



MEMORANDUM

TO: Bi-State Coordination Committee
FROM: Bob Hart, Project Manager
DATE: July 30, 2015
SUBJECT: **I-205 Bus on Shoulder Feasibility Study**

INTRODUCTION

RTC staff presented the recommendations of the I-205 Access and Operations (AO) Study to the Bi-State Coordination Committee at the March 19th meeting. The transit recommendation called for a feasibility study of the technical, policy, and engineering opportunities and constraints of bus on shoulder operations in the I-205 corridor. The purpose of this memorandum is to introduce the Bus on Shoulder (BOS) Feasibility Study, describe examples of bus on shoulder in other regions, outline the draft scope of work, and summarize the decision making process for the study.

The preliminary assessment conducted as part of the AO Study found that BOS offers the opportunity for improved transit reliability, travel time savings, expanded transit ridership, and can facilitate low-cost transit expansion in the corridor. While the high level assessment showed many potential benefits, there are still significant unknowns regarding its operation. These include understanding how it operates alongside adjacent vehicle traffic and at high volume interchanges, as well as how it would work in coordination with incidents and law enforcement/public safety needs. The region also needs to learn more about the roadway infrastructure requirements of a bus on shoulder operation such as shoulder width and pavement depth. The I-205 Bus on Shoulder Study is structured to answer these questions, to identify other technical issues, and address the policy and legal requirements needed for successful BOS operation.

The first phase of the study will outline the technical and engineering considerations for BOS in the I-205 corridor. At the completion of phase one, regional policy makers will determine whether to move forward with a more comprehensive phase two feasibility study and consider regional BOS policies. A detailed phase two scope would be developed if the region agrees that implementing a bus on shoulder project in the corridor should be considered.

WHAT IS BUS ON SHOULDER?

Bus priority treatments on streets and highways have been operating effectively throughout the United States for about a half century. Many bus on shoulder systems have been built over the last 20 years and are now a widely accepted treatment to improve transit reliability and mobility. A BOS system is a relatively simple concept in that it allows transit vehicles to use the shoulder on a freeway or major arterial during times of heavy congestion. Although there are BOS systems on both types of roadways, this summary focuses only on freeway systems since they are applicable to the I-205 corridor.

The general operating protocol is that buses that normally operate in regular traffic lanes would move to the shoulder when mainline travel speeds drop below a predefined speed. In many regions, the speed threshold is set at 35 mph. Since buses operate on the shoulder only during specified traffic conditions, a more descriptive name for this might be “dynamic” BOS. In addition, buses on the shoulder do not operate more than 15 to 20 mph faster than the adjacent traffic, depending on bus driver training, shoulder characteristics, ramp conflicts, and local operating protocols.

In some regions, buses stay on the shoulder continuously, including past interchanges. In other systems, buses will merge back into general purpose traffic lanes at high volume interchanges and return to the shoulder after passing the interchange. In addition, problems with emergency vehicles or incidents with buses on shoulder are minimized with buses merging back into general traffic flow to get around the event.

A BOS system differs from a strategy called hard shoulder running. While a hard shoulder running system is also utilized during periods of heavy congestion, it is open to general purpose traffic or carpool vehicles, and because of this, carries significantly higher vehicle volumes.

BUS ON SHOULDER IN THE UNITED STATES

As of 2012, there were about fifteen BOS systems operating in the United States. Most of them operate on the outside shoulder with a few using the inside shoulder. The systems range from just a few miles in length, such as in San Diego, up to comprehensive systems, like the Minneapolis-St. Paul region, with a 300 mile network of bus on shoulder lanes. Some systems operate only between interchanges with others serving as continuous lanes along a corridor. A common thread for the BOS systems has been the flexibility to develop each system in accordance with the needs and characteristics of their local operating environment. Many of the systems in operation have used the Minnesota experience as a template. After the planning and initial development, they have first implemented demonstration projects and have often used the same transit/traffic speed differential and the same operating rules for incidents or other vehicles on the shoulder.

A short summary of four different bus on shoulder systems is described below:

Minneapolis, Minnesota: The Twin Cities region has a 300 mile network of BOS lanes. They operate on the outside shoulder and are not restricted by time of day. Buses can use the shoulder anytime the freeway speeds drop below 35 mph and can operate up to 15 mph faster than adjacent traffic. The first BOS corridor was implemented quickly in response to a Mother’s Day flood in 1993 that closed a bridge on I-35, one of the major access points into the city. Within ten days, freeway shoulders were restriped and BOS was implemented, providing an alternate route into the city. This emergency test operation was so successful that officials began to look at applying it to other corridors. At the beginning of the development process, the goal was simply based on the opportunity for easy implementation. There were no shoulder or pavement depth standards, although these standards were developed later as the system grew and matured.

