



SR 710 North Study

Parts 2/3 – Project Report/Environmental Studies Documentation Phase

Structure Preliminary Geotechnical Report Garfield Avenue Bridge (Widening)

Prepared for



Metro

Los Angeles County
Metropolitan Transportation Authority

February 2014

07-LA-710
EA 07-187900

CH2MHILL®

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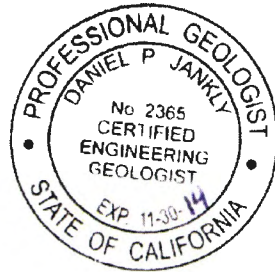
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Signature Page

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Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
APS	Advance Planning Study
bgs	below ground surface
BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CDMG	California Division of Mines and Geology
CIDH	cast-in-drilled-hole
DPW	Department of Public Works
ECI	Earth Consultants International
LRFD	Load and Resistance Factor Design
LRT	Light Rail Transit
Metro	Los Angeles County Metropolitan Transportation Authority
SPGR	Structure Preliminary Geotechnical Report
SR	State Route
TSM/TDM	Transportation System Management/ Transportation Demand Management
USGS	United States Geological Survey

Introduction

1.1 Scope of Work

The California Department of Transportation (Caltrans), in cooperation with the Los Angeles County Metropolitan Transportation Authority (Metro), proposes to improve mobility and relieve congestion in the area between State Route (SR) 2 and Interstates 5, 10, 210, and 605 in east/northeast Los Angeles and the San Gabriel Valley, through the implementation of various transportation improvement projects. One of these improvement projects involves the SR 710 North Study. Five alternatives are being evaluated for the SR 710 North Study as part of the transportation enhancement in the area, including a No Build Alternative. The four build alternatives include Transportation System Management/Transportation Demand Management (TSM/TDM), Bus Rapid Transit (BRT), Light Rail Transit (LRT), and Freeway Tunnel. Figure 1-1 shows a vicinity map for the SR 710 North Study Area.

The TSM/TDM Alternative for the SR 710 North Study includes widening the existing Garfield Avenue Bridge located immediately south of the intersection of Mission Road and Garfield Avenue in the city of Alhambra. As part of the Environmental Studies Documentation Process of the SR 710 North Study, CH2M HILL collected and reviewed geotechnical information for the Garfield Avenue Bridge, and then used information collected during the review to prepare this Structure Preliminary Geotechnical Report (SPGR). The intent of the SPGR is to provide geotechnical information for the Advance Planning Study (APS). Recommendations for other bridge structures as part of the SR 710 North Study are presented in separate reports.

The scope of work for this SPGR included the following:

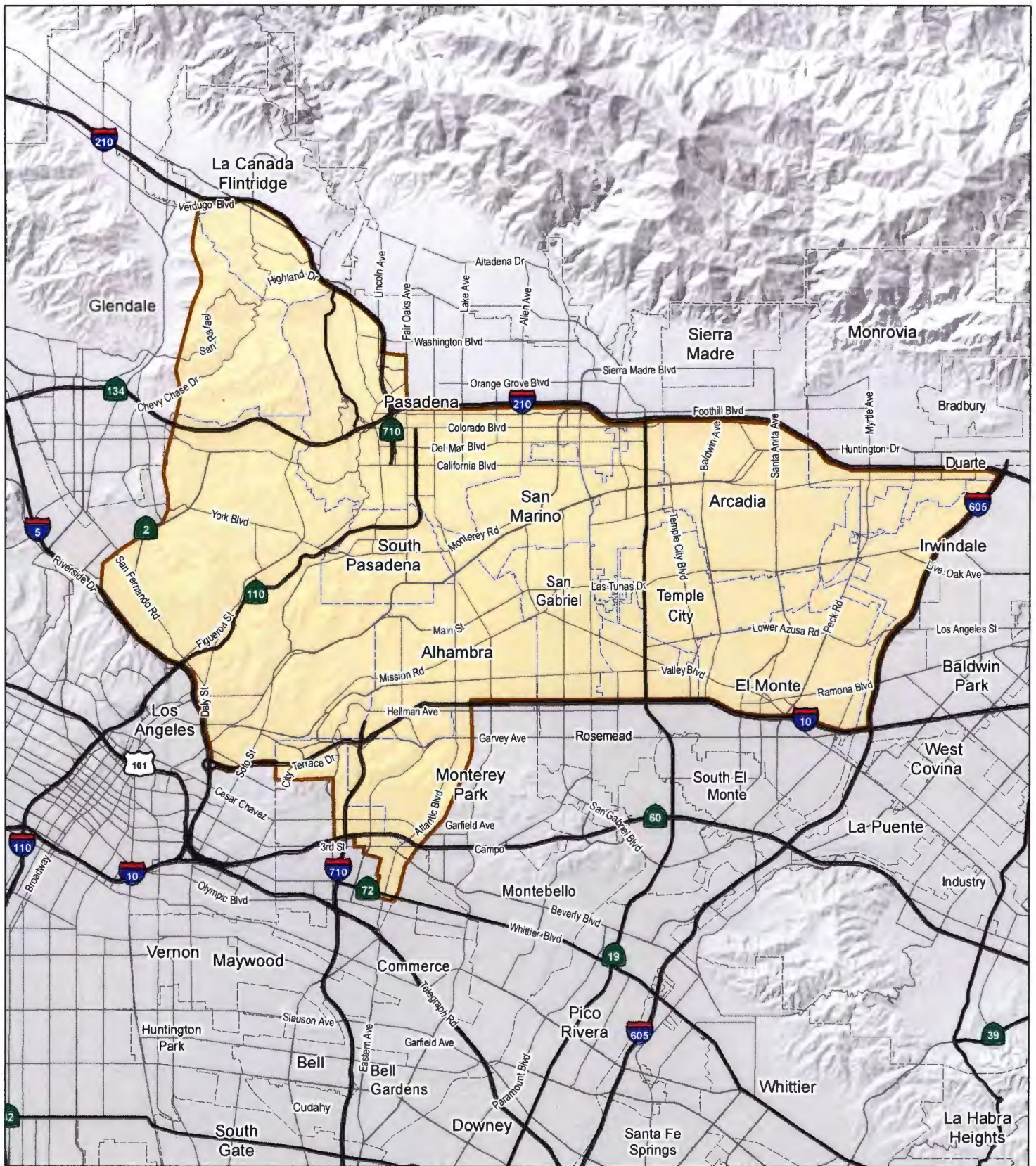
- Review available geology maps, as-built plans, and documents associated with the project site and existing bridge.
- Conduct a site reconnaissance at the bridge location to review the visible physical characteristics and surficial soil conditions on the site.
- Prepare a summary of geotechnical findings, subsurface soil conditions, and geological constraints at the site based on the available information.
- Provide preliminary recommendations for foundation type, and identify any additional geotechnical investigation necessary for the design of the proposed bridge structure widening.

1.2 Project Description

The proposed bridge widening structure will be located immediately south of the intersection of Mission Road and Garfield Avenue in the city of Alhambra, at approximately latitude 34°05'22.09"N and longitude 118°07'22.35"W. A site location map is provided in Figure 1-2.

Built in 1979, the existing Garfield Avenue Bridge is a 59-foot-long, 84-foot-wide, single-span, cast-in-place box girder structure with two railroad tracks crossing underneath the bridge. The existing superstructure is supported on seat-type abutments that are supported on Class 9 secant pile walls consisting of 36-inch-diameter cast-in-drilled-hole (CIDH) shafts spaced at 5 feet on center.

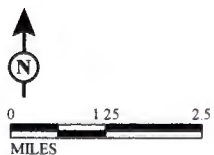
The proposed widening will add a dedicated 12-foot-wide right-turn lane to northbound Garfield Avenue. A new 8-foot-wide cast-in-place reinforced concrete box girder will be added to the east side of the existing bridge, connected with a closure pour. The widened bridge section will be supported on 36-inch CIDH piles located adjacent to and in line with the existing secant-pile wall. The general plan for the proposed bridge widening structure is provided in Appendix A.



LEGEND

 SR 710 North Study Area

FIGURE 1-1



SOURCE: ESRI (2008); LSA (2013)
 F:\CHM1105\GIS\StudyArea.mxd (1/21/2014)

SR 710 North Study
Project Location
 07-LA-710 (SR 710)
 EA 187900
 EFIS 070000191

PRE-DELIBERATIVE DRAFT



FIGURE 1-2
 Site Location Map
 Garfield Avenue Bridge
 SR 710 North Study
 Los Angeles County, California
CH2MHILL.

