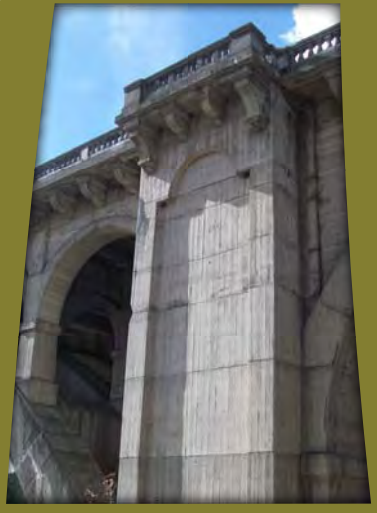
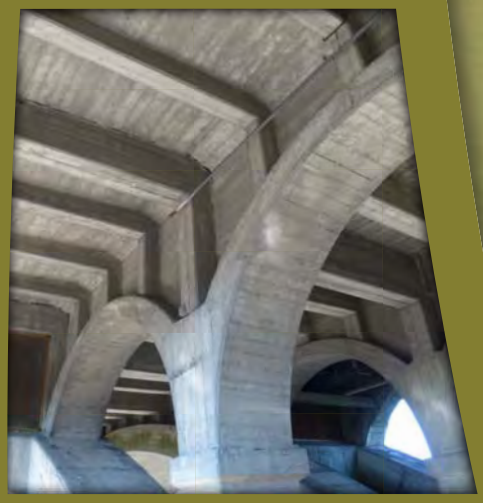
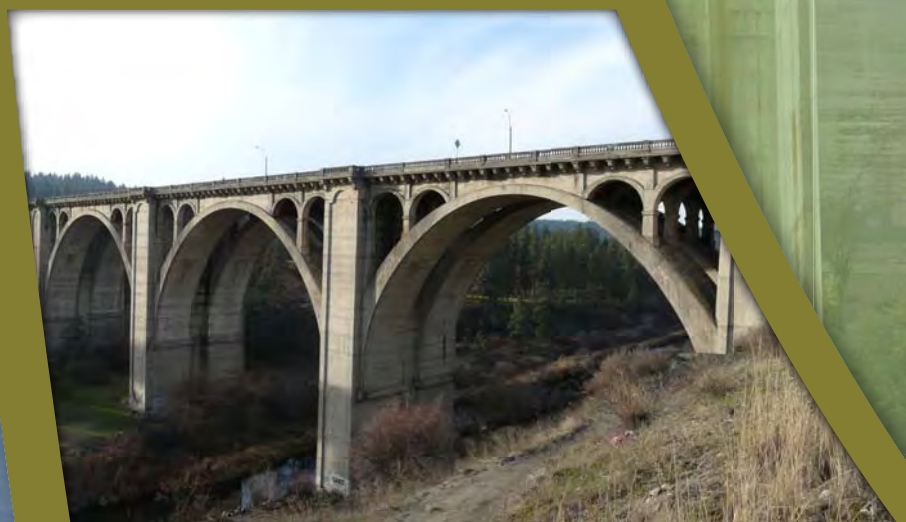






Latah Bridge Rehabilitation Study

VOLUME 1

Baseline Conditions Summary

City of Spokane

Submitted by

CH2MHILL®

February 2012

TBG110211012522SPK

Volume 1

Latah Bridge Rehabilitation Study

Baseline Conditions Summary

Prepared for

City of Spokane

February 2012

Submitted by

CH2MHILL®

Contents

Appendixes

Exhibits **Page**

Section 1
Purpose and Need

For nearly 100 years, the Latah Bridge has played a vital role in the Spokane area's transportation network—spanning the Latah Valley and providing a key surface link between downtown and the West Plains. Since its construction in 1913, the reinforced concrete arch bridge has withstood the test of time. Because of its unique elegance and strength, the structure is woven in to the fabric of the Spokane Community as a landmark—its legacy secured by its listing on the State and National Historic Register.

Recently, the bridge has begun showing its age. Portions of the bridge have deteriorated to the point that the City of Spokane (City) has restricted traffic to the two center lanes of the bridge. Projected growth in the West Plains and associated transportation infrastructure improvement projects may result in additional traffic demand for the Sunset Boulevard corridor and the aging Latah Bridge.

Construction progress, 1912. Photo courtesy of Washington State Digital Archives.

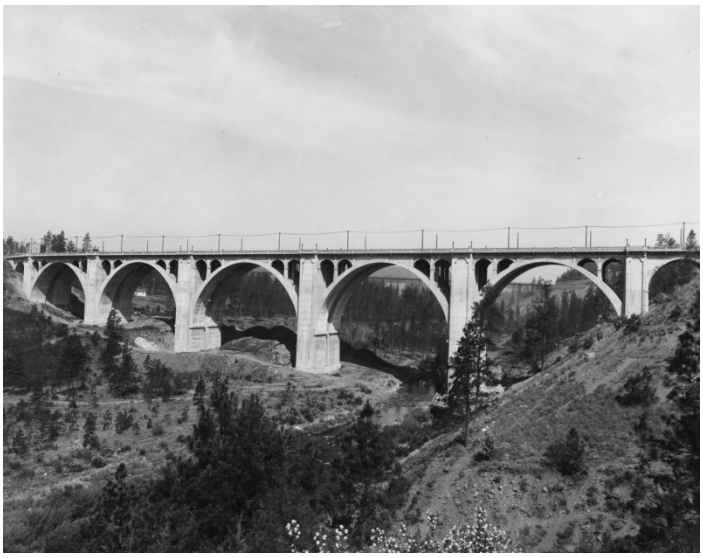
1.1 Purpose and Need

The City of Spokane has initiated the Latah Bridge Rehabilitation Study (Study) in an effort to identify and develop preliminary solution alternatives that will support public use of this historic and vital transportation link for future generations of drivers, riders, bicyclists, and pedestrians.

1.2 Project Objectives

The primary goal for the Study is to develop rehabilitation solutions for the Latah Bridge that will ensure the long-term vitality of the critical link it provides in the region's transportation system. Further, the following key objectives must be addressed:

- Provide the appropriate level of inspection and structural capacity analysis of the existing structure that will provide accurate estimates of work scope and estimated costs.
- Define the baseline existing and forecast traffic demand for the corridor, including



Completed bridge, looking northwest, 1913. Photo courtesy of Washington State Digital Archives.

accommodating pedestrians, bicycle facilities, and potential future light rail.

- Develop bridge rehabilitation evaluation and recommendations to include the following four primary scenarios:
  1. Repair or rehabilitate the bridge to extend its life for 20 years.
  2. Repair or rehabilitate the bridge to extend its life for 20 years and include nonmotorized facilities (bike lanes, sidewalks).
  3. Repair or rehabilitate the bridge to its original like-new condition for a much longer service life.
  4. Rehabilitate and strengthen the bridge to accommodate future multi-modal loading, in addition to current legal loading conditions.

Latah Bridge today, looking southeast.

- Comply with regulatory requirements, including state and federal historic preservation requirements, while still meeting bridge performance requirements.
- Understand environmental and permitting requirements and how these could impact the project solutions or costs.
- Understand existing and future utility requirements and how these could impact the project solutions or costs.
- Provide a collaborative and transparent stakeholder coordination and public involvement process with purposeful touch points and access throughout the process.

A successful Study will result in a publicly supported preferred rehabilitation plan that is both (1) flexible to meet future transportation and utility demands and (2) highly competitive for funding resources. Further, the rehabilitation plan must provide for budget and time line adequate to accomplish the plan.

1.3 Location

The Latah Bridge is located on Sunset Boulevard, a principal arterial serving the Spokane and the West Plains. The limits of this Study are the length of Sunset Boulevard from Government Way to 4th Avenue, as shown in Exhibit 1-1.

EXHIBIT 1-1. *Project Map*

1.4 Study Process

A tailored three-step process was established to efficiently navigate the Study and accomplish the Study goals and objectives. The process features guidance through critical decision making points via a Stakeholder Advisory Committee (SAC), and touch points with the general public to promote two-way communication and project understanding. Documentation of the stakeholder coordination and public outreach efforts is provided in Appendix A.

The three primary tasks for this Study are outlined below, with key task elements identified. Exhibit 1-2 illustrates the overall Study Process.

Task 1—Assess Baseline Conditions

- **Ascertain Existing Conditions**. Understand bridge condition, structural capacity, and traffic capacity.
- **Forecast Future Transportation Demands.** Understand traffic and multi-modal demands.
- **Ascertain Environmental Setting**. Understand complete array of elements that may influence rehabilitation solutions.

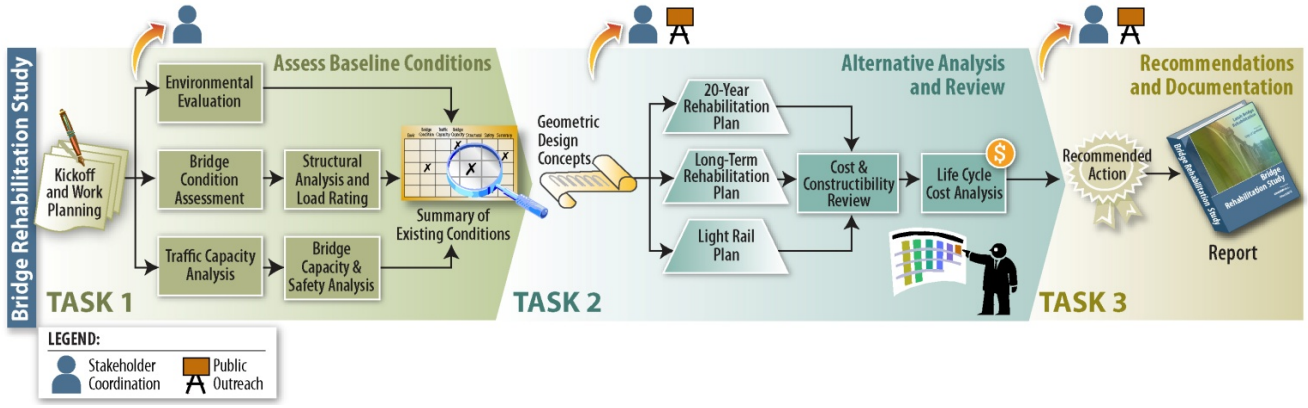
Task 2—Alternative Analysis and Review

- **Develop Viable Rehabilitation Alternatives.** Develop approach and bridge geometric concepts and associated structural alternatives.
- **Assess Constructibility and Cost.** Understand key sequencing elements that may impact costs and develop reasonable estimates of construction costs for each alternative.
- **Relate Long-Term Costs.** Conduct life cycle cost analyses to understand total estimated cost for each alternative in today's dollars.
- **Review Alternatives with Stakeholders and Public.** Communicate findings and alternatives with stakeholders and general public prior to finalizing and documenting.

Task 3—Recommendations and Documentation

- **Review Study Findings.** Coordinate findings with stakeholders and general public, and make refinements as needed.
- **Document the Planning Process.** Provide a useful deliverable for the City to secure funding and implement the preferred rehabilitation plan.

EXHIBIT 1-2. *Study Process Diagram*



Section 2
Baseline Conditions Summary

In order to be able to develop bridge rehabilitation solutions that are meaningful, we must first understand the baseline conditions. Baseline conditions include the following:

- **Bridge Condition.** Evaluation of the load-carrying capacity of the bridge as it was originally constructed, and in its current, deteriorated condition.
- **Transportation/Traffic.** Understanding current and forecast traffic demand, transit, freight, and multi-modal needs.
- **Environmental.** Understanding complete array of environmental elements that may influence rehabilitation solutions.

This section summarizes the existing and future baseline conditions for the Latah Bridge.

2.1 Bridge Condition

2.1.1 Introduction

An evaluation of the current condition of the Latah Creek Bridge is a necessary first step in understanding the options available for preserving and rehabilitating the structure. This evaluation consists of three components.

Exhibit 2-1 is partial plan view of the Latah Bridge. Exhibit 2-2 is a partial elevation. These exhibits identify the bridge elements discussed in this section.

