Discipline Report

Public Services and Utilities

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Draft EIS

Magnolia Bridge Replacement

City of Seattle

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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. The bridge provides an important link to the Magnolia community in Seattle (see Figure 1and Figure 2). Because the existing bridge provides the only public vehicular access to the land between North Bay, also referred to as Terminal 91, Smith Cove Park, Elliott Bay Marina, and U.S. Navy property, the project purpose also includes maintenance of access to these areas.

Need

Structural Deficiencies

The City of Seattle has identified the Magnolia Bridge as an important bridge that should remain standing following a "design" seismic event (an earthquake with a peak ground acceleration of 0.3g that is anticipated to happen every 475 years and may measure 7.5 on the Richter scale). Even with the repairs completed following the February 2001 earthquake, the existing bridge is susceptible to severe damage and collapse from an earthquake that is less severe than the "design" 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 bridge columns and bracing, the construction of six additional supports, and a retaining wall north of the bridge to stabilize the bluff from further landslides. Repairs after the 2001 earthquake included replacement of column bracing at 27 of the 81 bridge supports. A partial seismic retrofit of the single-span bridge structure over 15th Avenue West was completed in 2001. The other spans were not upgraded.

Inspections of the bridge conclude that the concrete structure is showing signs of deterioration. The concrete is cracking and spalling at many locations, apparently related to corrosion of the reinforcing steel. The bridge requires constant maintenance in order to maintain its load capacity, but there does not appear to be any immediate load capacity problem. The existing foundations have insufficient capacity to handle the lateral load and uplift forces that would be generated by a "design" seismic event. The existing foundations do not extend below the soils that could liquefy during a "design" seismic event. If the soils were to liquefy, the foundations would lose their vertical-load-carrying ability and the structure would collapse.

System Linkage

There are three roadway connections from the Magnolia community, with more than 20,000 residents, to the rest of Seattle. As the southernmost of the three connections, the Magnolia Bridge is the most direct route for much of south and west Magnolia to downtown Seattle and the regional freeway system.

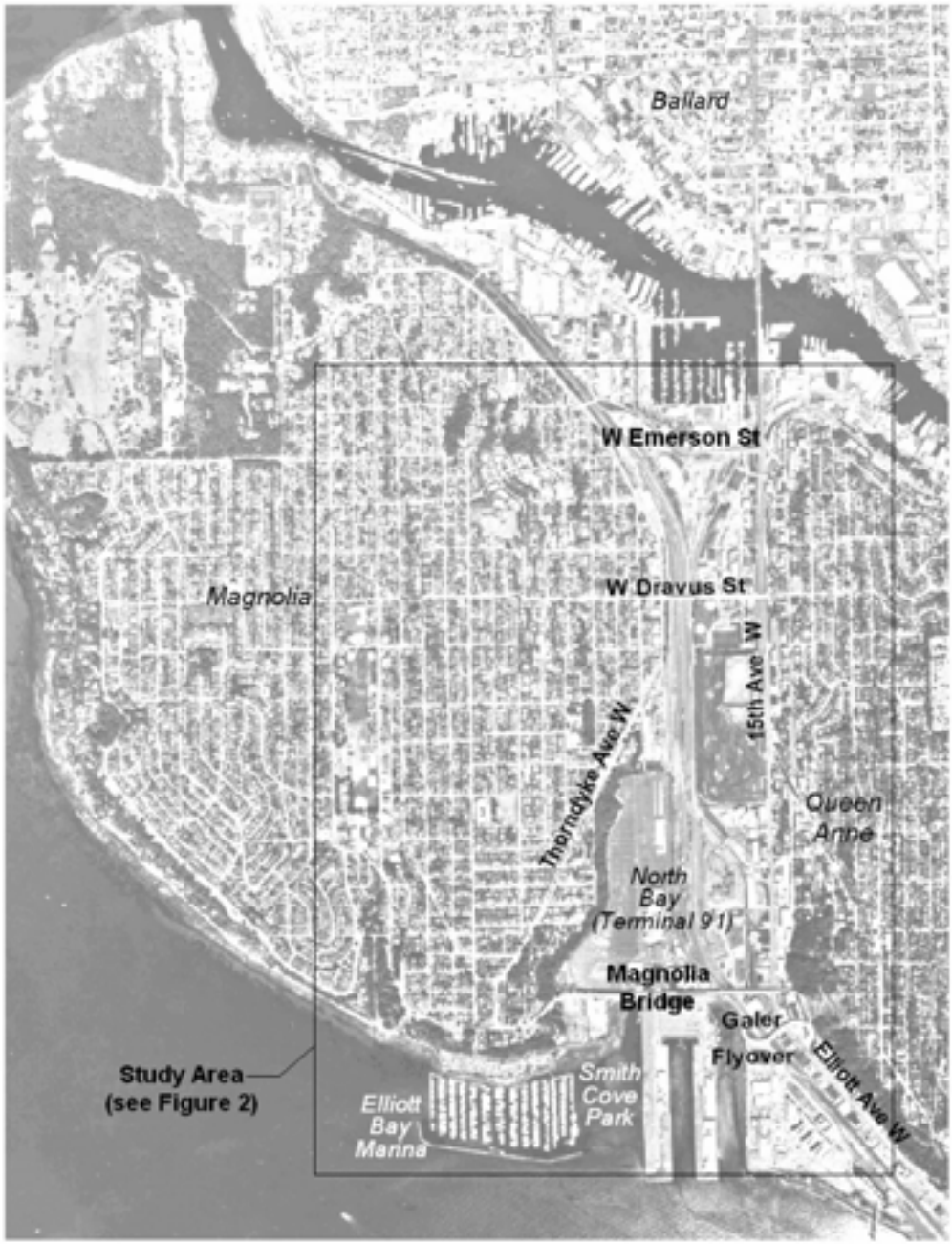


Figure 1
Vicinity Map

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

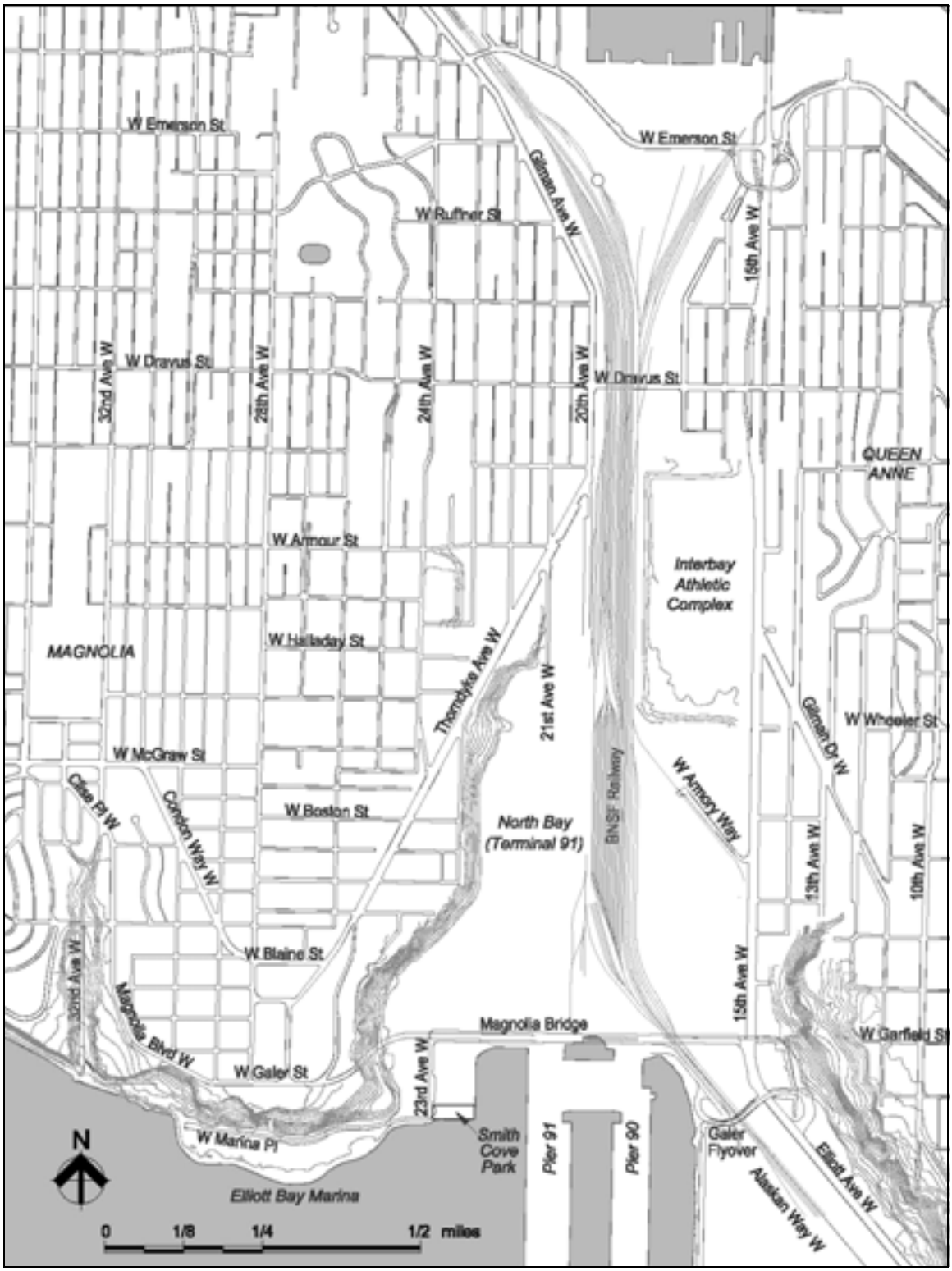


Figure 2
Study Area

Traffic Capacity

The three Magnolia community connections to the 15th Avenue West corridor are adequate for the present volume of traffic. Each of the three connections carries 30 to 35 percent of the 60,100 daily vehicle trips (2001 counts) in and out of the Magnolia community. Loss of the use of the Magnolia Bridge for several months after the February 2001 earthquake, and in 1997 following the landslide at the west end of the bridge, resulted in lengthy 15- to 30-minute delays and increased trip lengths for many of the users of the Magnolia Bridge. These users were required to use one of the two remaining bridges at West Dravus Street and West Emerson Street. Travel patterns in the Magnolia community changed substantially resulting in negative impacts on local neighborhood streets. 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. Losing the use of any one of these three bridges would result in redirected traffic volumes that would overwhelm the capacity of the remaining two bridges.

Modal Interrelationships

The Magnolia Bridge carries three of the four local transit routes serving Magnolia and downtown Seattle destinations. The topography of the east side of Magnolia, East Hill, would make access to the 15th Avenue West corridor via the West Dravus Street Bridge a circuitous route for transit. Use of the West Emerson Street connection to 15th Avenue West would add significant distance and travel time for most trips between Magnolia and downtown Seattle.

The Magnolia Bridge has pedestrian facilities connecting the Magnolia neighborhood to Smith Cove Park and Elliott Bay Marina as well as to 15th Avenue West/Elliott Avenue West. These facilities need to be maintained. 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 the BNSF rail yard, but there are no direct connections to the bridge.

Bicycle facilities on Magnolia Bridge need to be maintained or improved. Even with the steep (about 6.3 percent) grade, bicyclists use the Magnolia Bridge in both directions. There are no bike lanes on the bridge, so cyclists use the traffic lanes and sidewalks. Once cyclists 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 Galer Flyover.

Transportation Demand

The existing Magnolia Bridge provides automobile access for Port of Seattle North Bay (Terminal 91) to and from Elliott Avenue West/15th Avenue West. Truck access between Terminal 91 and Elliott Avenue West/15th Avenue West is accommodated via the Galer Flyover. Future planned expansion of the Amgen facility on Alaskan Way West and redevelopment of underutilized portions of North Bay and other areas of Interbay will increase demand for traffic access to the Elliott Avenue West/15th Avenue West corridor. The Port of Seattle has a master planning process under way (July 2003) for its North Bay (Terminal 91) property and the Washington National Guard property east of the BNSF Railway between West Garfield Street and West Armory Way. This area contains 82 acres available for redevelopment. There are also 20 or more acres of private property available for

redevelopment east of the BNSF Railway between West Wheeler Street and West Armory Way. Redevelopment of the North Bay property will include public surface streets with connections to the replacement for the Magnolia Bridge. Forecasts of future (year 2030) traffic demand indicate that the access provided by the Galer Flyover and West Dravus Street would be inadequate. The capacity provided by the existing Magnolia Bridge or its replacement would also be needed.

Legislation

Seattle Ordinance 120957, passed in October 2002, requires that the Magnolia Bridge Replacement Study: (1) identify possible additional surface roads from Magnolia to the waterfront (avoiding 15th Avenue West and the railroad tracks); (2) obtain community input on the proposed roads; and (3) identify the cost for such roads and include it in the total cost developed in the Magnolia Bridge Replacement Study.