Geotechnical Data

2.1 Field Exploration

No information on previous geotechnical investigations is available for the proposed bridge site. As-built plans for the existing Garfield Avenue Bridge did not include the Log of Test Borings pertinent to the bridge site.

No exploration was carried out at the proposed bridge site during the SR 710 North Study.

In the absence of information from the bridge site, the preliminary soil stratigraphy for the bridge site was inferred based on the general soil conditions observed during explorations for the SR 710 Tunnel Technical Study (CH2M HILL, 2010), as well as in this portion of the SR 710 North Study area. Additional field explorations will be performed during the subsequent phases of the project.

2.2 Laboratory Testing

No laboratory tests were performed during this phase of the project. Laboratory data from the existing bridge construction investigations were not available. Soil characteristics for the bridge site were inferred from the soil drilling and sampling carried out for the SR 710 Tunnel Technical Study (CH2M HILL, 2010) in other areas, as well as in the general area during the SR 710 North Study.

Site Geology and Subsurface Conditions

3.1 Topography

The Garfield Avenue Bridge is located within the San Gabriel Valley, atop a relatively flat, gently sloping alluvial fan. The topography in the vicinity of the bridge slopes gently toward the southeast into Alhambra Wash and ultimately Whittier Narrows. Locally, the bridge crosses over existing railroad tracks that are located within an open, concrete-lined, belowgrade easement. The minimum vertical clearance over the existing railroad tracks within the belowgrade easement is approximately 23 feet.

3.2 Geology

3.2.1 Regional Geology

The Garfield Avenue Bridge is located within the northwest-southeast-trending Peninsular Ranges physiographic/geologic province. The regional geology of the Peninsular Ranges consists of terrestrial and marine sedimentary rocks, as well as older igneous and metamorphic basement rocks. Alluvial soils derived from the San Gabriel Mountains fill the San Gabriel Valley. In the vicinity of the bridge site, Fernando Formation bedrock is anticipated at a depth on the order of 600 to 700 feet below ground surface (bgs) (CH2M HILL, 2010).

The Garfield Avenue Bridge is located in a tectonically active region of southern California. Nearby active and potentially active faults include the Raymond, Alhambra Wash, and San Rafael/Eagle Rock fault zones, among others. Additional details about these active and potentially active faults are described in the technical memorandum titled *Fault Rupture Evaluation for the SR 710 North Study, Los Angeles County, California* (CH2M HILL and Earth Consultants International [ECI], 2013).

3.2.2 Site Geology

The Garfield Avenue Bridge is underlain by alluvial soil deposits, overlying Fernando Formation bedrock. The composition of the alluvial soil deposits is described in Section 3.2.3.

3.2.3 Stratigraphy

Based on our review of existing geologic maps, the SR 710 Tunnel Technical Study (CH2M HILL, 2010), and the SR 710 North Study borings drilled in the general area of the proposed bridge site, the subsurface at the site consists of alluvial soils underlain by Fernando Formation bedrock. The alluvium soils extend to a depth of 600 to 700 feet bgs and consist of stiff to hard silty clays and dense to very dense sandy soils.

The Fernando Formation bedrock in the general area and at the bridge site is composed of low-strength siltstone and claystone with scarce, thin interbeds of fine sandstone.

Additional borings will be required for the design of the bridge widening. Information from the existing borings in the general area, as well as the proposed borings for the bridge widening, should factor into the final foundation design recommendations.

3.3 Groundwater Conditions

Based on the *Seismic Hazard Zone Report 024* (CDMG, 1998), the historically highest groundwater at the bridge site is noted at a depth of 150 feet bgs. Based on the information in this area, groundwater in the vicinity of the proposed bridge site was observed to be around 300 feet bgs.

Additional borings are required to verify the site groundwater conditions. Because the groundwater table could fluctuate as a result of seasonal variations, nearby construction, irrigation, and numerous other human-made and natural influences, the design groundwater elevation should be updated as more information becomes available regarding the maximum and seasonal variation in groundwater.

Foundation Recommendations

4.1 Foundation Recommendations

The proposed bridge widening will be supported on seat-type abutments similar to the existing structure. To match the foundation type of the existing structure, 36-inch-diameter CIDH concrete piles are proposed for the abutments. Driven precast concrete and steel piles are not recommended because of the anticipated hard driving conditions and the proximity of the existing secant pile wall.