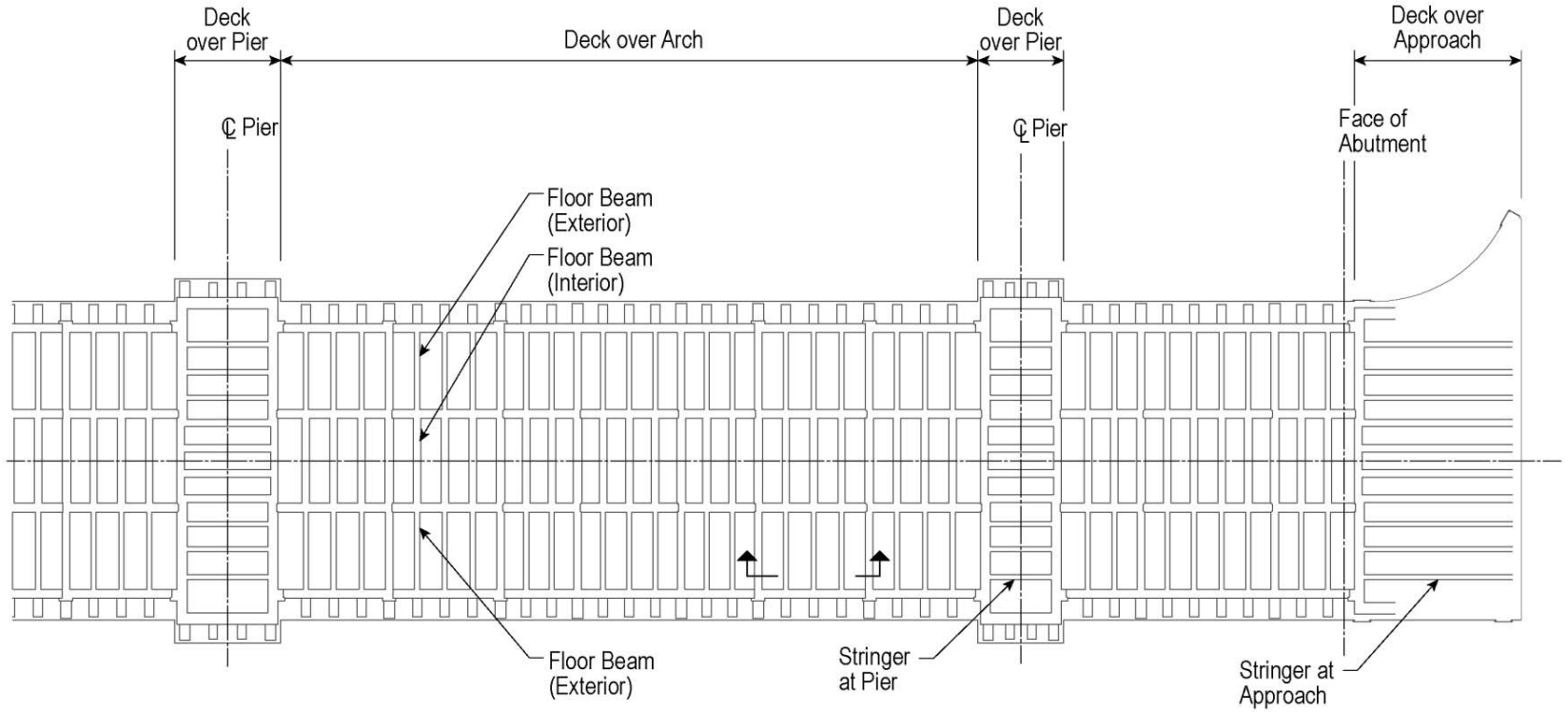
The first component is an evaluation of the load-carrying capacity of the bridge as it was originally constructed. This evaluation, referred to as “load rating,” entails calculating the force demands on the bridge resulting from dead loads and current design live loads. These force demands (compression, bending, and shear) are compared to the strength of the “as new” bridge members. The dead load demand is subtracted from the capacity. Any remaining capacity is available for supporting live loads. The ratio of available live load capacity to design live load demands is termed the Rating Factor. A Rating Factor less than 1.0 indicates that the member being investigated does not have the capacity to resist the full design live load, while a Rating Factor greater than 1.0 indicates that the member can support live loads in excess of design live loads.

The second component is determination of the condition of the bridge. In many cases components have deteriorated such that their capacities are not the same as when the structure was new. This requires a detailed inspection of the bridge, supplemented by physical testing of materials.

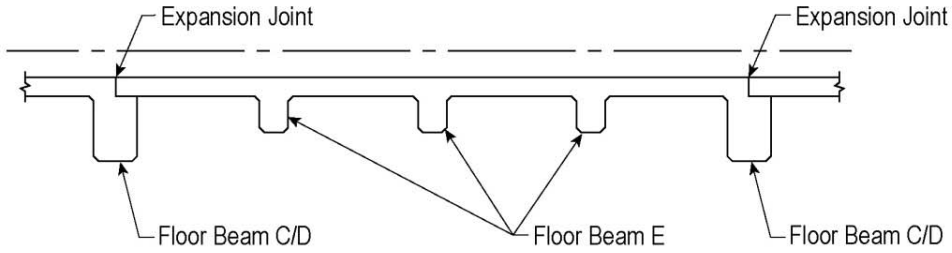
The third component is reevaluating capacities based on the condition of the bridge. The effect of the deterioration on the capacity is determined, and the revised capacity is used to compute Rating Factors of the existing bridge.

In a normal load rating process, the intent is to determine the safe load capacity of the bridge. The Rating Factor for the bridge is the lowest Rating Factor for any component—the “weakest link” in the bridge.

For this project, the Rating Factors will be used to understand the condition of the various components of the bridge and to understand which components need attention in order to meet the project objectives. Therefore instead of providing an overall Rating Factor for the bridge, Rating Factors for each key component are identified.



PLAN



SECTION

EXHIBIT 2-1
PARTIAL PLAN
Latah Bridge Rehabilitation Study

TBG110211012522SPK

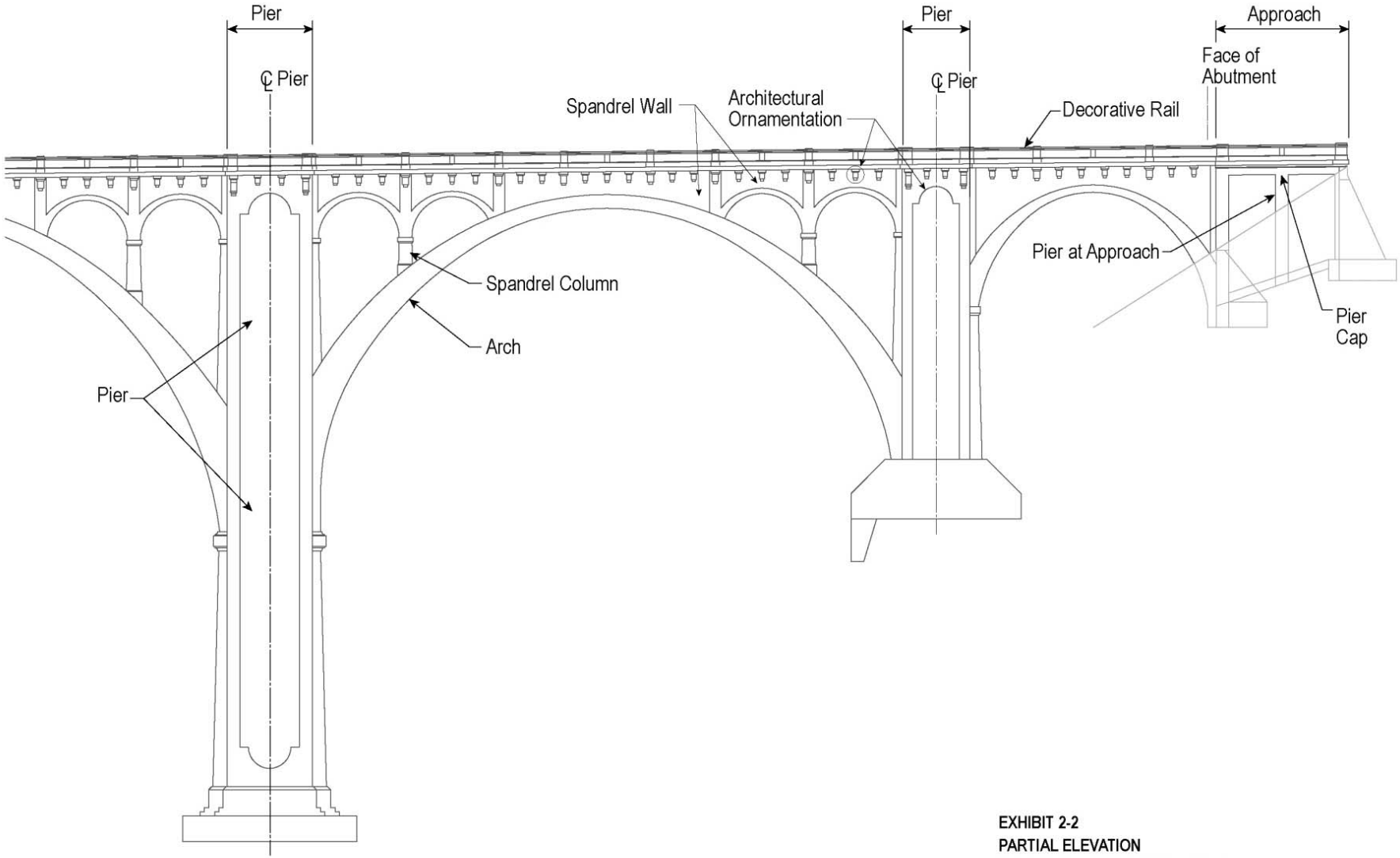


EXHIBIT 2-2
PARTIAL ELEVATION
Latah Bridge Rehabilitation Study

TBG110211012522SPK

CH2MHILL.

2.1.2 As-Constructed Load Rating

The bridge is modeled using SAP2000, which is a sophisticated general-purpose finite-element structural analysis program. Four spans of the bridge were modeled, complete with piers, arches spandrel columns, and floor system (deck, stringers, and floor beams) components.

The dimensions of the structure were taken from the original design record drawings. Live loads used for the analysis are the HL-93 live loads specified in the AASHTO *LRFD Bridge Design Specifications*.

Capacities of members are based on the original dimensions and structural reinforcement as shown in the record drawings. Reinforcement strengths are obtained from the design specifications, while concrete strengths are taken from the concrete strength tests performed on samples extracted from the bridge at several locations.

Seven cores were extracted for compressive strength tests. Test results ranged from 7.38 kips per square inch (ksi) to 10.83 ksi. Test reports are included in Appendix B.

Exhibit 2-3 summarizes material strengths as used in the As-Constructed Load Rating. Exhibit 2-4 summarizes the Rating Factors for key bridge components.

EXHIBIT 2-3. *Material Strengths*

Material	Strength
Concrete	7.0 ksi
Reinforcement	33.0 ksi

Source: CTL Compressive Strength Test Report, Nov. 8, 2011.

EXHIBIT 2-4. *Load Rating Summary, As-Built and Current Conditions*

Member	Rating Factor As-Built	Rating Factor Current	Action
Arch Spans			
Deck Slab	0.62	0.54	Flexure
Floor Beam—Interior			
Beams C/D	1.83	1.45	Flexure
Beam E	1.52	1.52	Flexure
Floor Beam—Exterior			
Beams C/D	0.83	0.61	Flexure
Beam E	0.33	0.33	Flexure
Spandrel Column	2.68	2.33	Axial + Flexure
Arch Rib—Interior	2.44	1.66	Axial + Flexure
Arch Rib—Exterior	1.54	1.30	Axial + Flexure

EXHIBIT 2-4. *Load Rating Summary, As-Built and Current Conditions*

Member	Rating Factor As-Built	Rating Factor Current	Action
Piers			
Deck Slab—Interior	0.62	0.54	Flexure
Deck Slab—Exterior	0.62	0.24	Flexure
Stringer—Interior	2.23	1.81	Flexure
Stringer—Exterior	0.98	0.98	Flexure
Stringer—Curb Line	0.46	-0.06	Flexure
Pier	1.45	1.22	Axial + Flexure
Approaches			
Deck slab	0.62	0.54	Flexure
Stringers—Interior	1.25	1.06	Flexure
Stringers—Exterior	0.53	0.44	Flexure
Stringers—Curb Line	1.50	1.27	Flexure
Pier Caps	1.42	1.15	Flexure

The load rating indicates that the bridge floor components are the weakest elements of the bridge. This is typical of bridges of this type and vintage because the design trucks used at the time were significantly smaller than those currently used to assess bridges.

2.1.3 Basis of Condition Evaluation

The evaluation of the condition of the Latah Creek Bridge is based on the original construction drawings and specifications, on recent bridge inspection reports, and on a detailed inspection of the bridge. Material strengths are based on the original specifications and on material strength tests.

A detailed inspection of the bridge was performed by Burgess and Niple, Inc., on September 26 through October 1, 2011. A report of that inspection is included in Appendix C.

Concrete samples were collected and provided to CTL Group, Inc., for testing. Testing included concrete compressive strength, chloride content, depth of carbonation, and petrographic evaluation of the constituent materials of the original concrete. A report of the material testing is included in Appendix B.

An evaluation of the corrosion activity was conducted on September 26 through October 1, 2011. This evaluation consisted of a visual scan of the structure and copper-copper-sulphate half cell testing to measure the electrical potentials generated by active corrosion. A report of this testing is included in Appendix D.

The results of the condition assessment, in particular the summary of deterioration and the material strengths, were used to modify the calculated capacity of bridge members to reflect the deterioration over time.

2.1.4 Observations of Current Condition

Several observations of the condition of the existing bridge can be made. These observations help to understand the significance of the load rating.

The overall bridge is in reasonably good condition considering the age and the physical environment of the Spokane area. Localized areas of significant deterioration are interspersed among areas of essentially intact structure. Corrosion activity in arches, columns, and stringers is low.

The following sections provide a narrative description of the condition of the bridge by element. Where elements are described as being in good or fair condition, localized and repairable deterioration may be evident. Exhibits 2-1 and 2-2 (see Section 2.1.1) identify the bridge components described in the following sections. Exhibits 2-5 and 2-6 graphically present the conditions found. The condition of any specific group of elements varies widely, and Exhibits 2-5 and 2-6 present conditions of structure elements by group. A specific element within a group may be in significantly better condition than is indicated for the group as a whole. Each category of element is assigned a condition of Good, Fair, Poor, or Extremely Poor. These condition descriptions are used in modifying structure capacities based on observed conditions.

Railing

The existing decorative railing system is heavily deteriorated because of exposure to weather and moisture. Rail components have been heavily repaired, and repaired portions show serious degradation. The condition is considered poor. The decorative railing is considered to have negligible structural capacity.