An alignment study process was implemented to help identify the specific bridge replacement alternatives to be studied in the EIS. Twenty-five concepts were developed and screened against the project goals and objectives. This resulted in nine alignment alternatives, identified as A through I, that merited further analysis. These nine went through an extensive public review and comment process as well as project screening criteria and prioritization. Initially, the top four priority alternatives, A, B, D, and H, were identified to be studied in the EIS. Early on, Alternative B was eliminated because it became clear that it violated City shoreline policies and Federal Section 4(f) criteria. Upon detailed traffic analysis, Alternative H was eliminated because two key intersections were predicted to function at a level of service F and could not be mitigated. The next priority, Alternative C, was then carried forward for analysis in the EIS.

Independent of this project, a new north-south surface street will be constructed on Port of Seattle property connecting 21st Avenue West at the north end of North Bay with 23rd Avenue West near Smith Cove Park. In addition, a southbound ramp will be added to the Galer Flyover to accommodate eastbound to southbound Elliott Avenue West traffic movements. The Galer Flyover ramp has been identified as a needed improvement for expected future development of property west of the railroad tracks. Locations for new surface streets through the Port of Seattle property will be determined through the Port's master planning process for the North Bay property. The north-south surface street and ramp are assumed to exist under any build alternative, but they are not part of this environmental process.

Typical cross sections and plans of the build and no build alternatives are located at the end of this section.

No Build Alternative

The No Build Alternative, shown in Figure 3 and Figure 5, would maintain the existing bridge structure in place with the existing connections at the east and west ends. Long-term strategies for maintaining the existing structure would be required for the No Build Alternative. To keep the existing bridge in service for over 10 years, the following would need to be accomplished:

- An in-depth inspection of the bridge would be required to determine needed repairs and a long-term maintenance program.
- Concrete repairs would be required. These repairs could include injection of epoxy grout into cracks, repair of spalled concrete, and replacement of deficient concrete and grout.
- Preservation measures to slow corrosion of the reinforcement would be required. These measures could include a cathodic protection system.
- Any structural elements that lack the capacity to carry a tractor-trailer truck with a 20-ton gross trailer weight would need to be identified, modeled, and strengthened.

Alternative A

Alternative A would replace the existing bridge with a new structure immediately south of the existing bridge as shown in Figure 4 and Figure 6. The alternative would construct a signalized, elevated intersection (Alternative A – Intersection) in the bridge's mid-span to provide access to the waterfront and the Port of Seattle North Bay property from both the east and west. Connections at the east and west ends of the bridge would be similar to the existing bridge.

An optional half-diamond interchange (Figure 7, Alternative A – Ramps) could be constructed in lieu of the elevated intersection to provide access to the waterfront and the Port of Seattle North Bay property to and from the east only.

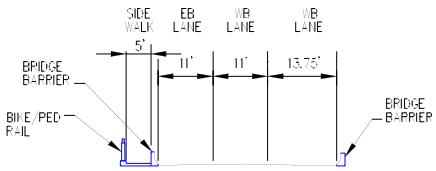
Alternative C

Alternative C would provide 2,200 feet of surface roadway within the Port of Seattle North Bay property between two structures as shown in Figure 4 and Figure 8. The alternative alignment would descend from Magnolia Bluff on a structure running along the toe of the slope. The alignment would reach the surface while next to the bluff before turning east to an intersection with the north-south surface street. The alignment would continue east from the intersection, turning south along the west side of the BNSF rail yard. The alignment would rise on fill and structure, turning east to cross the railroad tracks and connect to 15th Avenue West.

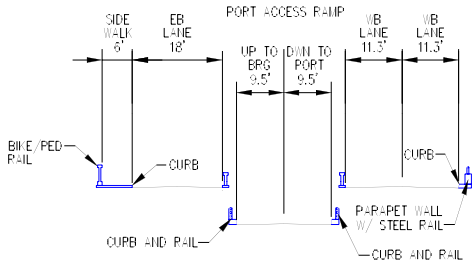
Alternative D

Alternative D would construct a new bridge in the form of a long arc north of the existing bridge as shown in Figure 4 and Figure 9. Connections at the east and west ends of the bridge would be similar to the existing bridge. This alternative would construct a signalized, elevated intersection (Alternative D – Intersection) in the bridge's mid-span to provide access to the waterfront and Port of Seattle North Bay property from both the east and west.

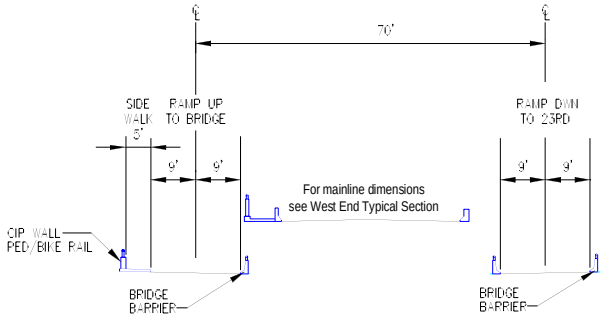
An optional half-diamond interchange (Figure 10, Alternative D – Ramps) could be constructed in lieu of the elevated intersection to provide access to the waterfront and the Port of Seattle North Bay property to and from the east only.



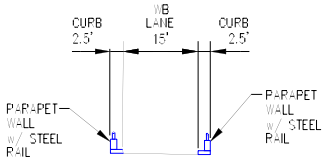
Bridge West End



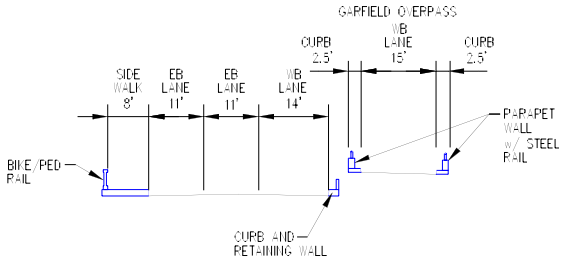
Ramp to Port Access



Ramps to 23rd Avenue West



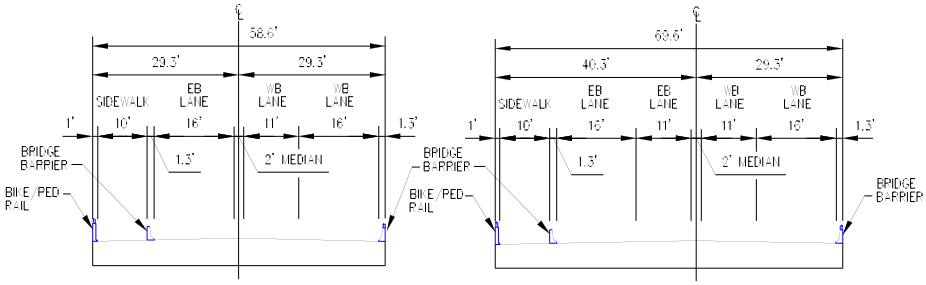
Garfield Overpass



15th Avenue West Connection
Eastbound Off-Ramp
Westbound On-Ramp

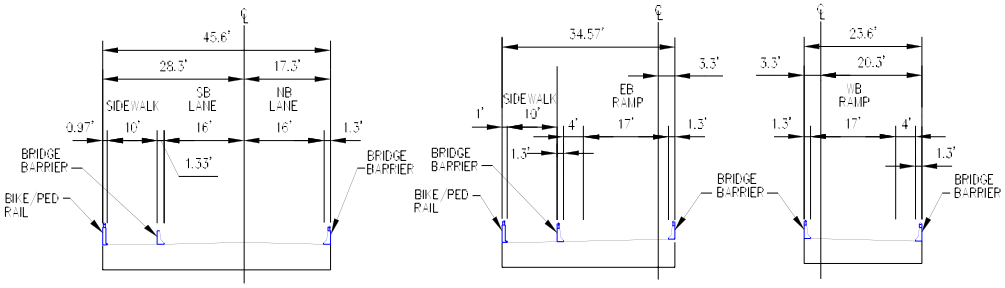
NOTE:
Dimensions are approximate and obtained from construction plans and aerial photographs. The information shown has not been field verified.