The CIDH piles will form the main part of the secant pile wall that will retain the soil behind the abutments. The proposed wall system would have to be designed with sufficient axial resistance against the bridge loads in addition to the lateral support against the static and seismic earth pressures.

4.2 Future Investigations

To provide the required foundation design information, additional structure-specific borings should be drilled and sampled. According to Section 10.4.2 of *AASHTO LRFD [Load and Resistance Factor Design] Bridge Design Specifications* (American Association of State Highway and Transportation Officials [AASHTO], 2007), a minimum of two borings with depths to 100 feet below the existing bridge deck level should be planned. Soil samples should be collected every 5 feet using the standard penetration test and modified California-driven sampler methods. Selected samples should be tested for soil classification, strength and consolidation characteristics, corrosivity, and expansion potential.

SECTION 5

References

- American Association of State Highway and Transportation Officials (AASHTO). 2007. *AASHTO LRFD [Load and Resistance Factor Design] Bridge Design Specifications*. 4th Edition.
- California Department of Transportation (Caltrans). 2009. *Foundation Report Preparation for Bridges*. December.
- California Division of Mines and Geology (CDMG). 1991. *State of California Special Studies Zones – El Monte Quadrangle Official Map*. November 1.
- California Division of Mines and Geology (CDMG). 1998. *Seismic Hazard Zone Report for the El Monte 7.5-Minute Quadrangle, Los Angeles County, California, Seismic Hazard Zone Report 024*.
- California Division of Mines and Geology (CDMG). 1999. *Seismic Hazard Zones Map for the El Monte 7.5-Minute Quadrangle, Los Angeles County, California*. March 25.
- CH2M HILL. 2010. *Final Geotechnical Summary Report, SR 710 Tunnel Technical Study, Los Angeles County California*. Prepared for Caltrans. EA-07-187900. April.
- CH2M HILL and Earth Consultants International (ECI). 2013. *Fault Rupture Evaluation for the SR 710 North Study, Los Angeles County, California*. Technical Memorandum prepared for Los Angeles County Metropolitan Transportation Authority (Metro). December 10.
- City of Alhambra, Department of Public Works (DPW). 1977. *As-Built Plans, Railroad Lowering Project, Garfield Avenue Bridge*. May 5.
- United States Geological Survey (USGS). 2005. *Preliminary Geologic Map of the Los Angeles 30' x 60' Quadrangle, Southern California*. Open File Report 2005-1019.
- United States Geological Survey (USGS). 2010. Quaternary Fault and Fold Database of the United States. Available at <http://earthquake.usgs.gov/hazards/qfaults/>. Accessed September 25, 2013.