Architectural Ornamentation

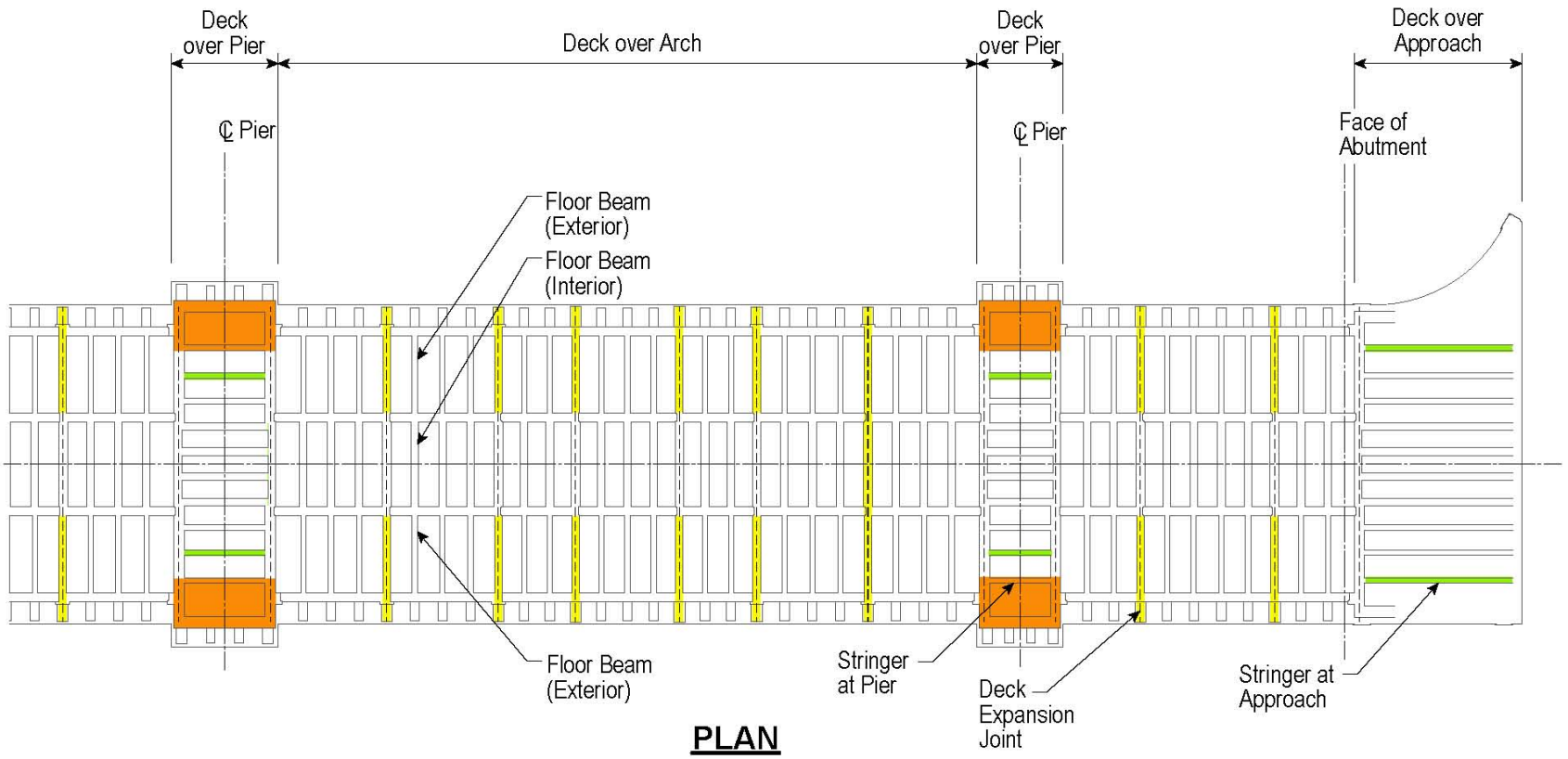
The bridge includes a moderate level of ornamentation, in the form of corbels, rabbets, and chamfers along corners of structural elements. This ornamentation is exhibiting a moderate level of deterioration, resulting primarily from weathering. A conditions rating is not assigned to the ornamentation, as it is not structural.

Deck over Arches and Approaches

The reinforced concrete deck is in fair condition. Limited spalling and surface deterioration is evident. The deck over the west approach exhibits the most deterioration. The asphalt concrete overlay is significantly deeper than shown in the original design, adding dead loads on the bridge. This added dead load was included in both the “as-built” and “current condition” rating calculation.

Deck over Piers

The deck slab at the piers is very heavily deteriorated, primarily because of stormwater leakage at deck drains and expansion joints. This deterioration is limited to the sections between the exterior stringers and the stringers below the curb line. The deck slab at the heavily deteriorated areas is considered extremely poor condition. The deck slab at the center of the bridge, which is where traffic is currently routed, is in generally good condition.



LEGEND:

- Good Condition
- Fair Condition
- Poor Condition
- Extremely Poor Condition

NOTE:
Intent of this exhibit is to provide a generalized condition summary at a glance. See Appendix B for detailed inspection findings.

EXHIBIT 2-5
PARTIAL PLAN – CURRENT CONDITION OVERVIEW
Latah Bridge Rehabilitation Study

CH2MHILL

TBG110211012522SPK

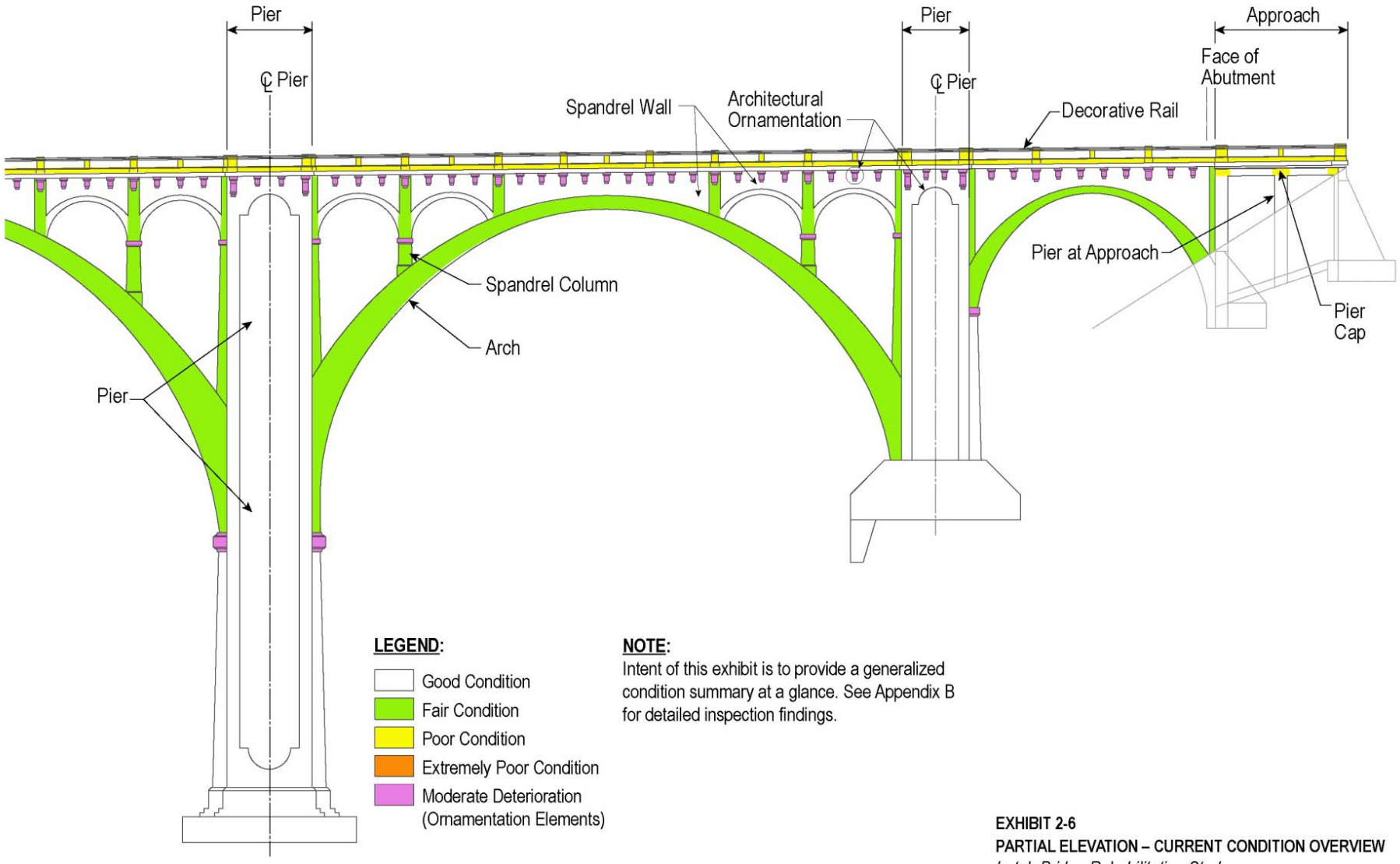


EXHIBIT 2-6
PARTIAL ELEVATION – CURRENT CONDITION OVERVIEW
Latah Bridge Rehabilitation Study

CH2MHILL

TBG110211012522SPK

Floor Beams

Most floor beams are in generally good condition. Floor beams adjacent to deck joints are exposed to water leaking from the deck and are assigned a condition of poor. Relatively few floor beams are deteriorated to a degree that suggests restoration would be problematic.

The floor beams at the center of the bridge were designed to accommodate rail transit, and so are stronger than are the floor beams closer to the sidewalks. The exterior floor beams were lightly reinforced and are substantially weaker than those at the center of the bridge.

Stringers at Piers

Stringers at the deck level of the piers are in generally good condition. An exception is the stringer under the curb line at each side of each pier. These stringers have been exposed to water leaking from deck drains, and are severely deteriorated. The live-load-carrying capacity of these stringers is considered to be negligible, with a condition rating of extremely poor.

Stringers at Approaches

Most stringers supporting the decks at the approaches are in good condition. Very few exceptions exist that reduce the condition to fair.

Spandrel Columns

Spandrel columns are in generally fair condition, with localized areas of spalling. Spandrel columns are lightly reinforced and include very little transverse reinforcement. The minimal reinforcement contributes to the columns' resistance to corrosion, but results in elements which are brittle and sensitive to damage if heavily loaded.

Spandrel Walls

Spandrel walls are generally in good condition.

Arches

The arches are in generally fair to good condition. Deterioration is limited to surface cracking and limited spalling. Corrosion activity in the arch reinforcement is low.

Piers

As noted previously, the decks and stringers over the piers near the north and south sides (the sidewalk areas) are in very poor condition. A second-level floor inside the piers is in poor condition also. Pier walls are in generally good condition with isolated areas degraded to fair condition. Cracking in the walls is exhibited. This cracking has limited effect on the structural capacity of the piers. This cracking does affect the on-going rate of deterioration of the structure, but in their current condition, the piers have sufficient capacity.

Piers at Approaches

The longitudinal stringers at the approaches are supported on piers consisting of columns and pier caps. The pier caps are subject to water leaking through deck joints, and are showing corrosion of reinforcement. Pier caps are considered to be in fair to poor condition.

Corrosion Assessment

Corrosion activity on the Latah Bridge substructure is limited and localized, and is primarily due to carbonation in conjunction with insufficient concrete cover. Corrosion-induced damage is limited to specific and repairable locations.

Most of the carbonation was occurring on the outside spandrel columns, spandrel arches, corbels, and corners. While some corrosion observed on deck beams was classified as chloride corrosion, it was caused by water leakage at manholes and drain basins.

Three of the concrete samples tested for acid soluble chloride content contained chlorides below the American Concrete Institute (ACI) corrosion threshold of 0.20 percent chloride based on weight of cement or 310 parts per million (ppm) chloride content. One concrete sample had chlorides contents of 340 and 360 ppm at 0.5 and 1.5 inches depth, respectively, which exceeds the ACI corrosion threshold. But the other two concrete samples had chloride contents less than 65 percent of the ACI chloride corrosion threshold. Exceeding the chloride content may not result in chloride corrosion because the quantity of cement was assumed to be approximately 7 bags per cubic yard. The actual cement content of the concrete is unknown.

Visual observations showed the majority of the corrosion activity occurs where concrete cover is less than 1 inch (for example, corners, honeycombed surfaces, and areas subject to water leakage). Most of the corrosion activity occurs in water runoff areas on the corbels, spandrel columns, spandrel arches, interior face of piers, and along the top of the lower arches. Water runoff increases concrete water saturation and the rate of carbonation and depth.

Electrical potential testing conducted on the spandrel columns and arches confirmed that the corrosion activity is localized. Much of the corrosion activity detected is near corners where concrete cover was lowest. Upper arches did not show any corrosion activity, except at some corners and near disbonded or delaminated areas.

2.2 Load Rating in Current Condition

Capacities of members are adjusted based on the observed deterioration of each member. The primary adjustment is the loss of reinforcement resulting from corrosion of flexural and shear reinforcement.

Demands on the structure remain the same as for the original load rating. Only the capacities of specific elements are modified.

Capacities of elements are reduced on the basis of condition rating determined from the inspection. The reduction in capacity is applied to each category of structural elements. Exhibit 2-7 shows the capacity reductions.

EXHIBIT 2-7. *Capacity Reduction*

Condition	Capacity Factor
Good	1.0
Fair	0.9
Poor	0.85
Extremely Poor	0.5

Exhibit 2-4 (see Section 2.1.2) summarizes the Rating Factors for individual members considering the observed current condition of the bridge. These Rating Factors are the minimum encountered and do not necessarily represent an average, or even a typical condition. The location in the structure of the controlling member is noted.

The current condition load rating follows a trend similar to that seen for the "as built" condition, except with lower rating factors for deteriorated members. In general, members further from the deck level are in better condition and have greater live load capacity than members close to the bridge deck.

2.3 Stormwater and Utilities

Utility providers known to have facilities on the Latah Bridge were contacted. Providers were asked to provide background on their facilities and identify any future facilities that are planned along Sunset Boulevard that may require the use of the Latah Bridge to cross the valley. Exhibit 2-8 is a summary of the coordination.