Figure 3
Typical Sections – No Build Alternative



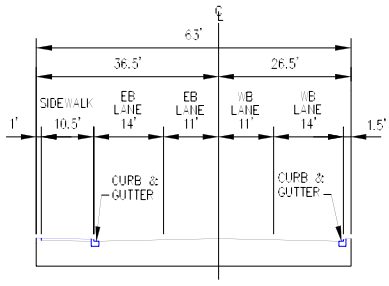
West End East End

Typical Bridge Structure

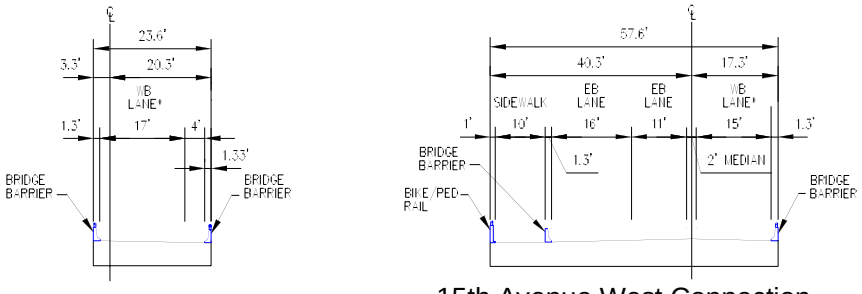


T-Ramp On-Ramp Off-Ramp

Typical A & D Intersection Option Typical A & D Ramp Option



Typical Alternative C Surface Road



Garfield Overpass

* 15' Alternative C
19' Alternative D

15th Avenue West Connection

Eastbound Off-Ramp
Westbound On-Ramp

* 16' Alternative D

Figure 4
Typical Sections – Build Alternatives

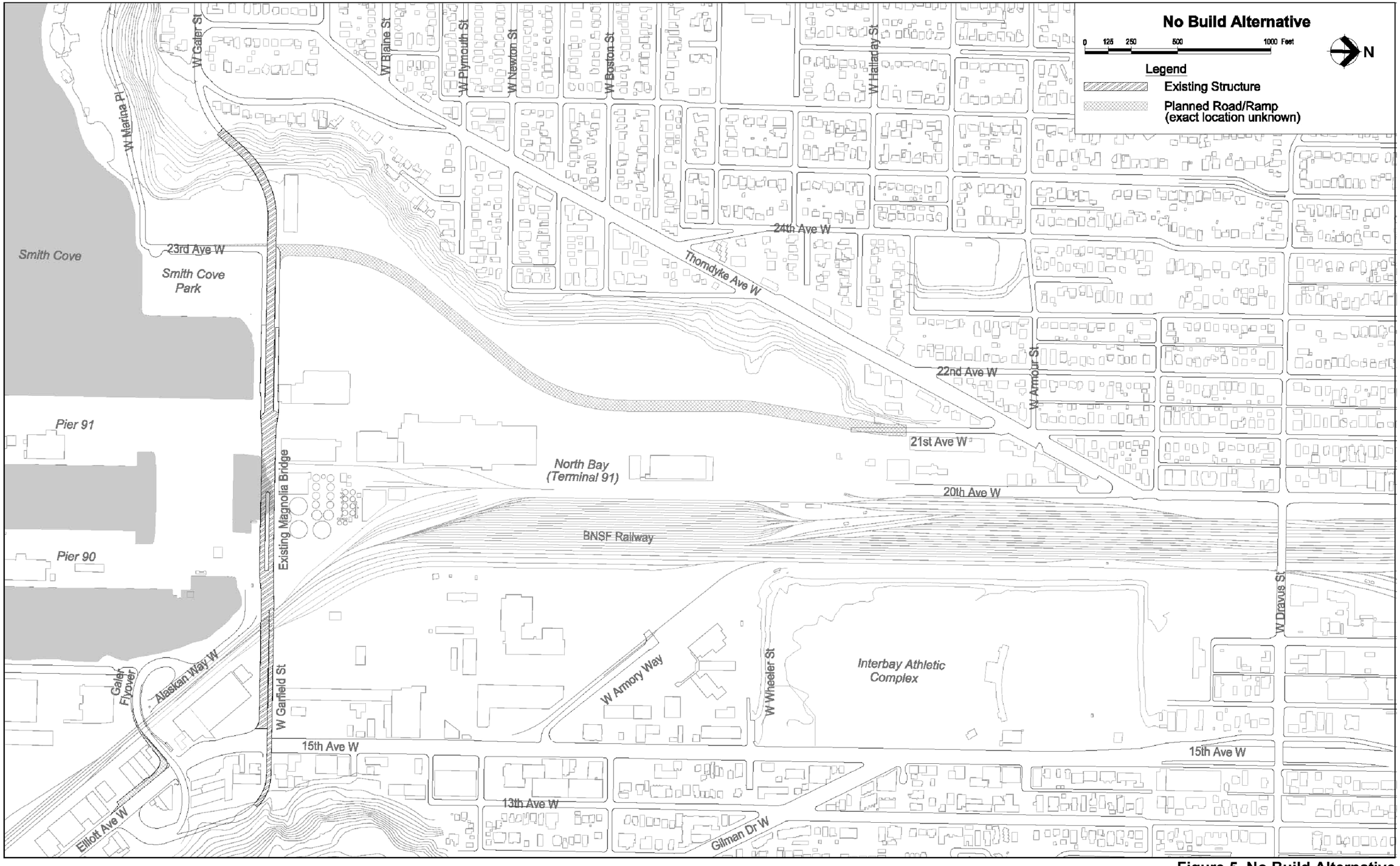


Figure 5 No Build Alternative

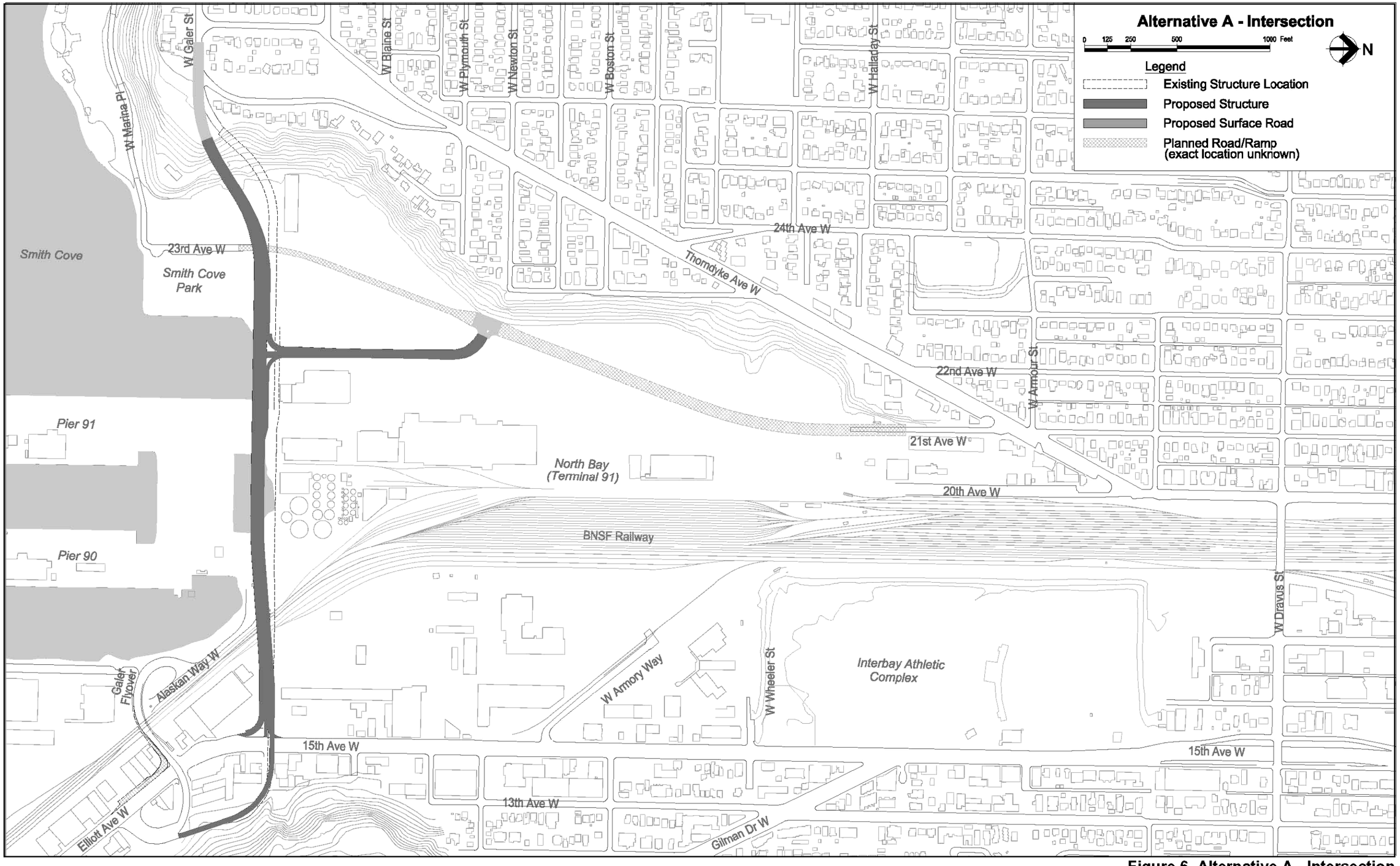


Figure 6 Alternative A - Intersection

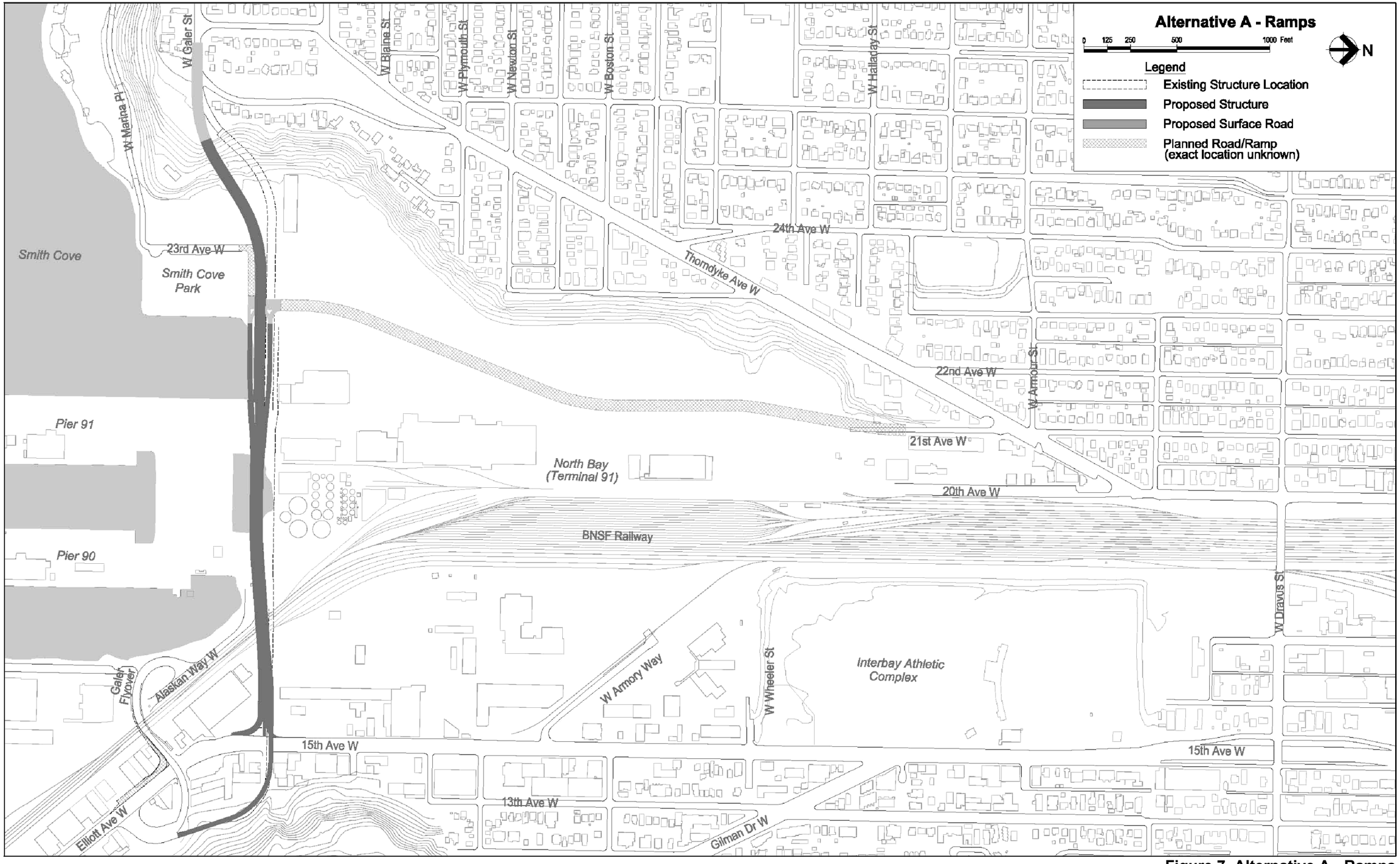


Figure 7 Alternative A - Ramps

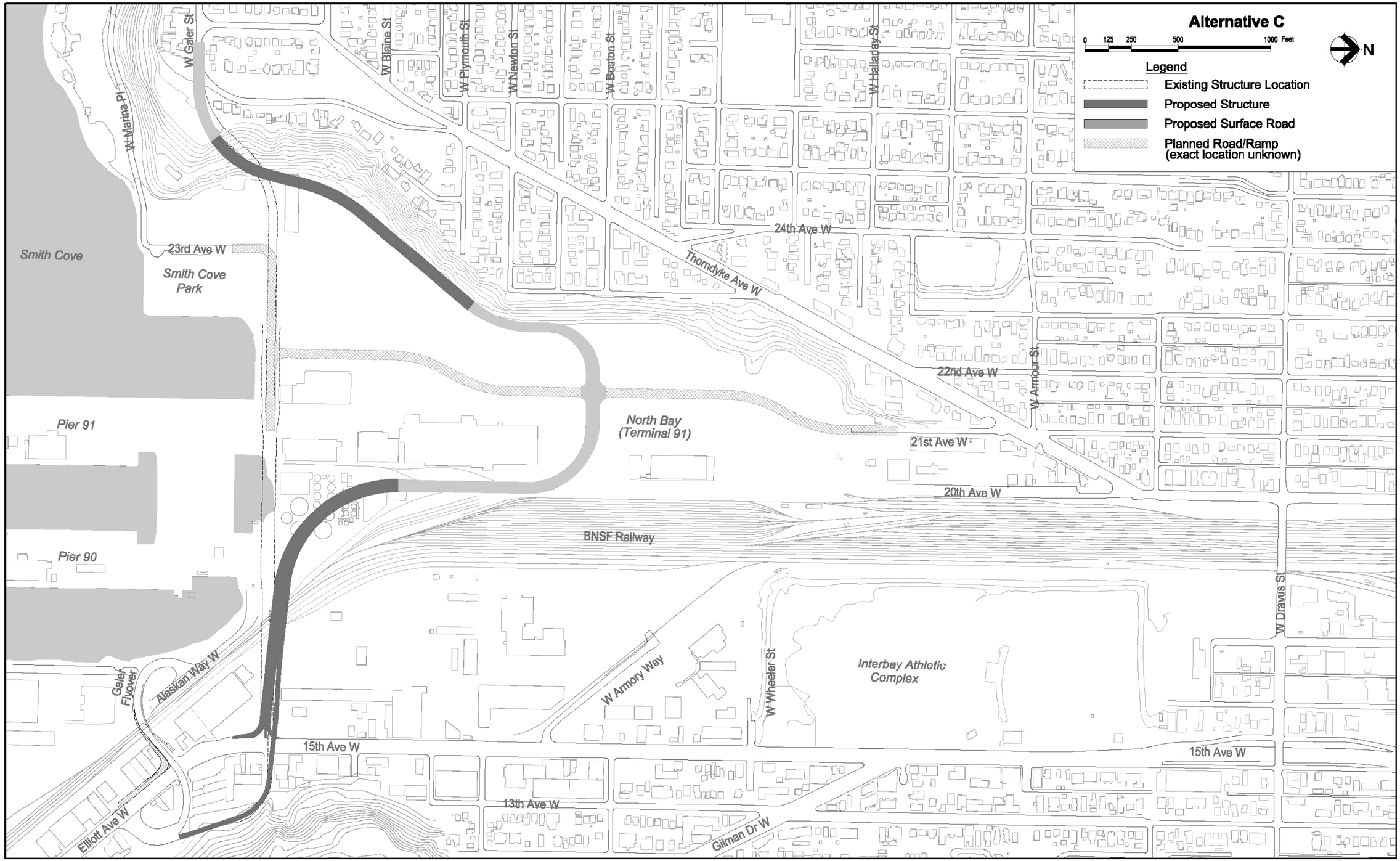


Figure 8 Alternative C

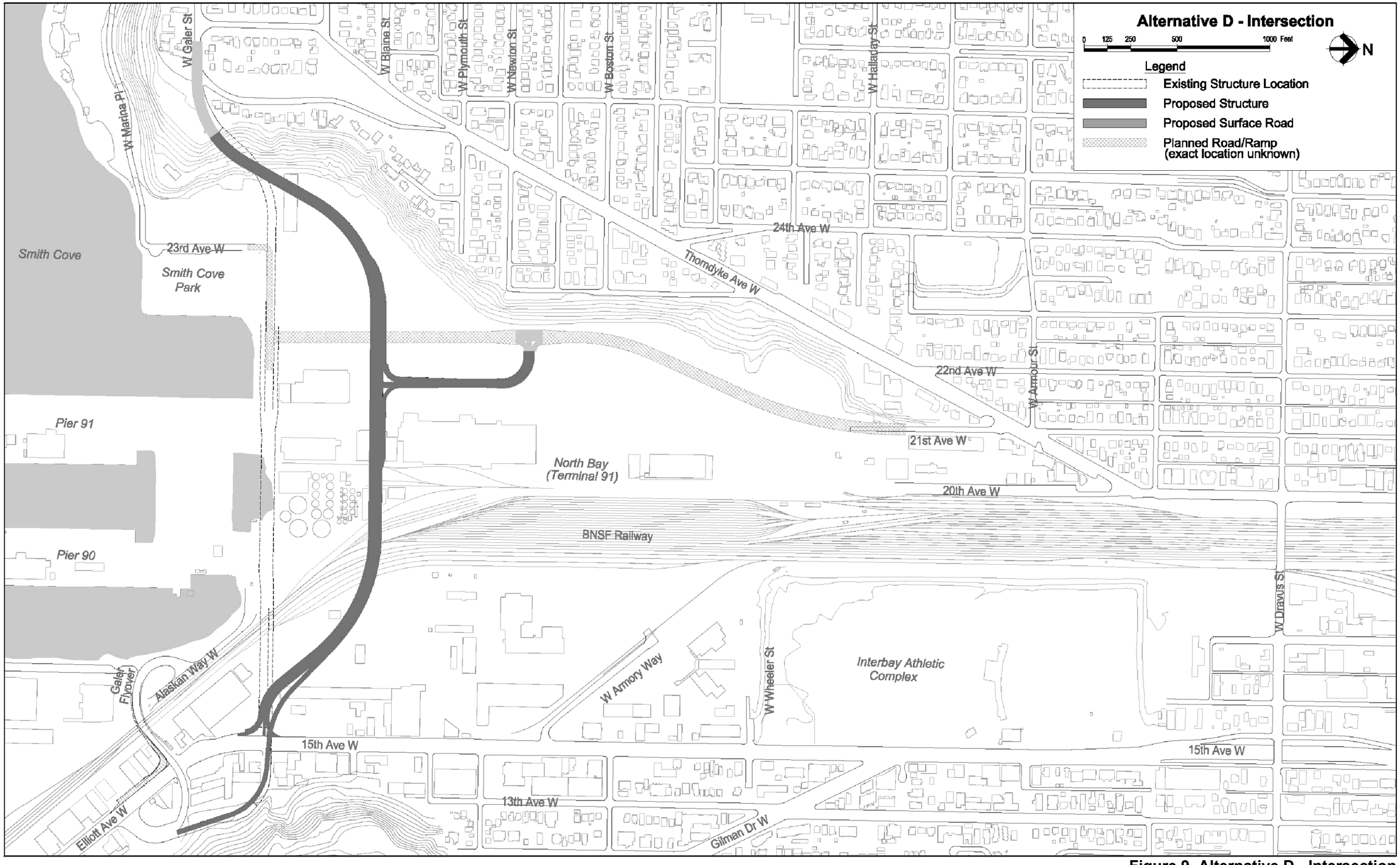


Figure 9 Alternative D - Intersection

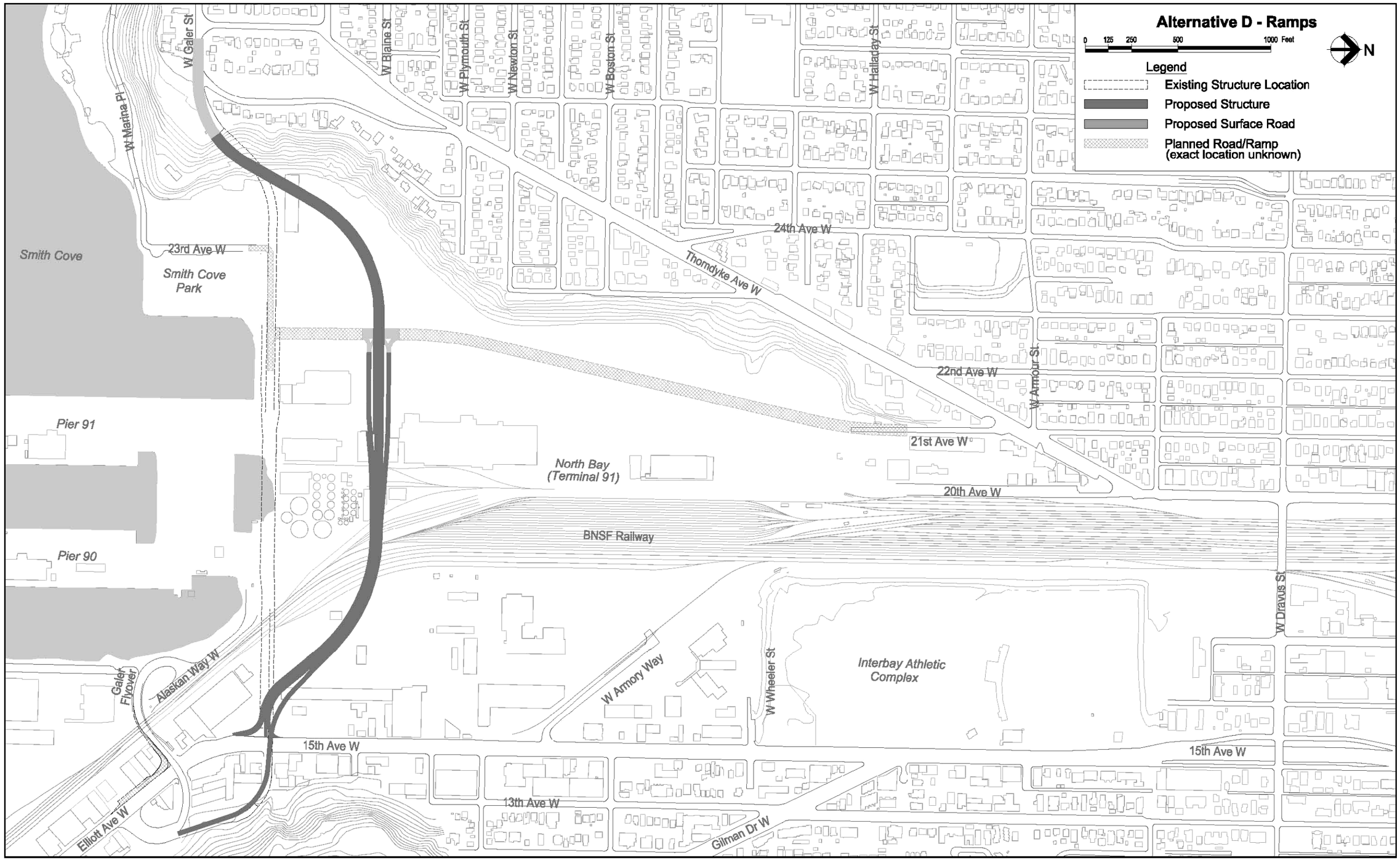


Figure 10 Alternative D - Ramps

Methods

This public services and utilities discipline report has been prepared consistent with the guidelines contained in Section 470 of the Washington State Department of Transportation (WSDOT) *Environmental Procedures Manual* (WSDOT 2003).

Public services analyzed in this report include police, fire and emergency medical services, and schools. For purposes of this analysis, the study area includes the portion of the City of Seattle that encompasses the Magnolia, Interbay, and Queen Anne neighborhoods and focuses on the local precincts, stations, and schools that serve those areas.

Field investigations were completed and service provider Web sites were reviewed to identify the locations of public facilities, current staffing levels, and service area boundaries. Representatives of the Seattle Police Department, Seattle Fire Department, Seattle Public Schools, and local private schools were contacted and given descriptions of the alternatives to solicit input for identifying potential impacts on public services and appropriate mitigation, if applicable. These representatives were also interviewed to receive current information regarding service issues in the study area and planned facility or service improvements.

Site utilities include publicly owned and Port of Seattle-owned water, stormwater sanitary sewer, natural gas, electricity, telecommunications lines, and garbage and recycling services. The utilities section identifies the applicable service providers that were contacted for maps of utility lines and to identify key areas of concern associated with the project. The utility networks are described and illustrated to the extent that location information was made available. The project strategy is first to avoid impact on major utility lines through strategic bridge foundation design and location, and second to relocate unavoidably affected utility lines with minimal service interruptions.

Public Services

This section describes existing services and facilities in the study area for police, fire and emergency medical services, and schools.

Police

The Seattle Police Department (SPD) provides public safety protection to businesses and residents within the City of Seattle. In 2003, 1,772 personnel, including 1,241 sworn officers, staffed the SPD (Seattle Police Department 2003). The City is divided into four precincts—the North, East, West, and South. The City's West Precinct provides police protection in the study area, which includes the Magnolia, Interbay, and Queen Anne neighborhoods. Overall, the West Precinct serves a population of 70,000 people and covers approximately 12 square miles. It is bordered by Puget Sound on the west and Lake Washington on the east and includes the area south of South Atlantic Street to the southern city limits. The precinct headquarters is located at 810 Virginia Street in downtown Seattle.

The West Precinct provides 24-hour patrols and a full range of emergency-response and public safety services to prevent crime and enforce the law. The study area is part of the West Precinct's "Queen" sector, which is divided into four "beats" (i.e., geographic areas that a police squad is assigned to patrol). The Queen 1 and Queen 2 beats cover all of the Magnolia and Interbay geographic area. Queen 1 and Queen 2 are separated approximately by east-west running West Dravus Street and bordered on the east by 15th Avenue West. In general, one officer is assigned to each beat, and a two-officer "umbrella" car canvasses the entire sector (Bray, pers. comm., 2003).

