



To: SFCTA Citizens Advisory Committee

From: Gary Kennerley, PB Project Manager

Copy: Lee Saage, SFCTA Doyle Drive Project Manager

Date: August 2008

Project: South Access to the Golden Gate Bridge
Doyle Drive Environmental and Design Project
SFCTA Contract Number: 99/00-7
PB Project Number: 13145B

Subject: Evaluation of Kobbe Ave. U/C

In order to clearly communicate the need to replace Doyle Drive, a plain language document entitled, "Structural Condition and Replacement Memorandum," (MSA 2008) was prepared. This document was assembled in response to concerns about the need to replace Doyle Drive and compiles a brief summary of the condition state of the corridor's structures, which are, the: Presidio Viaduct (a.k.a. High Viaduct), Marina Viaduct (a.k.a. Low Viaduct), Ruckman UC and Kobbe UC. All of these structures are at the end of their useful life. The structural condition and replacement memorandum summarized the reasons why Doyle Drive needs to be replaced and the methodology used to determine the replacement alternatives, from a structural engineering point of view. The Doyle Drive Final Environmental Impact Statement and Report addresses the full spectrum of environmental, aesthetic and operational considerations that led to a consensus among all participating agencies and the Doyle Drive Citizens Advisory Subcommittee of the San Francisco County Transportation Authority's Citizens Advisory Committee to replace Doyle Drive with the Presidio Parkway.

This memorandum is focused on the structures along Veterans Boulevard (Highway 1) and provides additional background explaining why the Ruckman structure would be replaced as part of the Doyle Drive project while the future rehabilitation or replacement of the Kobbe structure will be programmed separately by Caltrans. During the development of the initial alternatives, and in response to a request from the Doyle Drive Citizens' Subcommittee, the southern limit of the study area along Veterans Boulevard was extended to include the area between the Park Presidio interchange and the MacArthur Tunnel.

The realignment of Doyle Drive to the south of the existing facility will require a reconfiguration of the Park Presidio interchange. The exit ramp from southbound Doyle Drive to southbound Veterans Boulevard is to be replaced with standard exit ramp geometry and widened to two lanes. All other connectors of the interchange are also being realigned to provide standard ramp geometry. The southern limit of the project for each alternative was based on:

- (1) Required alignment
- (2) Condition of existing structures,
- (3) Project independence - necessity to include the area in order to complete the Doyle Drive project. In other words, the ability to make further improvements along Veterans Boulevard independent of the Doyle Drive project,

(4) Cost

Required Alignment

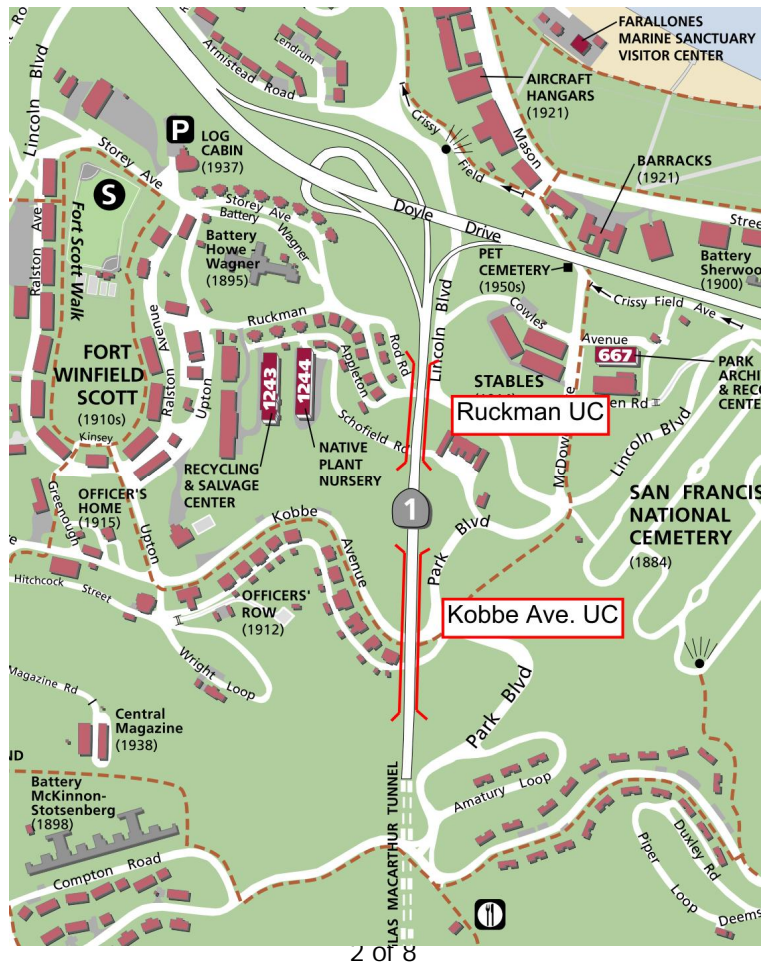
To provide a standard roadway cross section south to the MacArthur Tunnel would require widening the current facility from approximately 14 meters (46 feet) to 21 meters (69 feet) to achieve a standard roadway cross section along Veterans Boulevard. This widening would impact the two structures within this stretch:

- (1) Ruckman Avenue Undercrossing (UC) and
- (2) Kobbe Avenue UC

The above mentioned structures are adjacent bridges originally constructed in 1939 and are both very similar in their configuration. They are of the same structure type, reinforced concrete T-beam superstructure supported on reinforced concrete columns. Both structures underwent seismic retrofits in 1995 as part of Caltrans' statewide bridge seismic retrofit program. In addition, the required geometry for the reconfigured interchange ramps requires the modification of the Ruckman structure.

Figure 1 illustrates the location of the two structures and their location relative to the Park Presidio interchange and the MacArthur Tunnel along Veteran Boulevard.

Figure 1 Location of Ruckman and Kobbe Structures



Condition of Existing Structures

To evaluate the condition of the structures, a structural assessment was performed that indicates the structures' condition and potential need of immediate replacement.

The sufficiency rating (SR), the standard structural condition indicator used by FHWA, is a general indicator that accounts for many variables, including: structural adequacy, load carrying ability, serviceability, functional adequacy and importance to the public transportation network and the national defense network. The sufficiency rating is a numeric value which is indicative of bridge sufficiency to remain in service and is also used in the allocation of funding for repairs. Though made up of these many variables the SR is dominated by structural condition. The SR is a numeric value indicative of bridges' sufficiency to remain in service. It ranges from 0 - insufficient, to 100 - sufficient. The SR is the sum of 4 variables and each variable is made up of several components. The SR does not include any consideration of seismic safety or performance. Table 1 summarizes the SR variables and associated components for the major Doyle Drive structures. Note that special reduction, S4 does not apply to the Doyle Drive Structures.

$$SR = S1 + S2 + S3 - S4$$

Table 1 on the following page contains Sufficiency Ratings for the years 2001 and 2006. A direct comparison between these ratings for the Ruckman UC and the Kobbe UC indicates that both structure conditions indicators have gone down, with the Ruckman structure deteriorating at a much faster rate than the Kobbe structure.

The Sufficiency Rating as well as the Condition Fact sheets attached at the end of this memorandum, both indicate that the Ruckman structure is in much worse condition than the Kobbe structure and its replacement/rehabilitation needs to be scheduled advanced of the Kobbe structure.

Project Independence

The preliminary design for the preferred alternative encroaches onto the Ruckman structure and ends north of the Kobbe Avenue UC where it conforms to the existing roadway cross-section. In order to achieve a standard cross-section beyond this point, Veterans Boulevard would have to be reconstructed south to Lake Street, approximately 0.75 miles. As such, Kobbe Avenue UC and the MacArthur Tunnel would require reconstruction in order to provide a standard roadway cross-section.

Although the Kobbe structure possesses elements that are in better shape than the Ruckman UC, its deck deterioration rate has increased in the last 10 years. Like Ruckman and Marina, this bridge is an integral "T"-type. Deck life can be prolonged somewhat with deal sealing, joint sealing and an overlay, but a complete deck replacement would require a new substructure.

These improvements can be constructed independently from the Doyle Drive project, but it is anticipated that due to the given deck condition state, interim rehabilitation of the deck and joints will become necessary. It is judged likely that replacement will be necessary in the near future and would ideally be programmed concurrent with the Doyle Drive project.

Independent from the Doyle Drive project, Kobbe Avenue UC is part of Caltrans' ongoing maintenance review and will therefore be scheduled based on their maintenance priority list.

Cost

Widening work of any existing Caltrans' bridge structure will require seismic analysis of the existing structure in combination with the new widening portion. This analysis will have to conform to Caltrans' most recent seismic design criteria.

Such an analysis was performed on the Ruckman Avenue structure as part of preferred alternative selection and the Advanced Planning Studies for the Doyle Drive Alternative 5 (September 21, 2005)

Table 1 Structure Sufficiency Ratings

Structure	SR(2001)	SR (2006)	S1	S2	S3	Condition Status	Load Rating (Metric Tons)	Seismic Retrofit MCE
Current Standard	100	100					44.0	NA
Ruckman UC	38.3	31.3	29.3	2.0	0	Structurally deficient, Functionally Obsolete	30.8	Yes
Kobbe UC	60.3	58.3	54.3	4.0	0	Structurally deficient, Functionally Obsolete	30.8	yes

* based on SDC performance

Sufficiency Rating (SR): Numerical Indicator of bridge's sufficiency to remain in service (not including seismic sufficiency).