EXHIBIT 2-8. *Utility Coordination Summary*

Utility Provider/Contact	Existing Utility in Latah Bridge	Planned Utility in Latah Bridge
City of Spokane Water 914 N Foothills Dr. Spokane, WA 99207 *Contact: Chris Peterschmidt* *(509) 625-7803*	Two 12-inch water mains	18-inch water main
City of Spokane Sewer and Stormwater 909 East Sprague Spokane, WA 99202 *Contact: Bill Peacock* *(509) 625-7902*	None	Provisions to treat and control stormwater runoff per Regional Stormwater Manual Standards
Avista Corporation Construction Division East 1411 Mission Spokane, WA 99220-3727 *Electrical Contact: Theresa Damon* *(509) 495-2425*	None	Eight 4-inch conduits
Avista Corporation Construction Division East 1411 Mission Spokane, WA 99220-3727 *Gas Contact: Jim Mark* *(509) 495-4094*	None	One 10” conduit
CenturyLink (formerly Qwest) 904 N Columbus St, Room 120 Spokane, WA 99202 *Contact: Charisse Mathes* *(509) 623-0309*	Several communications conduits in duct bank; Twelve 4-inch conduit installed in 1980; vitreous clay pipe conduits installed in 1913	Twelve 4-inch conduits
Comcast *Contact: Brian Richardson* *(509) 370-7389*	None	Future needs on this corridor have not been determined
Zayo Bandwidth *Contact: Dan Barcomb* *(509) 727-3345*	None	Future needs on this corridor have not been determined

2.4 Transportation/Traffic

2.4.1 Existing Conditions

Study Area

The project area (see Exhibit 1-1) extends along West Sunset Boulevard between the signalized intersection at South Government Way and West 4th Avenue, which is stop-controlled.

Within the project limits, West Sunset Boulevard is a five-lane roadway with two travel lanes in each direction, including a center, two-way left-turn lane that transitions to an exclusive left-turn lane at intersecting streets. The roadway narrows to one travel lane in each direction with wide shoulders (approximately 10 feet) between Latah Bridge and at the connection with Inland Empire Way. The speed limit is posted at 30 miles per hour (mph) within the study area.

West Sunset Boulevard and South Government Way

The West Sunset Boulevard and South Government Way intersection is a four-leg, six-phase signalized intersection with protected left-turn phasing for the eastbound and westbound approaches and permissive left-turn phasing for the northbound and southbound approaches.

The southbound approach consists of an exclusive left-turn pocket (approximately 100 feet), one through lane, and one shared through/right-turn lane. The northbound approach consists of an exclusive left-turn pocket (approximately 75 feet long), one through lane, and one shared through/right-turn lane. The eastbound approach consists of an exclusive left-turn pocket (approximately 100 feet long), two through lanes, and an exclusive right-turn lane (approximately 110 feet long). The westbound approach consists of an exclusive left-turn pocket (approximately 100 feet long), two through lanes, and an exclusive right-turn pocket (approximately 110 feet long).

Crosswalks and pedestrian push-buttons are provided for all legs of the intersection.

West Sunset Boulevard and West 4th Avenue

The West Sunset Boulevard and West 4th Avenue intersection is a three-leg intersection with free-flowing east and westbound movements and a stop-controlled northbound approach. Two business driveways for Sunset Grocery oppose the West 4th Avenue approach on the north side and are considered to be stop-controlled.

The northbound approach consists of a left-turn lane and an exclusive right-turn pocket (approximately 50 feet long). The eastbound approach consists of a shared two-way left-turn lane (approximately 60 feet long), one through lane, and a shared through/right-turn lane that turns to a raised-curb separated and Yield-controlled turn lane. The westbound approach consists of an exclusive left-turn pocket (approximately 90 feet long), one through lane, and one shared through/right-turn lane. One uncontrolled marked crosswalk, with a raised-curb, median pedestrian refuge, is provided across the west leg of the intersection.

Weekday Traffic Volumes

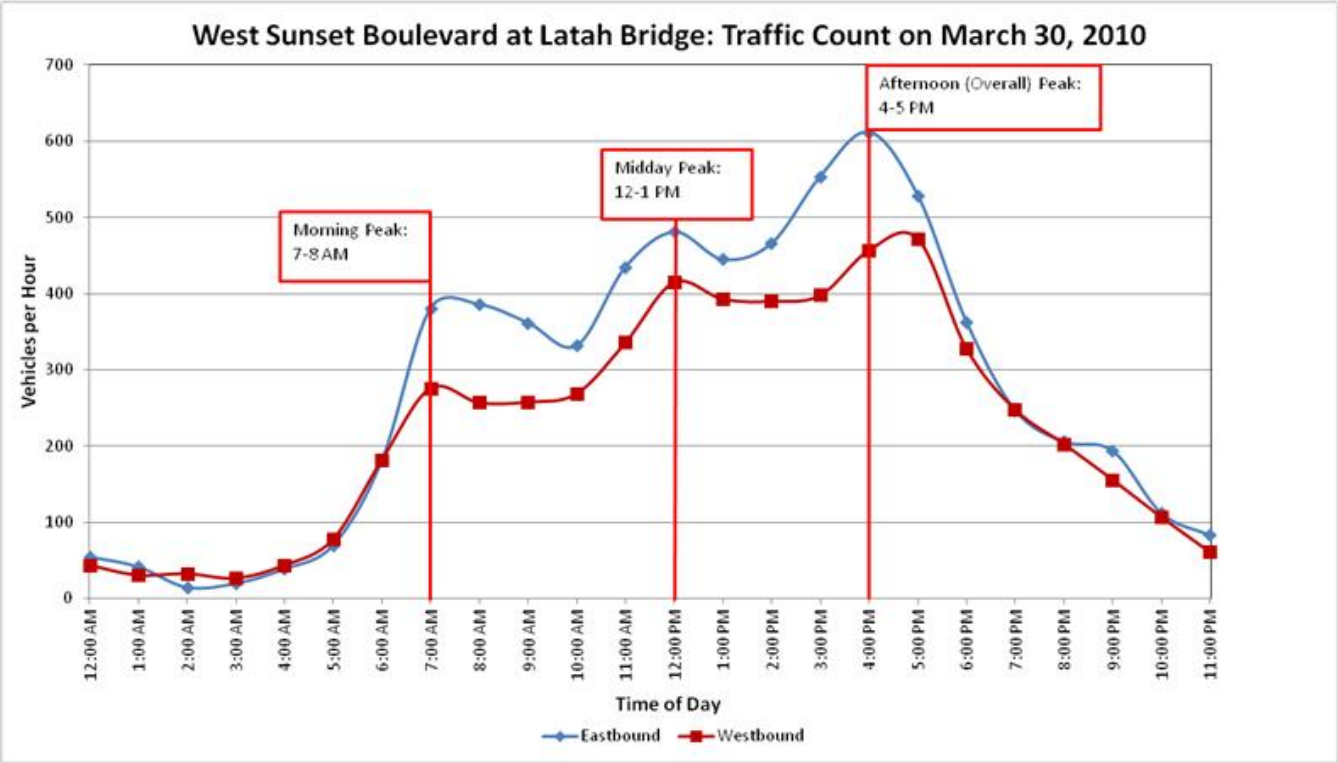
One daily 24-hour traffic count was conducted on Tuesday, March 30, 2010. The count was collected on West Sunset Boulevard near the west end of Latah Bridge. At this location, 6,610 vehicles travelled in the eastbound direction per day and 5,463 vehicles travelled in the westbound direction per day. The peak directional volume is, therefore, in the eastbound direction with approximately 55 percent of the total traffic volume.

Exhibit 2-9 summarizes the hourly volumes throughout the day of the count and shows that the eastbound direction is the peak traffic direction between the morning peak period and the afternoon peak period. During the morning peak period, 381 vehicles traveled in the eastbound direction and 276 vehicles traveled westbound. During the afternoon peak period, 612 vehicles traveled eastbound and 457 traveled westbound. Therefore, the afternoon peak was considered for the traffic analysis.

Vehicle Classification Data

Vehicle classification data were collected with the daily 24-hour count. The vehicle classification data were organized into the 13 vehicle types defined by the Federal Highway Administration (FHWA). The data were combined into two groups, Passenger Cars (FHWA Types 1 to 3) and Heavy Vehicles (FHWA Types 4 to 13). Overall, approximately 5 percent of the traffic on West Sunset Boulevard is considered to be heavy vehicles.

EXHIBIT 2-9. *West Sunset Boulevard, at Latah Bridge, 24-Hour Traffic Count*



Source: City of Spokane Street Department.

Afternoon Peak Hour Traffic Volumes

An afternoon peak-period turning movement count was conducted on November 2, 2010, at the West Sunset Boulevard and South Government Way intersection, and, on November 9, 2011, at the following intersections:

- Inland Empire Way and West 7th Avenue
- West Sunset Boulevard and Coeur d'Alene Street
- West Sunset Boulevard and Cannon Street
- West Sunset Boulevard and West 4th Avenue

The counts occurred between 4 p.m. and 6 p.m. in the afternoon. The afternoon peak hour occurred between 4:15 p.m. and 5:15 p.m. The afternoon peak hour turning movement counts were rounded and balanced between intersections to account for differences in traffic volumes over the one-year period between count studies. Exhibit 2-10 presents a summary of the existing (2011) afternoon peak hour turning movement volumes used in the intersection operational analysis. Appendix E contains the traffic count data collected in the study area. Additional traffic counts were conducted than required to complete the intersection analysis to better understand the traffic volumes for the various roadway segments in the study area.

LEGEND

2 ← Intersection Number

2 (2011 Existing LOS) 2 (2030 No Build LOS)

LOS Level-of-Service
- LOS A - D
- LOS E
- LOS F

Study area

Signalized intersection

Stop-controlled approach

Existing Lane Channelization

2030 No Build Lane Channelization

Yield-controlled right turn

Peak Hour Turning Movement Volumes

2030 No Build PM Peak Volumes
2011 Existing PM Volumes
2011 Existing PM Peak Volumes
2030 No Build PM Peak Volumes

LT	LT		LT	*LT*
TH	TH		XXX	*XXX*
RT	RT		RT	*RT*

KEY

LT: Left-turn volume
TH: Through volume
RT: Right-turn volume
XXX: Movement not allowed

1 W. Sunset Blvd & S. Government Way

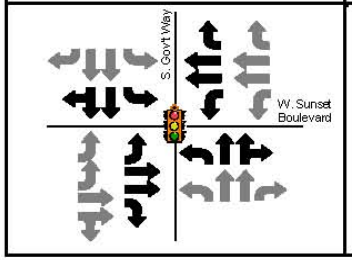
	LOS	Delay
2011 Existing	B	19
2030 No Build	C	*22*

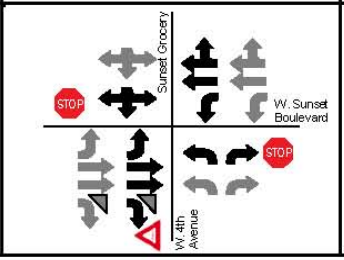
365	*250*	*260*	200	*205*	
70	90	220	330	*540*	
			60	*80*	
275	195				
695	585		10	95	40
110	20		*160*	*155*	*55*

2 W. Sunset Blvd & W. 4th Avenue*

	LOS	Delay
2011 Existing	F	85
2030 No Build	F	*>300*

20	*0*	*5*	15	*15*	
20	0	5	590	*1260*	
			30	*45*	
10	10				
800	585		120	XXX	80
365	340		*165*	*XXX*	*110*





NOTES

* Worst minor street stopped delay reported for two-way stop-controlled intersections.
City of Spokane level-of-service standard is LOS E.
These analyses were conducted using Synchro software, version 7, following the Highway Capacity Manual (HCM) methodologies. For signalized intersections, LOS/Delay results are from Synchro's HCM Signals report. For unsignalized intersections, LOS/Delay results are from Synchro's HCM Unsignalized report.

EXHIBIT 2-10
INTERSECTION VOLUMES, LANE CHANNELIZATION, AND LEVELS-OF-SERVICE
2011 EXISTING AND 2030 NO BUILD PM PEAK HOUR
Latah Bridge Rehabilitation Study

CH2MHILL

TBG110211012522SPK

Accident History

Accident data was provided by the Washington State Department of Transportation (WSDOT) Transportation Data Office for the period from January 1, 2006, to December 31, 2010 (see Appendix F). A total of 50 accidents were reported along West Sunset Boulevard for the 5-year period. Of the total, 22 accidents resulted in an injury, 26 resulted in property damage only, and 2 were unknown. No fatalities or pedestrian or bicyclist-involved accidents were reported.

The predominant accident types in the past 5 years were fixed object (24.0 percent), entering at angle (16.0 percent), and opposite direction-at angle (16.0 percent). The frequency of angle-type accidents is indicative of the numerous driveways and/or cross-streets along West Sunset Boulevard. Exhibit 2-11 summarizes the type and frequency of the accident.

EXHIBIT 2-11. *Accident Type Summary (January 2006 to December 2010)*

West Sunset Boulevard: South Government Way to West 4th Avenue

Accident Type	Number of Accidents	Percentage
Fixed Object*	12	24.0
Entering at Angle	8	16.0
Opposite Direction—At Angle	8	16.0
Same Direction—All Others	6	12.0
Rear End	6	12.0
Sideswipe	5	10.0
Same Direction—At Angle	2	4.0
Entering Driveway	1	2.0
Vehicle Overturned	1	2.0
Opposite Direction—All Others	1	2.0
Total	50	100

*Objects include bridge rail, concrete jersey barrier, fence, retaining wall, snow bank, street light, sign, or utility pole.

Source: WSDOT Collision Data Office, October 2011.

Roadway accident rates, expressed in “accidents per million vehicle-miles,” are used to assess the crash experience on that roadway and compare it to roadways of similar characteristics. An accident rate was calculated for West Sunset Boulevard on the basis of number of reported accidents between 2006 and 2010, as shown in Exhibit 2-12. The average annual accident rate of 2.27 accidents per million vehicle-miles compares favorably to the 2010 WSDOT Eastern Region accident rate of 2.62 for Principal Arterials in Urban areas.

EXHIBIT 2-12. *West Sunset Boulevard Accident Rate (January 2006 to December 2010)*

West Sunset Boulevard: South Government Way to West 4th Avenue

Year	Daily Traffic Volume[a]	Number of Collisions				Average Annual Collision Rate[b]
		PDO	Injury	Unknown	Total	
2006		5	6	1	12	
2007		10	6	1	17	
2008		4	6	0	10	
2009		3	3	0	6	
2010		4	1	0	5	
Overall	**12,073**	**26**	**22**	**2**	**50**	**2.27**

[a] From traffic count on March 30, 2010. In units of vehicles per day.

[b] Units for roadway accident rates are accidents per million vehicle-miles.