Each year, the SPD publishes an annual report that summarizes activities of the department and the year's crime statistics. The crime statistics are categorized into two classes—Part I and Part II. Part I offenses are the serious crimes reported to the Federal Bureau of Investigation (FBI). They include murder and negligent homicide, rape, robbery, aggravated assault, residential burglary, non-residential burglaries, theft, auto theft, and arson. In 2003, the latest full year for which statistics are available, officers in the West Precinct responded to 13,316 calls for service for Part I crimes, of which approximately 1,043 calls were categorized as "violent crimes." There were 2,584 Part I crimes reported in the Queen sector (Seattle Police Department 2003).

The City reports the citywide crime statistics by census tract. The study area is located within Census Tracts 56, 57, 58.01, 58.02, 59, and 69. Table 1 summarizes Part I crimes for 2003 in these census tracts.

Table 1
2003 Part I Crimes
Census Tracts 56, 57, 58.01, 58.02, 59, and 69

Type of Crime	Number of Incidents	Percentage of Total
Murder/Negligent Homicide	0	0.0%
Rape	4	0.29%
Robbery	14	1.00%
Aggravated Assault	28	2.00%
Residential Burglary	226	16.13%
Non-Residential Burglary	58	4.14%
Theft	796	56.81%
Auto Theft	267	19.06%
Arson	8	0.57%
Total	1,401	100.00%

Source: Seattle Police Department 2003.

The majority of Part I crimes in the study area in 2003 involved theft, auto theft, and residential burglary. The next most common Part I crime was non-residential burglary. The total of each of these crimes occurring in the study area's census tracts constitutes less than 5 percent of the total Part I crimes that occurred citywide in each category in 2003 (Seattle Police Department 2003).

In addition to SPD services, the Port of Seattle provides police services to its property in the study area.

Fire and Emergency Medical Services

The Seattle Fire Department (SFD) provides fire and emergency medical protection services in the City of Seattle. The City has 33 neighborhood fire stations scattered across the city. From these fire stations, the SFD deploys 33 engine companies, 11 ladder truck companies, 4 basic life support units, and 7 advance life support medic units. Each station provides fire protection and suppression services, emergency medical services, and salvage and rescue operations. The SFD headquarters is at Fire Station No. 10, located at 301 Second Avenue South. In 2003, the SFD maintained a staff of 1,003 uniformed personnel.

SFD services are centrally dispatched from the stations by a Fire Alarm Center that operates on a 24-hour schedule. The SFD also operates two fireboats on both saltwater (Chief Seattle) and freshwater (Alki). The boats provide fire suppression services, emergency medical services, and salvage and rescue operations (Seattle Fire Department 2003b).

Facilities Serving the Study Area

Table 2 shows staffing and locations for the emergency response facilities that provide direct service to the Magnolia, Interbay, and Queen Anne neighborhoods. Fire Station No. 41 in Magnolia houses one primary engine company (Engine 41) and a historic engine that is no longer in service. Station No. 20 in Queen Anne is one of the smallest stations in the SFD system and houses one engine (Engine 20). Station No. 8, also in Queen Anne, houses one engine company (Engine 8) and one ladder unit (Ladder 6). Station No. 18, located in Ballard, houses one engine company (Engine 18), one ladder unit (Ladder 8), one medic unit (Medic 18), one battalion chief (Battalion 4), and a spare ladder truck and hose wagon (Hose 18)

(Seattle Fire Department 2003a). Harborview Medical Center (HMC), located in downtown Seattle, also services the study area with two medic units (Medic 1 and Medic 10). The locations of these facilities are shown in Figure 11. (Note: Station No. 8 on Queen Anne Hill, Station No. 18 in Ballard, and HMC in downtown Seattle are not depicted in Figure 11.) Together, the personnel at each of these facilities provide emergency fire and medical services to the study area.

