Healdsburg Avenue Bridge

Seismic Retrofit and Rehabilitation Project

04-Son-Healdsburg Avenue
Bridge No. 20C0065

PROJECT STUDY REPORT (Local Rehabilitation)

Prepared For:
City of Healdsburg

Prepared By:

omni · means
ENGINEERS · PLANNERS

HEALDSBURG AVENUE BRIDGE

SEISMIC RETROFIT AND REHABILITATION PROJECT

04-SON-HEALDSBURG AVE
BR. NO. 20C0065

PROJECT STUDY REPORT
(LOCAL REHABILITATION)

PREPARED FOR:
CITY OF HEALDSBURG

PREPARED BY:
OMNI-MEANS, LTD.
ENGINEERS & PLANNERS
943 RESERVE DRIVE, SUITE 100
ROSEVILLE, CALIFORNIA 95678
(916) 782-8688

August 10, 2011

25-1752-01
(R1436PSR002.DOC)

PROJECT STUDY REPORT
(LOCAL REHABILITATION)

Responsible Agency: **City of Healdsburg**
Project Name: **Healdsburg Avenue Bridge – Seismic Retrofit and Rehabilitation**

APPROVED

Public Works Director, City of Healdsburg

1. Transportation Problem

The Healdsburg Avenue Bridge over the Russian River is located within the City of Healdsburg, California, between the intersection of Healdsburg Avenue/Kennedy Lane/Front Street and the intersection of Healdsburg Avenue/Veterans Memorial Beach Park entrance. Healdsburg Avenue is an important north/south road facility traversing through the City and is designated as an arterial in the City's General Plan. It is predominantly a two-lane conventional road through the project limits with a posted speed limit of 25 mph just west of the bridge, 15 mph across the bridge and 30 mph east of the bridge. The 89-year old Healdsburg Avenue Bridge across the Russian River was completed in December 1921. The bridge provided a vital link for commerce and trade between northern California and the San Francisco Bay area (Old Redwood Highway). Since the construction of U.S. 101, the bridge now serves as an alternative route for local traffic and as an entry way into Healdsburg. See Attachment A for a location map.

The existing bridge has undergone numerous evaluations and studies that have identified significant areas where the bridge does not meet current design and safety standards. The existing bridge length is approximately 437 feet long and is functionally obsolete having 9-foot 10-inch wide lanes with no shoulders and a vertical clearance of 14.9 feet. The bridge is also structurally deficient and scour critical with a sufficiency rating (SR) of 44 determined by Caltrans in 2008. A more detailed, recent analysis in Fall 2010 established an SR range of 37.5 and 41.5. The bridge is currently signed for a maximum truck weight limit of 17 tons. Caltrans has issued a letter indicating that the posting should be removed, but the City has elected to retain the posting to minimize dynamic and impact loading until such time as the scour and seismic deficiencies are addressed. See Attachment B for the existing facility layout and typical section.

2. Route – Location: Healdsburg Avenue, City of Healdsburg, California

3. Description of Project Limits

The existing bridge is located along Healdsburg Avenue within the Healdsburg city limits and serves as a local connection across the Russian River for residents and visitors going into town on the west side or to access the Veterans Memorial Beach Park and other areas on the east side. The bridge is located between the intersections of Healdsburg Avenue/Front Street/Kennedy Lane on the west and Healdsburg Avenue/Veterans Memorial Beach Park entrance on the east.

Net Length = 437 feet (0.1 mile)

4. Description of Project Scope

This project proposes to retrofit and rehabilitate the existing Healdsburg Avenue Bridge. The seismic retrofit strategy includes strengthening bearing shoes against transverse toppling; adding shear keys to prevent unseating of the superstructure; retrofitting the center pier with the addition of one 7-foot diameter column on a Type 1 pile shaft outboard of each edge of deck with a connecting pier cap that sandwiches the existing pier; replacing the existing steel roller bearings with lead-rubber bearings; adding chord beam splices; adding transverse end-diaphragm strengthening; and adding a superstructure segment-tie consisting of a steel compression strut and tension-tie at the pier to prevent longitudinal out-of-phase movement between the two spans.

The rehabilitation of the bridge will include replacing the existing bridge deck with a new cast-in-place concrete deck; strengthening the deficient top chords of the truss to a minimum rating factor of 1.0 under two lanes of HS20-44 design vehicle loading; repairing damaged steel truss elements; completely removing the existing lead paint system over the entire steel structure and providing a new paint system; and replacing the existing chain link fence at the edge of deck with a new fence or pedestrian railing system.

The project also proposes to install a new traffic signal at the intersection of Healdsburg Avenue/Front Street/Kennedy Lane to provide acceptable Levels of Service for future traffic and to address any potential sight distance issues.

5. Functional Classification/Federal-aid System

Federal-aid Highways

☐	Urban Principal Arterial	☐	Rural Principal Arterial
☒	Urban Minor Arterial	☐	Rural Minor Arterial
☐	Urban Collector	☐	Rural Major Collector

Highways ineligible for Federal-aid

☐	Urban Local	☐	Rural Minor Collector
		☐	Rural Local

Federal-aid System

On the National Highway System? Yes ☐ No ☒

6. Environmental Status

Environmental Document Type(s):

- Initial Study/Mitigated Negative Declaration under the California Environmental Quality Act (CEQA) and a
- Categorical Exclusion under the National Environmental Policy Act (NEPA).

Anticipated Completion Date: February 2012

Historic Resources:

On July 30, 2010, the State Office of Historic Preservation nominated the Healdsburg Avenue Bridge for listing on the National Register of Historic Places. Listing by the Keeper of the National Register in Washington, D.C. was granted in April 2011.

Other Environmental Issues:

It is anticipated that there would be no impact to built environment and cultural landscapes since the Healdsburg Avenue Bridge would remain in its current place and traffic circulation patterns would not change; hence, no community impacts are anticipated. Minor ground disturbance

would be necessary during rehabilitation construction activities which could have a minor impact to potential subsurface archaeological resources; even though, it is anticipated that none exist. Seismic retrofit of the existing bridge would likely require at least a small amount of work within the Russian River; however, no permanent effects on adjacent riparian habitat or special-status plant habitat are anticipated. Rehabilitation of the bridge may create minor visual changes to the existing structure and would involve use of some noise-generating equipment during construction that could potentially effect nearby residences.

7. Traffic and Accident Data

Current ADT: 8,204
% Trucks: 2.5%
Current Design Hourly Volume (PM Peak): 1,110
Future ADT (2035): 11,100

The accident history for this segment of Healdsburg Avenue in the 3-year period from 1/1/2008 to 12/31/2010 was provided by the California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS) and the Healdsburg Police Department. The following table presents a summary of the accidents and significance.

ACCIDENT SUMMARY TABLE
(1/1/2008 through 12/31/2010)

	Number of Accidents			
Location (PM)	**Fatal (F)**	**Injury (I)**	**Property Damage Only (PDO)**	**Total**
Healdsburg Ave (between University St & Bailhache Ave)	0	2	4	6

As indicated in the table above, Healdsburg Avenue experienced 6 accidents between University Street and the entrance to Veterans Memorial Beach Park. All these accidents occurred at the intersection of Healdsburg Avenue/Kennedy Lane/Front Street. One (1) of the six (6) accidents involved a collision between a bicycle and a vehicle. Two (2) of the accidents involved injuries and four (4) involved property damage only. The collision type for the accidents involving injuries were as follows: one was a broadside and the other one was hit an object. The collision type for the accidents involving property damage only were head on, side swipe, hit object and broadside. The primary collision factors were: influence of alcohol (17%), failure to yield (33%), inappropriate turning movement (17%), and inattention (33%).

All accidents noted above were analyzed to determine if any were a result of the existing non-standard geometrics. (For a detailed accounting of the existing non-standard design features, please refer to the Design Exception Fact Sheet contained in Attachment C.) In one accident out of six total (17%), the existing bridge geometrics may have been a contributing factor. The accident involved property damage only, the collision type was side swipe and the primary collision factor was inappropriate turning movement. That particular accident involved a car traveling southbound on Front Street and another car traveling westbound on the bridge. The car traveling southbound on Front Street turned left, heading eastbound onto the Healdsburg Avenue Bridge and hit the front left side of the other vehicle (sideswipe) traveling westbound on the Healdsburg Avenue Bridge. The reduced lane widths on the bridge may have been a contributing factor. The existing lane widths are 9'10" with no shoulders. Standard lane widths would be twelve feet (12') with an eight foot (8') shoulder. Another contributing factor may have been the somewhat hindered sight distance for southbound traffic on Front Street, due to the existing bridge truss system and original hand railing. The hindered sight distance safety issue, however, will be eliminated with this project by the

installation of a traffic signal at this intersection. This proposed safety improvement is expected to make this intersection safer. Other than the accident noted above, there were no accidents on the bridge or in the vicinity of the bridge where the existing non-standard geometrics could have been a contributing factor.

Pursuant to the Design Exception Fact Sheet contained in Appendix D, the City Engineer has currently directed that the structure be posted at 15 MPH in order to reduce the impact loads created by trucks and due to the inherent safety concerns associated with narrow travel lanes along with a load limit posting of 17 tons. Although this reduced speed limit and load limit would not be needed after the seismic retrofit and rehabilitation are completed, it is recommended that the reduced speed limit posting be continued, in addition to the placement of a "No Trucks" sign. The purpose for the placement of these signs would be to provide enhanced safety and provide a means to mitigate the design exceptions noted above, especially the exceptions associated with reduced lane widths, lack of shoulders and alignment.

The above analysis and discussion demonstrates that the existing and proposed safety features of the bridge are adequate to serve the intended use for the life of the bridge.

8. Roadway Geometric Information

Will this project change existing geometrics? Yes ☐ No ☒

Since this project does not propose to change existing geometrics, a design exception fact sheet was developed and approved by the City Council on February 22, 2011. This design exception fact sheet was submitted to Caltrans on February 23, 2011 in order to document the existing nonstandard design features and to meet the requirements of section 11.4 "Design Exceptions" of the Caltrans Local Assistance Procedures Manual. A copy of the design exception fact sheet can be found in Attachment C.

9. Structure Information

Is bridge rehabilitation work included in this project? Yes ☒ No ☐

Remaining Bridge Life:

It is estimated that the rehabilitation and retrofit of the existing bridge will extend the remaining design life of the bridge 50 to 75 years. Because the existing abutments will not be retrofitted, it is estimated that they will be the controlling factor in the determination of remaining design life. However, it is estimated that those elements that will be retrofitted and rehabilitated will have a remaining life of 75 years, provided normal maintenance, upkeep and inspections are carried out during that time. For a detailed description of how the remaining design life was determined and what type of maintenance work and inspections are required, please refer to the detailed design life analysis contained in the memorandum from Shawn Cullers to Doug Ries dated August 10, 2011 in Attachment G.

Bridge Structural Load Capacity:

With respect to the structural load capacity of the bridge, the current bridge design specifications, the 2007 AASHTO "LRFD Bridge Design Specifications", 4th Edition with Caltrans Amendments, requires the application of the HL-93 design vehicular loading for new bridges. HL-93 loading combines HS20-44 design vehicular loading with a 640 plf lane loading and has been specifically calibrated for use with Load and Resistance Factor Design (LRFD) and Load and Resistance Factor Rating (LRFR) methodologies. The AASHTO Manual for Bridge Evaluation (MBE) provides methods for determining Rating Factors by either LRFR or

Allowable Stress Design/Load Factor Design (ASD/LFD) methodologies. ASD/LFD ratings are based on HS20-44 design vehicular loads. Because the Healdsburg Avenue Bridge has been previously rated to ASD methodologies by Caltrans and the current Bridge Inspection Report is based on ASD/LFD ratings that utilize HS20-44 design vehicular loading, the bridge is proposed to be rehabilitated using the Caltrans Bridge Design Specifications (based on the 1996 AASHTO Standard Specification for Highway Bridges) which will result in an Inventory Rating Factor of 1.0 as determined by the ASD/LFD section of the MBE. With an ASD/LFD Inventory Rating Factor of 1.0, the Healdsburg Avenue Bridge live load capacity will be comparable to the capacity of a new bridge structure as discussed in MBE Section 6B.3.1. Furthermore, retrofit and rehabilitation projects often use the traditional HS20-44 truck loading in the Caltrans Bridge Design Specifications. It is proposed to use the HS20-44 loading criteria to rehabilitate the existing historical bridge.

The final approved Seismic Retrofit Strategy Report Update dated February 24, 2011 provides more detail regarding the seismic analysis for this project; the cover and signature sheet are provided in Attachment E. Based on the foregoing discussion, it has been demonstrated that the load capacity of the bridge will be adequate to serve the intended use for the life of the bridge.

Fracture Critical Members:

The 2008 Bridge Inspection Report (BIR) identifies the floor beams and the bottom truss chord members of the Healdsburg Avenue Bridge to be Fracture Critical Members (FCMs). AASHTO defines an FCM as a "component in tension whose failure is expected to result in the collapse of the bridge or the inability of the bridge to perform its function." Failure of these members is often caused by fatigue fractures or corrosion induced section loss. Fatigue fractures are caused by cycles of tension loading within the member, typically caused by the application of truck live loads on the bridge. Routine inspections of the FCMs are required to verify that fatigue fractures have not developed within the members. Corrosion induced section loss is caused by the failure of the steel protective paint system and can be mitigated through proper maintenance.

Routine Fracture Critical Investigations (FCI) have been provided by Caltrans on the Healdsburg Avenue Bridge to investigate whether fatigue fractures have developed on the FCMs. The most recent FCI was completed in August 2008 and no fractures were detected during the investigation. The Fracture Critical Investigation, however, only provides a measure of whether the bridge currently has fatigue damage but it does not provide a measure of the remaining life of the bridge. To do this, a fatigue life analysis was performed by Cornerstone according to the AASHTO Manual for Bridge Evaluation (MBE).

The fatigue life analysis consists of a two tier analysis. The first tier analysis is to check whether the structure members have an infinite fatigue life. Theoretically, a structural member will have an infinite fatigue life if the effective stresses in the member are less than the fatigue threshold. The fatigue threshold is per the LRFD Bridge Design Specifications and is dependent upon the member being considered. Per the MBE, the effective stresses in the member may be determined from field studies of the actual bridge or may be estimated based on the LRFD design fatigue truck. For this analysis, we have estimated the fatigue stresses based on the LRFD fatigue truck. Based on our analysis, the bottom truss chord eye bars and the floor beams of the Healdsburg Avenue Bridge meet the requirements of an infinite fatigue life. However, the web eye bars do not meet the infinite fatigue life requirements of the MBE. Therefore, a second tier analysis is required.

The second tier analysis estimates the finite fatigue life of the bridge based on the truck live loads

that the bridge has been subjected to in the past and an estimate of the truck live loads the bridge will be subjected to in the future. This second tier analysis requires that several assumptions be made with regards to the average live loads that the bridge has seen, and will see, over its life span, including weight and frequency of the truck traffic. The MBE provides adjustment factors for estimating the average truck live loads over the life span of the bridge based on the current Average Daily Truck Traffic (ADTT) and expected growth percentages. The MBE only provides adjustment factors up to a life span of 50 years. However, these adjustment factors approach a value of 1.0 for long life spans; therefore, for our analysis, the average lifetime ADTT for the bridge is based on the ADT shown in the 2008 BIR. To calculate the present ADTT, we used the LRFD Bridge Design Specifications recommended percentage of truck traffic of 15%. While the 2008 BIR shows a current percentage of truck traffic of 5%, this is based on the bridge currently being load posted. It is likely that this percentage of truck traffic is low compared to the percentage of truck traffic that has occurred over the life of the bridge. Therefore, we have used the more conservative 15% provided in the LRFD code to estimate the ADTT for the fatigue life analysis.

The MBE also provides three levels of finite fatigue life which allow the evaluator to adjust the calculated fatigue life for economic purposes. These levels are:

- The minimum expected fatigue life (which equals a conservative design fatigue life)
- The evaluation fatigue life (which equals a conservative fatigue life for evaluation purposes)
- The mean fatigue life (which equals the most likely fatigue life)

For our analysis, we calculated the evaluation fatigue life. This provides a conservative fatigue life compared to the mean fatigue life but is also not overly conservative (as would be the case with the minimum expected fatigue life).

Based on the MBE and our finite fatigue life analysis, the web members have a remaining life span of approximately 80 years (see attached calculations). This estimated expected life span is more than the life span of the other elements of the bridge, including the replacement pier, deck, and abutments.

Based on our fatigue life analysis and the estimated fatigue life span of the bridge elements, the Healdsburg Avenue Bridge Fracture Critical Members remaining design life do not appear to be controlled by fatigue loading. The remaining life span for the FCMs according to the MBE is only an estimate and these members will still be considered Fracture Critical after the rehabilitation is complete. Therefore, routine Fracture Critical Investigations (every 2 years) will continue to be required for the life of the bridge to ensure fatigue fractures do not develop within these members. If fatigue fractures do develop, repair or replacement of the effected members may be required at a later date. To further reduce the potential for the development of fatigue fractures on the bridge, the City of Healdsburg could maintain the current load posting on the bridge. This will reduce the number of fatigue cycles the bridge would experience and therefore reduce the potential for fatigue cracks and further increase the remaining fatigue life of the bridge.

Eligible Bridge List (EBL) and Associated Funding Requirements:

According to section 6.2.1 of the State of California's Local Assistance Program Guidelines, a bridge rated as Structurally Deficient or Functionally Obsolete with a Sufficiency Rating ≤ 80 will cause a bridge to be included on the Eligible Bridge List (EBL). The 2008 BIR and the

Structure Inventory and Appraisal Report (SI&A) shows that the Healdsburg Avenue Bridge has a Sufficiency Rating of 44.2 and is flagged Structurally Deficient (SD) and Functionally Obsolete (FO) and is therefore eligible to be on the EBL. The Sufficiency Rating of 44.2 is based on several factors including the bridge geometry, the structural condition of the bridge, and the calculated load rating of the bridge. The bridge is flagged as Structurally Deficient due to the structural condition of the deck. The deck condition, according to the 2008 SI&A (Item Code No. 58), is listed in critical condition. Because of the limited roadway width between the bridges trusses, the deck geometry (Item Code No. 68) is listed as a 2 which would also flag the bridge as Functionally Obsolete.

