Meeting Date: **2/18/2014**

Report Type: Consent

Report ID: 2014-00119

City of SACRAMENTO

City Council Report
915 I Street, 1st Floor
www.CityofSacramento.org

Title: (Pass for Publication) Sign Relocation Agreement for 2601 Redding Avenue (APN: 015-0033-048)

Location: District 6

Issue: A request to remove three existing billboards at various locations with a total display area of 1,500 square feet and construct one double-sided, 1,344-square-foot billboard. This project requires the review and approval of City Council because the project requires a General Plan Amendment, Rezone, Billboard Relocation Agreement, Site Plan and Design Review, and Variance.

Recommendation: Review 1) a Resolution determining the project exempt from review under the California Environmental Quality Act; 2) a Resolution amending the General Plan for 0.10 acres from Urban Neighborhood Low Density to Employment Center Low Rise; 3) an Ordinance to rezone 0.10 acres from Residential Mixed Use (RMX-TO) and located in the Transit Overlay to Light Industrial (M-1); 4) a Resolution adopting findings of fact and approving the Sign Relocation Agreement, Site Plan and Design Review, and Variance; and 5) pass for publication the Ordinance title as required by Sacramento City Charter 32c to be adopted on February 25, 2014.

Contact: Evan Compton, Associate Planner, (916) 808-5260; Lindsey Alagozian, Senior Planner, (916) 808-2659, Community Development Department

Presenter: Evan Compton, Associate Planner, (916) 808-5260, Community Development Department

Department: Community Development Dept
Division: Planning Design/Preservation
Dept ID: 21001226

James Sanchez, City Attorney Shirley Concolino, City Clerk Russell Fehr, City Treasurer
John F. Shirey, City Manager

Attachments:

01-Description/Analysis
02-Background
03-Resolution for CEQA
04-Resolution for General Plan Amendment
05-Ordinance for Rezone
06-Resolution for Project Approval
07-Vicinity Map
08-Aerial and Land Use Map
09-Emails of Opposition
10-Applicant Response to Opposition Emails
11-Digital Billboard Safety Study
12-Beyond Aesthetics Study

City Attorney Review

Approved as to Form
Joseph Cerullo
2/7/2014 6:30:21 PM

City Treasurer Review

Reviewed for Impact on Cash and Debt
Russell Fehr
1/29/2014 12:54:20 PM

Approvals/Acknowledgements

Department Director or Designee: Max Fernandez - 2/6/2014 9:22:19 AM

Description/Analysis

Issue Detail: The applicant proposes to construct a double-faced billboard with 1,344 square feet of display area at 2601 Redding Avenue and to remove three existing billboards with five sign faces and a total of 1,500 square feet from various other sites within the City. The proposal results in a net reduction of sign area (156 square foot) and a net reduction in the number of signs (from 3 to 1). The subject site is currently developed with an industrial use.

Policy Considerations: The proposal requires a General Plan Amendment, Rezone, Sign Relocation Agreement, Site Plan and Design Review, and a Variance to exceed the height limit. The relocation agreement meets the requirements of section 15.148.815 Sacramento City Code and the required findings can be made to support the agreement. Under both section 15.148.815 and the Outdoor Advertising Act (Bus. & Prof. Code, §5200 et seq.), the proposed new billboard may be located only on heavy commercial or industrial zoned property.

The subject site, currently designated Urban Neighborhood Low Density, is zoned Residential Mixed Use (RMX-TO) and located in the Transit Overlay zone. For the new billboard to be permitted at 2601 Redding Avenue, a 0.10-acre portion of the overall 12.95-acre site is proposed to be redesignated to Employment Center Low Rise and rezoned to Light Industrial (M-1) to accommodate the footprint of the billboard. The proposal will reduce the total number and the total square footage of billboards within the City.

The proposed new billboard has a simple, clean design with a primary supporting column and metal structure painted dark gray. The billboard will have a "V" shaped design for the display of the sign faces. Each sign face is proposed to be 14 feet by 48 feet. The billboard will be 80 feet in height and oriented towards Highway 50. The existing freeway is approximately 40 feet in height. Therefore, the top of the sign will be 40 feet in height from the grade of the freeway. A variance is required to exceed 35 feet in height; staff supports the variance because otherwise the billboard would not be visible to motorists on the freeway.

Economic Impacts: None

Environmental Considerations: The Environmental Planning Section of the Community Development Department reviewed this proposal and determined that it is categorically exempt from the California Environmental Quality Act because it is limited to the construction of one new, small structure—the new billboard—at a location that is not a particularly sensitive environment plus the permanent removal of three existing billboards. (Cal. Code Regs., title 14, §15303)

Commission/Committee Action: On January 30, 2014, the Planning and Design Commission held a hearing on the proposal and directed, by a vote of 10 ayes and 0 noes (Commissioners Kaufman, Nybo, and Mack were absent), that the proposal be forwarded to the City Council with a recommendation to approve.

Rationale for Recommendation: Staff supports this proposal because a) the applicant has met all relocation requirements, which will result in a net reduction of signage within the City; b) the proposal permanently removes two existing billboards near single-family homes and one existing billboard in the path of a future light-rail extension, for a total of three removed billboards; c) the new billboard will be oriented along an existing freeway and railroad tracks and on a parcel with an existing industrial use; d) the immediate area of the new-billboard site and along the north and south of Highway 50 is primarily commercial and industrial uses; and e) the changes to the General Plan designation and zoning will affect only 0.10 acres of the overall site, a very limited change that will not undermine the redevelopment of transit-supportive uses in the vicinity.

Financial Considerations: The project has no fiscal considerations.

Local Business Enterprise (LBE): No goods or services are being purchased under this report.

Background Information: On October 16, 2007, the Sacramento City Council adopted Ordinance No. 2007-079, which prohibits the construction and operation of new billboards within the City. Ordinance No. 2007-079 also provides, however, that this prohibition does not limit the City's ability to enter into billboard relocation agreements under which new billboards may be constructed in exchange for the permanent removal of existing billboards so long as there is a net reduction of both the total number and total square footage of billboards lawfully allowed. Section 15.148.815 of the City Code ("Section 15.148.815") prescribes when and how the City may enter into a billboard relocation agreement. Any legal, nonconforming off-site sign may be considered as a candidate for relocation under a relocation agreement, and the three billboards proposed for removal meet this criterion because the signs are located in zoning districts where billboards are no longer allowed. Iron Point Media proposes to construct a new billboard under a relocation agreement. The proposed agreement (Attachment 6) identifies the location of the proposed new billboard site (which is "freeway oriented") and the location, general description, and size of the billboards proposed for permanent removal.

Public/Agency Outreach and Comments: The proposal was routed to the Tahoe Park Neighborhood Association and the Power Inn Alliance, as well as to property owners within a 300-foot radius of the proposed billboard. At the time of writing this report, staff had received several emails expressing opposition, which have been included in this report as Attachment 9. Those emails largely focus on motorist safety, aesthetic concerns, and perceived conflicts with the 65th Street Station Area Plan.

Staff reviewed the concerns about motorist safety. As the proposed billboard is adjacent to Highway 50, project information was sent to Caltrans for review. Caltrans has determined that the installation of the new billboard would be permitted. Furthermore, the proposal was reviewed by the Public Works Department, which did not have any objections. Staff also evaluated the concerns about inconsistency with the 65th Street Station Area Plan (this plan replaced the "South 65th Street Area Plan" that was rescinded by City Council with Resolution No. 2010-625); as stated in the policy section of this report, staff finds that the proposal will not conflict with the stated goals and visions of the currently adopted plan. Commenters also requested that the project information be sent to Union Pacific Railroad and the California Highway Patrol. Staff provided information about the proposal to both agencies but did not receive any comments.

The applicant also reviewed the emails in opposition and has provided a response (Attachments 10, 11, and 12).

Proposed Billboard at 2601 Redding Avenue

The applicant proposes to construct one new billboard and to remove three existing billboards. The new billboard will be located at the northeast corner of 2601 Redding Avenue, will have two 14′ by 48′ display faces (with a total display area of 1,344 square feet) on a V-shaped structure oriented towards Highway 50 and supported by a single pole, and will have an overall height of 80 feet.

The Redding Avenue site is located in a commercial and industrial area adjacent to the freeway. There are single-family homes approximately 1,650 feet to the west of the billboard location, but there is existing commercial development buffering the homes on the west side of 65th Street. There is multi-family residence approximately 680 feet to the southwest of the site; however, the orientation of the billboard faces the freeway. That orientation should obscure the view of the front of the billboard faces from this residence. The applicant is requesting a sign height of 80 feet. This exceeds the maximum 35-foot sign height allowed in the M-1 zone under City Code section 15.148.160.B.4. Section 15.148.1010 allows the opportunity to vary certain provisions of City Code chapter 15.148 (the "Sign Code") through the Planning and Design Commission. The applicant is requesting the variance because the elevated freeway structure will prevent the visibility of the billboard if it were built to the 35-foot standard. The freeway structure is approximately 40 feet in height from the adjacent grade therefore the top of the proposed billboard will be 40 feet above the Highway 50 travel lanes.

In order to grant a sign-code variance, the following findings must be made under City Code section 15.148.1040(A), (B), and (C):

1. That exceptional or extraordinary circumstances or conditions apply that do not apply generally in the same district, and the enforcement of the regulations of the Sign Code would have an unduly harsh result upon the utilization of the subject property.

   Staff finds that the existing freeway structure and difference in grade would prevent the view of the proposed billboard for motorists on Highway 50 if the variance is not issued.

2. The variance will not result in a special privilege to one individual property owner and that the variance would be appropriate for any property owner facing similar circumstances.

   Staff finds that no special privilege is being extended to one individual property owner in that prior variances have been granted *to off-site signs where visibility has been diminished by freeway structures and grade differences.*

3. That the requested variance will not materially and adversely affect the health and safety of persons residing or working in the neighborhood, and will not be materially detrimental to the public welfare or injurious to property and improvements in the neighborhood.

   Staff finds that the requested variance will not materially and adversely affect the health and safety of persons residing or working in the neighborhood, and will not be materially detrimental to the public welfare or injurious to property and improvements in the neighborhood in that the new billboard will be located adjacent to the freeway and railroad and on the site of an existing industrial use.

Billboard Relocation

Sign Removal: The proposal calls for the removal of three existing off-site billboards and the construction of one new billboard. The table below outlines the off-site billboards to be removed. A photo of each billboard and an aerial has been included in this report as Attachment 6.

Table 2: Redding Avenue Relocation Billboard Removal			
Location	*Size*	*Sign Faces*	*Total Area S.F.*
Watt and Elder Creek	12' x 25'	2	600
16th Street & American River	10' x 30'	1	300
Richards Blvd	12' x 25'	2	600
Existing	3 Structures	5 Faces	1500
New	1 Structure	2 Faces	1344
Net Reduction	**2 Structures**	**3 Faces**	**156**

Of the billboards proposed to be removed, two are located on commercial properties near single-family homes. These are the billboards located on Watt Avenue and 16th Street. The proximity of these signs to residential development makes them appropriate candidates for removal. The third billboard proposed for removal, located on Richards Boulevard, is also a good candidate for removal. While this billboard is not located near residential, it is located in the path of the future Downtown-Natomas-Airport light-rail extension and is appropriate for replacement.

Relocation Agreement: New off-site billboards that are the subject of a relocation agreement are exempt from Ordinance No. 2007-079, which prohibits the construction and operation of new billboards within the City. Section 15.148.815 allows an applicant to apply for a sign-relocation agreement under which new signs may be constructed in exchange for the permanent removal of existing off-site signs so long as there is a net reduction in both the total number and total square footage of signs lawfully allowed. Under the proposed relocation agreement, a total of three existing billboards of different sizes, two of which are double-faced signs, will be removed, and a new, double-faced sign will be erected, resulting in a net reduction of two signs, three display faces, and 156 square feet of existing off-site display area. The list of signs proposed for removal is attached to the relocation agreement (Attachment 6).

Billboard-relocation agreements are subject to the same procedural and hearing requirements as a City Council level review under City Code section 17.812.010 (2)(b). A billboard-relocation agreement may be approved only if the following findings are made concerning the proposed new billboard:

1. The new billboard complies with the purpose and requirements of the Sign Code, including section 15.148.815.

   Staff finds that the new billboard complies with the Sign Code. Because the proposed billboard exceeds the maximum detached-sign height for the M-1 zone, the applicant is requesting a height variance under City Code section 15.148.1040.

2. The new billboard is compatible with the uses and structures on the new site and in the surrounding areas, including parks, trails, and other public facilities and amenities.

   Staff finds that the new billboard is compatible with the subject site. With the approval of the rezone, the billboard will be located on industrially zoned property and will not significantly impact residential development. Furthermore, the billboard will be oriented to motorists on Highway 50.

3. The new billboard will not interfere with onsite access, circulation, or visibility.

Staff finds that the proposed billboard is located at the rear of the site and will not interfere with the day-to-day operations, or visibility on the site.

4. The new billboard will not create a traffic or safety hazard.

   Staff finds that the new billboard will not create traffic or safety hazards. It is a static billboard that will have a constant illumination (no blinking or flashing lights) at night. Furthermore, staff has confirmed with CalTrans that it has no objection to the proposal.

5. The new billboard will not result in any undue or significant increase in visual clutter in the areas surrounding the new billboard.

   Staff finds that the new billboard will not result in any undue or significant increase in visual clutter because the outcome of the project approval includes the removal of three existing billboards, thereby reducing the amount of total billboard area within the City limits. The billboard at 2601 Redding Avenue will be located at least 250 feet from another off-site sign on the same side of the street, as required in the City Code.

Environmental Considerations: The Community Development Department, Environmental Planning Services Division, reviewed this proposal and determined that it is categorically exempt from the California Environmental Quality Act (CEQA) under CEQA Guidelines section 15303, New Construction or Conversion of Small Structures.

The staff report establishes that there are no unusual circumstances that would result in a significant effect on the environment. Any cumulative effects have been evaluated in the Master EIR that was certified in connection with the adoption of the 2030 General Plan.

The staff report identifies regulation of billboard design and lighting by the City that would ensure that significant effects from light and glare would not result. The relocation agreement, and removal of other billboards, will have a beneficial effect.

Billboards are regulated by the State, and these regulations also ensure that billboard location and lighting do not present hazards to the traveling public. The Caltrans is involved in the control of “off-premise” displays along state highways. Such displays advertise products or services of businesses located on property other than the display.

The Federal Highway Administration has entered into written agreements with various states as part of the implementation of the Highway Beautification Act of 1965. California has entered into two such agreements, one dated May 29, 1965, and a subsequent agreement dated February 15, 1968. The agreements generally provide that the State will control the construction of all outdoor-advertising signs, displays, and devices within 660 feet of the interstate highway right-of-way. The agreements provide that such signs may be erected only in commercial or industrial zones and are subject to the following restrictions:

- No signs may imitate or resemble any official traffic sign, signal or device, nor may signs obstruct or interfere with official signs;
- No signs may be erected on rocks or other natural features;
- Signs must not be larger than 25 feet in height and 60 feet in width, excluding border, trim, and supports;
- Signs on the same side of the freeway must be separated by at least 500 feet; and
- Signs may not include flashing, intermittent, or moving lights, and may not emit light that could obstruct or impair the vision of any driver.

California regulates outdoor advertising in the Outdoor Advertising Act (Business and Professions Code, section 5200 et seq.) and the California Code of Regulations, title 4, division 6 (section 2240 et seq.) Caltrans enforces the law and regulations. Caltrans requires applicants for new outdoor lighting to demonstrate that the owner of the parcel consents to the placement sign, that the parcel on which the sign would be located is zoned commercial or industrial, and that local building permits are obtained and complied with.

Additional restrictions on outdoor signage are found in the California Vehicle Code, section 21466.5 of which prohibits the placing of any light source "…of any color of such brilliance as to impair the vision of drivers upon the highway." Specific standards for measuring light sources are provided. The restrictions may be enforced by Caltrans, the California Highway Patrol, or local authorities.

Policy Considerations: The subject site at Redding Avenue is designated Urban Neighborhood Low Density on the 2030 General Plan Land Use and Urban Form Diagram. Although the proposed billboard is not inconsistent with the Urban Neighborhood Low Density designation, City Code section 15.148.815 requires that new offsite signs be located in specific zoning designations: Heavy Commercial (C-4), Light Industrial (M-1 or M-1S), and Heavy Industrial (M-2 or M-2S). Since the proposal requires a rezone to Industrial (M-1), a General Plan Amendment to Employment Center Low Rise will be required for consistency purposes. Additionally, sign relocations are consistent with the General Plan goal of reducing visual clutter by regulating the number, size, and design quality of signs (LU 6.1.12). The proposal will reduce the total number and total square footage of off-site signs within the City.

Lighting. The 2030 General Plan requires that the City minimize obtrusive light by limiting outdoor lighting that is misdirected, excessive, or unnecessary. (ER 7.1.5) *Staff finds that the image on the billboard is static and that any indirect lighting at night will be constant (no blinking or flashing lights)*.

65th Street Station Area Plan: The purpose of the plan is to guide future development and redevelopment within the plan area towards land uses that support transit ridership, reduce auto dependence, and provide needed housing. This document was adopted by City Council Resolution No. 2010-623 on October 26, 2010. It replaced the prior South 65th Street Area Plan, which was rescinded by City Council Resolution No. 2010-625. Staff believes the proposed billboard does not conflict with any of the stated goals and visions of the 65th Street Station Area Plan. The plan primarily focuses on developing an accessible circulation framework and encouraging transit supportive land uses. This proposal does not rezone the majority of the industrially used site, which will remain zoned Residential Mixed Use (RMX-TO) and located in the Transit Overlay zone. Only 0.10 acres will be redesignated and rezoned to allow the implementation of the proposed sign-relocation agreement. This portion of the site is located adjacent to the freeway and tracks on the northeast portion of the parcel, and its location and size will not undermine the stated goals and visions for a transit-oriented community.

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RESOLUTION NO.

Adopted by the Sacramento City Council

DETERMINING THAT THE REDDING AVENUE SIGN RELOCATION PROJECT (P13-059) IS EXEMPT FROM THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

BACKGROUND

A. On January 30, 2014, after conducting a public hearing, the City Planning and Design Commission forwarded to the City Council a recommendation to approve the Redding Avenue Sign Relocation Project (P13-059), concerning the construction of a new dual-face billboard with 1,344 square feet of display area and the removal of three existing billboards with a total of five display faces and 1,500 square feet of display area (the "**Project**").

B. On February 25, 2014, after giving notice as required by Sacramento City Code section 17.812.010 (2)(b), the City Council conducted a public hearing on the Project, receiving and considering evidence concerning it.

C. The City's Environmental Planning Section has reviewed the Project and has determined that the Project is exempt from review under the California Environmental Quality Act because it is limited to the construction of one new, small facility or structure at a location that is not a particularly sensitive environment.

BASED ON THE FACTS SET FORTH IN THE BACKGROUND, THE CITY COUNCIL RESOLVES AS FOLLOWS:

Section 1. The statements in paragraphs A, B, and C of the Background are true.

Section 2. Based on the determination and recommendation of the City's Environmental Planning Services Manager and the oral and documentary evidence received at the hearing on the Project, the City Council finds that the Project consists of the construction of one new, small structure and thus is categorically exempt from the California Environmental Quality Act (Cal. Code Regs., title 14, §15303).

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RESOLUTION NO. 2014-

Adopted by the Sacramento City Council

AMENDING THE GENERAL PLAN LAND USE MAP TO REDESIGATE 0.10 ACRES LOCATED AT 2601 REDDING AVENUE (APN 015-0033-048) FROM URBAN NEIGHBORHOOD LOW DENSITY TO EMPLOYMENT CENTER LOW RISE (P13-059); COUNCIL DISTRICT 6

BACKGROUND

A. On January 30, 2014, after conducting a public hearing, the City Planning and Design Commission forwarded to the City Council a recommendation to approve the Redding Avenue Sign Relocation Project (P13-059), concerning the construction of a new dual-face billboard with 1,344 square feet of display area and the removal of three existing billboards with a total of five display faces and 1,500 square feet of display area (the "**Project**"). Among other things, the Project calls for amending the City's General Plan by redesignating 0.10 acres from Urban Neighborhood Low Density to Employment Center Low Rise. The Project also calls for rezoning the same 0.10 acres as Light Industrial (M-1).

B. On February 25, 2014, after giving notice as required by Sacramento City Code section 17.812.010 (2)(b), the City Council conducted a public hearing on the Project, receiving and considering evidence concerning it.

BASED ON THE FACTS SET FORTH IN THE BACKGROUND, THE CITY COUNCIL RESOLVES AS FOLLOWS:

Section 1. The statements in paragraphs A and B of the Background are true.

Section 2. Based on the oral and documentary evidence received at the hearing on the Project, the City Council approves the General Plan Amendment for the Project as follows: the approximately 0.10-acre area depicted on Exhibit A is hereby designated on the City's General Plan land-use map as Employment Center Low Rise.

Section 3. The amendment described in Section 2 is internally consistent with the goals, policies, and other provisions of the General Plan, and it promotes the public health, safety, convenience, and welfare of the City.

Section 4. Exhibit A is a part of this resolution.

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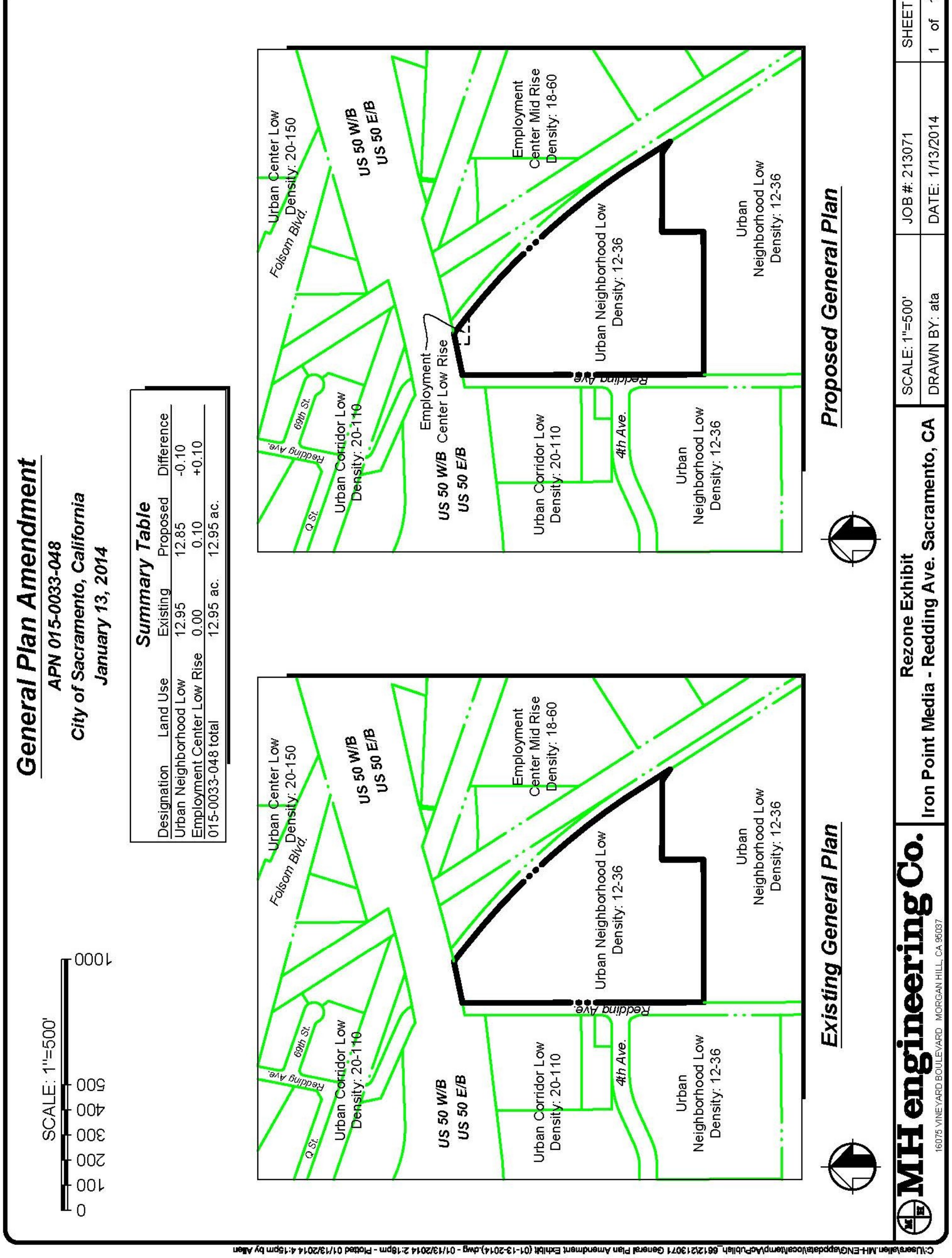
Exhibit A: General Plan Amendment



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ORDINANCE NO.

Adopted by the Sacramento City Council

AMENDING TITLE 17 OF THE SACRAMENTO CITY CODE BY REZONING A 0.10-ACRE PORTION OF 2601 REDDING AVENUE (APN 015-0033-048) FROM RESIDENTIAL MIXED USE LOCATED IN THE TRANSIT OVERLAY (RMX-TO) TO LIGHT INDUSTRIAL (M-1) (P13-059); COUNCIL DISTRICT 6

BE IT ENACTED BY THE COUNCIL OF THE CITY OF SACRAMENTO:

SECTION 1

As used in this ordinance, "**Property**" means the real property depicted in attached Exhibit A and generally known as 2601 Redding Avenue (APN 015-0033-048), consisting of approximately 0.10 acres of the approximately 12.95-acre site.

SECTION 2

Title 17 of the Sacramento City Code (the Planning and Development Code") is hereby amended by rezoning the Property from Residential Mixed Use located in the Transit Overlay (RMX-TO) to Light Industrial (M-1).

SECTION 3

The rezoning of the Property by this ordinance is consistent with the applicable land-use designation, use, and development standards in the City's General Plan; with the goals, policies, and other provisions of the General Plan; and with any applicable specific plan. The amendment promotes the public health, safety, convenience, and welfare of the City.

SECTION 4

The City Clerk is hereby directed to amend the City's official zoning maps to conform to this ordinance.

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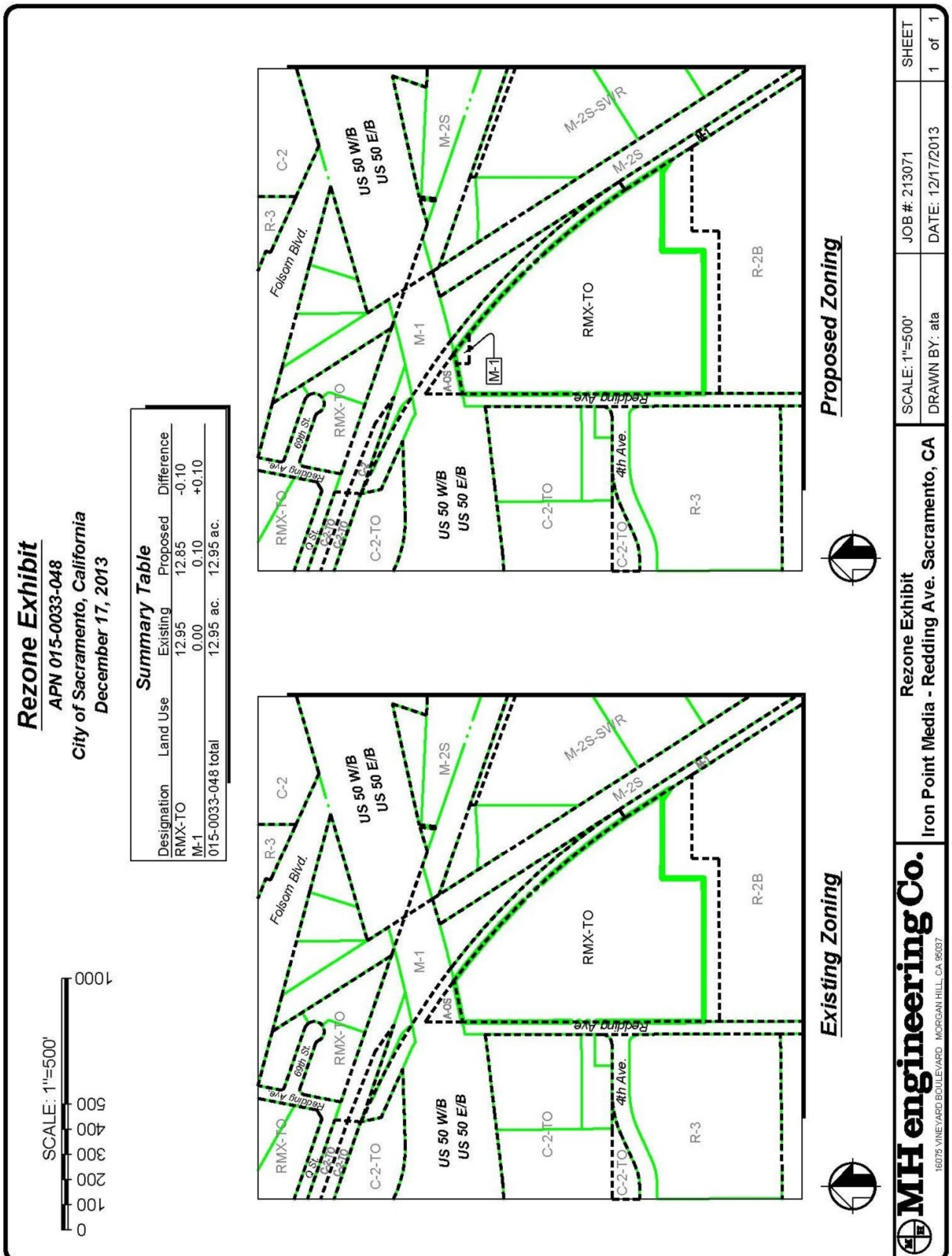
Exhibit A: Rezone Map



Designation	Land Use	Existing	Proposed	Difference
RMX-TO		12.95	12.85	-0.10
M-1		0.00	0.10	+0.10
015-0033-048 total		12.95 ac.	12.95 ac.	

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RESOLUTION NO.

Adopted by the Sacramento City Council

ADOPTING FINDINGS OF FACT AND APPROVING THE REDDING AVENUE SIGN RELOCATION PROJECT (P13-059)

BACKGROUND

A. On January 30, 2014, after conducting a public hearing, the City Planning and Design Commission forwarded to the City Council a recommendation to approve the Redding Avenue Sign Relocation Project (P13-059), concerning the construction of a new dual-face billboard with 1,344 square feet of display area and the removal of three existing billboards with a total of five display faces and 1,500 square feet of total display area (the "**Project**").

B. On February 25, 2014, after giving notice as required by Sacramento City Code section 17.812.010 (2)(b), the City Council conducted a public hearing on the Project, receiving and considering evidence concerning it.

BASED ON THE FACTS SET FORTH IN THE BACKGROUND, THE CITY COUNCIL RESOLVES AS FOLLOWS:

Section 1. The statements in paragraphs A, B, and C of the Background are true.

Section 2. Billboard Relocation Agreement. Based on the oral and documentary evidence received at the hearing on the Project and on the following findings of fact, the City Council hereby approves the Billboard Relocation Agreement attached in Exhibit A:

A. The new billboard complies with the purpose and requirements of City Code chapter 15.148, including section 15.148.815.

B. The new billboard is compatible with the uses and structures on the new site and in the surrounding areas, including parks, trails, and other public facilities and amenities. Because the proposed sign exceeds the maximum detached-sign height for the M-1 zone, the applicant is requesting a height variance under City Code section 15.148.1040. With the approval of the rezone, the sign will be located on industrially zoned property and will not significantly impact residential development. Furthermore, the billboard will be oriented to motorists on Highway 50.

C. The new billboard will not interfere with onsite access, circulation, or visibility; nor will it interfere with the day-to-day operations or visibility on the site, as it will be located at the rear of the site.

D. The new billboard will not create a traffic or safety hazard. It will be a static sign that will have a constant illumination at night (no blinking or flashing lights). Furthermore, Caltrans has confirmed that it does not object to the new billboard.

E. The new billboard will not result in any undue or significant increase in visual clutter in the areas surrounding it because the Project includes the removal of three existing billboards, which will reduce the total number of billboards and the amount of total billboard-display area within the City. The new billboard will be located at least 250 feet from another off-site sign on the same side of the street, as required by the City Code.

Section 3. Variance. Based on the oral and documentary evidence received at the hearing on the Project and on the following findings of fact, the City Council hereby approves the variance allowing the new billboard to be 80 feet in height within the proposed Light Industrial (M-1) zone:

A. Exceptional or extraordinary circumstances or conditions apply that do not apply generally in the same zoning district, and the enforcement of City Code chapter 15.148 would have an unduly harsh result upon the use of the subject property.

The existing freeway structure and the difference in grade would prevent the view of the proposed billboard by motorists on Highway 50 if the variance were not issued.

B. The variance will not result in a special privilege to one property owner and would be appropriate for any property owner facing similar circumstances.

No special privilege is being extended to one property owner in that variances have been granted before for off-site signs where visibility has been diminished by freeway structures and grade differences.

C. The variance will not materially and adversely affect the health and safety of persons residing or working in the neighborhood and will not be materially detrimental to the public welfare or injurious to property and improvements in the neighborhood.

The variance will not materially and adversely affect the health and safety of persons residing or working in the neighborhood and will not be materially detrimental to the public welfare or injurious to property and improvements in the neighborhood in that the new billboard will be located adjacent to the freeway and railroad and on the site of an existing industrial use.

Section 4. Site Plan Design Review. Based on the oral and documentary evidence received at the hearing on the Project and on the following findings of fact, the City Council hereby approves the Site Plan and Design Review for the Project:

A. The design, layout, and physical characteristics of the proposed billboard are consistent with the proposed General Plan designation of Employment Center Low Rise and the 65th Street Station Area Plan, which allows the continuation of industrial uses while encouraging new residential development.

B. The design, layout, and physical characteristics of proposed billboard are consistent with all applicable design guidelines and with all applicable development standards; alternatively, if deviations from design guidelines or development standards are approved, then the proposed billboard is consistent with the purpose and intent of the applicable design guidelines and development standards.

C. All streets and other public access ways and facilities, parking facilities, and utility infrastructure are adequate to serve the proposed billboard and comply with all applicable design guidelines and development standards.

D. The design, layout, and physical characteristics of the proposed billboard are visually and functionally compatible with the surrounding neighborhood in that the site is currently developed with an industrial use and the billboard will be located adjacent to a freeway and railroad tracks.

E. The design, layout, and physical characteristics of the proposed billboard ensure energy that consumption is minimized and that the use of renewable energy sources is encouraged.

F. The design, layout, and physical characteristics of the proposed billboard will not be detrimental to the public health, safety, convenience, or welfare of persons residing, working, visiting, or recreating in the surrounding neighborhood and will not result in the creation of a nuisance.

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Exhibit A: Billboard Relocation Agreement

Billboard Relocation Agreement

City of Sacramento and Iron Point Media, LLC

This agreement, dated February 25, 2014, for purposes of identification, is between the CITY OF SACRAMENTO (the "**City**"), a California municipal corporation; and IRON POINT MEDIA, LLC ("**Iron Point**"), a California limited-liability company.

Background

A. On October 16, 2007, the Sacramento City Council adopted Ordinance No. 2007-079, which prohibits the construction and operation of new billboards within the City. Ordinance No. 2007-079 also provides, however, that this prohibition does not limit the City's ability to enter into relocation agreements under which new billboards may be constructed in exchange for the permanent removal of existing billboards, as encouraged by the Outdoor Advertising Act.[1] Section 15.148.815 of the Sacramento City Code ("**Section 15.148.815**") prescribes when and how the City may enter into a relocation agreement.