Table 2
Study Area Emergency Response Facilities

Station/Facility	Companies	Staff	Address
Station No. 8	Engine[1] 8 Ladder[2] 6	3 firefighters 4 firefighters	110 Lee Street (Queen Anne)
Station No. 18	Engine 18 Ladder 8 Battalion 4 Medic[3] 18 Hose 18 Spare Ladder Truck	3 firefighters 4 firefighters 1 battalion chief 2 paramedics	1521 NW Market Street (Ballard)
Station No. 20	Engine 20	4 firefighters	3205 13th Avenue West (Queen Anne)
Station No. 41	Engine 41	4 firefighters	2416 34th Avenue West (Magnolia)
Harborview Medical Center	Medic 1 Medic 10	2 paramedics 2 paramedics	325 9th Avenue (Downtown)

Sources: Seattle Fire Department 2003b; Fitzpatrick, pers. comm., 2003.

Notes:
[1] Engine Company - pump truck with related equipment and personnel.
[2] Ladder Company - ladder truck with related equipment and personnel.
[3] Medic Unit - medic vehicle and two emergency medical technicians.

Incident History and Response

The SFD keeps statistics on the its overall response rate as well as those for fire, Basic Life Support (BLS), and Advanced Life Support (ALS) services. Response rates are also reported for each of the department's companies (i.e., engine and ladder companies). The SFD tries to maintain an overall response rate of 4 to 6 minutes (Fitzpatrick, pers. comm., 2003). This is the amount of time that elapses between the Fire Alarm Center's dispatch of the first response engine and ladder companies and their arrival at the incident.

The SFD reports fire and emergency response statistics annually. In 2003, the department's average response time for fires, rescues, and hazardous material incidents was 4.33 minutes. The average response time for emergency medical services was 4.01 for ALS and 3.81 for BLS (Seattle Fire Department 2003a). Therefore, most incidences in the city are responded to within 3 to 4.5 minutes.

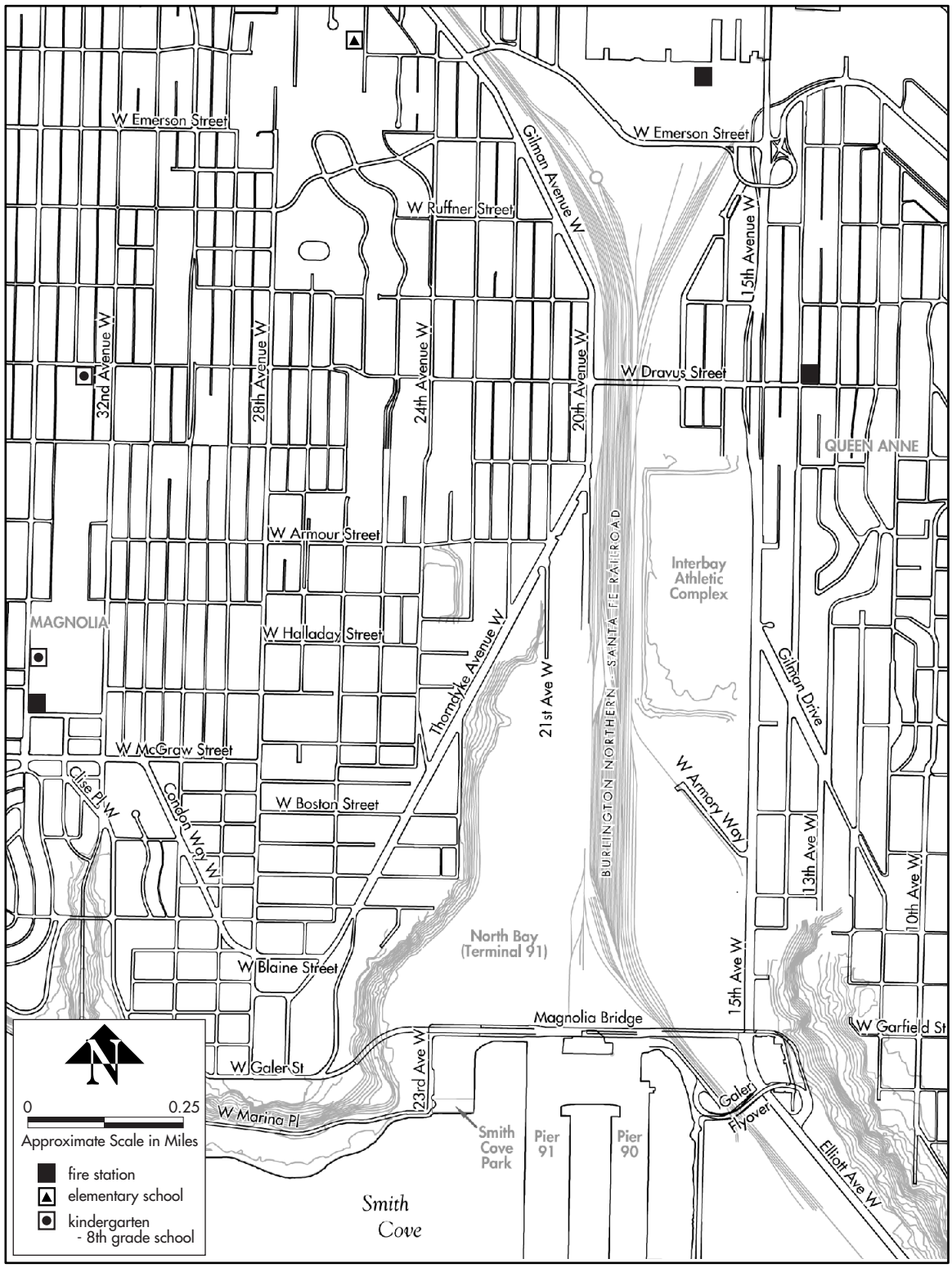


Figure 11
Public Facility Locations

Table 3 shows the total number of emergency responses by each of the companies in the four fire stations that directly serve the Magnolia, Interbay, and Queen Anne neighborhoods for 2000 through 2003. Emergency response totals for the two HMC medic units that service the study area are also shown. With the exception of Station No. 18, the total number of responses by each company did not vary significantly over the 2000-2003 period. The number of responses between 2000 and 2003 more than doubled for Engine 18, while the aid unit housed in Station No. 18 was permanently replaced with a medic unit in late 2001.

Table 3
Emergency Response Totals (2000-2003)
Facilities Serving Magnolia, Interbay, and Queen Anne

Station/Facility Company	Total Number of Responses			
	2000	2001	2002	2003
Station 8				
Engine 8	1,820	1,843	1,724	1,664
Ladder 6	713	628	625	602
Station 18				
Engine 18	1,029	1,268	2,212	2,210
Ladder 8	737	671	776	831
Aid 18[2]	2,053	1,861	N/A[1]	N/A[1]
Medic 18	N/A	497	2,889	2,714
Battalion 4	573	625	590	500
Station 20				
Engine 20	1,274	1,264	1,242	1,216
Station 41				
Engine 41	917	917	918	930
Harborview Medical Center				
Medic 1	4,887	4,705	4,275	4,348
Medic 10	4,800	4,605	4,205	4,296

Source: Seattle Fire Department 2003a.

Notes: [1] N/A = not available.
[2] The aid unit housed at Station 18 was permanently replaced with a medic unit in late 2001.

Average emergency response times for each of the companies residing in these facilities are shown in Table 4. Although the citywide overall response time goal is 4 to 6 minutes, Table 4 shows that not all of the individual company response times met this goal in 2003.

Table 4
Emergency Response Time (2003)
Facilities Serving Magnolia, Interbay, and Queen Anne

Station/Facility Company	Average Response Time (2003)			
	Runs[1]	BLS	Fire[2]	ALS
Station 8				
Engine 8	1,124	4.06	5.19	4.04
Ladder 6	259	4.85	5.94	4.71
Station 18				
Engine 18	1,582	3.65	4.46	3.76
Ladder 8	426	4.16	5.92	4.12
Medic 18	1,682	5.75	6.48	6.54
Battalion 4	123	4.84	6.56	5.61
Station 20				
Engine 20	795	4.32	5.44	4.58
Station 41				
Engine 41	520	4.59	5.47	4.95
Harborview Medical Center				
Medic 1	2,925	6.60	6.80	5.80
Medic 10	2,918	5.30	6.90	5.83

Source: Seattle Fire Department 2003a.

Notes: [1] Data represent the number of responses (runs) from which the Response Time Statistic is calculated, not the number of runs that the company made.
[2] "Fire" includes rescue and hazardous material responses.

Emergency Response Routes

Fire stations provide both primary (referred to as "first-in") and backup ("second-in," "third-in," and "fourth-in") services to any given service area. The responsibilities of the facilities that service different segments of the study area are shown in Table 5.

Table 5
Emergency Response Facilities
Service Area Responsibilities

Station/ Facility	Service	Responsibility	Service Area
Station No. 8	Engine 8	Third-In Fourth-In	Terminal 91 Smith Cove, W Dravus St., and 20th Ave. W, Magnolia
	Ladder 6	First-In Second-In	Terminal 91, Magnolia Smith Cove, W Dravus St., and 20th Ave. W
Station No. 18	Engine 18	Third-In	Magnolia, Smith Cove, W Dravus St., and 20th Ave. W
	Ladder 8	First-In Second-In	Smith Cove, W Dravus St., and 20th Ave. W Terminal 91, Magnolia
	Medic 18	First-In	Magnolia, Terminal 91, Smith Cove, W Dravus St., and 20th Ave. W
	Battalion 4	First-In	Terminal 91, Smith Cove, Magnolia, W Dravus St., and 20th Ave. W
Station No. 20	Engine 20	First-In Second-In	Terminal 91, Smith Cove, W Dravus St., and 20th Ave. W Magnolia
Station No. 41	Engine 41	First-In Second-In	Magnolia Terminal 91, Smith Cove, W Dravus St., and 20th Ave. W
Harborview Medical Center	Medic 1 and Medic 10	Second-In	Terminal 91, Smith Cove, Magnolia, W Dravus St., and 20th Ave. W

Source: HNTB Corporation and Mirai Associates 2003.

The three stations that provide first-in service to Magnolia from outside the immediate area (i.e., Station Nos. 8, 18, and 20) access this neighborhood via West Dravus Street. Stations that provide service to Smith Cove and North Bay/Terminal 91 use the Magnolia Bridge.

Future Plans

Over the past 15 years, the City has not significantly expanded or renovated any of its fire stations to keep current with modern seismic codes or facility design. The City's Fire Facilities and Emergency Response Levy, approved during the City of Seattle's November 2003 election, would fund work on fire stations throughout the city, turning them into modern, seismically secure facilities with expanded space for emergency response vehicles and equipment. Twelve stations would be replaced and 20 stations would be renovated or remodeled. The levy would also fund a number of emergency preparedness initiatives to protect citizens during earthquakes and other disasters.

In the study area, proposed improvements include renovating Station No. 41 and adding seismic bracing at Station No. 8 to meet current codes. Station No. 18 requires no seismic retrofits; its classification as a seismic and safety upgrade project relates to only proposed safety improvements and some modest remodeling. Renovating Station No. 20 has been determined to not be cost-effective because both the station and the site are too small to accommodate even the most basic functions. Therefore, the plan proposes to construct a new larger station at a new location. The City's siting decision will address operational and response requirements and be made in collaboration with members of the community served by Station No. 20. The existing structure will no longer serve as a fire station. The City intends to sell or transfer this property and use the proceeds to fund the acquisition of a new site (Seattle Fire Department 2003b).

Schools

Seattle Public Schools operates public schools in the study area. This school district enrolls children in a cluster of schools for elementary education based on the location of their residence. The district allows citywide enrollment for middle and high schools. Table 6 provides information about the cluster of elementary schools that serves the Magnolia, Interbay, and Queen Anne neighborhoods and about middle and high schools that are closest and most likely to serve residents of the study area. Table 6 also identifies private schools that operate in the study area. Figure 11 shows the locations of those schools within the immediate study area (i.e., Lawton Elementary, Catherine Blaine School, and Our Lady of Fatima).