The table below lists the current and proposed structural items and their ratings to better identify where the bridge meets the eligibility requirements for funding. The shaded boxes in the table represent the ratings for those items that cause the bridge to be on the EBL. A rating of 3 or less for any item within the Structural Deficient or Functionally Obsolete categories, combined with a SR of 80 or less will cause a bridge to be on the EBL.

Structural Ratings Table

Description		Current Rating	Proposed Rating After Project
Sufficiency Rating (80 or less to be eligible for rehabilitation)		44.2	74
Structural Deficient:			
Item	Description	Current Rating	Proposed Rating
58	Deck	3	9
59	Superstructure	6	9
60	Substructure	7	7
67	Structural Condition	2	9
71	Waterway Adequacy	8	8
Functionally Obsolete:			
Item	Description	Current Rating	Proposed Rating
68	Deck Geometry	2	2
72	Approach Roadway Alignment	6	6
67	Structural Condition (repeated for FO section)	2	9
71	Waterway Adequacy (repeated for FO section)	8	8

The existing bridge will be seismically retrofitted and rehabilitated which will significantly improve the structural condition of the existing bridge. The retrofit and rehabilitation will include replacement of the existing pier, replacement of the existing bridge bearings, strengthening of the bridge for HS20-44 design loading, replacement of the bridge paint system, and replacement of the existing bridge deck; increasing the bridge's Sufficiency Rating to approximately 74. The replacement of the deficient deck will remove the Structurally Deficient flag from the bridge. However, because the bridge width cannot be changed as part of this project, the bridge will remain Functionally Obsolete. Following the retrofit and rehabilitation, the bridge will remain on the EBL, with a Sufficiency Rating of approximately 74 and a flag of Functionally Obsolete.

The current ratings shown are based on the "Structure Inventory and Appraisal Report", included in Attachment F, that was provided in the Bridge Inspection Report dated August 12, 2008 which shows a detailed list of other structural-related items. The proposed ratings shown are based on the most recent structural design for retrofit and rehabilitation of the bridge; see Attachment F for further detail on the proposed ratings.

Section 6.3 of the Local Assistance Program Guidelines (LAPG) notes that it is the primary intent of the HBP program to remove bridges from the EBL and that local agencies shall ensure that HBP funded rehabilitation will result in a bridge that will not be rated FO or SD and that the SR will be greater than 80. While the Healdsburg Avenue Bridge will not meet the requirements of LAPG Section 6.3, the Healdsburg Avenue Bridge is a historic bridge listed on the National Register of Historic Places; and therefore, is eligible to meet the requirements of Section 6.2.10 of the LAPG. According to Section 6.2.10, the use of HBP funds is authorized for the reasonable costs associated with preserving the historical integrity of a designated bridge. Per Section 6.2.10, Paragraph 4, if the rehabilitation of the existing bridge does not remove the bridge from the EBL, approval of the Caltrans Office of Program Management will be required and is requested for this project.

Funding source of bridge rehabilitation (if not STIP): HBP, Proposition 1B (LSSRP) Bond and Local Match Funds.

10. Condition of Existing Facility (Repeat information for each homogeneous segment):

The existing bridge has undergone numerous evaluations and studies that have identified significant areas where the bridge does not meet current design and safety standards. The existing bridge length is approximately 437 feet long and is functionally obsolete having 9-foot 10-inch wide lanes with no shoulders and a vertical clearance of 14.9 feet. The bridge is also structurally deficient and scour critical with a sufficiency rating (SR) of 44 determined by Caltrans in 2008. A more detailed, recent analysis in Fall 2010 established an SR range of 37.5 and 41.5. The bridge is currently signed for a maximum truck weight limit of 17 tons.

11. Pavement Rehabilitation

Is any work on existing pavement included in this project? Yes ☒ No ☐

Rehabilitation would include a new deck which will likely require new approach paving to conform to existing roadways.

12. Cost Estimate Breakdown

		Cost
PUBLIC OUTREACH AND CONCEPTS ANALYSIS		**$740,000**
ENVIRONMENTAL STUDIES AND PERMITS		**$970,000**
PLANS, SPECIFICATIONS, AND ESTIMATE		**$940,000**
CONSTRUCTION		
Bridge Seismic Retrofit *	$2,700,000	
Bridge Rehabilitation *	$4,700,000	
Sub Total - Bridge Seismic Retrofit & Rehabilitation		$7,400,000
Traffic Signal *		$260,000
Miscellaneous Items (5%)		$380,000
* 10% mobilization & 20% contingency included in costs		
Construction SubTotal		$8,040,000
Construction Support (15%)		$1,210,000
Construction Total		**$9,250,000**
TOTAL		**$11,900,000**

Please refer to Attachment D for the engineer's estimate and item breakdown for the retrofit and rehabilitation project. The anticipated remaining bridge life is estimated to be 75 years, as discussed in Section 9, Structural Information, of this PSR. Because these costs and estimated remaining life are similar to those for a new structure; these costs are considered reasonable for the intended use for the remaining life of the bridge after completion of the retrofit and rehabilitation project.

13. Scheduling

Project Component	Start Date	Estimated Completion
Environmental Studies	4/5/2011	2/1/2012
Plans, Specifications, and Estimate	2/10/2012	8/3/2012
Construction	9/24/2012	6/26/2013

14. Other Agencies Involved:

This project will require permits/approvals from the following agencies:

- Army Corp of Engineers:
  - Nationwide Permit 6 – Survey Activities
  - Nationwide Permit 14 – Linear Transportation Projects
- Regional Water Quality Control Board
  - Clean Water Act, Section 401 Certification
- Department of Fish and Game
  - Section 1602 – Streambed Alteration Agreement

15. Other Considerations

Other Concepts Considered. During the Public Outreach and Concepts Analysis Phase of this project, 15 various concepts were developed with public input. These various concepts were analyzed and summarized in a Concept Analysis Report. At the September 7, 2010 City Council meeting, the concept analysis report and appendices was presented to the Council. After hearing public comment

and considering all of the facts presented by City staff and the consulting team, the City Council voted to select the seismic retrofit and rehabilitation concept as the locally preferred alternative. This concept will rehabilitate the bridge in place and continue its use as a vehicular bridge. The other concepts were not considered further because of the following reasons (as cited in the Design Exception Fact Sheet):

> *"The reasons for requesting the exception include minimizing impacts to environmentally sensitive areas, minimizing impacts to public lands (Veterans Memorial Beach Park), avoiding other right of way impacts, and the excessive cost to make standard which would increase the cost of rehabilitating the bridge by 120%.*
>
> *Other significant factors for requesting the exception to the design standards include:*
>
> - *Preserving the bridge "as is" is the purest form of historic preservation.*
> - *From March 2010 through September 2010, the City undertook a public outreach effort which included two open house type forums, three public meetings and one city council meeting. The overwhelming response voiced at these public meetings was to preserve the existing structure.*
> - *On September 7, 2010, after hearing public comment and considering all the facts presented by the City staff and the consulting team, the City Council of Healdsburg voted to select "Preservation of the historic structure" as the locally preferred alternative for the purposes of conducting environmental studies."*

The other primary concepts considered for this project are described as follows and an exhibit of each one is contained in Attachment H. Please note that the concept designations shown on the exhibits correlate with the previously developed concept analysis report.

- **Concept 3B –** This concept removes the existing historic bridge and constructs a new concrete bridge in its current location meeting all current design standards. The estimated preliminary cost for this alternative is $20,800,000 (including design, right of way and construction).
- **Concept 4A –** This concept preserves the historic bridge "in-place", rehabilitating as needed for bicycle and pedestrian usage only; with a new motor vehicle bridge constructed immediately adjacent to the north (upstream) of the existing bridge. The new vehicular bridge would meet all current design standards. The estimated preliminary cost for this alternative is $25,200,000 (including design, right of way and construction).
- **Concept 5B -** This concept preserves the historic bridge by relocating it south (downstream) of its current location, rehabilitates as needed for bicycle and pedestrian usage with a new motor vehicle bridge constructed on the existing Healdsburg Avenue roadway alignment. The estimated preliminary cost for this alternative is $22,200,000 (including design, right of way and construction).

16. Proposed Funding

	Local Commitment (11.47 %)	LSSRP Bond (construction value)	HBP Request (88.53 %)	Total
Public Outreach and Concepts Analysis	$84,878		$655,122	$740,000
Environmental Studies and Permits	$111,259		$858,741	$970,000
Plans, Specifications and Estimate	$107,818		$832,182	$940,000
Right of Way Acquisition (including support)	0		0	0
Construction (including support)	$816,664	$244,311	$8,189,025	$9,250,000
Total	**$1,120,619**	**$244,331**	**$10,535,070**	**$11,900,000**

17. List of Attachments

A. Location Map
B. Existing Facility Layout & Typical Section
C. Design Exception Fact Sheet & City Council approving resolution
D. Preliminary Cost Estimate
E. Seismic Retrofit Strategy Report (cover/signature sheet only)
F. Structural Inventory and Appraisal Report by Caltrans dated August 12, 2008 and Proposed New Structural Ratings Information
G. Memorandum from Shawn Cullers to Doug Ries dated August 10, 2011
H. Other Concepts Considered

18. Report Preparation

Prepared by: Douglas J. Ries Date: August 10, 2011

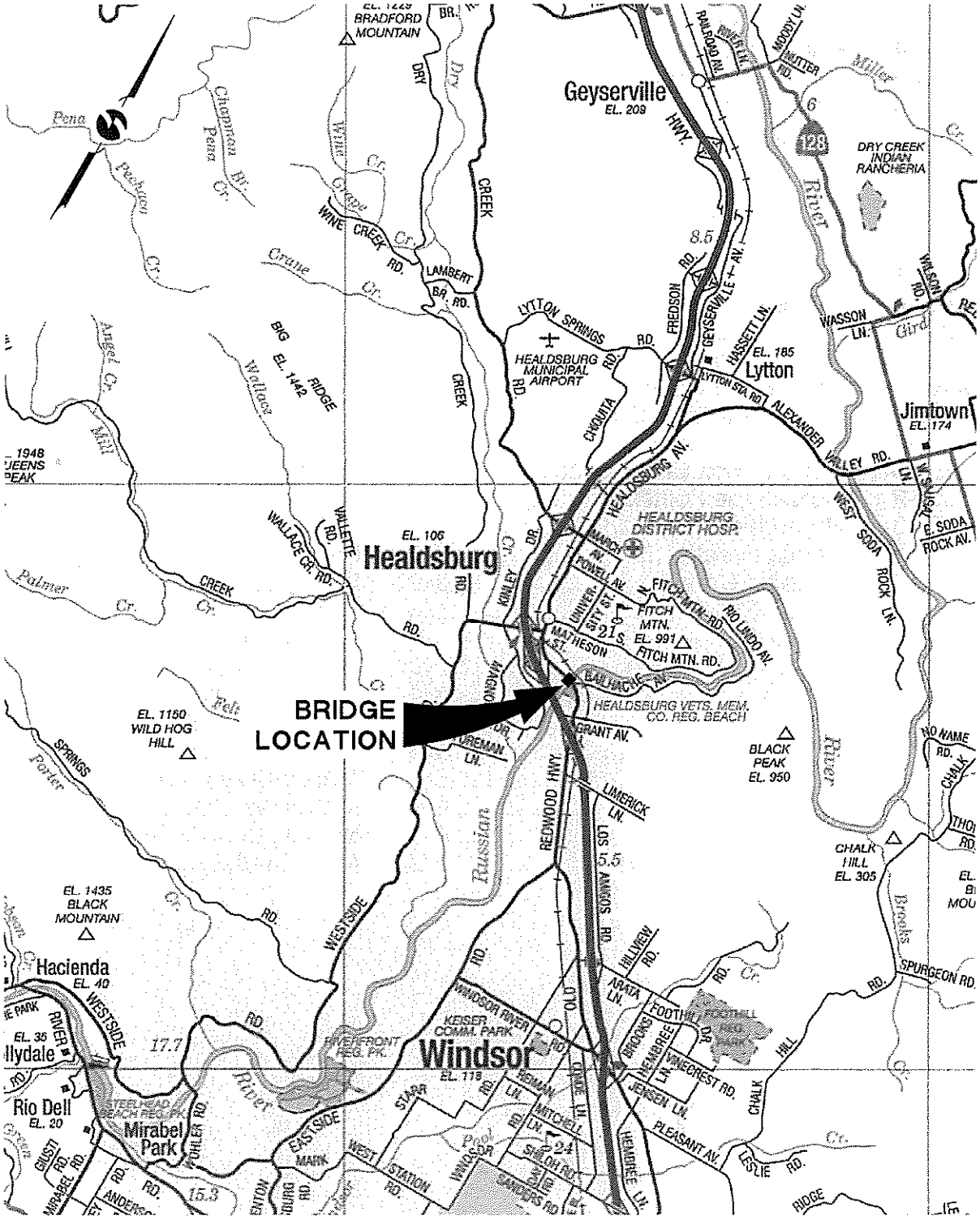
This Project Study Report (Local Rehabilitation) has been prepared under the direction of the following registered civil engineer. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

Douglas J. Ries 8/12/2011

REGISTERED CIVIL ENGINEER *DATE*

Attachment A

Location Map



Healdsburg Avenue Bridge

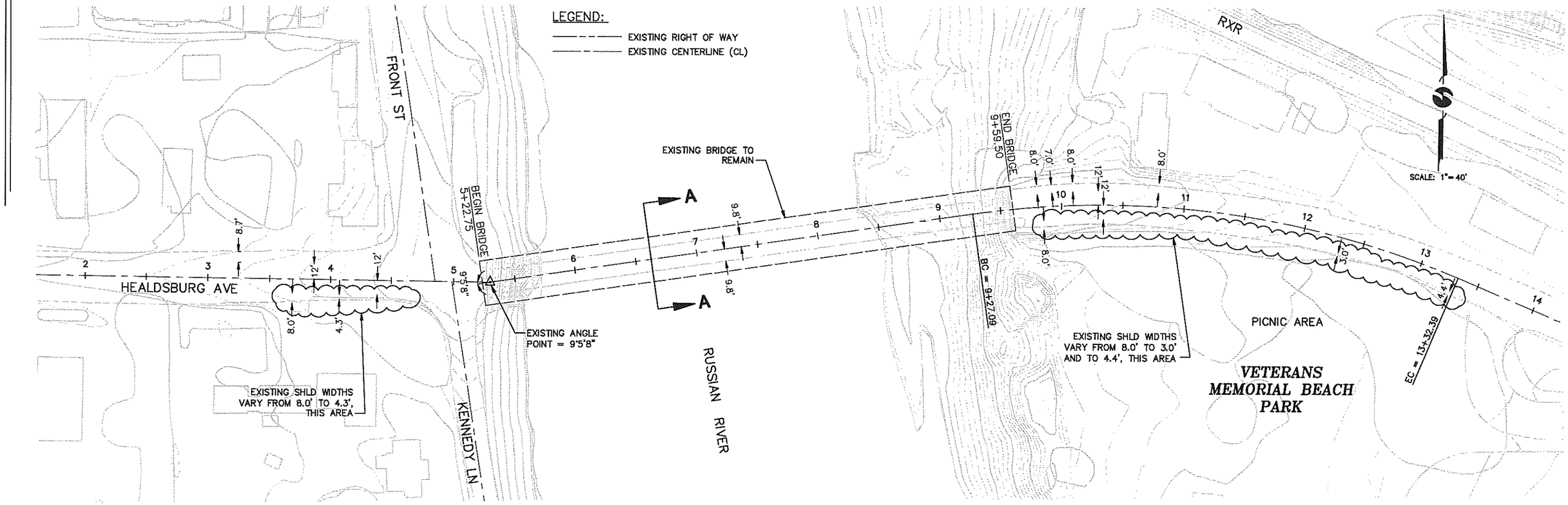
Attachment A

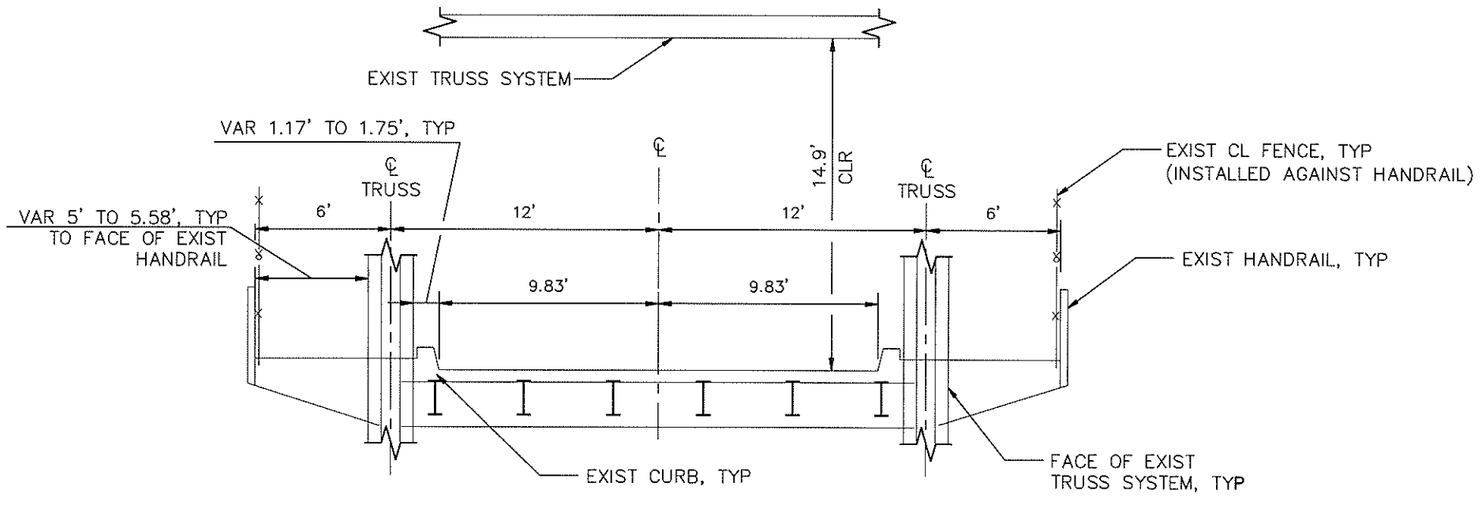
Location Map

K:\PRJ\1436\1436EX047.dwg 8/11/2011 3:30:48 PM PDT

Attachment B

Existing Facility Layout and Typical Section





SECTION A-A
NO SCALE

HEALDSBURG AVENUE BRIDGE REHABILITATION

SCALE AS NOTED

EXISTING FACILITY LAYOUT

Attachment C

Design Exception Fact Sheet
&
City Council Approving Resolution

DESIGN EXCEPTION FACT SHEET

District: 4

City/County: **Healdsburg/Sonoma**

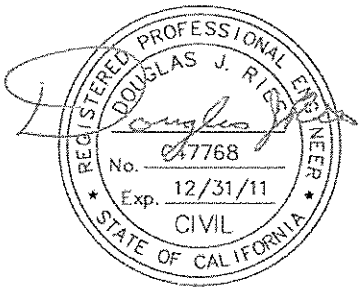
Date: February 11, 2011

Prepared by: Douglas J. Ries, PE
Project Principal
Omni Means Ltd

Route: **Healdsburg Avenue**

Description: **Healdsburg Avenue Bridge Rehabilitation**

Bridge Rehabilitation Cost: **$4,900,000 (CONSTRUCTION)**



1. Existing Conditions:

Healdsburg Avenue is an important north/south road facility traversing through the City of Healdsburg, California and is designated as an arterial in the City's General Plan. It is predominantly a two-lane conventional road through the project limits with a posted speed limit of 25 mph just west of the bridge, 15 mph across the bridge and 30 mph east of the bridge. The 89-year old Healdsburg Avenue Bridge across the Russian River was completed in December 1921. The bridge provided a vital link for commerce and trade between northern California and the San Francisco Bay area (Old Redwood Highway). Since the construction of U.S. 101, the bridge now serves as an alternative route for local traffic and as an entry way into Healdsburg.

