

# Purpose and Need

## *Purpose*

The purpose of this project is to replace the existing Magnolia Bridge Structure, approaches, and related arterial connections with facilities that maintain convenient and reliable vehicular and non-motorized access between the Magnolia community and the rest of the City of Seattle. Since the existing bridge also provides the only public vehicular access to the land between North Bay (also referred to as Terminal 91) and Magnolia Bluff, Smith Cove Park, Elliott Bay Marina, and US Navy property, the project purpose also includes maintenance of access to these areas.

## *Need*

### **Roadway Deficiencies**

The City of Seattle has identified the Magnolia Bridge as an essential bridge that should be usable following a “design” seismic event. Even with the modifications and strengthening completed following the February 2001 earthquake, the existing bridge is susceptible to severe damage from a major seismic event.

The original bridge was constructed in 1929 and has been modified, strengthened, and repaired several times. The west end of the bridge was damaged by a landslide in 1997, requiring repair and replacement of existing bridge columns and bracing and the construction of six additional supports. Bridge repairs and strengthening also occurred in 1953, 1960, 1962, 1969, 1974, 1975, and 1985. Repairs after the 2001 earthquake included replacement of column bracing at 27 of the 81 bridge supports, and a partial seismic retrofit of the bridge structure over 15th Avenue West.

The subsurface conditions at the existing bridge site were studied in 2002 to provide necessary information for the possible replacement of the existing bridge. The design criteria used to estimate the potential depth of soil liquefaction was a 475-year earthquake with a peak ground acceleration coefficient of 0.3g (approximately 7.5 on the Richter Scale). The subsurface investigation found that the bridge is located in a former marine mudflat which was filled to the present grade in the early 1900s. Potential soil liquefaction depth was found to be from about thirteen to sixty feet deep in the vicinity of the bridge.

An existing bridge condition report was prepared in April 2003 as part of the Type, Size, and Location study. Visual inspections of the bridge conclude that the concrete structure is showing signs of aging. The concrete is cracking and spalling at many locations, apparently related to corrosion of the underlying reinforcing steel. Additional structural problems were documented, but based on the visual inspection there does not appear to be any indication that the structure has a serious load capacity problem.

Long term strategies for maintaining the existing structure were also discussed in the existing bridge condition report. The report states that if the existing bridge is expected to be in service for over 10 years, then additional maintenance and repairs should be considered along with in-depth testing. A full seismic retrofit was described in a 1997 study to upgrade the bridge to current seismic standards. This study indicated the cost of a full retrofit could equal half the cost of a new facility.

Engineers believe the cost for repair, strengthening, preservation, continued maintenance, and a full seismic retrofit would approach the cost of replacing the existing bridge. The life of a retrofitted bridge would be significantly less than that of a new bridge.