PDO = property damage only

2.4.2 Existing Intersection and Roadway Segment Operations

Methods and Assumptions

A Synchro traffic operations model, provided by the City of Spokane, was used to understand the traffic operations within the study area. This model was modified on the basis of information gathered for the project (traffic counts, field observations, and online aerial photography). The Synchro model uses methodology defined in the Highway Capacity Manual to analyze both signalized and stop-controlled intersections. The model computes level-of-service (LOS), delay, and vehicle queues to quantify traffic operations at intersections.

On the basis of existing turning movement counts, signal timing parameters, and forecasted traffic volumes from the region's travel demand model, a traffic operations analysis was conducted for the existing year (2011) and the project's design year (2030). The analysis for both of these analysis years focused on the afternoon peak hour because that is the time period when traffic volumes and congestion are highest during the day.

Intersection Operations

At signalized intersections, LOS defines the overall operations based on average control delay. Control delay is a complex measure dependent on a number of variables, including the quality of progression, the cycle length, the deceleration and acceleration delay, the stopped delay, and the amount of green time available to a particular traffic movement. Exhibit 2-13 describes the LOS and delay criteria at signalized intersections.

The level-of-service for stop-controlled intersections is defined by the control delay at the minor stop-controlled approach. Control delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line. Exhibit 2-14 describes the LOS and delay criteria at unsignalized intersections.

The City of Spokane has established a LOS standard of LOS E for signalized and stop-controlled intersections (City of Spokane, 2008). The highest level (LOS A) describes free-flow conditions in which vehicles experience minimal delay. The lowest level (LOS F) describes stop-and-go conditions in which long delays are experienced by most vehicles in the traffic stream.

EXHIBIT 2-13. *Level-of-Service Criteria for Signalized Intersections*

Level of Service	Average Control Delay (seconds per vehicle)	Traffic Flow Characteristics
A	Less than or equal to 10	Most vehicles arrive during the green phase and do not stop at all.
B	10 to 20	More vehicles stop, causing higher delay.
C	Great than 20 to 35	Vehicle stopping is significant, but many still pass through the intersection without stopping.
D	Greater than 35 to 55	Many vehicles stop, and the influence of congestion becomes more noticeable.
E	Greater than 55 to 80	Very few vehicles pass through without stopping.
F	Greater than 80	Considered unacceptable to most drivers. Intersection is not necessarily over capacity even though arrivals exceed capacity of lane groups.

Source: 2010 Highway Capacity Manual.

EXHIBIT 2-14. *Level-of-Service Criteria for Unsignalized Intersections*

Level of Service	Average Delay (seconds per vehicle)	Traffic Flow Characteristics
A	Less than or equal to 10	Little or no traffic delays for stop-controlled approaches.
B	Greater than 10 to 15	Short traffic delays for stop-controlled approaches.
C	Greater than 15 to 25	Average traffic delays for stop-controlled approaches.
D	Greater than 25 to 35	Long traffic delays for stop-controlled approaches.
E	Greater than 35 to 50	Intermittent queuing and very long traffic delays for stop-controlled approaches.
F	Greater than 50	Significant queuing on minor (stop-controlled) approaches and not enough gaps of suitable size to allow safe crossing of major street.

Source: 2010 Highway Capacity Manual.

The Synchro software program was also used to calculate the 95th percentile queue length at each approach of a signalized intersection and at the stop-controlled approaches of an unsignalized intersection. The 95th percentile queue length is the accepted measurement in the transportation industry for determining the necessary storage length at signalized intersections. The 95th percentile refers to the amount of time out of the peak hour of travel that the line of cars queued will be that distance or less. Designing to the 95th percentile queue length will minimize the occurrence of vehicles extending beyond the available storage capacity.

Roadway Segment Volume-to-Capacity Ratio

In addition to the intersection analysis, the performance of West Sunset Boulevard and Inland Empire Way was also analyzed using roadway segment volume-to-capacity (V/C) ratios. Three roadway segments were analyzed: West Sunset Boulevard (on the Latah Bridge), West Sunset Boulevard (east of Inland Empire Way), and Inland Empire Way (north of West 7th Avenue). Roadway capacity values used in this study are consistent with the values used in the Spokane Regional Transportation Council (SRTC) travel demand model. A V/C ratio greater than or equal to 0.80 indicates congested conditions.

Existing (2011) Operations and Deficiencies

The signalized intersection of West Sunset Boulevard and South Government Way currently operates acceptably at LOS B during the afternoon peak hour. The 95th percentile queue lengths calculated by Synchro during the afternoon peak hour show that the eastbound left-turn queue (180 feet) and southbound left-turn queue (180 feet) exceed the available storage capacity (100 feet each) of those turn pockets. Calculated queues for all other movements are within the available storage.

The stop-controlled approach of West 4th Avenue at West Sunset Boulevard currently operates acceptably at LOS C during the afternoon peak hour. The 95th percentile queue lengths calculated by Synchro during the afternoon peak hour for the stop-controlled movements are within the available storage. The queue of left-turning vehicles does, however, block the right-turning vehicles from entering the right-turn pocket.

Exhibit 2-15 summarizes the existing afternoon peak hour levels-of-service at the study intersections. Appendix G contains the Existing conditions Synchro worksheets.

EXHIBIT 2-15. *Existing (2011) Afternoon Peak Hour Intersection Operations*

Intersection	LOS	Delay[b]
West Sunset Boulevard and South Government Way	B	19
West Sunset Boulevard and West 4th Avenue[a]	C	19

[a] Worst minor street (West 4th Avenue) approach LOS/delay.

[b] In units of seconds per vehicle.

The three roadway segments currently operate with minimal congestion as the roadway V/C ratios are less than 0.80, although the eastbound direction along West Sunset Boulevard, on Latah Bridge, is just below the congestion threshold of 0.80. The roadway V/C ratios along West Sunset Boulevard, east of Inland Empire Way are noticeably lower than on Latah Bridge because of the second travel lane provided in each direction. Inland Empire Way operates with minimal congestion as V/C ratios are under 0.20. Exhibit 2-16 summarizes the existing afternoon V/C ratios on the study roadway segments.

EXHIBIT 2-16. *Existing (2011) Afternoon Peak Hour Roadway Operations*

Roadway Segment/ Direction	Lane Capacity*	Number of Lanes	Traffic Volume*	V/C Ratio
West Sunset Boulevard, on Latah Bridge				
Eastbound	1,100	1	845	0.77
Westbound	1,100	1	590	0.54
West Sunset Boulevard, east of Inland Empire Way				
Eastbound	1,100	2	950	0.43
Westbound	1,100	2	750	0.34
Inland Empire Way, north of West 7th Avenue				
Northbound	900	1	120	0.13
Southbound	900	1	165	0.18

*In units of vehicles per hour.

2.4.3 Future (2030) Conditions

Future Traffic Volumes

The adopted SRTC travel demand model was used to forecast the future afternoon peak hour growth in the project's study area. The latest version of SRTC's 2008 Metropolitan Transportation Plan (MTP) VISUM models for 2008 and 2030 were reviewed to determine the expected growth in traffic volumes along West Sunset Boulevard and Inland Empire Way.

Surrounding Background Projects

The forecasts include background projects from the MTP 2008 Update, but do not account for potential transportation investments or land use changes in the area (for example, light rail service) that have yet to be adopted by the City of Spokane. The MTP 2008 Update included the following projects in the immediate vicinity of the study area (SRTC, 2008).

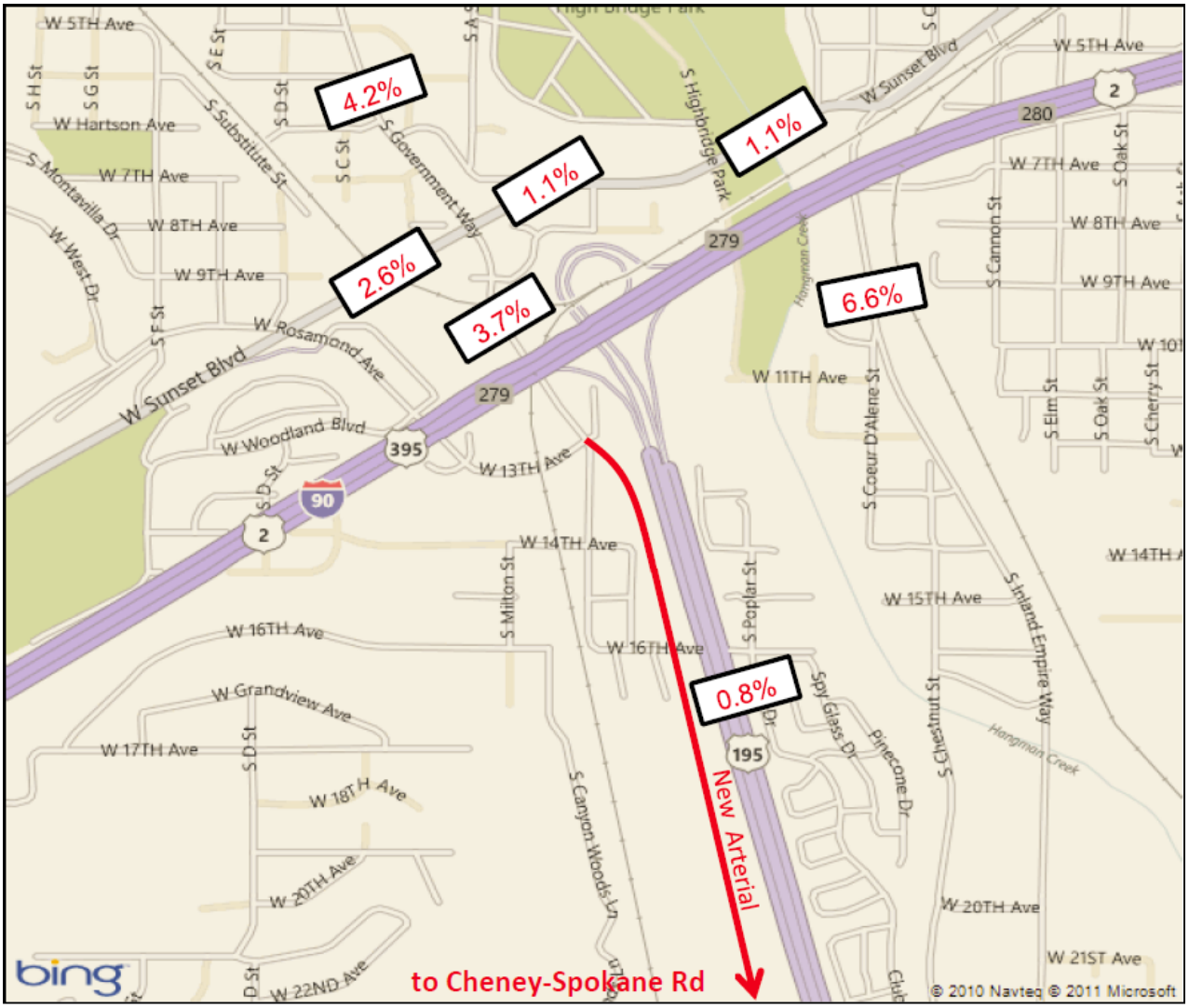
- **US-195 (Long-term Project Number 27).** Construct interchanges at Meadow Lane and Hatch Roads, WSDOT.
- **US-195 (Long-term Project Number 28).** Construct interchange at Cheney-Spokane Road, including new City of Spokane arterial to Lindeke Street, WSDOT.

These projects include a Thorpe Road overcrossing with US-195 and improvements at the Government Way and Sunset Boulevard intersection that are described in further detail later in this section.

Traffic Forecasts

Exhibit 2-17 summarizes the forecasted annual afternoon peak hour growth rates on West Sunset Boulevard, South Government Way, South Lindeke Street, Inland Empire Way, and US-195. West Sunset Boulevard is expected to experience an annual growth rate of slightly more than 1 percent per year. This growth rate is relatively less than the growth expected on Government Way/Lindeke Street and Inland Empire Way. This is because of the travel pattern changes caused by the background projects described in the previous section. This is especially noticeable when comparing the growth rate projected along Inland Empire Way. US-195 overcrossing improvements at Thorpe Road are expected to provide a more convenient movement across US-195 thereby creating a more attractive corridor to use.

EXHIBIT 2-17. *Average Annual Afternoon Peak Hour Roadway Growth Rates*



To reflect these growth rates into the intersection and roadway analysis, forecasting techniques, outlined in National Cooperative Highway Research Program (NCHRP) Report 255, "Highway Traffic Data for Urbanized Area Project Planning and Design," were applied to estimate future year 2030 No Build intersection turning movement volumes.

This process involved taking SRTC's 2008 and 2030 VISUM model results and existing (2011) traffic data to develop intersection turning movement volumes. This process is an iterative volume-balancing approach that distributes SRTC's forecasted segment volume growths onto the existing 2011 count data to determine the future year 2030 intersection turning movement volumes. To finalize the process, the turning movement volumes were rounded and balanced between adjacent intersections, when applicable. The future 2030 PM peak hour traffic volumes were then analyzed under the 2030 No Build alternative.

Future (2030) No Build Intersection and Roadway Segment Operations

Future afternoon peak hour traffic conditions were analyzed for the No Build alternative in the design year (2030). Forecasted roadway segment volumes and intersection turning movements developed in the previous

section were used to analyze the three roadway segments and two intersections in the project's study area. Exhibit 2-18 shows the design year (2030) afternoon peak hour traffic volumes forecasted for the intersection operational analysis.

No Build Intersection and Roadway Improvements

As part of the US-195-Hatch Road to Interstate 90—Proposed Design project, future intersection improvements are proposed at the West Sunset Boulevard and South Government Way signalized intersection. These improvements include adding a northbound right-turn pocket, a southbound right-turn pocket, and modifying the eastbound approach to have dual left-turn pockets, a through lane, and a shared through/right-turn lane. These improvements are indicated in the proposed design included in WSDOT (2011a).