The existing bridge length is approximately 437 feet long with existing 9-foot and 10-inch wide lanes and a vertical clearance of 14.9 feet. The bridge is currently signed for a maximum truck weight limit of 17 tons and Healdsburg Avenue is not a designated truck route within the City.

On July 30, 2010, the State Office of Historic Preservation nominated the Healdsburg Avenue Bridge for listing on the National Register of Historic Places. Listing by the Keeper of the National Register in Washington, D.C. is pending.

2. Proposed Work and Non-Standard Features:

A. Proposed Work

The proposal is to rehabilitate the Healdsburg Avenue Bridge. The items involved with rehabilitation of the bridge include deck replacement, painting, damaged member repair, top chord strengthening, and fencing replacement. The bridge geometrics (width, height and size) will remain "as is".

B. Non-Standard Features

There are several design features associated with the existing structure that do not meet current design standards. An exception is proposed to allow the existing non-standard design features to remain. Standards for which deviations are requested include the following:

1. **Design speed**
2. **Lane width**
3. **Shoulder width**
4. **Horizontal alignment**
5. **Vertical alignment**
6. **Horizontal clearance**
7. **Vertical clearance**
8. **Stopping sight distance**
9. **Bridge width**

3. Standard for Which Exception is Required:

1. Per the American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets" ("Green Book") 2004 Edition, Chapter 2, page 72, paragraph 2, **Design Speed**, *"It follows that the appropriate design speeds for arterials should range from 30 to 60 mph."*.

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing design speeds as posted.

2. Per AASHTO's "Green Book", Chapter 7, page 472, **Lane Widths**, *"The 12-ft lane widths are most desirable and should be used, where practical, on higher speeds, free-flowing, principal arterials."*

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing lane widths of 9' 10".

3. Per AASHTO's "Green Book", Chapter 7, page 448, **Widths (Shoulder)**, *"Exhibit 7-3 provides values for the width of traveled way and usable shoulder that should be considered for the volumes indicated."* The minimum shoulder width per Exhibit 7-3 for volumes over 2000 veh/day is 8 feet with a corresponding minimum width of traveled way of 24 feet.

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing condition with no shoulders provided.

4. Per AASHTO's "Green Book", Chapter 9, page 716, paragraph 3, **Tapers (Horizontal Alignment)**, *"Straight-line tapers are frequently used, as shown in Exhibit 9-95A. The taper rate may be 8:1 [L:T] for design speeds up to 30 mph and 15:1 [L:T] for design speeds of 50 mph."*

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing condition 6:1 taper on the west end of the structure (limiting to the existing speeds as posted).

5. Per AASHTO's "Green Book", Chapter 3, page 269, paragraph 3, **Crest Vertical Curves/ Design Controls – Stopping Sight Distance,** *"To recognize the distinction in design speed and to approximate the range of current practice, minimum lengths of vertical curves are expressed as about three times the design speed in mph, [Lmin=3V], where V is in miles per hour and L is in feet."* With a desired maximum design speed of 35 mph for east of the bridge, the minimum length for a vertical curve would be 105 feet (3x35mph).

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing profile grade of Healdsburg Ave which provides a 50-ft vertical curve at the end of the bridge, limiting the sight distance requirement.

6. A. Per AASHTO's "Green Book", Chapter 7, page 481, paragraph 3, **Horizontal Clearance to Obstructions,** *"Clear roadside design is recommended for urban arterials whenever practical. On curbed street sections, clear roadsides are often impractical, particularly in restricted areas. In such areas, a clearance between curb face and object of 1.5 ft (or wider where practical) should be provided."*

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the minimum existing condition horizontal clearance measured from the face of curb to the face of the existing steel truss members of 1.2 feet.

   B. Per AASHTO's "Green Book", Chapter 7, page 482, paragraph 3, **Horizontal Clearance to Obstructions,** *"Where pedestrians are not a factor, obstructions should be set well back, protected, or provided with breakaway features.*

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing 1-ft tall curb without placing a guardrail (protection) at the face of curb to shield the existing steel truss members.

7. Per AASHTO's "Green Book", Chapter 7, page 472, **Vertical Clearances,** *"New or reconstructed structures should provide 16-ft vertical clearance over the entire roadway width. Existing structures that provide clearance of 14-ft, if allowed by local statute, may be retained."*

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing bridge vertical clearance of 14.9 feet.

8. Per AASHTO's "Green Book", Chapter 7, page 471, **Sight Distance,** *"The provision of adequate sight distance is important in urban arterial design. Sight distance affects normal operational characteristics, particularly where roadways carry high traffic volumes. The sight distance values given in Exhibit 7-1 are also applicable to urban arterial design."* Per Exhibit 7-1, the minimum stopping sight distance for a design speed of 35 mph is 250 feet.

   Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing sight distance provided which is approximately 178 feet at the west end of the bridge corresponding to the existing 50-ft vertical curve and an algebraic grade difference of 3.4%.

9. Per AASHTO's "Green Book", Chapter 7, page 481, **Roadway Width for Bridges,** *"The minimum clear width for new bridges on arterial streets should be the same as the curb-to-curb width of the street. On long bridges, defined as bridges with overall lengths in excess of 200 ft, the offsets to parapets, rails, or barriers may be reduced to 4 feet where shoulders or parking lanes are provided on the arterial."* The existing roadway width is 40 feet.

Under rehabilitation of the Healdsburg Avenue Bridge, the City proposes to maintain the existing roadway bridge width of 19.7 feet as measured from bottom face of curb to bottom face of curb.

4. Accidents:

The accident history for this segment of Healdsburg Avenue in the 3-year period from 1/1/2008 to 12/31/2010 was provided by the California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS) and the Healdsburg Police Department. The following table presents a summary of the accidents and significance.

ACCIDENT SUMMARY TABLE
(1/1/2008 through 12/31/2010)

	Number of Accidents			
Location (PM)	**Fatal (F)**	**Injury (I)**	**Property Damage Only (PDO)**	**Total**
Healdsburg Ave (between University St & Baillhache Ave)	0	2	4	6

As indicated in the table above, Healdsburg Avenue experienced 6 accidents between University Street and the entrance to Veterans Memorial Beach Park. One (1) of the six (6) accidents involved a collision between a bicycle and a vehicle. Two (2) of the accidents involved injuries and four (4) involved property damage only. The collision type for the accidents involving injuries were as follows: one was a broadside and the other one was hit an object. The collision type for the accidents involving property damage only were head on, side swipe, hit object and broadside. The primary collision factors were: influence of alcohol (17%), failure to yield (50%) and inattention (33%).

5. Design Year Traffic Volumes:

The following table presents the Future (Year 2035) AADT's and PM peak hour traffic volumes for Healdsburg Ave within the bridge limits.

YEAR 2035 TRAFFIC VOLUMES

HEALDSBURG AVE	
AADT	PM PEAK
11,100	1,110

6. Added Cost to Make Standard:

In order to eliminate the non-standard features listed above, the existing bridge would have to be replaced with a standard box girder bridge. The total cost for a new bridge has been estimated to be $10,800,000, resulting in an additional cost to make standard of **$5,900,000.**

7. Description of Any Additional Work to Enhance Safety:

Under rehabilitation of the Healdsburg Avenue Bridge, the existing bridge railing at the west end of the bridge will be modified to increase sight distance for southbound vehicles turning left to eastbound Healdsburg Avenue.

Seismic Retrofitting of the existing bridge is being evaluated and proposes to address the existing seismic and scour vulnerabilities associated with the bridge foundation and substructure. It is currently anticipated that Seismic Retrofitting will be completed by fall 2011. This work will result in significant safety improvements to the existing structure and the general public.

Currently, the City Engineer has directed that the structure be posted at 15 MPH in order to reduce the impact loads created by trucks and due to the inherent safety concerns associated with narrow travel lanes along with a load limit posting of 17 tons. Although this reduced speed limit and load limit would not be needed after the seismic retrofit and rehabilitation are completed, it is recommended that the reduced speed limit posting be continued, in addition to the placement of a "No Trucks" sign. The purpose for the placement of these signs would be to provide enhanced safety and provide a means to mitigate the design exceptions noted above, especially the exceptions associated with reduced lane widths, lack of shoulders and alignment.

Additionally, signalization of the Healdsburg Avenue/Front Street/Kennedy Lane intersection is being recommended to provide acceptable Levels of Service for future traffic and will potentially provide enhanced safety.

8. Reason for Requesting Exception:

The reason for requesting the exception include minimizing impacts to environmentally sensitive areas, minimizing impacts to public lands (Veterans Memorial Beach Park), avoiding other right of way impacts, and the excessive cost to make standard which would increase the cost of rehabilitating the bridge by 120%.

Other significant factors for requesting the exception to the design standards include:

- Preserving the bridge "as is" is the purest form of historic preservation.
- From March 2010 through September 2010, the City undertook a public outreach effort which included two open house type forums, three public meetings and one city council meeting. The overwhelming response voiced at these public meetings was to preserve the existing structure.
- On September 7, 2010, after hearing public comment and considering all the facts presented by the City staff and the consulting team, the City Council of Healdsburg voted to select "Preservation of the historic structure" as the locally preferred alternative for the purposes of conducting environmental studies.

9. Other Considerations:

A. Sufficiency Rating (SR)

Section 11.4, "Design Exceptions", of the Caltrans Local Assistance Procedures Manual (LAPM), states "design exceptions that would result in the construction of a federally funded new bridge that would result in a Sufficiency Rating (SR) of less than 80 are not allowed."

After rehabilitation, the Sufficiency Rating (SR) of this structure will be approximately 74.7. This is noted as an informational item only and we are not seeking a design exception for this item because the above noted standard applies only to "new" structures, not rehabilitated structures.

B. Bridge Structural Capacity

Section 11.4, "Design Exceptions", of the Caltrans Local Assistance Procedures Manual (LAPM) states "Deviations from the criteria contained herein for the structural capacity of bridges and other structures are not allowed." The current 2010 AASHTO "LRFD Bridge Design Specifications", 5th Edition requires the application of the HL-93 loading for new bridges. Seismic retrofit and rehabilitation projects use the traditional Load Factor Design (LFD) using HS20-44 truck loading (2000 AASHTO with amendments by Caltrans).

It is proposed to use the HS20-44 loading criteria to rehabilitate this existing historical bridge that will remain in place. This is noted as an informational item only and we are not seeking a design exception for this item because the load rating utilized is consistent with current standards for a rehabilitation project.

10. Attachments:

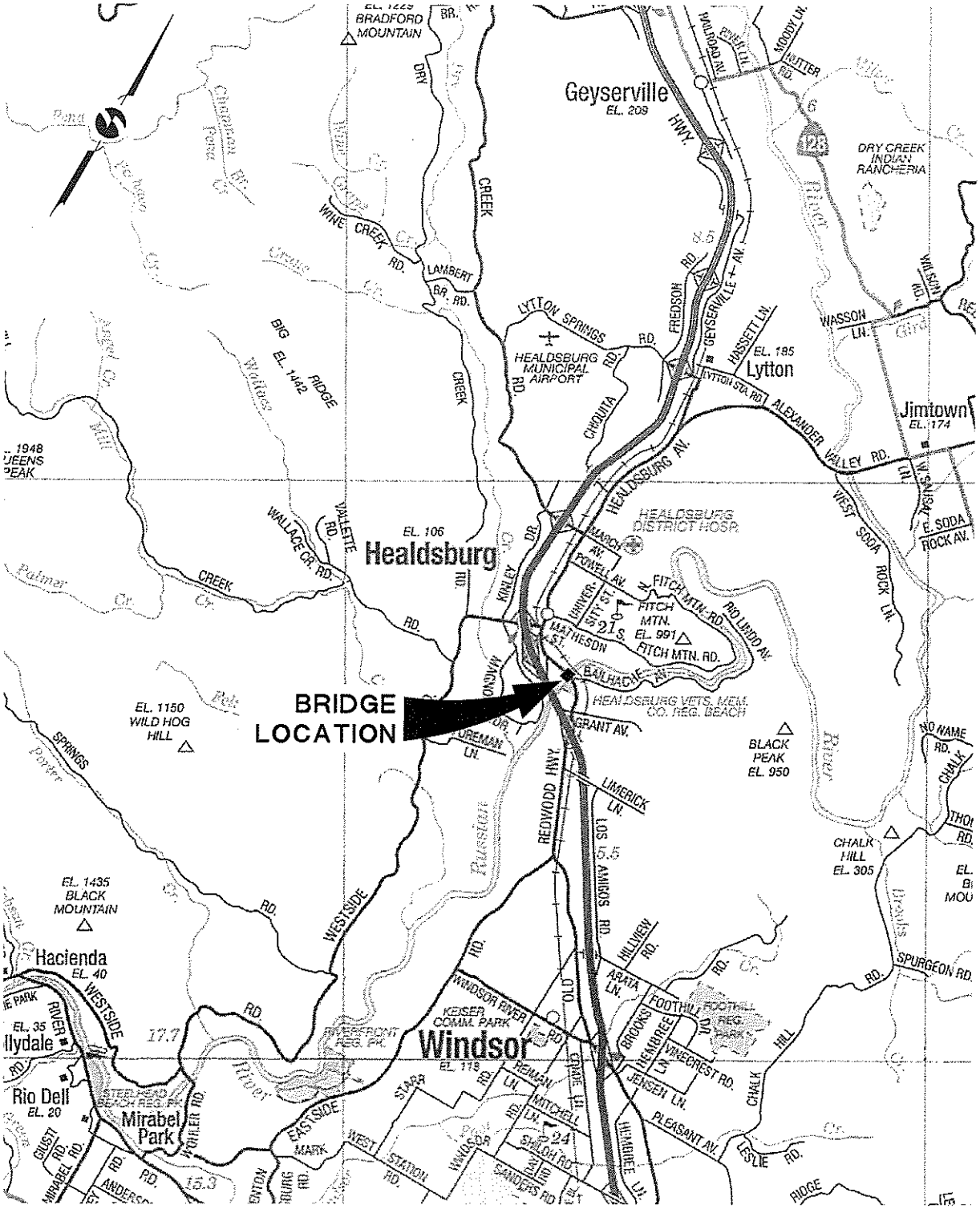
A. Location Map
B. Existing Facility Layout and Profile
C. Preliminary Cost Data

EXCEPTION APPROVED: M. T. Kuw **DATE:** 2/23/11

PUBLIC WORKS DIRECTOR

Attachment A

Location Map



Healdsburg Avenue Bridge

Attachment A

Location Map

Attachment B

Existing Facility Layout and Profile

LEGEND:
EXISTING RIGHT OF WAY
EXISTING CENTERLINE (CL)

SCALE: 1"= 40'

FRONT ST

HEALDSBURG AVE

RXR

EXISTING BRIDGE TO REMAIN

A

A

EXISTING ANGLE POINT = 9°5'8"