Miami, Florida: Nine miles of BOS were opened on SR-874 and SR-878 in 2007 following a planning study that was completed in 2005. The study identified the adequacy of the shoulders,

the amount of emergency service vehicles using the shoulders, and current, planned transit services and established criteria for use of the shoulder. In Miami, buses are allowed to operate on the outside freeway shoulder anytime speeds drop below 25 mph. This is different than Twin Cities, where the traffic threshold for transit use of the shoulder is 35 mph or less. Buses in Miami are not allowed to operate more than 15 mph faster than vehicle traffic. They must also yield to entering, merging, and exiting traffic and to emergency and law enforcement vehicles. When the shoulder is occupied by a disabled vehicle, law enforcement, or other obstacles, buses are required to move into the general purpose traffic lane. These operating rules are similar to Minnesota's.

Atlanta, Georgia: The first BOS lane opened in 2006 with a 6 mile segment and recently expanded to 12 miles on the GA-400 freeway. GA-400 is a 6 to 8 lane high volume facility, and while BOS has been in place for almost 10 years, the Georgia Department of Transportation technically considers it an interim treatment, until the freeway can be widened with managed lanes. When the system first opened it was estimated that commute buses were saving an average 5 to 7 minutes of travel time with a time savings of up to 25 minutes during major freeway incidents. The operating protocols are similar to Twin Cities, in that buses use the shoulder only when travel speeds are less than 35 mph with buses limited to speeds no more than 15 mph faster than the traffic flow. The key difference in operating rules compared to Twin Cities are that buses must always merge back into general purpose traffic lanes ahead of interchange off-ramps and cannot not re-enter the shoulder until after the end of the on-ramp weave. In the Twin Cities, with some exceptions at high volume interchanges, buses stay on the shoulder through the interchange.

Chicago, Illinois: PACE, the suburban division of the Chicago Regional Transit Authority, implemented BOS in 2011, with a 15 mile segment on I-55. Like many other systems, buses are allowed to use the shoulder when freeway speeds drop below 35 mph. Transit vehicles cannot travel more than 15 mph faster than general purpose traffic and are limited to a maximum speed of 35 mph. Unlike Minnesota, BOS operation is restricted by time of day allowing use only from 5-9 AM in the northbound direction and 3-7 PM southbound. Unlike the other systems, PACE is an inside shoulder system. The left shoulder was selected in order to minimize conflicts with ramps and interchanges. In addition, the outside shoulder on I-55 is narrower on several segments with more physical constraints than the inside shoulder. Like other regions, emergency use of the shoulder has priority. Buses are required to leave the shoulder if it is occupied for any reason.

I-205 FEASIBILITY STUDY TASKS

The full I-205 Feasibility Study is envisioned to occur in two steps. Step one is a planning phase which will outline the policy, technical, engineering, and cost considerations for a BOS operation. The second part of the study will depend on the results of the planning phase. At the completion of phase one, regional policy makers will determine whether to move forward with a comprehensive phase two feasibility study that would include a detailed bus service plan, needed physical improvements, bus operating protocols, and capital costs.

The study corridor encompasses the I-205 corridor from the 18th Street interchange, now under construction, south to the I-84 interchange and on SR-14 from I-205 to 164th Avenue. SR-14 is included because of the high congestion levels and the number of commuter buses using SR-14 that travel between Fisher's Landing Park and Ride facility. Although the detailed analysis will focus on I-205 and SR-14, the transit influence area may extend as far north as the Salmon Creek interchange in order to understand the technical issues and physical characteristics of the corridor associated with a BOS system if and when C-TRAN expands transit service north of 18th Street. Refinement of the corridor and BOS termini will occur under the BOS service and operating concept task.

The study tasks address only the first phase of the study; a phase two scope would be developed if the region agrees to advance a comprehensive feasibility study.

A flow chart of the study tasks are shown in Attachment 1.

AGENCY ROLES AND DECISION PROCESS

RTC will be the project lead for the overall study and the management of work tasks. Study partners consist of agencies that would be directly involved or affected by a bus on shoulder operation. A future system would operate on state facilities in Washington and Oregon, utilize C-TRAN resources and affect Tri-Met facilities. In addition, Metro and RTC, as the Metropolitan Planning Organizations for the Portland/Vancouver regions, have direct responsibility for regional transportation planning. All of these agencies will be partners in the study process.

RTC will be supported by a Technical Advisory Committee (TAC) made up of representatives from the Washington State Department of Transportation, C-TRAN, Oregon Department of Transportation, Tri-Met, Metro, and RTC. The Bus on Shoulder TAC will provide support regarding analysis approach and results, and input on development of scenarios and operational protocols. It will also provide technical and engineering expertise, and ensure consistency of study activities with transportation goals and policies of their respective agencies.

