = 1.37, 55mph=1.00, 45mph=0.86, 35=0.54

#### Pedestrian Facilities

- Sidewalks (Complete Urban) = \$250,000 per mile
- Pedestrian accommodations at traffic signals, \$10,000

#### Bridge Structure

- \$4,000 per LF of widening

#### Roundabout Interchange

- Base cost, \$3,000,000 (2 roundabouts, 4-legs each)

- Adjustments made for ROW needs, grades, size, additional legs

#### Street Lighting

- \$10,000 per streetlight

#### Traffic Signals

- \$200,000 per signalized intersection
- Signal coordination, \$7,000 per traffic signal in corridor

#### Roadway Widening (additional lane in each direction, total)

- Urban conditions, \$1,800,000 per mile

Final estimates for each project were rounded and are provided in **Tables 24-28** and on **Table 34**.

## **5.4 Potential Funding Sources**

Recommended Project/STIP improvements may be funded through various sources, with the majority of projects being channeled through the Statewide Transportation Improvement Program (STIP). This program manages federal transportation funding allocation (through SAFET-LU) at the state level, with projects being nominated by the Montana Department of Transportation districts. The information contained in this study is intended to begin the first step towards prioritizing interchange improvements at these five locations so that funding may be secured through the STIP.

Tables 24-28 and Table 34 provide potential funding sources that may be applicable for each of the recommended project improvements. These funding sources are as follows:

**Surface Transportation Funds (STP):** These funds encompass the majority of federal transportation funding at the state level, and include Primary (STPP), Urban (STPU), Hazard Elimination (STPHS), and Enhancement (CTEP) funds, all of which are applicable for this study. **STPP** funds are primarily used to preserve, restore, or reconstruct roads and bridges on the Primary Highway system. **STPU** funds can be used for a wide variety of both roadway and pedestrian/bicycle network projects and are prioritized with input at the local level. **STPHS** funds are used for safety projects that have a documented correctable accident trend. **CTEP** funds are distributed at the local level for projects including bicycle and pedestrian facilities, restoration/repair of historic sites/facilities, beautification projects, and some environmental projects.

**Congestion Mitigation and Air Quality Improvement Program (CMAQ):** CMAQ funds are used to finance transportation projects which document a projected air quality improvement. Such projects may be roadway, intersection, or other transportation system improvements that reduce vehicle use or improve corridor efficiency.

In addition to funds allocated through the STIP, additional funding may be available through **local** (City, County, MPO) funds and **private** funding. Projects located on the local roadway system in the interchange areas or public and private accesses may be appropriate for some level of local or private funding. Developer funding should be sought out particularly in high growth areas (Shiloh Road for example) where new development will greatly affect the need for system improvements and mechanisms for recoument will be in place.

**Interstate Maintenance (IM) Funds:** Interstate Maintenance funds are available to states to maintain previously completed sections of the Interstate System. The funds may be used to resurface, restore, rehabilitate and reconstruct sections of interstate highways.

**Bridge Replacement (BR) Funds:** Bridge Replacement funds are available to states to improve the condition of their eligible highway bridges over waterways, other topographical barriers, other highways and railroads.

**National Highway (NH) Funds:** National Highway funds are available to construct or reconstruct highways on the National Highway System. Since US 87 and 27<sup>th</sup> St. are part of the National Highway System at the interchange areas with I-90, NH funds could potentially used for improvements at these locations.

## 5.5 Prioritization

While prioritization of recommended projects is one of the goals of this effort, the entire list of recommended projects were not ranked in relation to one another since the scope and range of projects is so varied, the timing of each improvement is different, and several different funding sources will likely be used. For example, the mitigation of an existing left-turn accident problem is completely different in scope than construction of a roundabout interchange that may not be needed for 15 years, and each will come from a different pool of funding and will not be competing for available funds. However, Project/STIP improvements were categorized as either “safety” or “capacity” improvements to aid in planning of these projects. These improvements were then sorted by timing need (those anticipated to be needed sooner are towards the top of the list). Projects were then ranked relative to one another as high, medium, or low priority based on the following guidelines:

- High = Safety project based on a documented accident trend, or capacity improvement involving structure widening and/or advanced planning
- Medium = Project need is imminent, but not related to a documented safety issue and/or advanced planning not required
- Low = Project need is projected, but not related to a documented safety issue and/or advanced planning not required

Projects requiring “advanced planning” are those which may involve environmental assessments (EA), bridge structure widening projects, and/or additional right-of-way.

“Low” priorities were also given to projects which are not anticipated to have an impact on the immediate interchange area and/or influence interchange operations (such as off-system improvements near the edge of the study area).

O&M improvements are not anticipated to require additional funding and were not prioritized. These improvements are needed based on existing conditions and should be implemented as resources allow.

**Table 34** provides a complete list of recommended Project/STIP improvements sorted by timing need and priority. Cost estimates and potential funding sources are also provided.