BC = 9+27.09

EXISTING SHLD WIDTHS VARY FROM 8.0' TO 4.3', THIS AREA

EXISTING SHLD WIDTHS VARY FROM 8.0' TO 3.0' AND TO 4.4', THIS AREA

PICNIC AREA

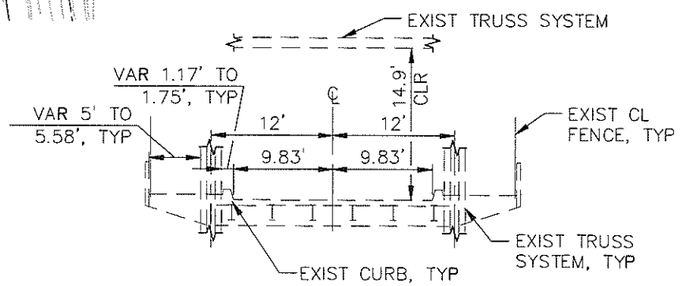
EC = 13+32.39

KENNEDY LN

RUSSIAN RIVER

VETERANS MEMORIAL BEACH PARK

EXISTING PARKING LOT



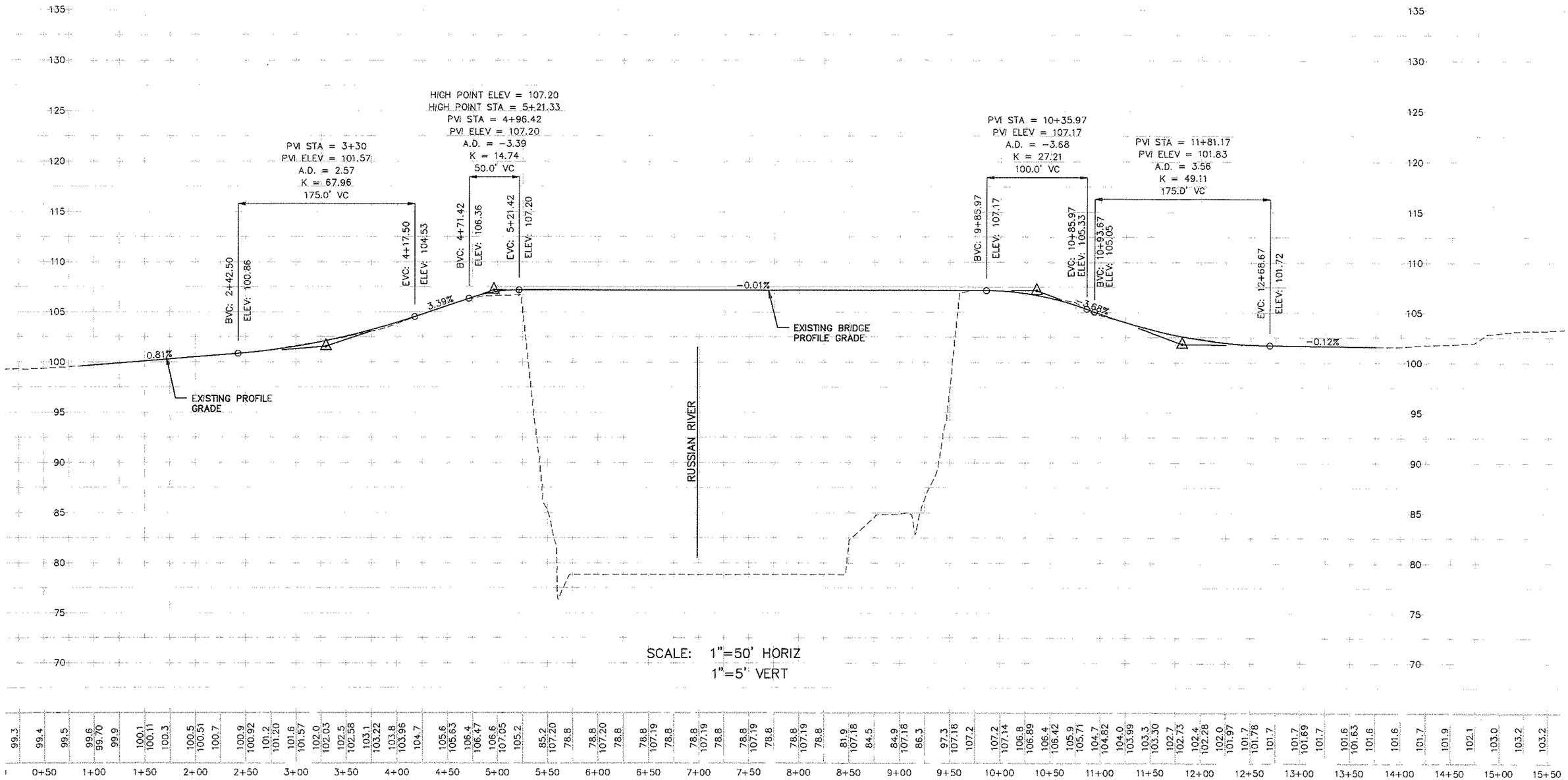
SECTION A-A
NO SCALE

HEALDSBURG AVENUE BRIDGE REHABILITATION

SCALE AS NOTED

EXISTING FACILITY LAYOUT

K:\PRJ\1436\1436EX046.dwg 2/2/2011 4:40:43 PM PST



SCALE: 1"=50' HORIZ
1"=5' VERT

HEALDSBURG AVENUE BRIDGE REHABILITATION

SCALE AS NOTED

EXISTING FACILITY PROFILE

Attachment C

Preliminary Cost Data

STATE OF CALIFORNIA-DEPARTMENT OF TRANSPORTATION

STRUCTURAL QUANTITY SURVEY AND GENERAL PLAN ESTIMATE

DS-D 0019 (REV. 10/12/05)

RECEIVED IN ESTIMATE SECTION BY	DATE
QUANTITIES BY	DATE
AEB/SMC	08/20/10
CHECKED BY	DATE
REVISED BY	DATE
APPROVED BY	DATE

CHARGE	EXPENDITURE AUTHORIZATION	BRIDGE NUMBER		LENGTH		
		20C0065		400		
BRIDGE				WIDTH	LONG SPAN	SPANS
Healdsburg - Alt 2A				36	200	2

DISTRICT	COUNTY	ROUTE	PM	TYPE	DEPTH	SKEW	DESIGN SECTION
4	SONOMA	Healdsburg Ave	-	-		0	Steel Truss

CODE	CONTRACT ITEMS	UNIT	QUANTITY			SUBSTRUCTURE			OTHER ELEMENTS-DESCRIBE			TOTALS		
			QUANTITY	CHECK	* USE	QUANTITY	CHECK	* USE	QUANTITY	CHECK	* USE	* USE	PRICE	AMOUNT
Existing Bridge:														
1	Seismic Retrofit	LS	1		1							1	1,960,000.00	1,960,000.00
2	Lead Abatement and 3 Coat Paint (bridge closed)	SF	63,400		63,400							63,400	30.00	1,902,000.00
3	Remove Existing Concrete Decking	LS	1		1							1	120,000.00	120,000.00
4	Furnish & Install Exodermic Deck	SF	14,400		14,400							14,400	50.00	720,000.00
5	Strengthen Top Chord Truss Members	LS	1		1							1	510,000.00	510,000.00
6	Rehabilitate & Replace Damaged Truss Members	LS	1		1							1	100,000.00	100,000.00
7	Replace Chain Link Fence	LF	840		840							840	80.00	67,200.00
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-

QUANTITY PER GIRDER					
	LENGTH OF PC PS GIRDER				
	CUBIC YARDS PCC				
	POUNDS BAR REINFORCING				
	POUNDS PRESTRESS STEEL				
	NUMBER OF GIRDERS				

* ESTIMATING BRANCH TO INPUT

MOBILIZATION 10%	537,920.00
SUB TOTAL-CONTRACT ITEMS	5,917,120.00
CONTINGENCIES 25%	1,479,280.00
SUPPLEMENTAL WORK	-
TOTAL	7,396,400.00
FOR BUDGET PURPOSES-SAY	7,396,000.00

	CONST COST (WITHOUT CONTING)		CONST COST (WITH CONTING)	ROUNDED	TRAFFIC SIGNAL	FINAL ROUNDED
SEISMIC:	$1,960,000	36.4%	$2,690,000	$2,700,000	-	= $2,700,000
REHAB:	$3,419,200	63.6%	$4,710,000	$4,700,000	+ $200,000	= $4,900,000
TOTAL:	$5,379,200		$7,400,000	$7,400,000		

STATE OF CALIFORNIA-DEPARTMENT OF TRANSPORTATION

STRUCTURAL QUANTITY SURVEY AND GENERAL PLAN ESTIMATE

DS-O 0019 (REV. 10/12/05)

RECEIVED IN ESTIMATE SECTION BY	DATE
QUANTITIES BY	DATE
AEB/SMC	08/20/10
CHECKED BY	DATE
REVISED BY	DATE
APPROVED BY	DATE

CHARGE	EXPENDITURE AUTHORIZATION	BRIDGE NUMBER	LENGTH
		20C0065	420

BRIDGE	WIDTH	LONG SPAN	SPANS
Healdsburg - Alt 3B	72	210	2

DISTRICT	COUNTY	ROUTE	PM	TYPE	DEPTH	SKEW	DESIGN SECTION
4	SONOMA	Healdsburg Ave	-	-		0	CIP Box Girder

CODE	CONTRACT ITEMS	UNIT	QUANTITY			SUBSTRUCTURE			OTHER ELEMENTS-DESCRIBE			TOTALS	PRICE	AMOUNT
			QUANTITY	CHECK	* USE	QUANTITY	CHECK	* USE	QUANTITY	CHECK	* USE	* USE		
Existing Bridge:														
1	Bridge Removal	LS	1		1							1	300,000.00	300,000.00
New Bridge:												0	-	-
1	New CIP Box Girder Bridge	SF	30,240		30,240							30,240	250.00	7,560,000.00
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-
												0	-	-

QUANTITY PER GIRDER					
	LENGTH OF PC PS GIRDER				
	CUBIC YARDS PCC				
	POUNDS BAR REINFORCING				
	POUNDS PRESTRESS STEEL				
	NUMBER OF GIRDERS				

* ESTIMATING BRANCH TO INPUT

MOBILIZATION 10%	786,000.00
SUB TOTAL-CONTRACT ITEMS	8,646,000.00
CONTINGENCIES 25%	2,161,500.00
SUPPLEMENTAL WORK	-
TOTAL	10,807,500.00
FOR BUDGET PURPOSES-SAY	10,810,000.00

ROUNDED : $10,800,000

ADDED COST TO MAKE STANDARD

NEW BRIDGE : $10,800,000

REHAB BRIDGE : $ 4,900,000

TOTAL : $ 5,900,000

CITY OF HEALDSBURG

RESOLUTION NO. 25-2011

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF HEALDSBURG AUTHORIZING THE SUBMITTAL OF A DESIGN EXCEPTION FACT SHEET FOR REHABILITATION OF THE HEALDSBURG AVENUE BRIDGE

WHEREAS, on September 7, 2010 the City Council of the City of Healdsburg conducted a public hearing to receive comments on fifteen different concepts for the Healdsburg Avenue Bridge developed through a series of three open houses and three public meetings; and

WHEREAS, on September 7, 2010 the City Council of the City of Healdsburg identified rehabilitation of the Healdsburg Avenue Bridge as the locally preferred concept for the purposes of conducting technical and environmental studies required by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) and directed staff to prepare the necessary reports and technical studies; and

WHEREAS, the City Council of the City of Healdsburg received a status report on the Healdsburg Avenue Bridge Project from the Public Works Director and the City's consultants Omni-Means on January 18, 2011 including a draft Design Exception Fact Sheet that identified several areas wherein a rehabilitated Healdsburg Avenue Bridge would not meet current standards established by the American Association of State Highway and Transportation Officials (AASHTO) including: design speed, lane width, shoulder width, horizontal alignment, vertical alignment, horizontal clearance, vertical clearance, stopping sight distance, bridge width; and

WHEREAS, Caltrans has indicated in order for them to consider funding rehabilitation of the Healdsburg Avenue Bridge, the City must prepare and submit a Design Exception Fact Sheet for their records identifying the areas for which design exceptions are being sought, and acknowledge the corresponding responsibilities associated with keeping the existing bridge in service.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Healdsburg acknowledges the design exceptions associated with rehabilitation of the Healdsburg Avenue Bridge, and the corresponding responsibilities.

BE IT FURTHER RESOLVED that the City Council of the City of Healdsburg authorizes the Public Works Director to submit the Design Exception Fact Sheet to Caltrans in its current form, subject to any non-substantive changes that may be made subject to the concurrence of the City Attorney.

PASSED, APPROVED, AND ADOPTED this 22nd day of February, 2011, by the following vote:

AYES: Councilmembers: (4) Babb, Jones, Plass, and Mayor Chambers

NOES: Councilmembers: (0) None

ABSENT: Councilmembers: (1) Wood

ABSTAINING: Councilmembers: (0) None

SO ORDERED:

/S/ THOMAS L. CHAMBERS
Thomas L. Chambers, Mayor

ATTEST:

/S/ MARIA CURIEL
Maria Curiel, City Clerk

I, MARIA CURIEL, City Clerk of the City of Healdsburg, do hereby certify that the foregoing is a full, true, and correct copy of a resolution adopted by the City Council of the City of Healdsburg on the 22nd day of February, 2011.

Maria Curiel, City Clerk

THE CITY OF HEALDSBURG INCORPORATED FEBRUARY 20, 1867 SONOMA COUNTY CAL.

Attachment D

Preliminary Cost Estimate

CORNERSTONE
structural engineering group

DATE: 6/21/2011
CONTRACT NO. 2010009

BRIDGE GENERAL PLAN ESTIMATE

ESTIMATING UNIT

STRUCTURE:	HEALDSBURG AVENUE BRIDGE	BR. NO: 20C-0065		RCVD. BY:		EE	
TYPE:	2 SPAN SIMPLY SUPPORTED STEEL PARKER THRU TRUSS BRIDGE	DIST: 04	CO: SON	RTE:	P.M:	LET	
LENGTH	397.75 x WIDTH 36	= AREA	14,319	SQ. FT.			

DESIGN SECTION CORNERSTONE
PROJECT INCLUDES 1 STRUCTURE(S)
AND $ ROADWORK

QUANTITIES BY SMC/REC DATE 6/14/2011
QUANTITIES CHECKED BY DATE
CHARGE UNIT AND EA

ESTIMATE NO 1
PRICED BY SMC/RED
COST INDEX 2008/2010

CONTRACT ITEMS	UNIT	QUANTITY	PRICE	AMOUNT
STRUCTURE ITEMS				
BRIDGE REMOVAL (PORTION)	LS	1	$160,000.00	$160,000
84" DIA CAST-IN-DRILLED HOLE OSCILLATED CONCRETE PILING	LF	200	$2,600.00	$520,000
STRUCTURAL CONCRETE (BRIDGE)	CY	590	$1,100.00	$649,000
DRILL & PRESSURE GROUT DOWEL	LF	210	$30.00	$6,300
DRILL & BOND DOWEL	LF	1,130	$30.00	$33,900
FURNISH SEISMIC ISOLATION BEARING	EA	8	$15,000.00	$120,000
INSTALL SEISMIC ISOLATION BEARING	EA	8	$20,000.00	$160,000
BAR REINFORCING STEEL (BRIDGE)	LB	192,000	$1.10	$211,200
STRUCTURAL STEEL (BRIDGE)	LB	62,000	$18.00	$1,116,000
HEAT STRAIGHTEN STEEL (EXISTING BRIDGE)	LS	1	$40,000.00	$40,000
CLEAN AND PAINT STRUCTURAL STEEL (EXISTING BRIDGE)	SF	63,400	$35.00	$2,219,000
CHAIN LINK RAILING (TYPE 3)	LF	800	$100.00	$80,000
WORK AREA MONITORING	LS	1	$10,000.00	$10,000
NOT INCLUDED:				
RIGHT OF WAY COSTS (IF REQUIRED)				
ENVIRONMENTAL MITIGATION (IF REQUIRED)				
CONTAMINATED/ HAZARDOUS MATERIAL DISPOSAL (IF REQUIRED)				
UTILITY RELOCATION (ASSUMED TO BE BY UTILITY COMPANIES				
TRAFFIC HANDLING/CONSTRUCTION AREA SIGNS				
ROCK SLOPE PROTECTION				
ROADWAY CONSTRUCTION COSTS (IF REQUIRED)				

SUBTOTAL		$5,325,400
MOBILIZATION (10%)		$591,711
CONTINGENCIES (25%)		$1,479,278
COST PER SQ FT OF STRUCTURAL ITEMS	$434	
TOTAL COST OF STRUCTURAL ITEMS		$7,396,389
TOTAL COST OF CIVIL ITEMS		$0
WORK BY RAILROAD OR UTILITY FORCES		$0
GRAND TOTAL		$7,396,389
FOR BUDGET PURPOSES - SAY		**$7,400,000**

COMMENTS

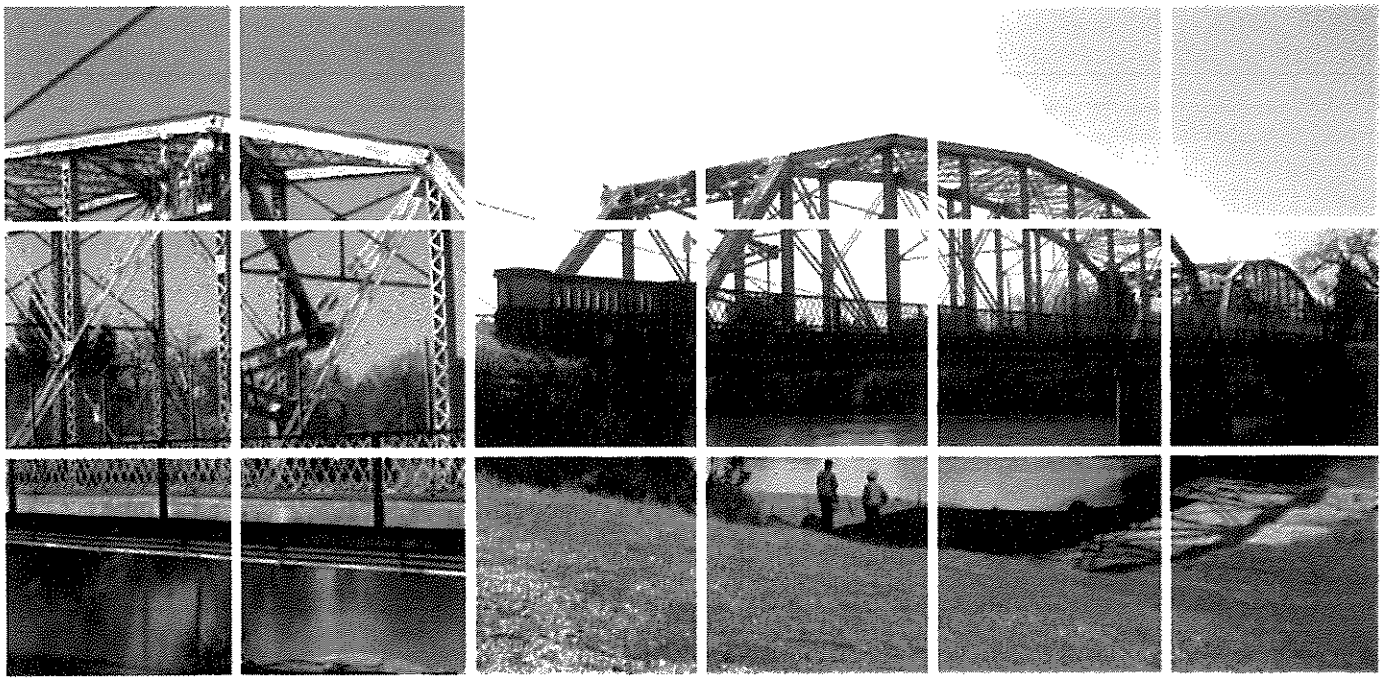
Attachment E

Seismic Retrofit Strategy Report

- Cover Sheet
- Signature Sheet
- Approval E-mail from Mike Kim, Caltrans Office of Structures Local Assistance

Seismic Retrofit Strategy Report Update

HEALDSBURG AVENUE BRIDGE OVER THE RUSSIAN RIVER
BRIDGE NO. 20C-0065



Presented to:

City of Healdsburg

February 24, 2011

Prepared by:

CORNERSTONE
structural
engineering
group

CORNERSTONE
structural
engineering
group

The Seismic Strategy Report contained herein has been prepared by or under the direction of the following registered persons.