These improvements were incorporated into the 2030 No Build intersection analysis. No other improvements are assumed within this project's study area. Exhibit 2-10 shows the intersection control and lane channelization analyzed in the 2030 No Build alternative.

Future (2030) No Build Operations and Deficiencies

Under the No Build alternative, the signalized intersection of West Sunset Boulevard and South Government Way is expected to operate acceptably at LOS C during the afternoon peak hour. The 95th percentile queue lengths calculated by Synchro during the afternoon peak hour show that the westbound left-turn queue (115 feet), northbound left-turn queue (140 feet), and southbound left-turn queue (225 feet) are expected to exceed the available storage capacity of those turn pockets (100 feet, 75 feet, and 100 feet, respectively). Queues for all other movements are within the available storage. The proposed intersection improvements on the eastbound approach resolve the existing deficiency of the eastbound left-turn queue.

The stop-controlled approach of West 4th Avenue at West Sunset Boulevard is expected to operate poorly at LOS F during the afternoon peak hour. It will exceed the City of Spokane's level-of-service standard of LOS E. The 95th percentile queue lengths calculated by Synchro during the afternoon peak hour for the stop-controlled movements are within the available storage. The queue of left-turning vehicles will lengthen and continue to block the right-turning vehicles from entering the right-turn pocket. Exhibit 2-18 summarizes the 2030 No Build afternoon peak hour levels-of-service at the study intersections. Appendix G contains the 2030 No Build Alternative Synchro worksheets.

EXHIBIT 2-18. *Future (2030) No Build Afternoon Peak Hour Intersection Operations*

Intersection	LOS	Delay[b]
West Sunset Boulevard and South Government Way	C	22
West Sunset Boulevard and West 4th Avenue[a]	**F**	**190**

Bold type text indicates intersections that do not meet the City of Spokane LOS standards.

[a] Worst minor street (West 4th Avenue) approach LOS/delay.

[b] In units of seconds per vehicle.

Two of the three roadway segments are expected to operate acceptably with V/C ratios less than 0.80. Only the eastbound direction of West Sunset Boulevard, on Latah Bridge, is expected to experience congested conditions, with a V/C ratio of 0.92. The westbound direction for the same roadway segment on Latah Bridge is expected to operate close to congested conditions with a V/C ratio of 0.75. Exhibit 2-19 summarizes the future (2030) No Build afternoon peak hour V/C ratios on the study roadway segments.

EXHIBIT 2-19. *Future (2030) No Build Afternoon Peak Hour Roadway Operations*

Roadway Segment	Lane Capacity*	Number of Lanes	Traffic Volume*	V/C Ratio
West Sunset Boulevard, on Latah Bridge				
Eastbound	1,100	1	1,010	**0.92**
Westbound	1,100	1	825	0.75
West Sunset Boulevard, east of Inland Empire Way				
Eastbound	1,100	2	1,195	0.54
Westbound	1,100	2	1,455	0.66
Inland Empire Way, north of West 7th Avenue				
Northbound	900	1	200	0.22
Southbound	900	1	635	0.71

Bold type text indicates roadway segments that are expected to operate with a V/C ratio exceeding 0.80.

*In units of vehicles per hour.

2.4.4 Freight

West Sunset Boulevard is classified by the City of Spokane as a Principal Arterial in the *2011 Comprehensive Plan* (City of Spokane, 2011b). This street is a required truck route for single unit vehicles of more than 10,000 gross volume weight, semi-tractor trailers, and trucks with trailers used in intercity or interstate hauling (City of Spokane, 2010). The route provides surface street connection between Spokane International Airport and downtown Spokane, and is commonly used by air/ground freight delivery vehicles. The route is used by private and public refuse haulers for local access to/from the Spokane Solid Waste Disposal & Recycling Facility on Geiger Avenue, near the Airport. The Latah Bridge, in its current two-lane operating condition, does not impose any load restrictions on truck traffic.

2.4.5 Transit

Spokane Transit Authority (STA) currently uses the Sunset Boulevard Corridor, and the Latah Bridge with two fixed-route bus services. Route 60 connects downtown Spokane with Spokane International Airport, via the Browne's Edition neighborhood. Route 61 connects downtown Spokane with the City of Airway Heights and Fairchild Air Force Base. Coaches provide service on 30-minute intervals. STA estimates that the two routes comprise 60 trips in each direction on weekdays, to account for roughly 1,000 to 1,400 passengers (Otterstrom, 2011).

Exhibit 2-20 illustrates the four bus stop locations on Sunset Boulevard within the project limits. In the east-bound direction, the first stop is east of the Government Way intersection. The second east-bound stop is approximately 60 feet west of the west end of the Latah Bridge, between the bridge end and Lindeke Street. In the west-bound direction, the first stop is at the intersection of Sunset Boulevard and Lindeke Street. The second west-bound stop is east of the Government Way intersection.

EXHIBIT 2-20
NON-MOTORIZED AND TRANSIT OPERATIONS
Latah Bridge Rehabilitation Study

TBG110211012522SPK

CH2MHILL

Exhibit 2-21 shows the STA route number, description, service days, service times, typical headways, and stops served by each route. No Park-and-Ride lots are located in the study area.

EXHIBIT 2-21. *Spokane Transit Authority Routes Within Study Area*

Route Number	Route Name	Service Days	Service Times*	Typical Headways	Study Area Stops
60	Airport via Browne's Addition	Weekdays	6 a.m. to 11:30 p.m.	30 minutes	West Sunset Blvd at South Government Way
		Saturdays	6 a.m. to 9:30 p.m.	60 minutes	
		Sundays	8 a.m. to 7:30 p.m.	60 minutes	West Sunset Blvd, just west of Latah Bridge
61	Highway 2 via Browne's Addition	Weekdays	5:40 a.m. to 11 p.m.	30 minutes	West Sunset Blvd at South Government Way
		Saturdays	6 a.m. to 10 p.m.	60 minutes	
		Sundays	8 a.m. to 8 p.m.	60 minutes	West Sunset Blvd, just west of Latah Bridge

*Service times are approximate.

Source: http://www.spokanetransit.com

The current mix of coaches that may be currently used on the Latah Bridge is shown in Exhibit 2-22 (Spokane Transit Authority, 2011).

For the long term, in order to meet anticipated growth and transit demand in Airway Heights, STA is planning to provide High Performance Transit options on Sunset Boulevard (Spokane Transit Authority, 2010). High Performance Transit service would run every 10 minutes during peaks, and every 15 minutes off peak. It is possible that passenger demand may ultimately require even greater frequency of service in this corridor. STA may deploy articulated (60-foot) coaches on the corridor (Otterstrom, 2011).

STA has indicated that the cost/benefit analysis is not favorable for light rail transit within their planning horizon. However, for this project, STA recommends that the City consider long-term bridge rehabilitation designs that would accommodate light rail loading and fixtures (Otterstrom, 2011).

EXHIBIT 2-22. *STA Fleet Mix, Courtesy of STA*

Eldorado "Cutaway"
Quantity: 7 (purchased in 2007)
Weight: 11,020 lbs. Wheelbase: 176" Seats: 16

30-Foot Gillig Diesel/Electric Hybrid
Quantity: 3 (purchased in 2009)
Weight: 24,000 lbs. Wheelbase: 163" Seats: 26

30-Foot Gillig Diesel
Quantity: 10 (purchased in 2003)
Weight: 22,360 lbs. Wheelbase: 163" Seats: 26

35-Foot Gillig Diesel
Quantity: 26 (13 purchased in 2003, 10 in 2005 & 3 in 2007)
Weight: 25,720 lbs. Wheelbase: 235" Seats: 32

40-Foot New Flyer Diesel
Quantity: 25 (purchased in 1997)
Weight: 26,960 lbs. Wheelbase: 293" Seats: 39

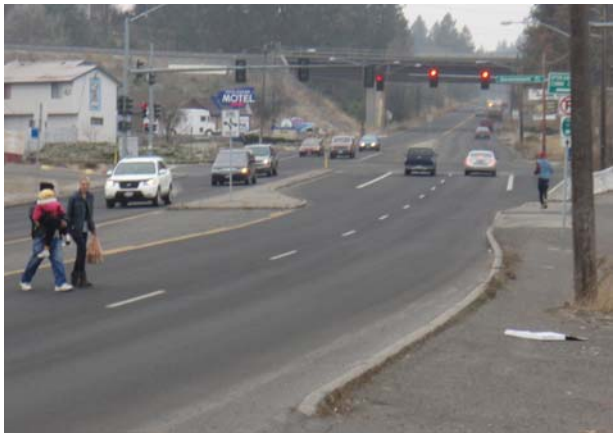
40-Foot Gillig Diesel
Quantity: 56 (19 purchased in 2006, 14 in 2007, 14 in 2008, & 9 in 2009)
Weight: 27,420 lbs. Wheelbase: 279" Seats: 39

40-Foot Gillig Diesel/Electric Hybrid
Quantity: 19 (3 purchased in 2007, 6 in 2008, & 10 in 2010)
Weight: 28,980 lbs. Wheelbase: 279" Seats: 39

61-Foot New Flyer Diesel Articulated
Quantity: 10 (6 purchased in 2006, & 4 in 2009)
Weight: 41,000 lbs. Wheelbase: 529" Seats: 62

2.4.6 Nonmotorized

Within the project limits, Sunset Boulevard has intermittent sidewalks on both sides of the street. Exhibit 2-20 depicts the nonmotorized facilities and associated deficiencies. Sidewalks are missing from Government Way to 7th Avenue along both sides of Sunset Boulevard. East of 7th Avenue, 5-foot sidewalks are on both sides of the street all the way to the Latah Bridge. East of the Latah Bridge, a 5-foot sidewalk runs along the north side of Sunset Boulevard to the east project limit at 4th Avenue. No sidewalk exists for approximately 470 feet, between the Inland Empire overpass, and Cannon St.



Intermittent sidewalks along Sunset Boulevard

While a formal accessibility survey has not been accomplished as part of this project, curb ramps at a number of intersection corner locations are not available, and/or do not appear to meet current Americans with Disabilities Act (ADA) guidelines. Detectable dome warning devices and adequate landings are some of the notable deficiencies.

The Latah Bridge has sidewalks on both sides. The sidewalks were originally constructed to be 7 feet wide, from the face of curb to the bridge railing. In the 1980s a City safety project placed concrete bridge railing along the top of the curb, reducing the available sidewalk width to 5.5 feet. At each of the six pier locations, the bridge sidewalk expands to provide an additional 5.5- by 17-foot pedestrian refuge, suitable for viewing the Latah Valley from multiple vantages.

Curb ramps are missing from the intersection of Coeur d'Alene Street and Sunset Boulevard.

The City's minimum sidewalk width for principal arterials is 5 feet (City of Spokane, 2007). Sidewalks are required on both sides of the street. A bridge rehabilitation project should, therefore, ensure that the minimum sidewalk widths are provided and that curb ramps meet current ADA guidelines.

Pedestrian and bicyclist volumes were collected. These counts showed that three total pedestrians crossed and five bicyclists travelled through the West Sunset Boulevard and South Government Way intersection in the afternoon peak hour. Four total pedestrians crossed West Sunset Boulevard at the marked crossing to the west of West 4th Avenue. The low number of nonmotorized users could be because of November weather, and travel in this area is primarily vehicle-oriented.

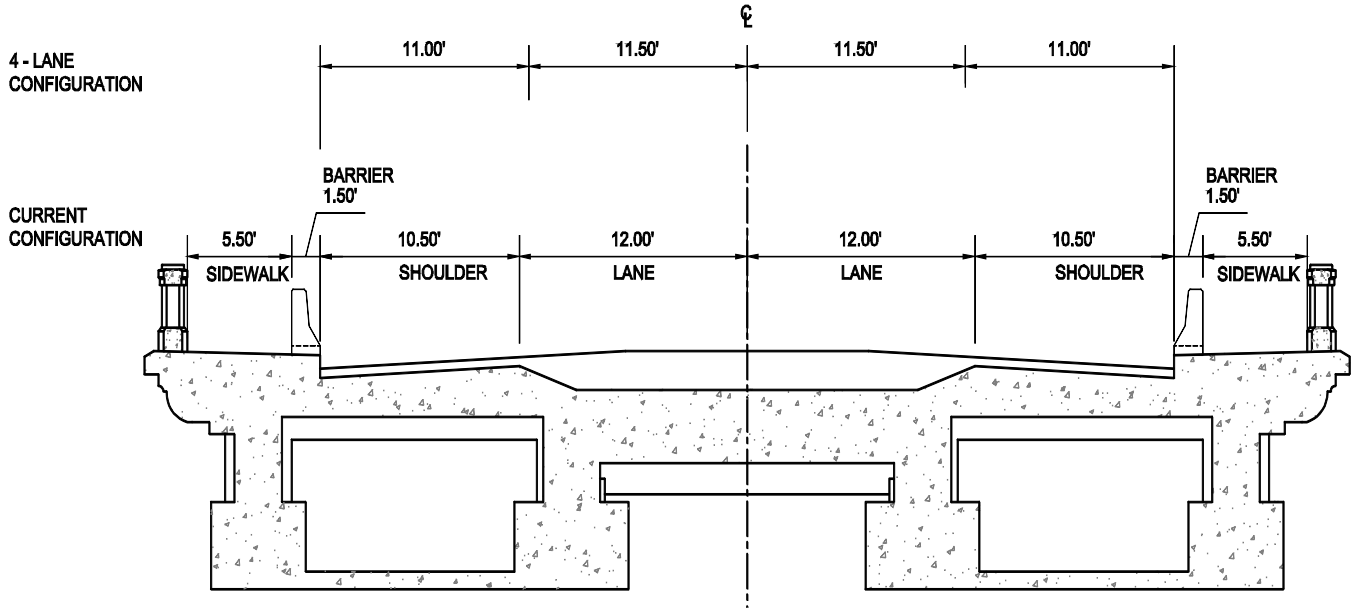
In 2009, the City of Spokane adopted a *Master Bike Plan* that facilitates planned bicycling related infrastructure improvements into an update of the City's *Comprehensive Plan*. The *Master Bike Plan* identifies the Sunset Boulevard corridor, within the project limits, to ultimately have marked, shared travel lanes—meaning that bicyclists would share travel lanes with vehicles, and that signs or pavement markings would notify drivers that lanes are to be shared (City of Spokane, 2009).