Table 6
Study Area Schools and Enrollment

School	Grades	Enrollment (October 2003 Unless Otherwise Noted)	Address
Lawton Elementary	Kindergarten-5	287	4000 27th Avenue West
John Hay Elementary	Kindergarten-5	424	201 Garfield Street
Frantz H. Coe Elementary	Kindergarten-5	357	2424 7th Avenue West
Matheia School[1]	Kindergarten-5	31[2]	414-A West Howe Street
Catherine Blaine School	Kindergarten-8	512	2550 34th Avenue West
Our Lady of Fatima[1]	Kindergarten-8	295[3]	3301 West Dravus Street
Seattle Country Day School[1]	Kindergarten-8	305[4]	2619 Fourth Avenue North
St. Anne School[1]	Kindergarten-8	239[5]	101 West Lee Street
McClure Middle School	6-8	590	1915 1st Avenue West
The Center School	9-12	300	305 Harrison Street
Ballard High School	9-12	1,628	1418 NW 65th Street
Secondary Bilingual Orientation Center	6-12	290[6]	411 Boston Street

Sources: Seattle Public Schools 2004a, 2004b; Rand McNally 2003;Murray, pers. comm., 2004; Kellogg, pers. comm., 2003; Dang, pers. comm., 2003; and Bonney, pers. comm., 2004; Seattle Times School Guide 2004.

Notes:
[1] Private school.
[2] 2002-03 school year.
[3] 2003-04 school year.
[4] Estimate for 2004-05 school year.
[5] Estimate for 2004-05 school year; includes 20 half-day pre-kindergarten students.
[6] Estimate for Fall 2003 semester.

The Magnolia Bridge is lightly used for school bus service. Two bus routes transport elementary school students over the bridge from the Rainier Valley in southeast Seattle to the Catherine Blaine and Lawton schools in Magnolia. One bus route transports students from Magnolia to Garfield High School and Washington Middle School in southeast Seattle (Anderson, pers. comm., 2003).

Utilities

Utility Services

This section describes existing utility service providers and major infrastructure in the study area. Public utility services within the study area are numerous and fall under both city and county jurisdictions. They include water, sanitary sewer and stormwater drainage, wastewater treatment, natural gas, electricity,

telecommunications, and garbage and recycling services. Table 7 lists the local service providers for the identified utilities within the study area and is followed by a brief discussion of each provider. Existing utility service mains are generally located within the public right-of-way. Service is extended to customers through overhead, side/lateral, and branch connections. Many utility mains span the North Bay/Terminal 91 property in multiple locations.

Table 7
Local Utility Service Providers

Utility Service	Service Provider
Water Service	Seattle Public Utilities
Sanitary Sewer and Drainage Service	Seattle Public Utilities
Wastewater Treatment	King County
Natural Gas	Puget Sound Energy
Electricity	Seattle City Light
Telecommunications	Qwest
Garbage and Recycling	Seattle Public Utilities

Source: HNTB Corporation and Mirai Associates 2003.

Water Service

Water service within the study area is provided and maintained by Seattle Public Utilities (SPU). The municipal water utility was established in 1890, when the City of Seattle purchased the Spring Hill Water Company and the Union Water Company. Potable water is supplied to Seattle customers through the Cedar River Pipeline, South Fork Tolt River Pipeline, and from three wells in the Highline Well Field. These pipelines distribute water to mains that are generally located within the public right-of-way.

Storm and Sanitary Sewer Services

SPU is responsible for managing and maintaining drainage services, including stormwater drains and sanitary (wastewater) sewers and pump stations. Stormwater runoff and wastewater flows are transported within conveyance infrastructure such as storm drains, sewer mains, combined storm and sanitary sewer mains, and overflow systems. Conveyance systems may also use ditches, culverts, and creeks. SPU drainage services include operation, maintenance, and repair of storm and sanitary sewer infrastructure, construction of trunk lines and detention ponds for alleviation of flood and erosion problems, preservation and enhancement of creek habitat, and protection of surface water quality through regulated installation of water quality controls and by positive prevention efforts.

Wastewater Treatment

King County provides wastewater treatment service within the City of Seattle. King County currently operates and maintains three treatment plants: West Point Treatment Plant, South Treatment Plant, and Vashon Treatment Plant. A fourth treatment plant, Brightwater, is planned for construction. The County system includes 42 pump stations and 19 regulator stations. Combined sewer overflows (CSOs), or wastewater discharged during high volume periods, is also a component of the King County system. The South Magnolia CSO storage tank is among the

recommended improvements included in the Regional Wastewater Services Plan 2000-2030; this project is roughly scheduled for 2010.

Natural Gas

Puget Sound Energy (PSE) supplies natural gas to the study area. Natural gas is purchased in the summer and stored in underground reservoirs until it is distributed during the winter. PSE is owned by investors and regulated by the State of Washington Utilities and Transportation Commission. PSE is responsible for extension of natural gas lines and connections of new permanent service lines. Construction and engineering services for natural gas improvements are provided under a contractual agreement with Potelco, Inc. and Pilchuck Contractors, Inc.

Electricity

Seattle City Light (SCL) has been providing electricity to local residences and business, and to public streets since 1910. SCL is a non-profit public utility that is owned by Seattle citizens and is governed by the City. SCL services include installation and/or relocation of electrical infrastructure, temporary connections or disconnections, and electrical equipment repair. SCL also provides technical information regarding electrical services and establishes programs for the conservation of electricity.

Telecommunications

Telecommunications services encompasses both voice and data networks, such as telephone, DSL (digital subscriber line), internet, wireless, long distance, and directory services. Qwest provides these services to 14 western states including Washington State. Qwest is responsible for installation, repair, and improvement of telecommunications infrastructure.

Garbage and Recycling

SPU operates and maintains garbage and recycling services for residential customers. Since 2001, SPU has operated under contractual arrangements with Rabanco Companies and Waste Management for the provision of commercial garbage collection. Rabanco Companies is known as Emerald City Disposal and Recycling. Rabanco Companies serves businesses within the study area. Private companies, hired at the expense of the business owner, provide commercial recycling services.

Major Utility Infrastructure

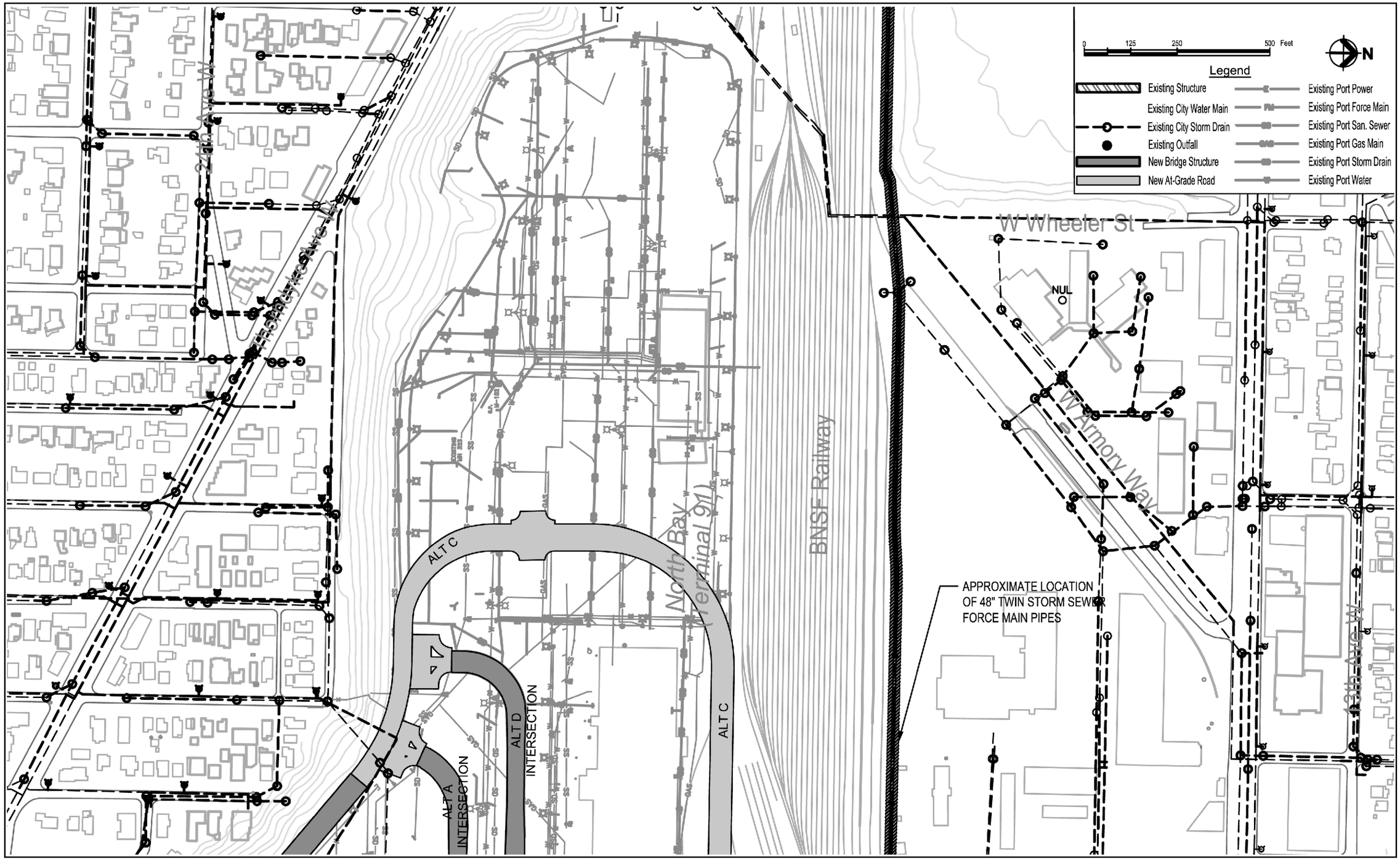
Figures 12 and 13 depict the existing utilities (public and private) within the study area based on information made available by the utility purveyors. The figures highlight the locations of major utility infrastructure within the study area, which includes the following:

- Twin 48-inch and 96-inch King County sanitary sewer force mains, which run both north-south and east-west across the Terminal 91 property (Figures 12 and 13);
- King County lift station located on Alaskan Way West;

- City of Seattle CSO line situated on the east and west sides of Terminal 91; and
- The gas line corridor that runs through Terminal 91.

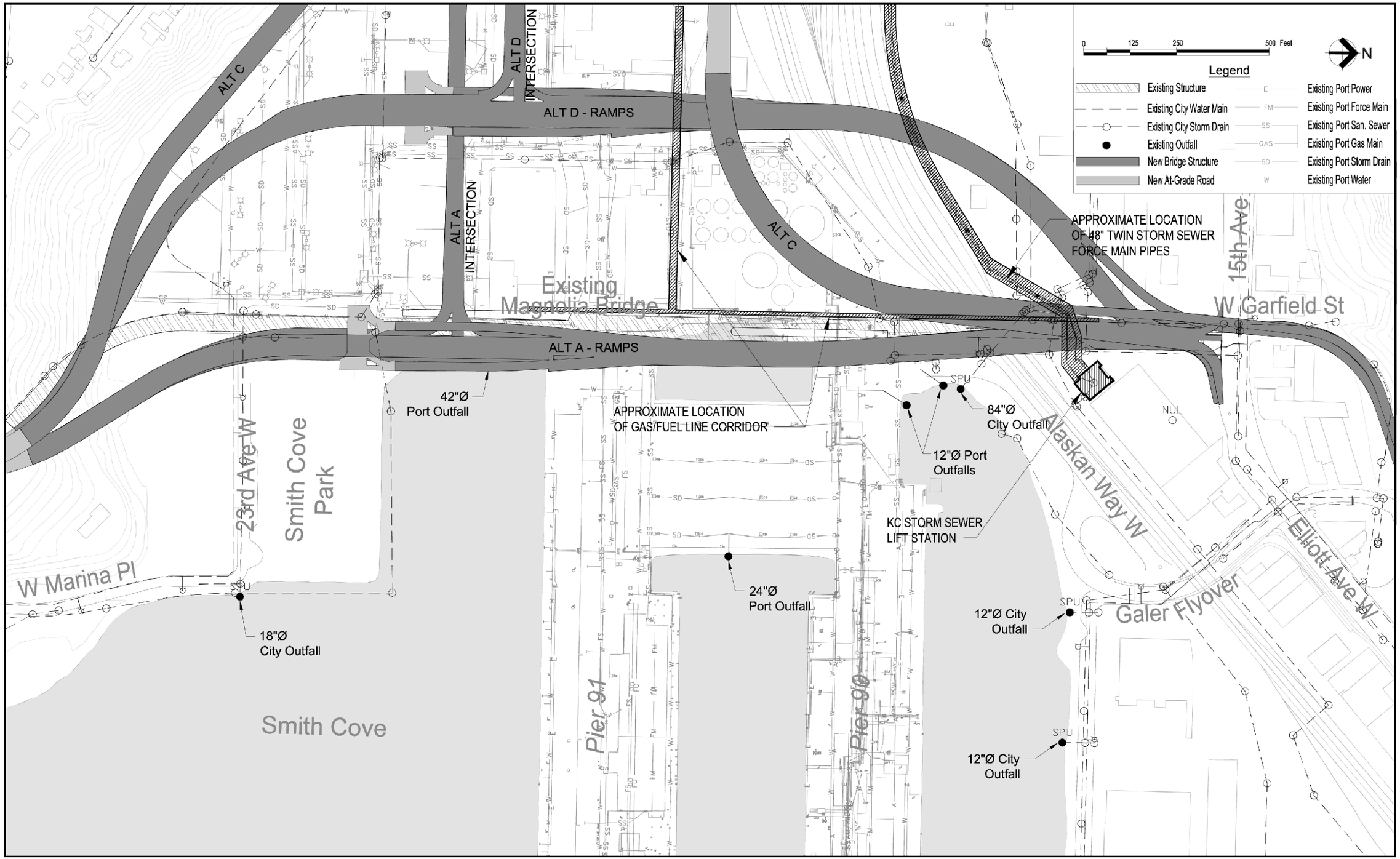
For security reasons, power facilities are not depicted in the figures. Power facilities (both overhead and underground) are prevalent in the study area, primarily along the 15th Avenue West corridor (overhead transmission) and within the existing Magnolia Bridge corridor and Port property (overhead and underground facilities).