Todd M. Goolkasian, REGISTERED STRUCTURAL ENGINEER
CORNERSTONE STRUCTURAL ENGINEERING GROUP

1111 West Alluvial Avenue, Suite 101 | tel. (559) 320-0200
Fresno, CA 93711 | fax. (559) 320-0201

----- Forwarded by Michael Kim/HQ/Caltrans/CAGov on 02/26/2011 05:40 PM -----

Michael Kim/HQ/Caltrans/CAGov
02/26/2011 05:39 PM

To: Srilatha Raavi/D04/Caltrans/CAGov
cc: Chien Wu/D04/Caltrans/CAGov@DOT, Gary Goff, Reza Fereshtehnejad
Subject: Healdsburg Bridge (20C0065) Strategy Report

Hi Srilatha,

The Office of Structures Local Assistance has reviewed the Final Seismic Strategy Report received February 24, 2011 by Cornerstone Structural Engineering Group for the above referenced project. The previously approved strategy included retrofitting the superstructure, abutments, and approach fills and had an estimated construction cost (escalated to 2009/2010 dollars) of $2,100,000. The new Final Seismic Strategy Report includes the use of isolation bearings and has an estimated construction cost of $2,090,000.

Although the construction costs are essentially the same, using isolation bearings will minimize damages to the facility after a seismic event. As such, we concur with the strategy recommendation of the report to use isolation bearings. Due to the specialized design requirements of isolation bearings, we request the design consultant submit the isolation bearing design prior to submittal of %100 PS&E.

At this time we recommend the project proceed to Final Retrofit Design and PS&E Phase. Please forward this information to the City of Healdsburg for their consideration.

Attached below are the above referenced Final Seismic Strategy Report along with the Appendix C (Original Strategy General plan), Appendix D (Updated Strategy General Plan), and Appendix E (Cost Estimate). Please let me know if you would like to the remaining appendixes for you files.

If you have any questions regarding this information, please feel free to contact me at (916) 227-8731.

Regards,
Mike

(See attached file: StratRpt.pdf) (See attached file: Appendix C.pdf)
(See attached file: Appendix D.pdf) (See attached file: Appendix E.pdf)

Attachment F

Structural Inventory and Appraisal Report by Caltrans
dated August 12, 2008

and

Proposed New Structural Ratings

STRUCTURE INVENTORY AND APPRAISAL REPORT

********** IDENTIFICATION **********

(1) STATE NAME- CALIFORNIA 069
(8) STRUCTURE NUMBER **20C0065**
(5) INVENTORY ROUTE(ON/UNDER)- ON 1500Z9230
(2) HIGHWAY AGENCY DISTRICT 04
(3) COUNTY CODE 097 (4) PLACE CODE 33056
(6) FEATURE INTERSECTED- RUSSIAN RIVER
(7) FACILITY CARRIED- HEALDSBURG AVE
(9) LOCATION- 35.2 MI N MARIN CO LINE
(11) MILEPOINT/KILOMETERPOINT 0
(12) BASE HIGHWAY NETWORK- NOT ON NET 0
(13) LRS INVENTORY ROUTE & SUBROUTE
(16) LATITUDE 38 DEG 36 MIN 14 SEC
(17) LONGITUDE 122 DEG 51 MIN 36 SEC
(98) BORDER BRIDGE STATE CODE % SHARE %
(99) BORDER BRIDGE STRUCTURE NUMBER

******** STRUCTURE TYPE AND MATERIAL *********

(43) STRUCTURE TYPE MAIN:MATERIAL- STEEL
TYPE- TRUSS - THRU CODE 310
(44) STRUCTURE TYPE APPR:MATERIAL- OTHER
TYPE- OTHER CODE 000
(45) NUMBER OF SPANS IN MAIN UNIT 2
(46) NUMBER OF APPROACH SPANS 2
(107) DECK STRUCTURE TYPE- CIP CONCRETE CODE 1
(108) WEARING SURFACE / PROTECTIVE SYSTEM:
A) TYPE OF WEARING SURFACE- CONCRETE CODE 1
B) TYPE OF MEMBRANE- NONE CODE 0
C) TYPE OF DECK PROTECTION- NONE CODE 0

********** AGE AND SERVICE **********

(27) YEAR BUILT 1921
(106) YEAR RECONSTRUCTED 0000
(42) TYPE OF SERVICE: ON- HIGHWAY-PEDESTRIAN 5
UNDER- WATERWAY 5
(28) LANES:ON STRUCTURE 02 UNDER STRUCTURE 00
(29) AVERAGE DAILY TRAFFIC 7403
(30) YEAR OF ADT 2007 (109) TRUCK ADT 5 %
(19) BYPASS, DETOUR LENGTH 3 KM

********** GEOMETRIC DATA **********

(48) LENGTH OF MAXIMUM SPAN 60.4 M
(49) STRUCTURE LENGTH 133.5 M
(50) CURB OR SIDEWALK: LEFT 2.1 M RIGHT 2.1 M
(51) BRIDGE ROADWAY WIDTH CURB TO CURB 5.9 M
(52) DECK WIDTH OUT TO OUT 10.8 M
(32) APPROACH ROADWAY WIDTH (W/SHOULDERS) 7.3 M
(33) BRIDGE MEDIAN- NO MEDIAN 0
(34) SKEW 0 DEG (35) STRUCTURE FLARED NO
(10) INVENTORY ROUTE MIN VERT CLEAR 4.54 M
(47) INVENTORY ROUTE TOTAL HORIZ CLEAR 5.9 M
(53) MIN VERT CLEAR OVER BRIDGE RDWY 4.55 M
(54) MIN VERT UNDERCLEAR REF- NOT H/RR 0.00 M
(55) MIN LAT UNDERCLEAR RT REF- NOT H/RR 0.0 M
(56) MIN LAT UNDERCLEAR LT 0.0 M

********** NAVIGATION DATA **********

(38) NAVIGATION CONTROL- NO CONTROL CODE 0
(111) PIER PROTECTION- CODE
(39) NAVIGATION VERTICAL CLEARANCE 0.0 M
(116) VERT-LIFT BRIDGE NAV MIN VERT CLEAR M
(40) NAVIGATION HORIZONTAL CLEARANCE 0.0 M

****

SUFFICIENCY RATING = 44.2
STATUS STRUCTURALLY DEFICIENT
HEALTH INDEX .0
PAINT CONDITION INDEX = 76.9

********** CLASSIFICATION ********** CODE

(112) NBIS BRIDGE LENGTH- YES Y
(104) HIGHWAY SYSTEM- NOT ON NHS 0
(26) FUNCTIONAL CLASS- MINOR ARTERIAL URBAN 16
(100) DEFENSE HIGHWAY- NOT STRAHNET 0
(101) PARALLEL STRUCTURE- NONE EXISTS N
(102) DIRECTION OF TRAFFIC- 2 WAY 2
(103) TEMPORARY STRUCTURE-
(105) FED.LANDS HWY- NOT APPLICABLE 0
(110) DESIGNATED NATIONAL NETWORK - NOT ON NET 0
(20) TOLL- ON FREE ROAD 3
(21) MAINTAIN- CITY OR MUNICIPAL HIGHWAY AGENCY 04
(22) OWNER- CITY OR MUNICIPAL HIGHWAY AGENCY 04
(37) HISTORICAL SIGNIFICANCE- ELIGIBLE 2

********** CONDITION ********** CODE

(58) DECK 3
(59) SUPERSTRUCTURE 6
(60) SUBSTRUCTURE 7
(61) CHANNEL & CHANNEL PROTECTION 8
(62) CULVERTS N

********* LOAD RATING AND POSTING ********* CODE

(31) DESIGN LOAD- OTHER OR UNKNOWN 0
(63) OPERATING RATING METHOD- ALLOWABLE STRESS 2
(64) OPERATING RATING- 34.3
(65) INVENTORY RATING METHOD- ALLOWABLE STRESS 2
(66) INVENTORY RATING- 14.3
(70) BRIDGE POSTING- EQUAL TO OR ABOVE LEGAL LOADS 5
(41) STRUCTURE OPEN, POSTED OR CLOSED- A
DESCRIPTION- OPEN, NO RESTRICTION

********** APPRAISAL ********** CODE

(67) STRUCTURAL EVALUATION 2
(68) DECK GEOMETRY 2
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL N
(71) WATER ADEQUACY 8
(72) APPROACH ROADWAY ALIGNMENT 6
(36) TRAFFIC SAFETY FEATURES 0000
(113) SCOUR CRITICAL BRIDGES 3

********** PROPOSED IMPROVEMENTS **********

(75) TYPE OF WORK- REPLACE POR DEFICIENC CODE 31
(76) LENGTH OF STRUCTURE IMPROVEMENT 141.634 M
(94) BRIDGE IMPROVEMENT COST $1,836,000
(95) ROADWAY IMPROVEMENT COST $184,000
(96) TOTAL PROJECT COST $2,753,000
(97) YEAR OF IMPROVEMENT COST ESTIMATE 1999
(114) FUTURE ADT 8495
(115) YEAR OF FUTURE ADT 2028

********** INSPECTIONS **********

(90) INSPECTION DATE 08/08 (91) FREQUENCY 24 MO
(92) CRITICAL FEATURE INSPECTION: (93) CFI DATE
A) FRACTURE CRIT DETAIL- YES 24 MO A) 08/08
B) UNDERWATER INSP- NO MO B)
C) OTHER SPECIAL INSP- NO MO C)

Structural Ratings Justifications			
Item Number	**Description**	**Proposed Rating**	**Justification for Proposed Rating**
58	Deck	9	Replacement of the deck will result in a revised rating of 9: Excellent Condition
59	Superstructure	9	Rehabilitation of the superstructure will repair all members showing signs of significant distress and will result in a revised rating of 9: Excellent Condition
60	Substructure	7	Although the piers will be retrofitted the abutments will not. Therefore, the overall substructure rating will not change and the existing rating of 7 shall remain the same.
67	Structural Condition	9	Rehabilitation of the superstructure will result in a strengthening of all members necessary to carry the full design vehicle loading, resulting in an Inventory Rating greater than 32.4 tonnes per Table 1 (pg 47) of the FHWA Coding Guide for National Bridge Inventory and a revised Structural Evaluation Rating of 9: Excellent Condition
68	Deck Geometry	2	The deck geometry after the replacement of the deck will still be less than the required width for a rating code of 3. Therefore the existing rating of 2 shall remain the same.
71	Waterway Adequacy	8	There will be no change in elevation at the abutments or piers from the existing condition. Therefore, the overtopping frequency will not change and the existing rating of 8 shall remain the same.
72	Approach Roadway Alignment	6	The approach roadway alignment will not be altered from the existing alignment. Therefore the existing rating of 6 shall remain the same.

Attachment G

Memorandum from Shawn Cullers to Doug Ries dated August 10, 2011

CORNERSTONE
structural
engineering
group

www.cseg.com

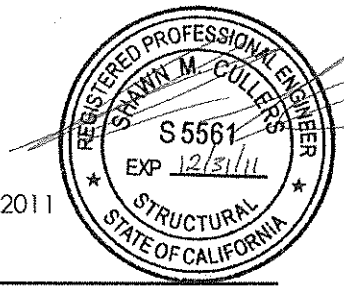
MEMORANDUM

TO: Doug Ries, PE
Omni Means
943 Reserve Drive, Suite 100
Roseville, CA 95678

Date: August 10, 2011
Job No: 2010004

FROM: Shawn M. Cullers, SE

PROJECT: Healdsburg Avenue Bridge over the Russian River
Response to District 4 Comments to PSR dated July 14, 2011



Remarks:

This memo is in response to the comments from Caltrans District 4 Office ot Local Assistance regarding the Project Study Report (PSR) for the Healdsburg Avenue Bridge rehabilitation dated July 14, 2011. Our responses to the comments are as follows:

1. *Justify the costs are reasonable for the intended use for the remaining life of the bridge after completion of rehabilitation. The remaining life of the bridge after rehabilitation was not discussed. The cost of the bridge rehabilitation was estimated at $4.7 million. There was no information on what specific work is contemplated. Nor was there engineer's estimate included to support the cost.*

   Response:

   The rehabilitation and retrotit ot the existing bridge as currently proposed in the PSR will extend the remaining design lite ot all elements ot the bridge being rehabilitated or retrofitted. For elements designed according to the current AASHTO LRFD Bridge Design Specifications, 4th Edition, a design life of 75 years is appropriate according to the specifications. The deck replacement, pier replacement, and seismic strengthening elements will be designed to the current AASHTO LRFD Bridge Design Specifications and a design life ot 75 years tor these elements is appropriate. This design lite is equivalent to a replacement structure designed to the current AASHTO specifications.

   For the existing steel elements (trusses, floor beams, cross-bracing, etc.), the additional design lite attorded by the repairs is ditticult to quantify; however, reasonable estimates can be made. Modern steel bridges, with a properly maintained steel protective paint coating system and proper detailing for tatigue, can theoretically have an indetinite service lite. A tatigue life analysis according to the AASHTO Manual for Bridge Evaluation (MBE) was completed by Cornerstone on all Fracture Critical Members identified in the

986 West Alluvial Avenue - Suite 201 | tel (559) 320-3200
Fresno, CA 93711 | fax (559) 320-3201

2008 Caltrans Bridge Inspection Report (BIR) and it was determined that the members either have an indefinite fatigue life or a fatigue life exceeding the design life specified by the AASHTO Bridge Design Specifications. Fatigue life analysis is only an estimate of the design life for these members and continued routine inspections of those elements susceptible to fatigue will be required throughout the life of the bridge.

Based on our field investigations and the Caltrans BIR reports, there does not appear to be any significant section loss on any of the steel members due to corrosion and most areas of corrosion appear to be limited to surface scale. The application of a new paint system as part of the bridge rehabilitation will increase the remaining design life of the steel members with respect to corrosion. The typical design life of new paint coating system is between 50 to 75 years with a maintenance overcoating every 20 to 25 years. Routine maintenance of the new paint system will be required to ensure the steel is protected against corrosion. This includes routine inspection and touchup of the paint system as required.

The abutments of the existing bridge are currently not proposed to be rehabilitated as part of the rehabilitation and retrofit project. The remaining design life of the existing abutments is difficult to estimate, particularly considering the unknown condition of the abutment foundations and the present condition of the existing concrete as it relates to degradation. According to the 2008 Caltrans BIR and SI&A Report, the 90 year old bridge substructure is currently in good condition. Based on the BIR and our visual inspections of the visible portions of the abutments, the existing abutments currently show no significant visual signs of distress or material degradation While this does not provide a quantitative measure of the remaining design life of the existing abutments, it does provide a qualitative measure of the quality of the concrete used in the abutments and it suggests that the abutments have a reasonably long amount of design life remaining. Based on the current condition, and assuming that the abutments receive regular maintenance (including regular inspections, sealing of cracks, removal of debris, etc.) this remaining design life in our opinion would be at least another 50 to 75 years. This, however, is a qualitative estimate based on very limited data. A quantitative estimate of design life would be required to provide a more accurate estimate of the remaining design life.

In order to provide a quantitative assessment of the existing abutments, a service life assessment per ACI 365.1R-00 could be completed. This service life assessment would require additional field and laboratory testing to determine the present condition of the concrete, identify the cause(s) of degradation, determine the condition of the concrete that would constitute the end of its service life, and determining the remaining service life based on an a time extrapolation from the present state of the concrete to the state determined to constitute the end of its service life. The additional field testing required to complete remaining service life assessment would include sample removal as well as completing crack, delamination/spall, chloride, and carbonation surveys. The additional laboratory testing required would include both petrographic and chemical studies to

determine such things as air content, w/cm ratio, air-void distribution, unstable aggregates, pH, the depth of carbonation, and chemical constituents of cementitious materials.

It should be noted that any estimate of remaining design life is, at best, an estimate. Design life will be heavily dependent upon the quality of the material and workmanship, environmental factors such as exposure to caustic elements (chlorides & carbonization), and maintenance over the lite of the element.

Refer to the Project Study Report for details of specitic rehabilitation work contemplated as well as engineer's estimates of rehabilitation cost.

2. *Demonstrate the load capacity and safety features of the bridge are adequate to serve the intended use for the life of the bridge. Safety issues must be analyzed and addressed whether the existing geometrics contributed to the accidents on the bridge from the traffic accident data. Also, in Section No. 9, "Structure Information" on Page 3 of the PSR, please expand on why the proposed work will not meet the current standards.*

   Response:

   Safety features and issues with the bridge geometry, as well as evaluation of previous accident data, should be addressed by the project roadway engineer.

   With respect to the structural load capacity of the bridge, the current bridge design specifications, the 2007 AASHTO "LRFD Bridge Design Specifications", 4th Edition with Caltrans Amendments, requires the application of the HL-93 design vehicular loading tor new bridges. HL-93 loading combines HS20-44 design vehicular loading with a 640plf lane loading and has been specifically calibrated for use with Load and Resistance Factor Design (LRFD) and Load and Resistance Factor Rating (LRFR) methodologies. The AASHTO Manual for Bridge Evaluation (MBE) provides methods for determining Rating Factors by either LRFR or Allowable Stress Design/Load Factor Design (ASD/LFD) methodologies. ASD/LFD ratings are based on HS20-44 design vehicular loads. Because the Healdsburg Avenue Bridge has been previously rated to ASD methodologies by Caltrans and the current Bridge Inspection Report is based on ASD/LFD ratings that utilize HS20-44 design vehicular loading, the bridge is proposed to be rehabilitated using the Caltrans Bridge Design Specitications (based on the 1996 AASHTO Standard Specitication for Highway Bridges) which will result in an Inventory Rating Factor of 1.0 as determined by the ASD/LFD section of the MBE. With an ASD/LFD Inventory Rating Factor of 1.0, the Healdsburg Avenue Bridge live load capacity will be comparable to the capacity ot a new bridge structure as discussed in MBE Section 6B.3.1. Furthermore, retrofit and rehabilitation projects often use the traditional HS20-44 truck loading in the Caltrans Bridge Design Specifications. It is proposed to use the HS20-44 loading criteria to rehabilitate the existing historical bridge.