RTC will also provide periodic updates to the Bi-State Coordination Committee. The Committee will review and comment on study milestones and provide input on issues and questions of bi-state significance. In addition, RTC will engage with the Federal Highway Administration and the Federal Transit Administration when necessary to inform them of study progress and ensure coordination on transit use of interstate facilities and regulatory or other requirements.

A chart of the decision process is shown on Attachment 2.

NEXT STEPS

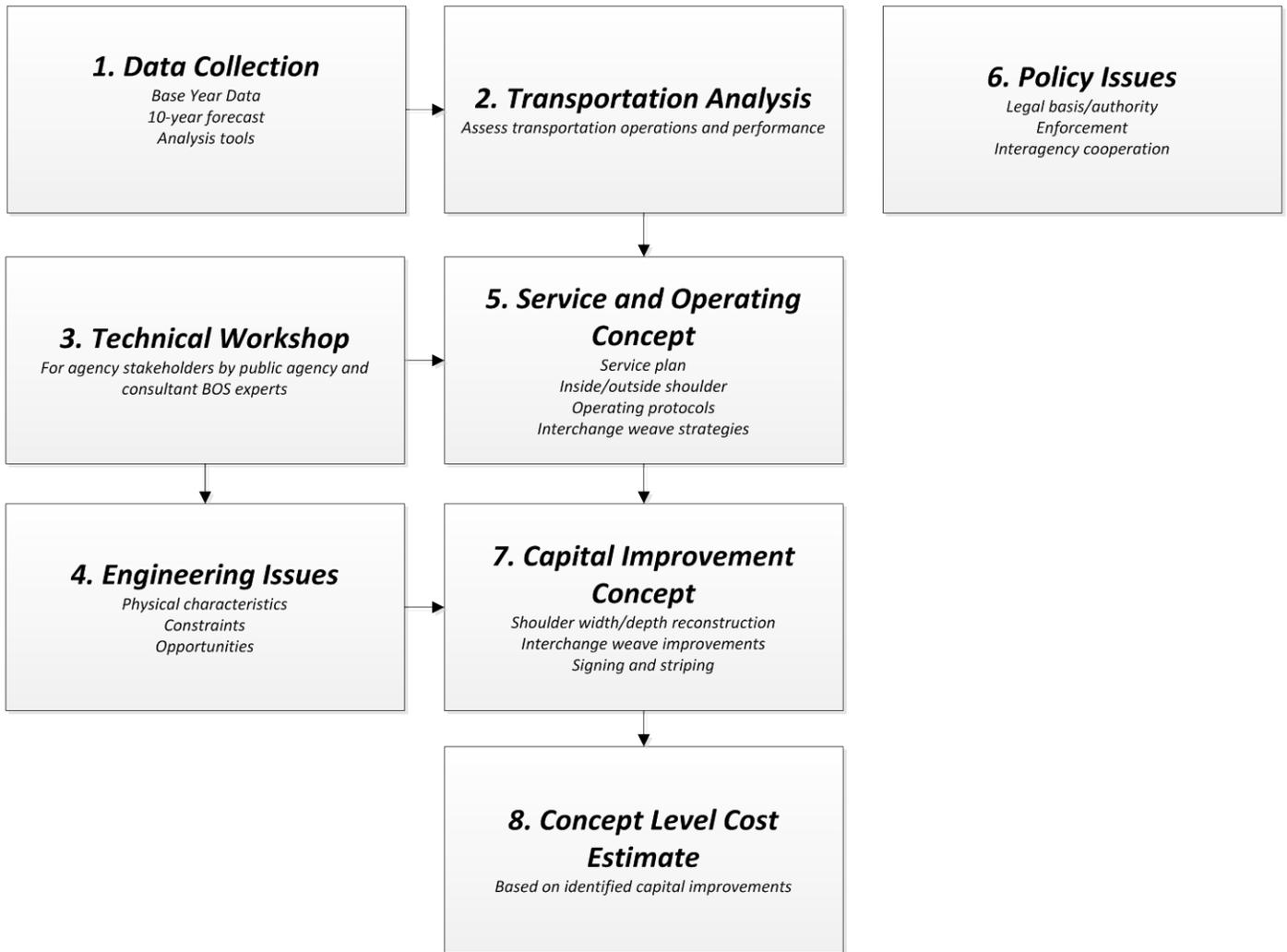
RTC held a meeting with WSDOT, ODOT, C-TRAN, Tri-Met, and Metro staff to review the scope of work on July 16 and is refining the scope based on input from the meeting.

Subsequent to the Bi-State meeting, RTC will work to with the partner agencies, finalize the scope of work, and develop a budget and funding plan for the study.

Attachments

Attachment 1

Study Tasks and Flow



Attachment 2

Decision-making Process