Appendix A
Proposed General Plan

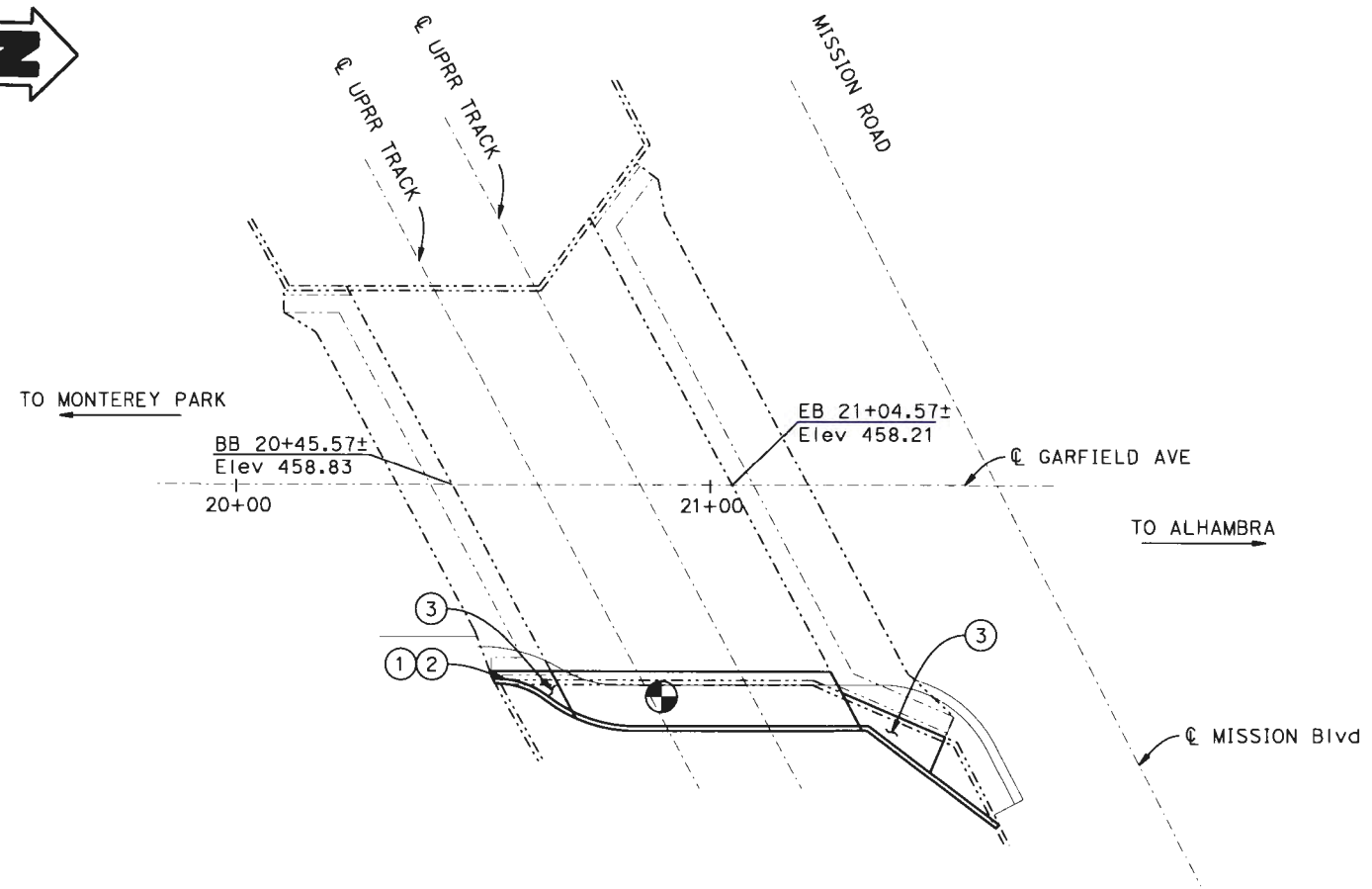
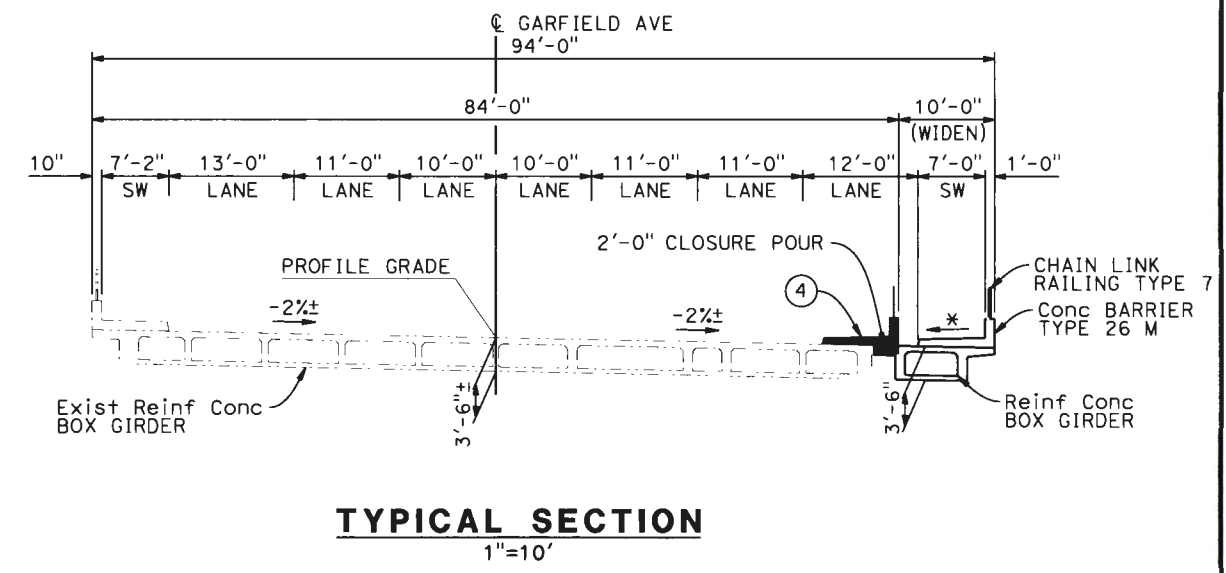
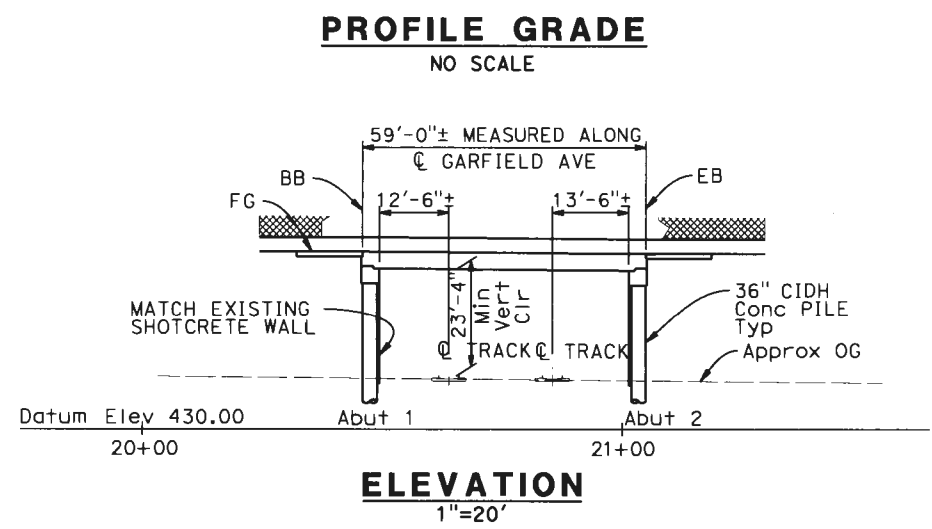
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT
7	LA	710	