3. *Address the deficiencies that cause the bridge to be on the Eligible Bridge List (EBL) and whether the bridge will remain on the EBL after rehabilitation. Please refer to Section 6.3 of the Highway Bridge Program (HBP) in the Local Assistance Program Guidelines for the program goals and requirements.*

   Response:
   According to section 6.2.1 of the State of California's *Local Assistance Program Guidelines*, a bridge rated as Structurally Deficient or Functionally Obsolete with a Sufficiency Rating ≤ 80 will cause a bridge to be included on the Eligible Bridge List (EBL). The 2008 BIR and the Structure Inventory and Appraisal Report (SI&A) shows that the Healdsburg Avenue Bridge has a Sufficiency Rating of 44.2 and is flagged Structurally Deficient (SD) and Functionally Obsolete (FO) and is therefore eligible to be on the EBL. The Sufficiency Rating of 44.2 is based on several factors including the bridge geometry, the structural condition of the bridge, and the calculated load rating of the bridge. The bridge is flagged as Structurally Deficient due to the structural condition of the deck. The deck condition, according to the 2008 SI&A (Item Code No. 58), is listed in critical condition. Because of the limited roadway width between the bridge trusses, the deck geometry (Item Code No. 68) is listed as a 2 which would also flag the bridge as Functionally Obsolete.

   The existing bridge will be seismically retrofitted and rehabilitated which will significantly improve the structural condition of the existing bridge. The retrofit and rehabilitation will include replacement of the existing pier, replacement of the existing bridge bearings, strengthening of the bridge for HS20-44 design loading, replacement of the bridge paint system, and replacement of the existing bridge deck; increasing the bridge's Sufficiency Rating to approximately 74. The replacement of the deficient deck will remove the Structurally Deficient flag from the bridge. However, because the bridge width cannot be changed as part of this project, the bridge will remain Functionally Obsolete. Following the retrofit and rehabilitation, the bridge will remain on the EBL, with a Sufficiency Rating of approximately 74 and a flag of Functionally Obsolete.

   Section 6.3 of the Local Assistance Program Guidelines (LAPG) notes that it is the intent of the HBP program to remove bridges from the EBL and that local agencies shall ensure that HBP funded rehabilitation will result in a bridge that will not be rated FO or SD and that the SR will be greater than 80. While the Healdsburg Avenue Bridge will not meet the requirements of LAPG Section 6.3, the Healdsburg Avenue Bridge is also listed on the National Register of Historic Places and therefore is eligible to meet the requirements of Section 6.2.10 of the LAPG. According to Section 6.2.10, the use of HBP funds is authorized for the reasonable costs associated with preserving the historical integrity of a designated bridge. Per Section 6.2.10, Paragraph 4, if the rehabilitation of the existing bridge does not remove the bridge from the EBL, approval of the Caltrans Office of Program Management will be required and is requested for this project.

4. *The bridge has fracture critical elements. What is the City's plan to address these fracture critical elements as the bridge continues to serve out its remaining life.*

   Response:

   The 2008 Bridge Inspection Report (BIR) identifies the floor beams and the bottom truss chord members of the Healdsburg Avenue bridge to be Fracture Critical Members (FCMs). AASHTO defines an FCM as a "component in tension whose failure is expected to result in the collapse of the bridge or the inability of the bridge to perform its function." Failure of these members is often caused by fatigue fractures or corrosion induced section loss. Fatigue fractures are caused by cycles of tension loading within the member, typically caused by the application of truck live load on the bridge. Routine inspections of the FCMs are required to verify that fatigue fractures have not developed within the members. Corrosion induced section loss is caused by the failure of the steel protective paint system and can be mitigated through proper maintenance.

   Routine Fracture Critical Investigations (FCI) have been provided by Caltrans on the Healdsburg Avenue Bridge to investigate whether fatigue fractures have developed on the FCMs. The most recent FCI was completed in August 2008 and no fractures were detected during the investigation. The Fracture Critical Investigation, however, only provides a measure of whether the bridge currently has fatigue damage but it does not provide a measure of the remaining life of the bridge. To do this, a fatigue life analysis was performed by Cornerstone according to the AASHTO Manual for Bridge Evaluation (MBE).

   The fatigue life analysis consists of a two tier analysis. The first tier analysis is to check whether the structure members have an infinite fatigue life. Theoretically, a structural member will have an infinite fatigue life if the effective stresses in the member are less than the fatigue threshold. The fatigue threshold is per the LRFD Bridge Design Specifications and is dependent upon the member being considered. Per the MBE, the effective stresses in the member may be determined from field studies of the actual bridge or may be estimated based on the LRFD design fatigue truck. For this analysis, we have estimated the fatigue stresses based on the LRFD fatigue truck. Based on our analysis, the bottom truss chord eye bars and the floor beams of the Healdsburg Avenue Bridge meet the requirements of an infinite fatigue life. However, the web eye bars do not meet the infinite fatigue life requirements of the MBE. Therefore, a second tier analysis is required.

   The second tier analysis estimates the finite fatigue life of the bridge based on the truck live loads that the bridge has been subjected to in the past and an estimate of the truck live loads the bridge will be subjected to in the future. This second tier analysis requires that several assumptions be made with regards to the average live loads that the bridge has seen, and will see, over its life span, including weight and frequency of the truck traffic. The MBE provides adjustment factors for estimating the average truck live loads

over the life span of the bridge based on the current Average Daily Truck Traffic (ADTT) and expected growth percentages. The MBE only provides adjustment factors up to a life span of 50 years. However, these adjustment factors approach a value of 1.0 for long life spans therefore, for our analysis the average lifetime ADTT for the bridge is based on the ADT shown in the 2008 BIR. To calculate the present ADTT, we used the LRFD Bridge Design Specifications recommended percentage of truck traffic of 15%. While the 2008 BIR shows a current percentage of truck traffic of 5%, this is based on the bridge currently being load posted. It is likely that this percentage of truck traffic is low compared to the percentage of truck traffic that has occurred over the life of the bridge. Therefore, we have used the more conservative 15% provided in the LRFD code to estimate the ADTT for the fatigue life analysis.

The MBE also provides three levels of finite fatigue life which allow the evaluator to adjust the calculated fatigue life for economic purposes. These levels are:

- The minimum expected fatigue life (which equals a conservative design fatigue life)
- The evaluation fatigue life (which equals a conservative fatigue life for evaluation purposes)
- The mean fatigue life (which equals the most likely fatigue life)

For our analysis, we calculated the evaluation fatigue life. This provides a conservative fatigue life compared to the mean fatigue life but is also not overly conservative (as would be the case with the minimum expected fatigue life).

Based on the MBE and our finite fatigue life analysis, the web members have a remaining life span of approximately 80 years (see attached calculations). This estimated expected life span is more than the life span of the other elements of the bridge, including the replacement pier, deck, and abutments.

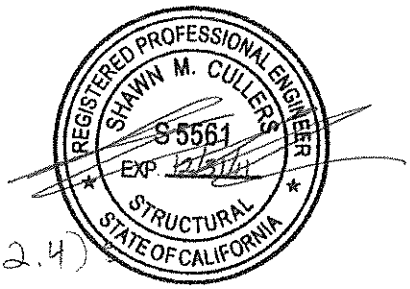
Based on our fatigue life analysis and the estimated fatigue life span of the bridge elements, the Healdsburg Avenue Bridge Fracture Critical Members remaining design life do not appear to be controlled by fatigue loading. The remaining life span for the FCMs according to the MBE is only an estimate and these members will still be considered Fracture Critical after the rehabilitation is complete. Therefore, routine Fracture Critical Investigations (every 2 years) will continue to be required for the life of the bridge to ensure fatigue fractures do not develop within these members. If fatigue fractures do develop, repair or replacement of the effected members may be required at a later date. To further reduce the potential for the development of fatigue fractures on the bridge, the City of Healdsburg could maintain the current load posting on the bridge. This will reduce the number of fatigue cycles the bridge would experience and therefore reduce the potential for fatigue cracks and further increase the remaining fatigue life of the bridge.

BY AB DATE 7/19/11 SUBJECT HEALDSBURG SHEET NO. ____ OF ____

CHKD. BY ____ DATE ____ FATIGUE LIFE JOB NO. 2010204

FATIGUE LIFE, Y

FATIGUE CRITICAL MEMBERS



BOTTOM CHORD

INFINITE-LIFE CHECK (MBE 7.2.4):

$(\Delta f)_{MAX} \leq (\Delta F)_{TH}$

$(\Delta f)_{MAX} = 2.0 \cdot (\Delta f)_{eff}$

$(\Delta f)_{eff} = R_s \Delta f$

$R_s = 1.0$ (MBE 7.2.2.1-1)

$\Delta f = .75 \times IM \left[T/A \right]$

$IM = 1.15$ (LRFD T3.6.2.1-1)

$T = 60^K$ (PER SAP MODEL W/ FATIGUE TRUCK PLACED PER LRFD 3.6.1.4)

$A = 24.0 IN^2$ (USE AREA OF EYE BAR)

$\Delta f = .75(1.15)\left[60^K/24 IN^2\right] = 2.16^{KSI}$

$(\Delta f)_{eff} = 1.0(2.16^{KSI}) = 2.16^{KSI}$

$(\Delta f)_{MAX} = 2.0(2.16^{KSI}) = 4.32^{KSI}$

$(\Delta F)_{TH} = 4.5^{KSI}$ (LRFD T6.6.1.2.5-3, DETAIL CAT. E)

$4.32^{KSI} < 4.5^{KSI}$ ∴ FATIGUE LIFE, Y = INFINITE YEARS

DIAGONAL WEB

INFINITE-LIFE CHECK (MBE 7.2.4):

$(\Delta f)_{MAX} \leq (\Delta F)_{TH}$

$(\Delta f)_{MAX} = 2.0 \times (\Delta f)_{eff}$

$(\Delta f)_{eff} = R_s \Delta f$

$R_s = 1.0$ (MBE 7.2.2.1-1)

$\Delta f = .75 \times IM \left[T/A \right]$

FATIGUE LIFE, Y CONT.

$IM = 1.15$ (LRFD T3.6.2.1-1)

$T = 54^K$ (PER SAP MODEL W/ FATIGUE TRUCK PER LRFD 3.6.1.4)

$A = 13.5\ in^2$ (NET AREA OF EYE BAR)

$\Delta f = .75 \times (1.15)\left[54^K / 13.5 in^2\right] = 3.45^{KSI}$

$(\Delta f)_{eff} = 1.0 \times 3.45^{KSI} = 3.45^{KSI}$

$(\Delta f)_{MAX} = 2.0 \times (3.45^{KSI}) = 6.9^{KSI}$

$(\Delta F)_{TH} = 4.5^{KSI}$ (LRFD TG.6.1.2.5-3, DETAIL CAT. E)

$6.9^{KSI} > 4.5^{KSI}$ ∴ FINITE FATIGUE LIFE MUST BE CALC'D

FINITE FATIGUE LIFE (MBE 7.2.5):

$$Y = \frac{R_R A}{365 n (ADTT)_{SL} \left[(\Delta f)_{eff}\right]^3} \quad \text{(MBE EQ 7.2.5.1-1)}$$

$R_R = 1.3$ (MBE T7.2.5.2-1, DETAIL CAT. E, EVAL LIFE)

$A = 11 \times 10^8$ (LRFD TG.6.1.2.5-1)

$n = 1.0$ (LRFD TG.6.1.2.5-2)

$(ADTT)_{SL} = p$ (TRUCK FRACTION × ADT) (LRFD 3.6.1.4.2)

$p = 1.0$ (LRFD T 3.6.1.4.2-1, 1 LANE PER DIRECTION)

TRUCK FRACTION $= 0.15$ (LRFD TC 3.6.1.4.2-1)

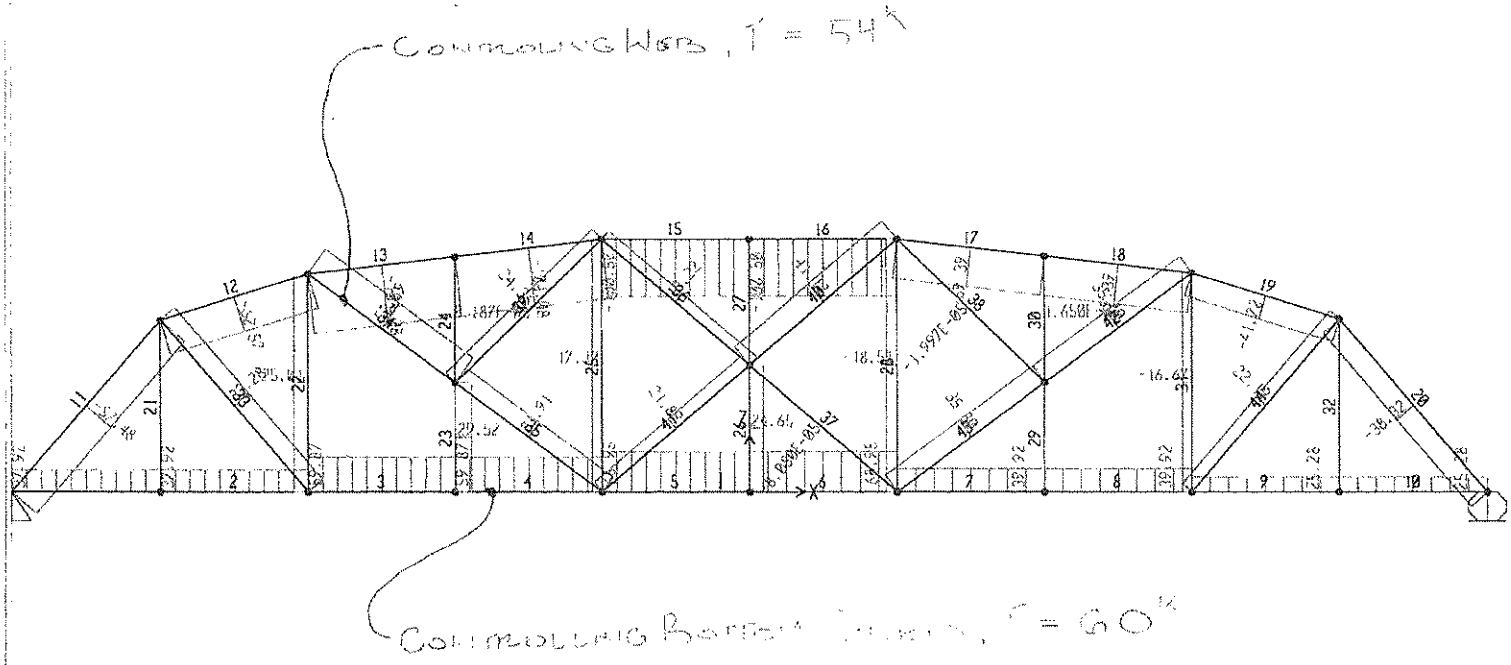
$ADT = \frac{7,500}{2} = 3,750$ (ONE DIRECTION)

$(ADTT)_{SL} = 1.0(0.15 \times 3,750) = 563$

$$Y = \frac{1.3 \times 11 \times 10^8}{365(1.0)(563)(3.45^{KSI})^3} = 169\ YRS$$

REMAINING FATIGUE LIFE = Y − PRESENT AGE (90 YRS OLD)

REMAINING FATIGUE LIFE $= 169 - 90 = 79$ YRS


Commoning Web, T = 54k
Commoning Bottom Chord, T = 60k

BY SB DATE 7/20/11 SUBJECT HENDERSBURG SHEET NO. ____ OF ____
CHKD. BY ____ DATE ____ FATIGUE LIFE JOB NO. 2010004

FATIGUE LIFE, Y CONT.