Port of Seattle utility lines are interspersed throughout the North Bay/Terminal 91 complex and are known to vary in terms of their age and functioning condition. For example, existing Terminal 91 sanitary sewer mains are reported to be in "severe distress" and would require evaluation prior to undertaking potential relocation (Birr, pers. comm., 2003). Public utility main lines are generally housed within existing right-of-way. Service is extended to individual property owners and to Port tenants through smaller side/lateral and branch connections.



NOTE: Locations of existing utilities are based on available data and are approximate. Not all utilities are shown.

Figure 12 North Study Area



NOTE: Locations of existing utilities are based on available data and are approximate. Not all utilities are shown.

Figure 13 South Study Area

Studies

To identify public service activity in the study area, the following were reviewed: enrollment and locations for local Seattle Public Schools, Seattle Police Department crime statistics, and Seattle Fire Department calls for service and response times.

To identify the location of existing utilities, GIS maps provided by Seattle Public Utilities, as-built drawings and engineering plans for North/Bay Terminal 91 provided by the Port of Seattle, and other applicable utility maps of the study area were reviewed. Other sources of utility information included service provider Web sites, including those of King County, Puget Sound Energy, Seattle City Light, Seattle Public Utilities, and Qwest.

Coordination

Representatives from local public service and utility providers were interviewed to gather information about public service and utilities activity in the study area and to receive input regarding potential impacts from the alternatives. Representatives contacted include the following:

- Seattle Fire Department
- Seattle Police Department
- Various public and private schools
- Seattle City Light

Maps that generally describe the local utility systems were available with the exception of overhead and underground power lines, which would be affected by all of the Build Alternatives. SCL represents the most affected utility. A representative from SCL was interviewed on January 8, 2004 regarding SCL's priority concerns and upcoming projects that may create potential conflicts with the proposed alternatives.

Major Assumptions

Because the project alternatives would not create additional traffic capacity, this analysis assumes that the alternatives would not induce population or housing growth in the study area and would not create additional demand for public services and utilities. The study area is expected to grow at approximately 1 percent per year as allowed by current City of Seattle land use plans and zoning. The same amount of growth would occur under the No Build Alternative and the Build Alternatives. This report, therefore, focuses on the impact of bridge construction for each alternative on the various public services. For example, specific major utility infrastructure and utility customers that may be affected are identified. Measures taken to mitigate the impacts are also discussed. For example, relocation of utility service lines associated with this project would be coordinated with the appropriate service providers and with any planned upcoming utility projects.

No Build Alternative

Public Services

Under the No Build Alternative, the existing bridge would not be replaced and would not be retrofitted to modern earthquake-resistant standards. The bridge would be more likely to be damaged and unusable after a major earthquake than under the Build Alternatives. The No Build Alternative would, therefore, be more likely to cause delays for police and fire/emergency medical access to Magnolia than the other alternatives. This alternative would also be more likely to cause rerouting of school buses.

Utilities

Under the No Build Alternative, adverse impacts on utility services may include collateral damage to:

- Electrical power supply to Pier 91;
- Interbay pump station;
- Port switchgear (located under the existing viaduct); and
- Area lighting.

Alternative A

Public Services

Alternative A would not create additional traffic capacity for access to Magnolia and would not induce population or housing growth in the study area. No additional demand for public services would occur under Alternative A compared to the No Build Alternative.

When in operation, Alternative A would provide similar access and maintain the same travel patterns as provided by the existing bridge. Emergency vehicle access and bus routes would not be affected. The T-intersection option with traffic signal is not expected to cause emergency vehicle delays because emergency vehicles can bypass the signal when necessary. However, if intelligent traffic signal controls were implemented on the new bridge, this system would preclude the need for emergency vehicles to bypass the signal.

Utilities

The Magnolia Bridge Replacement Project proposes to replace the existing, deteriorated bridge with a new bridge at its same traffic capacity. Replacing the bridge would not create additional demand for utility service within the study area. Operation of the bridge in its new configuration under Alternative A would likely result in permanent relocation of utility infrastructure; these relocation impacts are described below under “Construction Impacts.”

Alternative C

Public Services

Operational impacts on public services under Alternative C would be similar to those described under Alternative A. This alternative maintains traffic capacity and would not induce growth or increase demand for public services. Access to and from Magnolia and traffic patterns would be similar to existing conditions. Travel times for emergency vehicles and school buses would be incrementally longer because the proposed elevated structure and surface street curve farther to the north under Alternative C. This effect, however, is not expected to be substantial.

Utilities

Operational impacts on utilities under Alternative C would be the same as those described under Alternative A. This alternative maintains current traffic capacity and would not induce growth or increase demand for utilities.

Alternative D

Public Services

Operational impacts on public services under Alternative D would be similar to those described under Alternative A. This alternative maintains traffic capacity and would not induce growth or increase demand for public services. Access to and from Magnolia and traffic patterns would be similar to existing conditions. Travel times for emergency vehicles and school buses would be incrementally longer because the bridge curves to the north under Alternative D. This effect, however, is not expected to be substantial. As with Alternative A, the T-intersection option with traffic signal is not expected to cause emergency vehicle delays because emergency vehicles can bypass the signal when necessary. However, if intelligent traffic signal controls were implemented on the new bridge, this system would preclude the need for emergency vehicles to bypass the signal.

Utilities

Operational impacts on utilities under Alternative D would be the same as those described under Alternative A. This alternative maintains current traffic capacity and would not induce growth or increase demand for utilities.

No Build Alternative

No operational impacts would occur under the No Build Alternative, and no mitigation measures are proposed.

Alternative A

No permanent operational impacts on public services and utilities are anticipated to occur; therefore, no mitigation measures related to Alternative A are proposed.

Alternative C

No permanent operational impacts on public services and utilities are anticipated to occur; therefore, no mitigation measures related to Alternative C are proposed.

Alternative D

No permanent operational impacts on public services and utilities are anticipated to occur; therefore, no mitigation measures related to Alternative D are proposed.

No Build Alternative

Impacts

Under the No Build Alternative, the existing bridge would not be replaced and would not be retrofitted to modern earthquake-resistant standards. Therefore, there would be no construction impacts on public services or utilities under the No Build Alternative.

Mitigation Measures

No construction impacts would occur under the No Build Alternative, and no mitigation measures are proposed.

Alternative A

Impacts

Public Services

During construction, the existing bridge and the access to southern Magnolia it provides would need to be closed for a period of time (estimated at up to 17 months) while the east and west connections of Alternative A are completed. Vehicles, including some emergency service vehicles and school buses, would need to be rerouted to West Dravus Street and West Emerson Street to the north. Increased traffic on those streets and longer routes would temporarily affect public services. Emergency response times would be longer in instances when police and fire/emergency vehicles would need to approach or leave the south end of Magnolia. Existing school bus routes between Magnolia and southeast Seattle would also be temporarily lengthened. However, the availability of the 21st Avenue West surface street would facilitate emergency service access into the Terminal 91/North Bay area and into the Smith Cove/Elliott Bay Marina area during all stages of construction.

Construction of Alternative A would require activities over and within portions of the bicycle path that is located on the perimeter of the Port of Seattle's North Bay property. The path would be open to pedestrians and cyclists up to its intersection with the 21st Avenue West surface street on the east side of the Port property during all stages of construction. However, construction activities would occur within the pathway on the west side of the Port property. Bicycle and pedestrian movement on this portion of the pathway would be temporarily rerouted or delayed.

Construction impacts on fire protection and emergency medical services could include a slight increase in calls for service related to inspection of the construction site and potential construction-related injuries. The SPD could experience an increase in calls for service related to construction site theft or trespassing. The need for police department response would depend on implementation of security measures for the duration of construction, including fencing and signs.

Construction employees would be drawn from the Seattle area and no construction-related in-migration would occur. Therefore, no school enrollment increases in the study area associated with families of construction employees would occur.

Utilities

Utility Services

Utility systems within the study area are likely to be affected by construction of the new bridge and intersections under Alternative A. Port of Seattle utilities would be affected during construction of the main sections of the new bridge, while public utilities would primarily be affected at bridge connection points located at West Garfield Street and 15th Avenue West.

Construction of Alternative A would result in the temporary relocation of utility service connections, which is required to facilitate construction, as well as the permanent demolition and relocation of utility connections that are necessary to support the new bridge and intersection configurations. This process may result in unavoidable, temporary service interruptions. Such interruptions may have adverse economic impacts on utility customers, including local businesses whose operations are affected, and service providers, who are unable to bill because of inactivity. The potential impacts on specific utility services are described in further detail below.

No temporary service interruptions to sanitary sewer and drainage services would occur during construction of Alternative A. No impacts on major utility infrastructure would occur during construction of Alternative A, and no permanent interruptions to utility services are anticipated as a result of Alternative A.

Water Service

Adequate clearances for the water utility would be maintained at all times during construction. Relocation of water mains may result in unavoidable, short-term interruptions of service to North Bay/Terminal 91 tenants and potentially to property owners situated at the intersection of 15th Avenue West and West Garfield Street. Construction of the Build Alternatives may additionally affect the response time for utility emergency and maintenance work.

Sanitary and Storm Sewer Service

Sanitary sewer and drainage service relocations would occur without affecting users, meaning no service interruptions would occur. However, existing North Bay/Terminal 91 sanitary sewer mains would require evaluation prior to any necessary relocation.

Natural Gas Service

Under Alternative A, existing natural gas service would continue while new connections are constructed. Once the new connections are in place, flow would be allowed to pass through the new mains. Valves connected to the existing mains would then be shut down.

Electrical Service

Electrical service is the utility that would be most affected by construction of the Build Alternatives. Alternative A would affect a large network of overhead and underground power lines, as well as street lighting, at the intersection of 15th

Avenue West and West Garfield Street. Power lines running along the north and south sides of the existing bridge, beginning at this intersection, would require relocation to support demolition of the existing bridge. Power lines on the north side of the existing bridge serve the Terminal 91 south substation and other loads, while power lines on the south side feed the King County Interbay pump station. These power lines could be relocated underground. Relocation of these power lines would require close communication between affected parties and coordination with North Bay redevelopment plans (Russo, pers. comm., 2004).

In addition to the overhead lines, SCL has underground facilities near the existing Magnolia Bridge that may be affected by construction of the new bridge. These facilities would be located early in the design process and relocated and/or protected as required.

Alternative A would also affect power lines running on the east and west sides of 15th Avenue West at the West Garfield Street intersection. Relocation of these power lines would require coordination between the alignment chosen and the Monorail green line route, which is planned to travel north-south along the west side of 15th Avenue West, transitioning to the center of Elliott Avenue West. The configuration of relocated power lines will be decided in coordination with the Monorail project. According to SCL, these power lines would most likely be housed within concrete-encased duct banks, measuring approximately 2 feet wide by 4 feet deep, and located approximately 3 feet underground. Installation of the duct banks along 15th Avenue West would affect placement of new bridge footings, and the new bridge could require extension of the underground portion of these lines northward to a point beyond that of the Monorail (Russo, pers. comm., 2004).

SCL has two planned projects within the study area that are scheduled for construction in 2004 and 2005. One project will extend the existing 15th Avenue West underground power line north from the Galer Flyover to West Armory Way. The extension project will also affect the placement of new bridge footings. Additionally, SCL plans to construct a new transmission main of up to 240 kilovolts running south along 15th Avenue West from the Interbay substation to the Seattle Center. Because of its magnitude and cost, the transmission main will remain as an overhead power line until Mercer Street, where it will be placed underground. Placement of power poles for the transmission main would be of concern for the new bridge alignments and would require coordination. Furthermore, any service interruptions to a transmission main would need to be approved by the Bonneville Power Administration, which could take up to eight months to secure (Russo, pers. comm., 2004).

Requirements for permanent and temporary construction clearances would need to be considered when actual plans for project construction and utility relocations are developed.

Telecommunications Service

New telecommunications service may typically be established without service interruptions to customers. This can be accomplished by constructing and activating new connections before de-activating and/or removing existing connections.

Garbage and Recycling Service

Solid waste pickup at locations within the study area may be temporarily affected by construction activities. Potential impacts include temporary access restriction to pick-up areas within construction sites. Alternate pick-up sites and detours would be designated as needed during construction to avoid any potential service interruptions.