B. Iron Point desires to construct, maintain, and operate a new billboard on privately owned land within the City's jurisdiction, at Iron Point's sole expense (the "**New Billboard**"). The first column of Exhibit A to this agreement identifies the land on which Iron Point proposes to locate the New Billboard (the "**New Billboard Site**"). Iron Point owns the existing billboards identified in the second column of Exhibit A, each of which is located on privately owned land within the City's jurisdiction (the "**Existing Billboards**"). To fulfill the requirement that Iron Point remove existing billboards in return for the right to construct, operate, and maintain the New Billboard on the New Billboard Site, Iron Point applied to the City for a relocation agreement covering the Existing Billboards (Project No. P13-059). Removal of the Existing Billboards will result in a net reduction within the City of both (1) the total number of lawfully permitted offsite signs and (2) the total square footage of lawfully permitted offsite signage, as required by Section 15.148.815.

C. In accordance with Section 15.148.815, on January 30, 2014, the City's Planning and Design Commission held a public hearing on Iron Point's application for a relocation agreement and then forwarded a recommendation of approval to the City Council; and on February 25, 2014, the City Council held a public hearing on the application and approved it based on the findings of fact, and subject to the conditions of approval (if any), set out in Resolution No. 2014-___.

With these background facts in mind, the parties agree as follows:

1. Removal of Existing Billboards. In return for the City's approval of the New Billboard (Project No. P13-059), and to comply with Ordinance No. 2007-079, Section 15.148.815, and the Outdoor Advertising Act, Iron Point shall remove the Existing Billboards according to the schedule set forth in the second column of Exhibit A.

[1] Chapter 2 (beginning with section 5200) in division 3 of the California Business and Professions Code.

2. **Compliance with Law.** While removing the Existing Billboards and while constructing, operating, and maintaining the New Billboard on the New Billboard Site, Iron Point shall comply with all conditions of approval set out in Resolution No. 2014-___ and with all valid and applicable statutes, ordinances, regulations, rules, and orders that concern the Existing Billboards, the New Billboard, or the New Billboard Site, including Section 15.148.815 and the Outdoor Advertising Act, whether enacted or issued before, on, or after the effective date of this agreement (see Section 6(h), below).

3. **Waiver of Compensation.** Iron Point hereby waives and releases all claims for compensation Iron Point has or may have in the future that are against the City or the City's elected officials, officers, employees, or agents and are related to, or connected with, Iron Point's removal of the Existing Billboards. This waiver and release includes any claims made or arising under the California Government Claims Act,[2] the Outdoor Advertising Act, the California Constitution, the federal Highway Beautification Act of 1965,[3] or the United States Constitution.

4. **Release of Claims.** Iron Point unconditionally and forever releases and discharges the City and the City's elected officials, officers, employees, and agents from all liabilities, claims, demands, damages, and costs (including reasonable attorneys' fees and litigation costs through final resolution on appeal) that in any way arise from, or are connected with, Iron Point's removal of the Existing Billboards. This release and discharge covers all claims, rights, liabilities, demands, obligations, duties, promises, costs, expenses, damages, and other losses or rights of any kind, past, present, and future, whatever the theory of recovery, and whether known or unknown, patent or latent, suspected or unsuspected, fixed or contingent, or matured or unmatured. Iron Point hereby waives all rights it has or may have in the future under section 1542 of the California Civil Code, which provides as follows:

> "A general release does not extend to claims which the creditor does not know or suspect to exist in his or her favor at the time of executing the release, which if known to him or her must have materially affected his or her settlement with the debtor."

5. **Indemnity.** Iron Point shall indemnify, defend (upon the City's written request), protect, and hold the City and the City's elected officials, officers, employees, and agents harmless against all liabilities, claims, demands, damages, and costs (including reasonable attorneys' fees and litigation costs through appeal) that arise in any way from either or both of the following:

   (a) The acts or omissions of Iron Point or Iron Point's officers, employees, or agents in removing the Existing Billboards or in constructing, operating, and maintaining the New Billboard.

   (b) The City's processing and approval of Iron Point's application for this relocation agreement. Iron Point's obligation under this Section 5(b) includes all claims by the owner of property from which an Existing Billboard is removed, including claims based on the California

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[2] Parts 1 through 7 (beginning with section 810) in division 3.6 of title 1 of the California Government Code.

[3] Title 23 United States Code section 131.

Government Claims Act, the Outdoor Advertising Act, the California Constitution, the federal Highway Beautification Act of 1965, or the United States Constitution.

6. Miscellaneous.

(a) *Notices.* Any notice or other communication under this agreement must be in writing and will be considered properly given and effective only when mailed or delivered in the manner provided by this Section 6(a) to the persons identified below. A mailed notice or other communication will be effective or will be considered to have been given on the third day after it is deposited in the United States Mail (certified mail and return receipt requested), addressed as set forth below, with postage prepaid. A notice or other communication sent in any other manner will be effective or will be considered properly given when actually delivered. Any party may change its address for these purposes by giving written notice of the change to the other party in the manner provided in this section.

If to the City:

City of Sacramento
Community Development Department
Planning Division
300 Richards Boulevard, Third Floor
Sacramento, California 95811
Attention:
Evan Compton, Associate Planner

If to Iron Point:

Iron Point Media, LLC
5409 Rogers Street
Davis, California 95618
Attention:
David Nybo, Manager

(b) *Assignment.* A party may not assign or otherwise transfer this agreement or any interest in it without the other party's written consent. An assignment or other transfer made contrary to this Section 6(b) is void.

(c) *Successors and Assigns.* This agreement binds and inures to the benefit of the successors and assigns of the parties. This Section 6(c) does not constitute the City's consent to any assignment of this agreement or any interest in this agreement.

(d) *Interpretation.* This agreement is to be interpreted and applied in accordance with California law, without regard to conflict-of-law principles, subject to the following:

(1) Sections 3, 4, and 5 of this agreement are to be interpreted so as to provide the City and the City's elected officials, officers, employees, and agents with the maximum protection possible against any obligation or liability that in any way arises from, or is connected with, Iron Point's removal of the Existing Billboards or Iron Point's construction, operation, or maintenance of the New Billboard.

(2) The rule of interpretation in California Civil Code section 1654 will not apply.

(3) "Includes" and its variants are terms of enlargement rather than of limitation. For example, "includes" means "includes but not limited to," and "including" means "including but not limited to."

(4) Exhibit A is part of this agreement.

(e) *Waiver of Breach.* A party's failure to insist on strict performance of this agreement or to exercise any right or remedy upon the other party's breach of this agreement will not constitute a waiver of the performance, right, or remedy. A party's waiver of the other party's breach of any term or provision in this agreement will not constitute a continuing waiver or a waiver of any subsequent breach of the same or any other term or provision. A waiver is binding only if set forth in writing and signed by the waiving party.

(f) *Severability.* If a court with jurisdiction holds any nonmaterial provision of this agreement to be invalid, void, or unenforceable, then the remaining provisions will remain in full force.

(g) *Counterparts.* The parties may execute this agreement in counterparts, each of which will be considered an original, but all of which will constitute the same agreement.

(h) *Effective Date*. This agreement is effective as of the date on which both the City and Iron Point have signed it, as indicated by the dates in the signature blocks below.

(i) *Time of Essence.* Time is of the essence of this agreement.

(j) *Integration and Modification*. This agreement sets forth the parties' entire understanding regarding the matters addressed and is intended to be their final, complete, and exclusive expression of those matters. It supersedes all prior or contemporaneous agreements, representations, and negotiations (written, oral, express, or implied) and may be modified only by another written agreement signed by both parties.

(*Signature Page Follows*)

City of Sacramento

By: ___________________________
John F. Shirey
City Manager
Dated: _________, 2014

Attest:
Sacramento City Clerk

By: ______________________________

Approved as to Form
Sacramento City Attorney

By: ______________________________
Joseph Cerullo Jr.
Senior Deputy City Attorney

Iron Point Media, LLC

By: ______________________________
David Nybo
Manager
Dated: _________, 2014

Exhibit A to Billboard Relocation Agreement

City of Sacramento and Iron Point Media, LLC

New Billboard	Existing Billboards
New Billboard *General Location*: 2601 Redding Avenue *APN*: 015-0033-048 *Zoning*: M-1* *General Description*: two-sided billboard (14' X 48') *Total Display Area*: 1,344 square feet† *On the date Iron Point submitted its application for Project No. P13-059 (Sign Relocation), the General Plan designation and zoning for this location were Urban Neighborhood Low Density and Residential Mixed Use Transit Overlay (RMX-TO), respectively. As part of Project No. P13-059, the General Plan designation will be changed to Employment Center Low Rise, and the zoning will be changed to Light Industrial (M-1) with a variance allowing a sign that is 80 feet tall. †Each display face will be a billboard tri-prism.	**Iron Point shall permanently remove these three Existing Billboards from the indicated locations *before* Iron Point begins constructing the New Billboard:** **Existing Billboard 1** *General Location*: Richards Boulevard at Bannon Street *APN*: 001-0200-037 *Zoning*: OB-SPD *General Description*: two-sided billboard (12' X 25') *Total Display Area*: 600 square feet **Existing Billboard 2** *General Location*: Elder Creek at South Watt Avenue *APN*: 064-0033-029 *Zoning*: M-1 SR *General Description*: two-sided billboard (12' X 25') *Total Display Area*: 600 square feet **Existing Billboard 3** *General Location*: North 16th Street at Richards Boulevard (625 N. 16th Street) *APN*: 001-0104-014 *Zoning*: R-3A SPD *General Description*: one-sided billboard (10' X 30') *Total Display Area*: 300 square feet Total Existing Display Area: 1,500 square feet Total Existing Display Faces: 5

Net Reduction in Number of Signs:	**2 signs**
Net Reduction in Number of Display Faces:	**3 faces**
Net Reduction in Display Area:	**156 square feet**

Exhibit B: Redding Avenue Site Plan

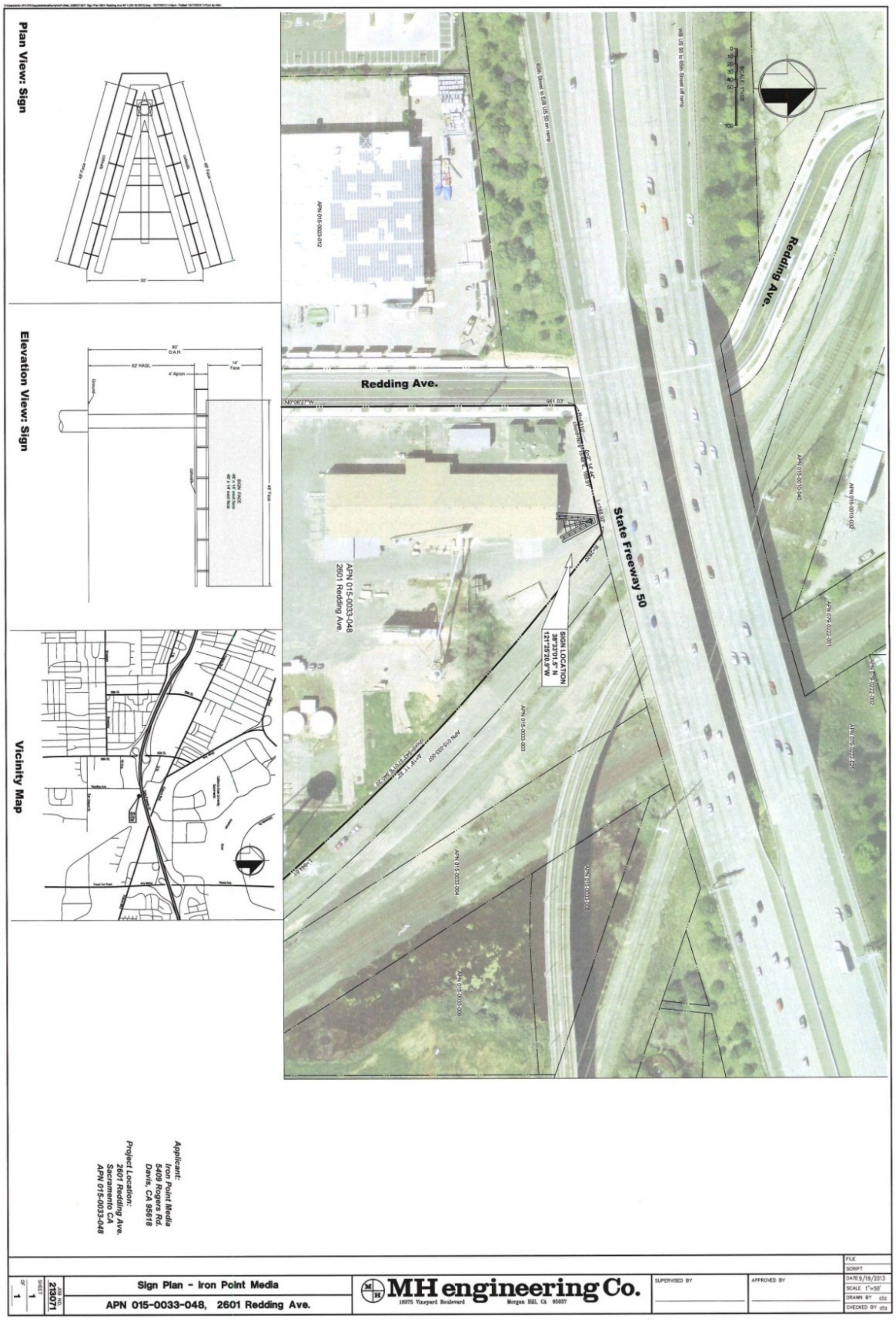


Exhibit C: Redding Avenue Sign Details

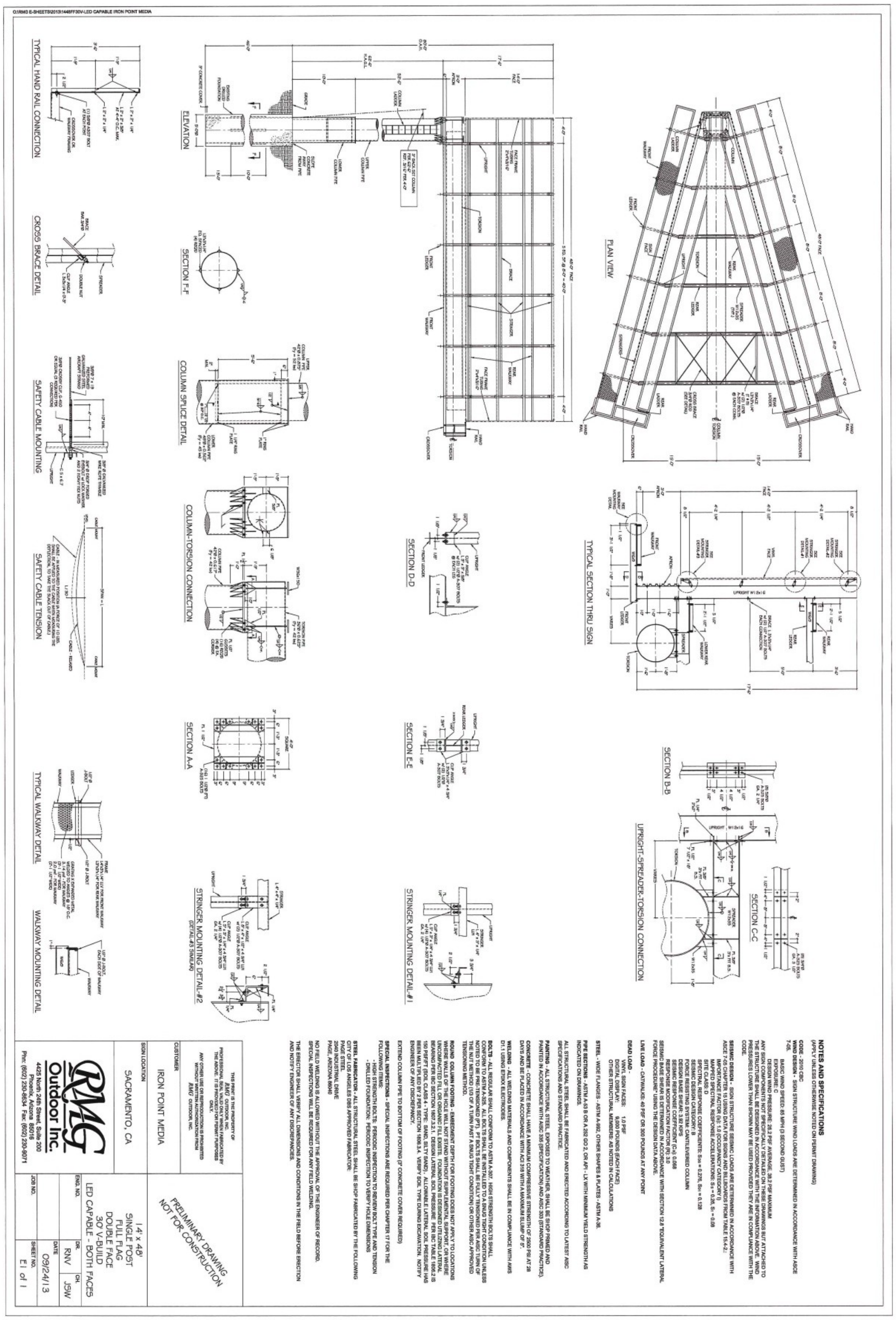


Exhibit D: Redding Avenue Sign Rendering –Westbound on Hwy 50

Exhibit E: Redding Avenue Sign Rendering –Eastbound on Hwy 50

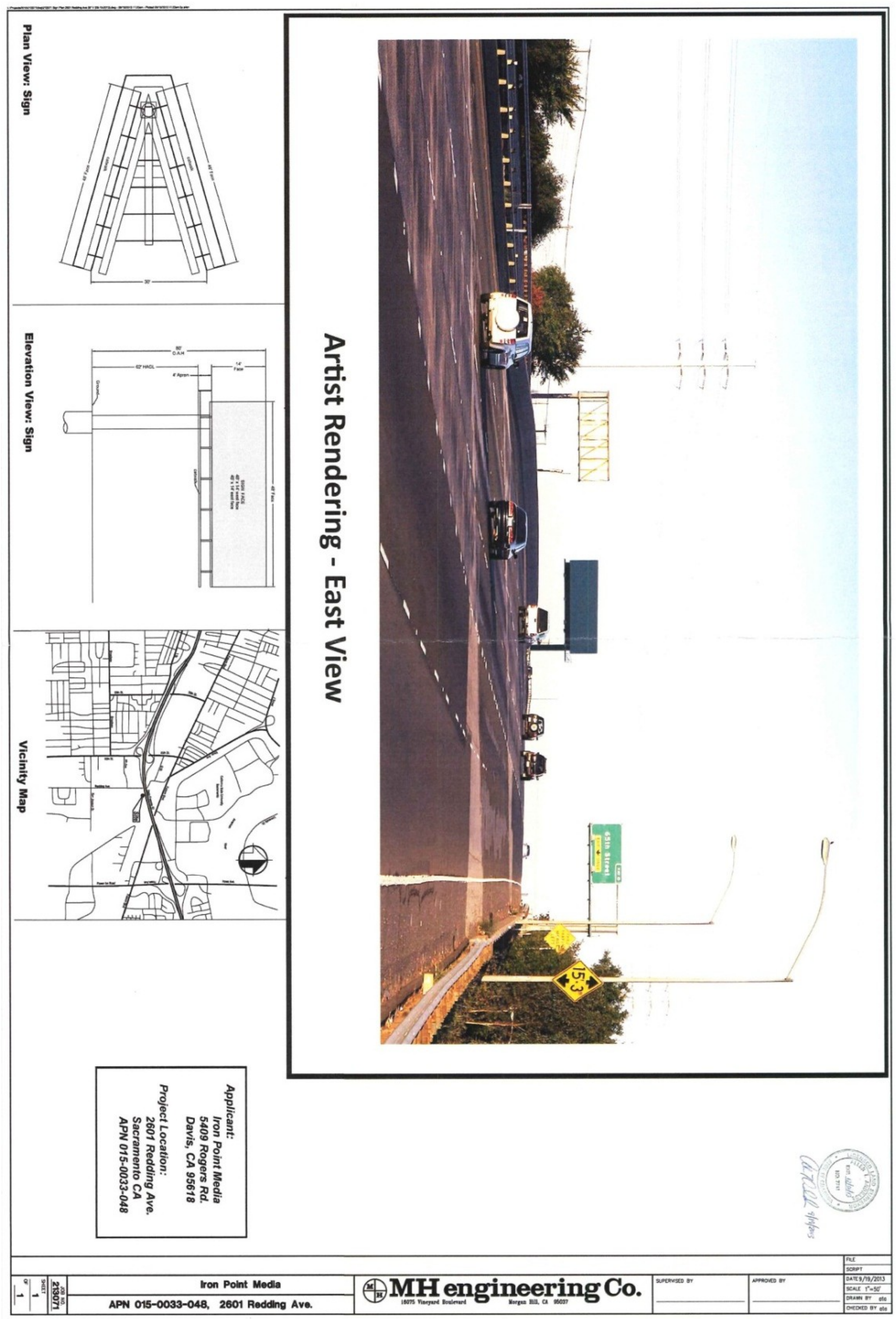
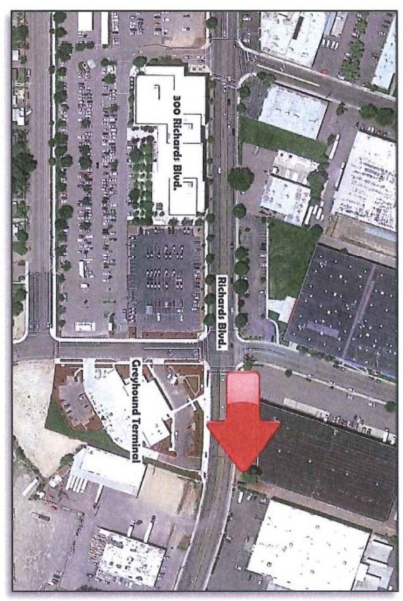
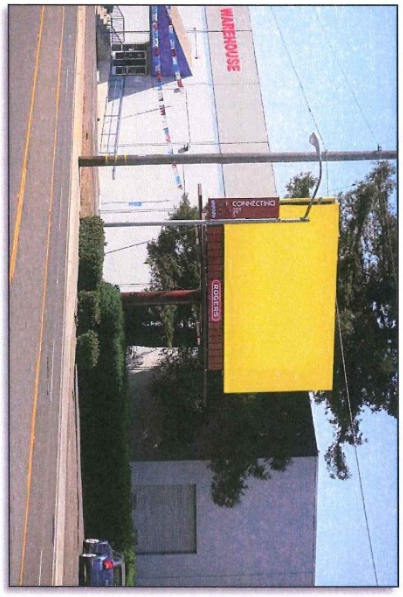


Exhibit F: Sign Removal for Richards Boulevard

Existing Billboards to be removed

Richards Blvd. (West Face) at Bannon Street





Richards Blvd. (West Face) at Bannon Street

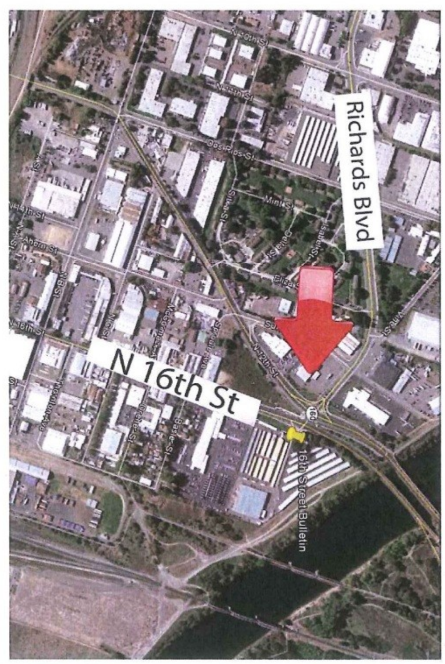
REDDING AVENUE RELOCATION
IRON POINT MEDIA, llc.

Exhibit G: Sign Removal for Watt Avenue

Exhibit H: Sign Removal for 16th Street

Existing Billboards to be removed

16 street (South Face) at River



REDDING AVENUE RELOCATION
IRON POINT MEDIA, llc.

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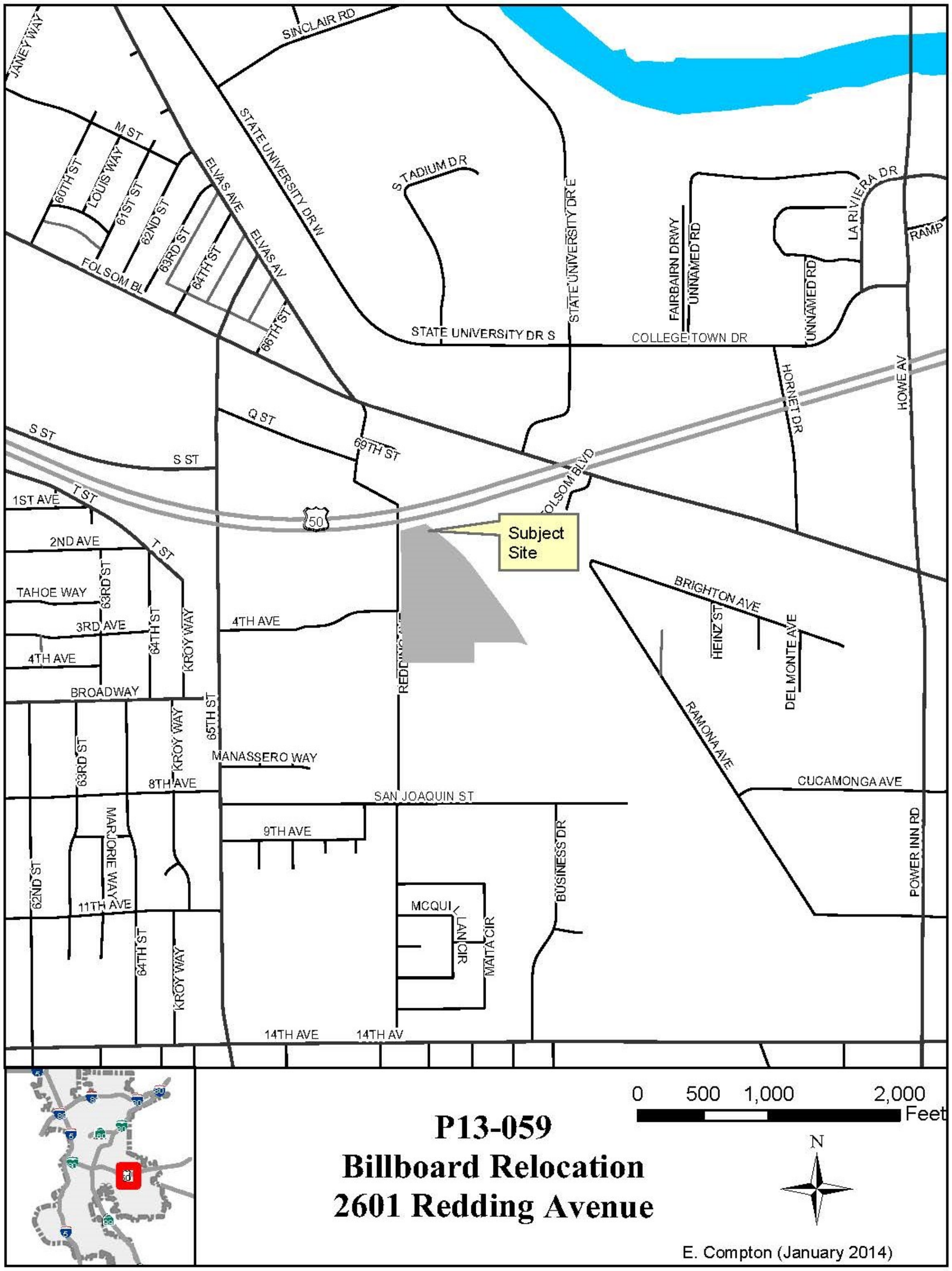
Vicinity Map



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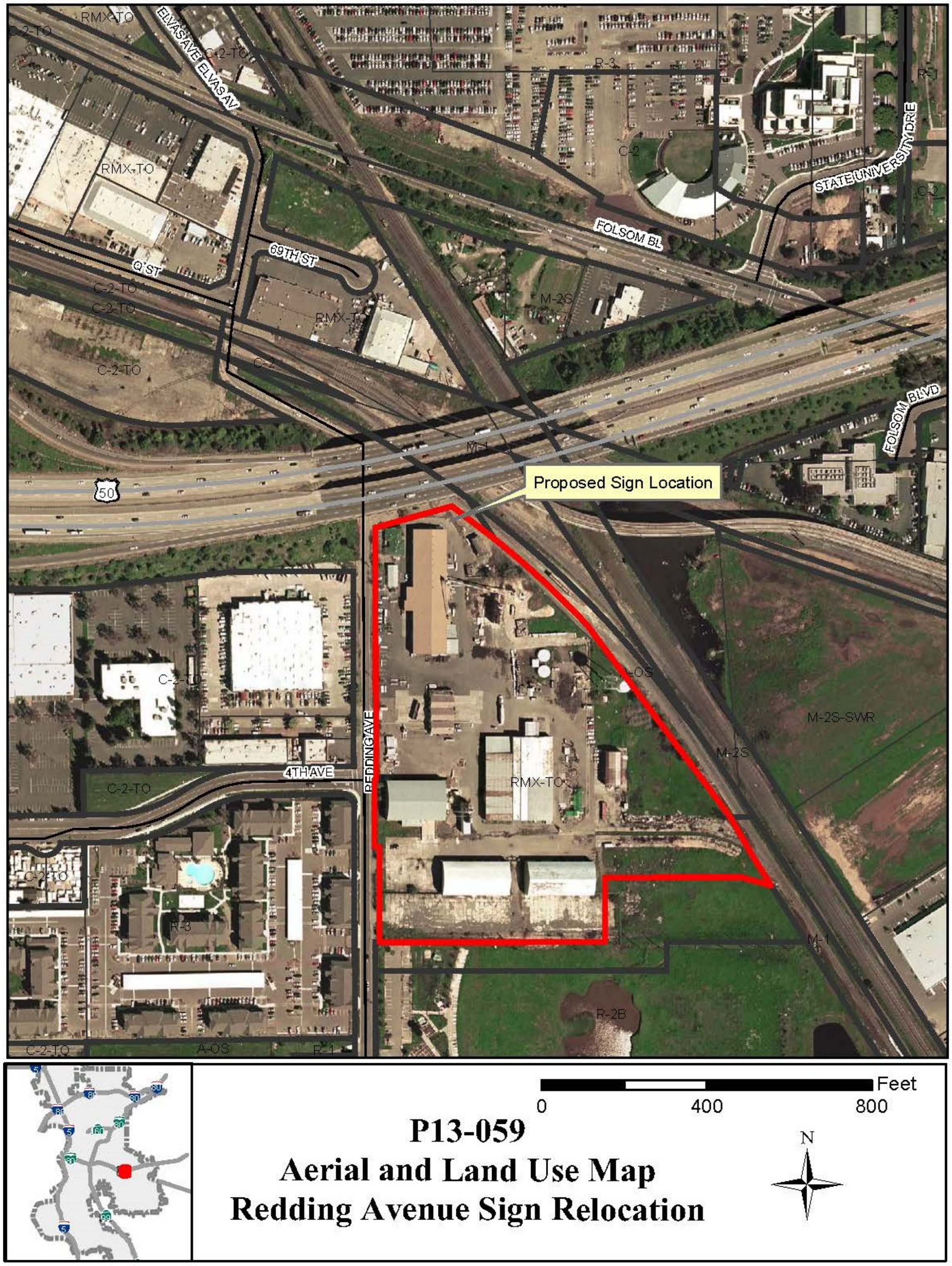
Aerial and Land Use Map



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Evan Compton

From: Jim Lane <luannjim@earthlink.net>
Sent: Wednesday, November 13, 2013 2:52 PM
To: Evan Compton
Cc: Kevin McCarty
Subject: Billboard in East Tahoe Park

Hello,

I am against the building of a billboard in East Tahoe Park. Our area is becoming too commercial, too traffic-ridden, and is in danger of losing its neighborhood feel.

Billboards de-humanize neighborhoods, encourage graffiti, and are just plain ugly.

I have lived in Tahoe Park since the 80's and have watched it slowly change from a drug, prostitute and billboard-infested area to a caring community.

Billboards dehumanize communities, add blight, and should not be built in our neighborhood.

LuAnn Higgs
5424 12th Avenue
Sacramento, CA
916-452-9350

Evan Compton

From: berrychinablue@aol.com
Sent: Wednesday, November 13, 2013 10:35 PM
To: Evan Compton
Subject: Billboard

Urban blight in my neighborhood!!! No way! Put that billboard right up your residential area! Enough said.

Evan Compton

From: Patrick McDaniel <mcdanielp@gmail.com>
Sent: Sunday, November 24, 2013 3:55 PM
To: Evan Compton
Subject: Proposed Billboard at 2601 Redding Avenue

Evan Compton, Associate Planner

City of Sacramento

Re: Proposed Billboard at 2601 Redding Avenue, adjacent to the Highway 50

Responsible Development for Tahoe Park (RDTP), a community organization which is comprised of Tahoe Park residents who advocate for sensible growth in our neighborhood, has reviewed the application to construct a 1,344 square foot Billboard that is 80 feet in height, or 40 feet above Highway 50 with two display faces at 2601 Redding Avenue. We are writing today to express our concerns with the proposed billboard.

First and foremost we are concerned with motorist safety. The proposed billboard will be located in close proximity to the Sacramento State University billboard. Both the Sacramento State University billboard and the proposed billboard are doubled sided, and as a result will draw the attention of eastbound and westbound motorists to both the north and south directions while traveling at high rates of speed. Additionally, given that the proposed billboard will only sit 40 feet above the Highway 50 travel lanes, it will pose an undeniable distraction to eastbound motorists. While the application does not provide details about the distance of the billboard from Highway 50 eastbound lanes (note: specifications page is illegible), the artist renderings depicts the billboard in a prominent location similar to the Highway 50 informational signs. Does this comply with Caltrans highway centerline setback requirements?

The application indicates that Caltrans, Regional Transit and the Sacramento Traffic Department received copies of the application. However, it does not appear as though the Union Pacific railroad was notified. Is this an oversight given the proximity of the billboard to the railroad corridor?

The parcel on which the billboard is proposed (Doris Lumber) is within the South 65th Street Station Area Plan and the 65th Street Station Area Plan which outline a transit oriented, compact, mixed-use community. The application calls for rezoning this parcel from Residential Mixed Use Transit Overlay (RMX-TO) to Light Industrial (M-1) which is not consistent with the type of development outlined in the aforementioned plans. Additionally, the Doris Lumber parcel is identified as a "Development and Reuse Opportunity Site" in the South 65th Station Area Plan. A rezone to Light Industrial in combination with a billboard will impede the type of development and reuse envisioned by city staff for the area. Furthermore, the South 65th Station Area Plan states:

> Future development should focus on non-industrial uses with an aim at transitioning the light industrial uses in the northern quadrants into higher intensity residential mixed-use developments (page 13); and
>
> The preferred land use plan for the project area provides for a variety of housing types including single-family, townhouses, and mixed-use housing (page 6).