Grant Wencel, City of Spokane Pedestrian/Bike Coordinator, stated that the *Bike Master Plan* designates bike lanes on Sunset Boulevard, west of Government Way. According to Mr. Wencel, the primary reason that bike lanes were not designated for Latah Bridge was because of the limited curb–to-curb width available. Mr. Wencel suggests that any bridge widening options considered as part of this Study include bike lanes on the bridge segment. This recommendation aligns with the City's goals and objectives to include non-motorized considerations for bridge rehabilitation scenarios.

2.4.7 Bridge Capacity and Safety Review

The Latah Bridge roadway section is shown in Exhibit 2-23. The curb-to-curb width is 45 feet. In modern times, the bridge deck has supported four traffic lanes (four-lane configuration)—two 11-foot (minimum) lanes in each direction. Because of deteriorating structural conditions and capacities, the City has limited the bridge to two travel lanes (current configuration)—one 12-foot lane in each direction. Large shoulders currently provide space for bicyclists to traverse the bridge outside of roadway travel lanes.

EXHIBIT 2-23. *Bridge Roadway Section*



The existing bridge configuration has been reviewed against City minimum standards for Principal Arterials. These minimum standards provide baseline requirements for City transportation infrastructure in order to ensure that "minimum requirements of the public are met, including safety, welfare, convenience, aesthetics and economical maintenance" (City of Spokane, 2007). Both configurations of the bridge have been compared to City standards, and the results are shown in Exhibit 2-24.

EXHIBIT 2-24. *Roadway Standards Review*

Feature	Principal Arterial City Standards	Current 2-Lane Configuration	4-Lane Configuration
Sidewalk	Required on both sides. Minimum 5-foot with.	5.5 feet[a]	5.5 feet[a]
On-street parking	8 feet	N/A	N/A
Exterior through lane	12 feet	N/A	11 feet
Interior Through Lane	12 feet	12 feet	11.5 feet
Bicycle facilities			
Shared-use lane	15 feet	N/A	N/A
Bicycle lane	5 feet	N/A	N/A
Paved shoulder	5 feet	10.5 feet	N/A
Curb-to-curb width	Varies[b]	45 feet	45 feet

[a] Physical dimension of sidewalk on bridge is 7 feet in width. Retrofitted barrier is 1.5 feet wide at base resulting in a 5.5-foot sidewalk width.

[b] Curb-to-curb width varies depending on road features including number of lanes, on-street parking, bike lane, median, and turn lanes.

The bridge currently meets minimum standards for principal arterials, with the exception of lane widths in the four-lane configuration. Although it is not uncommon for bridge structures to have narrow travel lanes, bridge rehabilitation alternatives that involve and bridge deck widening should adhere to the minimum standards as identified in the City of Spokane Design Standards for vehicular and nonmotorized facilities.

2.5 Environmental

A preliminary environmental evaluation was conducted of the historic Latah Bridge to briefly describe baseline or existing environmental conditions of the bridge. The intent of this initial evaluation is to identify potential environmental elements that may influence bridge rehabilitation solutions. Where applicable, the evaluation extended beyond the bridge structure and bridge footprint to approximately a 0.5-mile radius from the bridge. The environmental elements evaluated are those evaluated through National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) processes, and are summarized in Exhibit 2-25.

EXHIBIT 2-25. *Existing Environmental Conditions*

Environmental Element	Existing Conditions
Earth	Soils that are prevalent in project area (identified through U.S. Geological Survey [USGS] maps} are river wash (Rh) in the Latah Creek channel with 13.7 percent slope, Springdale gravelly loamy sand (SzE) with 8 percent slope on the east bank, and marble variant sandy loam (McB) and Speigle very stony silt loam (SoE) with 48.6 percent and 23.8 percent slope, respectively, on the west bank (NRCS, 2011). Soils on the creek banks are highly erodible. Hazardous geology lies west of the project and south of I-90, approximately 2,500 feet away from the project site.
Air	Spokane is in a maintenance area for carbon monoxide and PM_{10} (particulate matter). The project is listed in Spokane's *Metropolitan Transportation Plan* but is not listed in *State Transportation Improvement Plan* (STIP) or in SRTC's *Transportation Improvement Plan* (TIP). Bridge improvement alternatives that add capacity to the bridge structure and corridor will require an Air Quality analysis.
Water	Latah Bridge crosses Latah Creek (also known as Hangman Creek). Latah Creek flows into the Spokane River, a tributary of the Columbia River. This reach of Latah Creek is designated a Category 5 stream for temperature, dissolved oxygen, pH, and fecal coliform on the 303(d) list of impaired waters. The creek is in the Hangman Water Resource Inventory Area (WIRA) 56 (Ecology, 2011d). The nearest Latah Creek tributary is Spring Creek, south of Latah Bridge and immediately south of I-90. Latah Bridge crosses the entire 100-year flood plain in the Latah Creek valley and crosses the 500-year flood plain found only on the west side of the bridge (City of Spokane, 2011a). The entire bridge is in a channel migration zone (an area where the creek is expected to meander through time). Placement of a structure in a floodplain is approved through the building permit process. Work above the floodplain (such as on bridge superstructure elements) does not require City floodplain approvals. Shorelines jurisdiction and buffer area/set back applies to property 200 feet from the ordinary high water mark (OHWM) of Latah Creek (and would require a City shorelines permit (Black, 2011). The shoreline designation is "urban conservancy environment" and it lies in the "Latah Creek district." Because the entire bridge is located within the shorelines buffer area, all work on the bridge (including work within the Latah creek valley or work above the valley) will require a shorelines permit. Additional water resources permitting may be required. Any work within or **over** the OHWM of Latah Creek would require a Hydraulic Project Approval (HPA) (includes work on the bridge deck). Any work within the OHWM of Latah Creek would require a Clean Water Act Section 401 Water Quality Certification and Clean Water Act Section 404 Permit from state and federal agencies. A categorical exemption is typically issued by the United States Army Corps of Engineers (USACE) that requires compliance with the general conditions of a Nationwide Permit. No wetlands are listed on the National Wetlands Inventory (NWI) (USFWS, 2011) at the project area and none are shown on the City Map website (City of Spokane, 2011a). The NWI shows a freshwater forested/shrub wetland approximately 1,500 feet southwest of the project.

EXHIBIT 2-25. *Existing Environmental Conditions*

Environmental Element	Existing Conditions
	Latah Bridge lies within the Spokane/Rathdrum Prairie aquifer sensitive area. This shouldn't be a concern as long as a spill prevention and countermeasures control (SPCC) plan is implemented during construction to prevent any spills or contamination from reaching the aquifer. Also, if contaminated soils are encountered during construction, clean-up or remediation would be necessary as an aquifer protection measure. No active drinking water wells exist in project area. Five water resource wells drilled by Washington State Department of Transportation (WSDOT) are located south of I-90 with depths of 124, 118, 99.5, 31, and 171 feet. Two other water resource locations were identified approximately 0.15 mile from the project. West of the project area are three wells drilled by the Time Oil Company. They are located at 8th and 7th Avenues (one well at 35 feet deep and the other two at 20 feet). East of the project are two wells drilled by Greyhound. They are located north of I-90 and south of 6th Avenue (Ecology, 2011e). Stormwater is currently collected at inlets on the bridge and either piped through the piers to the ground or simply discharged below the bridge. Some water collects inside the piers because of failed pipes. The rehabilitated bridge will need to comply with the *Spokane Regional Stormwater Manual.*
Wildlife	Wildlife listed by WDFW Priority Habitats and Species report includes terrestrial habitat, mule deer (*Odocoileus hemionus hemionus*), and rainbow trout (*Oncorhynchus mykiss*). The U.S. Fish and Wildlife Service (USFWS) lists the following threatened species for Spokane County: bull trout (*Salvelinus confluentus*), Spalding's catchfly (*Silene spaldingii*), and water howellia (*howellia aquatilis*). Grey wolf (*Canis lupus*) is listed in recovery status. No endangered or threatened species exist in the project area (WDFW, 2011 a, 2011b and WDFW, 2011c). No listings exist for Section 24, Township 25N, and Range 42E on the Washington Natural Heritage Features List (WDNR, 2011). City habitat designation for project area is riparian habitat, and the riparian habitat area is zoned No. 5. Latah Creek has a nonfish stream buffer of 150 feet (SMC, Chapter 17E.020.050) and is considered a wildlife corridor (Black, 2011).The bridge's nooks and crannies are used by a variety of nesting birds—including peregrine falcons *(Falco peregrines)*, swallows *(Hirundo rustica)* and white-throated swifts *(Aeronautes saxatalis)* (Spokesman Review, 2011). In Washington, peregrine falcon courtship (pre-nesting) generally takes place from February through March, with fledging (young leaving the nest) occurring by the end of July. Swallows and swifts may also nest on bridges during approximately same time period. Falcon presence may limit the construction schedule, or the type and location of construction that can take place on the bridge, especially during the nesting period. Townsend's big-eared bats (*Corynorhinus townsendii*) are known to use the bridge. It is designated as a state candidate species and a federal species of concern. Bridge-roosting bats likely use the bridge mostly in the evening/night and not during the winter. The roosting period overlaps with the nesting season of the peregrine and extends into late August. Similar to the falcons, the presence of bats may interfere with the desired construction schedule, or prevent construction or rehabilitation of the bridge during sensitive times (nesting and hibernation times should they be occurring on the bridge) or at least restricting construction activities in those parts of the bridge being used by bats during these times. Fish and fish habitat protection is not anticipated to be an issue in Latah Creek (Divens, 2011).
Energy and Natural Resources	Fuel consumption is not anticipated to increase as a result of the bridge rehabilitation. The consumption of energy (fuel) from automobiles should remain the same as what would be found from vehicles on those access streets currently serving the bridge. Traffic patterns, volumes and speed zones are anticipated to remain the same with bridge rehabilitation. Bridge rehabilitation options are favorable from a natural resources conservation perspective as compared to building a new replacement bridge.
Environmental Health (noise and hazardous materials)	A preliminary search of the Washington State Department of Ecology's (Ecology's) website and discussions with City Planning (Black, 2011) revealed only one potential hazardous waste site in the vicinity of the bridge. Three underground storage tanks (USTs) were removed at Sunset Food Mart (2627 West Sunset Blvd.) west of the bridge. The bridge rehabilitation project is not expected to generate hazardous materials from bridge demolition or bridge operations.

EXHIBIT 2-25. *Existing Environmental Conditions*

Environmental Element	Existing Conditions
	Noise in the project area is generated from existing traffic on Latah Bridge and I-90, and from a railroad viaduct immediately south of the bridge. Potential projects that add capacity to the bridge and Sunset Boulevard may require a noise study to ascertain impacts to receptors in the project area.
Land Use/ Housing/ Relocation	Land use beneath Latah bridge is conservation/open space (Highbridge Park), and it is zoned residential single family (RSF). High density residential (Browne's Addition Historic District) is northeast of the bridge, and medium-level residential (Ninth Avenue Historic District) is southeast of the bridge. Directly east of the bridge is zoned downtown central and directly south of that area is zoned office retail. A mix of general commercial, neighborhood retail, and medium-level density residential is northwest of the bridge and low- to medium-density residential is southwest of the bridge. A railroad viaduct and I-90 is immediately south of the bridge, with I-90 ramps, and SR 195 southeast of Latah Bridge. If bridge alternatives selected for study result in housing or business relocation, the costs in acquiring right of way should be included in the overall project costs. If the ownership of replaced housing and businesses are minority or low-income populations, an environmental justice evaluation and report will be necessary to determine if a disproportionate impact is occurring to those populations and if so, recommend mitigation measures.
Environmental Justice	Within the immediate area of Block Group 1, Census Tract 38 (Census, 2000), the total population is 706, with the White population of 696 (99 percent). Of the remaining 1 percent, most are Asian, Hispanic, or Black. The total population is 1,746 for the 2010 Census and remains 99 percent White (Census, 2010). The City of Spokane's minority population concentration is approximately 28 percent, so the Census Tract and Block Group where the project is located have a lower minority concentration than the larger geographic area of Spokane. Poverty information is only available for the 2000 Census total population. Fewer than 1 percent of the households were at the poverty level (U.S. Census, American Fact Finder). The minority and low-income populations in the project area are low; however, in any case, the bridge rehabilitation project is anticipated to have the same affect on all groups of people.
Aesthetics, Light and Glare	The bridge has pleasing aesthetic characteristics, with arches supporting the bridge and an aesthetically pleasing balustrade that lines each side of the bridge. Lights are currently provided on the bridge, although a consistent lighting level along the bridge is currently not provided. The architectural and historic elements of the bridge should be preserved in compliance with Section 106 of the National Historic Preservation Act of 1966 (as amended), which is discussed below in this table under cultural resources.
Recreation [including Section 4 (f) Evaluation]	The City of Spokane's Highbridge Park lies underneath the bridge and is within the project area. This will likely result in a Section 4(f) evaluation of the bridge project and consultation with City Parks and Recreation Department. The goals of the evaluation and consultation will be to ensure that (1) use of the park for project purposes during bridge rehabilitation will be avoided, (2) public use of the park will be continued during rehabilitation, and (3) impacts to the park will be minimized.
Cultural Resources	The Latah Bridge is listed in the National Register of Historic Places (NRHP) and the Washington Heritage Register (WHR), but not on the Spokane Register for Historic Places (SRHP). Its character-defining features are the concrete arches that support the bridge and the balustrade that lines the bridge on both sides of the Sunset Boulevard roadway. The bridge is also noted as one of the "commanding architectural focal points within the city." Two historic districts within the 0.5-mile research area are listed on the NRHP and the WHR, but not on the SRHP: Browne's Addition Historic District and the Ninth Avenue Historic District, are shown in Exhibit 2-26. In addition to evaluation of effects to the bridge itself, consideration must also be given to the effects to the historic districts (direct, indirect, and proximity) that may include changes to the viewshed from the districts, noise effects, and effects related to project construction.

EXHIBIT 2-25. *Existing Environmental Conditions*

Environmental Element	Existing Conditions
	Seven archaeological sites have been documented within the 0.5-mile search radius. Of these sites, two were determined not eligible for listing in the NRHP. No determination of eligibility has been completed for the remaining five. However, one of these sites (45SP16) is an Indian camp site and is located near Latah Bridge. Therefore, a high potential exists for intact subsurface cultural deposits within the project area. No known Traditional Cultural Properties (TCP) exist in the project area; however, the Spokane and Coeur d'Alene Tribes have stated that Tribal consultation would be necessary for both the potential archaeological site and TCP, and would likely lead to an archaeological survey with subsurface testing, a TCP evaluation and/or an ethnographic study. Because of the historic properties and the immediately adjacent city park (Highbridge Park), compliance with Section 4(f) of the Department of Transportation Act would be required if federal funding is acquired. No cemeteries were identified within the 0.5-mile radius search area. A detailed documentation of the preliminary cultural resource investigations is provided in Appendix H.
Transportation	Lane restrictions are in force that restrict the bridge designed (originally as a four-lane bridge) to two lanes (one lane each way). This restriction reduces the vehicle capacity of the bridge, causes traffic congestion, and may lead to more accidents as vehicles merge from two lanes to one from both east and westbound directions. Bridge rehabilitation alternatives may include additional travel lanes and address some of these safety concerns.
Socioeconomic	Latah Bridge serves as an important nonfreeway link between the main city metropolis and the residential, commercial, and industrial areas that lie west of Latah Creek. It also connects and provides an alternative route from the city center to Spokane Falls Community College, Northern Quest Casino, Fairchild Air Force Base, Spokane Interstate Airport, and the West Plains. This linkage supports socioeconomic functions occurring both east and west of Latah Creek.
Public Services	No public schools, hospitals or fire stations are located within or near Project area. The proposed project should not require additional public services.
Utilities	The bridge is a vital link for utilities, especially for communications links to the West Plains from downtown Spokane. Utilities currently crossing Latah Bridge are the two City of Spokane's 12-inch water mains and several communications conduits in a duct bank for CenturyLink. Two sewer lines cross north-south underneath the bridge.

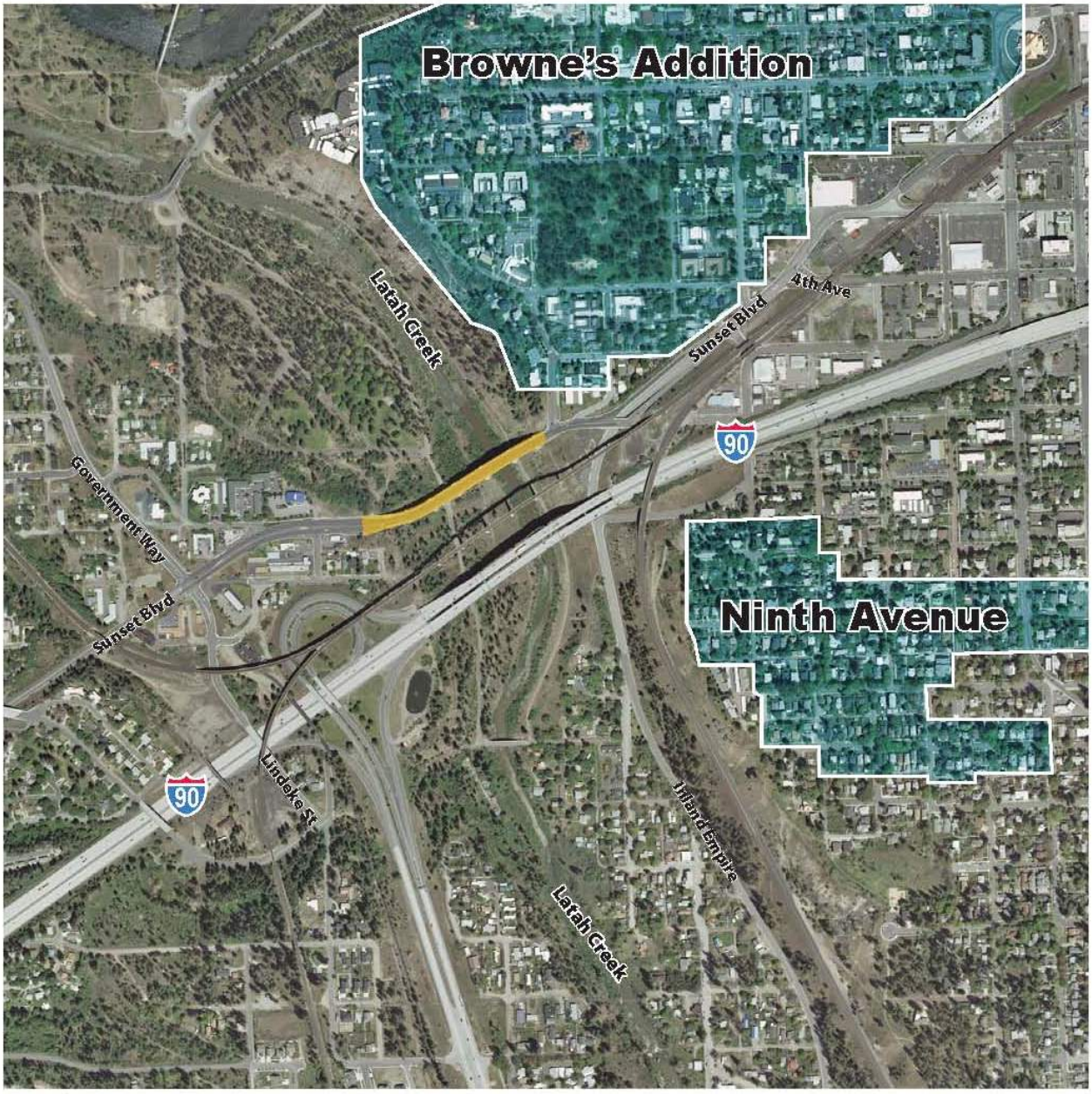


EXHIBIT 2-26
LATAH BRIDGE AND ADJACENT
HISTORIC DISTRICTS
Latah Bridge Rehabilitation Study

TBG110211012522SPK

Preliminary research indicates that the NEPA/SEPA environmental elements in Exhibit 2-27 will be of most concern, resulting in additional research, studies, evaluations, permitting, or consideration as the bridge rehabilitation project moves forward into design and construction.

EXHIBIT 2-27. ***Environmental Elements of Concern***

Environmental Element	Issue
Water	Water resource (Latah Creek) protection and permitting. Acquisition of permits must be considered in the project schedule. Protection of shorelands, Latah Creek, and the aquifer may lead to mitigation measures (for example, limit construction activities and methods in shoreland areas and in Latah Creek; and protect surface and ground waters by implementing SPCC Plans, preventing debris from entering Latah Creek, and compliance with water quality standards such as creek turbidity).
Wildlife	No endangered or threatened species, but priority species (Peregrine falcons and Townsend big-eared bats) use the bridge. May limit or restrict construction schedule and activities.
Environmental Health (hazardous materials)	Records show removal of USTs near the west side of the bridge project at 2627 West Sunset Blvd. that might be a source of hazardous materials. May result in site cleanup should hazardous materials be encountered during construction.
Recreation	Section 4(f) compliance— avoid and minimize harm to Highbridge Park and maintain public use of the park. May limit or control construction activities (for example, avoid debris dropping into the park and potentially harming park users, avoid parkland ground disturbance or acquisition, and prevent disruption to park public access). Also, protect historic resources as discussed further in this table under cultural resources.
Cultural Resources	Section 106 compliance– the bridge is listed in the NRHP, and has adjacent NRHP historic districts and archaeology sites, and a possible TCP. Must prevent adverse harm to historical structural elements of the bridge (particularly architectural elements that are highlighted in historic preservation reports such as the arches and balustrades), avoid adverse harm to neighboring historic districts, avoid disturbance to existing archeological sites and protect any that might be found during construction when ground is disturbed, and coordinate with the tribes and DAHP on cultural resource documentation including possible preparation of a TCP evaluation or ethnographic study.
Other	Other issues may arise that would require further study and possible mitigation measures, depending upon the alternative selected. All environmental elements will be evaluated during the alternative evaluation to compare differences. After a final alternative is selected, an additional environmental review will be conducted to look at environmental impacts, specific to the selected alternative.

Section 3
Works Cited and References Consulted

Black, Tirrell. 2011. City of Spokane Planner. Personal conversation with Marlena Guhlke (CH2M HILL). November 18.

City of Spokane. 2007. *City of Spokane Design Standards*. February.

City of Spokane. 2008. *Transportation Concurrency Level of Service Standards.* December 26.

City of Spokane. 2009. *Spokane Master Bike Plan.*

City of Spokane. 2010. *Required Routes for Semi-Tractor Trailers and Trucks with Trailers.* January,

City of Spokane. 2011a. City Map. http://www.spokanegis.org/citymap2/.

City of Spokane. 2011b. *2011 Comprehensive Plan*. Revised April 4.

Divens, Karin. 2011. Washington State Department of Fish and Wildlife Biologist. Conversation with Latah Bridge stakeholders committee meeting on December 9, 2011.

National Cooperative Highway Research Program. 1982. *Highway Traffic Data for Urbanized Area Project Planning and Design*. Report 255. Transportation Research Board. Washington D.C. December.

Natural Resources Conservation Service. 2011. *Web Soil Survey, National Cooperative Soil Survey, Soil Map.* http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed November 8.

Otterstrom, Karl. 2011. Spokane Transit Authority Director of Planning. E-mail correspondence with Katherine Miller (City of Spokane). October 24.

Spokane Municipal Code (SMC) 17E.020.050. 2011. *Environmental Standards, Fish and Wildlife Conservation Areas, Regulated Activities*.

Spokane Regional Transportation Council. 2008. *Spokane Metropolitan Area Metropolitan Transportation Plan – 2008-2030*. 2008 Update.

Spokane Regional Transportation Council. 2011a. *West Plains-Spokane International Airport Transportation Study.*

Spokane Regional Transportation Council. 2011b. *SMARTROUTES Projects Map – 2010 Update.*

Spokane Transit Authority. 2010. *Connect Spokane – A Comprehensive Plan for Public Transportation.*

Spokane Transit Authority. 2011. *2010 STA Fixed Route Fleet Site.* http://www.spokanetransit.com/ride-sta/view/sta-fleet/

Spokesman Review. 2004. "Critter Watch: Bridge Favors Troubled Critters." Written by Rich Landers. http://www.spokesman.com/stories/2007/jun/17/critter-watch-bridge-favors-troubled-critters/.

U.S. Census. 2000. *American Factfinder. "*Total Population, Median Household Income, Poverty Status, Tenure by Vehicles Available." http://factfinder.census.gov/servlet/DTTable?_bm=y&-context=dt&-ds_name=DEC_2000_SF3_U&-mt_name=DEC_2000_SF3_U_P001&-mt_name=DEC_2000_SF3_U_P053&-mt_name=DEC_2000_SF3_U_P087&-mt_name=DEC_2000_SF3_U_H044&-CONTEXT=dt&-tree_id=403&-all_geo_types=N&-geo_id=14000US53063003800&-geo_id=15000US530630038001&-search_results=14000US53063003800&-format=&-_lang=en

U.S. Census Bureau. 2010. *American Factfinder, 2010.* http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?fpt=table

U.S. Fish and Wildlife Service. 2011. National Wetlands Inventory Mapper. http://www.fws.gov/wetlands/Data/Mapper.html.

Washington State Department of Ecology. 2011a. Facility Site. https://fortress.wa.gov/SearchData/SearchDataList.aspx

Washington State Department of Ecology. 2011b. *Integrated Site Information System (ISIS) Web Reports*. https://fortress.wa.gov/ecy/tcpwebreporting/reports.aspx.

Washington State Department of Ecology. 2011c. *Washington Facility Site Atlas*. http://apps.ecy.wa.gov/website/facsite/viewer.htm.

Washington State Department of Ecology. 2011d. *Water Quality Assessment, 303(d) and WIRA Mapper*. http://apps.ecy.wa.gov/wqawa2008/viewer.htm.

Washington State Department of Ecology. 2011e. *Well Log Mapper*. http://apps.ecy.wa.gov/welllog/MapSearch/viewer.htm?left=2389800&right=2396634&top=860063&bottom=856611&sessionid=682916576.

Washington State Department of Fish and Wildlife. 2011a. Northwest Region Critical Habitat Mapper. http://map.streamnet.org/website/bluecriticalhabitat/viewer.htm.

Washington State Department of Fish and Wildlife. 2011b. Protected Areas Mapper. http://map.streamnet.org/website/protectedquery/viewer.htm.

Washington State Department of Fish and Wildlife. 2011c. Streamnet Mapper. http://map.streamnet.org/website/bluesnetmapper/viewer.htm.

Washington State Department of Natural Resources. 2011. *Washington Natural Heritage Program, Natural Heritage Features List*. http://www.dnr.wa.gov/ResearchScience/HowTo/ConservationRestoration/Pages/amp_nh_data_instructions.aspx.

Washington State Department of Transportation. 2009. *US 195 at Cheney-Spokane Intersection, 2012 & 2035 Forecast Traffic Volumes for Partial and Full Interchange Construction.*

Washington State Department of Transportation. 2011a. *US 195 - Hatch Road to Interstate 90 - Proposed Design*. http://www.wsdot.wa.gov/Projects/US195/HatchRoadtoI90/ProposedDesign.htm. Accessed December 13.

Washington State Department of Transportation. 2011b. *WSDOT Functional Classification Map Site.* http://www.wsdot.wa.gov/MapsData/Tools/FunctionalClass/.