Range is from 0, insufficient, to 100, sufficient.

Two thresholds are used to aid management decisions. An SR < 80 indicates eligibility for federal rehabilitation funds and an SR < 50 indicates eligibility for federal replacement funds.

S1 - structural adequacy and safety

S2 - serviceability and functional obsolescence

S3 - essentiality for public use

MCE

Maximum Credible Earthquake

Seismic Retrofit

Non-collapse design performance criterion

SDC

Caltrans Design Criteria – limited post earthquake operation

Structurally Deficient:

Indicative of an insufficiency in either the Condition Rating or Appraisal Rating (Structural Evaluation) or both.

Functionally Obsolete:

Indicates that the design features, impacting usage not load carrying capacity, are no longer adequate for its current tasks.

included a cost estimate for the proposed widening work. This estimate incorporated a cost item for additional seismic retrofitting of the existing structure. However, further deterioration of the structure now requires a full replacement at an estimated cost of \$15,576,936 (\$4,713 per square meter in 2008-\$) for the Ruckman Avenue UC.

Assuming the Kobbe Avenue structure that would have comparable square meter replacement costs as the Ruckman Avenue UC, the total cost for replacing the Kobbe Avenue UC would be approximately \$22,080,405 (\$4,713 per square meter in 2008-\$).

Conclusion

The determination of the southern project limit along Veterans Boulevard, between the Park Presidio interchange and the MacArthur Tunnel was based on the needs of the project and conditions of the existing structures in the area, these structures' necessity to be included in the Doyle Drive project and the costs associated of extending the southern project limits.

The area south of the Ruckman structure, including Kobbe Avenue, was included in the Project Study Area. Based on the structure's higher sufficiency rating and its ability to be constructed as a project independent of Doyle Drive, the replacement of Kobbe Avenue UC was not included in the Doyle Drive project. The rehabilitation and /or replacement of the Kobbe Avenue UC will be programmed by Caltrans as part of its regular Bridge Replacement and Rehabilitation Program. As a result, the further development of alternatives for the rehabilitation of the Kobbe structure ceased prior to the end of 2001.

The project team will continue to work with Caltrans to program the replacement of the Kobbe Ave UC structure to coincide with the Doyle Drive project to minimize construction disruption of this portion of the Highway 1 corridor.

Ruckman Undercrossing Structure Condition Fact Sheet

Variable S_2 is a function of road geometry and traffic demand as well as structural condition and load rating. The structural variables are:

Deck Condition: POOR CONDITION

Structural Evaluation: MEETS MINIMUM TOLERABLE LIMITS TO BE LEFT IN PLACE AS IS

Load Rating: 30.8 T METRIC (VS. MINIMUM STD FOR NEW BRIDGES OF 32.4 T METRIC)

Variable S_1 is a function of load rating & condition:

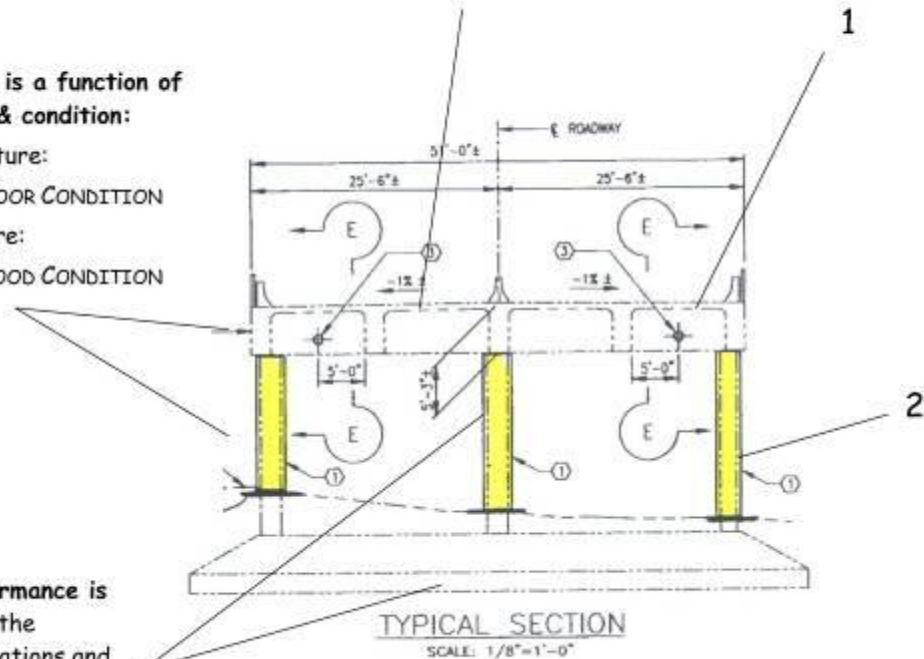
Superstructure:

POOR CONDITION

Substructure:

GOOD CONDITION

Seismic performance is a function of the existing foundations and the 1995 Seismic Retrofit (Yellow)



Ruckman/Story UC-Typical Section

Notes on Condition:

1. Reinforced concrete bridge deck is original and is integral with the deck stringer forming a "T" beam. The deck is bare and it is at the end of its useful life. Leaks in the expansion joints and salt air have deteriorated the concrete. Barrier and light standards are also in an advanced state of deterioration
2. The 1995 Seismic Retrofit jacketed columns and added seat extenders at the abutments. Expected Seismic Performance is judged to be that expected for Ordinary Highway Bridges.

Kobbe Undercrossing Structure Condition Fact Sheet

Variable S_2 is a function of road geometry and traffic demand as well as structural condition and load rating. The structural variables are:

Deck Condition: *SERIOUS CONDITION*

Structural Evaluation: *SATISFACTORY CONDITION*

Load Rating: 30.8 T METRIC (VS. MINIMUM STD FOR NEW BRIDGES OF 32.4 T METRIC)

Variable S_1 is a function of load rating & condition:

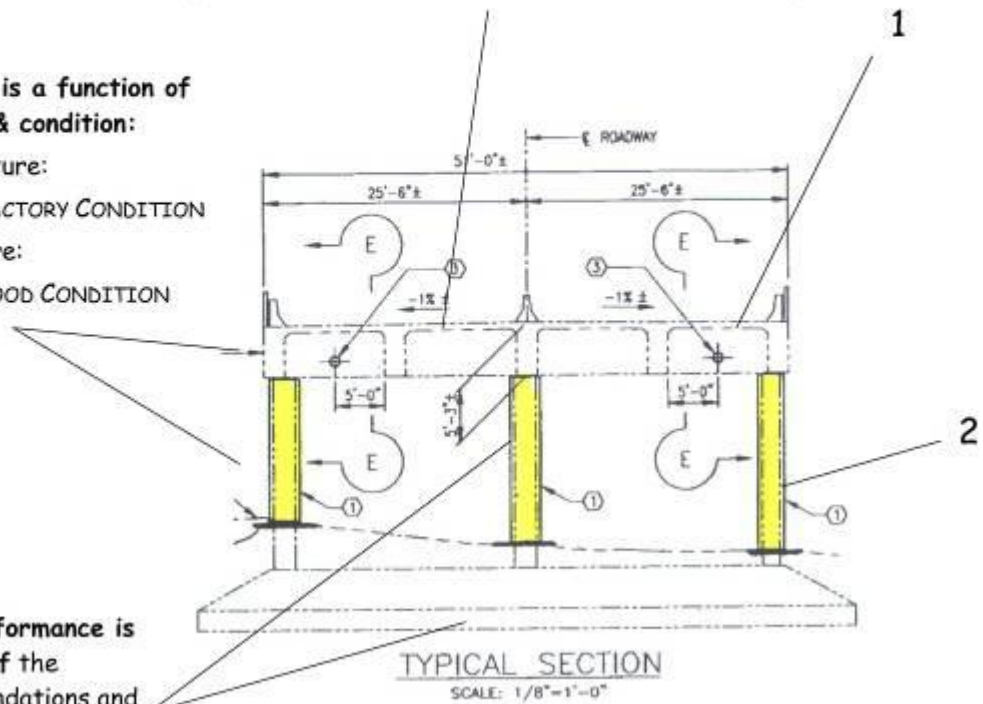
Superstructure:

SATISFACTORY CONDITION

Substructure:

GOOD CONDITION

Seismic performance is a function of the existing foundations and the 1995 Seismic Retrofit (Yellow)



Kobbe UC-Typical Section

Notes on Condition:

1. Reinforced concrete bridge deck is original and is integral with the deck stringer forming a "T" beam. The deck is bare and it is at the end of its useful life. Leaks in the expansion joints and salt air have deteriorated the concrete. Barrier and light standards are also in an advanced state of deterioration
2. The 1995 Seismic Retrofit jacketed columns and added seat extenders at the abutments. Expected Seismic Performance is judged to be that expected for Ordinary Highway Bridges.