## **System Linkage**

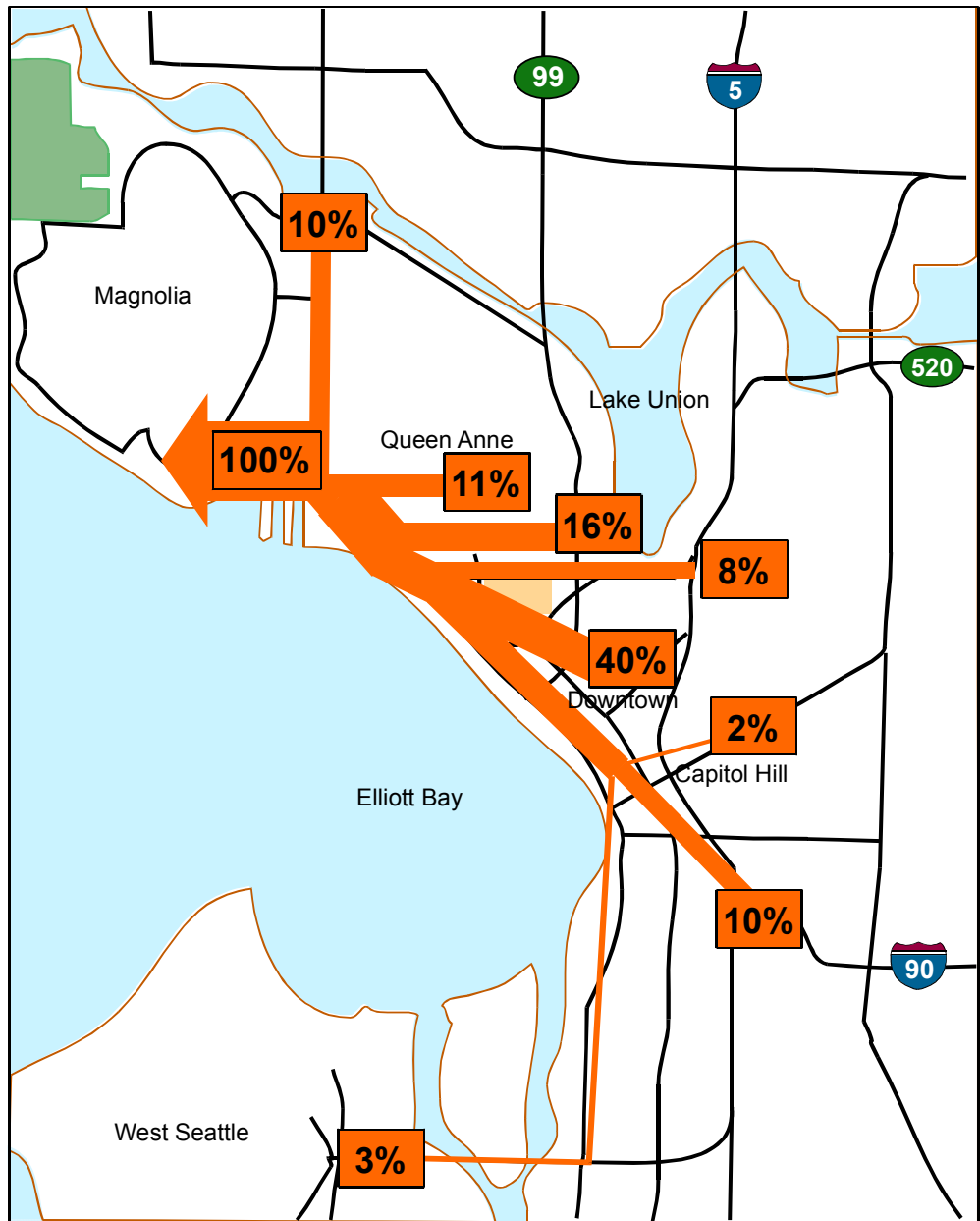
The proposed project is one of three roadway connections from the Magnolia community to the rest of Seattle. Much of the existing Magnolia Bridge structure was built in 1929 to replace a wooden trestle carrying West Garfield Street to West Galer Street on Magnolia Bluff. As the southernmost of the three connections, it is the most direct route for much of south and west Magnolia to downtown Seattle and the regional freeway system.

In meetings with the public and Design Advisory Group, the importance of this route for emergency services has been emphasized. The loss of use of this bridge in 1997 and again in 2001 has demonstrated to the community that the remaining two bridges do not provide acceptable operation. During the bridge closure after the February 2001 earthquake, the City addressed community concerns about reduced emergency response time to medical facilities outside of Magnolia by 24-hour stationing of paramedics at Fire Station 41 (2416 34<sup>th</sup> Avenue West).

Figure 1 shows the distribution of traffic using the Magnolia Bridge, based on the current City of Seattle travel demand models. During the PM peak period, 90 percent of existing traffic traveling westbound on the Magnolia Bridge originates from downtown Seattle and other locations south of the bridge. Ten percent of westbound bridge traffic originates from locations north of the Magnolia Bridge. For traffic traveling eastbound on the Magnolia Bridge during the PM peak period, 75 percent of the traffic is destined for downtown Seattle and areas south of the bridge, while 25 percent of the eastbound traffic is destined to the north of the bridge.

## **Modal Interrelationships**

The existing Magnolia Bridge provides non-truck vehicle access for Port of Seattle North Bay to and from the Elliot Avenue West/15th Avenue West. Truck access between North Bay and Elliot Avenue West/15th Avenue West is accommodated via the West Galer Street Flyover. The West Galer Street Flyover was built to replace an existing at-grade crossing of the Burlington Northern Santa Fe (BNSF) Railway mainline tracks and serves the Port of Seattle and commercial properties. The flyover eliminated delays at the train crossing, but did not add road connection capacity to the waterfront area west of the railroad. Future planned development of the Amgen facility is projected to use the remaining vehicle capacity of the West Galer Street Flyover, requiring that the capacity provided by the existing Magnolia Bridge ramps to North Bay be maintained. Redevelopment of underutilized portions of North Bay will increase demand for traffic access to the Elliott Avenue West/15th Avenue West corridor.