This project has the potential to negatively impact our neighborhood and other redevelopment projects proposed in and around the proposed project area. Who would want to build anything of quality and value to the surrounding neighborhood in the vicinity of a billboard? Impacts to the neighborhood range from light pollution - even with timed lights that automatically shut off at 12:00 pm to the visual blight impact that this proposed project would have on view sheds for homeowners whose homes are in the line of sight to the billboard. These include existing homes in the following locations: T Street between 59th and Kroy Street, Broadway between 64th Street and 65th street, all of 4th Avenue, all of San Joaquin Avenue, 65th Street between Broadway and Folsom, Redding Street from Highway 50 to San Joaquin, Maita Circle, The Element apartments, and proposed Campus Crest apartments. Studies have shown that Billboards have a downward effect on surrounding property values (*Beyond Aesthetics: How Billboards Affect Economic Prosperity*).

The City of Sacramento is currently in the process of approving a plan to transform the industrial corridor east of the Union Pacific Railroad tracks, i.e., Sacramento Center for Innovation Specific Plan. Is there really a need for another industrial property that sits adjacent to an industrial area poised for redevelopment? The proposed billboard is in an area planned to accommodate TOD, compact, mixed-use development. We request that you do not approve the General Plan amendment in order to accommodate a billboard which has the potential to negatively affect the surrounding neighborhood.

We appreciate your consideration of our concerns, most notably the safety concerns for motorists on Highway 50.

Sincerely,

Patrick McDaniel, Chairperson

Responsible Development for Tahoe Park

Evan Compton

From: Melanie <melanie94121@att.net>
Sent: Monday, November 25, 2013 12:44 PM
To: Evan Compton
Subject: Proposed Billboard at 2601 Redding Avenue, adjacent to the Highway 50

Re: Proposed Billboard at 2601 Redding Avenue, adjacent to the Highway 50
Dear Evan Compton

I am in full agreement with the below letter - I do not wish to have a billboard in my nieghborhood. I feel it will bring down property values, bring up crime and contribute to unwanted light pollution. I have already noticed a significant increase in homelessness, crime and litter, please do not add more blight to the area. Thank you
Responsible Development for Tahoe Park (RDTP), a community organization which is comprised of Tahoe Park residents who advocate for sensible growth in our neighborhood, has reviewed the application to construct a 1,344 square foot Billboard that is 80 feet in height, or 40 feet above Highway 50 with two display faces at 2601 Redding Avenue. We are writing today to express our concerns with the proposed billboard.

First and foremost we are concerned with motorist safety. The proposed billboard will be located in close proximity to the Sacramento State University billboard. Both the Sacramento State University billboard and the proposed billboard are doubled sided, and as a result will draw the attention of eastbound and westbound motorists to both the north and south directions while traveling at high rates of speed. Additionally, given that the proposed billboard will only sit 40 feet above the Highway 50 travel lanes, it will pose an undeniable distraction to eastbound motorists. While the application does not provide details about the distance of the billboard from Highway 50 eastbound lanes (note: specifications page is illegible), the artist renderings depicts the billboard in a prominent location similar to the Highway 50 informational signs. Does this comply with Caltrans highway centerline setback requirements?

The application indicates that Caltrans, Regional Transit and the Sacramento Traffic Department received copies of the application. However, it does not appear as though the Union Pacific railroad was notified. Is this an oversight given the proximity of the billboard to the railroad corridor?

The parcel on which the billboard is proposed (Doris Lumber) is within the South 65th Street Station Area Plan and the 65th Street Station Area Plan which outline a transit oriented, compact, mixed-use community. The application calls for rezoning this parcel from Residential Mixed Use Transit Overlay (RMX-TO) to Light Industrial (M-1) which is not consistent with the type of development outlined in the aforementioned plans. Additionally, the Doris Lumber parcel is identified as a "Development and Reuse Opportunity Site" in the South 65th Station Area Plan. A rezone to Light Industrial in combination with a billboard will impede the type of development and reuse envisioned by city staff for the area. Furthermore, the South 65th Station Area Plan states:

Future development should focus on non-industrial uses with an aim at transitioning the light industrial uses in the northern quadrants into higher intensity residential mixed-use developments (page 13); and

The preferred land use plan for the project area provides for a variety of housing types including single-family, townhouses, and mixed-use housing (page 6).

This project has the potential to negatively impact our neighborhood and other redevelopment projects proposed in and around the proposed project area. Who would want to build anything of quality and value to the surrounding neighborhood in the vicinity of a billboard? Impacts to the neighborhood range from light pollution - even with timed lights that automatically shut off at 12:00 pm to the visual blight impact that this proposed project would have on view sheds for homeowners whose homes are in the line of sight to the billboard. These include existing homes in the following locations: T Street between 59th and Kroy Street, Broadway between 64th Street and 65th street, all of 4th Avenue, all of San Joaquin Avenue, 65th Street between Broadway and Folsom, Redding Street from Highway 50 to San Joaquin, Maita Circle, The Element apartments, and proposed Campus Crest apartments. Studies have shown that Billboards have a downward effect on surrounding property values (Beyond Aesthetics: How Billboards Affect Economic Prosperity).

The City of Sacramento is currently in the process of approving a plan to transform the industrial corridor east of the Union Pacific Railroad tracks, i.e., Sacramento Center for Innovation Specific Plan. Is there really a need for another industrial property that sits adjacent to an industrial area poised for redevelopment? The proposed billboard is in an area planned to accommodate TOD, compact, mixed-use development. We request that you do not approve the General Plan amendment in order to accommodate a billboard which has the potential to negatively affect the surrounding neighborhood.

We appreciate your consideration of our concerns, most notably the safety concerns for motorists on Highway 50.

Sincerely,

Melanie Balfour
4000 Fotos Court
Sacramento, CA 95820

Evan Compton

From: JoAnn Anglin <joannpen@comcast.net>
Sent: Wednesday, November 27, 2013 2:59 PM
To: Evan Compton
Subject: Proposed Billboard at 2601 Redding Avenue

TO: Evan Compton, Associate Planner
City of Sacramento

Re: Objection to Proposed Billboard at 2601 Redding Avenue, adjacent to the Highway 50

I am a Tahoe Park resident, and a member of Responsible Development for Tahoe Park (RDTP), a community organization that advocates for sensible growth in our neighborhood. We are alarmed about the application to raise a new 1,344 square foot Billboard that is 80 feet in height, or 40 feet above Highway 50 with two display faces at 2601 Redding Avenue. I write today to express concern over the proposed billboard.

First and foremost is concern for motorist safety. The proposed billboard would be in close proximity to the Sac State University billboard. Both the one by Sac State and the proposed billboard are double sided, of a type to entice the attention of eastbound and westbound motorists to both the north and south directions while they are traveling at high speeds. With the proposed billboard to sit only 40 feet above the Highway 50 travel lanes, it will pose an *undeniable* distraction to eastbound motorists. *And this will take place where motorists are entering traffic from 65th Street, and exiting for Sac State, Howe Avenue and Power Inn Road. The weaving in and out of traffic in this area is already dicey at times.*

While the application does not provide details about the distance of the billboard from Highway 50 eastbound lanes, the artist renderings depict the billboard in a prominent location similar to the Highway 50 informational signs. Does this comply with Caltrans highway centerline setback requirements?

The application indicates that Caltrans, Regional Transit and the Sacramento Traffic Department received copies of the application. However, it does not appear as though the Union Pacific railroad was notified. Is this an oversight given the proximity of the billboard to the railroad corridor?

The parcel on which the billboard is proposed (Doris Lumber) is within the South 65th Street Station Area Plan and the 65th Street Station Area Plan which outline a transit oriented, compact, mixed-use community. The application calls for rezoning (!!!) this parcel from Residential Mixed Use Transit Overlay (RMX-TO) to Light Industrial (M-1), and is NOT consistent with the type of development outlined in the aforementioned plans. Additionally, the Doris Lumber parcel is identified as a "Development and Reuse Opportunity Site" in the South 65th Station Area Plan. Rezoning to Light Industrial in addition to a billboard will impede the type of development and reuse envisioned by city staff, and the neighborhood, for the area. Furthermore, the South 65th Station Area Plan states:

Future development should focus on non-industrial uses with an aim at transitioning the light industrial uses in the northern quadrants into higher intensity residential mixed-use developments (page 13); and

The preferred land use plan for the project area provides for a variety of housing types including single-family, townhouses, and mixed-use housing (page 6).

This billboard project and rezoning would be likely to negatively impact our neighborhood and other redevelopment projects proposed in and around the proposed project area. Who would want to build anything of quality and value to the surrounding neighborhood in the vicinity of a giant billboard?

Impacts to the neighborhood range from light pollution - even with timed lights that automatically shut off at midnight to the visual blight impact that this proposed project would have on viewsheds for homeowners whose homes are in the line of sight to the billboard. These include existing homes in the following locations: T Street between 59th and Kroy Street, Broadway between 64th Street and 65th street, all of 4th Avenue, all of San Joaquin Avenue, 65th Street between Broadway and Folsom, Redding Street from Highway 50 to San Joaquin, Maita Circle, The Element apartments, and proposed Campus Crest apartments.

Studies have shown that Billboards have a downward effect on surrounding property values (Beyond Aesthetics: How Billboards Affect Economic Prosperity).

The City of Sacramento is currently in the process of approving a plan to transform the industrial corridor east of the Union Pacific Railroad tracks, i.e., Sacramento Center for Innovation Specific Plan. Is there really a need for another industrial property that sits adjacent to an industrial area poised for redevelopment? Surely not. The proposed billboard is in an area planned to accommodate TOD, compact, mixed-use development. We strongly request that you do not approve the General Plan amendment in order to accommodate a billboard which has the potential to negatively affect the surrounding neighborhood.

Responsible Development for Tahoe Park (RDTP) is a public group within the Tahoe Park neighborhood. But only members of the Responsible Development for Tahoe Park (RDTP) group receive e-mail notifications and see this post on the Tahoe Park home page.

We appreciate your consideration of our concerns, most notably the safety concerns for motorists on Highway 50.

Sincerely,

JoAnn Anglin, Member
Responsible Development for Tahoe Park

Evan Compton

From: Donna Bettencourt <bettencourt1045@softcom.net>
Sent: Sunday, December 01, 2013 2:21 PM
To: Evan Compton
Subject: Oppose Tahoe park billboard

I am in opposition to the grotesque billboard planned for Tahoe park.

Donna

Peace to you

Evan Compton

From: Tiffany Wilson <wilson.tiff@gmail.com>
Sent: Monday, December 02, 2013 1:00 PM
To: Evan Compton
Subject: 2601 Redding Avenue

Good afternoon Evan,

I am emailing to express my concern about the proposed billboard at 2601 Redding Avenue. The billboard is not consistent with city plans for the area, specifically the South 65th Street Area Plan and the 65th Street Station Area Plan. Both plans outline a TOD, mixed-use neighborhood to promote connectivity and encourage residential in-fill. A billboard will impede the type of redevelopment outlined in the plans, as 1) the site will be converted to industrial to accommodate the billboard, and 2) quality, residential in-fill will not be sited adjacent to industrial property or a billboard. The billboard will negatively impact the redevelopment potential of the area. Given Tahoe Park's proximity to Highway 50, the American River Trail, and the downtown core, the neighborhood has a lot of potential that will be stymied by a billboard. Furthermore, a billboard will also negatively impact the property values of homeowners whose homes are in line-of-sight of the billboard. The billboard will negatively impact viewsheds and be a source of light pollution. I also worry that down the line when the time comes either renovate Highway 50, the rail line or the lightrail line, the billboard will impede progress and cost taxpayers millions of dollars to remove. (http://www.times-standard.com/news/ci_24586370/sticker-shock-hcaog-surprised-by-billboard-removal-costs). Lastly, with its close proximity to Highway 50 and the existing billboard on the north side of Highway 50 the billboard poses a safety issue.

With respect,

Tiffany Wilson

Evan Compton

From: MONTYSTOWERS@comcast.net
Sent: Monday, December 02, 2013 2:07 PM
To: Evan Compton
Subject: P13-059

Don't think this is the right place for a billboard, there's on ramps and off ramp on both the east and west bound sides and the purposed billboard would be in the middle of them. Have been a professional driver for forty years this is not a good idea, maybe between Howe Ave and Watt Ave it would fit better less safety issue there. Understand billboards money maker for the city but not at the cost of safety and it seems low. Why isn't CHP on the project routing distribution list? Seems like they could have input to the safety of the location of this billboard.

Thank You
Monty Stowers
6756 9th Ave.
Sacramento, Ca. 95820-2106

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To: Evan Compton
City of Sacramento, Community Development

From: Iron Point Media, llc.

Date: January 19, 2014

Regarding: Redding Avenue Billboard Relocation, Neighbor Concerns

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Tahoe Park Neighborhood Association was noticed in early November about the proposed billboard relocation. Five Tahoe Park neighbors have responded with comments that oppose the proposed billboard relocation. Our Response to the comments is included within the following letters that have sent as of January 19, 2014.

Letter Writers
LuAnn Higgs
Monty Stowers
Tiffany Wilson
JoAnn Anglin
Patrick McDaniels

EXHIBITS

A. Caltrans Preliminary Application Approval
B. Site Photographs of Dorris Lumber and Moulding
C. Photos Survey of Visual Impacts
D. Letters of Support
E. *Driver Visual Behavior in the Presence of Commercial Electronic Variable Message Signs (CEVMS)* March 2011
F. *Beyond Aesthetics: How Billboards Affect Economic*

LuAnn Higgs (11/13/13 2:52pm)

I am against the building of a billboard in East Tahoe Park. Our area is becoming too commercial, too traffic-ridden, and is in danger of losing its neighborhood feel.

Billboards de-humanize neighborhoods, encourage graffiti, and are just plain ugly.

I have lived in Tahoe Park since the 80's and have watched it slowly change from a drug, prostitute and billboard-infested area to a caring community.

Response

> The proposed location of the billboard is not within the boundaries of either Tahoe Park or East Tahoe Park.

Billboards dehumanize communities, add blight, and should not be built in our neighborhood.

LuAnn Higgs
5424 12th Avenue
Sacramento, CA
916-452-9350

Monty Stowers (12/2/13 2:07pm)

Don't think this is the right place for a billboard, there's on ramps and off ramp on both the east and west bound sides and the purposed billboard would be in the middle of them. Have been a professional driver for forty years this is not a good idea, maybe between Howe Ave and Watt Ave it would fit better less safety issue there. Understand billboards money maker for the city but not at the cost of safety and it seems low. Why isn't CHP on the project routing distribution list? Seems like they could have input to the safety of the location of this billboard.

Response

The comment is based on a misunderstanding of the location of the billboard relative to Caltrans Right-of-Way and travel lanes. The proposed location of the pole and billboard is wholly located on private property and is completely outside of Caltrans Right of Way. The location of the structure has been reviewed and cleared by Caltrans engineers (**Exhibit A** *Caltrans Preliminary Approval*).

Tiffany Wilson (12/2/13 1:00pm)

I am emailing to express my concern about the proposed billboard at 2601 Redding Avenue.

The billboard is not consistent with city plans for the area, specifically the South 65th Street Area Plan and the 65th Street Station Area Plan. Both plans outline a TOD, mixed-use neighborhood to promote connectivity and encourage residential in-fill.

A billboard will impede the type of redevelopment outlined in the plans, as 1) the site will be converted to industrial to accommodate the billboard, and 2) quality, residential in-fill will not be sited adjacent to industrial property or a billboard.

Response

The property is currently used as light industrial manufacturing. Development of the billboard is appropriate for the current use of the property.

The area that will be rezoned is approximately 4000 square feet. Rezoning to Light Industrial reflects the current use of the property. Future development will not be adversely impacted by the billboard because the billboard will be within the setback area between the future commercial and residential mixed uses and the adjacent freeway (**Exhibit B** *Site Photographs)*.

The billboard will negatively impact the redevelopment potential of the area. Given Tahoe Park's proximity to Highway 50, the American River Trail, and the downtown core, the neighborhood has a lot of potential that will be stymied by a billboard.

Furthermore, a billboard will also negatively impact the property values of homeowners whose homes are in line-of-sight of the billboard. The billboard will negatively impact view sheds and be a source of light pollution.

Response

The vast majority of locations within Tahoe Park will have no view of the billboard because of view obstructions between the potential viewer and the billboard. A few locations east of 65th street might have a glimpse of the billboard (**Exhibit C** *Photo Survey of Visual Impacts*). There will be no light intrusion; however, because the view will only be of the back of the board and not of the lit front. The distance between the detached residence and the billboard is approximately 1,860 linear feet (1/3 of a mile). There are no detached homes near the billboard.

I also worry that down the line when the time comes either renovate Highway 50, the rail line or the lightrail line, the billboard will impede progress and cost taxpayers millions of dollars to remove. (http://www.times-standard.com/news/ci_24586370/sticker-shock-hcaog-surprised-by-billboard-removal-costs).

Response

There are no current or anticipated plans to expand the perimeter of Highway 50. If, in the future, Caltrans does expand the footprint of Highway 50 the acquisition of the billboard will be handled in the same manner as any piece of privately owned property when acquired by the State of California.

Lastly, with its close proximity to Highway 50 and the existing billboard on the north side of Highway 50 the billboard poses a safety issue.

Response

The safety of billboards has been analyzed by the California Department of Transportations and the Federal Highway Administration. Both agencies have determined that appropriately built billboards are safe. The proposed billboard has been reviewed by Caltrans and has been determined to meet all State of California outdoor advertising requirements. As a matter of fact, a Preliminary Outdoor Advertising Permit has been issued for the site (**Exhibit A** *Caltrans Preliminary Approval*).

For further information please see the enclosed Federal Highway Administration published report *Driver Visual Behavior in the Presence of Commercial Electronic Variable Message Signs (CEVMS)* March 2011 (**Exhibit E**). The study is the most conclusive analysis of the distractive nature of billboards ever conducted. It found that the average length of time drivers spent looking at digital billboards was 379 milliseconds, compared to 335 milliseconds for standard signs. The results were both well below the "currently accepted threshold of 2,000 milliseconds," the study said.

JoAnn Anglin (11/27/13 2:59pm)

I am a Tahoe Park resident, and a member of Responsible Development for Tahoe Park (RDTP), a community organization that advocates for sensible growth in our neighborhood. We are alarmed about the application to raise a new 1,344 square foot Billboard that is 80 feet in height, or 40 feet above Highway 50 with two display faces at 2601 Redding Avenue. I write today to express concern over the proposed billboard.

First and foremost is concern for motorist safety. The proposed billboard would be in close proximity to the Sac State University billboard. Both the one by Sac State and the proposed billboard are double sided, of a type to entice the attention of eastbound and westbound motorists to both the north and south directions while they are traveling at high speeds. With the proposed billboard to sit only 40 feet above the Highway 50 travel lanes, it will pose an *undeniable* distraction to eastbound motorists. *And this will take place where motorists are entering traffic from 65th Street, and exiting for Sac State, Howe Avenue and Power Inn Road. The weaving in and out of traffic in this area is already dicey at times.*

Response

The safety of billboards has been analyzed by the California Department of Transportations and the Federal Highway Administration. Both agencies have determined that appropriately built billboards are safe. The proposed billboard has been reviewed by Caltrans and has been determined to meet all State of California outdoor advertising requirements. As a matter of fact, a Preliminary Outdoor Advertising Permit has been issued for the site (**Exhibit A** *Caltrans Preliminary Approval*).

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While the application does not provide details about the distance of the billboard from Highway 50 eastbound lanes, the artist renderings depict the billboard in a prominent location similar to the Highway 50 informational signs. Does this comply with Caltrans highway centerline setback requirements?

Response

The comment is based on a misunderstanding of the location of the billboard relative to Caltrans Right-of-Way and travel lanes. The proposed location of the pole and billboard is wholly located on private property and is completely outside of Caltrans Right of Way. The location of the structure has been reviewed and cleared by Caltrans engineers (**Exhibit A** *Caltrans Preliminary Approval*).

The application indicates that Caltrans, Regional Transit and the Sacramento Traffic Department received copies of the application. However, it does not appear as though the Union Pacific railroad was notified. Is this an oversight given the proximity of the billboard to the railroad corridor?

Response

Union Pacific Railroad, an adjacent property owner, has been notified about the application. Their response is that since the project is outside of their property lines, outside of the area of operation and has no impact on either safety or operation of rail operations, they do not have a position on the application.

The parcel on which the billboard is proposed (Dorris Lumber) is within the South 65th Street Station Area Plan and the 65th Street Station Area Plan which outline a transit oriented, compact, mixed-use community. The application calls for rezoning (!!!) this parcel from Residential Mixed Use Transit Overlay (RMX-TO) to Light Industrial (M-1), and is NOT consistent with the type of development outlined in the aforementioned plans. Additionally, the Doris Lumber parcel is identified as a “Development and Reuse Opportunity Site” in the South 65th Station Area Plan. Rezoning to Light Industrial in addition to a billboard will impede the type of development and reuse envisioned by city staff, and the neighborhood, for the area. Furthermore, the South 65th Station Area Plan states:

Future development should focus on non-industrial uses with an aim at transitioning the light industrial uses in the northern quadrants into higher intensity residential mixed-use developments (page 13); and

The preferred land use plan for the project area provides for a variety of housing types including single-family, townhouses, and mixed-use housing (page 6).

This billboard project and rezoning would be likely to negatively impact our neighborhood and other redevelopment projects proposed in and around the proposed project area. Who would want to build anything of quality and value to the surrounding neighborhood in the vicinity of a giant billboard?

Response

The area that will be rezoned is approximately 4000 square feet. Rezoning to Light Industrial reflects the current use of the property (**Exhibit B** *Site Photographs*). Future development will not be adversely impacted by the billboard because the billboard will be within the setback area between the future commercial and residential mixed uses and the adjacent freeway.

Impacts to the neighborhood range from light pollution - even with timed lights that automatically shut off at midnight to the visual blight impact that this proposed project would have on viewsheds for homeowners whose homes are in the line of sight to the billboard. These include existing homes in the following locations: T Street between 59th and Kroy Street, Broadway between 64th Street and 65th street, all of 4th Avenue, all of San Joaquin Avenue, 65th Street between Broadway and Folsom, Redding Street from Highway 50 to San Joaquin, Maita Circle, The Element apartments, and proposed Campus Crest apartments.

Response

The vast majority of locations within Tahoe Park will have no view of the billboard because of view obstructions between the potential viewer and the billboard. A few locations east of 65th street might have a glimpse of the billboard (**Exhibit C** *Photo Survey of Visual Impacts*). There will be no light intrusion; however, because the view will only be of the back of the board and not of the lit front. The distance between the detached residence and the billboard is approximately 1,860 linear feet (1/3 of a mile). There are no detached homes near the billboard.

Studies have shown that Billboards have a downward effect on surrounding property values (Beyond Aesthetics: How Billboards Affect Economic Prosperity).

Response

Beyond Aesthetics: How Billboards Affect Economic Prosperity (**Exhibit F**) is not relevant to the proposed billboard for two reasons.

The first reason is that the study determined that there only is a correlation between billboard density and property values. The subject of the study is Philadelphia, PA which has approximately 6x's more billboard faces on **one** freeway (324) than Sacramento has on **all** of the freeways within the city limits (55). The density of billboards between the two studies are nowhere near the on the same scale.

The second reason the study is not appropriate is that the remedy the study suggests is billboard regulations. The City of Sacramento already has stronger ordinance controls than the study recommends. As a side note, on November 13, 2013 Philadelphia started the process to institute a new billboard ordinance. The new ordinance will still be more lenient than the current City of Sacramento's ordinance.

The City of Sacramento is currently in the process of approving a plan to transform the industrial corridor east of the Union Pacific Railroad tracks, i.e., Sacramento Center for Innovation Specific Plan. Is there really a need for another industrial property that sits adjacent to an industrial area poised for redevelopment? Surely not. The proposed billboard is in an area planned to accommodate TOD, compact, mixed-use development. We strongly request that you do not approve the General Plan amendment in order to accommodate a billboard which has the potential to negatively affect the surrounding neighborhood.

Response

The billboard will not adversely affect the recently approved Sacramento Center for Innovation Specific Plan. As a matter of fact, several large property owners have submitted letters of support for the project (**Exhibit D** *Letters of Support*). The nearest house is a 1/3rd of a mile from the billboard. Both of the supporting property owners are within 500 linear feet of the billboard.

Responsible Development for Tahoe Park (RDTP) is a public group within the Tahoe Park neighborhood. But only members of the Responsible Development for Tahoe Park (RDTP) group receive e-mail notifications and see this post on the Tahoe Park home page.

We appreciate your consideration of our concerns, most notably the safety concerns for motorists on Highway 50.

Sincerely,

Iron Point Media, llc.

JoAnn Anglin, Member
Responsible Development for Tahoe Park
Patrick McDaniels (11/25/13 9:48am), resent (01/17/14 8:19pm)

Responsible Development for Tahoe Park (RDTP), a community organization which is comprised of Tahoe Park residents who advocate for sensible growth in our neighborhood, has reviewed the application to construct a 1,344 square foot Billboard that is 80 feet in height, or 40 feet above Highway 50 with two display faces at 2601 Redding Avenue. We are writing today to express our concerns with the proposed billboard.

First and foremost we are concerned with motorist safety. The proposed billboard will be located in close proximity to the Sacramento State University billboard. Both the Sacramento State University billboard and the proposed billboard are doubled sided, and as a result will draw the attention of eastbound and westbound motorists to both the north and south directions while traveling at high rates of speed. Additionally, given that the proposed billboard will only sit 40 feet above the Highway 50 travel lanes, it will pose an undeniable distraction to eastbound motorists. While the application does not provide details about the distance of the billboard from Highway 50 eastbound lanes (note: specifications page is illegible), the artist renderings depicts the billboard in a prominent location similar to the Highway 50 informational signs. Does this comply with Caltrans highway centerline setback requirements?

Response

The safety of billboards has been analyzed by the California Department of Transportations and the Federal Highway Administration. Both agencies have determined that appropriately built billboards are safe. The proposed billboard has been reviewed by CalTrans and has been determined to meet all State of California outdoor advertising requirements. As a matter of fact, a Preliminary Outdoor Advertising Permit has been issued for the site (**Exhibit A** *Caltrans Preliminary Approval*).

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This project has the potential to negatively impact our neighborhood and other redevelopment projects proposed in and around the proposed project area. Who would want to build anything of quality and value to the surrounding neighborhood in the vicinity of a billboard? Impacts to the neighborhood range from light pollution - even with timed lights that automatically shut off at 12:00 pm to the visual blight impact that this proposed project would have on view sheds for homeowners whose homes are in the line of sight to the billboard. These include existing homes in the following locations: T Street between 59th and Kroy Street, Broadway between 64th Street and 65th street, all of 4th Avenue, all of San Joaquin Avenue, 65th Street between Broadway and Folsom, Redding Street from Highway 50 to San Joaquin, Maita Circle, The Element apartments, and proposed Campus Crest apartments.

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We appreciate your consideration of our concerns, most notably the safety concerns for motorists on Highway 50.

Sincerely,

Patrick McDaniel, Chairperson

Responsible Development for Tahoe Park

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY

EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
OFFICE OF THE DIRECTOR
P.O. BOX 942873, MS-49
SACRAMENTO, CA 94273-0001
PHONE (916) 654-5266
FAX (916) 654-6608
TTY 711
www.dot.ca.gov

Flex your power!
Be energy efficient!

September 25, 2013

Iron Point Media Inc.
Matt Rogers
5409 Rogers Street
Davis, CA 95618

Dear Mr. Rogers,

The proposed display location on the South side of 50 in Sacramento County, .1400 feet East of the 65th Street Overpass is conforming at this time. One hundred dollars of the preliminary review fee you had paid shall be credited toward an application for a permit at this location if a permit is applied for within one year of the above date and the display location remains conforming.

If you have any questions, please contact our office at (916) 654-6473.

Sincerely,

Kenneth Parmelee
Outdoor Advertising Program

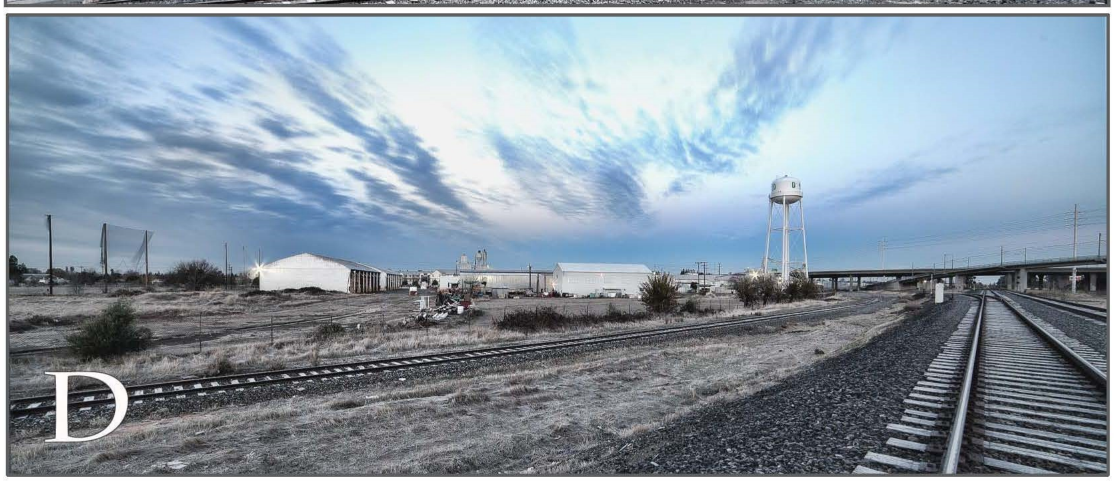
Enclosure

"Caltrans improves mobility across California"

EXHIBIT B
DORRIS PROPERTY SITE PHOTOS


B


C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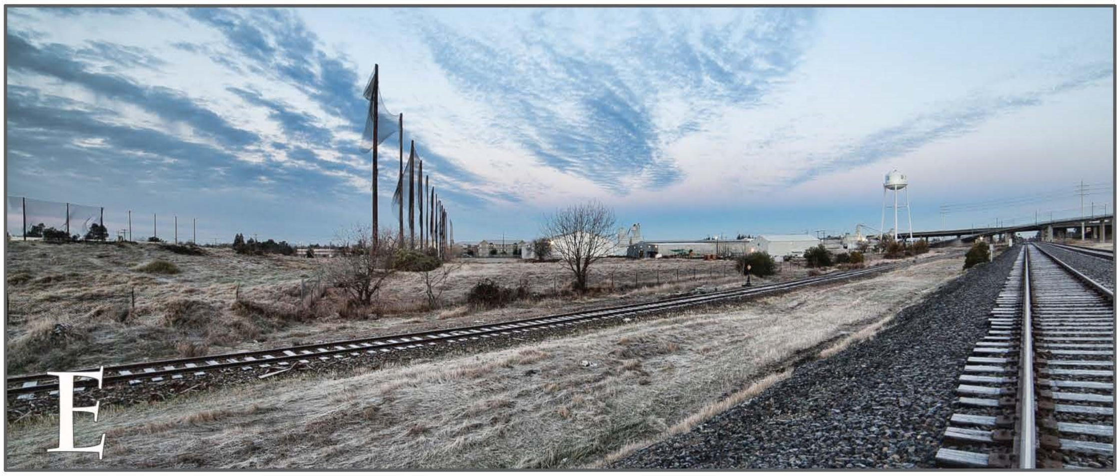
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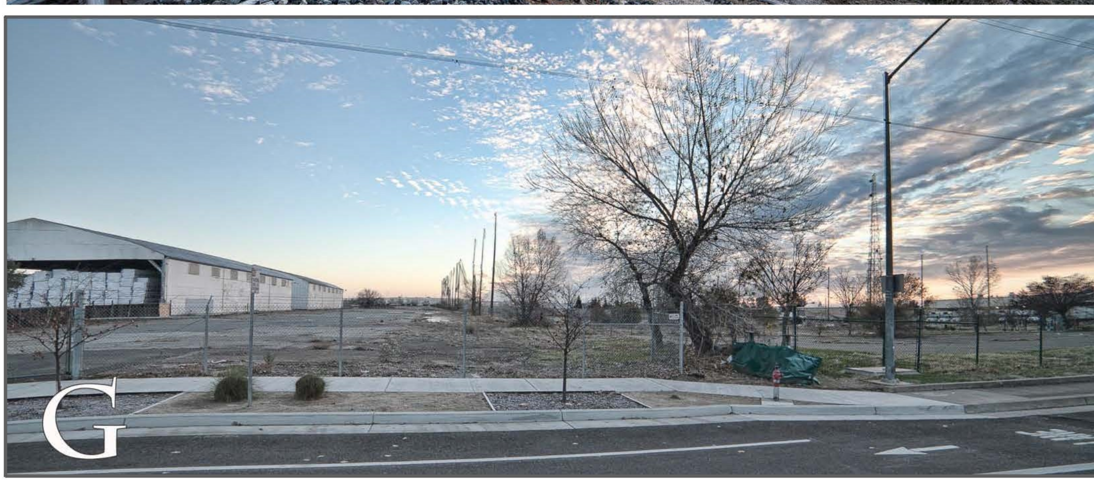
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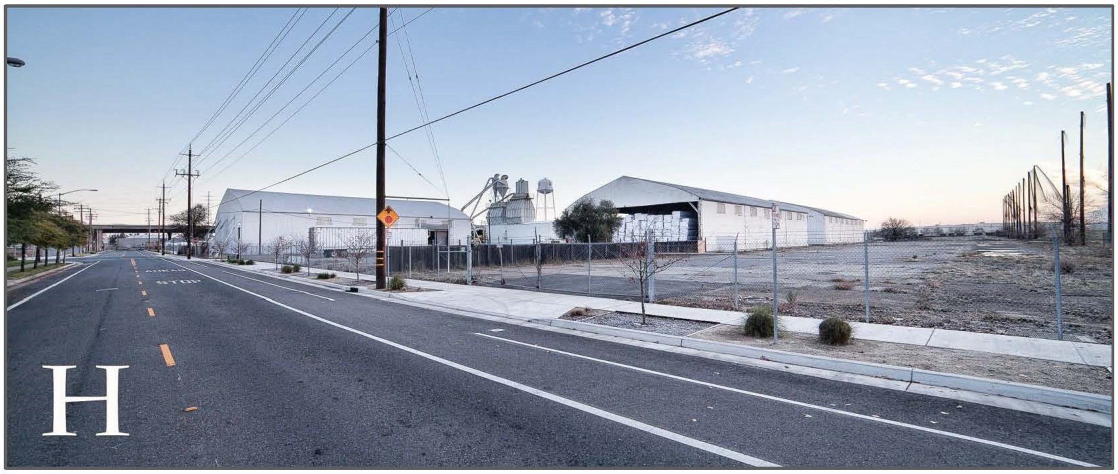
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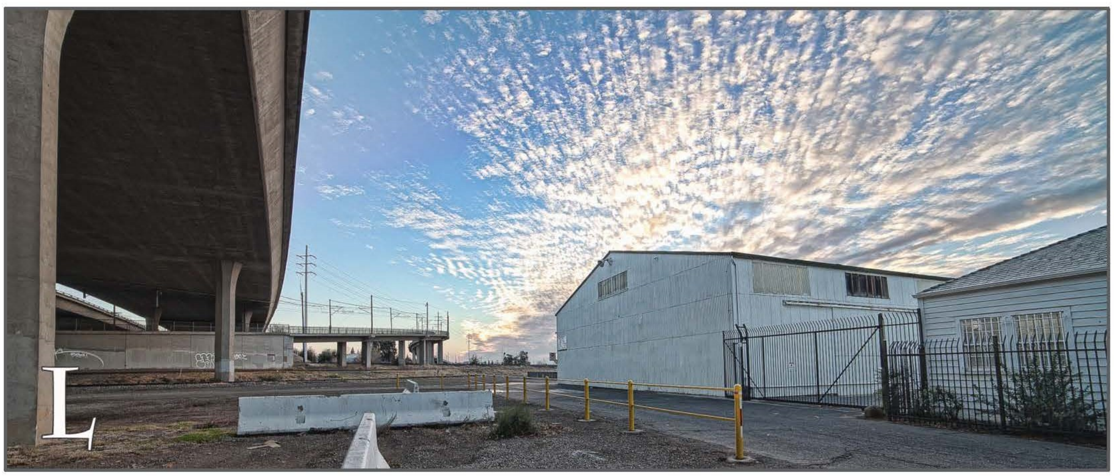