Major Utility Infrastructure

No adverse impacts on major utility infrastructure within the project vicinity are anticipated as a result of Alternative A. This includes the twin 48-inch or 96-inch King County sanitary sewer force mains, the King Country lift station, the City of Seattle CSO, and the Terminal 91 gas line corridor.

Mitigation Measures

Construction would require coordination among WSDOT, the City of Seattle, the Port of Seattle, individual utility departments, contractors, and property owners or Port tenants. This collaboration would be essential to both preserving the function of utility services throughout project construction and to providing for the least disruption to project activities or the project schedule.

Public Services

A construction management plan would be prepared to manage construction traffic in the project vicinity. The plan would identify mitigation measures to be implemented during the construction phases to ensure access by emergency service providers and schools. The measures would include in part providing advanced notice of construction activities to the schools, emergency services, and law enforcement agencies serving the area, and stipulating detour routes and parking locations.

As was the case during repairs to the existing Magnolia Bridge after the February 2001 earthquake, between two and four police officers would need to be deployed along the West Dravus Street corridor during the peak travel hour to ameliorate traffic congestion during project construction.

Construction site security would be implemented to reduce potential criminal activity, including onsite security surveillance and fencing to prevent public access.

Construction worker safety measures would be consistent with Occupational Safety and Health Administration (OSHA)/Washington Industrial Health and Safety Act (WISHA) standards and regulations.

Utilities

Potential impacts on major utility infrastructure (as previously defined) and sanitary sewer and drainage services would be avoided through the careful placement of bridge footings, the configuration of project excavations, and the careful execution of construction. Exact locations of utilities would be verified by a locator service prior to construction. In addition, the following would be used to minimize impacts on existing utilities: a construction management plan, erosion and sedimentation control plan, vibration and settlement monitoring, and a plan to maintain adequate clearances to utilities. Whenever feasible, unavoidable utility outages that would

have a significant effect on customers would be scheduled during the least disruptive time period. Strategic bypass plans would be developed to ensure no interruptions to sewer or drainage services occur.

The project would avoid and/or mitigate all impacts on major utility infrastructure including the King County force mains, King County lift station, and the City of Seattle CSO (Figures 12 and13). A bypass would be developed to ensure that no CSOs would occur throughout construction. A flow bypass or other means would also be used to continue service while new connections are established.

Mitigation for unavoidable, temporary disruptions of other utility services (power, gas, communications, etc.) would first aim to minimize the duration and impact of the interruptions to utility customers through methods such as installing and preparing alternate replacement connections before de-activating existing connections. Mitigation would also include coordinating the timing of interruptions to coincide with the lowest utility demand periods. This strategy could involve scheduling utility service interruptions to take place at night when affected business may be closed or inactive.

Mitigation for permanent relocation of utilities would provide new service connections in the best possible location, depending on the needs and plans of service providers and customers. Demolition (retiring) and/or construction of utility mains and service connections would be conducted in close collaboration with service providers and site users including Port tenants and local businesses. In some instances, the utility purveyor would retire existing facilities prior to onsite demolition by the contractor. Whenever feasible, relocated utilities would be constructed within standard clearances as required by the utility purveyors.

The City of Seattle Street Improvement Manual dictates that new water mains are subject to SPU specifications and will be designed and installed accordingly. Water main relocations would be conducted in cooperation with the Seattle Fire Department, service providers, property owners, and Port tenants. In the event of temporary service disruptions, provisions would be made to supply the needs of construction and fire protection through installation of new, temporary connections to be active until the construction is completed. Unavoidable, temporary water service shutdowns would not exceed 12 hours in duration and would be carefully planned to coincide with periods of low water demand. A minimum of 48 hours advance notice would be given to affected parties. Construction impacts on water service would be avoided by implementing protection measures for the duration of construction. These protection measures would include vibration and settlement monitoring and use of a locator service to identify the specific locations of water mains as necessary. It is possible to provide natural gas service to customers without interruptions during the relocation process. One method is to provide an onsite temporary trailer supplied with compressed natural gas during construction. A second method would be to construct parallel service mains up to their connection with existing gas mains before de-activating existing service.

Alternative C

Impacts

Public Services

Construction impacts related to public services under Alternative C would be similar to those described for Alternative A, but the magnitude of potential impacts related to emergency response times and length of school bus routes would be less because the existing bridge is expected to be closed for only 11 months, about one-third less time than required for Alternative A.

Potential temporary increased demand for police, fire, and emergency medical services at and around the construction site would be the same as described for Alternative A.

Utilities

Construction impacts related to utilities under Alternative C would be similar to those described for Alternative A.

Because structures on Port of Seattle property would be displaced under Alternative C, additional planning to provide continued utility service to relocated structures and businesses would be required. Potential consequences of construction include temporary interruptions to utility services, which may occur when existing service connections are temporarily or permanently relocated. Permanently relocated utilities are all of those supporting structures planned for demolition. Utility connections to these structures would be demolished (retired) or abandoned and reestablished at the structure's new location.

Electrical power connections to existing buildings within North Bay/Terminal 91 would be affected under Alternative C. Power connections to businesses at the 15th Avenue West and West Garfield Street intersection may also require demolition and relocation to allow for the use of construction equipment such as cranes. If new electrical connections are required, a parallel electrical feed may be installed and activated before service is transferred from the existing feed. This would involve constructing new electrical conductors before the existing ones are removed. Power is reestablished when the new conductors are joined to the existing service connections. If this method is used, the average duration of this process would range from 15 to 30 minutes, depending on the size of the system in place.

Mitigation Measures

Mitigation measures proposed for Alternative C would be the same as those described for Alternative A.

Alternative D

Impacts

Public Services

Construction impacts related to public services under Alternative D would be similar to those described for Alternative A, but the magnitude of potential impacts related

to emergency response times and length of school bus routes would be less because the existing bridge is expected to be closed for only nine months, almost half the time required for Alternative A.

Utilities

Construction impacts related to utilities under Alternative D would be the same as those described for Alternatives A and C.

Mitigation Measures

Mitigation measures proposed for Alternative D would be the same as those described for Alternative A.

Affected Environment

Public Services

The Seattle Police Department provides public safety protection to businesses and residents within the City of Seattle. The City's West Precinct provides police protection in the study area, which includes the Magnolia, Interbay, and Queen Anne neighborhoods. The West Precinct runs 24-hour patrols and has a full range of emergency response and public safety services to prevent crime and enforce the law. The study area is part of the West Precinct's Queen sector.

The Seattle Fire Department provides fire and emergency medical protection services in the City of Seattle. Four fire stations directly serve the Magnolia, Interbay, and Queen Anne neighborhoods in the study area. Fire Station No. 41 in Magnolia houses one primary engine company (Engine 41) and a historic engine that is no longer in service. Station No. 20 on Queen Anne houses one engine (Engine 20). Station No. 8 on Queen Anne houses one engine company (Engine 8) and one ladder unit (Ladder 6). Station No. 18 in Ballard houses one engine company (Engine 18), one ladder unit (Ladder 8), one medic unit (Medic 18), one battalion chief (Battalion 4), and a spare ladder truck and hose wagon (Hose 18). Harborview Medical Center located in downtown Seattle also services the study area with two medic units (Medic 1 and Medic 10). The personnel at each of these facilities provide emergency fire and medical services to the study area.

Seattle Public Schools operates public schools in the study area. This school district enrolls children in a cluster of schools for elementary education based on the location of their residence. The district allows citywide enrollment for middle and high schools. There are also several private schools in the study area. The Magnolia Bridge is lightly used for school bus service.

Utilities

Utility service providers in the study area include Seattle Public Utilities (water, sanitary sewer and drainage, garbage and recycling), King County (wastewater treatment), Puget Sound Energy (natural gas), Seattle City Light (electricity), and Qwest (telecommunication). The study area is served by both Port and public-owned utilities. Port utility lines are interspersed throughout the North Bay/Terminal 91 complex. Public utility main lines are generally located within existing rights-of-way. Service is extended to individual property owners and to Port tenants through overhead, side/lateral, and branch connections.

Impacts

Operational Impacts

No Build Alternative

Under the No Build Alternative, the bridge would likely be damaged and unusable after a major earthquake, which would cause delays for police and fire/emergency

medical access and rerouting of school buses. Adverse impacts on utility services may include collateral damage to:

- Electrical power supply to Pier 91;
- Interbay pump station;
- Port switchgear (located under the existing viaduct); and
- Area lighting.

Alternative A

Alternative A would not create additional traffic capacity for access to Magnolia and would not induce population or housing growth in the study area. No additional demand for public services would occur. Emergency vehicle access and bus routes would not be affected. The T-intersection option with traffic signal would not cause emergency vehicle delays because emergency vehicles can bypass the signal when necessary. However, if intelligent traffic signal controls were implemented on the new bridge, this system would preclude the need for emergency vehicles to bypass the signal. Alternative A would not create additional demand for utility service within the study area.

Alternative C

Operational impacts on public services under Alternative C would be similar to those described under Alternative A. Travel times for emergency vehicles and school buses would be incrementally longer because the proposed elevated structure and surface street curve farther to the north under Alternative C. This effect, however, is not expected to be substantial.

Operational impacts on utilities under Alternative C would be the same as those described under Alternative A.

Alternative D

Operational impacts on public services under Alternative D would be similar to those described under Alternative A. Travel times for emergency vehicles and school buses would be incrementally longer because the bridge curves to the north under Alternative D. This effect, however, is not expected to be substantial. As with Alternative A, emergency vehicles can bypass the T-intersection traffic signal when necessary.

Operational impacts on utilities under Alternative D would be the same as those described under Alternative A.

Construction Impacts

Public Services

During construction of any of the Build Alternatives, the existing bridge and the access to southern Magnolia it provides would need to be closed for a period of time while the east and west bridge connections are completed. The closure period would range from 9 months under Alternative D to up to 17 months for Alternative A. During bridge closure, increased traffic on alternative routes to and from Magnolia would result in longer emergency response times and longer school bus routes.

For all Build Alternatives, construction impacts to fire protection and emergency medical services could include a slight increase in calls for service related to potential construction-related injuries, while the Seattle Police Department could experience an increase in calls for service related to construction site theft or trespassing.

Similarly, construction employees would be drawn from the Seattle area under all Build Alternatives; therefore, no school enrollment increases associated with families of construction employees would occur.

Utilities

No permanent interruptions to utility services are anticipated as a result of any of the Build Alternatives. No temporary interruptions to major utility infrastructure or sanitary sewer and drainage services would occur. Impacts to other utility services (e.g., power, gas, communications) can be defined as any unavoidable, temporary interruptions incurred during the construction period. Some temporary service interruptions are expected.

Construction would also result in temporary relocations of utility service connections. Temporary utility relocations may be required to facilitate the construction of the bridge structure, ramps, footings, tunnels, and walkways. Furthermore, demolition of the existing bridge and the planned building demolitions (under Alternatives C and D) would result in the permanent demolition, retirement, and/or relocation of affected utilities. Major utility infrastructure (as previously defined) would not be affected.

Secondary and Cumulative Impacts

Indirect impacts are not anticipated because the project would not induce regional growth; therefore, there would not be any corresponding indirect increases in the demand for public services or utilities.

Demand for public services and utilities would not increase under any of the alternatives. Therefore, it is not anticipated that they would contribute to cumulative increases in the demand for public services and utilities caused by other development in the study area such as the Monorail project.

Mitigation Measures

Operational Mitigation

No permanent operational impacts on public services and utilities are anticipated to occur; therefore, no additional mitigation measures related to project operations are proposed.

Construction Mitigation

For all Build Alternatives, a construction management plan would be prepared to manage construction traffic in the project vicinity. The plan would identify mitigation measures to be implemented during the construction phases to ensure access by emergency service providers and schools.

For all Build Alternatives, construction site security would be implemented to reduce potential criminal activity, including onsite security surveillance and fencing to prevent public access.

For all Build Alternatives, construction worker safety measures would be implemented consistent with OSHA/WISHA standards and regulations.

For all Build Alternatives, between two and four police traffic officers would need to be deployed along the West Dravus Street corridor during the peak travel hour to ameliorate traffic congestion during project construction.

Potential impacts on major utility infrastructure and sanitary sewer and drainage services would be avoided through the careful placement of bridge footings, the configuration of project excavations, and the careful execution of construction. In addition, the following would be used to minimize impacts on existing utilities: a construction management plan, erosion and sedimentation control plan, vibration and settlement monitoring, and a plan to maintain adequate clearances to utilities. Whenever feasible, unavoidable utility outages that would have a significant effect on customers would be scheduled during the least disruptive time period. Strategic bypass plans would be developed to ensure no interruptions to sewer or drainage services occur.

Mitigation for unavoidable, temporary disruptions of other utility services (e.g., power, gas, communications) would first aim to minimize the duration of the interruptions to utility customers and service providers and second to provide for temporary or new connections in the best possible locations.

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