**Figure 1 – PM Peak Hour Travel Patterns**

The Magnolia Bridge carries three of the four local transit routes serving Magnolia. These routes serve downtown Seattle destinations and the Magnolia Bridge is the most direct path for these routes. The topography of the east side of Magnolia, East Hill, would make access to the 15<sup>th</sup> Avenue West corridor via West Dravus Street bridge circuitous for transit routes. Use of the West Emerson Street connection to 15<sup>th</sup> Avenue West would add significant distance and travel time for most trips between Magnolia and downtown Seattle.

In November 2002, Seattle voters approved local funding for an initial elevated monorail line to connect the Ballard and West Seattle neighborhoods with downtown Seattle. The initial route segment will use the Elliott Avenue West/15<sup>th</sup> Avenue West corridor. The environmental scoping process for this project occurred in early 2003. The preferred alignment alternative (March 2003) has a station at the

West Dravus Street and 16th Avenue West intersection to serve the Interbay area. South of the West Dravus station, the alignment shifts to the west side of the 15th Avenue West right of way and shifts to the center of Elliott Avenue West south of West Garfield Street. A future station site is provided at West Howe Street, about a third of the distance from the Magnolia Bridge (West Garfield Street) to West Dravus Street.

The BNSF mainline is the route for the proposed Seattle to Everett commuter rail service to be provided by the Central Puget Sound Regional Transit Authority (Sound Transit). The 1996 to 2006 ten-year transit plan does not include a station in the Interbay area.

The Magnolia Bridge has pedestrian facilities connecting the Magnolia neighborhood to 15<sup>th</sup> Avenue West/Elliott Avenue West. The Elliott Bay multi-use trail connects Magnolia with downtown Seattle through Myrtle Edwards Park. The trail passes under the Magnolia Bridge along the west side of BNSF railyard, but there are no direct connections.

The steep grade (6-1/2 percent) makes it difficult for most recreational bicyclists to use the Magnolia Bridge in the westbound, uphill direction. However, bicyclists have been observed using the Magnolia Bridge in both directions. There are no bike lanes on the bridge, so bicyclists use the traffic lanes. Once bicyclists cross the bridge, they must either travel with motor vehicles on Elliott Avenue West or find a way back to the Elliott Bay Trail using local east-west streets such as the West Galer Flyover.

### Capacity

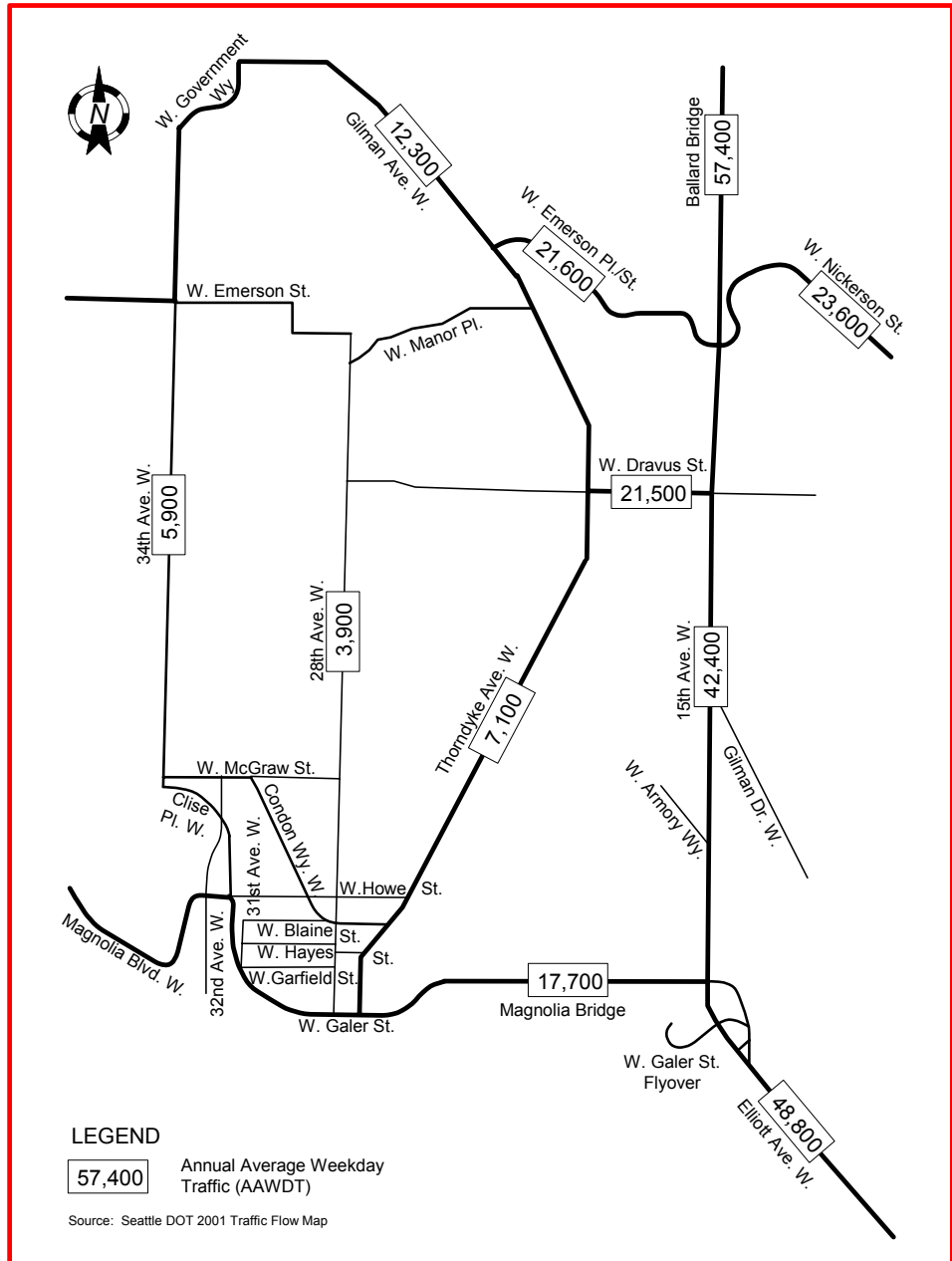
The existing facility is adequate for the present traffic. The structure provides one eastbound, downhill lane, with a second eastbound lane between the North Bay ramp and the 15th Avenue West intersection. One westbound lane is provided from the east side of 15th Avenue West, crossing on a structure over 15th Avenue West and joined by a second westbound lane from the west side of West Garfield Street intersection with 15th Avenue West. The two westbound lanes continue to the west end of the bridge, and merge to single westbound lane at the intersection of West Galer Street and Thorndyke Avenue West. The capacity limitation is presently at the signalized intersections of West Garfield Street and 15th Avenue West, and the combined West Galer Street Flyover and Magnolia Bridge westbound approach intersection with Elliott Avenue West. Table 1 shows existing (2002) peak hour operation of these intersections, as well as the unsignalized intersection of W. Galer Street and Thorndyke Avenue W (stop-sign controlled approach). These intersections provide acceptable level of service.

**Table 1  
Existing (2002) Intersection Level of Service**

Intersection	Control	AM Peak Hr.		PM Peak Hr.	
		LOS	Delay	LOS	Delay
W Galer Street Flyover/Westbound Magnolia Bridge at Elliott Avenue W	Signal	A	1.7	C	29.3
W Garfield Street at 15th Avenue W	Signal	A	5.6	A	8.4
W Galer Street at Thorndyke Avenue W	Stop sign	A	7.6	B	11.0

Notes: Delay is average seconds per vehicle entering the intersection.

Level of service and delay at the W. Galer Street and Thorndyke Avenue W. intersection is for the north (Thorndyke) stopped approach.



**Figure 2 – Annual Average Weekday Traffic**

Figure 2 shows existing (2001) annual average weekday traffic (AAWDT) at each of the three Magnolia community connections to the 15th Avenue West corridor. The fourth connection, the West Galer Street Flyover, opened in late 2001, serves Port of Seattle and commercial properties, but does not provide a through connection to the Magnolia community or to the marina and other properties southwest of North Bay. Loss of the use of the Magnolia Bridge for several months after the February 2001 earthquake resulted in lengthy delays and increased trip lengths for many of the users of the Magnolia Bridge. The increase of traffic through the West Dravus Street and West Emerson Street connections also resulted in congestion and delay for the regular users of these routes.

## **Transportation Demand**

This project is included in 2003-2005 Transportation Improvement Plan (TIP) of the Puget Sound Regional Council (PSRC) as project SEA-125, "Magnolia Bridge Replacement Study & Preliminary Engineering." Federal funding has been made available for planning, environmental documentation, and design. The 2003-2005 TIP was adopted by the U.S. Department of Transportation on January 9, 2003.

## **Legislation**

The adopted 2003-2008 Capital Improvement Program (CIP) of the City of Seattle includes about \$9 million over the 2002 to 2005 period for the Magnolia Bridge Replacement Project (CIP identification number TC366060).