FLOOR BEAM

INFINITE-LIFE CHECK (MBE 7.2.4):

$(\Delta f)_{MAX} \leq (\Delta F)_{TH}$

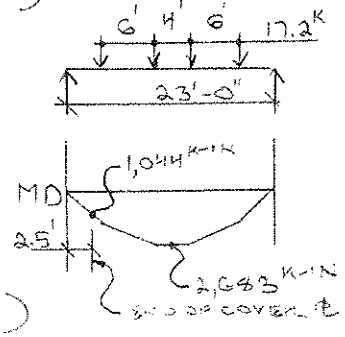
$(\Delta f)_{MAX} = 2.0 \times (\Delta f)_{ESS}$

$(\Delta f)_{ESS} = R_S \Delta f$

$R_S = 1.0$ (MBE T 7.2.2.1-1)

$\Delta f = .75 \times IM$ [M/S]

$IM = 1.15$ (LRFD T 3.6.2.1-1)



$M = 1,044$ K-IN, $S = 196$ IN^3 (@ COVER PL END, UNIDIR 2 LANES OF FATIGUE TRUCK)

$M = 2,683$ K-IN, $S = 368$ IN^3 (@ CENTER SPAN, UNIDIR 2 LANES OF FATIGUE TRUCK)

$\Delta f = .75 \times 1.15 \left[\frac{2,683 \text{ K-IN}}{368 \text{ IN}^3}\right] = 6.3$ KSI (5.3 KSI @ COVER PL END)

$(\Delta f)_{ESS} = 1.0 \times 6.3 \text{ KSI} = 6.3$ KSI

$(\Delta f)_{MAX} = 2.0 \times 6.3 \text{ KSI} = 12.6$ KSI

$(\Delta F)_{TH} = 16$ KSI (LRFD T 6.6.1.2.5-3, DETAIL CAT. B)

$12.6 \text{ KSI} < 16 \text{ KSI} \therefore$ FATIGUE LIFE, Y = INFINITE YEARS

Attachment H

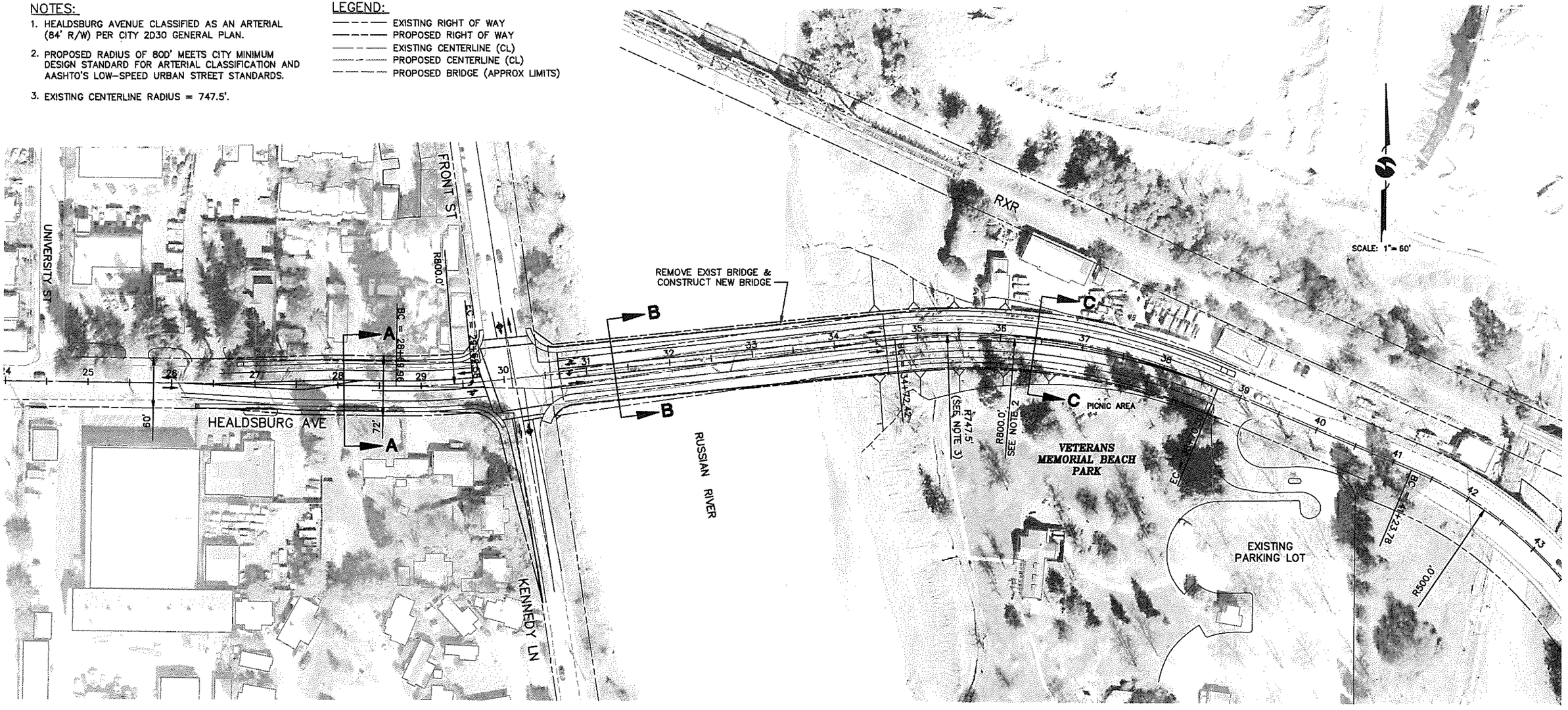
Other Concepts Considered

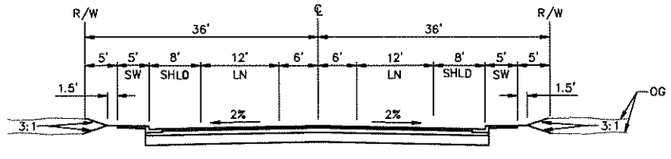
NOTES:

1. HEALDSBURG AVENUE CLASSIFIED AS AN ARTERIAL (84' R/W) PER CITY 2030 GENERAL PLAN.
2. PROPOSED RADIUS OF 800' MEETS CITY MINIMUM DESIGN STANDARD FOR ARTERIAL CLASSIFICATION AND AASHTO'S LOW-SPEED URBAN STREET STANDARDS.
3. EXISTING CENTERLINE RADIUS = 747.5'.

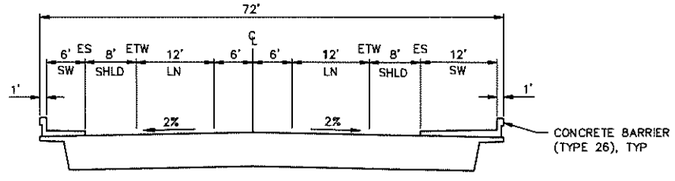
LEGEND:

- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING CENTERLINE (CL)
- PROPOSED CENTERLINE (CL)
- PROPOSED BRIDGE (APPROX LIMITS)



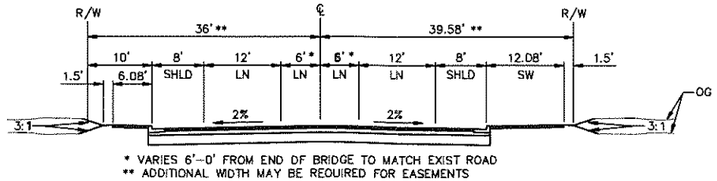


SECTION A-A
(WEST OF BRIDGE)



SECTION B-B *
(AT BRIDGE)

* CROSS SECTION PURSUANT TO CITY GENERAL PLAN



* VARIES 6'-0' FROM END OF BRIDGE TO MATCH EXIST ROAD
** ADDITIONAL WIDTH MAY BE REQUIRED FOR EASEMENTS

SECTION C-C
(EAST OF BRIDGE)

HEALDSBURG AVENUE BRIDGE PROJECT

CONCEPT 3B

CONCEPT: 3B - REPLACE EXISTING STRUCTURE WITH NEW STYLE (CONCRETE) STRUCTURE

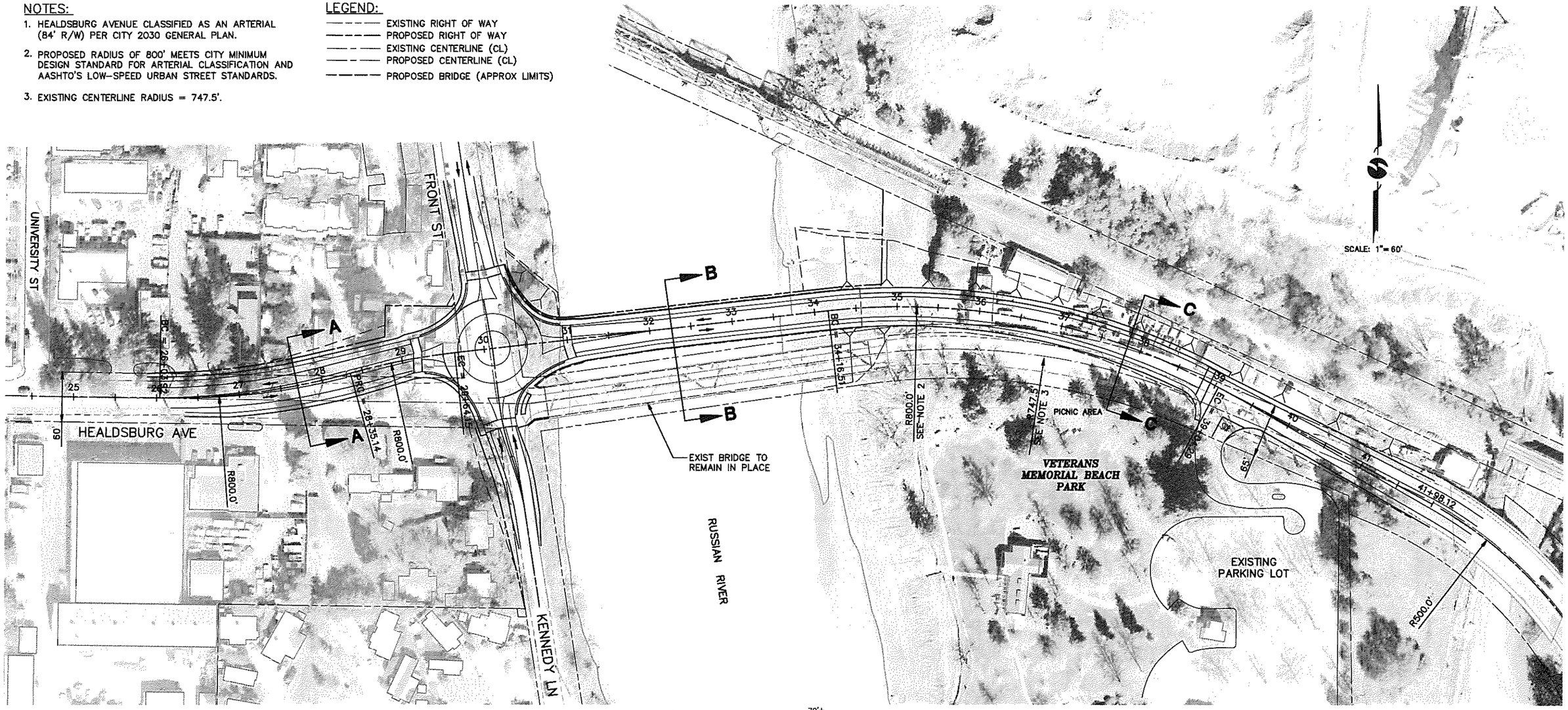
K:\PRJ\1436\1436EX015.dwg 5/5/2011 11:28:00 AM PDT

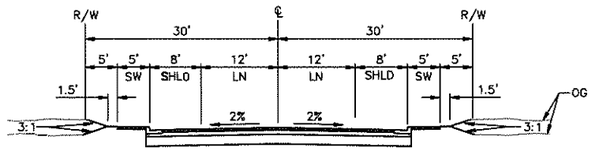
NOTES:

1. HEALDSBURG AVENUE CLASSIFIED AS AN ARTERIAL (84' R/W) PER CITY 2030 GENERAL PLAN.
2. PROPOSED RADIUS OF 800' MEETS CITY MINIMUM DESIGN STANDARD FOR ARTERIAL CLASSIFICATION AND AASHTO'S LOW-SPEED URBAN STREET STANDARDS.
3. EXISTING CENTERLINE RADIUS = 747.5'.

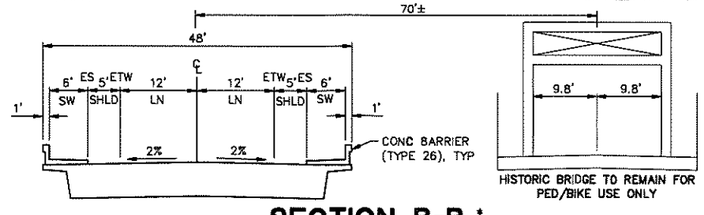
LEGEND:

- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING CENTERLINE (CL)
- PROPOSED CENTERLINE (CL)
- PROPOSED BRIDGE (APPROX LIMITS)



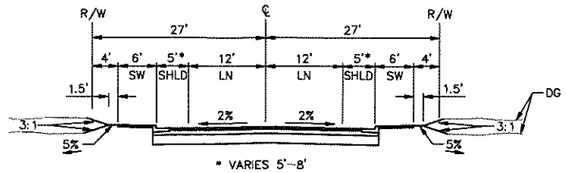


SECTION A-A
(WEST OF BRIDGE)



SECTION B-B *
(AT BRIDGE)

* CROSS SECTION PURSUANT TO CITY GENERAL PLAN INTENT



* VARIES 5'-8'

SECTION C-C
(EAST OF BRIDGE)

HEALDSBURG AVENUE BRIDGE PROJECT

CONCEPT 4A

CONCEPT 4A - NEW STRUCTURE TO NORTH WITH ROUNDABOUT

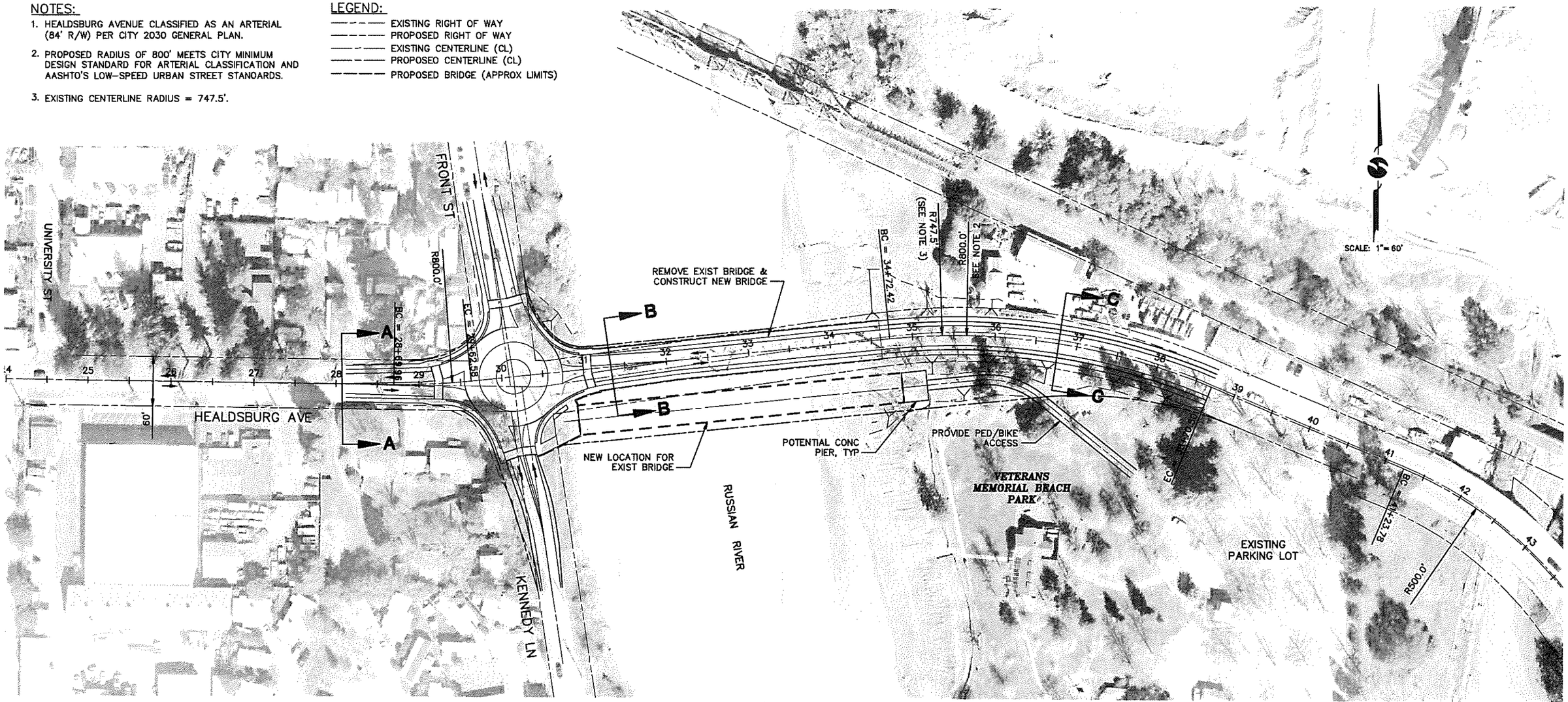
K:\PRJ\1436\1436EX036.dwg 5/5/2011 11:51:35 AM PDT

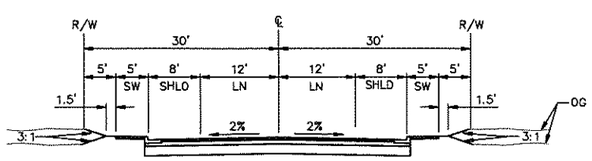
NOTES:

1. HEALDSBURG AVENUE CLASSIFIED AS AN ARTERIAL (84' R/W) PER CITY 2030 GENERAL PLAN.
2. PROPOSED RADIUS OF 800' MEETS CITY MINIMUM DESIGN STANDARD FOR ARTERIAL CLASSIFICATION AND AASHTO'S LOW-SPEED URBAN STREET STANDARDS.
3. EXISTING CENTERLINE RADIUS = 747.5'.

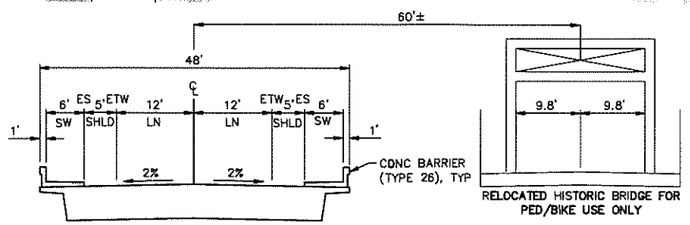
LEGEND:

- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING CENTERLINE (CL)
- PROPOSED CENTERLINE (CL)
- PROPOSED BRIDGE (APPROX LIMITS)



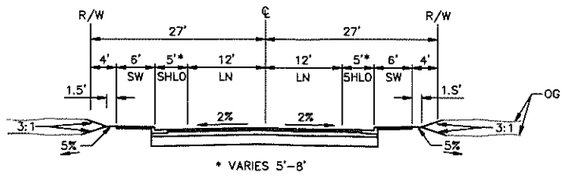


SECTION A-A
(WEST OF BRIDGE)



SECTION B-B*
(AT BRIDGE)

* CROSS SECTION PURSUANT TO CITY GENERAL PLAN INTENT



SECTION C-C
(EAST OF BRIDGE)

HEALDSBURG AVENUE BRIDGE PROJECT

CONCEPT 5B

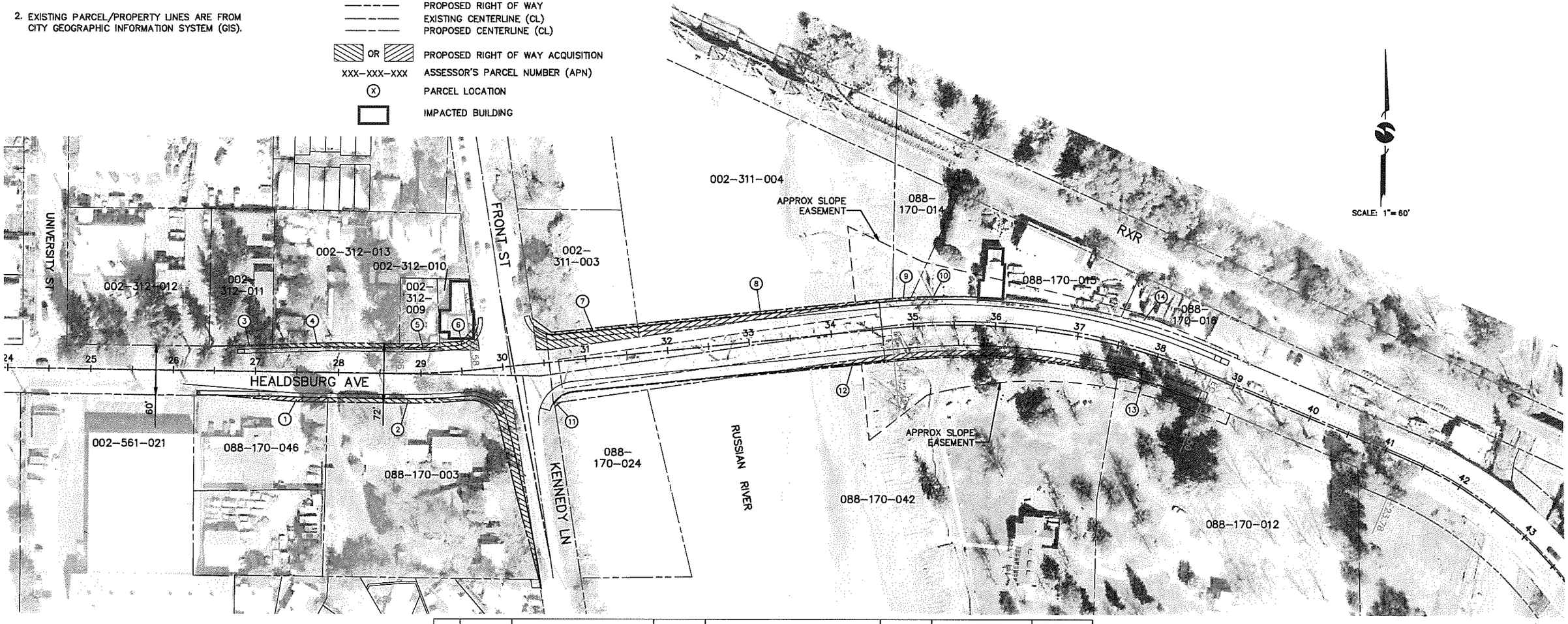
CONCEPT 5B - RELOCATE EXISTING STRUCTURE TO SOUTH (WITH ROUNDABOUT)

NOTES:

1. HEALDSBURG AVENUE CLASSIFIED AS AN ARTERIAL (84' R/W) PER CITY 2030 GENERAL PLAN.
2. EXISTING PARCEL/PROPERTY LINES ARE FROM CITY GEOGRAPHIC INFORMATION SYSTEM (GIS).

LEGEND:

- EXISTING PROPERTY LINES
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING CENTERLINE (CL)
- PROPOSED CENTERLINE (CL)
- OR — PROPOSED RIGHT OF WAY ACQUISITION
- XXX–XXX–XXX — ASSESSOR'S PARCEL NUMBER (APN)
- (X) — PARCEL LOCATION
- IMPACTED BUILDING



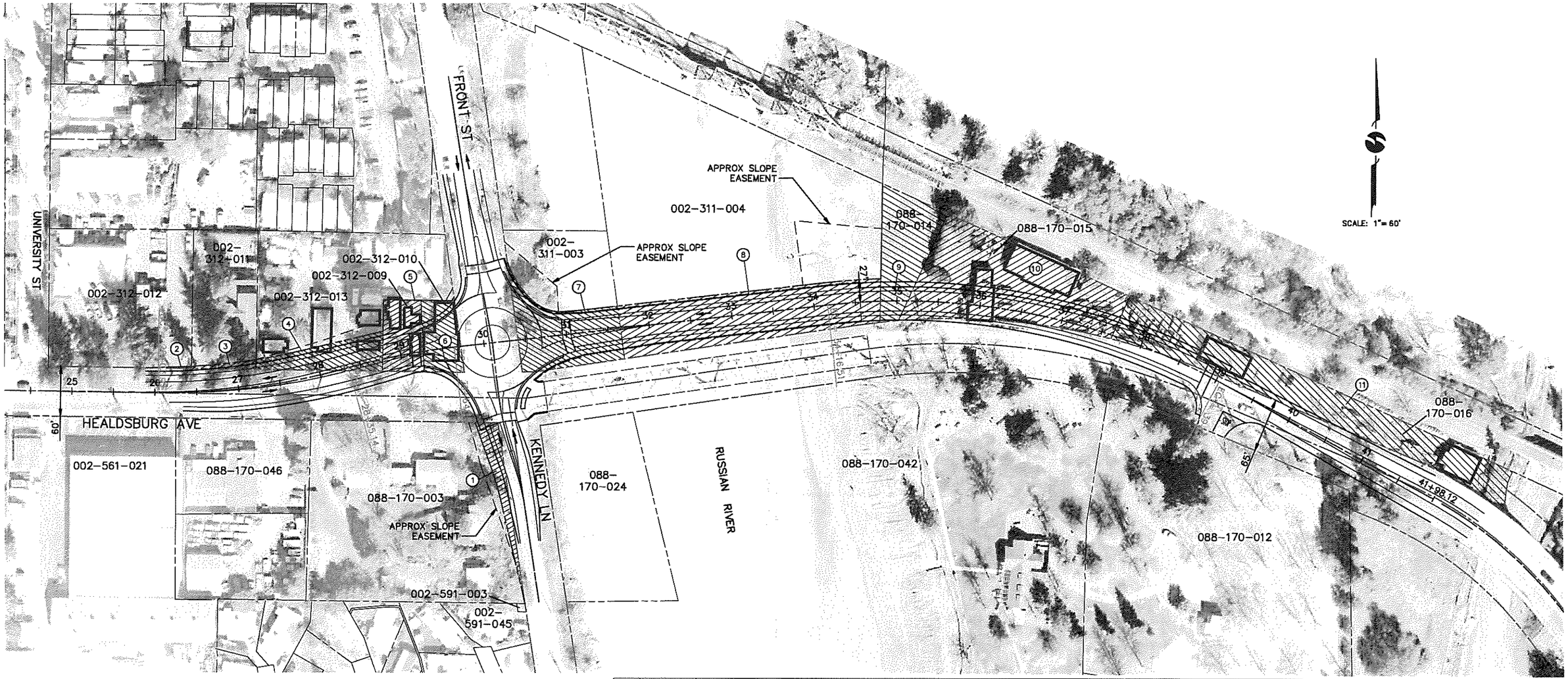
Parcel No.	APN	Owner	Total Parcel Area		R/W Acquisition						R/W Remainder		Impacted Buildings				Slope Easement	
					Res		Comm		Public				Res		Comm			
			(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	# of	(sf)	# of	(sf)	(sf)	(ac)
1	088-170-046	WARNER CHARLES D TR & PATRICIA H TR	18370	0.4			441	0.01			17929	0.4						
2	088-170-003	BLUM JOHN FRANKLIN	53358	1.2	3596	0.08					49762	1.1						
3	002-312-011	ZAM ENTERPRISES INC ET AL	12814	0.3			122	0.00			12692	0.3						
4	002-312-013	KAISER CHARLES P & PATRICIA A	31640	0.7	873	0.02					30766	0.7						
5	002-312-009	KAISER CHARLES P & PATRICIA A TR	4052	0.1	354	0.01					3698	0.1						
6	002-312-010	AITKEN STEVE C & JANA	3771	0.1			668	0.02			3104	0.1			1	2175		
7	002-311-003	SORACCO JOHN R TR ET AL	20371	0.5	2447	0.06					20371	0.5						
8	002-311-004	TROWBRIDGE RECREATION INC	94748	2.2	2886	0.07					94748	2.2					3788	0.09
9	088-170-014	TROWBRIDGE RECREATION INC	9224	0.2			56	0.00			9168	0.2					1706	0.04
10	088-170-015	ALVAREZ RAPHAEL & ELVIA	25274	0.6			96	0.00			25178	0.6			1	1531	5199	0.12
11	088-170-024	COUNTY OF SONOMA	27373	0.6					15	0.00	27358	0.6						
12	088-170-042	COUNTY OF SONOMA	308161	7.1					2755	0.06	305406	7.0					11707	0.27
13	088-170-012	COUNTY OF SONOMA	106432	2.4					375	0.01	106057	2.4					2003	0.05
14	088-170-016	TROWBRIDGE RECREATION INC	21366	0.5							21366	0.5					898	0.02
		TOTALS	736954	16.9	10157	0.23	1383	0.03	3144	0.07	727603	16.7	0	0	2	3706	25301	0.58

HEALDSBURG AVENUE BRIDGE PROJECT

CONCEPT 3

CONCEPTS 3A & 3B - PRELIMINARY RIGHT OF WAY ACQUISITIONS

K:\PRJ\1436\1436EX025.dwg 5/5/2011 12:02:18 PM PDT



NOTES:

1. HEALDSBURG AVENUE CLASSIFIED AS AN ARTERIAL (84' R/W) PER CITY 2030 GENERAL PLAN.
2. EXISTING PARCEL/PROPERTY LINES ARE FROM CITY GEOGRAPHIC INFORMATION SYSTEM (GIS).

LEGEND:

- EXISTING PROPERTY LINES
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING CENTERLINE (CL)
- PROPOSED CENTERLINE (CL)
- OR — PROPOSED RIGHT OF WAY ACQUISITION
- XXX-XXX-XXX — ASSESSOR'S PARCEL NUMBER (APN)
- (X) — PARCEL LOCATION
- IMPACTED BUILDING

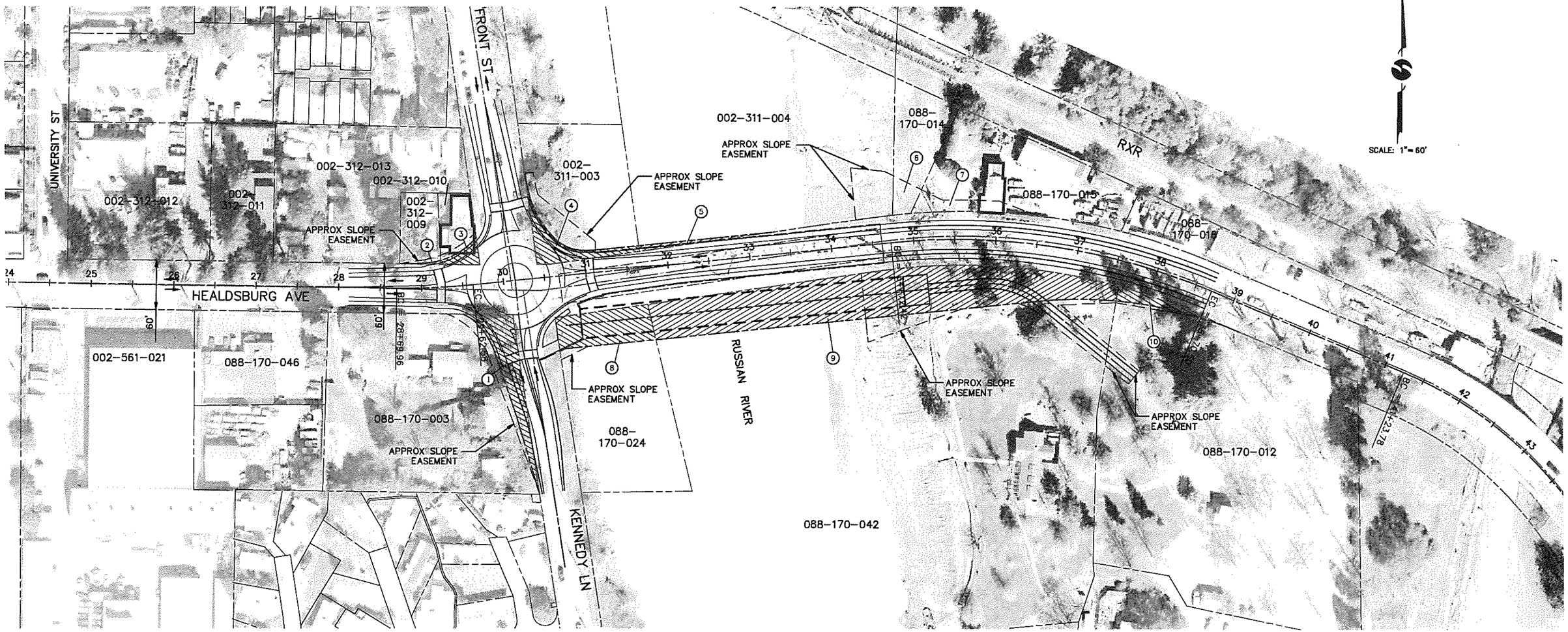
Parcel No.	APN	Owner	Total Parcel Area		R/W Acquisition						R/W Remainder		Impacted Buildings				Slope Easement	
					Res		Comm		Public				Res		Comm			
			(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	# of	(sf)	# of	(sf)	(sf)	(ac)
1	088-170-003	BLUM JOHN FRANKLIN	53358	1.2	2342	0.05					51016	1.2					1287	0.03
2	002-312-012	TROWBRIDGE & WRIGHT INV INC	28697	0.7			66	0.00			28631	0.7						
3	002-312-011	ZAM INTERPRISES INC ET AL	12814	0.3			497	0.01			12317	0.3						
4	002-312-013	KAISER CHARLES P & PATRICIA A	31640	0.7	4445	0.10					27195	0.6	4	2358			1097	0.03
5	002-312-009	KAISER CHARLES P & PATRICIA A TR	4052	0.1	4052	0.09					0	0.0	3	1137				
6	002-312-010	AITKEN STEVE C & JANA	3771	0.1			3771	0.09			0	0.0			1	2175		
7	002-311-003	SORACCI JOHN R TRET AL	20371	0.5	9289	0.21					20371	0.5					2265	0.05
8	002-311-004	TROWBRIDGE RECREATION INC	89158	2.0	18575	0.43					89158	2.0					6764	0.16
9	088-170-014	TROWBRIDGE RECREATION INC	7953	0.2			7953	0.18			0	0.0					2896	0.07
10	088-170-015	ALVAREZ RAPHAEL & ELVIA	21969	0.5			21969	0.50			0	0.0			2	4387		
11	088-170-016	TROWBRIDGE RECREATION INC	21365	0.5			21365	0.49			0	0.0			2	3015		
	TOTALS		295149	7	38703	0.89	55622	1.28	0	0.00	228688	5.2	7	3495	5	9577	14309	0.33

HEALDSBURG AVENUE BRIDGE PROJECT

CONCEPT 4A

CONCEPT 4A - PRELIMINARY RIGHT OF WAY ACQUISITIONS (WITH ROUNDABOUT)

K:\PRJ\1436\1436EX035.dwg 5/5/2011 12:03:22 PM PDT



NOTES:

1. HEALDSBURG AVENUE CLASSIFIED AS AN ARTERIAL (84' R/W) PER CITY 2030 GENERAL PLAN.
2. EXISTING PARCEL/PROPERTY LINES ARE FROM CITY GEOGRAPHIC INFORMATION SYSTEM (GIS).

LEGEND:

- EXISTING PROPERTY LINES
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING CENTERLINE (CL)
- PROPOSED CENTERLINE (CL)
- OR — PROPOSED RIGHT OF WAY ACQUISITION
- XXX-XXX-XXX — ASSESSOR'S PARCEL NUMBER (APN)
- ⊗ — PARCEL LOCATION
- PROPOSED RIGHT OF WAY TAKE

Parcel No.	APN	Owner	Total Parcel Area		R/W Acquisition						R/W Remainder		Impacted Buildings				Slope Easement	
					Res		Comm		Public				Res		Comm			
			(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	(sf)	(ac)	# of	(sf)	# of	(sf)	(sf)	(ac)
1	088-170-003	BLUM JOHN FRANKLIN	53358	1.2	4100	0.09					49258	1.1					1589	0.04
2	002-312-009	KAISER CHARLES P & PATRICIA A TR	4052	0.1	70	0.00					3982	0.1					151	0.00
3	002-312-010	AITKEN STEVE C & JANA	3771	0.1			766	0.02			3005	0.1			1	2175	307	0.01
4	002-311-003	SORACCO JOHN R TR ET AL	20371	0.5	2524	0.06					20371	0.5					2396	0.05
5	002-311-004	TROWBRIDGE RECREATION INC	94748	2.2	567	0.01					94748	2.2					2733	0.06
6	088-170-014	TROWBRIDGE RECREATION INC	9224	0.2							9224	0.2					1126	0.03
7	088-170-015	ALVAREZ RAPHAEL & ELVIA	25274	0.6							25274	0.6			1	1531	1956	0.04
8	088-170-024	COUNTY OF SONOMA	27372	0.6					4725	0.11	22647	0.5					217	0.00
9	088-170-042	COUNTY OF SONOMA	310098	7.1					26433	0.61	283664	6.5					4215	0.10
10	088-170-012	COUNTY OF SONOMA	106432	2.4					1065	0.02	105367	2.4					885	0.02
		TOTALS	654700	15	7261	0.17	766	0.02	32223	0.74	617541	14.2	0	0	2	3706	15575	0.36

HEALDSBURG AVENUE BRIDGE PROJECT

CONCEPT 5B

CONCEPT 5B - PRELIMINARY RIGHT OF WAY ACQUISITIONS (WITH ROUNDABOUT)

K:\PRJ\1436\1436EX042.dwg 5/5/2011 12:04:23 PM PDT

Healdsburg Avenue Bridge Project Process

Concept Planning PRELIMINARY Cost Estimates ($ x1000)

Concept		PE*	R/W (Incl row eng'r)	CE**	Construction				Total Project Cost
					Structure				
					Existing Bridge	Replacement Bridge	Lifecycle Maint Cost	Roadway/ other items***	Total
3B	Replace Existing Bridge with 420ft long, 72ft wide Box Girder Bridge	$2,760	$2,170	$2,070	$0	$10,800		$2,990	$13,790	**$20,790**
4A	Rehab. And Convert Existing Bridge to Ped/Bike Bridge; Build new 42ft long, 37ft+/- wide Vehicular Bridge North of Existing Bridge	$2,760	$6,990	$2,010	$3,565	$6,900		$2,950	$13,415	**$25,175**
5B	Rehab. And Convert Existing Bridge to Pedestrian Bridge South of Existing Alignment, Build new 420ft long 37+/-ft wide Vehicular Bridge	$2,760	$2,460	$2,210	$5,500	$6,900		$2,350	$14,750	**$22,180**

* Preliminary Engineering, environmental and PS&E
** Construction Engineering (preliminary 15%)
*** Detour - Stage Construction, Utility Relocation, Mobilization