L

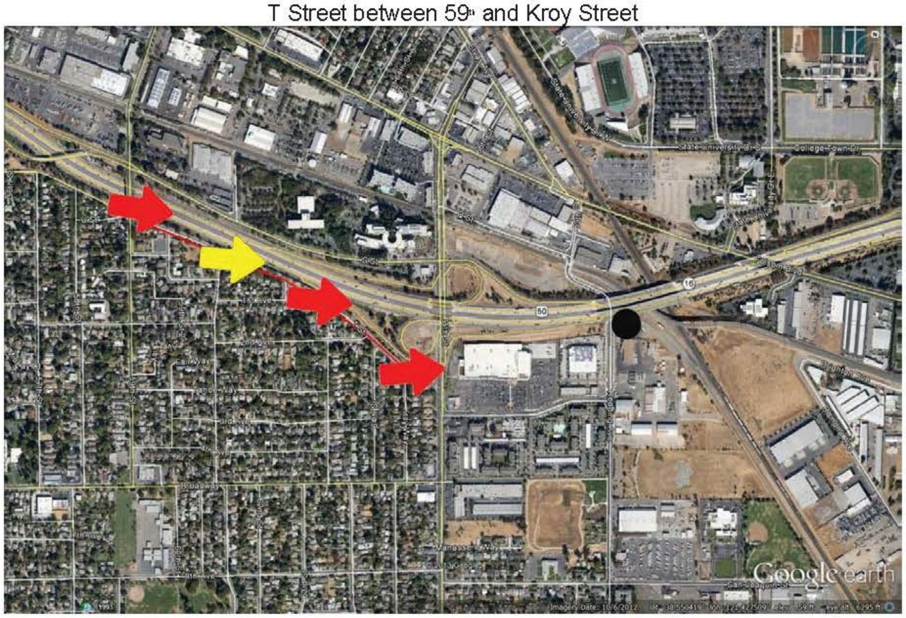
McDaniel Letter Impact Area
SUMMARY MAP

Area Analyzed In Order of Letter

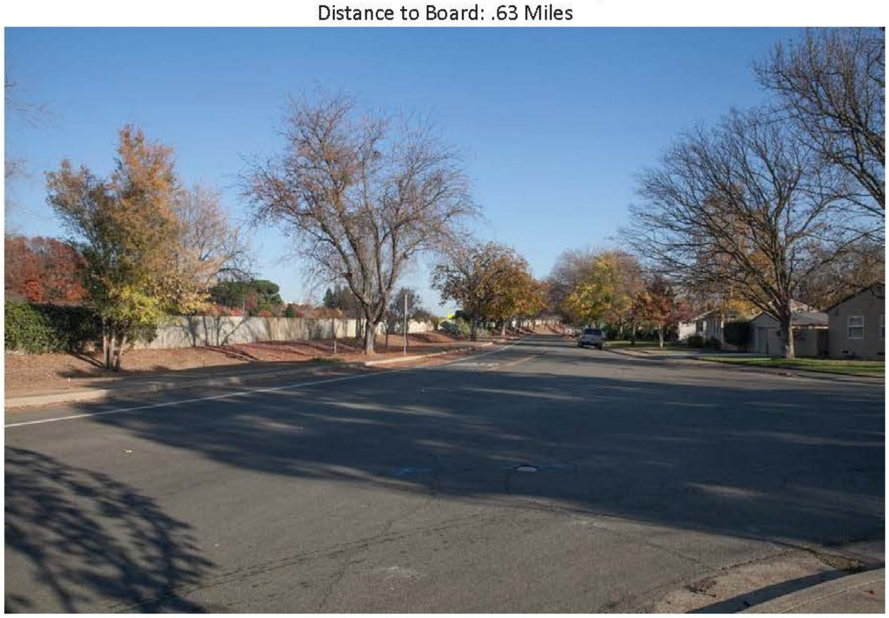
- T Street between 59th and Kroy Street,
- Broadway between 64th Street and 65th street,
- all of 4th Avenue,
- all of San Joaquin Avenue,
- 65th Street between Broadway and Folsom,
- Redding Street from Highway 50 to San Joaquin,
- Maita Circle, The Element apartments, and proposed Campus Crest apartments.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

T Street between 59th and Kroy Street



Possible Partial View 61st & T View Impact
Distance to Board: .63 Miles

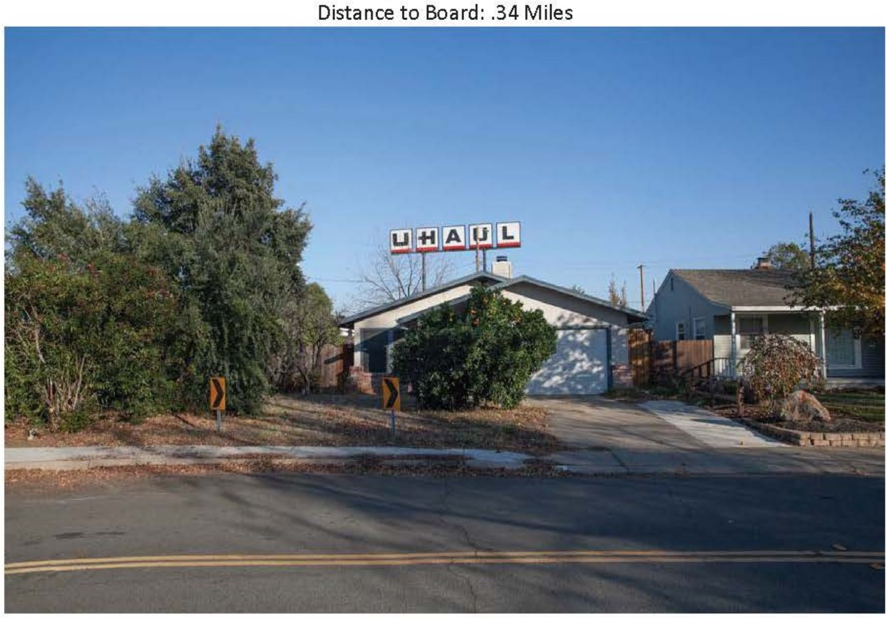


IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

No Impact, 62nd & T st.
Distance to Board: .52 Miles

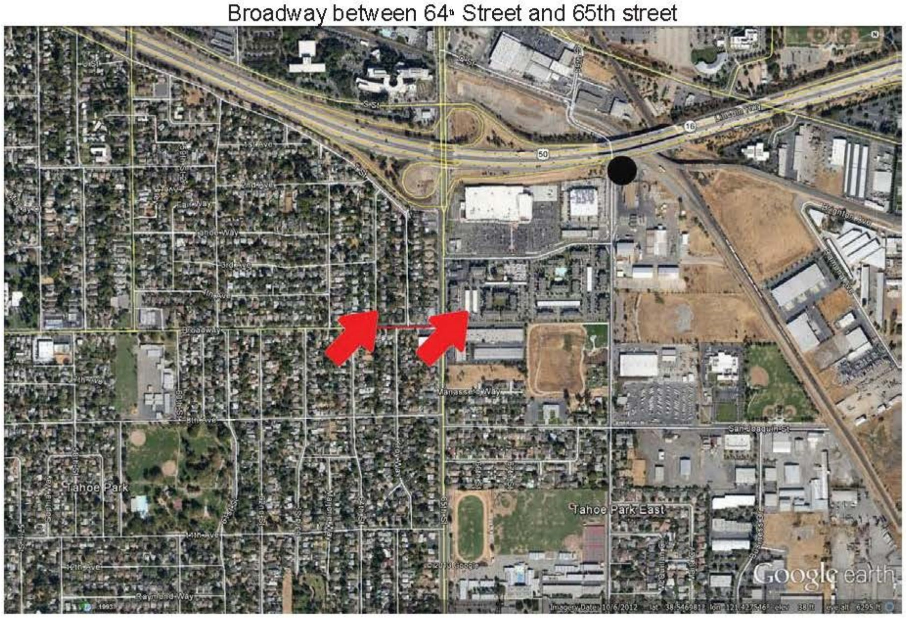
No Impact, T st. and Kroy
Distance to Board: .34 Miles



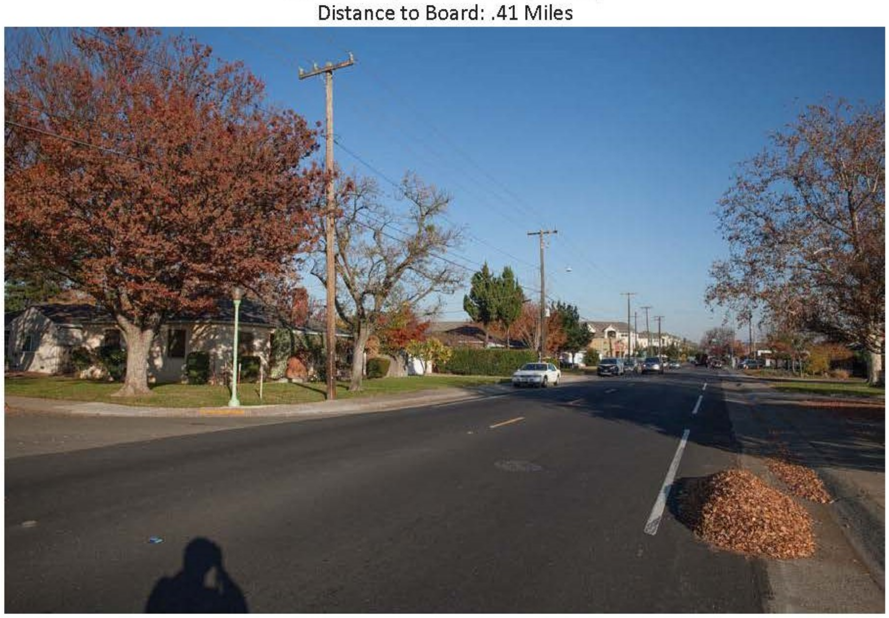
IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

Broadway between 64th Street and 65th street



No View Impact, Broadway at Kroy
Distance to Board: .41 Miles



IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

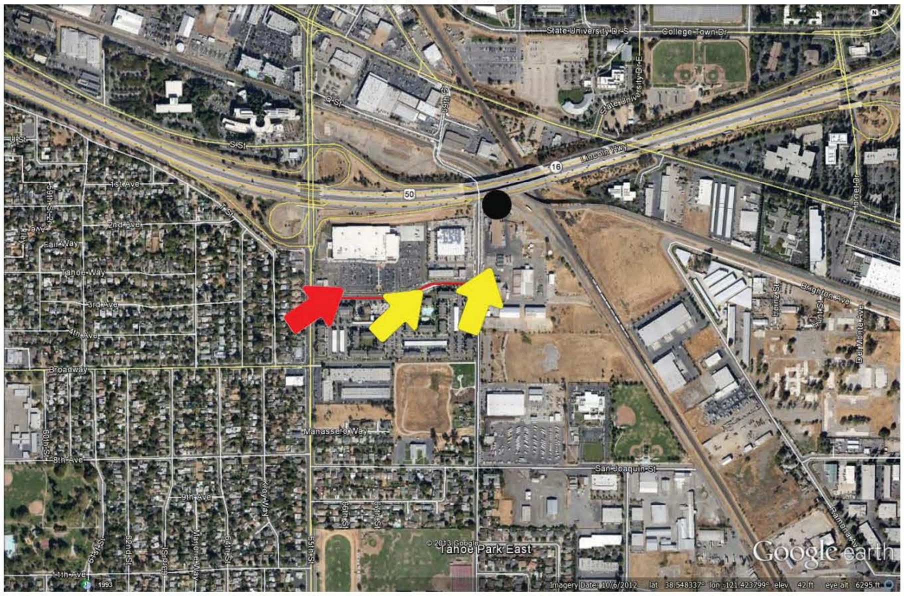
Response to Patrick McDaniel Letter, November 24, 2013; View Impact

No View Impact, Broadway at Kroy
Distance to Board: .37 Miles

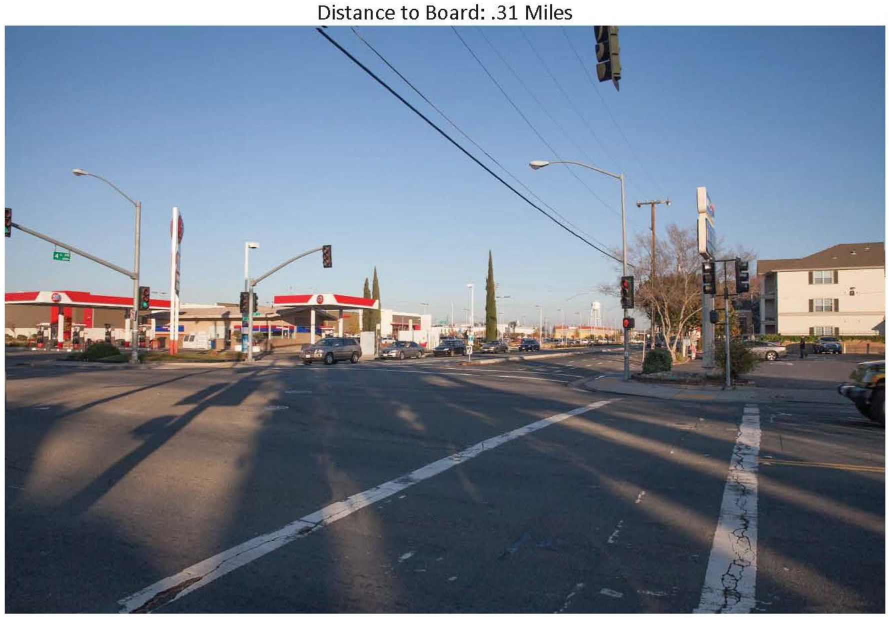
IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

All of 4th Avenue



No View Impact, behind Target
Distance to Board: .31 Miles



IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

Partial View Back of Board; In front of The Elements Apartments
Distance to Board: .25 Miles

Back of Board View Impact, 4^{th} Ave. & Redding Ave.
Distance to Board: .25 Miles

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

All of San Joaquin Ave

No View Impact, Too Many Obstructions
Distance to Board: .5 Miles

IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

Possible Partial View Back of Board; In front of Church of Christ Central
Distance to Board: .43 Miles

Back of Board View Impact, San Joaquin & Redding Ave.
Distance to Board: .40 Miles

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

65th Street Between Folsom and Broadway

No View Impact, 65th at Folsom

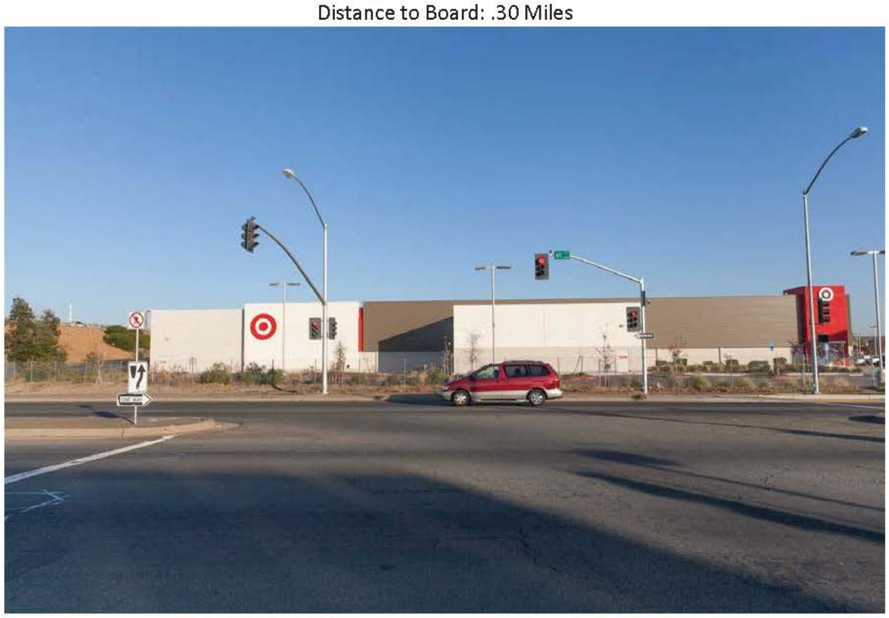
Distance to Board: .39 Miles

IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

View of Billboard Face Impact, 65th at Folsom
Distance to Board: .31 Miles

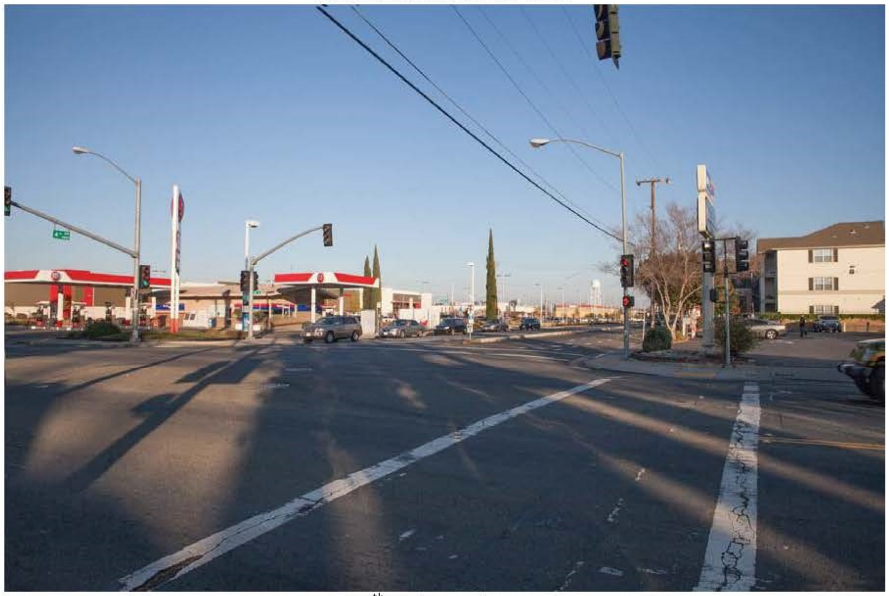
No View Impact, 65th at Hwy Off-Ramp
Distance to Board: .30 Miles



IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

No Impact, 65th and 4th Ave., View Impact
Distance to Board: .32 Miles



No Impact, 65th and Broadway, View Impact
Distance to Board: .38 Miles

IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

Redding Avenue Between Hwy 50 and San Joaquin

Solid View of Billboard, Redding Avenue
Distance to Board: 200 Feet

IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

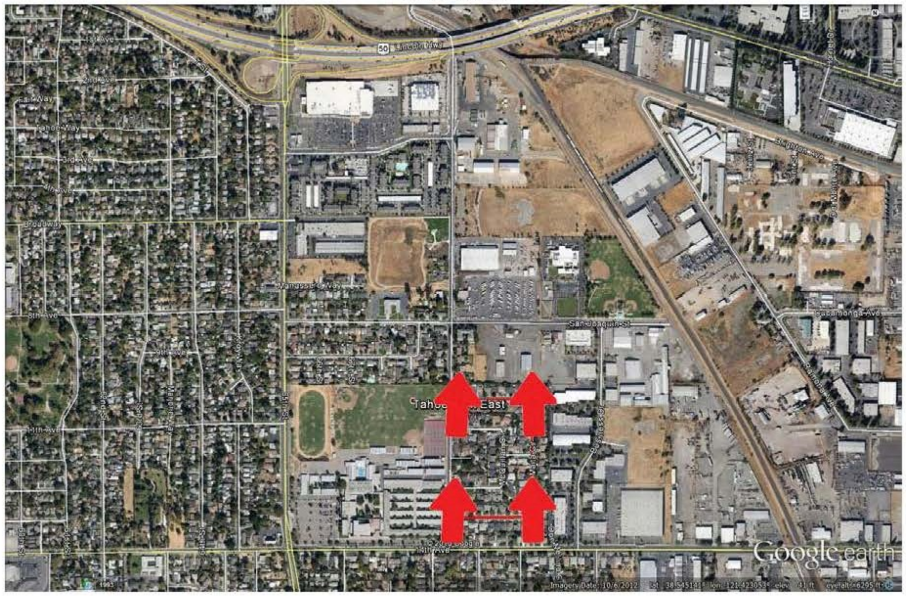
Partial View Impact, Redding Ave at Mae Fong Park
Distance to Board: .30 Miles

Partial View Impact, Redding Ave at San Joaquin
Distance to Board: .40 Miles

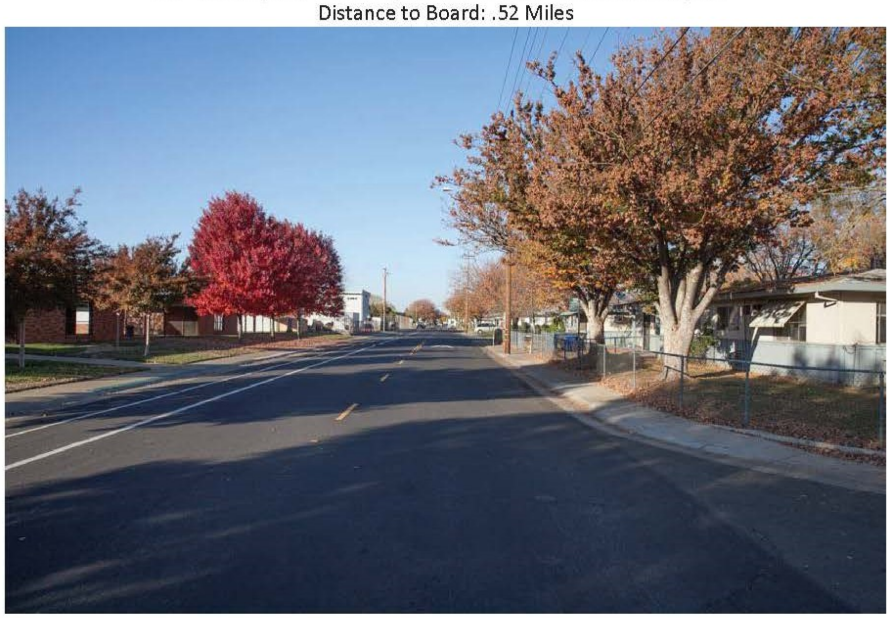
IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

Maita Circle



No View Impact, Too Many Obstructions, Maita at Redding Ave.
Distance to Board: .52 Miles



IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

No View Impact, Too Many Obstructions, Maita Circle
Distance to Board: .53 Miles

No View Impact, Too Many Obstructions, Maita Circle
Distance to Board: .71 Miles

Response to Patrick McDaniel Letter, November 24, 2013; View Impact

No View Impact, Too Many Obstructions, Maita Circle at Redding Ave.
Distance to Board: .70 Miles

IRON POINT MEDIA - Sign Relocation for 2601 Redding Ave.

JACKSON
PROPERTIES, INC.
REAL PROPERTY DEVELOPMENT · GENERAL CONSTRUCTION

January 14, 2014

Chair Kiyomi Burchill
Planning and Design Commission
City of Sacramento
900 I Street
Sacramento, CA 95814

RE: Support for Project No. 13-059; Redding Avenue Billboard Relocation

Dear Chair Burchill:

I would like to convey to you my support for the development of the proposed billboard at the Dorris Lumber property on Redding Avenue.

My company has owned the 4.35 acre at 1817 65th Street for almost 10 years. We consider it to be a prime location for the future development of 65th street. Currently we are in the process of working with City of Sacramento Staff on a proposal that will lead to the development of the property.

We believe that the billboard will not present a challenge to either the development of the property or the operation of the property. As a matter of fact, depending on the use of the property the billboard may even be an asset that will help with the operation of the eventual user.

Your support for this project's proposal is much appreciated.

Sincerely,

John M. Jackson, Jr.
President/Owner

5665 POWER INN ROAD, SUITE 140 SACRAMENTO, CALIFORNIA 95824 TEL 916/381-8113 FAX 916/381-3153
CALIFORNIA LICENSE #365437

THE DORRIS LUMBER & MOULDING CO.

2601 REDDING AVE., SACRAMENTO, CALIFORNIA 95820
(800) 827-5823 — (916) 452-7531

January 14, 2014

Chair Kiyomi Burchill
Planning and Design Commission
City of Sacramento
900 I street
Sacramento, CA 95814

RE: Expression of Support for the 2601 Redding Avenue Billboard Relocation Proposal (P13-059).

Dear Chair Burchill,

I would like to express my strong support for the proposed billboard relocation to the Dorris Lumber and Moulding Company property on Redding Avenue. Our family business, Dorris Lumber and Moulding Company, has owned and operated at 2601 Redding Avenue for over 70 years. As a matter of fact, our facilities are the largest producer of solid lineal mouldings in the State of California.

A lumber company has a good use for the property and we are proud of our contribution to the community. A lumber company, however, is eventually not going to be the highest and best use for the property. That is why over the years I have personally spent hundreds of hours working with City of Sacramento Long Range Planning Staff on multiple boards and associations in an effort to create a legal framework that will allow for the dense development our property and the neighborhood. These efforts have resulted in the current mixed-use zoning and general plan designation.

Our belief is that the development of a billboard along highway 50 will not adversely impact those development plans. The billboard is an appropriate addition because the current property use is industrial by its very nature. Future development will not be adversely impact because the billboard will be in the buffer zone between the freeway and the new development.

Please rest assured that if we thought the billboard would be a negative impact we would not support it because we have every intention of owning this property for another 70 years.

Thank you for your support of this project.

Sincerely,

Joshua Tyler
CEO

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Driver Visual Behavior in the Presence of Commercial Electronic Variable Message Signs (CEVMS)

March 2011

U.S. Department of Transportation
Federal Highway Administration

FHWA-HEP-11-014

Foreword

The advent of new electronic billboard technologies, in particular the digital Light-Emitting Diode (LED) billboard, has necessitated a reevaluation of current legislation and regulation for controlling outdoor advertising. In this case, one of the concerns is possible driver distraction. In the context of the present report, outdoor advertising signs employing this new advertising technology are referred to as Commercial Electronic Variable Message Signs (CEVMS). They are also commonly referred to as Digital Billboards and Electronic Billboards.

The present report documents the results of a study conducted to investigate the effects of CEVMS used for outdoor advertising on driver visual behavior in a roadway driving environment. The report consists of a brief review of the relevant published literature related to billboards and visual distraction, the rationale for the FHWA research study, the methods by which the study was conducted, and the results of the study, which used an eye tracking system to measure driver glances while driving on roadways in the presence of CEVMS, standard billboards, and other roadside elements. The report should be of interest to highway engineers, traffic engineers, highway safety specialists, the outdoor advertising industry, environmental advocates, Federal policy makers, and State and local regulators of outdoor advertising.

Monique Evans
Director, Office of Safety Research and Development

Nelson Castellanos
Director, Office of Real Estate Services

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16. Abstract
This study was conducted to investigate the effect of CEVMS on driver visual behavior in a roadway driving environment. An instrumented vehicle with an eye-tracking system was used. Roads containing CEVMS, standards billboards, and areas not containing off-premises advertising were selected. Two experiments are reported that were conducted in two separate cities in which the same methodology was employed and differences with respect to such variables as the roadway visual environment were taken into account. The results showed that drivers did look at CEVMS a greater percentage of time than at standard billboards; however, the time spent looking at off-premise advertising was less than 5 percent when the signs were visible to the participants across the two experiments. Long glances at off-premises advertising were not evident. The longest glance at a CEVMS was less than 1.3 seconds and glances greater than 1 second were rare events. The percentage of time that drivers dedicated to the road ahead was not significantly affected by the presence of CEVMS or standard billboards. Rather, the overall clutter and complexity of the visual scene appeared to be the principal driver of glance time away from the road ahead. This was the case regardless of the presence or absence of off-premise advertising. The results suggest that overall visual complexity of the highway environment needs to be taken into account when considering driver glance behavior.

17. Key Words	18. Distribution Statement
Driver visual behavior, visual environment, billboards, eye-tracking system, commercial electronic variable message signs, visual complexity	No restrictions.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of Pages	22. Price
Unclassified	Unclassified	66	N/A

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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I. INTRODUCTION

> *"The primary responsibility of the driver is to operate a motor vehicle safely. The task of driving requires full attention and focus. Drivers should resist engaging in any activity that takes their eyes and attention off the road for more than a couple of seconds. In some circumstances even a second or two can make all the difference in a driver being able to avoid a crash." – US Department of Transportation*

The advent of new electronic billboard technologies, in particular the digital Light-Emitting Diode (LED) billboard, has prompted a reevaluation of regulations for controlling outdoor advertising. For outdoor advertisers, an attractive quality of these LED billboards, which are hereafter referred to as Commercial Electronic Variable Message Signs (CEVMS), is that advertisements can instantly change, and the changes can be controlled from a central office. Of concern is whether CEVMS may attract driver's attention from their primary task in ways that compromise safety. The current FHWA guidance regarding CEVMS is that they not change content more frequently than once every 8 seconds (s);[(1)] however, according to Scenic America, the basis of the safety concern is that the "…distinguishing trait…" of a CEVMS "… is that it can vary while a driver watches it, in a setting in which that variation is likely to attract the drivers' attention away from the roadway."[(2)] This study was conducted to provide the Federal Highway Administration (FHWA) with data to help clarify whether there is an empirical basis for regulating CEVMS differently than other off-premise advertising billboards and, if so, what those differences might entail.

A. BACKGROUND

A recent review of the literature by Molino et al. failed to find convincing empirical evidence that CEVMS, as currently implemented, constitute a safety risk greater than that of conventional vinyl billboards.[(3)] Absence of persuasive evidence indicating a safety risk associated with CEVMS is not the result of a lack of research. A great deal of work has been focused in this area, but the findings of these studies have been mixed.[(3,4)] A summary of the key past findings is presented here, but the reader is referred to Molino et al. for a comprehensive review of studies prior to 2009.[(3)]

Post-Hoc Crash Studies

Post-hoc crash studies review police traffic collision reports or statistical summaries of such reports in an effort to understand the causes of crashes that have taken place in the vicinity of some change to the roadside environment. In the present case, the change of concern is the introduction of CEVMS to the roadside or the replacement of conventional billboards with CEVMS.

The review of the literature conducted by Molino et al. did not show compelling evidence for a distraction effect attributable to CEVMS.[(3)] The authors concluded that all post-hoc crash studies are subject to certain weaknesses, most of which are difficult to overcome. For example, the vast majority of crashes are never reported to police; thus, such studies are likely to underreport crashes. Also, when crashes are caused by factors such as driver distraction or inattention, the involved driver may be unwilling or unable to report these factors to a police investigator. Another weakness is that police, under time pressure, are rarely able to investigate the true root causes of crashes unless they involve serious injury, death, or extensive property damage. Furthermore, to have confidence in the results, such studies need to collect comparable data before and after the change, and, in the after phase, at equivalent but unaffected roadway sections. Also, since crashes are infrequent events, data collection needs to span extended periods of time, both before and after introduction of the change. Few studies are able to obtain such extensive data.

Field Investigations

Field investigations include unobtrusive observation, naturalistic driving studies, on-road instrumented vehicle investigations, test track experiments, driver interviews, surveys, and questionnaires. The following focuses on relevant studies that employed naturalistic driving and on-road instrumented vehicle research methods.

Lee, McElheny, and Gibbons undertook an on-road instrumented vehicle study on Interstate and local roads near Cleveland, OH.[(5)] The study looked at driver glance behavior toward digital billboards, conventional billboards, comparison sites (sites with buildings and other signs, including digital signs), and control sites (those without similar signage). The results showed that there were no differences in the overall glance patterns (percent eyes-on-road and overall number of glances) between event types. Drivers also did not glance more frequently in the direction of digital billboards than in the direction of other event types, but drivers did take longer glances in the direction of digital billboards and comparison sites than in the direction of conventional billboards and baseline sites. However, the mean glance length towards the digital billboards was less than 1 second. It is important to note that this study employed a video-based approach for examining driver's visual behavior, which has an accuracy of no better than 20 degrees.[(6)] Whereas this technique is likely to be effective in assessing the level to which devices inside of the vehicle detract from focusing on the road ahead, they may not have sufficient resolution to discriminate what specific object the driver is looking at outside of the vehicle.

Beijer, Smiley, and Eizenman evaluated driver glances toward four different types of roadside advertising signs on roads in the Toronto, Canada area.[(7)] The four types of signs included: (a) billboard signs with static advertisements; (b) roller bar signs with billboard advertisements placed on vertical rollers that could rotate to show one of three advertisements in succession; (c) scrolling text signs with a minor active component, which usually consisted of a small strip of lights that formed words scrolling across the screen or, in some cases, a larger area capable of displaying text but not video; and (d) signs with video images that had a color screen capable of displaying both moving text and, more importantly, moving images. The study employed an on-road instrumented vehicle with a head-mounted eye-tracking device. They found no significant differences in average glance duration or the maximum glance duration for the various sign types; however, the number of glances was significantly lower for billboard signs than for the roller bar, scrolling text, and video signs.

Smiley, Smahel and Eizenman conducted a field driving study that employed an eye tracking system that recorded driver's eye movements as participants drove past video signs located at three downtown intersections and along an urban expressway.[(8)] The study route included static billboards and video advertising. The authors described the video advertising as presenting a continuous stream of changing images. The results of the study showed that on average 76 percent of glances were to the road ahead. Glances at advertising, including static billboards and video signs, constituted 1.2 percent of total glances. The mean glance durations to advertising signs were between 0.5 s and 0.75 s, although there were a few glances of about 1.4 s in duration. Video signs were not more likely than static commercial signs to be looked at when headways were short; in fact, the reverse was the case. Furthermore, the number of glances per individual video sign was small, and so statistically significant differences in looking behavior were not found.

Kettwich, Kartsen, Klinger, and Lemmer conducted a 2008 field study where drivers' gaze behavior was measured with an eye tracking system.[9] Sixteen participants drove an 11.5 mile (18.5 km) route comprised of highways, arterial roads, main roads, and one-way streets in Karlsruhe, Germany. The route contained advertising pillars, event posters, company logos, and video screens. Mean gaze duration for the four types of advertising was computed while the vehicle was in motion and when it was stopped. Gaze duration while driving for all types of advertisements was under 1 s. On the other hand, while the vehicle was stopped, the mean gaze duration for video screen advertisements was equal to 2.75 s. The study showed a significant difference between gaze duration while driving and while sitting still. The gaze duration was affected by the task at hand; that is, drivers tended to gaze longer while the car was stopped and there were few driving task demands.

Laboratory Studies

Laboratory investigations related to roadway safety can be classified into several categories: driving simulations, non-driving-simulator laboratory testing, and focus groups. The review by Molino et al. of relevant laboratory studies did not show conclusive evidence regarding the distracting effects of CEVMS. Moreover, the authors concluded that in the case of CEVMS, present driving simulators do not have sufficient visual dynamic range, image resolution, and contrast ratio capability to produce the compelling visual effect of a bright, photo-realistic LED-based CEVMS on a natural background scene. The following is a discussion of a driving simulator study conducted after the publication of Molino et al. This recent study focused on the effects of advertising on driver visual behavior.

Recently, Chattington, Reed, Basacik, Flint, and Parkes conducted a driving simulator study in the United Kingdom to evaluate the effects of static and video advertising on driver glance behavior. [10] The researchers examined the effects of advertisement position relative to the road (left, right, center on an overhead gantry, and in all three locations), type of advertisement (static or video), and exposure duration of the advertisement (the paper does not provide these durations in terms of time or distance). For the advertisements presented on the left side of the road (comparable to our right side of the road), mean glance durations for static and video advertisements were significantly longer (approximately 0.65 to 0.75 s) when drivers experienced long advertisement exposure as opposed to medium and short exposures. Drivers looked more at video advertisements (about 2 percent on average) than at static advertisements (about 0.75 percent on average). They also spent more time looking at both types of advertisements under the long and medium exposure durations. In addition, the location of the advertisements had an effect on glance behavior. When advertisements were located in the center of the road or in all three positions simultaneously, the glance duration was about 1 s and was significantly longer than for signs placed on the right or left side of the road. For advertisements placed on the left side of the road, there was a significant difference in glance duration between static (about 0.40 sec) and video (about 0.80 sec). Advertisement position also had an effect on the proportion of time that a driver spent looking at an advertisement. The percentage of time looking at advertisements was greatest when signs were placed in all three locations, followed by center location signs, then the left location signs, and finally the right location signs. Drivers looked more at the video advertisements relative to the static advertisements when they were placed in all three locations, placed on the left, and placed on the right side of the road. The center placement did not show a significant difference in percent of time looking between static and video.

Summary

The results from these key studies offered some insight into whether CEVMS pose a visual distraction threat, but they also revealed some inconsistent findings and potential methodological issues that were addressed in the current study. The studies conducted by Smiley et al. showed drivers glanced forward at the roadway about 76 percent of the time in the presence of video and dynamic signs. A few long glances of approximately 1.4 sec were observed, and this bears further investigation. However, the video and dynamic signs used in these studies present moving objects that are not evident in CEVMS as deployed in the US. In another field study employing eye tracking, Kettwich et al. found that gaze duration while driving for all types of advertisements that they evaluated was less than 1 s; however, when the vehicle was stopped, mean gaze duration for advertising was as high as 2.75 s. [9] Collectively, these studies did not demonstrate that the advertising signs detracted from driver's glances forward at the roadway or at traffic control devices.

In contrast, the simulator study by Chattington et al. demonstrated that dynamic signs showing moving video or other dynamic elements may draw attention away from the roadway. Furthermore, the location of the advertising sign on the road is an important factor in drawing drivers' visual attention. Advertisements with moving video placed in the center of the roadway on an overhead gantry or in all three positions (right, left, and in the center) simultaneously are very likely to draw glances from drivers.

Finally, in a study that examined CEVMS as deployed in the United States, Lee et al. did not show any effect of CEVMS on driver glance behavior. However, the methodology that was employed probably did not employ sufficient sensitivity to determine what specific object in the environment a driver was looking at.

None of these studies combined all necessary factors to address the current CEVMS situation in the United States. Those studies that used eye-tracking on real roads had animated and video-based signs, which are not reflective of current CEVMS practice in the United States.

B. STUDY APPROACH

Based on an extensive review of the literature, Molino et al. concluded that the most effective method to use in an evaluation of the effects of CEVMS on driver behavior was the instrumented field vehicle method that incorporated an eye tracking system.[3] The present study employed such an instrumented field vehicle with an eye tracking system and examined the degree to which CEVMS attract drivers' attention away from the forward roadway.

Land's review of eye movements in dynamic environments concluded that the eyes are proactive and typically seek out information required in the second before each activity commences.[11] Specific tasks (e.g., driving) have characteristic but flexible patterns of eye movement that accompany them, and these patterns are similar between individuals. Land concluded that the eyes rarely visit objects that are irrelevant to the task, and the conspicuity of objects is less important than objects' role in the task. Using devices in a vehicle such as a cell phone for texting are very likely to result in eye movement patterns that are incompatible with safe driving. However, for external stimuli, especially those near the roadway, the evaluation of eye glances with respect to safety is less clear. As part of the driving task one examines mirrors, the gauge cluster, side of the road, and so on. Research by Klauer et al. indicated that short, brief glances away from the forward roadway for the purpose of scanning the driving environment are safe and actually decrease near-crash/crash risk.[12] Klauer et al. also concluded that glances away from the roadway for any purpose lasting more than 2 seconds increase near-crash/crash risk by at least two times that of normal, baseline driving.

Technology for measuring a driver's direction of gaze to reasonably high levels of accuracy has existed since at least the 1960s.[13] Eye tracking systems used in on-road driving studies use light reflected off the cornea to compute the direction of gaze. These systems then overlay the direction of gaze on film or video of the forward roadway that is recorded at the same time as gaze data. Early systems used head-mounted sensors, but in recent years systems have been developed that utilize dashboard-mounted sensors. In addition, newer technology exists that can accurately measure gaze behavior in the presence of sun light, which has been an issue with many eye tracking systems.

The present study evaluated the effects of CEVMS on driver distraction under actual roadway conditions both in the day time and at night. Roads containing CEVMS, standards billboards, and areas not containing off-premise advertising were selected. The CEVMS and standard billboards were measured with respect to luminance, location, size, and other relevant variables to characterize these visual stimuli extensively. Unlike the previous studies, the present study examined CEVMS as deployed in two US cities that did not contain dynamic video or other dynamic elements. In addition, the eye tracking system that was employed had about a 2 degree level of resolution, which provided significantly more accuracy in determining what objects the drivers were looking at than the study by Lee et al.

Two studies are reported that were conducted in two separate cities employing the same methodology but taking into account differences with respect to such variables as the roadway visual environment. The study's primary research questions were:

- Do drivers look at CEVMS more than at standard billboards?
- Are there long glances at CEVMS that would be indicative of a decrease in safety?
- Do drivers look at CEVMS and standard billboards at the expense of looking at the road ahead?

II. EXPERIMENTAL APPROACH

The study used a field research vehicle (FRV) equipped with an eye-tracking system. The FRV was a 2007 Jeep® Grand Cherokee Sport Utility Vehicle (SUV). The eye-tracking system used (Smart Eye vehicle-mounted infra-red (IR) eye-movement measuring system) is shown in figure 1. The system consists of two IR light sources and three face cameras mounted on the dashboard of the vehicle. The cameras and light sources are small in size, and are not attached to the driver in any manner. The face cameras are synchronized to the IR light sources and are used to determine the head position and gaze of the driver.

Figure 1. Smart Eye Face Camera Placement.

As a part of this eye tracking system, the FRV was outfitted with a three-camera panoramic scene monitoring system for capturing the forward driving scene. The scene cameras are mounted on the roof of the vehicle directly above the driver's head position. The three cameras together provide an 80 degree wide by 40 degree high field of forward view. The scene cameras captured the forward view area available to the driver through the left side of the windshield and a portion of the right side of the windshield. The area visible to the driver through the rightmost area of the windshield was not captured by the scene cameras.

The FRV was also outfitted with equipment to record GPS position, vehicle speed, and vehicle acceleration. The vehicle was also equipped to record events entered by an experimenter. The FRV is pictured in figure 2.

Figure 2. FHWA's Field Research Vehicle.

A. EXPERIMENTAL DESIGN OVERVIEW

The approach entailed the use of the instrumented vehicle in which drivers navigated routes in cities that presented CEVMS and standard billboards in areas of varying visual complexity. The drivers were instructed to drive the routes as they would normally drive paying attention to other traffic, speed limits, and other elements in the roadway. The drivers were not informed that the study was about outdoor advertising but rather it was about examining drivers' glance behavior as they followed route guidance directions.

Site Selection

More than 40 cities were evaluated in the selection of the test sites. Locations with CEVMS displays were identified using a variety of resources that included State DOT contacts, advertising company websites, and Google Earth™. A matrix was developed that listed the number of CEVMS in each city. For each site, the number of CEVMS along limited access and arterial roadways was determined.

One criterion for site selection was whether the location had practical routes that could be driven in about 30 minutes and pass by a number of CEVMS as well as standard (vinyl) off-premise billboards. Other considerations included access to vehicle maintenance personnel/facilities, proximity to research facilities, and ease of participant recruitment. Two cities were selected: Reading, PA, and Richmond, VA.

Table 1 presents the 16 cities that were included on the final list of potential study sites.

Table 1. Distribution of CEVMS by Roadway Classification for Various Cities.

State	*Area*	*Limited Access*	*Arterial*	*Other [(1)]*	*Total*
VA	Richmond	4	7	0	11
PA	Reading	7	11	0	18
VA	Roanoke	0	11	0	11
PA	Pittsburgh	0	0	15	15
TX	San Antonio	7	2	6	15
WI	Milwaukee	14	2	0	16
AZ	Phoenix	10	6	0	16
MN	St. Paul/Minneapolis	8	5	3	16
TN	Nashville	7	10	0	17
FL	Tampa-St. Petersburg	7	11	0	18
NM	Albuquerque	0	19	1	20
PA	Scranton-Wilkes Barre	7	14	1	22
OH	Columbus	1	22	0	23
GA	Atlanta	13	11	0	24
IL	Chicago	22	2	1	25
CA	LA	3	71	4	78

(1) Other includes roadways classified as both limited access and arterial or instances where the road classification was unknown. *Source:* www.lamar.com and www.clearchannel.com

In both test cities, the following independent variables were evaluated:

- **The type of advertising.** This included CEVMS, standard billboards, or no off-premises advertising. (It should be noted that in areas with no off-premises advertising, it was still possible to encounter on-premise advertising; e.g., gas stations, restaurants, other miscellaneous stores and shops.)
- **Time of day.** This included both driving in the day time and night time.
- **The complexity of the visual scene in data collection zones.** This was classified in terms of visual complexity or clutter. This variable was handled differently in the two cities and is further discussed in subsequent sections. The results presented in this report are tied to the specific implementations of advertising that were present. The fact that the two cities contained CEVMS but differed in other respects is advantageous when attempting to extrapolate the results to other settings.

Photometric Measurement of Signs

Two primary metrics are used to describe the photometric characteristics of the target CEVMS and standard billboards: luminance (cd/m^2) and contrast (Weber contrast ratio). This part of the procedure serves to characterize the billboards that were evaluated in the study. Also if data are collected at other sites, the luminance and contract measures reported here can be used to determine the degree to which the current results may relate to another site with CEVMS and standard billboards.

Photometric Equipment

Luminance was measured with a Radiant Imaging ProMetric 1600 Charge-Coupled Device (CCD) photometer with both a 50 mm and a 300 mm lens. The CCD photometer provided a method of capturing the luminance of an entire scene at one time.

The photometric sensors were mounted in an SUV of similar size to the FRV. Figure 3 shows the set up for taking photometric measurements. The photometer was located in the experimental vehicle as close to the driver's position as possible and was connected to a laptop computer on the center console that stored data as the images were acquired.

Figure 3. CCD Photometer and Laptop Setup in Vehicle

Measurement Methodology

Luminance measurements were taken at each target billboard location. Images of the billboards were acquired using the Radiant Imaging ProMetric software installed on the laptop. An example of the software's interface is shown in Figure 4. Using the software provided with the system, the mean luminance of each billboard message was measured. In order to prevent overexposure of images in daylight, neutral density filters were manually affixed to the photometer lens and the luminance values were scaled appropriately. Standard billboards were typically measured only once; however, for CEVMS multiple measures were taken because the luminance can vary with advertising content.

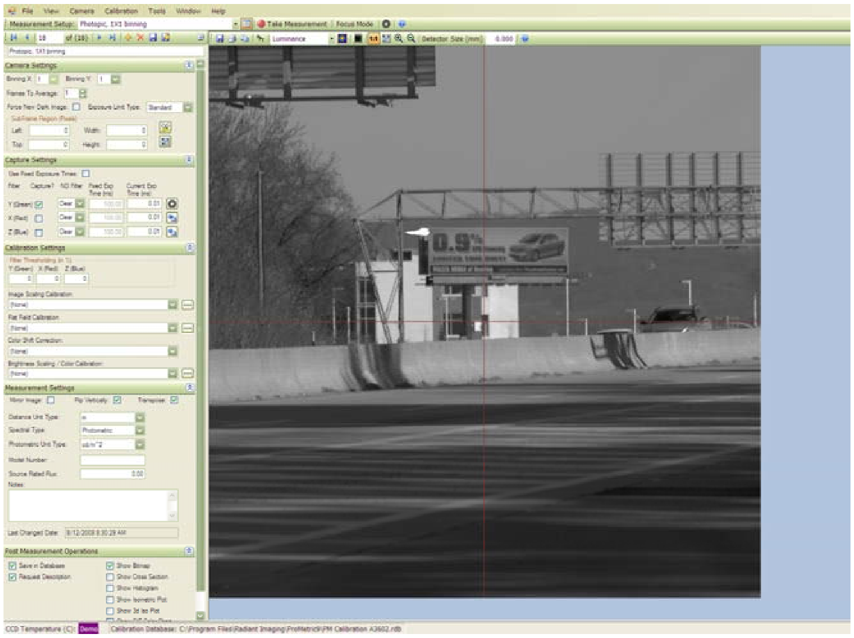

Figure 4. ProMetric Software Interface.

Photometric measurements were taken during day (between 8:15AM and 4:45PM) and at night (after 6:00PM). Measurements were taken by centering the billboard in the photometer's field of view with approximately the equivalent of the width of the billboard on each side and the equivalent of the billboard height above and below the sign. This was done to ensure adequate background luminance data in each image. The selected background region data was used in billboard contrast calculations. Figure 5 shows a target billboard and two adjacent areas (outlined in red) that were used to calculate the contrast ratio.

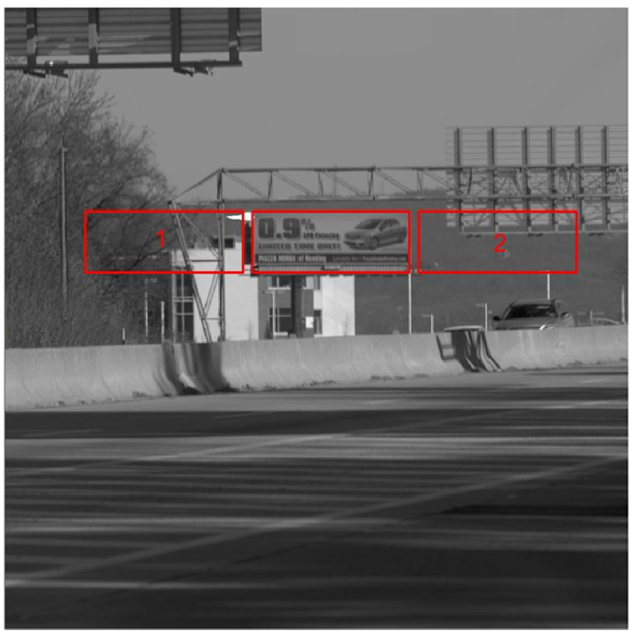

Figure 5. Regions of Background for Contrast Ratio Analysis.

Measurements of the standard billboards were taken at a mean distance of 284 ft (ranging from 570 ft to 43 ft). The mean measurement distance for measurements of the CEVMS was 479 ft (ranging from 972 ft and 220 ft). To include the background regions of appropriate size, the close measurement distances required the use of the 50 mm lens while measurements made further from the signs required the 300 mm lens.

The Weber Contrast Ratio was used because it characterizes a billboard as having negative or positive contrast when compared to its background area. [14] Figure 6 shows differences in background behind a billboard. A negative contrast indicates the background areas have a higher mean luminance than the target billboard. A positive contrast indicates the target billboard has a higher mean luminance than the background. Overall, the absolute value of a contrast ratio simply indicates a difference in luminance between an item and its background.

High Contrast | Low Contrast

Figure 6. Contrast Background Differences.

Visual Complexity

Regan, Young, Lee and Gordon presented a taxonomic description of the various sources of driver distraction.[15] Potential sources of distraction were discussed in terms of: things brought into the vehicle; vehicle systems; vehicle occupants; moving objects or animals in the vehicle; internalized activity; and external objects, events, or activities. The external objects may include buildings, constructions zones, billboards, road signs, vehicles, and so on. A taxonomy suggested by Horberry and Edquist focuses on visual information outside of the vehicle. This suggested taxonomy includes four groupings of visual information: built roadway, situational entities, natural environment, and built environment.[16] These taxonomies provide an organizational structure for conducting research; however, they do not currently provide a systematic or quantitative manner with which to classify the level of clutter or visual complexity present in a visual scene. The methods proposed by Rozenholtz, Li, and Nakano do provide quantitative and perhaps reliable measures of visual clutter.[17] This approach measures the entropy or variance in a visual image.

The data collection zones were scaled in terms of overall visual complexity (i.e., clutter). Subband entropy was used as a measure of visual clutter in photographs taken in each data collection zone. [17] The calculation of subband entropy is based on the assumption that the more organized a scene is, the less clutter it contains. Using this assumption, subband entropy calculates the organization or predictability of a scene (e.g., color, shape, size, and alignment of items). Presumably, less cluttered images can be visually coded more efficiently than cluttered images. For example, visual clutter can cause decreased recognition performance and greater difficulty in performing visual search. For each data collection zone a single frame was captured from a color video and saved as a JPEG. The JPEGs were analyzed with MATLAB® routines that computed a measure of subband entropy for each image.

III. EXPERIMENT 1

The first on-road experiment was conducted in Reading, PA. The overall objectives of the study were to determine: (a) if drivers looked more at CEVMS than at standard billboards, (b) if there were long glances to off-premise billboards, and (c) if there is a tradeoff between looking at off-premise billboards and the road ahead. To address these objectives, the experiment examined the type of advertising (CEVMS, standard billboard, or no off-premise advertising) and time of day (day or night) as independent variables. Eye tracking was used to assess where participants looked and for how long while driving. The luminance and contrast of the advertising signs were measured to account for any photometric contributions to the results.

Participants drove two test routes (referred to as Route A and B) in Reading. Each route required 25 to 30 minutes to complete and included both freeway and arterial segments. Route A was 13 miles long and contained 12 data collection zones. Route B was 16 miles long and contained 8 data collection zones, for a total of 20 data collection zones. Although the data collection zones were selected because they included a specific type of advertising, some zones encompassed other off-premises and on-premises advertising. For example, one zone contained 2 CEVMS, and 10 standard billboards as well as commercial buildings and parking lots. This type of data collection zone was kept for analysis but classified as a separate category of visual complexity (referred to as CEVMS complex), a factor that was handled more fully in experiment 2. Scene visual complexity was quantified to ensure that the classification of these more visually complex CEVMS conditions was justified.

Other data collection zones were comprised of the single target billboard and no other forms of off-premise advertising. Each route also included two data collection zones that did not contain off-premise billboards; one contained minimal manmade structures (natural environment) and the other was comprised mostly of buildings and other manmade structures (built environment). Table 2 presents an inventory of target billboards in Reading and their relevant parameters.

Table 2. Inventory of Target Billboards in Reading with Relevant Parameters.

Advertising Type	*Copy Dimensions (ft)*	*Change Rate (sec)* (1)	*Side of Road*	*Setback from Road (ft)*	*Data Collection Zone Length (ft)*	*Other Standard Billboards*
CEVMS	10.5x 22.75	6	L	35	960	2
CEVMS	10.5 x 22.75	10	R	47	960	3
CEVMS	14 x 48	10	L	188	960	2
CEVMS	14 x 48	10	R	142	960	2
CEVMS	10.5 x 22.75	8	L	92	960	3
CEVMS	10.5 x 22.75	8	R	54	960	0
CEVMS	10.5 x 22.75	10	R	128	960	2
CEVMS	14 x 48	10	L	188	960	2
CEVMS	14 x 48	10	R	142	960	2
CEVMS Complex	10.5 x 36	10	R	36	960	10
CEVMS Complex	14 x 48	8	R	22	1860	10
Standard	10.5 x 36	—	L	71	960	1
Standard	14 x 48	—	L	50	682	0
Standard	14 x 48	—	L	97	960	1
Standard	21 x 22.75	—	R	34	547	2
Standard	10.5 x 45.25	—	L	79	960	2

(1) Change rate is only calculated for CEVMS. The indicated value is the number of seconds each advertisement copy is on display. For Copy Dimensions, Setback from Road, and Data Collection Zone Length values: 1 ft = 0.305 m. *Source:* www.lamar.com and satellite imagery.

A. METHOD

Advertising Type

The type of advertising present in data collection zones was examined as an independent variable. Data collection zones fell into one of the following categories, which are listed in the third column of table 2:

- **CEVMS**. These were data collection zones that contained one target CEVMS with a relatively low level of scene complexity. Figure 7 shows an example of a CEVMS data collection zone with the CEVMS located in the center of the image.
    - **CEVMS complex**. This was an area that contained two CEVMS displays (about 800 feet or 243.84 m apart), 10 non-target standard billboards, and other built environment (e.g., buildings, parking lots). Figure 8 shows a picture of a portion of this data collection zone. The two CEVMS are highlighted with red rectangles in the figure.
- **Standard billboard**. These were data collection zones that contained one target standard billboard. Figure 9 is an example of a standard billboard data collection zone; the standard billboard is located in the top left corner.

- **No off-premise advertising conditions**. These data collection zones contained no off-premise advertising and were divided into the following categories:
  - **Natural environment**. These were data collection zones without off-premise advertising and principally contained trees. Figure 10 is an example of this type of data collection zone.
  - **Built environment**. These were data collection zones that contained buildings, businesses, parking areas, and other areas of built environment but not off-premise billboard advertising. Figure 11 is an example of this type of data collection zone.

Figure 7. Data Collection Zone with a Target CEVMS.

Figure 8. Visually Complex Data Collection Area with 2 CEVMS and 10 Non-Target Standard Billboards.

Figure 9. Data Collection Zone with a Target Standard Billboard.

Figure 10. Data Collection Zone with Natural Environment.

Figure 11. Data Collection Zone with Built Environment.

Photometric Measurements

Luminance: The mean daytime luminance of both the standard billboards and CEVMS was greater than at night. Nighttime luminance measurements reflect the fact that CEVMS use illuminating LED components while standard billboards are often illuminated from beneath by Metal Halide lamps. At night, CEVMS have a greater average luminance than standard billboards. Table 3 presents summary statistics for luminance as a function of time of day for the CEVMS and standard billboards.

Contrast: The daytime and nighttime Weber contrast ratios for both types of billboards are shown in table 3. Both CEVMS and standard billboards had contrast ratios that were close to zero (the surroundings were about equal in brightness to the signs) during the daytime. On the other hand, at night the CEVMS and standard billboards had positive contrast ratios.

Table 3. Summary of Luminance (cd/m^2) and Contrast (Weber ratio) Measurements in Reading.

	Luminance (cd/m^2)			Contrast		
Day	*Min*	*Max*	*Mean*	*Min*	*Max*	*Mean*
CEVMS Complex	1,109	1,690	1,400	-0.59	-0.40	-0.50
CEVMS	1,544	4,774	2,631	-0.71	0.37	-0.19
Standard Billboard	291	6,752	2,277	-0.81	1.15	-0.13
Night						
CEVMS Complex	56	139	97	53	81	67
CEVMS	34	76	52	6	179	81
Standard Billboard	6	45	17	12	69	29

The mean contrast ratios of CEVMS complex and CEVMS were each greater than the mean contrast ratio of standard billboards. This is the result of greater mean luminance values of the two categories of CEVMS at night when compared to standard billboards.

Visual Complexity

Recall that the data collection zones were also scaled in terms of their overall visual complexity or clutter. Figure 12 shows the mean subband entropy measures for each of the data collection zone environments (note that due to the limited number of data collection zones, standard error information is not included). In addition, high (Times Square) and low (a desert road) clutter scenes are provided for comparison. The built environment and the CEVMS Complex data collection zones showed the greatest subband entropy values, followed by the natural environment and standard billboard zones. Finally, the CEVMS zone resulted in the lowest mean subband entropy value.

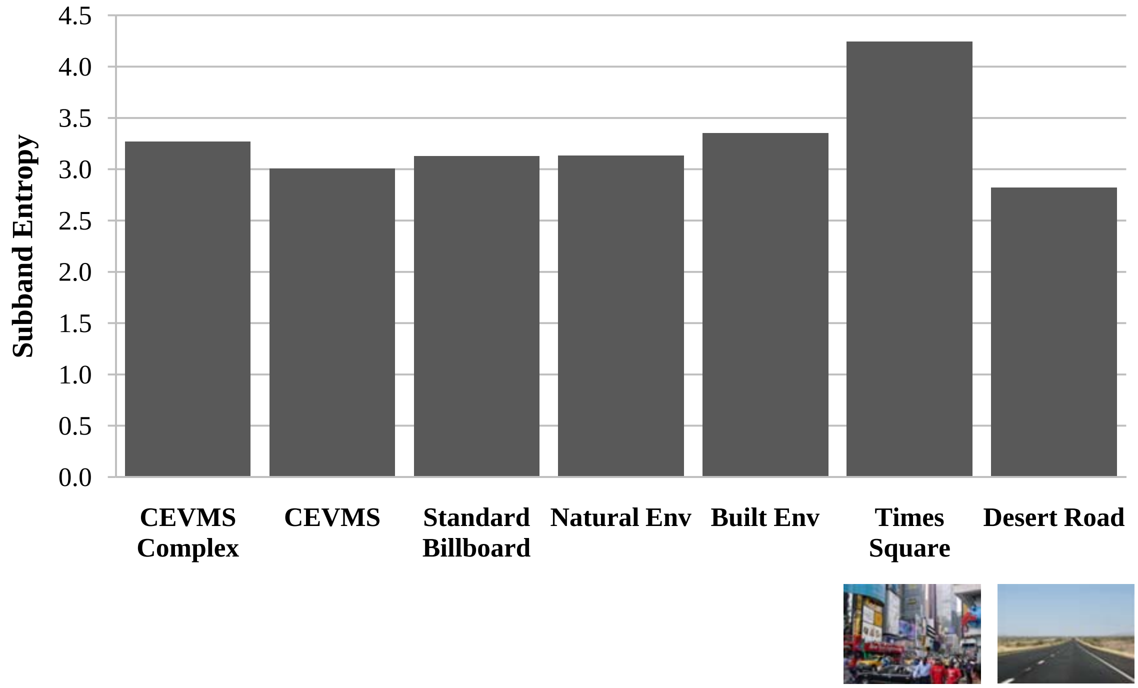

Figure 12. Mean Subband Entropy Measures for Each of the Data Collection Zone Types.

Participants

Participants were recruited at public libraries in the Reading, PA area. A table was set up so that recruiters could discuss the requirements of the experiment with candidates. Individuals who expressed interest in participating were asked to complete a pre-screening form, a record of informed consent, and a department of motor vehicles form consenting to release of their driving record.

All participants were between 18 and 64 years of age and held a valid driver's license. The driving record for each volunteer was evaluated to eliminate drivers with excessive violations. The criteria for excluding drivers were as follows: (a) more than one violation in the preceding year; (b) more than three recorded violations; and (c) any driving while intoxicated violation.

Forty-three individuals were recruited to participate. Of these, five did not complete the drive because the eye tracker could not be calibrated to accurately track eye movements. Data from an additional seven participants was excluded as the result of equipment failures (e.g., loose camera). In the end, usable data was collected from 31 participants (12 males, M = 46 years; 19 female, M = 47 years) 14 participated at night and 17 participated during the day. All participants were under the age of 64.

Procedures

Data were collected from two participants per day (beginning at approximately 12:45 PM and 7:00 PM). Data collection began on September 18, 2009, and was completed on October 26, 2009.

Pre-Data Collection Activities. Participants were greeted by two researchers and asked to complete a fitness to drive questionnaire. This questionnaire focused on drivers' self-reports of alertness and use of substances that might impair driving (e.g., alcohol). It was expected that if a participant did not appear to be fit to drive upon meeting then he or she would be disqualified from the study; however, no participants presented themselves in such a manner.

Next, the participant and both researchers moved to the eye-tracking calibration location in the test vehicle. If it was not possible to calibrate the eye tracking system, the participant was dismissed and paid for his or her time. Causes of calibration failure included reflections from eye glasses, participant height (which put their eyes outside the range of the system), and participants' eye lids obscuring a portion of the pupil (preventing a focus on the whole pupil).

Practice. After eye-tracker calibration, a short practice drive was made. Participants were shown a map of the route and written turn-by-turn directions prior to beginning the practice drive. Throughout the drive, verbal directions were provided by a GPS device.

During the practice drive, a researcher in the rear seat of the vehicle monitored the accuracy of eye-tracking. If the system was tracking poorly, additional calibration was performed. If the calibration could not be improved, the participant did not participate in the data collection drive. Instead participants were thanked (and paid) for their time and were dismissed.

Data Collection. Similar to the practice drive, participants were shown a map of the route and written turn-by-turn directions. A GPS device provided turn-by-turn guidance during the drive. Participants were not told that the focus of the study was related to billboards. Rather, participants were told that researchers were investigating eye-gaze behavior as it relates to driving while following auditory directions. The first half of the data collection for each participant lasted approximately 30 minutes. Roughly one half of the participants drove Route A first and the remaining participants began with Route B. A five minute break followed the completion of the first route.

During the drives, a researcher in the front passenger seat assisted the driver when additional route guidance was required. That researcher also recorded near misses or driver errors as necessary. The researcher in the rear seat monitored the performance of the eye tracker. If the eye tracker performance became unacceptable (i.e., loss of calibration), then the researcher in the rear asked the participant to park in a safe location so that the eye tracker could be recalibrated.

Debriefing. **After driving both routes, participants were asked to complete a driver feedback questionnaire and were given $120.00 cash for their participation. Participants were informed of the study's true purpose after all data from that participant was collected.**

B. DATA REDUCTION

Selection of Data Collection Zone Limits

In evaluating eye gaze measures to CEVMS and standard billboards, it is important to take into consideration the abilities of the driver to see and read signs. Also, the capability of the data collection system and data analyses procedure needs to be taken into account when setting the limits of each data collection zone. In this study, data collection zones were defined as the distance leading up to a target billboard (CEVMS or standard) that is used in the analysis of the gaze data. One must use caution when selecting data collection zone limits for many reasons. If a very long data collection zone length was selected where the drivers could not be expected to read the billboards and the eye tracking and video analysis system could not resolve the billboard, then the proportion of time that drivers were looking at billboards would tend to be underestimated. On the other hand, very short data collection zone lengths would result in missing gazes to the billboards that should have logically been captured.

The rationale for selecting the data collection zone limits took into account the geometry of the roadway (e.g., road curvature or obstructions that blocked view to the billboards) and capabilities of the eye-tracking system (two degrees of resolution). Nine hundred and sixty feet was accepted as the maximum approach length. The MUTCD 2009 guideline of 30 ft (9.14m) per inch (25.4 mm) of letter height was used to estimate the sign legibility distance. Given an average letter height of 32 in (812.8 mm) for the CEVMS, a maximum distance of 960 ft (292.61 m) was computed (actual distances can be seen in table 2). An exception was made in the case where a CEVMS data collection zone overlapped with a collection zone of the previous CEVMS; in this case the data collection zone was greater than 960 ft (292.61 m). The start of the second data collection zone was defined as the location of the preceding. If the target billboard was not visible from 960 ft (292.61 m) due to roadway geometry or other visual obstructions, such as trees or an overpass, then the data collection zone was shortened to a distance that prevented these objects from interfering with the driver's vision of the billboard. In data collection zones with target off-premise billboards, the end of the data collection zone was marked by that billboard. If the area contained no off-premise advertising, then the end of the data collection zone was defined by a physical landmark.

In Reading, the average billboard height was 12.8 ft (3.90 m) and the average width was 36.9 ft (11.25 m). At a distance of 960 ft (292.61 m), a 12.8 ft (3.90 m) by 36.9 ft (11.25 m) sign would subtend a horizontal visual angle of 2.20 degrees and a vertical visual angle of 0.76 degrees. Given these values, the billboards were resolved by the eye tracking system and could be read by the participants.

Researchers attempted to examine glances to the billboards at very long distances (up to 3,883 ft or 1,183.54 m). However, at these long distances an eye glance that may have been to a billboard could not be differentiated from a glance to another object nearby, the roadway, or the sky. Table 2 shows the data collection zone limits utilized in this experiment.

Eye Tracking Measures

The images recorded from the three cameras mounted on the roof of the research vehicle were stitched into a single panoramic view. Glance behavior was reduced by observing gaze location indicated by a cursor that was overlaid onto the panoramic view. The cursor location approximated where the participant's gaze was directed within 2 degrees on a frame-by-frame basis. The panoramic view was generated at 25 frames per second. In addition, a text file containing parameters from the eye tracking system was generated. The text file included information regarding eye-gaze vectors and their quality, gaze location in relation to a world model, and other gaze variables (e.g., eye blinks, pupil diameter). A second text file was also produced that contained GPS coordinates, vehicle speed data, and distance from the beginning of the trip. The eye tracker recorded at 60Hz and was down sampled and matched to the corresponding video frames that were output at 25Hz. The digital data containing the GPS and speed data were also processed such that these data would correspond to the 25Hz frame rate.

The video data was reduced on a frame-by-frame basis and recorded in a relational database. Glance locations were classified as follows:

1. **Road ahead.** This category of glances included the roadway surface from edge of shoulder to edge of shoulder or curb to curb. That is, the physical roadway (for both directions of travel) between the research vehicle and the vanishing point of the roadway was included. Distant trees and buildings defining the path of the roadway ahead, as well as bridges, guard rails, embankments, etc. were also classified as road ahead as were traffic control devices, other vehicles, and pedestrians who could potentially interact with the vehicle.

2. **Target CEVMS.** These were glances to a pre-determined digital billboard in its respective data collection zone.

3. **Target standard billboard**. These were glances to a pre-determined standard billboard in its respective data collection zone.

4. **Other standard off-premise billboards**. These were glances to other non-target standard (vinyl) billboards present in a data collection zone. These other non-target off-premise billboards occurred in both CEVMS and standard billboard data collection zones.

5. **Miscellaneous.** This category included glances to areas of extraneous built environment (such as building structures, houses, hotels, commercial and industrial buildings, malls, parking lots, etc.) and natural environment (fields, forests, foliage, trees, bushes, mountains, lakes, rivers, clouds, sky, etc.) which did not assist in defining the roadway.

6. **Indeterminate**. These were video frames where the eye-tracking cursor was not present or the cursor was outside the panoramic field of view. This category included glances to the vehicle instruments and rear view mirrors, as well as glances to areas of the roadway outside the panoramic view. A proportion of the indeterminate glances were later classified as to the gauge cluster based on analysis of the data; this ultimately resulted in glances to seven categorical areas.

Analysts coded each frame of the data collection zone using one the six categories listed above (the sixth category was later subdivided allowing glances to the gauge cluster to become its own category). On each frame, the cursor needed to touch a given object for the analyst to score a category glance to that object category. Figure 13 illustrates a video frame that was scored as a glance to a target CEVMS.

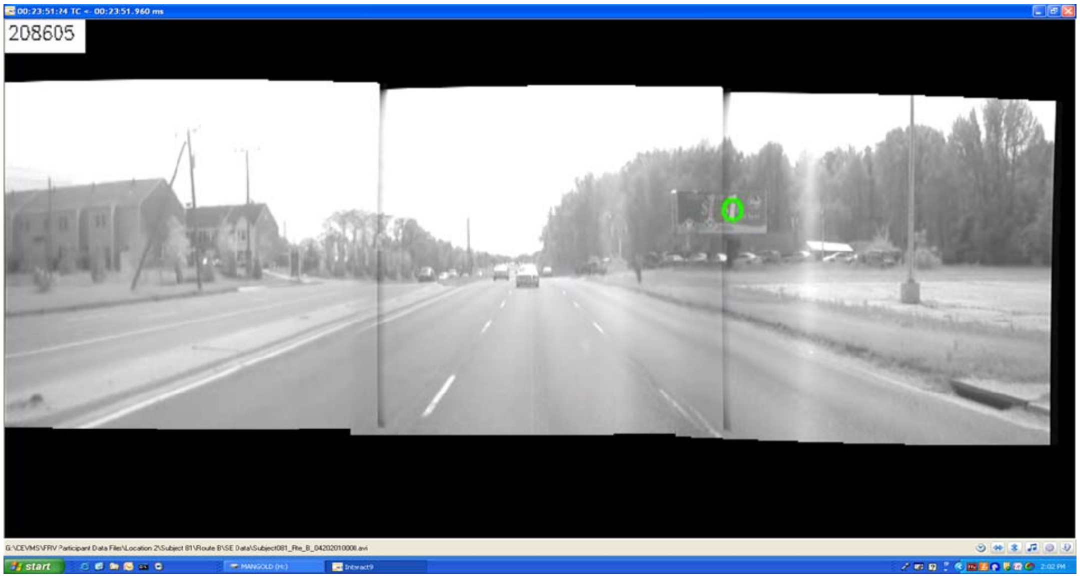

Figure 13. Panoramic Video with the Eye-Tracking Cursor (Highlighted by the Green Circle) in the Center of a CEVMS.

After the video data was reduced, data validation and processing procedures were carried out. Software programs insured that frames were not accidentally double-coded, the beginning and end of each data collection zone were correct, and the correct codes were used for target billboards.

Data Processing

Data processing resulted in a data file that could be used for calculating glance duration to the different pre-defined objects and categories (Road Ahead, CEVMS, etc.).

Gaze Calculation. **Within each data collection zone, the processed data files were examined to determine the number of consecutive frames that were scored as being in the same category. Each group was considered one gaze and it was possible for a gaze to contain only a single frame (0.04 sec. duration). Previous research has shown that gazes cases do not need to be separated into saccades and fixations before calculating such measures as percent of time looking to the road ahead.** **[18]** **The analyses performed in this report are therefore based on gaze data.**

Ultimately, calculating gazes resulted in a data file that contained gazes and gaze durations as a function of scoring categories and data collection zones for each participant.

Performance Measures. **The following performance measures were computed from the gaze data files.**

Mean Percent of Time: Within each data collection zone, the mean percent of time spent looking at a given object or class of objects was computed for each of the following categories:

1. Road ahead.
2. Target CEVMS.
3. Target standard billboard.
4. Other standard billboard.
5. Miscellaneous.
6. Unknown (these were indeterminate glances that could not be classified to the gauge cluster).
7. Gauge cluster.

For each data collection zone, the sum of the percent of time across the above seven categories equaled 100. That is, all gazes were accounted for in data analysis and none were excluded.

Mean Rate of Eye Gazes: The mean rate of eye gazes was defined as the frequency of eye gazes to a particular object category divided by the amount of time available in the data collection zone. If a data collection zone consisted of 23 frames (23/25 of a second or 0.92 sec), then the mean rate of eye gazes for the target CEVMS category would be equal to two gazes divided by 0.92 sec, or approximately 2.17 gazes per second. This measure was computed for the target CEVMS and target standard billboard categories within their respective collection zones. Note that this metric was not sensitive to the duration of eye glances.

Mean Duration of Eye-Gazes: The mean duration of eye-gazes was defined as the average length of each gaze to a particular object category (i.e., the total duration of eye glances divided by the number of separate gazes). This measure was calculated for the target CEVMS and standard billboard categories within their respective data collection zones.

Driving Behavior Measures: During data collection the front-seat researcher observed the drivers' behaviors and the driving environment. The following categories were used to score researcher observations:

- **Driver Error:** Signified any error on behalf of the driver in which the researcher felt slightly uncomfortable, but not to a significant degree (e.g., driving on an exit ramp too quickly, turning too quickly).
- **Near Miss:** Signified any event in which the researcher felt uncomfortable due to driver response to external sources (e.g., slamming on brakes, swerving). A near miss is the extreme case of a driver error.
- **Incident:** Signified any event in the roadway which may have had a potential impact on the attention of the driver and/or the flow of traffic (e.g., crash, emergency vehicle, animal, construction, train).

These observations were entered into a notebook computer linked to the FRV data collection system. However, neither driver errors nor near misses occurred in the limits of a data collection zone.

C. RESULTS AND DISCUSSION

The results are presented principally to address three key experimental questions: (a) do drivers look more at CEVMS than at standard billboards, (b) are there long glances to off-premise advertising billboards, and (c) is there a tradeoff between looking at off-premise advertising billboards and the road ahead? However, the overall distribution of time spent looking at the different target categories for each of the billboard and no off-premise advertising environments are presented to give an overall picture of the results.

All statistical analyses used an alpha level of .05. All error bars presented in the following figures show ± two standard errors about the mean (which closely approximate a 95 percent confidence interval).

Mean Percent of Time

Table 4 presents the mean percent of time participants spent gazing at each of the areas of interest as a function of data collection zone type. As previously noted, the data collection zones are classified in terms of the presence or absence of off-premise advertising and the type of advertising (CEVMS or standard billboards). The data in table 4 are averaged across time of day. This table illustrates the tradeoffs between gazing at different objects and areas in the visual scene. As the table shows, gaze activity in the CEVMS, standard billboard, and built environment data collection zones resulted in approximately the same percent of time for the road ahead, ranging from 83.3 percent to 84.3 percent. The natural environment shows the highest percent of time looking to the road ahead.

Table 4. Mean Percent of Time Looking to Areas of Interest Based on Data Collection Zone Type.

	Road Ahead	Misc	Unknown	Gauges	Target Billboards	Non-Target Standard Billboards	*Total*
CEVMS	83.3%	6.9%	5.4%	1.2%	2.8%	0.4%	*100%*
Standard Billboards	84.3%	7.2%	4.7%	1.3%	1.6%	1.0%	*100%*
Built Environment	82.3%	14.2%	3.0%	0.5%	—	—	*100%*
Natural Environment	87.3%	4.5%	5.7%	2.5%	—	—	*100%*
Mean	***84.3%***	***8.2%***	***4.7%***	***1.4%***	***2.2%***	***0.7%***	—

Data were analyzed using a 2 (time of day) x 4 (data collection zone type) mixed design ANOVA on each target category. Because the raw percentages are positively skewed (deviating from normality), additional analyses were performed using transformed data. Data were transformed using the arcsine of the square root of the proportions. This transformation works on measures distributed between zero and one and thus proportions rather than percentages were used. (19)

Mean Percent of Time to Target Advertising

Participants spent significantly more time looking at CEVMS than at standard billboards: $F(1, 29) = 9.88$, $p < .01$. As can be seen in Table 4, the mean percent of time drivers spent looking at CEVMS (2.8 percent) was nearly double that of standard billboards (1.6 percent).

Overall, participants directed a significantly greater percent of glances to billboards during the daytime (2.9 percent) as they did at nighttime (1.3 percent): $F(1, 29) = 14.24$, $p < .01$. There was not a significant interaction between billboard type and the time of day.

Mean Percent of Time to Road Ahead

Figure 14 shows the main effect for advertising: $F(3, 87) = 3.93$, $p < .05$. The percent of time looking to the road ahead was the greatest for the natural environment and lowest for the built environment. As figure 14 shows, the CEVMS, standard billboard and built environment data collection zones did not significantly differ from each other but each significantly differed from the natural environment: $p < .05$. Participants spent significantly more time gazing at the road ahead at night (89 percent) than during the day (81 percent): $F(1, 87) = 9.07$, $p < .01$. This is true for all data collection zones.

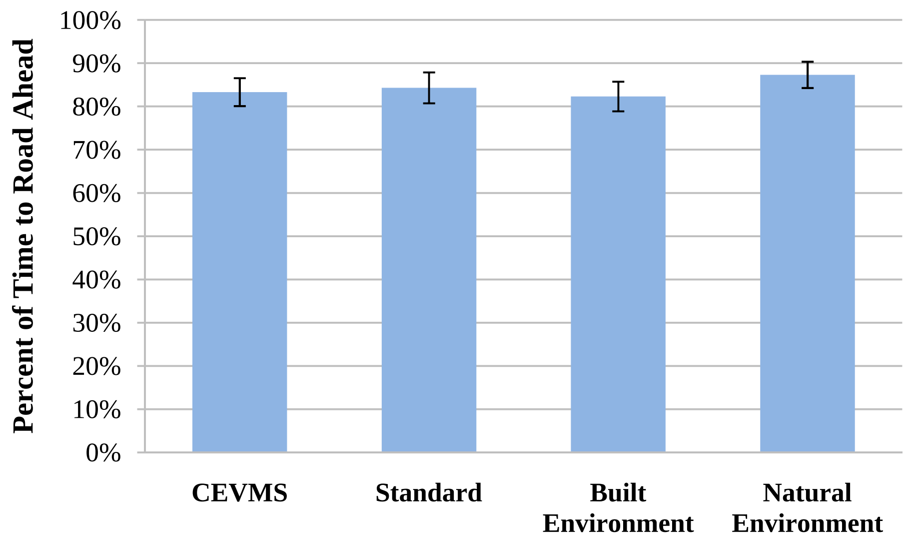

Figure 14. Percent of Time to Road Ahead as a Function of Data Collection Zone Type.

Mean Duration of Eye Gazes

Overall, data collection zone type did not significantly affect mean glance duration: $F(1, 29) = 1.52$, $p > .05$. Averaged across data collection zones, the mean glance duration, was 0.07 s (standard deviation 0.06 s).

The mean duration of gazes to the road ahead were also examined ($M = 0.59$ s), revealing no significant differences based upon data collection zone type: $F(1, 29) = 0.34$, $p > .05$.

Mean gaze durations may be misleading when the distribution of the duration of glances is skewed, which, as can be seen in Figure 15, was the case for glances to billboards. The figure shows the proportion of glance durations to CEVMS and standard billboards under nighttime and daytime conditions. All of these distributions show a positive skew with most of the gaze durations being relatively short.

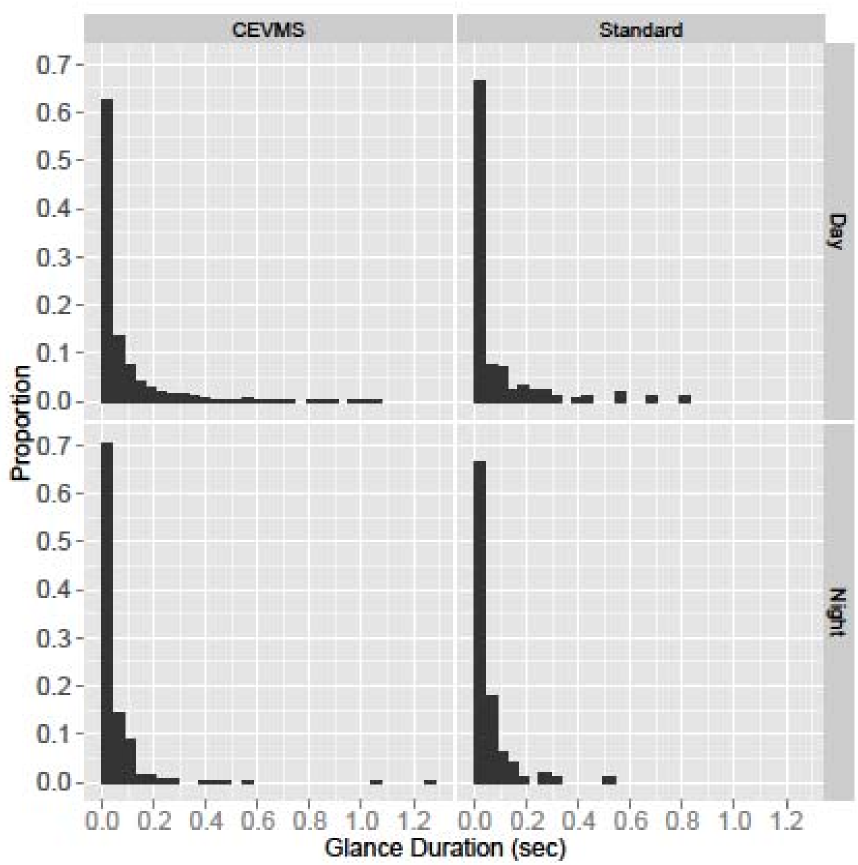

Figure 15. The Proportion of Gaze Duration for CEVMS and Standard Billboards under Daytime and Nighttime Driving Conditions.

Table 5 shows the total number of glances to target billboards summed over participants and target billboards. Although the shapes of the distributions are similar, there were approximately four times more gazes toward CEVMS than standard billboards. This difference in the number of gazes is principally due to the fact that there were 11 CEVMS and only 5 standard (target) billboards in the study. The numbers presented in parenthesis in this table are the result of the total number of glances to billboards divided by the number of billboards multiplied by the number subjects in each condition. Even when accounting for the number of billboards, there was still a higher frequency of glances to CEVMS than to standard billboards. Overall, there also were more glances to billboards during the day than at night.

Table 5. Total Number of Gazes for the CEVMS and Standard Billboard Conditions as a Function of Time of Day.

Advertising Condition	*Time of Day* Day	Night
CEVMS	668 (3.57)*	404 (2.62)
Standard Billboard	155 (1.82)	96 (1.37)

* Numbers in parenthesis are the glance frequency totals divided by the number of billboards and participants in the respective conditions.

Figure 15 shows that a small percentage of glances exceeded 1 s in duration. The following section presents analyses of these glances. Previous research has shown that glances away from the forward roadway exceeding 2 s have increased crash risk.(12) As a conservative measure, a value of shorter duration was selected for the analyses.

Long Duration Eye Gazes

Table 6 presents a summary of participant glances longer than 1 s to target billboards. The long glances were to CEVMS and were as likely to happen during the day as at night. Long glances to off-premises advertising were rare events. Of the total 1,072 glances to target CEVMS, only 5 exceeded 1 s (0.47 percent; ranging from 1.0 – 1.28 s).

Table 6. Summary of Long Gazes to Off-Premises Advertising in Reading.

Data Collection Zone	*Time of Day*	*Advertising*	*Duration (sec)*	*Horizontal Offset (ft)*	*Distance from Sign (ft)*	*Horizontal Angle (deg)*
1	Day	CEVMS Complex	1.04	22	402	3.13
5	Day	CEVMS	1.28	50	605	4.72
17	Day	CEMVS	1.00	92	824	6.37
19	Night	CEMVS	1.28	54	241	12.63
19	Night	CEMVS	1.04	54	464	6.64

Figure 16 shows the CEVMS (horizontally offset 54 ft from the roadway) in data collection zone 19, a relatively uncluttered visual environment. That sign had two long glances, both at night, beginning at 464 ft and 241 ft away. The visual angle subtended by the sign at these distances and offset was close to the area defined as road ahead. As a result of its proximity to the roadway, drivers may have felt comfortable directing longer glances to this sign. In other words, because this billboard was so close to the roadway, it is possible that it captured longer glances than if it were a greater distance from the vehicle path.

Figure 16. Data Collection Zone 19.

Mean Percent of Time to Other Non-Target Standard Billboards

Participants spent a significantly greater percentage of their time looking at standard non-target billboards in standard billboard data collections zones (.99 percent) than in CEVMS zones (.38 percent): $F(1, 29) = 11.06$, $p < .01$.

Participants also directed more glances at other non-target standard billboards during the day (1.02 percent) than at night (0.26 percent): $F(1, 29) = 16.35$, $p < .01$.

Mean Percent of Time Looking at Miscellaneous

Participants looked at many miscellaneous objects along the roadway, including buildings, parking lots, on-premises advertising, and other built environments away from the roadway. The amount of time participants spent looking at miscellaneous objects was significantly affected by data collection zone type: $F(3, 87) = 44.7$, $p < .01$. As can be seen in Figure 17, in the built environment, participants spent the most amount of time looking at miscellaneous objects, followed by the CEVMS and the standard billboard data collection zones. No significant difference in the percent of time spent looking at miscellaneous objects was found between the CEVMS and standard billboard zones: $p > .05$. The natural environment data collection zone showed the lowest percent of time gazing at miscellaneous objects; participants spent about 4.5 percent of the time looking at trees: $p < .05$.

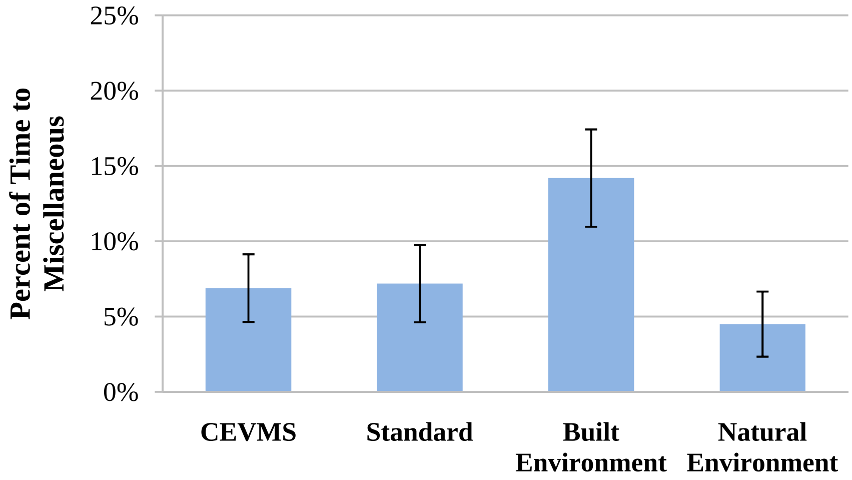

Figure 17. Percent of Time Looking at Miscellaneous as a Function of Data Collection Zone Type.

There were more glances toward miscellaneous objects in the daytime (10.9 percent) than the nighttime (4.9 percent): $F(1, 87) = 9.07$, $p < .01$.

Mean Percent of Time to the Gauge Cluster

Advertising type had a significant effect on glances to the vehicle gauge cluster: $F(3, 87) = 11.89$, $p < .01$. Figure 18 illustrates that there were more glances to the gauge cluster in natural environment data collection zones than in any of the others. The built environment data collection zone showed the lowest percentage of glances to the gauge cluster. The CEVMS and standard billboard zones did not significantly influence the amount of time participants spent looking at the gauge cluster. The built environment data collection zone showed the lowest percentage of glances to the gauge cluster. The CEVMS and standard billboard zones did not significantly influence the amount of time participants spent looking at the gauge cluster: $p > .05$.

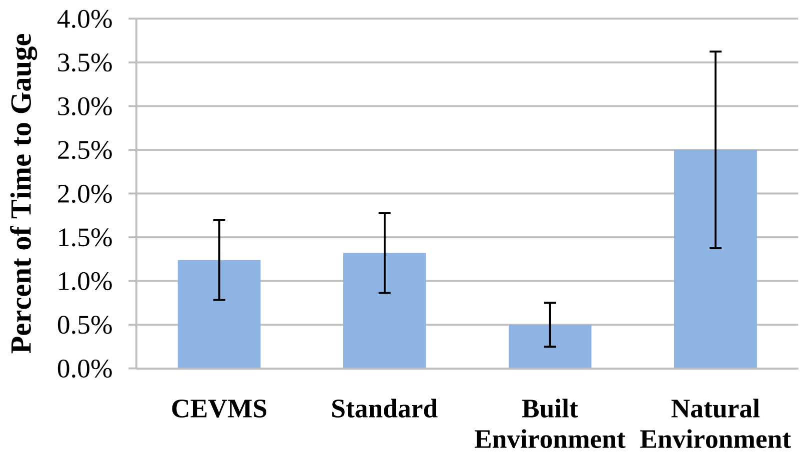

Figure 18. Percent of Time Looking to the Gauge Cluster as a Function of Data Collection Zone Type.

Mean Percent of Time Glances at Unknown Objects

The percent of time that glances could not be classified also varied significantly with data collection zone: $F(3, 87) = 7.45$, $p < .01$. As can be seen in Figure 19, there were significantly fewer glances at unknown objects in the built environments than in the other three environments (natural, standard, CEVMS) which did not differ from each other: $p < .05$. There were no other significant differences $p > .05$.

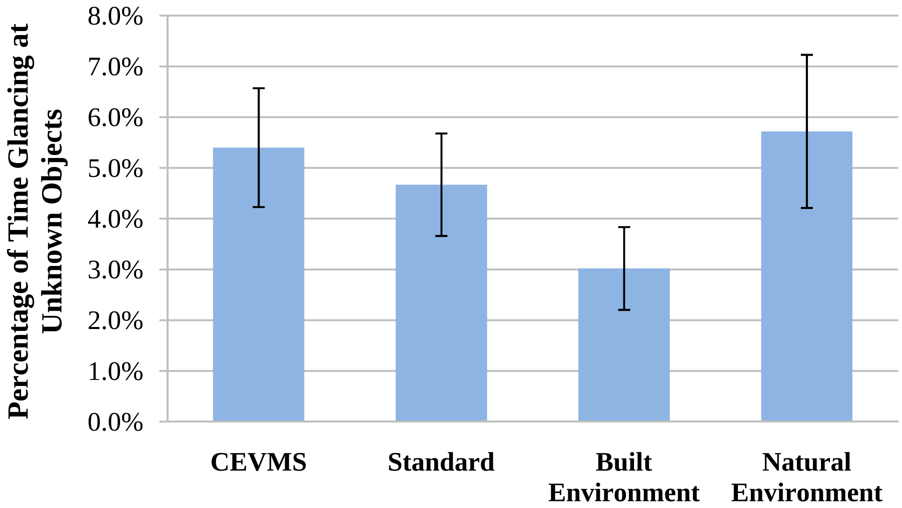

Figure 19. Percentage of Time Glancing at Unknown Objects as a Function of Data Collection Zone Type.

Mean Rate of Glances

Overall there were low rates of glances to both types of billboards. When separated by billboard type, participants showed a greater mean rate of glances at target CEVMS than at target standard billboards: $F(1, 29) = 15.54$, $p < .01$. In the CEVMS data collection zones, the average rate of glances at target advertising is about 0.42 per s, or 4.2 glances every 10 s. In the standard billboard data collection zones, a rate of 0.20 per s, or 2 glances every 10 s, was found. Overall, the rate of glances was higher during the day (0.39 glances per second) than at night (0.21 glances per s): $F(1, 29) = 8.32$, $p < .01$.

There were no significant differences for mean rate of glances at the road ahead as a function of time of day or data collection zone type. The mean rate of glances at the road ahead was 5.00 gazes per second.

Relationship between Photometric Measures and Glance Behavior

Analyses were conducted to determine if there was a relationship between sign luminance or contrast and participant glance behavior. Correlational analyses were conducted among glance duration and luminance and the Weber contrast measures for the individual signs. Separate correlational analyses were conducted for CEVMS and standards billboards during nighttime and daytime. The correlations among glance duration and the photometric measures were all low and not statistically significant ($p > .05$).

CEVMS Correlations. For the daytime, the correlation between glance duration and luminance was $r = -.007$. For the nighttime the correlation was $r = 0.037$. The correlation between glance duration and contrast were $r = 0.049$ for daytime and $r = -.071$ for nighttime. None of these correlations were significant ($p < .05$).

Standard Billboard Correlations. The correlation between glance duration and luminance was $r = 0.053$ for the daytime and $r = -0.147$ for the nighttime. The correlation between glance duration and contrast was $r = 0.07$ in the daytime and $r = 0.160$ for the nighttime. None of these correlations were significant ($p < .05$).

Observation of Driver Behavior

No near misses or driver errors were observed in data collection zones experiment 1.

Results Including CEVMS Complex

As noted previously, the CEVMS complex condition included two CEVMS, multiple standard billboards, and a visually complex built environment (hotel, car dealership, restaurants, and parking lots). Table 7 shows the percent of time glances were directed at different objects or areas (e.g., road ahead) in the driving environment. The CEVMS complex data collection zone shows the lowest percent of time looking to the road ahead. The largest difference between the CEVMS complex and the CEVMS/standard billboard data collection zones is the percent of glances to miscellaneous objects. The following presents statistical results for percent of time measures and glance duration.

Table 7. Mean Percentage of Time Looking at Areas of Interest Based on Data Collection Zone Type.

	Road Ahead	Misc	Unknown	Gauges	Target Billboards	Non-Target Standard Billboards	*Total*
CEVMS Complex	75.9%	10.4%	5.6%	1.7%	3.8%	2.5%	*100%*
CEVMS	83.3%	6.9%	5.4%	1.2%	2.8%	0.4%	*100%*
Standard Billboards	84.3%	7.2%	4.7%	1.3%	1.6%	1.0%	*100%*
Built Environment	82.3%	14.2%	3.0%	0.5%	—	—	*100%*
Natural Environment	87.3%	4.5%	5.7%	2.5%	—	—	*100%*
Mean	***82.6%***	***8.6%***	***4.9%***	***1.4%***	***2.7%***	***1.3%***	—

There were significantly more glances at target CEVMS relative to target standard billboards: $F(2, 57) = 7.02$, $p < 0.002$. Figure 20 presents the mean percentage of time spent looking at target billboards as a function of data collection zone.

The results including the CEVMS complex data collection zone were similar to those presented earlier. The percent of eye glances to target advertising in the CEVMS complex and CEVMS environments were not significantly different from each other ($p > .05$); however, participants spent a significantly greater percentage of time glancing at target advertising in both types of CEVMS environments than in the standard billboard zones ($p < .05$).

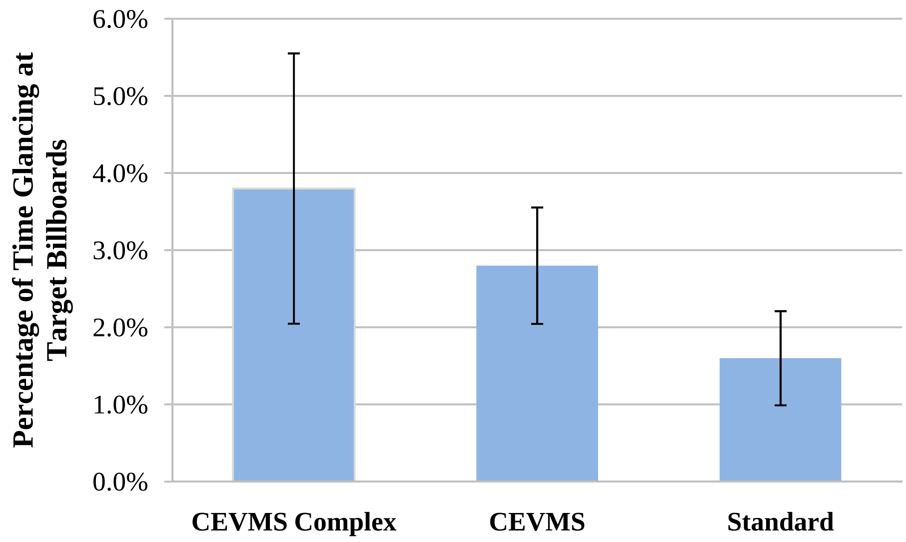

Figure 20. Percent of Time Glancing at Target Advertising as a Function of Data Collection Zone Type.

The participants directed a greater percentage of glances at target billboards during the daytime (3.4 percent) than during the nighttime (1.8 percent): $F(1, 29) = 6.76$, $p < .02$. The time of day did not interact with target billboard type.

The percentage of time spent looking at the road ahead was significantly influenced by the type of data collection zone: $F(4, 115) = 12.90$, $p < .01$. Figure 21 presents these results. The percent of time looking to the road ahead was the highest for the natural environment and lowest for the CEVMS complex data collection zone. CEVMS, standard billboard, and built environment zones did not differ from each other, but differed from the CEVMS complex and natural environment conditions. This finding suggests that whereas visual attention to CEVMS and standard billboards did not result in a tradeoff of time spent looking at the road ahead, there was evidence of such a tradeoff in the CEVMS complex zone.

The participants spent significantly more time gazing at the road ahead at night (87 percent) than during the daytime (79.2 percent): $F(1, 29) = 6.80$, $p < .05$. The time of day did not interact with data collection zone type. In each of the data collection zone types, drivers spent more time looking at the road ahead at night.

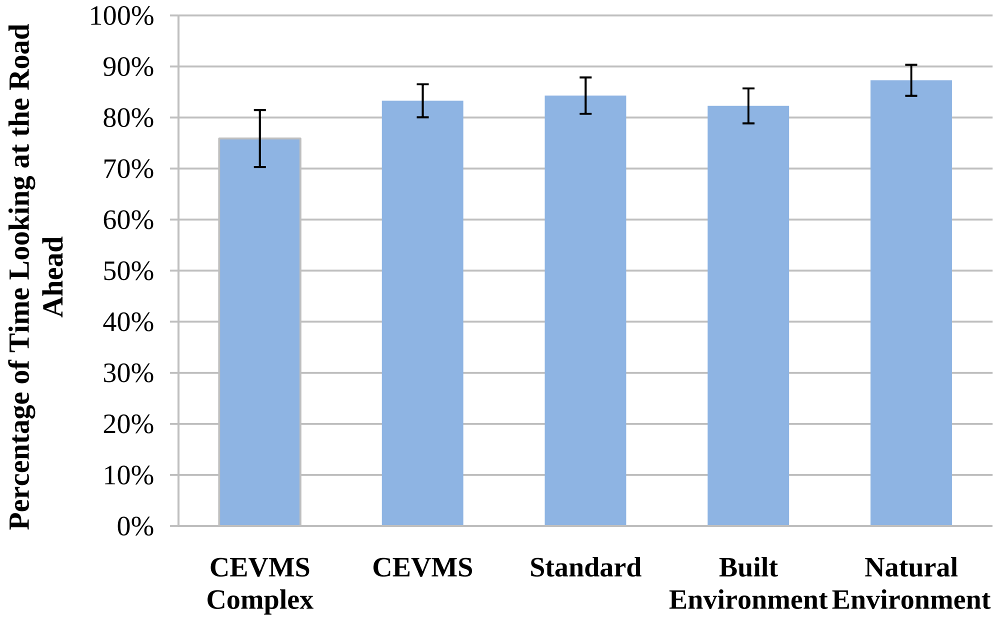

Figure 21. Percent of Time Looking at the Road Ahead as a Function of Data Collection Zone Type.

Figure 22 shows the mean duration of glances at target off-premise billboards. There were no significant differences in mean glance duration among the three advertising types (CEVMS complex, CEVMS, and standard). The CEVMS complex data collection zone shows a mean duration of approximately 0.08 s; however, the variability is such that it is not statistically different from the other data collection zones. The average glance duration regardless of advertising type was 0.070 s (standard deviation 0.058 s).

The average duration of glances at the road ahead was also evaluated for the CEVMS complex, CEVMS, and standard billboard data collection zones. The analysis showed no statistically significant differences. On average, glances to the road ahead were 0.59 s (standard deviation 0.19 s).

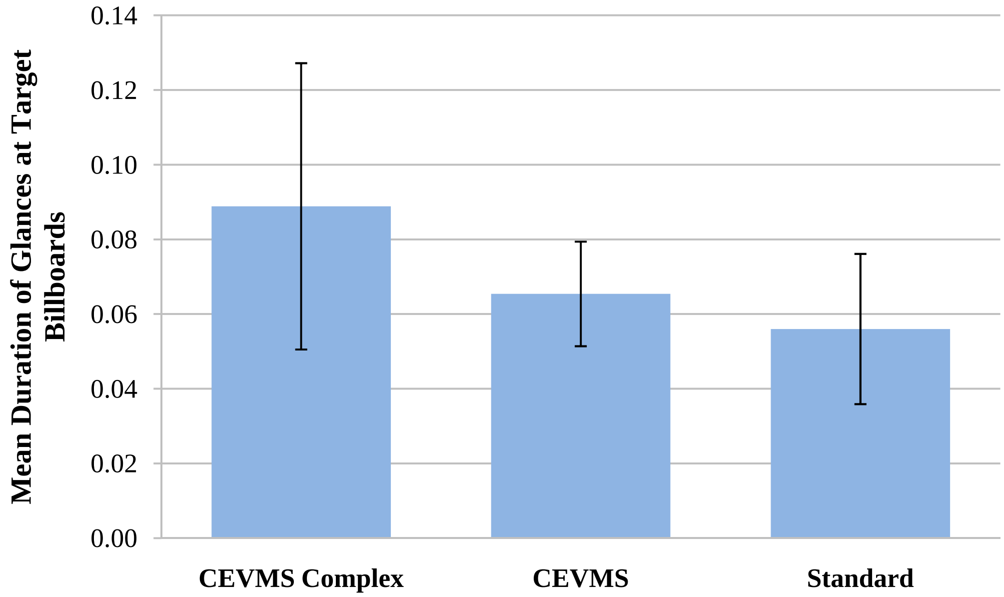

Figure 22. Mean Duration of Glances at Target Billboards as a Function of Data Collection Zone Type.

Discussion

A road experiment was conducted to examine the following three experimental questions regarding CEVMS and visual attention:

- Do drivers look at CEVMS more than at standard billboards?
- Are there long glances at CEVMS that would be indicative of a decrease in safety?
- Do drivers look at CEVMS and standard billboards at the expense of looking at the road ahead?

The drivers did look more at CEVMS than at standard billboards. The percentage of time spent glancing at CEVMS was 2.8 percent and at standard billboards 1.6 percent. These are small percentages; however, they are statistically different from each other. In the CEVMS complex data collection zone, time spent glancing at CEVMS was 3.8 percent; however this data collection zone had two CEVMS and so the percent per CEVMS averaged 1.9 percent. These results are consistent with previous finding from Smiley et al. showing a relatively small percentage of glances at advertising.[8] Smiley et al. recorded 0.2 percent of glances at billboards and 2 percent at video advertising.

There were no differences between CEVMS and standard billboard conditions with respect to the average duration of glances. On average the glance duration was about 0.07 s for both CEVMS and target standard billboards, and there were only five eye glances to CEVMS in the entire study that were equal to or greater than 1 s in duration. The longest glance at a CEVMS was of 1.28 s. Klauer et al. observed increases in near-crash/crash risks of more than two times normal, baseline driving where the duration of eyes off the forward roadway exceeded 2 s.[12] None of the glance durations to CEVMS approached this length.[12] Horrey and Wickens focused on how safety-related phenomena may be more strongly linked to those observations that lie in the tail of a given distribution and not necessarily to the mean.[20] In their research they used a threshold of eye glances longer than 1.6 s away from the forward roadway as an indication of poor driving and an increase in risk.[21] The current results are also below this more conservative threshold.

The CEVMS, standard billboard, and built environment conditions did not differ significantly from each other (83, 84, and 82 percent, respectively) in the percent of glances to the road ahead. In these areas drivers also gazed at objects that were on the side of the road for about an equal amount time. In the case of CEVMS and standard billboard areas, drivers gazed at off-premises advertising as well as other objects on the side of the road. In the case of built environment, about 14 percent of the time the drivers were looking at the side of the road where no off-premises advertising was present. In these three areas there appear to have been trade-offs as to where the drivers directed their gazes away from the roadway while maintaining about the same percentage of time looking at the road ahead.

The degree to which drivers gazed toward the road ahead was affected by the nature and quantity of visual information on the roadside. The CEVMS complex area was included in the analysis to examine the effect of a complex roadway scene with a large quantity of off–premise advertising on driver visual behavior. In this area, participants spent the lowest percentage of time looking at the road ahead (76 percent). Overall, participants spent about 10 percent of the time, on average, gazing at objects on the side of the road (i.e., buildings, on-premises advertising, parked cars in a car dealership, etc.).

In natural environment zones, drivers gazed at the road ahead 87 percent of the time, which was significantly more than for the other data collection zones in the study. These natural environment data collection zones principally contained trees and other foliage on the side of the road.

The results also showed that drivers spent more time looking at billboards (both CEVMS and standard billboards) in the daytime than at night. As one would expect, at night, the CEVMS complex and CEVMS zones had higher luminance and contrast than the standard billboards. However, these differences in sign luminance did not appear to affect gaze behavior in this study. This finding is supported by previous research by Olson, Battle, and Aoki, who reported that drivers devote more of their time to the road ahead at night than in the day.[22] In the present study, at night, the drivers focused more of their gazes on the road ahead and devoted less time to CEVMS, target standard billboards, other standard billboards, and other objects on the side of the road (e.g., miscellaneous). Objects along the side of the road generally receive less illumination (i.e., are of lower contrast) at night and are subsequently more difficult to see than during the daytime.

The study indicated that as the overall clutter or complexity of the roadside visual environment increases, drivers will look at it, and glances to the road ahead will decrease. This effect was evident in the CEVMS complex and built environment data collection zones, where drivers spent 10.4 and 14.2 percent of the time, respectively, looking at object along the roadside. Clutter was defined in terms of the amount of visual information and included buildings, signs, businesses, parked cars, and so on. Areas with high levels of clutter tended to be on arterials with associated businesses on the sides of the road. This aspect of the high-clutter areas also relates to the potential for safety risks (e.g., vehicle coming out of a business) and thus more glances to the left and right sides of the road cannot definitively be attributed to distraction alone.

IV. EXPERIMENT 2

The objectives of the second experiment were the same as those in the first experiment, and the design of experiment 2 was very similar to experiment 1. The independent variables included the type of data collection zone (CEVMS, standard billboard, or no off-premises advertising) and time of day (day or night). In addition, the data collection zones in this experiment were grouped into those presenting low and moderately high visual complexity. In total, experiment 2 included the following independent variables: time of day (day or night), type of data collection zone (CEVMS, standard billboards, no off-premise advertising), and visual complexity (low and high). As with experiment 1, the time of day was a between-subjects variable and the other variables were within subjects.

On average, the test routes for Richmond, VA were slightly longer in duration than those for Reading, lasting approximately 30 to 35 minutes. As in Reading, the routes represented a variety of freeway and arterial driving segments. Route A was 15 miles long and contained five target CEVMS, three target standard billboards, and two no off-premise advertising data collection zones. Route B was 20 miles long and had four target CEVMS, three target standard billboards, and two no off-premise advertising data collection zones. Table 8 is an inventory of the target billboards along the Richmond data collection routes with relevant parameters.

Table 8. Inventory of Target Billboards in Richmond with Relevant Parameters.

Visual Complexity	*Advertising Type*	*Copy Dimensions (ft)*	*Change Rate (sec)*	*Side of Road*	*Setback from Road (ft)*	*Approach Length (ft)*	*Other Standard Billboards*
High	CEVMS	11’0 x 23’0”	10	R	35	960	0
High	CEVMS	10’6” x 36’0”	10	L	88	960	0
High	CEVMS	12’ 6” x 42’ 0”	10	L	227	960	5
High	Standard	14’0” x 48’0”		R	134	889	3
High	Standard	10’6” x 45’3”		L	124	960	2
High	Standard	10’6” x 22’9”		L	76	863	0
Low	CEVMS	12’5” x 40’0”	10	R	82	960	2
Low	CEVMS	14’0 x 36’0”	10	R	69	960	2
Low	CEVMS	14’0 x 36’0”	10	L	128	960	2
Low	CEVMS	14’0” x 28’0”	20	L	119	960	0
Low	CEVMS	10’6” x 36’0”	10	R	42	960	2
Low	CEVMS	14’0” x 28’0”	10	R	56	960	0
Low	Standard	14’0” x 48’0”		L	195	960	0
Low	Standard	14’0” x 48’0”		R	125	960	3

A. METHOD

Advertising Type

Three data collection zone types (similar to those used in experiment 1) were used in Richmond:

- **CEVMS.** Data collection zones contained one target CEVMS.
- **Standard billboard.** Data collection zones contained one target standard billboard.

- **No off-premise advertising.** Data collection zones did not contain any off-premise advertising.

The zones were further categorized in terms of visual complexity (described in greater detail below). This categorization considered the presence or absence of buildings, businesses, and on-premise advertising.

Table 9 presents a breakdown of the data collection zones for the three advertising conditions as a function of visual complexity.

Table 9. Advertising Conditions by Level of Visual Complexity.

	Level of Visual Complexity	
Advertising	**High**	**Low**
CEVMS	3	6
Standard Billboard	3	2
No Advertising	2	2

Figures 23-36 below represent various pairings of data collection zone type and visual complexity. Target off-premise billboards are indicated by red rectangles.

Figure 23. Example of a CEVMS Data Collection Zone with High Visual Complexity.

Figure 24. Example of CEVMS Data Collection Zone with Low Visual Complexity.

Figure 25. Example of a Standard Billboard Data Collection Zone with High Visual Complexity.

Figure 26. Example of a Standard Billboard Data Collection Zone with Low Visual Complexity.

Photometric Measurement of Signs

The photometric measurements in Richmond were performed using the same equipment and procedures that were employed in Reading with a few minor changes. Photometric measurements were taken during the day (between 8:20AM and 11:20AM) and at night (between 5:40PM and 10:45PM). Measurements of the standard billboards were taken at an average distance of 284 ft, with maximum and minimum distances of 570 ft and 43 ft. The average distance of measurements for the CEVMS was 479 ft, with maximum and minimum distances of 972 ft and 220 ft.

Luminance: The mean luminance of CEVMS and standard billboards disaggregated by visual complexity, during daytime and nighttime are shown below in Table 10.

Table 10. Luminance Values (cd/m^2) for the Low and High Visual Complexity Conditions.

	High Complexity			Low Complexity		
Day	*Min*	*Max*	*Average*	*Min*	*Max*	*Average*
CEVMS	1,339	2,536	2,027	1,422	3,357	2,228
Standard Billboard	1,014	1,567	1,258	4,424	7,149	5,787
Night						
CEVMS	26	53	42	39	79	61
Standard Billboard	7	11	9	5	16	11

Contrast: The daytime and nighttime Weber contrast ratios for both types of billboards are shown in Table 11. During the daytime, the contrast ratios of both CEVMS and standard billboards were close to zero (the surroundings were about equal in brightness to the signs). At night, the CEVMS and standard billboards had positive contrast ratios. Similar to Reading, PA, the CEVMS produced greater contrast ratios at night than during the day.

Table 11. Weber contrast values in low and high visual complexity environments.

	High Complexity			Low Complexity		
Day	*Min*	*Max*	*Average*	*Min*	*Max*	*Average*
CEVMS	-0.56	-0.41	-0.48	-0.47	0.64	-0.05
Standard Billboard	-0.14	0.28	0.06	-0.26	0.73	0.24
Night						
CEVMS	19.20	123.60	67.80	15.82	162.11	68.85
Standard Billboard	7.22	15.18	12.44	-0.01	6.02	3.00

Visual Complexity

As with experiment 1, the subband entropy measure was used to estimate the level of visual complexity/clutter in the data collection zones. For each zone, a single frame was captured from a color video and saved as a JPEG image. The JPEGs were analyzed with MATLAB routines that computed a measure of subband entropy for each image. Figure 27 shows the mean subband entropy measures for each of the advertising conditions (note that due to the limited number of data collection zones, standard error information is not included). The subband entropy measures correlate well with the categorization of the data collection zones into two levels of visual complexity.

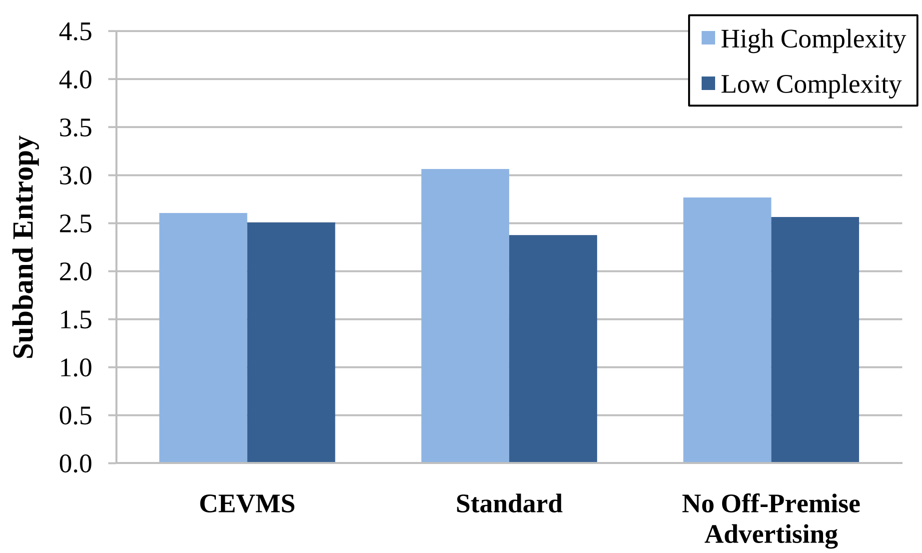

Figure 27. Subband Entropy Measures for the Data Collection Zones.

Participants

A total of 41 participants were recruited for the study. Of these, six participants did not complete data collection because of an inability to properly calibrate with the eye-tracking system and eight were excluded because of equipment failures. A total of 27 participants (16 male, M = 28 years; 11 female, M = 22 years) successfully completed the drive. All participants were under the age of 64. Fourteen people participated during the day and 13 participated at night.

Procedures

Research participants were recruited locally by means of visits to public libraries, student unions, community centers, etc. A large number of the participants were recruited from a nearby university, resulting in a lower mean participant age than in experiment 1.

Participant Testing

Two people participated each day. One person participated during the day beginning at approximately 12:45 PM. The second participated at night beginning at around 7:00 PM. Data collection ran from November 20, 2009, through April 23, 2010. There were several long gaps in the data collection schedule due to holidays and inclement weather.

Pre-Data Collection Activities. This was the same as in experiment 1.

Practice Drive. Except location, this was the same as in experiment 1.

Data Collection. The procedure was much the same as in Reading. However, the data collection drives in Richmond were longer than those in Reading. As a result, the eye-tracking system had problems dealing with these large files. To mitigate this technical difficulty, participants were asked to pull over in a safe location during the middle of each data collection drive so that new data files could be initiated.

Upon completion of the data collection, the participant was instructed to return to the designated meeting location for debriefing.

Debriefing. This was the same as in experiment 1.

B. DATA REDUCTION

Selection of Data Collection Zone Limits

Selection of data collection zone limits for Richmond was the same as in Reading. Data collection zone distances of 960 ft or less were selected. In Richmond, the average target CEVMS height was 12.9 ft and the average width was 37.7 ft. At 960 ft, a 12.9 ft by 37.7 ft sign would subtend a horizontal visual angle of 2.25 degrees and a vertical visual angle of 0.77 degrees. Thus, at 960 ft (292.8 m) the eye glances to CEVMS billboards could be resolved by the eye-tracking system and could be read by the participants. Attempts to identify glances at billboards at longer distances were not feasible with the equipment used in this study, and in any case it is unlikely that messages on the billboards could be resolved by participants from a distance greater than 960 ft.

With the exception of defining data collection zones as having low or high visual complexity, all other aspects of the data reduction were the same as that described for experiment 1.

C. RESULTS AND DISCUSSION

As with experiment 1, results are presented to address three key experimental questions: (a) do drivers look more at CEVMS than at standard billboards, (b) are there long glances to off-premise billboards, and (c) is there a tradeoff between looking at off-premise billboards and the road ahead? The results of the visual complexity factor are also presented within the context of the questions above.

All statistical analyses used an alpha level of .05. All error bars presented in the following figures show ± two standard errors about the mean (which closely approximate a 95 percent confidence interval).

Mean Percent of Time

The average percent of time was calculated by time-of-day and visual complexity for the following seven categories that were discussed earlier:

1. Road ahead.
2. Target CEVMS.
3. Target Standard Billboard.
4. Other Standard Billboard.
5. Miscellaneous.
6. Unknown.
7. Gauge cluster.

In the low visual complexity data collection zones there were more glances to target advertising relative to the high visual complexity approaches. The difference in glance behavior between CEVMS and standard billboard conditions was most evident at night in low visual complexity data collection zones.

Table 12 and table 13 present the mean percent of glance time for each of seven categories as a function of data collection zone type. In experiment 2 these variables significantly affected drivers' glance behavior. As a result, separate tables are presented to show the tradeoff in glance behavior across visual complexity and time of day.

The following sections provide the results of statistical analysis for each of the above seven dependent measures (areas of glances). The statistical model used was a 2 (time of day) x 2 (visual complexity) x 3 (data collection zone type) mixed design analysis of variance. Because the raw percentages are positively skewed (deviating) from normality, additional analyses were performed using transformed data. Data were transformed using the arcsine of the square root of the proportions. This transformation works on measures distributed between zero and one, and thus proportions rather than percentages were used. The results with and without the transformation were similar. All the reported analysis of variance statistics used the transformed data.

Table 12. Mean Percentage of Time for All Object Categories as a Function of Data Collection Zone Type for Low and High Visual Complexity Data Collection Zones During the Daytime.

DAYTIME		Road Ahead	Misc	Unknown	Gauges	Target Billboards	Non-Target Standard Billboards	*Total*
High Visual Complexity	CEVMS	70.3%	16.1%	1.1%	1.4%	1.0%	1.1%	*100%*
	Standard Billboards	72.7%	15.7%	15.7%	1.8%	0.5%	1.0%	*100%*
	No Off-Premise Advertising	72.7%	17.2%	7.5%	2.6%	—	—	*100%*
	Mean	***71.9%***	***16.3%***	***8.1%***	***1.9%***	***0.8%***	***1.1%***	—
Low Visual Complexity	CEVMS	79.2%	8.1%	7.9%	1.2%	2.9%	0.7%	*100%*
	Standard Billboards	87.6%	4.0%	5.1%	0.7%	2.2%	0.4%	*100%*
	No Off-Premise Advertising	85.6%	3.4%	9.2%	1.8%	—	—	*100%*
	Mean	***84.1%***	***5.2%***	***7.4%***	***1.2%***	***2.6%***	***0.6%***	—
Overall Mean		***78.0%***	***10.8%***	***7.8%***	***1.6%***	***1.7%***	***0.8%***	—

Table 13. Mean Percentage of Time for all Object Categories as a Function of Data Collection Zone Type for Low and High Visual Complexity Data Collection Zones During The Nighttime.

NIGHTTIME		Road Ahead	Misc	Unknown	Gauges	Target Billboards	Non-Target Standard Billboards	*Total*
High Visual Complexity	**CEVMS**	72.6%	13.4%	11.0%	1.0%	0.8%	1.2%	*100%*
	Standard Billboards	72.0%	14.0%	10.7%	1.1%	0.7%	1.4%	*100%*
	No Off-Premise Advertising	69.1%	17.5%	12.0%	1.4%	—	—	*100%*
	Mean	***71.2%***	***15.0%***	***11.2%***	***1.2%***	***0.8%***	***1.3%***	—
Low Visual Complexity	**CEVMS**	76.7%	6.2%	10.8%	1.2%	4.5%	0.6%	*100%*
	Standard Billboards	80.9%	5.0%	11.5%	1.3%	1.0%	0.3%	*100%*
	No Off-Premise Advertising	81.1%	3.5%	13.2%	2.2%	—	—	*100%*
	Mean	***79.6%***	***4.9%***	***11.8%***	***1.6%***	***2.8%***	***0.5%***	—
Overall Mean		***75.4%***	***9.9%***	***11.5%***	***1.4%***	***1.8%***	***0.9%***	—

Mean Percent of Time to Target Advertising

The interaction of time of day, advertising, and visual complexity was statistically significant: $F(1, 75) = 6.03$, $p < .05$. Figure 28 (also table 12 and table 13) illustrates the interaction among these three variables. There were no significant differences between CEVMS and standard billboards under high visual complexity during the day or nighttime. Unlike in experiment 1, the only time in which target CEVMS billboards attracted more glances than standard billboards was at night in low visual complexity environments.

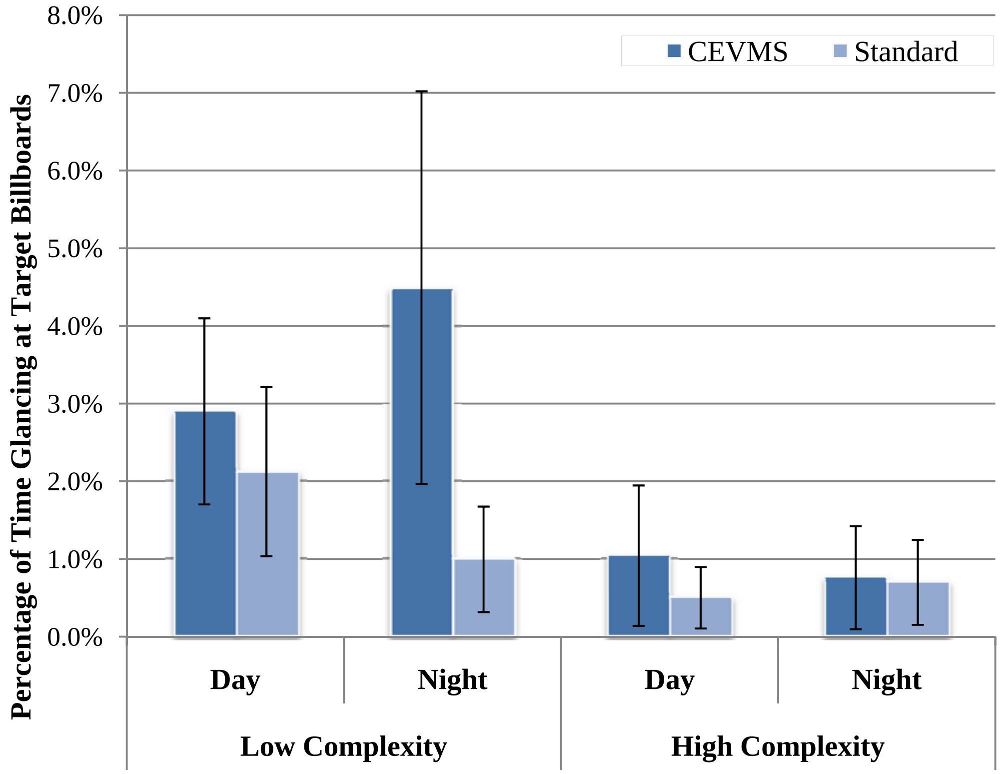

Figure 28. Percentage of Time Glancing at Target Billboards as a Function of Visual Complexity and Time of Day.

Mean Percentage of Time Looking at the Road Ahead

Time spent looking at the road ahead was significantly less in areas of high visual complexity (M = 72 percent) than in low visual complexity zones (M = 82 percent): $F(1, 125) = 65.81$, $p < .01$. The mean time spent glancing to the road ahead (averaged across CEVMS, standard, and no off-premise advertising) was 77 percent. There were no other statistically significant results for road ahead.

Mean Duration of Glances

There were no statistically significant differences between mean duration of glances to target CEVMS or standard billboards. Visual complexity of the environment also did not affect the mean duration of glances. Further, no significant interaction between billboard type and visual complexity was found. Overall, the mean glance duration to target billboards was 0.097 s.

When looking at the mean duration of glances to the road ahead, no significant differences for billboard type or visual complexity were found. Further, no significant interaction between billboard type and visual complexity was found. Overall, the mean duration of gazes at the road ahead was 0.69 sec.

Figure 29 shows the distribution of gaze durations as a function of time of day and billboard type. (Since the effect of visual complexity was not significant, this variable is omitted from the figure.) Table 14 shows the frequency of glances used to generate the distribution of glance durations. Across all data collection drives there were 901 glances at target CEVMS signs and 172 glances at target standard billboards. The shapes of the distributions for CEVMS and standard billboards are similar. The difference in the frequency of glances between the conditions is principally due to the fact that there were nine target CEVMS and only five target standard billboards. After accounting for exposure, the glance preference for CEVMS remained. There was also a trend toward more glances at billboards during the day than at night.

Table 14. Frequencies of Glances for the CEVMS and Standard Billboard Conditions as a Function of Time of Day.

V.	***Time of Day***	
Billboard Type	**Day**	**Night**
CEVMS	537 (4.26)*	364 (3.11)
Standard Billboard	112 (1.60)	60 (0.92)

*Numbers in parenthesis are the glance frequency totals divided by the number of billboards and participants in the respective conditions.

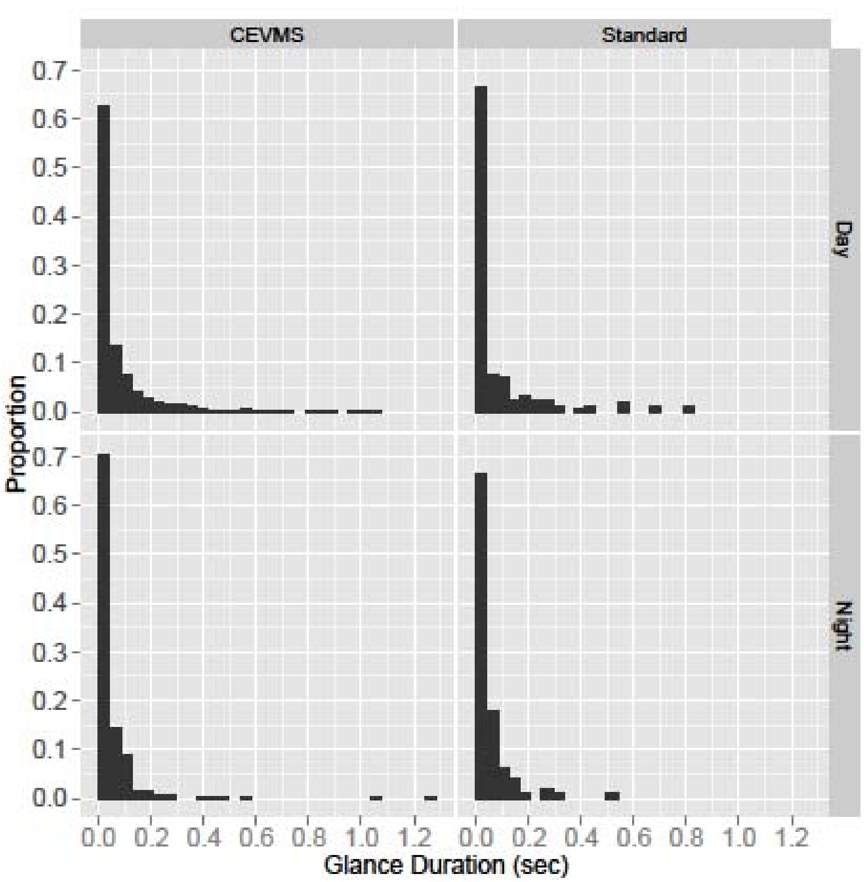

Figure 29. Proportion of Gaze Duration for CEVMS and Standard Billboards under Daytime and Nighttime Driving Conditions.

Long Duration Eye Glances

Table 15 presents a summary of the seven glances at target billboards that were equal to or greater than 1 s. All long glances were to CEVMS, ranging from 1 s to 1.28 s and all but one occurred at night. Glances equal to or greater than 1 s represent 0.78 percent of all glances at CEVMS.

Table 15. Summary of Long Glances at Off-premise Advertising in Richmond.

Data Collection Zone	***Time of Day***	***Advertising***	***Duration (sec)***	***Horizontal Offset (ft)***	***Distance from Sign (ft)***	***Horizontal Angle (deg)***
2	Night	CEMVS	1.12	82	334	13.79
10	Night	CEMVS	1.28	128	317	22.02
13	Day	CEMVS	1.00	119	554	12.12
16	Night	CEMVS	1.04	42	375	6.40
17	Night	CEMVS	1.00	56	141	21.68
17	Night	CEVMS	1.24	56	298	10.64
17	Night	CEMVS	1.04	56	142	21.58

Figure 30 shows the CEVMS (horizontally offset 56 ft from the roadway) in data collection zone 17, a relatively uncluttered environment (in the image, the CEVMS is highlighted with at red rectangle and is on the right side of the road). This billboard had three long glances (all at night), beginning at 141, 142, and 298 ft away. The visual angle subtended by the sign at these distances and offset was close to the area classified as road ahead. There is a traffic signal in close proximity to this billboard, but examination of individual records showed that no driver was stopped at this signal on any of the data collection drives.

Figure 30. Data Collection Zone 17 in Richmond.

Mean Percentage of Time Spent Glancing at Other Non-Target Standard Billboards

The analysis for percentage of time spent glancing at other standard billboards did not yield any significant differences. The overall average percentage of time for glances at non-target, off-premise, standard billboards was 0.84 percent.

Mean Percentage of Time Spent Glancing at Miscellaneous

Overall, there were more glances at miscellaneous objects in high visual complexity zones (M = 16 percent) than in low complexity zones (M = 5 percent): $F(1, 125) = 161.05$, $p < .01$. A significant interaction between visual complexity and advertising was found, $F(2, 125) = 6.55$, $p < .01$. As can be seen in figure 31, the interaction is the result of a large difference in the percentage of glances (at miscellaneous objects) between high and low complexity areas in the no advertising zones.

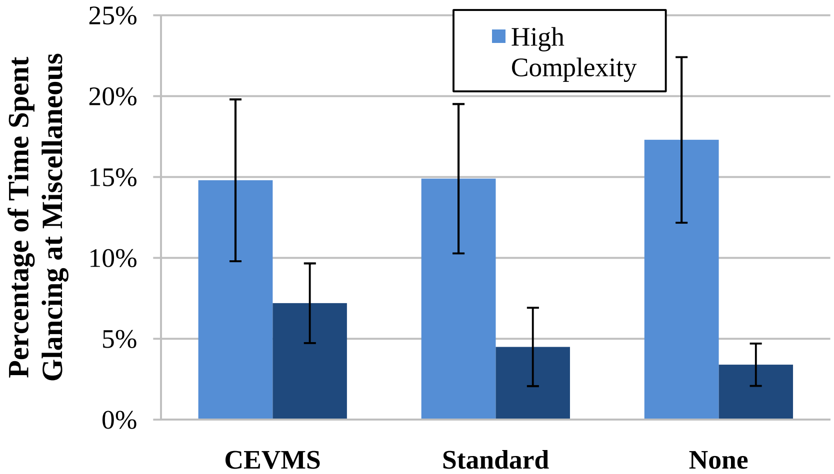

Figure 31. Percentage of Time Spent Glancing at Miscellaneous as a Function of Data Collection Zone Type and Visual Complexity.

Mean Percentage of Time Spent Glancing at Unknown Objects

There were no significant differences for percentage of time spent glancing at unknown areas. Overall, the mean percentage of time spent glancing at unknown areas was 9.7 percent.

Mean Percentage of Time Spent Glancing at the Gauge Cluster

The type of advertising zone (i.e., CEVMS, standard billboard, no off-premises advertising) significantly affected the percentage of time participants spent looking at the gauge cluster: $F(2, 125) = 4.15$, $p < .05$. Figure 32 shows the main effect for this variable. Participants spent significantly more time looking at the gauge cluster in zones with no off-premises advertising, than in zones with target billboards (i.e., CEVMS, standard billboards).

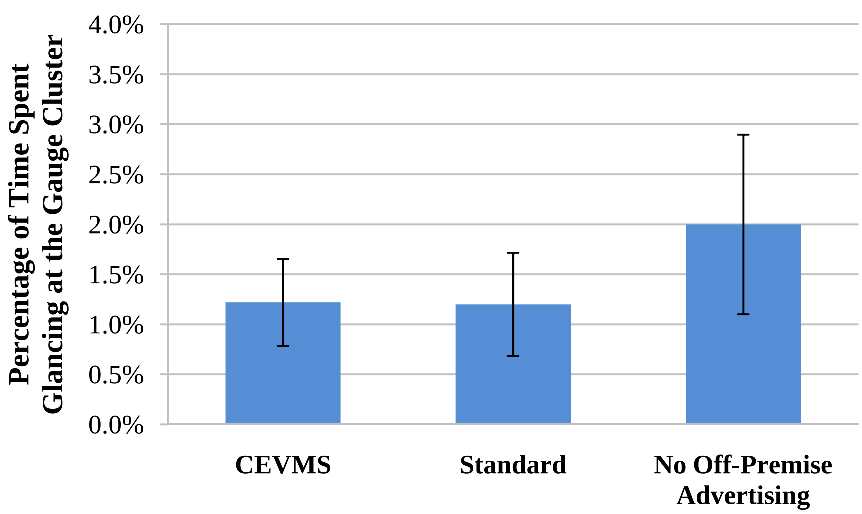

Figure 32. Percentage of Time Spent Glancing at the Gauge Cluster as a Function of Data Collection Zone Type.

Mean Rate of Glances

Overall, the mean rate of glances per second to CEVMS was 0.448. This was significantly greater than the mean rate of 0.277 glances per second to standard billboards: $F(1, 54) = 21.63$, $p < .01$. These rates are similar to those observed in experiment 1 (.42 and .20, respectively).

The mean rate of glances per second to target advertising in high visual complexity zones was 0.319, which was significantly less than the mean rate of 0.554 glances per second in low visual complexity zones: $F(1, 54) = 7.85$, $p < .01$. This finding suggests that drivers looked more frequently at the target advertising (regardless of CEVMS or standard billboards) when there were fewer information sources in and along the roadway environment (i.e., less visual complexity).

Relationship Between Photometric Measures and Glance Behavior

Analyses were conducted to determine if there was a relationship between photometric measures (luminance and sign contrast) and glance behavior. Correlational analyses compared glance duration to both luminance and Weber contrast measures for the individual signs. Separate correlational analyses were conducted for CEVMS and standard billboards during daytime and nighttime conditions. None of the correlations between glance duration and the photometric measures are statistically significant ($p > .05$). Exact correlational values follow:

CEVMS Correlations. In the daytime, the correlation between glance duration and luminance was $r = -.040$. At night the correlation was $r = 0.067$. The correlation between glance duration and contrast are $r = 0.020$ during the day and $r = 0.044$ at night. None of these correlations were significant ($p < .05$).

Standard Billboard Correlations. The correlations between glance duration and the luminance of standard billboards were $r = -0.015$ during the day and $r = -0.113$ at night. The correlation between glance duration and contrast of standard billboards with their background were $r = -0.061$ during the day and $r = -0.115$ at night. None of these correlations were significant ($p < .05$).

Observation of Driver Behavior

No near misses or driver errors were detected by the observers in the vehicle, or in later reviews of the recorded video.

Discussion

A second road experiment was conducted to examine the following three experimental questions regarding CEVMS and visual attention.

- Do drivers look at CEVMS more than at standard billboards?
- Are there long glances at CEVMS that would be indicative of a decrease in safety?
- Do drivers look at CEVMS and standard billboards at the expense of looking at the road ahead?

This experiment also included visual complexity as a factor since higher visual complexity had an impact on the results from the first experiment. In this experiment, the data collection zones were classified with respect to the visual complexity, or evident clutter, in the overall driving scene as defined by buildings, shopping areas, and other built environments [16,17]. In addition, subband entropy was calculated for representative images from the routes.[17] This measure correlated well with the categorization of the data collection zones.

In response to the first question, the results from this study showed that drivers glanced more at off-premises advertising (CEVMS and standard billboards) under low levels of visual complexity than under high levels of visual complexity. During the daytime, the percentage of time spent looking at CEVMS and standard billboards was about equal (with a higher percentage of time in low visual complexity areas). At night, however, the percent of time spent glancing at CEVMS was greater than that spent glancing at standard billboards under low levels of visual complexity. In fact, it was this difference in the nighttime and low visual complexity condition that appeared to be principally responsible for the observed greater visual attention paid to CEVMS than to standard billboards.

Regarding the second question, average durations of glances did not vary between CEVMS and standard billboard areas. On average, the gaze duration was about 0.097 s for both CEVMS and standard billboards. There were seven glances at CEVMS that were 1 s or greater in duration, and the longest glance was 1.28 s in duration. There were no glances of 1 sec or longer at standard billboards. Glances at advertising that were equal to or greater than 1 s in duration were rare in the study, and occurred at distances between 554 and 141 feet, at horizontal angles of 22 degrees or less, and when the surrounding environment had low visual complexity.

Overall, the rate of glances toward CEVMS (4.48 glances per 10 s) was higher than for standard billboards (2.77 glances per 10 s). The rate of glances at advertising (CEVMS and standard billboards) was higher under low visual complexity (5.54 gazes per 10 s) than under high levels of visual complexity (3.19 glances per 10 s). The drivers tended to direct more glances at off-premises advertising when the complexity of the visual environment was low, and in general directed more glances at CEVMS than at standard billboards.

In terms of the tradeoff in looking at the road ahead, visual complexity had an effect on the percentage of time that drivers devoted to the road ahead. Under high levels of visual complexity, drivers devoted an average 72 percent of the time to the road ahead, whereas they devoted an average 82 percent of the time to the road ahead in low visual complexity zones. In high visual complexity zones drivers glanced at non-billboard items on the side of the road more frequently than in low visual complexity zones. Drivers devoted approximately the same amount of time to looking at the road ahead in CEVMS, standard billboard, and no advertising zones. As in experiment 1, the drivers did look at the advertising; however, this did not appear to be at the expense of looking at the road ahead.

The nighttime luminance of the CEVMS ranged between 26 and 79 cd/m^2. Furthermore, the CEVMS in the high visual complexity areas had lower mean luminance than those in the low visual complexity areas. The combination of less visual clutter and higher luminance at night generally leads to greater conspicuity. It is likely that this led to the resulting higher percentage of time spent glancing at CEVMS than at standard billboards. Under high levels of visual complexity at night, the percentage of time spent glancing at CEVMS and standard billboards was equally low (0.8 percent and 0.7 percent, respectively). This result suggests that, at luminance levels observed in Richmond, the overall background in which the billboards appear affects glance probability. In other words, the visual complexity of the sign's surroundings (and not just the sign itself) influences drivers' gaze behavior.

In summary, the results of experiment 2 showed that drivers looked more at CEVMS than at standard billboards, but only at night under low levels of visual clutter. However, this did not appear to be at the expense of looking at the road ahead, where the average time spent looking was 77 percent across all conditions (with and without off-premise advertising). Rather, glance behavior was affected by the visual complexity of the scene, such that under high levels of visual complexity, percentage of time spent looking at the road ahead decreased and percentage of time spent looking at miscellaneous objects increased. The average duration of glances at CEVMS and standard billboards was about .097 s, which was up considerably from experiment 1 where the average was .07 s. However, both durations are well below the more than 2 s duration of eyes off the forward roadway at which Klauer et al. observed near-crash/crash risks more than two times those of normal, baseline driving.(12,20) When looking at the tails of the distributions of durations, there were very few glances that were equal to or greater than 1.0 s, with the longest glance being equal to 1.28 s. (20,21)

V. GENERAL DISCUSSION

This study was conducted to investigate the effect of CEVMS on driver visual behavior in a roadway driving environment. An instrumented vehicle with an eye tracking system was used. Roads containing CEVMS, standards billboards, but that did not contain off-premise advertising were selected. The CEVMS and standard billboards were measured with respect to luminance, location, size, and other relevant variables to characterize these visual stimuli. Unlike previous studies on digital billboards, the present study examined CEVMS as deployed in two US cities that did not contain dynamic video or other dynamic elements. These billboards changed content approximately every 8 to 10 seconds (s), consistent within the limits provided by FHWA guidance.(1) In addition, the eye tracking system used had nearly a 2-degree level of resolution that provided significantly more accuracy in determining what objects the drivers were looking at as compared to previous field studies examining CEVMS. Two experiments were conducted that were conducted in two separate cities where the same methodology was used but taking into account differences with respect to such variables as the roadway visual environment. The results and conclusions from this study are presented in response to the three main research questions listed below.

1. Do drivers look at CEVMS more than at standard billboards?
2. Are there long glances to CEVMS that would be indicative of a decrease in safety?
3. Do drivers look at CEVMS and standard billboards at the expense of looking at the road ahead?

In general, drivers devoted more glances at CEVMS than at standard billboards; however, there were no significant decreases in the proportion of time spent looking at the road ahead (i.e., eyes on the road) that could be directly attributed the CEVMS at the measured luminance and contrast levels. In experiment 1, the proportion of time spent looking at CEVMS was greater than for standard billboards (2.8 versus 1.6 percent). In a visually complex data collection zone with CEVMS, the proportion of time spent looking at CEVMS was 3.8 percent; however, this data collection zone had two CEVMS, which would represent an average of 1.9 percent per CEVMS. In experiment 2, drivers looked more at CEVMS than standard billboard at night under low levels of visual complexity (4.5 versus 1 percent). There were no significant differences between CEVMS and standard billboards under any of the other tested conditions. Regardless of experiment or type of billboard, the mean percentage of time drivers spent looking at target billboards was less than 5 percent.

Glances away from the forward roadway of greater than 2 s or 1.6 s duration have been proposed as indicators of increased risk of crashes. (12,20,21) In the current experiments there were no long glances at billboards meeting or exceeding 1.6 s. The longest glance at a target billboard was less than 1.3 s in both studies. Glances with a duration of 1 s or greater were rare: there were 5 in Reading (0.47 percent of the glances to CEVMS) and 7 in Richmond (0.78 percent of the glances to CEVMS). All of the glances greater than 1 s were to CEVMS.

Looking at the number of glances at advertising (per sign), the results from both experiments show substantially more glances at CEVMS than at standard billboards both during day and night conditions. As shown in table 16, drivers do dedicate more glances at CEVMS than to standard billboards; however, long glances considered as having the potential to increase risk were not observed.

Table 16. Number of Glances per Sign to CEVMS and Standard Billboards in Day and Night Conditions for Both Experiments.

	Day		Night	
	CEVMS	**Standard**	**CEVMS**	**Standard**
Experiment 1	3.57	1.82	2.62	1.37
Experiment 2	4.26	1.60	3.11	0.92

Drivers in experiment 1 devoted between 76 and 87 percent of their time looking at the road ahead. The highest percent was in the natural environment condition, where there were principally trees to the side of the road. The CEVMS complex data collection zone showed the lowest percentage of glances at the road ahead. This data collection zone had 2 CEVMS, 10 non-target standard billboards, and businesses and other on-premises advertising. Drivers in the CEVMS and standard billboard data collection zones devoted about the same percentage of time to looking at the road ahead (83 percent for CEVMS and 84 percent for standard billboards). The percentage of time devoted to looking at the road ahead measured in this experiment is comparable, but slightly higher, than those measured in other studies. Lee et al. observed 76 percent of driver time spent looking at the road ahead for the CEVMS scenario and 75 percent for the standard billboards scenario.

Drivers in experiment 2 devoted between 69 and 88 percent of their time to looking at the road ahead. The highest percentage of time spent looking at the road ahead was in the low clutter standard billboard data collection zones during the daytime. The lowest percentage of time spent looking at the road ahead was for data collection zones without off-premises advertising but with high visual clutter during nighttime conditions. In experiment 2 the percentage of time spent looking at the road ahead was affected by the level of visual clutter present in the data collection zones regardless of the presence or absence of CEVMS or standard billboards (82 percent for low clutter and 72 percent for high clutter zones).

Visual complexity, or visual clutter, has been shown in past research to have an effect on visual search performance.[17] Drivers may have difficulty with visual search (for example, searching for street signs) in environments that are highly cluttered.[16] In the experiments reported here, areas with high levels of clutter tended to be on arterials with businesses on the sides of the road. Increased glances away from the forward roadway in a high clutter environment also relates to the potential for safety risks (e.g., vehicle coming out of a business) and thus more glances the side of the road and away from the road ahead cannot be wholly attributed to distraction; however, it does appear to contribute to a decrease in the time drivers devote looking at the road ahead.

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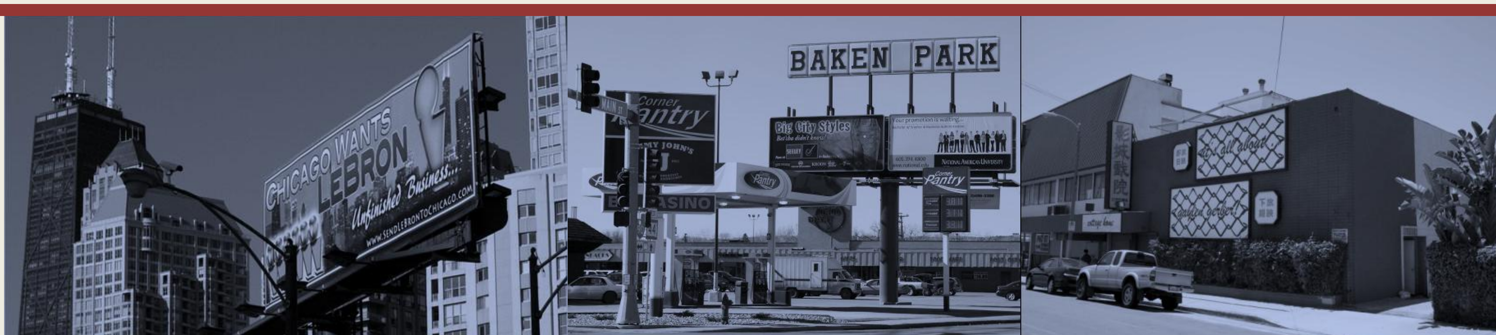
Beyond Aesthetics:

How Billboards Affect Economic Prosperity



Jonathan Snyder

Samuel S. Fels Fund

December 2011

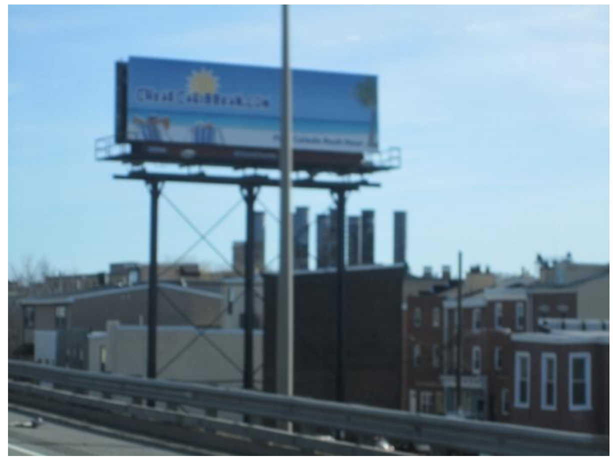
Introduction

This paper seeks to answer the question of how billboards affect the economic prosperity of their surrounding areas. By combining US Census data, local home price data, and zoning code data with geographic information system (GIS) and statistical analysis tools, one can examine the complex interplay between billboards and economic prosperity. After a brief examination of the history of billboards and billboard regulation and a review of the available literature, this paper will analyze three fundamental questions:

1. What impact do billboards have on real estate prices in the City of Philadelphia?
2. What impact do billboards have on home value within census tracts in the City of Philadelphia?
3. What impact do billboard regulations have on median income, poverty rates, and vacancy rates in different cities in the United States?

Philadelphia was selected for this research for several reasons. It is large enough to make a careful examination of the interplay between billboards and real estate prices. Further, it has elements of both weak and strong market cities in that it has an affluent residential downtown area with significant purchasing power[1], but as a whole the city has a lower median income compared to the national average.[2] Lastly, Philadelphia has a zoning code that caps billboards and attempts to decrease their number through attrition, but it also has a history of allowing billboard companies to bypass the restrictions within the zoning code.[3]

In short, Philadelphia presents a good case study for this analysis as it embodies the different arguments and tools of the debate while containing both strong and weak market characteristics. Additionally, because of research conducted at the University of Pennsylvania, the locations of all billboards are known, thus allowing much of the spatial analysis to occur.



Literature Review

A review of available literature reveals a dearth of information on the economic impact of outdoor advertising billboards on the surrounding community. A number of articles have focused on the economic benefit to businesses, and one study examined how billboards affect the values of the property on which they reside, but we found no studies that examined how billboards affect the surrounding area. Further, we found no studies that have been conducted which examine the relationship between billboard controls and the economic condition of cities within the United States.

The argument against outdoor advertising which appears most often focuses on billboards' adverse visual and aesthetic impact on the surrounding community. Harvey K. Flad, emeritus professor of geography at Vassar College, comments on the "visual pollution"

[1] $74,317 household income according to the Center City District's November 2010 retail report.
[2] US median household income is $51,425 according to US Census 2005-9 estimates, Philadelphia median household income is $36,669.
[3] The passage of Bill 100720 creates a signage district in Center City.

created by billboards[4] and how they "desecrate the landscape."[5] Similarly, Charles R. Taylor, professor of marketing and Weih Chang of Villanova University describe how the public and law makers responded to the growth of outdoor advertising with legislation designed to curtail it.[6]

An article in the *Journal of Law and Politics* made the comment that "…the American public has consistently found outdoor advertising to be intrusive, ugly, crassly commercial, and a taint on nature. The story of billboards in America is thus characterized by an ongoing struggle between an expanding industry and a resistant public."[7]

The arguments against billboards traditionally have followed this aesthetic narrative with varying degrees of success in terms of restricting the proliferation of billboards. In its assessment of its billboard regulations, the City of San Jose notes that "Signs play a significant role in the visual environment of a city in that they are prominent structures that are typically, and deliberately, highly visible in the public realm. Billboards are more prominent than most other signs due to their size and height."[8] Flad goes further in stating that "they [billboards] actively seek the eye and tend to dominate the visual field."[9]

From their first appearance in the late 19th Century through today, billboards have met resistance on aesthetic grounds. However, the arguments against billboards often did not discuss their impact on the surrounding area. Some anti-billboard writers do discuss the economic impact of billboards but do not find the argument compelling. For example Flad comments that "…they [billboards] also do not perform an effective function. They simply encourage consumption."[10] Other researchers such as Taylor and Chang, in referencing a previous study, note that "…billboards had critics long before the turn of the century. While public opinion and legislation managed to curb some of the most blatant abuses, outdoor advertising was such a valuable and economical

medium for many advertisers that it was difficult to control (Wood 1958)."[11] They further comment that "the [billboard] industry was quick to point out that billposting had a positive effect on the economy, both by helping landowners better utilize their property and by

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[4] Flad, Harvey K, "Country Clutter: Visual Pollution and the Rural Roadscape," *Annals of the American Academy of Political and Social Science*, 533: September 1997, pp. 124-125.

[5] Ibid, p. 123.

[6] Taylor, Charles R. and Weih Chang, "The History of Outdoor Advertising Regulation in the United States," *Journal of Macromarketing,* 15(47): 1995, pp. 48.

[7] "Note: Judging the Aesthetics of Billboards," *Journal of Law and Politics*, 23: 2007, pp. 173.

[8] "Billboards on Private Property & Off-Site Advertising on City Property: An Assessment of City of San Jose Sign Ordinance Regulations," City of San Jose, p. 7.

[9] Flad, p. 124.

[10] Flad, p. 123.

[11] Taylor and Chang, p. 50.

creating positive publicity for products and services."[12]

Despite the number of articles arguing for and against billboards on aesthetic, constitutional, and economic grounds, we are not aware of any studies that have been conducted which examine how billboards impact the area adjacent to them. Nor have any studies of which we are aware been conducted which examine whether billboard restrictions in different cities impact economic prosperity. A study conducted by Lilley III, DeFranco, and Buffalo of iMapData, Inc. entitled "The Outdoor Advertising Market and its Impact on Tampa Property Values" examined how billboards impacted the value of property in Tampa, Florida.[13] However, the study only examined the value of the property on which the billboards were located and determined that their presence elevated the property value. This is not an unexpected conclusion as the billboards represent income to the property owner. However the study did not attempt to assess whether those same billboards had any impact on the property values in the surrounding area.

In their paper "Ghettoizing Outdoor Advertising: Disadvantage and Ad Panel Density in Black Neighborhoods", Kwate and Lee

[12] Ibid, p. 53.
[13] Lilley III, William, Laurence J. DeFranco, and Clarence W. Buffalo, "The Outdoor Advertising Market and its Impact on Tampa Property Values,"iMap Data Inc. July 24, 2001.

examined how the quantity of outdoor advertising varies between neighborhoods which are predominantly black and predominantly white.[14] Their research showed that "black neighborhoods have more total billboards…than white neighborhoods"[15], however "income level was not significantly related to ad density after controlling for vacant lots."[16] More directly related to the discussion of billboards and economic prosperity, they concluded that "…the visual disorder caused by a high density of outdoor ads may reproduce inequality by marking neighborhoods as 'the ghetto' and reducing assessed value by residents and business owners."[17]

One reason for the paucity of studies on the issues of the economic impact of billboards on the surrounding area could be the difficulty in the valuation of open space. In their article "The Economic Value of Open Space," Fausold and Lilleholm comment:

Like all natural ecosystems, open space provides a variety of functions that satisfy human needs. However, attempting to assign monetary values to these functions presents several challenges. First, open space typically provides several functions simultaneously. Second, different types

[14] Kwate, Naa Oyo A. and Tammy H. Lee, "Ghettoizing Outdoor Advertising: Disadvantage and Ad Panel Density in Black Neighborhoods," *Journal of Urban Health: Bulletin of the New York Academy of Medicine*. 84(1): 2006.
[15] Ibid, p. 21.
[16] Ibid p. 27.
[17] Ibid, p. 29.

of value are measured by different methodologies and expressed in different units. Converting to a standard unit (such as dollars) involves subjective judgments and is not always feasible. Third, values are often not additive, and "double counting" is an ever-present problem. Finally, some would argue that it is morally wrong to try to value something that is by definition invaluable.

At a minimum, they say, open space will always possess intangible values that are above and beyond any calculation of monetary values.[18] They do mention that "the most direct measure of the economic value of open space is its real estate market value"[19] which suggests that the market value of the real estate could be a useful proxy for evaluating whether billboards impact adjacent home values. A study examining home value and proximity to cell phone antenna towers demonstrated the effectiveness of using this approach to analyze home values in relation to the homes' distance from a tower.[20]

Using a similar methodology in evaluating billboards could provide useful indicators of the true economic benefits and costs to a community of such billboards in order to determine whether relevant regulation might be appropriate. An examination of billboard controls between cities could also provide useful information in order for cities to make informed decisions as to which regulations (if any) to apply in order to provide the most benefit to their city.

Findings

Analytical Overview[21]

This paper attempts to determine how billboards affect economic prosperity. Economic prosperity is a broad concept, and the paper analyzes several characteristics that can be easily measured and captured: median income, poverty rate, vacancy rate, and home values. For the city of Philadelphia, this data is publicly available through the US Census, the University of Pennsylvania's Cartographic Modeling Lab, and the City's Recorder of Deeds Office. Using ArcGIS and SPSS software, this paper marshals the data to answer the general question of how billboards affect economic prosperity.

Question 1: What impact do billboards have on real estate prices in the City of Philadelphia?

[18] Fausold, Charles J. and Robert J. Lilieholm, "The Economic Value of Open Space," *Landlines*, 8(5): September 1996, p. 2

[19] Ibid, p. 3

[20] Bond, Sandy, "The Effect of Distance to Cell Phone Towers on House Prices in Florida," *Appraisal Journal*, Fall 2007

[21] This section presents a brief examination of the analysis which follows. For a more thorough review of the methodological considerations, please examine Appendix XX.

In Philadelphia, there is a statistically significant correlation between real estate value (as measured by sales price) and proximity to billboards. Using 2010 sale price data, and taking into account adjacent amenities such as libraries and parks, residential real estate within 500 feet of a billboard is $30,826 less valuable (p=.035) at the time of purchase, according to the statistical model shown in Table 1 below, and further described in Appendix A. According to the model, the amount of livable area is the most important factor in determining the price of a property. For each additional SQ FT of livable area, there is an $89.34 increase in price. Similarly, properties located within 1,000 ft. of amenities (such as Bike Paths, Libraries, and Parks) are associated with a higher price. Properties purchased within 500 ft. of billboards have a decrease in sale price of $30,826 and the correlation is statistically significant (p ≤ .05).

Statistical Model for the Price of Properties within 500 ft. of a Billboard

Model[22]		Unstandardized Coefficients		Standardized Coefficients		
		B[25]	Std. Error[26]	Beta[27]	t[23]	Sig.[24]
1	(Constant)	-4936882.57	315905.74		-15.628	.000
	Livable Area	89.34	.46	.820	195.084	.000
	Bike Path 1000 Ft	82254.61	11494.54	.030	7.156	.000
	Library 1000 Ft	120130.59	17703.46	.029	6.786	.000
	Park 1000 Ft	102946.99	11027.36	.040	9.336	.000
	Year Built	2510.88	162.52	.065	15.450	.000
	Billboard 500 Ft	-30825.85	14634.00	-.009	-2.106	.035

a. Dependent Variable: Sales Price

Table 1

Question 2: What impact do billboards have on home values within census tracts in the city of Philadelphia?

An analysis of Philadelphia census tracts and various economic prosperity indicators such as median income, percentage of vacant parcels, and population decrease do not reveal a correlation between billboards and economic prosperity. However, the analysis reveals a correlation between billboard density and home value. Billboards negatively impact home values. For each additional billboard in a census tract, there is a $947 decrease in home value. Considering that the mean number of billboards in a census tract is 4.8, the resulting decrease in value is $4,546 per house for homes in such districts when compared to the price of

[22] Multiple variables were tested in different combinations, most of which were found not to be statistically significant. This model includes only statistically significant variables (p < .05).
[23] A measure of how well the variable fits the model.
[24] Denotes whether the variable is statistically significant. Numbers less than .05 are statistically significant.
[25] The unstandardized coefficient indicates the strength of a relationship between an independent variable (e.g. Livable Area) and a dependent variable (e.g. Sales Price). Results are expressed as a change in the dependent variable per unit change of the independent variable. i.e., for each additional square foot of Livable Area, a property increase in value $89.40.
[26] Standard error of the independent variable
[27] The Standardized Coefficient or beta weight is the relative strength of each independent variable in the regression equation. The larger the absolute value of the beta weight, the larger the influence of the independent variable.

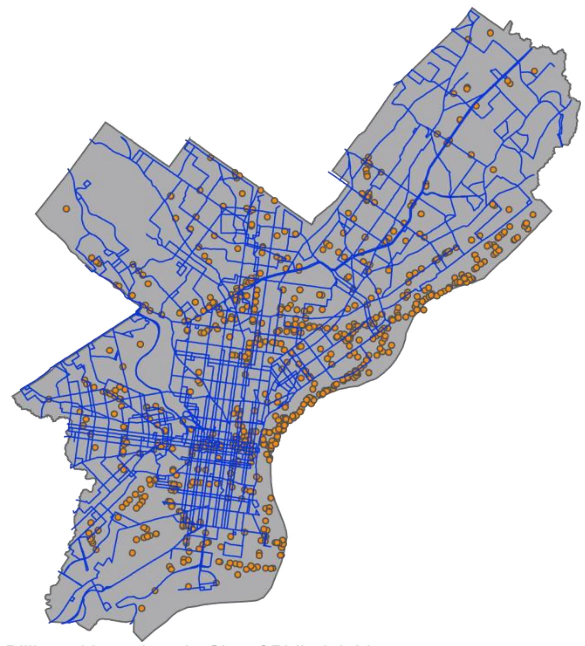
an equivalent home in a census tract without billboards.

Each additional billboard further degrades home value, but the reason behind the depression in home values is a nuanced one. Of course, billboards tend to be located along commercial corridors, yet our analysis shows that it is not the presence of the commercial corridor itself which has a negative impact on home values. Indeed when the variable "Percent of commercial properties" was included in the regression model, it was found to be not statistically significant. Thus, in this analysis, it is the billboard itself that has a depressing effect on the whole of the census tract. What this analysis cannot tell us is what characteristics of the billboard contribute to this problem. Is it the pole, the billboard itself, the lights upon it, or the commercialization of the viewscape[28] of local residents? It is likely that it is all, or some combination, of these factors that leads to this impact, but such analysis is beyond the scope of this paper.

Question 3: What impact do billboard regulations have on median income, poverty rates, and vacancy rates in different cities in the United States?

The sign codes of 20 cities listed to the right in Table 2 were condensed into a series of yes or no questions indicating the presence of a regulation or restriction pertaining to billboards. After all of the cities' answers were tabulated, a cluster analysis was undertaken which divided the cities into those having higher restriction (labeled "strict" in the following charts) and those having fewer restrictions (labeled "not strict" in the following charts).

These cities were divided into strict and not strict, and added as a variable to a chart listing median income, vacancy rates, and poverty rates. The medians of these rates were compared for strict and not-strict cities as seen below in Figures 1, 2, and 3.



Billboard Locations in City of Philadelphia

Table 2

Philadelphia	Jacksonville
Indianapolis	San Francisco
Youngstown	Austin
Tampa bay	Columbus
Houston	Fort Worth
Phoenix	Charlotte
San Antonio	Detroit
Chicago	El Paso
San Diego	Memphis
San Jose	Baltimore

[28] Lise Burcher in the case study "Urban Character and Viewscape Assessment " Isocarp Congress 2005 define viewscape as "a visual connection that occurs between a person and the spatial arrangement of urban and landscape features."

Median Income

The mean of the median income for strict control cities is higher than that for not-strict cities.

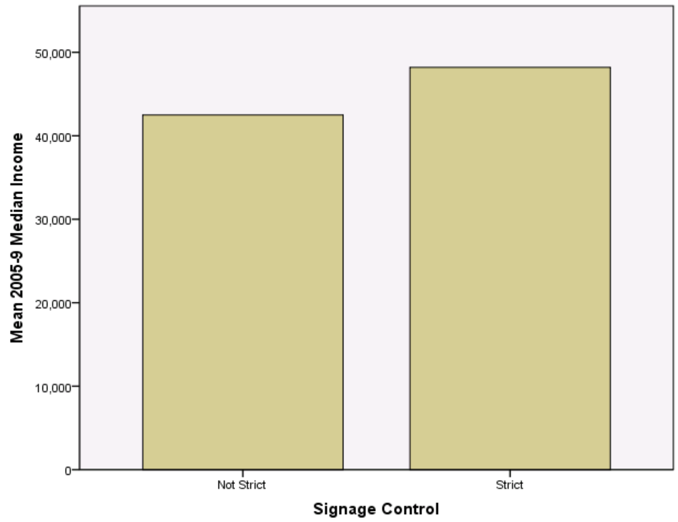


Figure 1 Billboard Control

Poverty Rate

The mean poverty rate for cities with stricter sign controls is lower than for cities without strict sign controls.

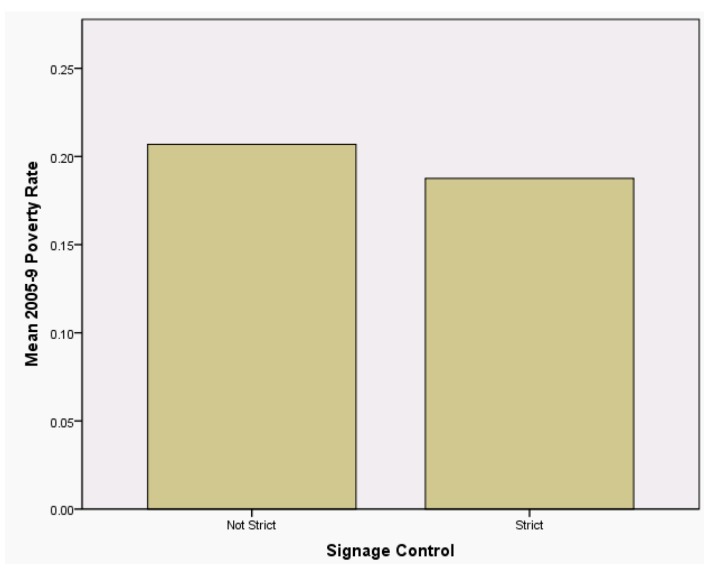


Figure 2 Billboard Control

Home Vacancy Rates

The mean home vacancy rate is lower for strict sign control cities.

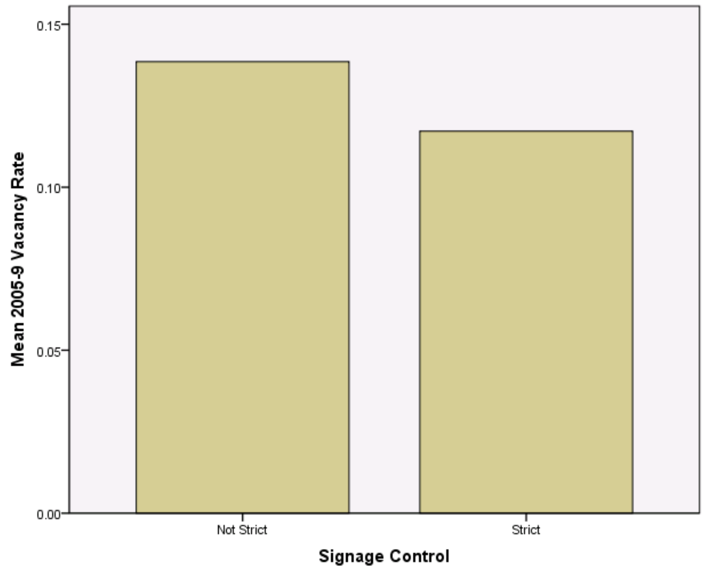


Figure 3 Billboard Control

Conclusion

This paper provides an approach and findings in an attempt to quantify the effects of billboards on real estate values in Philadelphia, and multiple measures of prosperity in 20 cities across the United States. Across these multiple measures, billboards were found to have negative financial and economic impacts. In Philadelphia, there is a statistically significant correlation between real estate value (as measured by sales price) and proximity to billboards. Properties located within 500 ft. of a billboard have a decreased real estate value of $30,826. Additionally, homes located further than 500 ft. but within a census tract/community where billboards are present experience a decrease of $947 for every billboard in that census tract. Income for strict sign control cities is higher than that for not-strict cities. Furthermore, the home vacancy and poverty rates for strict control cities are lower. Having strict sign controls does not negatively impact the economic prosperity of a city.

About the Author:

Jonathan Snyder is an urban planner from Philadelphia, Pennsylvania. He is a graduate of the University of Pennsylvania, with a Master in City Planning degree and a concentration in Community and Economic Development. He has worked to reform the process for obtaining accessory sign permits in Philadelphia. His research was generously support by a grant from the Samuel S. Fels Fund.

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Appendix

In order to conduct an analysis of billboards and economic prosperity, three questions were considered:

1. What impact do billboards have on real estate prices in the City of Philadelphia?
2. What impact do billboards have on home values within census tracts in the City of Philadelphia?
3. What impact do billboard regulations have on median income, poverty rates, and vacancy rates in different cities in the United States?

These questions get to the heart of the issue on economic prosperity incorporating home values, real estate prices, median income, poverty, and vacancy rates. These variables create a portrait of the economic status of a neighborhood. In order to answer these questions, a number of analyses were undertaken using the available information from the University of Pennsylvania's Cartographic Modeling Lab, the United States Census, and the Philadelphia Office of Property Assessment. Information about billboard locations was obtained from a Geographic Information System (GIS) map supplied by Prof. Amy Hillier of the University of Pennsylvania, School of Design.

Question 1: What impact do billboards have on real estate prices in the City of Philadelphia?

In order to answer this question we obtained data from the Philadelphia Office of Property Assessment and geocoded the housing sale data for the year 2010 into a GIS shapefile using ArcMap from ESRI. We chose 2010 data because it was the most recent. Further, using multiple years exposes the data to the vagaries of the market. By only using one year, we can limit the market price fluctuations and also eliminated the need to convert price data into constant 2011 dollars. We combined this point data with the billboard locations provided by Prof. Amy Hillier and calculated distance from 2010 property sales to billboards and used that as a variable in our statistical model.

OPA data included home values, however home values are not uniformly updated in Philadelphia and can prove to be unreliable. Likewise information on the number of bathrooms, bedrooms, fireplaces, pools, and exterior condition are not available for every house. Sales price, lot size, and livable area are present for every sale. We did not use data for sales with less than 100 square feet (SF) of livable area as those properties could be vacant lots or in poor condition. Similarly, we did not include properties whose sale prices were under $500. Many times properties will sell between relatives for $1 and this skews the data as these properties can have significant value even though that price does not reflect it. After eliminating real estate under $500 and under 100 SF, we tried many variable combinations to derive a statistical model that explains property value including: neighborhood characteristics (census tract population 1990, 2000, 2010, and percent changes in population; median income; licenses and inspection violations; fires; arsons; and percent owner-occupied), real estate characteristics (lot size, livable area, and age), distance to amenities (parks, libraries, and schools); and distance to billboards. Using different combinations of variables, the statistical model which best explains the sales price is as follows:

Model Summary

Model	R	R Square[29]	Adjusted R Square	Std. Error of the Estimate
1	.826[a]	.683	.683	675184.969

a. Predictors: (Constant), Billboard 500 Ft, Livable Area, Park 1000 Ft, Library 1000 Ft, Year Built, Bike Path 1000 Ft

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4936882.574	315905.74		-15.628	.000
	Livable Area	89.34	.46	.820	195.084	.000
	Bike Path 1000 Ft	82254.61	11494.54	.030	7.156	.000
	Library 1000 Ft	120130.56	17703.46	.029	6.786	.000
	Park 1000 Ft	102946.99	11027.36	.040	9.336	.000
	Year Built	2510.88	162.52	.065	15.450	.000
	Billboard 500 Ft	-30825.85	14634.00	-.009	-2.106	.035

a. Dependent Variable: Sales Price

Question 2: What impact do billboards have on home values within census tracts in the City of Philadelphia?

Another way of examining how billboards impact economic prosperity is to examine how they affect home values. Combining census tract data, along with Cartographic Modeling lab data, and billboard information allowed us to build a statistical model that effectively explains median home values in census tracts.

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[29] The R Square is a measure of how well the statistical model explains predicts the dependent variable; it varies between 0 and 1. The R square of .683 means that 68.3% of the property value can be explained by the independent variables.

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.920[a]	.847	.841	45651.456
a. Predictors: (Constant), % Hispanic 2005-9, % Asian 2005-9, Billboards per Tract, % Fed/State Owned 2007, Median Home Sale Price 2006, % Population Change, % PHA Owned 2007, % Water Shut-off 2007, % College Degree 2005-9, Median Home Value 2000, % African American 2005-9, % L&I Vilations 2005 b. Dependent Variable: Median Home Value 2005-9				

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	82868.258	9755.310		8.495	.000
	Billboards per Tract	-947.24	402.706	-.055	-2.352	.019
	% L&I Vilations 2005	85701.29	25769.992	.124	3.326	.001
	% PHA Owned 2007	-400493.10	144587.829	-.090	-2.770	.006
	Median Home Sale Price 2006	.138	.026	.178	5.369	.000
	% Water Shut-off 2007	-505543.69	153061.067	-.118	-3.303	.001
	% College Degree 2005-9	252775.73	18920.030	.442	13.360	.000
	Median Home Value 2000	.29	.044	.214	6.458	.000
	% Fed/State Owned 2007	1175955.48	261486.584	.109	4.497	.000
	% Population Change	53297.14	14705.008	.084	3.624	.000
	% African American 2005-9	-47591.10	11333.477	-.153	-4.199	.000
	% Asian 2005-9	-111195.66	36243.755	-.072	-3.068	.002
	% Hispanic 2005-9	-55228.04	18919.073	-.078	-2.919	.004

a. Dependent Variable: Median Home Value 2005-9

Question 3: What impact do billboard regulations have on median income, poverty rates, and vacancy rates in different cities in the United States?

This last question looks beyond Philadelphia and required the assistance of a legal intern. We examined the zoning codes of different cities across the United States. We converted the answers to these regulatory questions into yes/no answers which we then input into SPSS Statistical software (see the table below). We used cluster analysis to divide the cities into two clusters: those which regulate strictly and those which do not regulate strictly. Using this as an independent variable we added in economic information for each city and graphed the results. The graphing function allowed us to compare the median of the median incomes of strict control cities and not-strict control cities. We then employed this method to evaluate the median of the poverty rates and the vacancy rates between the two classifications of cities. The following column headings refer specifically to sign regulations; i.e. "Distance Between Signs" means: does the city require a certain distance between billboards.

City	Distance from Prohibited Areas	Distance from Highways	Distance Between Signs	Distance from Residential	Regulate Flashing Signs	Regulate Animated	Regulate Revolving
Philadelphia	Yes	No	Yes	Yes	No	No	Yes
Indianapolis	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Youngstown	Yes	No	Yes	Yes	Yes	Yes	Yes
Tampa bay	Yes	Yes	Yes	Yes	No	Yes	Yes
Houston	No	No	Yes	Yes	No	No	No
Phoenix	Yes	No	Yes	Yes	No	Yes	No
San Antonio	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chicago	Yes	Yes	Yes	Yes	Yes	No	No
San Diego	Yes	Yes	Yes	Yes	Yes	Yes	Yes
San Jose	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jacksonville	Yes	Yes	Yes	Yes	Yes	Yes	Yes
San Francisco	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Austin	Yes	No	No	No	Yes	No	No
Columbus	Yes	No	Yes	Yes	No	No	Yes
Fort Worth	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Charlotte	Yes	No	Yes	Yes	Yes	Yes	Yes
Detroit	Yes	Yes	Yes	Yes	No	Yes	No
El Paso	Yes	No	Yes	Yes	Yes	Yes	Yes
Memphis	No	No	Yes	Yes	No	Yes	Yes
Baltimore	No	No	Yes	No	No	Yes	Yes

City	Regulate Changeable Message	Regulate Lighting	Regulate Landscaping	Regulate Maintenance	Regulate Traffic	Ban Off-Premise Signage	Ban Electronic Billboard	Regulate Size
Philadelphia	No	Yes	No	No	No	No	No	No
Indianapolis	Yes	Yes	No	No	Yes	No	No	Yes
Youngstown	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Tampa bay	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Houston	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Phoenix	No	Yes	Yes	No	Yes	No	No	Yes
San Antonio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chicago	Yes	Yes	No	No	Yes	No	No	Yes
San Diego	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
San Jose	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jacksonville	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
San Francisco	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Austin	no	Yes	No	No	Yes	Yes	Yes	Yes
Columbus	Yes	Yes	No	No	No	No	No	Yes
Fort Worth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Charlotte	Yes	Yes	No	No	Yes	No	No	Yes
Detroit	Yes	Yes	Yes	No	No	No	No	Yes
El Paso	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Memphis	No	Yes	No	Yes	Yes	No	No	Yes
Baltimore	No	No	No	No	Yes	Yes	Yes	No

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