METRO
ONE GATEWAY PLAZA
LOS ANGELES, CA 90012

CH2M HILL
1000 WILSHIRE BLVD, SUITE 2100
LOS ANGELES, CA 90017

- LEGEND:**
- Indicates Existing Structure
 - Indicates New Construction
 - ① Paint "GARFIELD AVENUE BRIDGE"
 - ② Paint Bridge Number & Year Constructed
 - ③ Structure Approach Type N(30S)
 - ④ Remove existing concrete barrier & overhang
 - Bridge removal (Portion)
 - ⊕ Denotes Point of Minimum Vertical Clearance
 - * Match existing grade & cross slope

Sta 17+00 Elev (459.87 FS)
Sta 17+50 Elev (459.34 FS)
Sta 18+00 Elev (458.82 FS)
Sta 18+50 Elev (458.29 FS)
Sta 19+00 Elev (457.97 FS)
Sta 19+50 Elev (458.17 FS)
Sta 20+00 Elev (458.83 FS)
Sta 20+50 Elev (458.83 FS)
Sta 21+00 Elev (458.34 FS)
Sta 21+50 Elev (456.97 FS)
Sta 22+00 Elev (455.50 FS)



DATE OF ESTIMATE	FEBRUARY 2014
BRIDGE REMOVAL	PARTIAL
STRUCTURE DEPTH	3'-6"
LENGTH	59'-0"
WIDTH	10'-0"
AREA	590 SF
COST/FT ² INCLUDING 10% MOBILIZATION & 25% CONTINGENCY	\$ 617
TOTAL COST	\$ 364,000

DESIGN OVERSIGHT _____

SIGN OFF DATE _____

DESIGNED BY	A. Issa	DATE	02-28-2014
DRAWN BY	N. Morales	DATE	02-28-2014
CHECKED BY	M. Atiqullah	DATE	02-28-2014
APPROVED		DATE	

PLANNING STUDY	
GARFIELD AVENUE BRIDGE (WIDEN)	
BRIDGE NO. 53C-1669	UNIT:
SCALE: 1"=20'	PROJECT NUMBER & PHASE:

