CITY OF MILWAUKIE
CITY COUNCIL MEETING
NOVEMBER 1, 2011

CALL TO ORDER

Mayor Ferguson called the 2113th meeting of the Milwaukie City Council to order at 7:00 p.m. in the City Hall Council Chambers.

Present: Mayor Ferguson, Council President Chaimov, and Councilors Dave Hedges, Joe Loomis, and Mike Miller

Staff present: City Manager Bill Monahan, Assistant to the City Manager Teri Bankhead, City Attorney Tim Ramis, City Recorder Pat DuVal, Public Affairs Coordinator Grady Wheeler, Community Development/Public Works Director Kenny Asher, Community Services Director JoAnn Herrigel, Planning Director Katie Mangle, Assistant Planner Ryan Marquardt, and Operations Director Jon LeBaron

PLEDGE OF ALLEGIANCE

Mayor Ferguson announced item 6.B, Decision on Metropolitan Area Communication Commission (MACC) Membership, was pulled from the agenda and it would not be considered further.

PROCLAMATIONS, COMMENDATION, SPECIAL REPORTS AND AWARDS

None scheduled.

CONSENT AGENDA

It was moved by Councilor Miller and seconded by Councilor Hedges to adopt the consent agenda as presented. Motion passed with the following vote: Councilors Miller, Chaimov, Hedges, and Loomis and Mayor Ferguson voting "aye." [5:0]

A. Resolution No. 97-2011: A Resolution of the City Council of the City of Milwaukie, Oregon, appointing Sine Adams as an at-large member to the Public Safety Advisory Committee;
B. City Council Minutes:
   1. September 27, 2011 study session;
   2. October 4, 2011 work session; and
   3. October 4, 2011 regular session; and
C. OLCC Application – Gramma's Corner Restaurant, 10880 SE McLoughlin Boulevard – change of ownership, greater privilege

AUDIENCE PARTICIPATION

Ed Zumwalt, Milwaukie, discussed his objections to the $5 million going to TriMet for the Portland-Milwaukie Light Rail because of that agency's questionable and underhanded tactics. He loved baseball but wanted the City Council to think about its neighborhoods along with the impacts of light rail. The City Council needed to take a more hands-on role.

Charles Arnell, Milwaukie, was the property owner and resident on the southern border of Spring Park. He mowed the grass to reduce fire danger and enhance the appearance as well maintained the irrigation system. He hoped to state his side of the story to the City Council related to code enforcement issues.

Mr. Monahan explained this had been an ongoing code enforcement issue, and staff and the City Attorney had been in contact with Mr. Arnell. He understood the City was interested in having the violations addressed and then move on to a discussion of what could be permitted.

Mr. Ramis understood Mr. Arnell wanted to address the City Council and provide his background.

Mayor Ferguson would contact Mr. Arnell to discuss the issue outside the 3-minute audience participation time.

Eric Schilling did not speak but supported Mr. Arnell.

Les Poole, Clackamas County, discussed the Countywide ballot measure and asked when Kellogg Lake and Kronberg Park would appear on the ballot.

PUBLIC HEARING

A. Sign Code Amendments.: Electronic Display Signs (File #ZA-11-02), Continued from October 18, 2011

Mayor Ferguson opened the public hearing that was continued from October 18, 2011 at 7:18 p.m.

Two items of correspondence were received: a letter dated November 1, 2011, from Lisa Batey that include supplemental information on jurisdictions to ban electronic billboards and a letter dated October 28, 2011, from Howard Dietrich, Oregon Worsted, with a proposed amendment to the code.

Public Testimony:

Bryan Dorr, Milwaukie, asked if the existing sign code or proposed amendments included signs mounted on vehicles. He fully supported the amendments because the signs installed for advertising purposes were not good for the aesthetics or livability of the community and created traffic safety issues.

Dan Dhruva, Clear Channel Outdoor, commented on the proposed amendments and expressed his opposition to several. The words "emergency" and "safety" were used but with no correlation between traffic accidents and signage. These electronic signs differed only in that they displayed multiple messages and therefore should only be limited to the same size as fixed messages. The State regulates sign series on its highways. Electronic display signs would be limited to only a handful of locations, so Milwaukie would not look like Las Vegas. He noted sign companies were required by state law to provide emergency messages including Amber Alerts. He felt dwell times needed to be considered.

Russ Stoll, Milwaukie, Planning Commission member, discussed availability of new technologies and compatibility with Milwaukie neighborhoods. Most people he spoke with did not like the big video display on McLoughlin Boulevard. He felt the Commission had struck a balance with the two-minute change time.

Mark Gamba, Milwaukie, Planning Commission members, said the question came down to whether Milwaukie wanted billboards or not and balancing a handful of businesses with the livability and beauty of Milwaukie. If Milwaukie had code in place that make it less interesting, then there will be fewer billboards.

Ms. Mangle briefly reviewed the project. Remodeling the community with care will take some time while these amendments target fixing those things which are now broken. These were allowing gas stations to advertise their prices through LED technology and allowing more electronic billboards along the highways. Other elements of the sign code would be looked at in more depth in the future.

Mr. Marquardt reviewed the October 18, 2011, hearing and the Planning Commission recommendations. During the hearing, staff heard concerns about specific areas and wanted to address that feedback. The first was the removal of the retroactive provisions of the code which staff did not feel would have much impact on the efficacy of the sign code regulations and found no problems in removing them. The second was the emergency provision which was not strictly necessary for the sign code but did leave a longer period of time during which people could apply for permits. On the issue of hold times, staff sensed some discomfort so proposed maintaining the current 10-second hold time in the current code which was consistent with what other jurisdictions were doing. The fourth issue was exemptions from size limitations on LED signs in some portions of the City including the North Industrial area along Hwy 99E. Other issues not addressed were whether that should apply to LED signs visible or fronting on McLoughlin Boulevard. A couple of other issues were addressed in the October 18, 2011, hearing including LED signs permitted in other parts of the downtown, and the Planning Commission recommended they only be allowed on McLoughlin Boulevard as they did not support the style in the Downtown Plan.

Ms. Mangle added the sign code already allowed for some separate provisions on McLoughlin Boulevard and the rest of the downtown.

Mr. Marquardt said in areas not along McLoughlin Boulevard exterior illumination was allowed, and people could apply for internally illuminated cabinet signs or awning signs. Lighted signs were not prohibited, but LED signs were more appropriate on McLoughlin Boulevard. If the City Council wanted to consider those changes it would be appropriate to go through the Historic Milwaukie Neighborhood District Association (NDA), downtown properties, Planning Commission, and Design and Landmarks Committee for their feedback because it was different from what was proposed and advertised. The second issue staff did not address was LED signs in neighborhood commercial areas surrounded by residential uses. The proposed amendments would reduce the amount of LED signage that could be allowed so there were some limits. Once again this would be more stringent, and people should have a chance to comment. Staff did have an ordinance prepared that removed the emergency clause, removed the retroactive provision, adjusted the hold time, and provided some exemptions for properties in the M-Zone along Hwy 99E. Staff anticipated coming back to the City Council with a revised ordinance at a future date based on Council direction.

Mayor Ferguson said from his perspective the first three changes were accurate.

Councilor Chaimov was normally reluctant to take direction other than that given by the Planning Commission because its recommendation was based on a public input process. He had heard few comments from the public than he would like to have prior to making a decision. He heard from the Planning Commission, North Industrial area property owners, sign companies, and Mr. Dorr. He had no problem with anything about the ordinance except the strip described along 99E north of Hwy 224. He felt other property owners should have the opportunity for the same economic advantage. He saw the area as being fundamentally different from the rest because it was an industrial area and for the most part was not interactive with the neighborhood around it. He supported the suggestion to carve out that strip without size and hold restrictions and the longer hold times throughout the rest of the City. He was not opposed to the emergency clause.

Councilor Hedges would like to go back to the 3-hour change rate. These signs were installed to distract people which he felt was a safety issue, so he supported the emergency clause. He did not agree with LED signs in neighborhood commercial areas. He referred to 14.18.100 having to do with the City's not issuing a permit if ODOT had not. He understood there would be income for building owners in industrial areas but was concerned about what would be visible from the Riverfront Park or to erect neon signs that would be visible from people's houses.

Councilor Loomis said staff identified the three things that would cause him to vote in favor of the amendments. He discussed his views about personal and property rights. He asked if there were a City fee, like a franchise fee, of some kind to generate revenue.

Ms. Mangle thought it would only be possible if the sign were on City property. She discussed market demands which seemed greater along Hwys 224 and 99E but not so much along 32nd and 42nd Avenues. The issue of signs will be included in the upcoming work with the community on these commercial areas within or near residential neighborhoods.

Councilor Loomis was not bothered by the signs nor were any of his contacts.

Councilor Miller asked how businesses on Main Street, 21st Avenue, and the side streets downtown could have illuminated signs with basic information.

Mr. Marquardt replied window signs were allowed as long as they did not take up more than 20% of the window area. They can be LED as long as they were in a window and not mounted on the outside of the building.

Councilor Miller was concerned about the fairness of the situation and would like to see the same standards apply to all downtown businesses. Could a business owner put a sign on another property on McLoughlin Boulevard to indicate it was open?

Mr. Marquardt responded that would be allowed, but there would be limits to the overall area.

Councilor Miller felt businesses were being treated differently. He would like to see a sign code that was uniform downtown and gave every business an equal opportunity.

Councilor Chaimov asked Mr. Ramis for comments about Councilor Hedges' suggestion changing from being permissive to mandatory language relative to ODOT's issuance of a permit.

Mr. Ramis replied the City Council could do that.

Mr. Marquardt understood ODOT would not issue a permit if the City had not indicated it was likely to issue its approval.

Mr. Ramis understood ODOT would issue a permit if indications were that the City was likely to issue its approval. He felt the code provision would work.

Councilor Hedges pointed out that the first sign that went up and attracted all the attention did not comply with ODOT's regulations.

Mr. Marquardt added it was now in compliance after the coordination issue.

Ms. Mangle recommended staying with the word "may" as it gave the Planning Director the authority to withhold the permit of the two agencies if the agencies were having coordination problems. She did not want to go into a bad governance program in the event ODOT cut back on its sign program.

Mr. Ramis added ODOT did have a program to solve this kind of problem called the Land Use Compatibility Statement, and the City can comment on whether it believed the application was in compliance or not.

Councilor Hedges recommended language that stated the Planning Director "will" withhold the permit if the application did not comply with State regulations. He further suggested changing the language to refer to compliance rather than a letter from ODOT.

The group discussed the hold times.

Councilor Miller requested an amendment that indicated more clearly what could be done by businesses not fronting McLoughlin Boulevard.

Mayor Ferguson recommended an information sheet for businesses about what could and could not be done but not include that language in the Code.

Mayor Ferguson closed the public testimony portion of the hearing at 8:20 p.m.

It was moved by Mayor Ferguson and seconded by Councilor Chaimov to provide direction to direct staff to revise §14.08.100, the 10-second and 2-minute provision would be included, emergency language included, amending Title 14, Sign Ordinance; to revise standards and regulations related to electronic display signs – File ZA-11-02 for the next regular session. Motion passed with the following vote: Councilors Miller, Chaimov, Hedges, and Loomis, and Mayor Ferguson voting "aye." [5:0]

OTHER BUSINESS

A. Energy Savings Projects – Resolution

Mr. LeBaron provided the staff report in which it was requested that the City Council approve a resolution authorizing the City Manager to sign an intergovernmental agreement with Clackamas County for an Energy Efficiency and Conservation Block Grant. He presented a summary of the 10 retrofit projects on City buildings using federal funds. Facilities maintenance funds would be used upfront and reimbursed as projects completed. Work would be done through existing contracts, and workload impacts would be managing contracts.

It was moved by Councilor Miller and seconded by Councilor Loomis to adopt the resolution authorizing execution of an intergovernmental agreement between the City of Milwaukie and Clackamas County for an Energy Efficiency and Conservation Block Grant. Motion passed with the following vote: Councilors Miller, Chaimov, Hedges, and Loomis, and Mayor Ferguson voting "aye." [5:0]

RESOLUTION 98-2011:

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, TO EXECUTE AN INTERGOVERNMENTAL AGREEMENT BETWEEN THE CITY OF MILWAUKIE AND CLACKAMAS COUNTY FOR AN ENERGY EFFICIENCY AND CONSERVATION BLOCK GRANT (EECBG)

B. Decision on Metropolitan Area Communication Commission Membership – Resolution

This item had been pulled from the agenda.

D. Board, Commission, and Committee Alternate Program – Resolution

Ms. Bankhead provided the staff report in which the City Council was requested to adopt a resolution establishing an alternate program for boards, commissions, and committees.

It was moved by Councilor Chaimov and seconded by Councilor Hedges to adopt the resolution establishing a program to select alternates for Boards, Commissions, and Committees. Motion passed with the following vote: Councilors, Miller, Chaimov, Hedges and Loomis and Mayor Ferguson voting "aye." [5:0]

<u>RESOLUTION 99-2011:</u>

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, ESTABLISHING A PROGRAM TO SELECT ALTERNATES FOR BOARDS, COMMISSIONS, AND COMMITTEES ("BOARD")

E. <u>Council Reports</u>

Mayor Ferguson and Councilors provided updates on meetings they attended on behalf of the City and announced upcoming community events.

Mayor Ferguson announced an executive session pursuant to ORS 192.660(2)(i) to review and evaluate the job performance of the chief executive officer.

ADJOURNMENT

It was moved by Councilor Chaimov and seconded by Councilor Hedges to adjourn the meeting. Motion passed with the following vote: Councilors Miller Chaimov, Hedges, and Loomis and Mayor Ferguson voting "aye." [5:0].

Mayor Ferguson adjourned the regular session at 8:46 p.m.

Respectfully submitted,

Pat DuVal

Pat DuVal, Recorder

Stauffer, Scott

From: DuVal, Pat
Sent: Tuesday, February 11, 2014 3:02 PM
To: Stauffer, Scott
Subject: FW: for sign code hearing record
Attachments: FHWA 2009 study on safety of electronic billboards.pdf; ltr to Council on electronic billboards + attachments 11-1-11.docx

Please add to 11/1/11 City Council packet as an exhibit. Thanks, P

From: Lisa Batey [mailto:lisabatey@msn.com]
Sent: Tuesday, November 01, 2011 12:36 AM
To: _City Council; Monahan, Bill; DuVal, Pat; Mangle, Katie
Cc: jh6432@gmail.com; monroestreetassociates@earthlink.net; mark@markgamba.com; russell@designameri.com; soilchem@gmail.com; clareleanne@gmail.com
Subject: for sign code hearing record

Gentlemen: Please see letter and attachments for your consideration in connection with tonight's consideration of sign code amendments. Thank you. --Lisa

Lisa Batey
11912 SE 19th Avenue
Milwaukie, Oregon 97222

Milwaukie City Council
10722 SE Main Street
Milwaukie, Oregon 97222

November 1, 2011

RE: Supplemental Information on Jurisdictions to Ban Electronic Billboards

Dear Mayor Ferguson and Council Members:

I write you on my own behalf, and am not representing the views of the Planning Commission (but am copying the other members for their information). I wanted to share some supplemental information as you consider the proposed amendments to the Milwaukie Sign Code at tonight's meeting. Specifically, attached are a series of newspaper articles on the growing number of cities to ban such signs, as well as a 2009 report from the Federal Highway Administration.

To the extent you have the contrary impression from your first hearing, I would point you to that FHA report, which is considered the most comprehensive federal study to date, and which makes no specific finding about driver distraction from electronic billboards, but says in several places that there is no conclusive evidence *either* way. E.g., page 39, "[t]he conclusion of the literature review is that the current body of knowledge represents an inconclusive scientific result with regard to demonstrating detrimental driver safety effects due to [electronic billboard] exposure." Interestingly, however, the attached *USA Today* article quotes a study done by an association of state transportation officials that determines that electronic billboards "attract drivers' eyes away from the road for extended, demonstrably unsafe periods of time."

The attached articles also reflect that so far this year the cities of Tacoma, Salt Lake City, and St. Petersburg, Florida have joined the ranks of cities banning electronic billboards. And other cities, like Phoenix, allow them along interstate freeways but not elsewhere.

Some cities have allowed electronic billboards only if multiple regular billboards are removed. For example, Albuquerque allows electronic billboards in restricted corridors, but requires three conventional billboards to be taken down for each electronic one erected. *See* http://www.abqjournal.com/main/2011/10/18/news/council-approves-new-sign-rules.html. But as noted in one of the attached articles, the St. Petersburg City Council declined a deal that would have removed 80 traditional billboards to allow for six digital ones.

Apart from the safety issues, I think it is also relevant to consider the issue of visual clutter. Do we want Milwaukie to look like stretches of Highway 99E further to our south or like 82nd Avenue? I, for one, would prefer the model of Lake Oswego, where the sign code disallowing signs mounted on poles (to say nothing of billboards) was upheld all the way to the Supreme Court. Compare the drive through Lake Grove (Boone's Ferry Road) to the one through Oak Grove in terms of visual clutter and distraction. On the subject of visual clutter, I would suggest that you take a look at the webpage of Scenic America, www.scenic.org, which reports on efforts to curtail the proliferation of billboards, whether electronic or traditional. For instance, the Missouri legislature recently abandoned efforts to override the Governor's veto of a pro-billboard bill.

In sum, the trend appears to be toward curtailing billboards generally, and electronic billboards in particular. From my discussions with a handful of Milwaukie residents, I believe that if more people were aware of the issue, there would be general support for the code package forwarded to you by the Planning Commission. But because of the nature of what was intended as a narrowly-crafted interim sign code amendment, broad consultation with neighborhood associations has not occurred. If you think the Planning Commission recommendation does not represent the views of the wider community, I would encourage you enact an interim moratorium on any additional electronic billboards, to preserve the status quo while consultation with neighborhood associations on a permanent code provision can occur.

Sincerely,

Lisa M. Batey

cc: Bill Monahan, City Manager
Pat Duval, Recorder
Katie Mangle, Planning Director
Planning Commission members

More cities ban digital billboards

Updated 3/24/2010, Larry Copeland, USA TODAY
http://www.usatoday.com/news/nation/2010-03-22-visual-soup_N.htm

[see map showing locations of bans at that site as well]

As the USA cracks down on texting while driving, more than a dozen cities around the nation have banned what some consider a growing external driving distraction: digital billboards.

Digital billboards change images every four to 10 seconds, flashing multiple messages from one or more advertisers on the same sign. Opponents such as John Regenbogen of Scenic Missouri deride them as "television on a stick."

Several communities have banned digital billboards outright, the most recent being Denver earlier this month. Other places have put a moratorium on them pending a federal study on whether they distract drivers. At least two other cities and two states are studying moratoriums.

"The digital billboards are a distraction," says Fred Wessels, an alderman in St. Louis, which just approved a one-year moratorium on new such signs in that city.

"If they weren't distracting, they wouldn't be doing their job," says Max Ashburn, spokesman for Scenic America, a national non-profit group that seeks to limit billboards.

Research on the issue is mixed. A Virginia Tech Transportation Institute study in 2007, financed by the billboard industry, found that they aren't distracting. A review of studies completed last year for the American Association of State Highway and Transportation Officials, however, concluded that they "attract drivers' eyes away from the road for extended, demonstrably unsafe periods of time."

"There's no doubt in my mind that they are not a driving distraction," says Bryan Parker, an executive vice president for Clear Channel Outdoor, which owns about 400 digital billboards. He cites industry-sponsored studies of collisions before and after digital billboards were installed in Albuquerque, Cleveland, and Rochester, Minn., that found no correlation.

"We've looked at that very carefully," says Bill Ripp, vice president of Lamar Advertising, which owns 159,000 billboards, 1,150 of them digital. "We don't want to cause any unsafe conditions for drivers."

Digital billboards are a fast-growing segment of the outdoor advertising market. Since a federal rule against them was eased in 2007, the number of digital billboards has more than doubled to about 1,800 of 450,000 total billboards. At least 39 states allow them. They cost an average $200,000 to $300,000 apiece, according to the industry group Outdoor Advertising Association of America.

In 2007, the Federal Highway Administration relaxed a rule against digital billboards, saying they don't violate the 1965 Highway Beautification Act's ban on "intermittent," "flashing" or "moving" lights. FHWA is researching the signs, using eye-trackers inside volunteers' vehicles to determine whether drivers look at the billboards and for how long. The study is to be completed this summer.

There is little current data on whether greater distractions for drivers come from in-vehicle or external factors. The Department of Transportation, which is leading the national push against texting while driving, says that 5,870 people were killed in distracted driving crashes in 2008. But the agency has not determined how many of those deaths involved an electronic device, another distraction such as eating or tuning the radio, or something outside the vehicle.

City council passes code that bans digital billboards

http://tacoma.komonews.com/news/politics/658605-city-council-passes-code-bans-digital-billboards
Tuesday, August 9th, 2011, 7:23pm

The Tacoma City Council has approved a new city code that bans digital billboards and requires the removal of existing non-confirming billboards.

The council, with a 7-to-1 vote, passed the measure on Tuesday. One council member was absent.

The decision is the latest development in that more than decade-old battle between the city of Tacoma and media giant Clear Channel Outdoor.

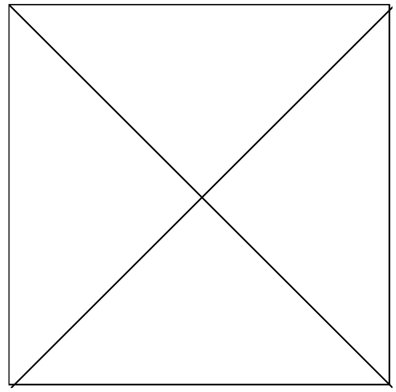
The fight began in 1997 when the council enacted an ordinance requiring "non-compliant" signs to be phased out over the following 10 years. The media company had until August 2007 to remove the non-compliant billboards. But when 2007 came, Clear Channel, instead of removing the billboards, filed a lawsuit against the city, claiming it was forced to enter litigation to protect its constitutional rights.

The city of Tacoma last year entered a preliminary settlement agreement under which Clear Channel could begin installing digital billboards in exchange for the removal of a certain number of existing billboards with each sign.

But following a public outcry over the issue, the city council made the decision against Clear Channel.

It is worth noting that digital billboards are known to be immensely profitable. The billboards, however, face fierce opposition from people who say they are ugly, distracting and dangerous.

All non-conforming billboards must be taken down by March of next year.

Salt Lake City Council bans electronic billboards 

BY DEREK P. JENSEN, The Salt Lake Tribune

http://www.sltrib.com/sltrib/news/51617372-78/billboards-council-electronic-ban.html.csp

First published Apr 12 2011 10:42PM, Updated Apr 27, 2011 02:05AM

Utah’s powerful billboard industry, which sees its future in electronic signs, suddenly has a blackout zone — Salt Lake City.

By unanimous vote, the City Council elected Tuesday to ban any new electronic billboard or the conversion of existing billboards to digital along all major roadways throughout the state’s capital.

Urged by Mayor Ralph Becker to take action, the council agreed — in the face of heated billboard-industry pressure — that glowing, image-swapping signs are a public-safety distraction to freeway drivers. At the same time, the council agreed to revisit the new ordinance (along with new studies on the impact of e-billboards) and perhaps make tweaks within nine months.

Council Chairwoman Jill Remington Love said the prohibition is not meant to disparage billboard companies, particularly Young Electric Sign Company — a “great, corporate citizen” with a near-60-year legacy. Instead, Love said, the ban will give City Hall an opportunity to look at “how do we showcase our skyline and how do we showcase our mountains? We are the capital city and we are a beautiful city. For me, while there may be studies that show that billboards may not be a distraction, it’s just common sense. … I don’t need studies to tell me that.”

Becker, who called it a “passionate subject,” said the restriction is important for Utah’s progressive capital community. “We have a new form of billboards and we don’t have standards, really, for that,” the mayor said. “We need to get a handle on that before we’re overwhelmed by electronic billboards.”

The city’s blackout will not affect its six existing electronic billboards. Neither will it impact digital business signs, though the Mayor’s Office insists regulations on those so-called “on-premise” signs must be contemplated soon.

A team of billboard executives waited patiently for hours before Tuesday's vote. They filed out without addressing the council.

"The ban on billboards is bad for business and at a bad time for the economy," YESCO Vice President Jeff Young said. "It's a scary, scary thing."

Young insisted his industry already is heavily regulated and said he hopes city officials will loosen the restriction over the next nine months.

On Monday, Downtown Alliance Chairman Vasilios Priskos and Executive Director Jason Mathis sent Love a letter calling for a postponed vote until the city can "create a truly comprehensive plan governing billboards."

Councilman Soren Simonsen also pointed out the usefulness of e-billboards for Amber Alerts. The controversial signs, he said, have probably saved more people through Amber Alerts than they have harmed.

Still, he supported the ban, saying he wants to take seriously how the "visual clutter" impacts the image of the city at its gateways.

"That could really have a lot do to with how we perceive ourselves as a community."

Earlier this week, Senate President Michael Waddoups, R-Taylorsville, said the city's ban could likely end up at the Legislature next year. "I don't know how it would turn out — I'd like to think we'd be accommodating to business," he told The Tribune.

YESCO, Reagan Outdoor Advertising and others now have the rest of the year to convince the city their buzzing billboards aren't that bad.

Durham Council votes unanimously against digital billboards
By Lisa Sorg, Indy Weekly, 02 Aug 2010

http://supportdurhambillboardban.com/results.html

It wasn’t the dozen pairs of blinking sunglasses or the parade of nonprofit groups pleading their cases, but a photo of the R. Kelly Bryant Jr. Bridge that may have made the biggest impact on the Durham City Council’s vote on digital billboards.

The graceful pedestrian bridge, which spans N.C. 147, serves as the eastern gateway to Durham and joins northern and southern neighborhoods that had been fractured by the highway. And posted near one of its ends is a billboard advertising the Dixie Gun & Knife Show happening this weekend in Raleigh.

The clash of these two landmarks underscored public and council concerns about the impact of digital billboards on aesthetics and property values—without any proven benefits to offset these social and financial costs. After more than three hours of public hearing and discussion, Durham City Council voted unanimously, 7-0, to keep the current billboard ordinance, which prohibits digital billboards.

Councilmembers had received more than 1,000 e-mails from the public in favor of keeping the current ordinance, which does not allow digital billboards. Less than 10 e-mails asked for a change to permit them.

"This issue has united Durham like no other," said Councilman Mike Woodard, shortly before voting to keep the current ordinance.

One of the 1,000 e-mails was from the bridge's namesake, who asked that Council keep the current ordinance.

"What are we going to do about that billboard?" asked Councilman Howard Clement.

Lewis Cheek, an attorney for K&L Gates, the firm representing Fairway Outdoor Advertising, noted erroneously that only by changing the ordinance could that billboard come down.

Councilwoman Diane Catotti contradicted Cheek, noting that the billboard could indeed be dismantled under the current ordinance—it just couldn’t be replaced.

"Durham has nothing to gain from [the change]," Catotti added.

St. Pete council rejects digital billboards

By Michael Van Sickler, Saint Petersburg Times Staff Writer
In Print: Friday, August 19, 2011

http://www.tampabay.com/news/st-petersburg-council-rejects-digital-billboard-deal/1186802

ST. PETERSBURG — After more than three years of negotiations, digital billboards were rejected by the City Council in a vote early this morning.

Council Chair Jim Kennedy and council members Wengay Newton, Steve Kornell, Herb Polson and Karl Nurse rejected a deal to remove 80 traditional billboards and replace six regular billboard faces with six digital billboard faces. It would have included $2.1 million worth of advertising space over 20 years for city public service announcements.

Overall, it would have meant 6.4 square feet of traditional billboard faces would be replaced with one square foot of digital, which wasn't enough for dozens of residents who spoke in opposition to the deal.

"I can turn off my television, but I can't turn off a billboard," said Bill Bucolo, a Park Street neighborhood resident. "They are going to pollute our airspace and no one will be able to turn them off."

A far smaller number of residents who spoke Thursday said they supported the plan because it meant fewer overall billboards. And some said they liked how the billboards looked.

"I'm less concerned with the narrow view of some residents who are anti-billboard and more concerned with people who don't have jobs," said David McKalip, a neurological surgeon. "These boards promote business in a low-cost way."

Beginning under then-Mayor Rick Baker, city attorneys had been negotiating with billboard companies to allow the digital signs, a new generation in outdoor advertising. The new signs use screens that advertise messages that change frequently, some every 10 seconds. That makes the signs more profitable for the billboard companies,

But some say the ads, because they are brighter, are more dangerous and distracting for motorists and annoying for nearby homes.

Digital billboards have already been permitted in Tampa, Pinellas and Hillsborough counties, Pinellas Park and South Pasadena.

But the signs have run into sustained opposition from the Council of Neighborhood Associations in St. Petersburg. Members of the group have written letters and made phone calls to council members.

During an Aug. 4 public hearing where 20 people spoke against the plan to allow the signs along Interstate 275 and its feeder streets, the council voted 5-3 to allow the deal to move forward, with Kennedy, Kornell and Nurse voting against it.

Some who allowed the deal to move to Thursday's second hearing, however, said they could only do so if it was changed to allow a "sunset clause" that would require the signs to come down at a later date.

Clear Channel Outdoor, which had previously objected to such a clause, agreed to take the digital signs down in 20 years and replace them with traditional signs.

"Part of our calculation was that was what it would take to get this plan done," said Todd Pressman, a local lobbyist for Clear Channel.

That wasn't good enough, however, for CONA officials, who said it wasn't an actual sunset clause because Clear Channel got to replace the signs.

"A 'sunset' is that the signs come down — period," said Travis Jarman, a CONA representative.

In a discussion that last about three hours, Kennedy and Polson said it would be more effective to review the city's entire sign ordinance, which is scheduled next month, before recommending changes to a portion of it by allowing digital billboards.

"If we're going to do this, we should look at the entire ordinance," Kennedy said.

Kornell said he disapproved of the way the council learned what the deal was. He said that, beginning under Baker, administrative staff met with Clear Channel representatives, and excluded residents from participating.

"I won't accept any deals that come out like that," he said. "That's not democracy."

Nurse and Newton seemed more conflicted and didn't explain why they voted against the deal.

Council members Leslie Curran, Jeff Danner and Bill Dudley voted to approve the plan.

Dudley said he believed in free enterprise. A supporter of red light cameras because he thinks it makes streets safer, Dudley dismissed concerns that digital billboards were distracting.

"A pretty girl walking down the street is distracting, too," he said. "Let's outlaw that, too."

Danner said there was a threat the state would now pass a more onerous law that would allow Clear Channel to erect more digital billboards.

"We have an opportunity to rid our city of blight," Danner said. "The harm is to do nothing."

Curran said the deal, far from being negotiated in a backroom, had been put together quite openly.

Afterward, Pressman said he didn't know what Clear Channel would do next except for maintain its existing inventory of billboards. He said unlike other jurisdictions in Tampa Bay that have recently approved the billboards, St. Petersburg proved to be quite different.

"The citizen input was higher than we saw elsewhere," Pressman said. "It was a matter of emotion overcoming facts."

Maureen Stafford, who helped lead CONA to defeat the deal, said afterward that it was far from a victory.

"It's not a win," she said. "I hope we can use this neighborhood energy that we showed on this issue and move forward and remove existing billboards."

The Effects of Commercial Electronic Variable Message Signs (CEVMS) on Driver Attention and Distraction: An Update

PUBLICATION NO. FHWA-HRT-09-018 FEBRUARY 2009

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
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McLean, VA 22101-2296

FOREWORD

The Highway Beautification Act of 1965 outlined control of outdoor advertising, including removal of certain types of advertising signs, along the Interstate Highway System and the existing Federal-aid primary roadway system. Since that time, most States have evolved a body of legislation and/or regulations to control off-premise outdoor advertising (billboards), and many local governments have developed similar rules.

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 (DBB) and Electronic Billboards (EBB).

The present report reviews research concerning the possible effects of CEVMS used for outdoor advertising on driver safety, including possible attention and distraction effects. The report consists of an update of earlier published work, an investigation of applicable research methods and techniques, recommendations for future research, and an extensive bibliography. 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.

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Services

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16. Abstract

The present report reviews research concerning the possible effects of Commercial Electronic Variable Message Signs (CEVMS) used for outdoor advertising on driver safety. Such CEVMS displays are alternatively known as Electronic Billboards (EBB) and Digital Billboards (DBB). The report consists of an update of earlier published work, a review of applicable research methods and techniques, recommendations for future research, and an extensive bibliography. The literature review update covers recent post-hoc crash studies, field investigations, laboratory investigations, previous literature reviews, and reviews of practice.

The present report also examines the key factors or independent variables that might affect a driver's response to CEVMS, as well as the key measures or dependent variables which may serve as indicators of driver safety, especially those that might reflect attention or distraction. These key factors and measures were selected, combined, and integrated into a set of alternative research strategies. Based on these strategies, as well as on the review of the literature, a proposed three stage program of research has been developed to address the problem.

The present report also addresses CEVMS programmatic and research study approaches. In terms of an initial research study, three candidate methodologies are discussed and compared. These are: (1) an on-road instrumented vehicle study, (2) a naturalistic driving study, and (3) an unobtrusive observation study. An analysis of the relative advantages and disadvantages of each study approach indicated that the on-road instrumented vehicle approach was the best choice for answering the research question at the first stage.

17. Key Words	18. Distribution Statement
Commercial Electronic Variable Message Signs, CEVMS, Digital Billboards, DBB, Electronic Billboards, EBB, Driver Attention, Driver Distraction, Driver Safety, Outdoor Advertising	No restrictions. This document is available through the National Technical Information Service, Springfield, VA 22161.

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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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1.0 INTRODUCTION

The present report reviews research concerning the possible effects of Commercial Electronic Variable Message Signs (CEVMS) used for outdoor advertising on driving safety. The report consists of an update of earlier published work by Farbry et al., which consists of an investigation of applicable research methods and techniques, recommendations for future research, and an extensive bibliography.[1] The Federal Highway Administration (FHWA) has evaluated possible safety effects of CEVMS in two previous studies. The first study was completed in 1980 and the second in 2001.[1,2] Since then, CEVMS technology has evolved, in particular the expanded use of digital Light Emitting Diode (LED) arrays, as well as the implementation of new programmable formats and messages. The present report concentrates on identifying potential factors that may contribute to determining whether there are any significant safety concerns or distraction effects with regards to CEVMS used for outdoor advertising. Throughout the present report, the acronym CEVMS will be employed to refer to both the singular and plural case.

1.1 BASIC RESEARCH QUESTION

The basic research question being addressed in this report is whether the presence of CEVMS along the roadway is associated with a reduction in driving safety for the public. Increases in vehicle crashes along a certain portion of the roadway are generally regarded as an indication of a possible safety concern. Thus, the measurement of crash rates in the vicinity of CEVMS in comparison with crash rates at matched control locations without CEVMS is one possible way to determine possible safety impacts. But, the crashes are rare multicausal events which are difficult to measure. Therefore, measurements of driving behavior in near-crash situations are sometimes taken as a substitute for crashes. These safety surrogate measures may then be generalized to other driving behaviors that represent possible precursors of crashes—like sudden braking, sharp swerving, or traffic conflicts—even though no crash occurs. Usually, because these safety surrogate measures are more frequent and easier to measure, they are often employed instead of or in addition to crashes. Thus, determining the frequency of occurrence of certain relevant safety surrogate driving behaviors in the vicinity of CEVMS in comparison with the frequency of occurrence of such behaviors at matched control locations without CEVMS is another possible way to determine possible safety impacts. The validity of using such safety surrogate measures rests on the assumption that they are related to actual vehicle crashes, which seems intuitively reasonable but has not been conclusively demonstrated.

There is another approach to determining the possible safety impact of CEVMS. This approach is based upon the abstract psychological constructs of driver attention and distraction. A driver must devote a certain amount of attention to the driving task at hand, and sufficient distraction from that driving task could be associated with the higher risk of a crash. The measurement of driver eye glance behavior is often taken as an indirect indicator of attention. Thus, the driver's eye glances should be concentrated in the region of the roadway ahead, and any frequent or long eye glances away from this region toward other objects, including CEVMS, could be regarded as an indication of possible driver distraction. If the eye glances toward a certain object and away from the roadway ahead are sufficiently frequent or sufficiently long to exceed criteria established for safe driving, this outcome can be taken as an indication of a possible safety impact. The validity of using eye glance behavior measures in this manner rests on two assumptions: that eye glances are related to attention and/or distraction and that there are generally accepted safety criteria for excessive eye glances away from the roadway ahead. These assumptions are not universally accepted.

In summary, the basic research question is whether the presence of CEVMS along the roadway is associated with a reduction in driving safety for the public. The three fundamental methods for answering this question include if there is an increase in crash rates in the vicinity of CEVMS, if there is an increase in near-crashes or safety surrogate measures in the vicinity of CEVMS, and if there are excessive eye glances away from the roadway ahead in the vicinity of CEVMS.

1.2 SCOPE

In this report, a CEVMS will be defined as a self-luminous advertising sign which depicts any kind of light, color, or message change which ranges from static images to image sequences to full motion video. The CEVMS may also be referred to as an Electronic Billboard (EBB) or a Digital Billboard (DBB). The present report concentrates on the possible effects of CEVMS on driver attention, driver distraction, and roadway safety. The report is divided into 10 sections: Introduction, Literature Review Update, Key Factors and Measures, Research Strategies, Future Research Program, Recommended First Stage Study, Conclusions, References, Bibliography, and Appendices.

Investigating the possible safety effects of CEVMS is sufficiently complex so that no single experiment will answer all of the relevant scientific and engineering questions. The present report outlines a top-level broad program of potential future research, and it defines in greater detail three possible studies, any one of which could serve as a possible first step. After these discussions, a course of action is recommended. Although off-premise advertising signs constitute the main focus of FHWA attention, the influence of on-premise advertising signs will also be considered to create a more comprehensive and consistent research approach.

In parallel with the present project, a related study is being performed under National Cooperative Highway Research Program (NCHRP) Project 20-7 (256), titled "Safety Impacts of the Emerging Digital Display Technology for Outdoor Advertising Signs." Both the present project and the NCHRP study begin with the understanding that, despite years of research, there have been no definitive conclusions about the presence or strength of adverse safety impacts from CEVMS. The two projects differ in three significant ways. First, the NCHRP study is undertaking a broad, critical review of the research literature in this field. The present project is more focused on literature update oriented toward the identification of suitable independent and dependent variables for future research. Second, the NCHRP study is reviewing current regulations and guidelines for the control of roadside advertising that may exist in foreign countries to assess their applicability to U.S. highways and streets. Aside from mention in the literature review update portion, the present report does not directly address regulations and guidelines. Third, the NCHRP study will synthesize current research results and current regulations and guidance to recommend how State and local governments might enact reasonable temporary guidance for the control of CEVMS within their own jurisdictions. Such guidance may be applicable on an interim basis pending the outcome of future, more conclusive research outlined in the present project. As a result, such interim guidance may need to change as new technical information is developed. The present report does not provide guidance to States on the control of CEVMS.

2.0 LITERATURE REVIEW UPDATE

2.1 BACKGROUND

The research that addresses the possible safety and distraction effects of outdoor advertising billboards has been extensive and long standing. Dating back to the 1930s, this research reached a peak in the 1950s and 1960s. Research continued at low ebb through the 1980s, and then all but ceased. With the advent of newer billboard technologies (e.g., lamp matrix, rotating disc, tri-vision, and, most recently, LED) and with the corresponding questions raised by regulators, safety researchers, and the public, research has increased again since the turn of the century. These newer billboard technologies, especially the LED technology, ushered in the increasing use of CEVMS for on-premise and off-premise advertising. The current research focuses on information that has become available since the publication of the most recent FHWA report, but it also includes earlier relevant studies not previously identified.[1] The present review is organized into five major categories according to the research context for the study: post-hoc crash studies, field investigations, laboratory investigations, previous literature reviews, and reviews of practice. The categories that contain empirical data have a brief discussion of potential methodological problems inherent in the types of studies characteristic of that category.

2.2 POST-HOC CRASH STUDIES

Post-hoc crash studies review police traffic collision reports or statistical summaries of such reports 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.

A number of studies have been conducted over the years using the crash methodology. Three such studies were not reviewed in prior FHWA studies. In a study similar to that conducted in the 1970s in Massachusetts, the Freeway Operations Unit of the Wisconsin Department of Transportation (WisDOT) analyzed bidirectional crashes on I-94 near an electronic billboard with a 5.0 s message dwell time.[3,4] Crash rate data were collected for 3 years prior to and 3 years after sign operation began. For eastbound traffic, total crashes increased 36 percent over the 3 year post operational period compared to the baseline preoperational condition. In addition, side-swipe crashes increased 8 percent, and rear-end crashes increased 21 percent. For westbound traffic, total crashes increased 21 percent, sideswipe crashes increased 35 percent, and rear-end crashes increased 35 percent. The authors of the WisDOT study concluded that, "it is obvious that the variable message sign has had an effect on traffic, most notably in the increase of the side-swipe rate" (p. 3).[4]

Stutts et al. conducted an analysis of several crash data reporting systems to identify major sources of driver distraction and the relative importance of different types of distraction as contributing factors in motor vehicle crashes.[5] Distraction was described as one form of inattention, and it has been implicated as a factor in more than half of the police reported inattention crashes identified by the National Highway Transportation Safety Administration.[6] In this study, 8.3 percent of drivers involved in police-reported crashes were identified as distracted, but 35.9 percent of these crashes were coded as "unknown." For this and other reasons, it is believed that the reported percentage of distraction-related crashes substantially under-represents the true statistics.[5] Among the types of distractions coded in the database, the largest contributor (29.4 percent) was "outside person, object, or event," and the second largest (25.6 percent) was "other."

Smiley et al. studied the relationship between video advertising signs and motor vehicle crashes at downtown intersections and on the freeway.[7] Crash data were analyzed from three intersections before and after the introduction of video advertising signs. When the three intersections were evaluated individually, two demonstrated increases in both total and rear-end crashes; the third showed no significant increase in such crashes. The authors believe that the lack of statistical significance may be due to the small number of crashes identified. For the freeway environment, crash data on the video approach was compared to crash data for three non-video approaches, one of which was deemed the most comparable (control) segment. For this comparison, the authors report a negligible increase in injury collision crash frequencies on the video approach.

Following the design of their earlier study on conventional billboards, Tantala and Tantala analyzed police accident reports in the vicinity of seven digital billboards on interstate highways near Cleveland, OH.[8] Both their current and earlier studies were sponsored by the outdoor advertising industry. Reported crashes were analyzed for a period of 18 months prior to and after the conversion of these billboards from conventional to digital. They found essentially no statistically significant differences in crash rates before and after the conversion.

Unfortunately, all post-hoc crash studies are subject to certain weaknesses, most of which are difficult to overcome. For example, the vast majority—more than 80 percent in one study—of accidents 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, researchers need to collect comparable data in such studies before and after the change and in the after phase at equivalent but unaffected roadway sections. Last, 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. For a more specific analysis of some possible design and methodological concerns with the study by Tantala and Tantala, see Wachtel.[8,9]

2.3 FIELD INVESTIGATIONS

The spectrum of field investigations related to roadway safety is broad. It includes unobtrusive observation, naturalistic driving studies, on-road instrumented vehicle investigations, test track experiments, driver interviews, surveys, and questionnaires. Klauer et al., in one of several papers to emerge from a National Highway Traffic Safety Administration (NHTSA) project known as the "100-Car Naturalistic Driving Study," provides preliminary information about the role of driver inattention in crashes and near-crashes.[10] Although the study did not specifically address CEVMS, it represents an important methodology for investigating driver distraction. Their results show that 78 percent of crashes and 65 percent of near-crashes included driver inattention and/or distraction as a contributing factor. This contribution from inattention and distraction is larger, by a factor of three, than previous research has indicated. The authors believe that the “100-Car Naturalistic Driving Study” provides the first direct link (i.e., without reliance on crash surrogate measures) showing distraction/inattention as a contributing factor to motor vehicle crashes. In another variant of the “100-Car Naturalistic Driving Study,” Klauer et al. identifies four specific unsafe behaviors that contributed to crashes and near-crashes.(11) One of these, inattention and/or distraction, is of direct relevance to the present project. This term is operationally defined by Klauer et al. as a driver looking away from the forward roadway for greater than 2.0 s. Under these conditions, the odds of a crash or near-crash are nearly twice those than when the driver attends to the forward roadway. The study stresses the importance of including near-crashes in the database for two reasons. First, the kinematics of crashes and near-crashes are similar, meaning they involved comparable levels of driver emergency actions, such as swerving and hard braking. Second, 83 percent of the crashes in this study were not reported to the police. Thus, the study indicates that relying on crash statistics alone will substantially underreport crashes due to inattention and/or distraction.

Lee, McElheny, and Gibbons undertook an on-road instrumented vehicle study on interstate and local roads near Cleveland, OH.(12) The project, conducted on behalf of the outdoor advertising industry, looked at driver eye 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). Performance measures, such as speed maintenance and lane keeping, were also recorded. Although the major data collection was done in daylight, a small pilot study was conducted at night. One of the key questions that the study sought to answer was whether longer glances consisting of over 1.6 s were associated more with any of the event types.(12) This question is based on findings from various studies, including the “100-Car Naturalistic Driving Study,” which indicates that longer glances away from the road are associated with higher crash rates.(13) In discussing their results, the authors state, “…the distributions of glance duration were similar across all event types, and there was no obvious pattern of longer glances being associated with any of the event types” (p. 59).(13) The findings from the nighttime pilot study led to, “the overall conclusion, supported by both the eye glance results and the questionnaire results, that the digital billboards seem to attract more attention than the conventional billboards and baseline sites (as shown by a greater number of spontaneous comments regarding the digital billboards and by longer glances in the direction of these billboards” (p. 10).(13) However, in view of the small number of participants, these data were not analyzed. The authors suggest that at least some of these findings, “would show statistical significance” if a larger study were to be conducted (p. 64).(13)

Beijer, Smiley, and Eizenman, working on behalf of the Government of Toronto, Canada, evaluated driver eye glances toward four different types of roadside advertising signs on roads in the Toronto, Canada area.(14) The study employed an on-road instrumented vehicle approach with a head-mounted eye-tracking device. Active signs—all but traditional billboards—consistently received longer glances and more total glances than fixed signs. The study found that 22 percent of all glances were defined as long or greater than 0.75 s. Since 22 of the 25 subjects made at least one long glance at an advertising sign, the authors conclude that, “distraction…was not just an isolated incidence” (p. 101).(14) The authors suggest that active signs may result in greater distraction than past studies of the effects of commercial signing might indicate.

After a previous study raised concerns about the number and duration of glances made to video advertising signs along an expressway in Toronto, Canada, Smiley et al. conducted another study at the request of the city government.[7,15] Five different measures were taken, including eye movements, traffic conflicts, traffic speed and headway, crash data, and public surveys. The crash data results were described earlier. The results from the other measures were mixed. All of the video signs attracted attention; the probability of a driver's looking at such a sign upon approach was nearly 50 percent. The average glance duration was 0.5 s, similar to those for official traffic signs. However, one-fifth of the video sign glances lasted longer than 0.75 s, and some lasted as long as 1.47 s, which were considered unsafe amounts of time. About 38 percent of glances at the video billboards were made when headways were 1.0 s or less, and 25 percent of the glances took place when the signs were more than 20 º off the line-of-sight. These glances were also considered to be unsafe. According to the study, glances at static billboards and bus shelter ads were made at even greater angles and shorter headways.

It is noteworthy that the earlier study that led to this research, also evaluating a video billboard on an expressway in Toronto, Canada, produced dramatically different results. This study found five times the number of glances per subject and three times the glance duration than did the later 2004 study.[15] Smiley et al. attribute these differences to the longer sight distance available for the sign in the earlier study, the uninterrupted view, and the location of this sign on a curve.[7]

Smiley et al. also employed safety surrogate measures of conditions which might be precursors of a possible crash.[7] The study measured these safety surrogate indicators by means of the unobtrusive observation method. The drivers of the vehicles were not aware that they were being observed. In this context, the study measured traffic conflicts, vehicle speed, and vehicle headway. When comparing video and non-video approaches at the same intersection, at one intersection the authors found no differences in traffic conflicts; however, at the other, they found a significant increase in drivers who applied their brakes without cause on the video approach. Given the comparability of sites, they concluded, "the only reason that could be found for increased braking…was the presence of the video sign" (p. 108).[7] The speed and headway data were inconclusive.

In addition, Smiley et al. employed a "public" survey method to determine whether video advertising might be considered to have "a negative effect on traffic safety" (p. 110).[7] Participants in the survey were approached at three intersection sites which had video advertising. Of the 152 persons surveyed at the 3 locations, 65 percent felt that video advertising signs had a negative effect on the ability of a driver to attend to pedestrians and cyclists. Furthermore, 59 percent of the people said that as drivers, their attention was drawn to such signs, while 49 percent of those felt that such signs had a negative effect on traffic safety. A surprisingly large number of people—9 out of 152—stated that they personally had experienced near-crashes, and 2 had experienced actual rear-end crashes that they associated with video advertising signs. In addition, 86 percent of the respondents suggested that restrictions should be placed on those types of signs, such as their locations and brightness.

Three of the field investigations of CEVMS effects mentioned earlier employ indirect measures of driver attention (eye glances) in the context of an on-road instrumented vehicle experimental approach. Although CEVMS stimuli are real, the experimental approach suffers from a degree of artificiality in its implementation. The research participants usually drive in an experimental vehicle along a route which is contrived for experimental purposes, and the route does not serve a useful purpose in their daily lives. The research participants sometimes drive with an experimenter present in the instrumented vehicle, and they sometimes wear a head-mounted eye-tracking device. Two of the three studies cited used a somewhat intrusive but more accurate head-mounted eye-tracking device. One study used a less obtrusive but also less accurate vehicle-mounted eye-tracking device, where cameras were mounted in the vehicle cab. Although the research participants were not told the purpose of the investigation, the participants were definitely aware that they were participating in a driving experiment of some kind, and they may not have exhibited entirely natural behaviors as a result. Furthermore, eye glance behavior is difficult to measure, and it is not easy to relate directly to attention and distraction. For a more specific analysis of some further design and methodological concerns with the Lee et al. study cited above, see Wachtel.[12,9]

The unobtrusive observation method employed in the field by Smiley et al. to collect safety surrogate measures of potential crashes (e.g., sudden braking, inadequate headway, etc.) does not create an artificial environment for the driver.[7] Usually, the sensing devices (loop detectors, remote cameras, or posted human observers) are hidden in the environment, and they are not noticed by the drivers. There is no problem of artificiality; the drivers in the study are not even aware that they are part of a study. However, the safety surrogate variables being measured are usually infrequent, often multicausal, comparatively subtle, and difficult to measure. For CEVMS, these variables can also occur over great distances, adding to the difficulty in accurately and reliably capturing data relating to these variables.

Finally, the public survey method employed by Smiley et al. collected the opinions, attitudes, and feelings of passersby at intersections with video advertising signs.[7] The results, while interesting as a measure of public sentiment, are difficult to relate to the basic research question of determining whether there are any significant distraction effects or concrete safety concerns with regards to CEVMS used for outdoor advertising.

2.4 LABORATORY INVESTIGATIONS

Laboratory investigations related to roadway safety can be classified into several categories: driving simulations, non-driving simulator laboratory testing, and focus groups.

For one such investigation, a non-driving simulator laboratory testing environment was used.[16] For this study, researchers filmed a 27 minute drive and had 200 licensed drivers view the film while their eye movements were recorded. Billboards generated greater levels of visual attention than suggested by measures of recall. Billboards were viewed by individuals whether they were in the “target” audience or not and regardless of whether the billboard was of high or low interest. In addition, billboards located close to official highway signs received more attention than those that were farther away.

In a driving simulation laboratory, Crundall et al. compared street level advertisements (SLAs), such as those on bus shelters, to raised level advertisements (RLAs), which include elevated ads on poles or streetlights.[17] The study was based on the understanding that, in undemanding situations, drivers have spare attentional capacity; however, when cognitive demands increase, spare capacity diminishes. As a result, eye movements must focus on the driving task at hand.

Based on their prior research, Crundall et al. believe that if an advertisement is within the driver's visual field during a search for hazards, it will attract visual fixations and distract attention needed to safely perform the driving task.[17] Because the most relevant information for hazard detection is distributed along a horizontal plane, the authors believe that the majority of visual fixations will fall within this plane when the driver is looking for driving-relevant information. Thus, if an advertisement is located within this window, it will receive more fixations than will advertisements located outside this window. The principal research hypotheses tested were that during conditions when drivers were looking for hazards, SLAs would receive the most attention. When spare capacity was greater, the attention given to RLAs would increase. The results supported these hypotheses. A post-drive survey showed that SLAs were judged more hazardous than RLAs.

Young and Mahfoud used a driving simulator in which subjects drove three routes in the presence and absence of billboards.[18] The presence of billboards adversely affected driving performance in terms of lateral control and crashes. Billboards also had an adverse impact on driver attention in terms of the number of glances made to them, and they were associated with a higher subjective mental workload. In addition, the recall of official road signs was adversely affected by billboards, which the authors interpreted to mean that drivers were attending to billboards instead of relevant road signs. The authors reached a "persuasive overall conclusion that advertising has adverse effects on driving performance and driver attention" (p. 18).[18]

In a recent study using a driving simulator, Chan and her colleagues compared the impacts of in-vehicle versus external-to-vehicle distractors on performance of inexperienced versus experienced drivers.[19] The authors were particularly concerned with young, novice drivers because of the elevated crash risk for this segment of the driving population. They were also concerned because the researchers believed that distraction could adversely affect the novice drivers' poorly developed hazard detection and avoidance skills. Chan et al. theorized that external distraction may be more harmful than internal distraction because when drivers are looking within the vehicle, it should be obvious to them that they are not processing relevant roadway information. However, when drivers are looking at sources outside the vehicle, it is likely that the forward roadway is still somewhere within the field of view. Thus, it may not be obvious to drivers (particularly inexperienced drivers) that this important information is not being fully processed since it is peripheral, unattended, or both.

Chan et al. were primarily interested in the longest glances away from the forward roadway since these have been implicated in prior studies (e.g., Horrey and Wickens[20]) as major contributors to crashes. Thus, they used as their dependent measure the maximum time that drivers spent continuously looking away from the forward roadway during a specific distraction task. In terms of in-vehicle distractors, as hypothesized, inexperienced drivers showed a consistent pattern of looking away from the roadway for longer periods of time than experienced drivers. However, the findings about external distractions were quite different and unexpected in two key ways. There was very little difference in the duration of distraction episodes between the experienced and inexperienced drivers, and the maximum distraction durations were significantly longer for the out-of-vehicle tasks than for the in-vehicle tasks. The two experience groups showed little differences in the percentage of distraction episodes longer than 2.0 s, 2.5 s, and 3.0 s, in all cases longer for the external than for the in-vehicle distractors. The study also demonstrated that, "drivers are more willing to make extended glances external to the vehicle than internal to the vehicle" (p. 17).[19] Chan et al. conclude that, "it is likely that our out-of-vehicle tasks (which not only engage attention but also draw the eyes and visual attention away from in front of the vehicle) would have quite significant detrimental effects on processing the roadway in front of the vehicle" (p. 22).[19]

Three of the laboratory investigations of possible distraction effects mentioned above employ indirect measures of driver attention (eye glances) in the context of a driving simulation experimental approach. The interactive driving simulator approach offers considerable experimental control over stimulus parameters, like the size, number, proximity, and change rate of CEVMS or other advertising display. The simulator is also well suited for executing parametric studies of the effects of these variables on possible driver distraction. However, the approach suffers from all of the sources of artificiality found in the on-road instrumented vehicle approach for conducting field research mentioned earlier. Also, the approach adds the important source of virtual driving as opposed to real driving. Although the vehicle cab of the driving simulator may have certain degrees of motion (pitch, roll, heave, etc.) to enhance the sense of virtual driving, the vehicle cab does not move down the roadway. The visual scene passes by while the driver and vehicle remain stationary. This degree of artificiality requires considerable adaptation on the part of the research participants, most of whom need some amount of training to become accustomed to the differences between driving in a simulator and driving on a real road. Moreover, 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.

One laboratory investigation had research participants watch films of driving scenes containing billboards while their eye movements were being recorded.[16] This study represents an example of a non-driving simulator laboratory method. It suffers from all of the aforementioned limitations of laboratory CEVMS or billboard research. In addition, it does not measure the participants' response while engaged in a driving task.

2.5 PREVIOUS LITERATURE REVIEWS

Garvey summarizes the literature on sign visibility, legibility, and conspicuity on behalf of the advertising industry.[21] One of his recommendations bears on the issue of distraction from billboards. He suggests that signs need not be detectable at distances greater than the minimum required legibility distance. Specifically, he states, "if a sign is detected before it is legible, the driver will take numerous glances at the sign in attempts to read it" before it becomes legible, and "these momentary diversions are inefficient and potentially dangerous" (p. 1).[21]

Cairney and Gunatillake, working on behalf of the Government of Victoria, Australia, undertook a review of the literature with the goal of generating recommendations for guidelines for the control of outdoor advertising in that State.[22] They cited two prior reviews by Wachtel and Netherton in the United States and by Andreassen in Australia as the basis of their review.[2,23] Since these earlier studies, the technology used for the display of roadside advertising and the addition of in-vehicle distractors has changed. Cairney and Gunatillake conclude that the principal concern remains the effects that a sign may have on a driver's visibility of other road users, the roadway, and traffic control devices, particularly at high-demand locations, such as interchanges. They suggest several research approaches, including case studies, site investigations, and laboratory simulations to address these newer technologies. They conclude that the best of the studies conducted to date demonstrate that when all confounding variables are controlled statistically, sites with advertising signs have higher crash rates than sites without them. However, large, well-controlled studies will be required to detect significant effects because the effect size is small. They further conclude that changeable message signs may have a more direct bearing on crash rate than static signs. The findings of the study suggest that unregulated roadside advertising has the capability of creating a significant safety problem. The conclusions from their review run counter to Andreassen's conclusion that, "there is no current evidence to say that advertising signs, in general, are causing accidents" (p. 4).[23]

On behalf of the Scottish government, Wallace undertook the most extensive and critical review of the literature since the two earlier FHWA studies.[24] The study concludes that driver distraction from attention-getting sources can occur even when the driver is concentrating on the driving task. Furthermore, there is abundant evidence that billboards can function as distractors, particularly in areas of visual clutter. Billboards can distract in "low information" settings, and distraction from external factors is likely to be underreported and underrepresented in crash databases.

The Dutch National Road Safety Research Institute reviewed the recent literature for the Dutch authorities and emphasized some of the stronger, more consistent points made in other studies, such as billboards should not be placed near challenging road settings, especially at or near intersections. Also, they should not resemble official traffic signs in pattern or color.[25] Furthermore, dynamic signs that display motion or include moving parts should not be permitted. A key conclusion was that, "precisely in a dangerous situation it is important for the driver to have his attention on the road; an advertising billboard can slow the driver's reaction time, which increases the chance of a crash" (p. 2).[25]

The WisDOT sponsored a study which summarizes available information about the safety impacts of outdoor electronic billboards and tri-vision signs.[26] Similar to Crundall, et al. and Wallace, the authors of this study determined that greater visual complexity associated with a high-volume location, such as intersections, required drivers to search the environment more than at lower-volume locations.[17,26] The authors stated, "it can be conjectured that additional visual stimuli such as billboards may add additional demand to driver workload in high-volume intersections" (p. 6).[26]

Bergeron, on behalf of the Government of Quebec, Canada, re-reviewed many of the studies originally examined by Wachtel and Netherton and added reviews of several studies conducted subsequent to 1980.[2,27] His findings and conclusions, similar to those of other researchers, indicate that attentional resources needed for the driving task are diverted by the irrelevant information presented on advertising signs. This distraction leads to degradation in oculomotor performance, which adversely affects reaction time and vehicle control capability. The study concludes that when the driving task imposes substantial attentional demands that might occur on a heavily traveled, high-speed urban freeway, billboards can create an attentional overload that can have an impact on micro and macroperformance requirements of the driving task.

2.6 REVIEWS OF PRACTICE

Bergeron also performed a site review at a major elevated expressway in Montreal, Canada, which was proposed for two future billboards.[28] By reviewing the scene and considering various parameters such as traffic volumes, road geometry, and traffic control devices, Bergeron concludes that this 1.1 km section was already causing excessive cognitive demands, particularly for the many unfamiliar drivers. He concluded that the billboards would be inadvisable for several reasons. First, the location creates a substantial demand on drivers' mental workloads because of its complex geometry, heavy traffic, high traffic speeds, merging and diverging traffic, and the presence of signs and signals that require drivers to make rapid decisions. Also, at the perceptual level, the billboards would add confusion to the visual environment, thus impairing drivers' visual search, tracking, and reaction time. In addition, at an attention level, billboards could distract drivers. Last, the billboards could add to a driver's mental workload in a setting where workload is already quite high. In a road situation such as this one, Bergeron concludes that the billboard is a "useless drain on limited attentional resources" (p. 5), and it could lead to reduced performance through inattention errors by overloading the driver's information processing abilities.[28]

du Toit and Coetzee address the current regulatory process for advertising signs visible from national roads.[29] The authors report that the South African government engages in careful scrutiny of proposed advertising signs before they are approved for use. All applications receive a desktop review followed by a site visit. If a decision cannot be made at this point, the authorities evaluate crash statistics for the proposed location to determine that if it is hazardous. Key questions asked as part of the review include the following:

- Will the proposed sign obscure the view of an official road sign?
- Will the sign cause a disruption of information flow to the driver?
- Will the sign's location distract the driver's attention at merge/diverge areas, curves, and interchanges?

A clear system exists in South Africa that requires certain spacing between road signs, particularly those that are close to interchanges; proposed advertising signs must fit within the parameters. This system, as codified in the South African Road Traffic Signs Manual (SARTSM), is intended, "to allow adequate time for the driver to read, interpret and react on the information on the road sign" (p. 7).[29] The authors report that for a recent review period, 86.7 percent of all applications were rejected. Of those, 40.8 percent were rejected because the advertisement was too close to existing road signs, 20 percent were rejected because the sign disrupted the flow of information to the driver, and 7.5 percent were rejected because the sign was too close to a ramp gore.

As a result of his work cited immediately above, Coetzee reviewed literature, performed a regulatory analysis, and recommended changes to regulations for outdoor advertising control in South Africa.[30] Although superficially similar to regulations in the United States, billboard control in South Africa goes much further, regulating the design and amount of information (in bits) that can be displayed on a given sign, as well as the proximity of two or more advertising signs to one another and to road features, such as official signs and interchanges. In South Africa, message sequencing, visual clutter, and sign size are restricted for different display technologies. This document includes a description of the terms *critical event* and *critical zone*, and it demonstrates how regulations would control advertising signs in these applications. Coetzee finds support from the earlier work of Ogden and the experiments of Johnston and Cole, concluding that, whereas drivers may be able to ignore advertisements when the driving task requires attention, it is possible that an attention-getting sign can assume primary importance and interfere with not only any spare capacity that a driver might have but also the information processing capacity reserved for primary task performance.(31,32) The danger arises, according to Coetzee, when processing the information on the advertisement interferes with the driver's principal vehicle control task in situations that demand attention and rapid reactions.(30) The Coetzee report is the only work in the present review of the literature that has attempted to establish the parameters of billboard location and content based on theories of information processing and cognitive demand.

2.7 CONCLUSIONS FROM LITERATURE REVIEW

2.7.1 Basic Research Question

The basic research question being addressed in the present report is whether the presence of CEVMS used for outdoor advertising is associated with a reduction in driving safety for the public. When regarded from a scientific perspective, the present literature review does not provide an adequate answer to this question. The studies reviewed are inconclusive.

The present literature review reveals a disjointed array of isolated studies revealing sometimes contradictory and inconclusive results. Some studies show statistically significant driver safety concerns or distraction effects, but not all levels of distraction have negative safety impacts. Some studies go one step further and compare a statistically significant distraction with a criterion level of distraction claimed to represent the threshold of negative safety performance. This approach represents a substantial improvement, but it depends heavily upon the veridicality of the chosen criterion level of distraction. Other studies show no statistically significant safety or distraction effects at all, or they show mixed results. Some studies which show no statistically significant safety or distraction effects have been demonstrated to have serious flaws in their experimental and/or statistical designs. These studies are often plagued with two intrinsic methodological problems. First, they may not have sufficient measurement accuracy and precision to distinguish CEVMS distraction from noise in the data. Second, they may not have sufficient statistical power to reveal a small but important distraction effect which may really exist; i.e., they have not sampled enough events, drivers, or conditions to demonstrate an effect which may be obscured by variability due to sampling. In summary, from the perspective of strict statistical hypothesis testing, the present literature review is inconclusive with regard to demonstrating a possible relationship between driver safety and CEVMS exposure. From this perspective, the more stringent restrictions on the placement of billboards found in other countries might be regarded as a conservative precautionary measure, erring on the side of protecting public health from a possible but unproven threat and not as a response to an established driving safety hazard. That is not to say that such a conservative approach is inappropriate, but it should be acknowledged as such.

The present literature review does reveal a preponderance in the number of studies (5:1) which show some driver safety effects due to traditional billboards and CEVMS in comparison with the number of studies that show no driver safety effects at all due to these stimuli. In addition, four other studies show mixed results. Three lists were prepared below to demonstrate this outcome. These lists included only empirical research studies, regardless of the methodology employed. Studies that reviewed literature or practice were not included unless they also contained an original research component. Studies previously reviewed in the earlier FHWA projects were also not included.

The following research studies reported potential adverse safety effects for all dependent measures:

- Wisconsin Department of Transportation.[4]
- Young.[16]
- Crundall, et al.[17]
- Young and Mahfoud.[18]
- Chan, et al.[19]

The research study by Tantala and Tantala[8] reported no adverse safety effect on any dependent measure.

The following research studies reported potential adverse safety effects using some dependent measures and no effects using other dependent measures:

- Lee, McElheny, and Gibbons.[12]
- Beijer, Smiley, and Eizenman.[14]
- Beijer.[15]
- Smiley et al.[7]

Such an outcome could lead one to conclude that there is more evidence for a possibly meaningful negative safety impact than evidence against such an impact. This conclusion is not warranted for at least two reasons. First, a simple tally of the number of studies which support a given research hypothesis compared with the number of studies which do not support the hypothesis may be misleading. Such a tally neglects to weight the various studies for their intrinsic strength of experimental design, statistical power, and care of execution. One strong landmark study with a robust experimental design and a sufficiently large sample of cases or drivers can topple a host of weaker investigations with fewer credentials. Yet, credentialing and weighting studies can become a subtle and subjective matter. It is difficult to judge studies on their relative strengths because it requires experience and judgment. While it may be relatively easy to identify the champion study and give that study a strong weighting, it is more difficult to evaluate the weaker studies at the middle and bottom of the list.

Second, there is a strong propensity in scientific research to search for differences. The current Western model of reductionist scientific inquiry, coupled with its reliance on the paradigm of parametric statistics, is aligned against supporting the null hypothesis. This hypothesis states that there are no observed differences between two or more different treatments, i.e., that matters under scientific scrutiny are due to chance. This propensity to search for differences is so strong that when anticipated results are small or subtle, researchers often seek out conditions in nature that are worst case examples to find any affect at all. This causes the results to suffer from a lack of generalization when the entire population becomes the frame of reference. Thus, the present literature review acknowledges a possible natural and intrinsic bias toward including more studies that show a possible distraction effect of CEVMS exposure than studies that do not. Once these two considerations are recognized—a lack of weightings for comparing studies and a propensity to emphasize differences—the present literature review realigns to its original inconclusive outcome. In summary, present scientific techniques are not adapted to providing proof that CEVMS do not distract drivers; they only afford opportunities to demonstrate that they do distract drivers and possibly to what extent. If the demonstrated extent of distraction is minor and below the accepted criterion to interfere with safe driving, then the safety impact may be considered negligible.

2.7.2 Methodological Implications

The inconclusive literature review findings suggest the need for carefully controlled and methodologically sound investigations of the relationships between CEVMS, driver distraction, and safety. The review also suggests several factors that need to be considered in future research. One plausible model posits that drivers often have spare attentional capacity, and they can afford to divert their visual attention away from the driving task to look at objects irrelevant to the driving task, such as CEVMS. According to this model, when driving demand increases because of fixed hazards (such as dangerous roadway geometry or complex interchanges) or transient hazards (such as slowing traffic, vehicle path intrusion, or adverse weather), spare capacity is reduced or eliminated, and the driver devotes more capacity to the driving task. In this model, driver workload emerges as an important issue. By applying this model, in some countries, outdoor advertisements are not allowed in areas where known fixed hazards exist. Such locations include, but are not limited to, sharp horizontal or vertical curves and areas where high cognitive demand is imposed by the roadway, traffic, or environment, like intersections, interchanges, and locations of merging or diverging traffic. In some countries, billboards are also not allowed where they might interfere with the processing of important information from official road signs. These prohibitions do not in themselves prove that distraction is worse in high driver workload situations. However, they do point to the need to consider conditions of differing driver workload in an effective future research program on possible safety effects from CEVMS exposure.

When scanning for hazards, drivers' eye movements tend to fall within a horizontal window centered on the focus of expansion in the forward view. This focus of expansion is related to the visual flow of the moving scene where points and objects all emerge from a single point. Because an attention-getting billboard may be able to attract a driver's glance even unintentionally, a CEVMS that falls within this scanning pattern can interrupt the pattern and cause a distraction at an inopportune time. Furthermore, research suggests that the distraction from a roadside billboard may be unconscious. Consequently, drivers may not be aware that they are being distracted, and they are unable to verbalize that any distraction occurred. Although where someone's eyes look may not be the same as where his or her attention is focused, a theoretical connection may be implied. Through this connection, measurements of eye glance behavior permit the researcher to gain potential entrance into this realm of unconscious allocation of attention. This allocation of attention should play an important role in an effective program for future research.

In addition, it cannot be assumed that all CEVMS are equal, even those of the same size, height, and LED technology to display their images. The impact of a CEVMS in an undeveloped area with relatively low levels of nighttime ambient lighting may be quite different from that of a CEVMS in a more urban context among other buildings and structures in an area with high nighttime illumination levels. Furthermore, characteristics of the CEVMS displays may, in and of themselves, lead to measurable differences in distraction, such as information density, colors of figure and background, character size and font, and message content. These characteristics cannot be assumed to be equivalent for purposes of comparisons. One possible solution to this problem may be for future research studies to exercise a certain degree of experimental control over the CEVMS message itself. This may require a deeper level of cooperation with the billboard industry than has been encountered in previous studies. Such increased cooperation could be beneficial in establishing a collaborative research environment among industry, government, and university stakeholders.

Finally, a frequently changing CEVMS, which can generally be seen long before it can be read, raises a particular concern for distraction. This is because drivers may continue to glance at the CEVMS to observe changes in varying content with various sizes of lettering until the sign content can be read. The implication here is that future studies may need to embrace longer viewing distances.

3.0 KEY FACTORS AND MEASURES

The study of possible CEVMS effects on driver safety represents a complex research endeavor. There are numerous key factors affecting a driver's response to CEVMS. Many of these influential factors may be designated as independent research variables in need of specification or control within a given research design. Likewise, there are numerous inferred measures of driver safety which may serve as possible dependent variables for observation and measurement. Depending upon the specific research design, some of these independent and dependent variables may swap places.

3.1 KEY FACTORS (INDEPENDENT VARIABLES)

For classification purposes, the key factors, or major independent variables, may be categorized into various types. The list of key factors shown below gives some of the independent variables which might be considered in the study of possible safety effects of CEVMS. These key independent variables were selected from a more comprehensive analysis by means of a process to be described later. This analysis grouped all of the independent variables into five major categories according to source as follows:

- Billboard.
- Roadway.
- Vehicle.
- Driver.
- Environment.

After this initial analysis, a subsequent evaluation selected only the most important, or key, factors or variables. Each category lists the key independent variables which belong to that category. The lists below contain independent variables from four of the five above mentioned categories. The vehicle category is missing because all of the variables belonging to that category were eliminated in the selection process. For cross reference purposes, the decimal number shown in brackets to the right of each variable gives the outline number from the more detailed analysis upon which the selection was based (see table 1 in appendix A). In parentheses to the right of certain variables are given some examples and explanations which serve to clarify that particular variable.

The following are the key factors relating to the billboard:

- Location [1.1] (lat./long., GPS, mile marker, survey location, reference location).
- Sight distance [1.1.3].
- Resolution [1.2.3] (dpi, LEDs/inch, crispness).

- Luminance [1.2.4] (brightness).
- Contrast ratio [1.2.4].
- Day/night settings [1.2.4].
- Change rate [1.3.2] (image changes).
- Dwell time [1.3.2].
- Change time [1.3.2].
- Sequencing [1.3.2] (apparent motion).
- Full motion video [1.3.4].
- Engagement value [1.3.5] (ability to hold attention).
- Message [1.4].

The following are the key factors relating to the roadway:

- Category [2.1.1] (two-lane rural, collector, arterial, freeway).
- Geometry [2.2.2] (curve radius: horizontal, vertical).
- Intersection [2.2.3] (signalized, stop controlled).
- Interchange [2.2.4].
- Exit [2.2.4].
- Entrance [2.2.4].
- Merge [2.2.4].
- Gore [2.2.4].
- Traffic [2.3] (average daily traffic, peak traffic, level of service).

The following are the key factors relating to the driver:

- Age [4.1].
- Gender [4.1].
- Demographics [4.1].

- Years driving [4.2].
- Route familiarity [4.2].
- State [4.3] (alert, fatigue, alcohol, drugs).

The following are the key factors relating to the environment:

- Visual clutter [5.1.1].
- Nearby billboards [5.1.1].
- Ambient lighting [5.1.1].
- Official signs [5.2] (illuminated, luminous (VMS), retro-reflective).
- On-premise signs [5.3] (conventional, tri-vision, digital, full motion video).

The combined list of key factors given above represents a subset of the most influential independent variables in terms of importance to a future program of research. This subset of variables was selected from a more extensive list of the major independent variables which might play a role. As mentioned previously, the list of all major independent variables may be found in outline form in table 1 in appendix A. The bracketed decimal numbers in the list of key factors refer to the corresponding outline numbers in table 1. In addition, the table cites some of the advantages and disadvantages of employing that particular variable. The combined list of key factors presents the 32 variables which were judged to be the most influential variables from table 1.

The more comprehensive and detailed analysis represented in table 1 identifies considerably more possible independent variables. The approximately 60 types of variables listed in the table are further broken down into 185 specific subtypes or levels of independent variables which could play an important role in studying the possible effects of CEVMS on driver distraction and roadway safety. It is encouraged to carefully examine the many independent variables and their advantages and disadvantages, as described in table 1 in appendix A, to gain a greater appreciation of the complexity of the research problem. With such a profusion of important factors affecting the study of CEVMS effects, no single experiment could possibly answer all of the relevant scientific or engineering questions.

The key independent variables were selected from the expanded list represented in table 1 by three senior research psychologists, all coauthors of the present report and familiar with CEVMS research. The criterion for selection was the importance of that factor in conducting research on CEVMS effects. Thus, the list of key factors indicates critical independent variables which need to be considered in any proposed program of research. The brightness and crispness, or photo realism, of the CEVMS images are extremely important. Any image changes, apparent motion or video motion in the CEVMS, and location parameters are also critical factors. The next level of importance relates to environmental factors. Two distinct classes of variables must be taken into account: general visual clutter and the presence of other off-premise commercial CEVMS (nearby billboards). In particular, compelling information from CEVMS used for advertising may conflict with important roadway safety information conveyed by nearby traffic control devices (official signs). The question should also be raised concerning possible enhanced distraction caused by the urgency of Amber Alerts and other public safety messages displayed on CEVMS. Any contextual links among the messages from several sequential CEVMS, as well as any specific user interactions with the CEVMS must be taken into account. Factors to consider for drivers include their familiarity with the driving route and the expected presence or absence of CEVMS. Lastly, the complexity of the roadway geometry and the volume of traffic are likely to play significant roles.

3.2 KEY MEASURES (DEPENDENT VARIABLES)

The study of driver safety is a complex area of investigation. There are numerous objective, inferred, and subjective measures of driver behavior which might serve as dependent variables in a program of proposed research on the possible safety effects of CEVMS. As demonstrated in the discussion concerning independent variables, the key measures or dependent variables may be categorized into types. The list of key measures shown below gives 28 key measures, or dependent variables, which might be considered possible safety effects of CEVMS. As was the case for the list of key factors (independent variables), the list of key measures represents a down selection from a more extensive list of the major dependent variables of interest (see table 2 in appendix A). The dependent variables are grouped into the following four major categories:

- Vehicle behavior.
- Driver and vehicle interactions.
- Driver attention and distraction.
- Crashes.

The structure of the list of key measures for dependent variables is similar to that for the list of key factors for independent variables. In the case of dependent variables, the major variable categories of driver and vehicle interactions and crashes found in table 2 are missing from the list of key measures below because all of the variables belonging to these two categories were eliminated in the selection process.

Key measures relating to vehicle behavior are as follows:

- Speed [1.1] (continuous, exceeding speed, speed variance).
- Lane position [1.2] (continuous, lane excursions, lane variance).
- Acceleration [1.3] (longitudinal, lateral, heave).
- Other vehicle interactions [1.4].
- Headway [1.4.1] (time to collision).

- Gap acceptance [1.4.2] (merge, passing).
- Conflicts [1.4.3] (near-crashes).
- Violations [1.4.4] (red light running, failure to yield, failure to stop).
- Errors [1.4.5] (missed exit, wrong lane).
- Timing [1.4.6] (late movements, premature movements).
- Infrastructure interactions [1.5].
- Response to roadway geometry [1.5.1] (swerves, sudden braking).
- Response to traffic control devices [1.5.2] (misses, delays).
- Pedestrian interactions [1.5.3] (yields).

Key measures relating to driver attention/distraction are as follows:

- Eye glance behavior [3.1.1] (number and duration of glances, glance object).
- Distractor performance [3.1.2] (secondary task).
- Visual occlusion [3.1.3].
- Feature detection [3.1.4].
- Feature recognition [3.1.5].
- Driver workload [3.1.6] (task performance).
- Head turning [3.1.7].
- Driver errors [3.1.8].
- Reaction time [3.1.9] (perception-reaction time).
- Surprise [3.2.1] (orienting response).
- Conspicuity [3.2.2] (attention grabbing).
- Search patterns [3.2.3].
- Capacity [3.2.4] (self-regulated attention, spare capacity).
- Subjective measures [3.3].

As mentioned above, the more detailed analysis underlying the combined list of key measures shown above may be found in table 2 in appendix A. Table 2 for the dependent variables has the same general structure as table 1 for the independent variables. The approximately 65 types of dependent variables listed in table 2 are further broken down into 105 specific subtypes or levels of variables which could play an important role in measuring the possible effects of CEVMS on driver distraction. As noted before, it is encouraged to carefully examine the many dependent variables and their advantages and disadvantages, as described in table 2 in appendix A, to gain a greater appreciation of the wide variety of ways that driver safety can be measured as they relate to possible influences from CEVMS. With so many potential measurement techniques available, care must be taken in selecting appropriate dependent variables for any proposed program of research.

Only the key dependent variables are listed in the combined list of 28 key measures given above. They were selected by the same process used to select the key independent variables in the list of key factors. As indicated before, the criterion for selection was importance in conducting research on CEVMS effects. Thus, the list of key measures indicates critical measures which need to be considered in future research. Eye glance behavior can serve as a particularly important potential indicator of specific visual distractions. The concept of self-regulated attention is very important for establishing excessive levels of distraction, despite difficulties in establishing a criterion threshold. This concept refers to attention that is under the driver's conscious control, as opposed to involuntary attention, which may compel the driver to glance away from the road for an excessive amount of time. Increases in driving conflicts and errors are likewise effective measures of safety. The next level of importance relates to other observations of vehicle behaviors, including determinations of acceleration, lane position, and speed. Similarly important infrastructure interactions, such as driver responses to roadway geometry and traffic control devices, need to be considered.

4.0 RESEARCH STRATEGIES

To successfully investigate the potential safety effects of CEVMS, the key factors (independent variables) and key measures (dependent variables) described in the previous section need to be selected, combined, and integrated into an effective research strategy. There are a number of possible research strategies that could address the basic research question. The list of recommended research strategies shown below lists eight key research approaches that might be considered. This list was generated from a more comprehensive and detailed analysis of the research strategies which might be of interest. This comprehensive analysis of research strategies was divided into six major groups (see table 3 in appendix A). The first group focuses on observing or counting actual motor vehicle crashes as they might occur or have occurred in the field. This field portion includes retrospective crash data base studies. The second group entails observing motor vehicle crashes as they might occur in a driving simulator. The third group involves observing safety surrogate measures as they might actually occur in the field. The fourth group focuses on observing safety surrogate measures as they might occur in a driving simulator. The fifth and sixth groups relate to social surveys and analytical studies. In this instance, the down-selection process eliminated all research strategies concerning crashes, social surveys, and analytical studies. Within the parentheses next to each strategy are some selected advantages and disadvantages associated with using that type of strategy in conducting research.

Only the key strategies are shown in the list of recommended research strategies. They were selected by the same process used to select the key independent and dependent variables, with one important exception. This exception involves the incorporation of several assumptions which were derived from the antecedent analysis of potential independent and dependent variables. First, the brightness, sharpness, photo realism, and visual context of the CEVMS are extremely important. Since these characteristics are difficult to reproduce in a laboratory, laboratory methods tended to be judged low. In addition, certain participant-related variables, in particular eye glance behavior, are highly effective measures of distraction and workload. Any research method that supported the measurement of such variables tended to be judged high. Last, crash data involve rare events with multiple causal factors, making them difficult to measure. The CEVMS technology is too new to have an adequate crash heritage. In general, crash estimation methods tended to be judged low.

After incorporation of the above assumptions, the following final list of recommended research strategies was developed. This final list included strategies from only two of the original six groups of strategies.

The recommended research strategies for the safety surrogate field group include the following:

- Unobtrusive observation [3.1] (natural driving context/no eye glance data, expensive).
- Naturalistic driving [3.2] (natural driving context/insensitive eye glance data, expensive).
- On-road instrumented vehicle [3.3] (experimental control, sensitive eye glance data, efficient, cost effective/artificial drive purpose).

- Closed-course test track [3.4] (stimulus control, efficient, cost effective/out of context driving).

- Commentary driving [3.5] (easy/artificial response, interfere with driving).

- Non-vehicle based field testing [3.6] (easy/artificial, out of context).

The recommended research strategies for the safety surrogate laboratory group include the following:

- Driving simulator [4.1] (experimental control, sensitive eye glance data, efficient/limited stimulus, artificial).

- Non-simulator laboratory [4.2] (relatively easy/artificial, out of context).

The more detailed analysis underlying the above combined list of recommended research strategies may be found in table 3 in appendix A. In the table, the more comprehensive analysis of research strategies is further broken down into approximately 55 specific categories and 165 subtypes or levels of these categories. The reader is encouraged to carefully examine the many strategies and their advantages and disadvantages, as described in the table, to gain a greater appreciation of the wide variety of potentially relevant research methods which might be employed to study possible CEVMS effects.

Table 3 can be used to discriminate among potential candidate research strategies. Certain research strategies can be eliminated from further consideration. Analytical studies cannot fill knowledge gaps and consequently often fall prey to reliance on unfounded assumptions. Social surveys are based on memory and opinion, and they are generally administered far from the event of interest both in terms of time and space. Crash rates, whether observed in the field or in the laboratory, represent extremely rare events, which are often the result of multiple complex causes and thereby difficult to evaluate. CEVMS technology has not been deployed long enough to accumulate a sufficient number of proximal motor vehicle crashes to make reliable estimates concerning population crash statistics in the field. Driving simulators used to measure safety surrogates have the advantage of careful control over stimulus parameters and testing conditions, but they suffer the disadvantage of being unnatural and artificial. More importantly, driving simulators have difficulty reproducing the luminance contrast and bright photorealism of the new CEVMS technology. In a similar manner, the closed-course test track and non-vehicle based field testing techniques represent a comparatively artificial and out-of-context experimental environment even though they are conducted in the field. Finally, commentary driving also affords natural billboard stimuli, but the driving task becomes somewhat artificial.

The three research strategies which were judged to be the most effective were the on-road instrumented vehicle, the naturalistic driving, and the unobtrusive observation method, which were all used to measure driver distraction and safety surrogates. Thus, the outcome of the present investigation of research strategies recommends three primary candidates for consideration in any program of future research to study the possible effects of CEVMS on driver distraction and roadway safety. Each of the three study methods represented has its own unique advantages and disadvantages. All three of these top candidate research strategies should be considered in developing any future research program on CEVMS effects. They provide the basis for selecting a recommended first stage study in such a program.

This is not to say that other research strategies do not have a significant role to play in a comprehensive research program directed toward a common goal. For example, if significant negative CEVMS safety effects have already been found using one of the primary research strategies, subsequent driving simulator experiments might be employed to systematically vary certain billboard location, timing, or spacing parameters in a controlled and consistent manner to establish billboard placement guidance. In addition, combinations of research strategies can result in synergistic efficiency. For example, both the unobtrusive observation and the naturalistic driving methods naturally support the simultaneous collection of crash, near-crash, or safety surrogate data. The analysis of crash data will also be needed to relate measures of driver distraction to more direct determinants of roadway safety.

5.0 FUTURE RESEARCH PROGRAM

As stated previously, it is not possible to answer all of the critical questions concerning possible attention, distraction, and safety impacts from CEVMS in a single experiment. Instead, a carefully crafted program of research needs to be conceived and implemented to embrace a series of interrelated experiments and studies directed at answering different facets of this complex issue. This section describes the important elements of a recommended research program. This research program is broadly defined to provide a background and context for more concrete alternative first stage studies outlined in section 6.0. This section describes a long-range multistudy research program covering a number of years. Section 6.0 will outline three methods for implementing the first stage of that program.

5.1 STAGES

The proposed research program would have the following three stages:

- Stage 1—The attention and distraction effects of CEVMS would be investigated to determine whether any observed or measured distractions due to CEVMS is sufficient to interfere with attentional criteria for safe driving. This stage is directed at discovering whether or not distraction from CEVMS represents a potential driving hazard. Initial CEVMS parameters must be chosen carefully so as not to bias the result from the outset.

- Stage 2—If potential interfering distraction is observed, it would be necessary to investigate the relationship between the observed distraction and various CEVMS parameters (e.g., luminance, change rate, distance, CEVMS spacing, engagement level of sign content, and road geometry) to determine possible limitations on CEVMS deployment and operation which might reduce distraction to noninterfering levels. This stage is directed at developing empirical data to support the development of possible restrictions or regulation of CEVMS to reduce potential driving hazards.

- Stage 3—As related to CEVMS, researchers would have to investigate the relationship between distraction, defined in terms of eye glance behavior and safety surrogate measures (driving conflicts, errors, etc.), and safety, defined more directly in terms of crashes, fatalities, injuries, and property damage. This stage focuses on validating the eye glance and safety surrogate measures used to infer attention and distraction effects of CEVMS through the primary safety criterion of protecting life, health, and property.

The above stages of the proposed research program are to be pursued sequentially. The initial stage is directed at determining whether or not a potentially harmful CEVMS distraction effect exists. To demonstrate such a distraction effect, an independent and objective threshold criterion of excessive distraction must be employed. If no potentially harmful distraction is shown, at least as far as driving safety is concerned, there would be little need to pursue the second stage of developing a basis for regulating CEVMS or the third stage of relating CEVMS distraction to more direct measures of safety (crashes). If potentially harmful distraction is shown in the first stage, the second and third stages would be implemented in order. The order of the last two stages may appear to be reversed. Normally, it would seem desirable to establish a relationship between CEVMS distraction and crashes before developing a basis for regulation. However, in this instance, the LED-based digital CEVMS technology is so new that it will not be possible to reliably measure crashes for some time. Meanwhile, if possible distraction is shown, the community of practitioners engaged in outdoor advertising control will need near-term technical information on the luminance, contrast, change rates, and spacing of CEVMS to minimize that distraction. For this reason, the stages have been proposed in the order given above.

5.2 APPROACH

The literature review update in section 2.0 points to some important principles that should be incorporated into the proposed program of research to enhance the probability that the program can successfully achieve its goals. These principles can be regarded as lessons learned from the experience of previous research. First, empirical studies should employ CEVMS stimuli, as well as a variety of comparison stimuli, including standard (non-digital) billboards, built objects of casual visual interest (e.g., houses, barns), and natural background control scenery (e.g., trees, fields). This principle establishes a relevant visual context against which to contrast CEVMS stimuli. Next, empirical studies should be constructed so as to compare the effects of CEVMS and the effects of the various comparison stimuli. This principle implies that some measurable (statistically significant) effect should be demonstrated for as many of the comparison stimuli as possible, at least for the standard billboards. It is necessary to show some distraction effect for both CEVMS and standard billboards relative to a baseline to be sure that the study is not just measuring random noise in the data. In addition, for the case of distraction and safety surrogate performance measures, the measured effects of CEVMS and standard billboards need to be compared with each other and with an independently determined criterion of potentially harmful consequences. The application of this criterion needs to incorporate the concept of self-regulated attention, as indicated in section 3.0. Last, to the degree possible, direct experimental control should be exerted over the CEVMS stimuli. In the first stage of determining a meaningful distraction effect, this control can be limited to turning the CEVMS on and off for predetermined periods according to a strict experimental protocol. In the second stage of establishing possible parameter limitations, this control may need to be expanded to changing the luminance, message change rate, or some other CEVMS characteristic according to an experimental protocol.

These four principles define the basic approach for implementing the proposed research program. They provide guidance and direction to the proposed program. It should be emphasized that only a systematic multiyear broad program of research can adequately answer the important questions posed by the community interested in outdoor advertising control concerning the possible distraction effects and safety implications of CEVMS. No single experiment can provide the solution. It should also be emphasized that all stages of the research program must be sensitive to the practical needs of the outdoor advertising community, which includes highway engineers, traffic engineers, the outdoor advertising industry, environmental advocates, and outdoor advertising regulators. Even though the second stage is where most of these practical needs are addressed, at all stages of the research, investigators need to try to provide practical information on the luminance, contrast, change rate, display size, display spacing, or other parameters over which the outdoor advertising community could possibly exert some control. Administrators concerned with issuing permits for billboards need practical engineering results to assist them in there daily jobs.

5.3 STRUCTURE

As outlined above, the proposed research program consists of three stages. The first stage focuses on determining the potential existence of harmful distraction effects due to CEVMS. The second stage involves determining limitations or restrictions to CEVMS parameters which could reduce or eliminate the implied potentially harmful distracting effects. The third stage focuses on relating the reduction in implied potentially harmful distraction to actual safety benefits of decreasing crashes, fatalities, injuries, and property damage on the roadway. The sections below describe these stages in more detail.

5.3.1 Stage 1—Determination of Distraction

The first stage, to determine the potential existence of harmful CEVMS distraction, may be implemented in many different ways. According to the analysis of research strategies in section 4.0, the three most effective approaches are the on-road instrumented vehicle, the naturalistic driving, and the unobtrusive observation methods.

The on-road instrumented vehicle method is sensitive to a wide range of variables, including accurate eye glance measurements. It affords the opportunity to ensure that the test participants drive by many CEVMS and comparison sites in a structured and reproducible manner.

The naturalistic driving method is similar to the on-road instrumented vehicle technique, but it has less control since the test participants drive their own vehicles according to their own personal daily schedules. As a result, the participants may pass few, if any, billboards. Furthermore, the naturalistic driving method has difficulty supporting accurate eye glance measurements, and it requires considerably more effort and expense. However, the naturalistic driving method is less artificial and has a high degree of face validity.

Although the unobtrusive observation method also involves considerable effort and expense, the data collected are based on the observation of vehicles rather than individual drivers. The unobtrusive observation method is the least artificial of the three because with this technique, research participants are generally unaware of being observed.

This first stage of the research program would employ one or more of these study approaches as a first step. A single method could be selected, or more than one approach could be combined. For example, the on-road instrumented vehicle and the unobtrusive observation method could make an effective combination, but the cost would be high. In either case, this first stage should also be designed to answer, at least in a preliminary manner to whatever degree possible, some of the practical questions of interest to the community concerned with outdoor advertising control.

5.3.2 Stage 2—Basis for Regulation

If the results of the first stage reveal a CEVMS driver distraction effect sufficient for public concern, then the second stage of the proposed research program would be implemented to provide an initial technical basis for possible regulation. This stage would consist of a series of eye glance and safety surrogate evaluations in the field and in the laboratory designed to investigate the various parameters of CEVMS which contribute to driver distraction. Although field methods can capture the realism of the CEVMS stimulus, they do not allow the researcher to independently vary a variety of CEVMS parameters one at a time so as to isolate the effect of that variable, as some of the laboratory techniques would. For example, this second stage might begin with attempts to estimate the gross effects of certain salient CEVMS parameters in the field. Throughout this section, the brightness of the CEVMS will be used as an example, but the approach can be adapted to many other relevant CEVMS characteristics. For example, many current CEVMS displays adjust their brightness for day and night. If the outdoor advertising industry would agree to adjust the brightness of several installations both during the day and at night for the purposes of experimentation, partial estimates of the effects of brightness on eye glance behavior might be elaborated for selected luminance levels.

To obtain a more complete functional relationship between eye glance distraction and CEVMS luminance, a test track or driving simulator experiment might be devised. If it were possible to erect an experimental CEVMS installation at a test track location, the test track experiment would have realistic brightness and contrast levels, as well as controlled exposure conditions. However, it would suffer from a highly constrained and unnatural driving environment. The driving simulator experiment could easily portray a wide variety of driving environments with realistic contexts, but it would suffer from a severely restricted range of luminance and contrast ratios. Nonetheless, to overcome these disadvantages, correction factors or transformations might be applied to the test track data to account for discrepancies in level of attention and to the driving simulator data to account for photometric discrepancies. The incorporation of such correction factors or transformations to relate test track and laboratory data to driving data on real roads underscores the necessity of conducting a combination of field and laboratory testing environments in this stage of the proposed research program. Some degree of field validation needs to be a part of any laboratory component of the research during this stage.

This second stage of the research program must be designed to answer, to the degree possible, the practical questions of the community interested in outdoor advertising control. This is the stage of research which addresses functional relationships regarding the effects of CEVMS luminance (brightness), change rates, size, display spacing, and other variables on driver distraction and roadway safety. These functional relationships could subsequently be translated by outdoor advertising administrators and regulators into concrete rules which protect the safety of the driving public while at the same time allowing commercial growth and the rights of the outdoor advertising industry. To be fully successful, this stage of the research program must be pursued with active participation from all stakeholders, which include industry, environmentalists, researchers, and regulators alike.

5.3.3 Stage 3—Relationship to Crashes

The third stage of the proposed research program relates changes in potentially harmful distraction effects due to various CEVMS parameters to changes in actual roadway safety (crashes and their consequent fatalities, injuries, and property damage). This stage is directed at validating the earlier findings with regard to CEVMS distraction based on eye glance and safety surrogate measures in the context of retrospective crash data. This stage of the program would likely employ the Empirical Bayes, or Bayesian, method of analyzing crash statistics. The Bayesian approach formally incorporates prior knowledge into the process of current research, and it translates probabilistic calculations into statements of belief concerning statistical hypotheses in place of the classical confidence interval concept employed in parametric statistics. The Empirical Bayes method also incorporates the crash history of other control sites with similar traits to account for extraneous factors which may be influencing the crash data at the site of interest. In short, the Empirical Bayes method possesses distinct statistical advantages over the naïve before/after technique and even the before/after technique with a simple control. The Empirical Bayes method is well suited for the task of estimating vehicle crash rates along different stretches of roadway, including those stretches with CEVMS. The prediction of baseline crash rates, and their potential increase or decrease with the introduction of CEVMS, is essential to this final stage of the proposed research program. This final stage should also be designed to answer, to whatever degree possible based on crash statistics, some of the practical questions of interest to the community concerned with outdoor advertising control. Because of the low numbers of crashes and their susceptibility to multiple determining causes, considerable effort, time, and expense will likely have to be expended on this final stage.

6.0 RECOMMENDED FIRST STAGE STUDY

The first stage of the research program, determination of distraction, provides the context for selecting the recommended next study. The first goal of this stage of the program is to determine whether any observed or measured distraction due to CEVMS is sufficient to interfere with attentional criteria for safe driving. The second goal is to provide some preliminary practical technical information that could be of help to the community interested in outdoor advertising control. This goal could consist of furnishing initial indications of the possible distraction effects produced by one or more of the concrete variables over which the community might exert some control, such as luminance (brightness), change rate, display size, and display spacing. According to the analysis summarized in section 4.0, to provide an initial answer to these types of questions, the three most effective research strategies are the on-road instrumented vehicle, the naturalistic driving, and the unobtrusive observation methods. In the present section, one possible preliminary study is briefly described using each of these three approaches. A more detailed description of each study approach is given in appendix B. This detailed description includes more specific information on the general method, factors and measures employed, advantages and disadvantages, and budgetary cost. After project initiation, a more comprehensive work plan and more in-depth budget will need to be developed. That comprehensive work plan should receive inputs from all of the important stakeholders in CEVMS research, which include industry, environmentalists, researchers, and regulators alike. After careful and thorough deliberation, the final details of that comprehensive work plan and budget may differ considerably from what is suggested in this section or in appendix B.

6.1 SUMMARY OF STUDY APPROACHES

6.1.1 On-Road Instrumented Vehicle

The on-road instrumented vehicle method employs an instrumented vehicle which is brought to the study site. The study site is a location where there are one or more CEVMS installations along a public access roadway. Each research participant drives the instrumented vehicle along a prescribed route, which includes CEVMS installations, standard (non-digital) billboards, objects of casual visual interest (e.g., houses and barns), and natural background control scenery (e.g., trees and fields). Each participant completes several such drives. The instrumented vehicle is capable of measuring vehicle speed, vehicle lane position, longitudinal acceleration, lateral acceleration, GPS time and position, and driver eye glance direction and duration. The instrumented vehicle is also equipped with accurate vehicle-mounted or head-mounted eye-tracking equipment, video cameras (forward and cab views), and a voice recorder. The major independent variable in the study is the presence or absence of CEVMS and other comparison visual stimuli along the driving path. If possible, the CEVMS should be capable of being turned off and on or changing along some other dimension like luminance or change rate, according to a prearranged experimental design. Other important independent variables are the time of day (day/night), traffic conditions (peak, nonpeak) and driver variables (age, gender, and route familiarity). The primary dependent variables are the frequency, direction, and duration of driver eye glances. Secondary dependent measures are safety surrogate indicators associated with driver errors and other measures of driver performance, such as speed changes, headway, lane deviation, and traffic conflicts. A rough budgetary estimate for conducting such an on-road instrumented vehicle study is between $400,000 and $800,000 (see appendix B for more details).

6.1.2 Naturalistic Driving

The naturalistic driving method employs a standardized instrument package which is installed in each participant's own private vehicle or in a vehicle loaned to the participant. The participant's vehicle appears and performs as it normally would. Participants drive their vehicles as part of their daily life routines, making control of CEVMS exposure difficult. The instrument package is capable of measuring speed, lane position, acceleration, GPS time and position, driver eye glance frequency, direction, and duration. However, because of the unobtrusive nature of the experimental technique, this method cannot support the use of accurate head-mounted or vehicle-mounted eye-tracking equipment. Once the participant's vehicle has been instrumented, data are collected by means of automatic wireless downloads without participant awareness or involvement. The major independent variable is the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, control settings, etc.) along the driven path. If possible, the CEVMS should be controlled according to a prearranged experimental protocol. Secondary independent variables could include the type of vehicle (sedan, pickup, or SUV) and driver characteristics (age, gender, and route familiarity). The primary measures or dependent variables are the frequency, direction, and duration of the driver's eye glances. However, as a result of the lower degree of accuracy in eye movement recording, this study method depends more heavily on secondary dependent variables. Safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, conflicts, and erratic maneuvers) are of increased importance in this method. Additional dependent variables may include the time of day (day/night), traffic conditions (peak, nonpeak), in-vehicle distractions (eating, cell phone use), state of fatigue, etc. A rough budgetary estimate for conducting such a naturalistic driving study is between $2 million and $4 million (see appendix B for more details).

6.1.3 Unobtrusive Observation

The unobtrusive observation method employs an array of static cameras or other sensors mounted near the locations of the CEVMS and other comparison stimuli. The cameras are capable of recording the behavior of vehicles passing the various relevant visual stimuli as a part of the natural flow of traffic. The drivers are usually completely unaware that their vehicles are being observed. Post-hoc analysis of the video recordings from these cameras can yield data similar to some of that obtained by the on-road instrumented vehicle and naturalistic driving methods including vehicle speed, lane position, acceleration, and time. However, the data from distal video cameras are usually far less accurate and reliable than what can be collected by instruments on board the vehicle. Moreover, with present measurement technology, such video recordings cannot yield any data concerning driver eye glance movements. The major independent variable is the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, etc.) along the driving path. If possible, the CEVMS should be controlled according to a prearranged experimental protocol.

Some secondary independent variables might include the time of day (day/night) and traffic conditions (peak, nonpeak). This study method depends completely on safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, and erratic maneuvers), and it requires a large camera array over a long distance recording for extended periods, as well as extensive data analysis. A rough budgetary estimate for conducting such an unobtrusive observation study is between $1 million and $3 million (see appendix B for more details).

6.2 COMPARISON OF STUDY ALTERNATIVES

This section has introduced and described three different candidate approaches for the recommended next study, which include the on-road instrumented vehicle method, the naturalistic driving method, and the unobtrusive observation method. Each study method would be capable of addressing the two-part basic research question to determine whether any observed or measured distraction due to CEVMS is sufficient to interfere with attentional criteria for safe driving, and to provide some preliminary practical technical information that could be of help to the community interested in outdoor advertising control. However, each method has certain advantages and disadvantages with regard to its ability to address these two questions.

The on-road instrumented vehicle method was judged the best, having the advantage of being sensitive to a wide range of participant variables, including accurate eye glance measurements with real CEVMS stimuli in natural settings. The degree of experimental control afforded by this method makes it the most productive of the three. Driving scenarios can be selected with a number of CEVMS and standard billboard stimuli along a single drive, which can be repeated both within and across research participants. To the degree that accurate measurements of visual distraction and eye glance behavior are pivotal dependent variables, the on-road instrumented vehicle method has the clear advantage. The high degree of experimental control ensures that exposure to CEVMS and to comparing visual stimuli is uniform and consistent. The on-road instrumented vehicle approach is the most productive research method for producing quality data in the shortest amount of time for the least cost.

The naturalistic driving method was judged the second best, offering some similar advantages to the on-road instrumented vehicle method. However, it suffered from less experimental control over CEVMS exposure, less ability to capture participant-related variables, and more logistical complication and expense. Both of these methods are somewhat related from the perspective of the research participant. In both cases, the research participant is driving in an instrumented vehicle on a real road. Both allow the determination of driver eye glance behavior to some degree, but the increased level of experimental control exercised in the on-road instrumented vehicle method gives this technique a distinct advantage, both in terms of more accurate eye glance measurements and more consistent driver exposure.

Finally, unobtrusive observation of safety surrogate measures involves no direct contact with the driver, thus preserving a completely natural driving environment. However, this method is not sensitive to participant variables. In particular, it is not possible to measure eye glance behavior with this method. This method depends solely on safety surrogate measures. Furthermore, since these safety surrogate measures are relatively subtle to detect at a distance, this method can be costly and time-consuming to implement.

The on-road instrumented vehicle method has a strong advantage in productivity and efficiency. The major advantage of the other two methods is the natural and unobtrusive nature of the study procedure from the perspective of the research participants. However, some degree of artificiality may be a small price to pay to gain the cost effectiveness of the on-road instrumented vehicle method. In the final analysis, the present report recommends the on-road instrumented vehicle method as the best choice for the first stage study. This recommendation is made on the basis of scientific merit, timeliness of producing a meaningful result, and cost.

7.0 CONCLUSIONS

The present report reviews the possible safety effects of CEVMS. The report consists of an update of earlier published work, an investigation of applicable research methods and techniques, recommendations for future research, and an extensive reference list and bibliography. The literature review update covers recent post-hoc crash studies, field investigations, laboratory investigations, previous literature reviews, and reviews of practice. The conclusion of the literature review is that the current body of knowledge represents an inconclusive scientific result with regard to demonstrating detrimental driver safety effects due to CEVMS exposure. This outcome points toward the importance of conducting carefully controlled and methodologically sound future research on the issue.

The present report also analyzes the key factors or independent variables affecting a driver's response to CEVMS and the key measures or dependent variables which serve as indicators of driver safety. These key factors and measures are selected, combined, and integrated into a set of optimal research strategies. Based on these strategies, as well as on lessons learned from the literature review update, a proposed long-term program of research has been developed to address the problem. This research program consists of three stages, which include determination of distraction, basis for possible regulation, and relationship of distraction to crashes.

The present report only addresses the first stage of the proposed research program in detail. For this first stage, three candidate studies, which are an on-road instrumented vehicle study, a naturalistic driving study, and an unobtrusive observation study, have been introduced and compared. An analysis of the relative advantages and disadvantages of each study indicate that the on-road instrumented vehicle study is the best choice as the recommended first stage in answering the basic research question.

APPENDIX A—EXPANDED TABLES

A.1 KEY FACTORS (INDEPENDENT VARIABLES)

Table 1. Expanded key factors (independent variables).

Variable	Ref. #	Advantages	Disadvantages
1.0 Billboard			
1.1 Location	8, 129, 38, 15, 44, 32		
1.1.1 Lat./long.; GPS; mile marker; survey location; reference location; mobile	13, 53, 160	Important to define stimulus; Easy to measure.	Likely to require travel expenses.
1.1.2 Distance from roadway; setback			Less important.
1.1.3 Sight distance; visual occlusions; distance first detected	13, 53	Determines exposure time.	
1.1.4 Orientation; angle to road; side of road; two-sided	144		Less important.
1.2 Display	144		
1.2.1 Type: Conventional; Digital; Tri-vision	125, 48	Digital type stands out.	Tri-vision likely to disappear.
1.2.2 Size; length; height; visual angle; mounting height	129, 32	Off-premise sizes somewhat standard.	On-premise sizes variable.
1.2.3 Resolution; dpi; LEDs/in	95, 48, 53	Crispness (sharpness) of image important.	
1.2.4 Luminance; contrast ratio; day/night settings	48, 53, 144	Brightness (luminance) extremely important.	Night setting may depend upon background illumination.
1.3 Dynamics	31		

Variable	Ref. #	Advantages	Disadvantages
1.3.1 Type: static; changing	158, 129, 26	Changing images extremely important. Static serves as control.	
1.3.2 Change rate; dwell time; change time; sequencing	48, 50, 158, 94	Change pattern important. Easy to measure.	
1.3.3 Special effects: wipe, dissolve, scintillate		Adds to uniqueness and conspicuity.	More difficult to measure.
1.3.4 Full motion video	125, 126	Full motion video extremely compelling.	Difficult to specify exact content seen.
1.3.5 Engagement value: ability to hold attention		Important overall distraction variable	Difficult to measure; requires subjective rating.
1.3.6 Sound			
1.4 Message	129, 44, 144, 53		
1.4.1 Type: text; graphics; mixed; targeted	32, 31	Particular message may be secondary.	
1.4.2 Text: word count; font size; color; content; legibility; affect	32, 48		Many variations. Less important.
1.4.3 Graphics: size; complexity; color; content; affect	31, 50		Difficult to specify. Many varieties.
1.4.4 Public safety alerts		Social benefit.	May be more distracting than advertising.
1.4.5 Interactive: encourages driver response		Interactive may require more attention.	
2.0 Roadway			
2.1 Type			

Variable	**Ref. #**	**Advantages**	**Disadvantages**
2.1.1 Category: two-lane rural; collector; arterial; freeway	13, 15 71, 54	Important determinate of driver workload.	Many variations even in single category.
2.1.2 Lanes: number; width; markings; medians; shoulders; rumble strips			Less important.
2.1.3 Speed: posted; advisory; 85th percentile; median	50	Changes urgency of correct driving responses.	
2.1.4 Condition: dry, wet, ice, rain; oil slick		Important to driver control over vehicle.	
2.1.5 Traction: coefficient of friction			
2.2 Complexity	15		
2.2.1 Tangent: level; grade			Less important.
2.2.2 Curve: horizontal; vertical	13, 44, 118	May place sudden demand on driver attention.	
2.2.3 Intersection: signalized; stop controlled	129, 38, 48	Increased driver workload.	Wide variety of intersection complexities.
2.2.4 Interchange: exit, entrance, merge, gore	26, 44, 32, 48	Controlled access. More carefully engineered.	
2.2.5 Driveway; entrance			Less important.
2.2.6 Lane change: merge; diverge; lane drop		May place sudden demand on driver attention.	
2.2.7 Other: bicycle lane; fire house			Less important.
2.3 Traffic	158, 38, 15, 113,		

Variable	Ref. #	Advantages	Disadvantages
2.3.1 Average daily traffic; peak traffic; level of service	118	Likely to increase driver workload.	
2.3.2 Traffic mix: cars, trucks, buses, motorcycles			Less important.
2.3.3 Pedestrians			Mainly only in urban settings.
3.0 Vehicle	59		
3.1 Type: automobile; SUV; truck; motorcycle		Motorcycle has least obstructed view.	
3.2 Condition: response; vehicle dynamics			Hard to determine in field.
3.3 Windshield: size; tinting; field of view		Defines some stimulus exposure characteristics.	
4.0 Driver	10		
4.1 Characteristics: age; gender; demographics	53, 23, 12, 54		Less important.
4.2 Experience: years driving; route familiarity	15, 100	Route familiarity extremely important.	
4.3 State: alert; fatigue; alcohol; drugs			Difficult to measure.
4.4 Distractions: conversation; eating; cell phone	24, 90, 25		
5.0 Environment			
5.1 Visual—general	113		
5.1.1 Visual clutter; nearby billboards; ambient lighting	160, 15, 32, 44	Complexity of visual environment extremely important.	Difficult to specify.

Variable	Ref. #	Advantages	Disadvantages
5.1.2 Day/night viewing: dawn; dusk; sun-glare	53	Nighttime viewing of bright images important.	
5.1.3 Visual flow			Less important.
5.2 Official signs	160, 2, 26, 100		
5.2.1 Type: regulatory, advisory, navigational	94	Regulatory most important.	
5.2.2 Location: left, right, overhead	44, 15	Billboard can conflict with sign.	
5.2.3 Lighting: illuminated; luminous (VMS); retro-reflective		Luminous (VMS) signs most important.	
5.2.4 Density: number in view, type mix	15		Many variations in urban settings.
5.2.5 Dynamics: change rate; motion; video		Extremely important point of possible conflict.	Motion and video not yet allowed.
5.2.6 Message: text; graphics			Less important
5.3 On-premise signs			
5.3.1 Type: conventional; Tri-vision; digital; full motion video	144	Digital and video most important.	Tri-vision likely to disappear.
5.3.2 Location: left, right, high, low	144		
5.3.3 Lighting: illuminated; luminous; LED	144	Bright, high resolution very compelling.	Difficult to measure.
5.3.4 Density: number in view, type mix		Can add to visual clutter.	Many variations possible.
5.3.4 Dynamics: change rate; motion; video; sound	144	Extremely important variable.	

Variable	Ref. #	Advantages	Disadvantages
5.3.5 Message: text; graphics; interactive		Interactive important.	Text and graphics less important.
5.4 Geographic	15		
5.4.1 Population: urban; suburban; rural	13, 71	Can affect visual clutter.	Many variations.
5.4.2 Terrain: mountain; valley; desert; hilly; near water		Can affect driver workload.	Many variations.
5.4.3 Area: city; state; region			Less important.
5.5 Meteorological			
5.5.1 Temperature; humidity; cloud cover	53		Less important.
5.5.2 Precipitation: rain; snow; fog; ice; visibility	53	Can affect driver workload.	

A.2 KEY MEASURES (DEPENDENT VARIABLES)

Table 2. Expanded key measures (dependent variables).

Variable	Ref. #	Advantages	Disadvantages
1.0 Vehicle Behavior	48		
1.1 Speed	125, 50		
1.1.1 Continuous		More accurate profile.	Large amounts of data. Expensive.
1.1.2 Discrete locations		Less data.	Cheaper.
1.1.3 Speed exceedances: high; low		Distraction indicator.	
1.1.4 Speed variance		Distraction indicator.	Best with continuous data.
1.2 Lane position	161, 48, 54		
1.2.1 Continuous		More accurate profile.	Large amounts of data. Expensive.
1.2.2 Discrete locations		Less data.	Cheaper.
1.2.3 Lane excursions: right; left	23	Distraction indicator.	More difficult to measure.
1.2.4 Lane variance		Distraction indicator.	Best with continuous data.
1.3 Acceleration	48, 54		
1.3.1 Longitudinal: hard braking; delayed acceleration; braking without cause		Excellent surrogate for distraction.	
1.3.2 Lateral: swerves	39	Good surrogate for distraction.	
1.3.3 Heave: bumps	125, 48		Not important.
1.4 Other vehicle interactions	39		

Variable	Ref. #	Advantages	Disadvantages
1.4.1 Headway (car following); time to collision	125, 48, 118	Good surrogate for distraction.	
1.4.2 Gap acceptance: merge; passing		Good surrogate for distraction.	Difficult to measure.
1.4.3 Conflicts; near-crashes	125	Extremely important measure.	
1.4.4 Violations: red light running; failure to yield; failure to stop			Low probability events.
1.4.5 Errors: missed exit; wrong lane		Good surrogate for distraction.	
1.4.6 Timing: late movements; premature movements			Difficult to measure.
1.5 Infrastructure interactions			
1.5.1 Response to roadway geometry: swerves; sudden braking	118, 15	Surrogate for distraction.	
1.5.2 Response to traffic control devices: misses, delays	15	Surrogate for distraction.	
1.5.3 Pedestrian interactions; yields			Only in urban settings.
1.6 Signals	39		
1.6.1 Brake light	125	Indication of sudden deceleration.	
1.6.2 Turn signals			Less important.
1.6.3 Other: backup lights			Not important.

Variable	Ref. #	Advantages	Disadvantages
2.0 Driver/Vehicle Interactions			
2.1 Steering			
2.1.1 Gross movements: curves; turns		Surrogate for distraction.	
2.1.2 Fine movements: lane keeping	60		Difficult to measure.
2.2 Throttle			
2.2.1 Pedal press; pedal position; duration			Less important.
2.2.2 Pedal release; duration			Less important.
2.3 Brake	125		
2.3.1 Pedal press; duration; excursion		Surrogate for distraction.	
2.3.2 Pedal release			Less important.
2.4 Shift (manual only)			
2.4.1 Gear selection (speed)			Not important.
2.4.2 Gear transitions (shifts)			Not important.
2.5 Displays	154		
2.5.1 Speedometer		Secondary visual distractor.	
2.5.2 Other: gauges; radio			Less important.
2.6 Other controls	154, 25		
2.6.1 Safety: windshield wipers; instrument lights; horn; turn signals	54		Less important, except turn signals.

Variable	Ref. #	Advantages	Disadvantages
2.6.2 Entertainment: radio; CD player	48, 24, 54	Secondary distractor.	
2.6.3 Auditory/vocal: voice actuated	154		Low probability of occurrence.
3.0 Driver Attention / Distraction	79, 113, 32, 146, 145		
3.1 Objective measures	129		
3.1.1 Eye glance behavior: eye movements; number of glances; duration of glances; glance object	129, 42, 125, 53, 160, 83, 161, 78	Excellent measure of unconscious attention / distraction.	Delicate, expensive equipment. Difficult to calibrate. Expensive to analyze data.
3.1.2 Distractor performance; secondary task	83, 53	Excellent measure of distraction.	Can increase risk in field experiments. Can be artificial.
3.1.3 Visual occlusion	15	Good measure of distraction.	Can increase risk in field experiments. Unnatural driving task.
3.1.4 Feature detection	48		
3.1.5 Feature recognition	48	Good measure.	
3.1.6 Driver workload; task performance	38, 15, 113	Excellent indicator of distraction.	Complicated to measure.
3.1.7 Head turning	78	Easy to measure.	Less important.
3.1.8 Driver errors	83	Excellent measure of distraction.	Many varieties. Low probability of occurrence.
3.1.9 Reaction time; perception-reaction time	15	Good indicator of distraction.	Difficult to measure.
3.2 Inferred measures			
3.2.1 Surprise; orienting response			Difficult to measure.

Variable	Ref. #	Advantages	Disadvantages
3.2.2 Conspicuity; attention grabbing			Difficult to measure.
3.2.3 Search patterns	15	Indicative of visual hypotheses.	
3.2.4 Capacity: self-regulated attention; spare capacity	15	Extremely important concept.	Hard to establish criterion threshold.
3.3 Subjective measures	161		
3.3.1 Conversational drive		Good possible method.	Lots of extraneous data.
3.3.2 Rating scale		Inexpensive.	Imprecise.
3.3.3 Questionnaire		Inexpensive.	Imprecise.
3.3.4 Survey	125	Relatively inexpensive.	Sampling frame difficult.
3.3.5 Focus group		Small sample. Lots of data.	Confounding social variables.
4.0 Crashes	158, 125, 26, 44, 128, 161, 95, 121		
4.1 Type: head-on; sideswipe; rear-end; backing; run-off-road; pedestrian	39	Very important discriminator variable. Related to ultimate goal.	Rare events. Many contributing factors. Difficult to estimate statistically.
4.2 Severity: fatal; injury; property damage; unreported		Important to determine impact.	Rare events. Many factors. Difficult to estimate statistically.
4.3 Method of measurement			Rare events. Hard to estimate.
4.3.1 Direct observation: simulator; field camera	42	Best studied in simulator. No chance of injury.	
4.3.2 Before/after study	39, 158	Most common study type.	No control site. Regression toward mean.

Variable	Ref. #	Advantages	Disadvantages
4.3.3 Before/after with control		Control adds rigor.	Regression toward mean.
4.3.4 Before/after/before		More convincing causal effect.	Regression toward mean.
4.3.5 Regression model		Directly account for multiple factors	Large amounts of data on many variables
4.3.6 Empirical Bayes		Control for regression toward mean.	More complicated statistical model.
4.3.7 Full Bayes		More complete treatment of conditional probabilities.	Not widely used.

A.3 KEY RESEARCH STRATEGIES

Table 3. Expanded key research strategies.

Method	Ref. #	Advantages	Disadvantages
1.0 Crashes: Field	97, 95, 21		
1.1 Unobtrusive observation			
1.1.1 Participant: random, uncontrolled; usually unknown	49	No sampling bias.	Do not know participant sample.
1.1.2 Experimenter: usually absent; remote observation; unknown to participant	49	No artificial participant behaviors due to experimenter.	
1.1.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	49	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
1.1.4 Responses: crashes; antecedent vehicle behaviors; rare; few participant variables	49	Directly related to the safety goal.	Extremely rare events; insensitive to participant variables.
1.1.5 Scenario: natural route and purpose; uses own vehicle	49	Completely natural experimental context; uses own vehicle.	Long-term monitoring required.
1.2 Naturalistic driving			
1.2.1 Participant: selected, sampled	79, 78, 42	Know participant sample.	Possible sampling bias.
1.2.2 Experimenter: absent; remote observation; known to participant	79, 78, 42		Possible artificial participant behaviors.
1.2.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	79, 78, 64, 42	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
1.2.4 Responses: crashes; antecedent vehicle and participant behaviors; rare	79, 78, 64, 42	Directly related to ultimate goal; sensitive to some participant variables.	Extremely rare events; difficult to collect adequate sample of crashes.

Method	Ref. #	Advantages	Disadvantages
1.2.5 Scenario: natural route and trip purpose; uses own vehicle	79, 78, 64, 42	Mostly natural experimental context; uses own or borrowed vehicle.	Participant aware of test status; may be injured or killed; vehicle may be damaged or destroyed; expensive.
1.3 Retrospective database: fatal, injury, property damage	87, 49, 128, 14, 58,	Directly related to ultimate goal.	Crashes are rare events; difficult to estimate.
1.3.1 Before-after study	158, 1, 130	Most common study type.	No control site; regression toward mean.
1.3.2 Before-after study with control	120	Control adds rigor.	Regression toward mean.
1.3.3 Before-after-before study		More convincing causal effect.	Regression toward mean.
1.3.4 Regression model		Directly account for multiple factors.	Large amounts of data on many variables.
1.3.5 Empirical Bayes		Control for regression toward mean.	More complicated statistical model.
1.3.6 Full Bayes		More complete treatment of conditional probabilities.	Not widely used.
2.0 Crashes: Laboratory			
2.1 Driving simulator			
2.1.1 Participant: selected, sampled	70	Know participant sample.	Possible sampling bias.
2.1.2 Experimenter: remotely present, unobtrusive observation	70	More experimenter control.	Possible artificial participant behaviors.
2.1.3 Stimuli: simulated, artificial; consistent, controlled	70	Extremely repeatable stimulus conditions.	Artificial stimuli; hard to simulate conspicuity and legibility.

Method	Ref. #	Advantages	Disadvantages
2.1.4 Responses: programmed crashes; antecedent participant and vehicle behaviors; can be more frequent crashes	70	Some control over crashes; can program more frequent crash opportunities.	Lack of negative consequences can unnaturally alter frequency of crashes.
2.1.5 Scenario: contrived route, artificial; unnatural vehicle and environment; safe from harm	70	Control over driving scenario; participant safe from harm.	Unnatural vehicle and environment; artificial scenario; simulator sickness.
2.2 Non-simulator laboratory	87		
2.2.1 Crash scenarios: movies, pictures, acting out		Relatively easy; less resources.	Artificial, out-of-context testing environment.
2.2.2 Crash reconstructions: questionnaires, focus groups		Relatively easy; focus groups more expensive.	Artificial, out-of-context testing environment; focus group social biases.
3.0 Safety Surrogate: Field	34, 85		
3.1 Unobtrusive observation			
3.1.1 Participant: random, uncontrolled; usually unknown	15	No sampling bias.	Do not know participant sample.
3.1.2 Experimenter: usually absent; remote observation; unknown to participant	15	No artificial participant behaviors due to experimenter.	
3.1.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	15	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.1.4 Responses: crash precursors; antecedent vehicle behaviors; more frequent; few participant variables	15	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators; insensitive to participant variables.
3.1.5 Scenario: natural route and trip purpose; uses own vehicle	15	Completely natural experimental context; uses own vehicle.	
3.2 Naturalistic driving			

Method	Ref. #	Advantages	Disadvantages
3.2.1 Participant: selected, sampled	79, 78, 42	Know participant sample.	Possible sampling bias.
3.2.2 Experimenter: absent; remote observation; known to participant	79, 78, 42		Possible artificial participant behaviors.
3.2.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	79, 78, 42	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.2.4 Responses: crash precursors; antecedent vehicle and participant behaviors; more frequent events	79, 78, 42	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators.
3.2.5 Scenario: natural route and trip purpose; uses own vehicle	79, 78, 118, 42	Mostly natural experimental context; uses own or long-term borrowed vehicle.	Participant aware of test status; may be injured or killed; vehicle may be damaged or destroyed; expensive.
3.3 On-road instrumented vehicle	14		
3.3.1 Participant: selected, sampled	54, 18	Know participant sample.	Possible sampling bias.
3.3.2 Experimenter: present; direct observation and interaction	83	More experimenter control; increased experiment safety.	Possible artificial participant behaviors.
3.3.3 Stimuli: selected; natural, in context	83, 18	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.3.4 Responses: crash precursors; antecedent vehicle and participant behaviors; more frequent	54, 18	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators.
3.3.5 Scenario: natural route, artificial trip purpose; uses experimental vehicle	54, 83, 18	Semi-natural experimental context; more safe.	Artificial trip purpose; unfamiliar vehicle.
3.4 Closed-course test track			

Method	Ref. #	Advantages	Disadvantages
3.4.1 Participant: selected, sampled	136	Know participant sample.	Possible sampling bias.
3.4.2 Experimenter: present; direct observation and interaction	136	More experimenter control; increased experiment safety.	Possible artificial participant behaviors.
3.4.3 Stimuli: selected; out of context	136	Semi-natural stimuli.	Stimuli not uniform; some possible control.
3.4.4 Responses: crash precursors; antecedent vehicle and participant behaviors; more frequent	136	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators.
3.4.5 Scenario: unnatural route, artificial trip purpose; uses experimental vehicle	136	Low probability of harm to participant or vehicle.	Unnatural experimental context.
3.5 Commentary driving			
3.5.1 Participant: selected, sampled	36	Know participant sample.	Possible sampling bias.
3.5.2 Experimenter: present; direct observation; extensive interaction	36	More experimenter control; increased experiment safety.	Possible artificial participant behaviors.
3.5.3 Stimuli: selected; natural, in context	36	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.5.4 Responses: extensive driver commentary; running verbal description; crash precursors observable		Collect large amounts of data; direct observation of gross attention.	Commentary could interfere with driving task; artificial task.
3.5.5 Scenario: natural route, artificial trip purpose		Semi-natural experimental context; more safe.	Artificial trip purpose.
3.6 Non-vehicle based field testing			
3.6.1 Roadside interviews	14, 125, 85	Relatively easy; less resources.	Artificial, distal testing environment.

Method	Ref. #	Advantages	Disadvantages
3.6.2 Fuel station, nearby mall interviews		Relatively easy; less resources.	Artificial, out-of-context testing environment.
4.0 Safety Surrogate: Laboratory	36		
4.1 Driving simulator			
4.1.1 Participant: selected, sampled	161, 4, 70, 82	Know participant sample.	Possible sampling bias.
4.1.2 Experimenter: remotely present, unobtrusive observation	161, 4, 70, 82	More experimenter control.	Possible artificial participant behaviors.
4.1.3 Stimuli: simulated, artificial; consistent, controlled	161, 4, 70, 82	Extremely repeatable stimulus conditions.	Artificial stimuli; hard to simulate conspicuity and legibility.
4.1.4 Responses: programmed crash precursors; antecedent participant and vehicle behaviors; can have more frequent events	10, 82, 4	Some control over near-crashes; can program more frequent near-crash opportunities.	Lack of negative consequences can unnaturally alter frequency of near-crashes.
4.1.5 Scenario: contrived route, artificial; unnatural vehicle and environment; safe from harm	161, 4, 70, 82	Control over driving scenario; participant safe from harm.	Unnatural vehicle and environment; artificial scenario; simulator sickness.
4.2 Non-simulator laboratory	75		
4.2.1 Pre-crash scenarios: movies, pictures, acting out	160, 36	Relatively easy; less resources.	Artificial, out-of-context testing environment; weak response measure.
4.2.2 Pre-crash reconstructions: questionnaires, focus groups	36	Relatively easy; focus groups more expensive.	Artificial, out-of-context testing environment; weak response measure; focus group social biases.
5.0 Social Survey	14, 125		
5.1 Telephone survey		Less resources; personal interviewer; more flexible.	Out of context; opinions only; more labor intensive; smaller scale.

Method	Ref. #	Advantages	Disadvantages
5.2 Mail survey		Less resources; standardized; larger scale.	Out of context; opinions only.
5.3 E-mail survey		Less resources; standardized; large scale.	Out of context; opinions only; internet user bias.
6.0 Analytical Study			
6.1 Literature review	53, 38, 26, 129, 52	Benefit from previous knowledge and mistakes.	Based on old information; abstract; hard to apply.
6.2 Review of practice	15, 44	Socially oriented, practical, legal.	Based on old information; not scientific; possibly misleading.
6.3 Deductive-inductive reasoning study	26	Less resources; no need for new data.	Must often make dangerous assumptions; cannot fill in knowledge gaps.

APPENDIX B—DETAILED DESCRIPTION OF STUDIES

B.1 ON-ROAD INSTRUMENTED VEHICLE APPROACH

The most effective research strategy to emerge from the analysis undertaken in section 6.0 is the on-road instrumented vehicle method. The following describes one possible study which might be conducted using this method.

B.1.1 Method

The on-road instrumented vehicle method employs an instrumented vehicle which is brought to the study site, along with a crew of about two or three researchers. The study site is a location where there is at least one CEVMS installation along a public access roadway. Preferably, there would be several CEVMS installations at the location so that a single test driving scenario might pass a few different CEVMS in the course of about half an hour of driving. The investigation should include at least two or three study sites which already have CEVMS in place. At each study site, approximately 20 to 30 research participants would be recruited from the local area.

Each research participant would drive the instrumented vehicle along a prescribed route, which includes CEVMS installations, standard (non-digital) billboards, human-constructed objects of casual visual interest (houses, barns, etc.), and natural background control scenery (trees, fields, etc.). Each drive takes less than 1 hour (preferably about 30 minutes), and each participant would return for several drives on different days. Other aspects would vary as well, such as the time of day, traffic density, and CEVMS conditions (e.g., CEVMS turned on versus CEVMS turned off). Each participant would complete between three and six such drives. The instrumented vehicle and crew would usually remain at a given study site for about 1 to 2 months. The crew would consist of an experimenter and a safety observer, who would both be present in the instrumented vehicle. The safety observer would also serve as a research assistant or technician. The instrumented vehicle is capable of measuring vehicle speed, vehicle lane position, longitudinal acceleration, lateral acceleration, GPS time and position, and driver eye glance direction and duration. The instrumented vehicle is also equipped with accurate vehicle-mounted or head-mounted eye-tracking equipment, video cameras (forward and cab views) and a voice recorder.

B.1.2 Factors and Measures

The major factors or independent variables in the study are the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, etc.) along the driving path. If possible, the CEVMS should be capable of being turned off and on or changed along some other dimension like luminance or change rate, according to a prearranged experimental design. The period of time that the CEVMS is off or changed could be kept relatively brief and carefully controlled since the study will follow a strict protocol. Other important independent variables are the time of day (day/night), traffic conditions (peak and nonpeak), and driver variables (age, gender, and route familiarity). One or more of the primary CEVMS variables of interest to the community concerned with outdoor advertising control should be represented by varying levels along the driving route (e.g., different degrees of luminance, change rate, or display spacing) as much as possible. Direct experimental control would be preferable to site selection in this regard.

The primary measure or dependent variable in this study is the frequency, direction, and duration of driver eye glances, which serves as an indication of visual attention and distraction. The fundamental hypothesis is that drivers have limited attention; they self-regulate their attention to perform demanding tasks. In the case of the driving task, a certain proportion of their attention needs to be concentrated on the roadway scene ahead. To the degree that eye glance behavior can serve as a measure of visual attention, eye glances need to be concentrated on the roadway ahead. If the frequency and duration of eye glances away from the roadway ahead exceed accepted norms or criteria for keeping a driver's eyes on the road, then driver safety may be compromised. Thus, eye glance behavior is the primary dependent variable in the study. Eye glance behavior has an intuitive connection to visual attention and is sensitive to subtle visual search strategies, including those which are below the level of conscious awareness (see section 2.7.2). Depending upon the type of eye glance measuring instrumentation selected, the act of measuring eye glance behavior may prove to be a more or less significant distraction to the driver in itself. This experimentally-induced artifact can be controlled by selecting a minimally intrusive measurement method or by ensuring adequate adaptation to the instrumentation on the part of the research participant.

This study includes another class of secondary dependent variables. These are safety surrogate measures associated with driver errors and other measures of driver performance, such as speed changes, headway, lane deviation, and traffic conflicts. These secondary variables can be measured by instrumentation in the vehicle in terms of speed, acceleration, and lane position. These secondary variables can also be directly observed and noted by the experimenter and/or safety observer in the instrumented vehicle for later analysis in terms of sudden braking, inadequate headway, swerving, and conflicts. Thus, events indicative of possible driver error or other maladaptive behavior can be flagged by human observers. Also, for these events, only objective vehicle performance data needs to be analyzed, saving considerable effort and expense by eliminating the need to analyze large amounts of continuous vehicle performance data.

B.1.3 Advantages/Disadvantages

One advantage of this method is its ability to implement accurate eye-tracking measurements which afford the opportunity to observe subtle and often unconscious eye movements. This ability to measure unconscious eye movements correlates with unconscious distraction facilitates incorporation of the notion of self-regulated attention into the experimental paradigm. When a driver is attempting to concentrate on the roadway ahead, a distractor, which unconsciously diverts attention away from the roadway against the driver's will, may have a more severe safety consequence than a distractor which can be maintained under conscious and voluntary control. Thus, in addition to being able to measure distraction which is both conscious and voluntary, accurate eye-tracking determinations have the potential to probe other phenomena, such as unconscious and involuntary distraction as they relate to CEVMS exposure.

Another advantage of this method is the ability to structure driving scenarios to have an appropriate number of CEVMS, standard billboard, and other visual stimuli all located on a controlled course, which all research participants drive in a consistent manner. The ability to choose and structure the test drive assures adequate and uniform exposure to CEVMS and other relevant visual stimuli. The ability to exert experimental control is a valuable asset to this method. It facilitates a clean and robust statistical analysis of the data because all of the participants are exposed to all of the experimental conditions the same number of times in a relatively controlled manner. Experimental control ensures a high level of CEVMS exposure, thereby contributing to the productivity and cost effectiveness of this technique.

However, examined from a different perspective, such a degree of experimental control may also be regarded as a disadvantage. A certain amount of artificiality is introduced into the driving situation thereby. Research participants are definitely aware that they are participating in a controlled experiment, driving someone else's car on a contrived route which does not serve a personal purpose related to daily life. In addition, with the experimenter riding along with the participants in the vehicle, there may be a tendency for the participants to try to please the experimenter and to drive in some unnatural way. The introduction of eye-tracking equipment adds to the artificiality of the situation. Wearing head-mounted eye-tracking gear definitely represents unnatural driving attire. However, most research participants rapidly adapt to the gear with time, and they often report that they are unaware of its presence after a short drive. Vehicle-mounted eye-tracking equipment can be far less intrusive, although the tedious calibration procedures and the presence of the cameras in the car remind participants that their head and eye movements are constantly being monitored. These are all valid experimental concerns; however, none of these interventions is likely to profoundly alter the driving behavior, much less the eye glance movements, of the research participants, as long as they are not informed of the purpose of the study. The enhanced experimental efficiency that this approach has to offer far outweighs its artificiality drawbacks.

B.1.4 Budgetary Cost

A rough budgetary estimate for conducting such an on-road instrumented vehicle study is between $400,000 and $800,000. The main cost drivers for this method are the eye glance measuring technology and the crew needed to implement the experiment at the study sites. The range in this estimate relates to the number of study sites, adequacy of the sites, length of the experimental drive, number of experimental drives, number of research participants, difficulty in obtaining research participants, ability to turn the CEVMS off and on, and numerous other factors which cannot be determined without further planning.

B.2 NATURALISTIC DRIVING APPROACH

The naturalistic driving method is similar to the on-road instrumented vehicle method. The major difference is that the participants drive their own vehicles (or loaned vehicles) for their own personal purposes. The method typically employs a large number of such vehicles. The following describes one possible study which might be conducted using this method.

B.2.1 Method

The naturalistic driving method employs a standardized instrument package which is installed in the participant's own private vehicle or in a vehicle loaned to the participant. The installation is made as unobtrusive as possible so that the participant's vehicle appears and performs as it normally would. The instrument package is capable of measuring many of the same variables as the on-road instrumented vehicle, such as speed, lane position, acceleration, GPS time and position, driver eye glance frequency, direction, and duration. The instrument package is also connected to the vehicle data bus so that additional vehicle-related measures of engine, braking, and steering performance are also recorded. However, because of the unobtrusive nature of the experimental technique, this method cannot support the use of extremely accurate head-mounted or vehicle-mounted eye-tracking equipment. In the present state of technology, these accurate eye movement instruments involve careful calibration procedures with the driver. With this method, the eye-tracking system is mounted in the dashboard in a manner which involves little or no driver interaction. Once the participant's vehicle has been instrumented, data are collected by means of automatic wireless downloads without participant awareness or involvement. The instrumentation is left in the vehicle for a period of 3 to 6 months, during which time the participant drives the vehicle for normal personal or business use.

The fact that participants drive their own vehicles for their own use reduces control and adds uncertainty to the study. It is difficult to control where the participants are going to drive and when. The study site must be selected carefully so that participants are likely to drive by at least some of the target CEVMS installations. The participants must be selected carefully so that they are likely to take the selected roadway with some reasonable frequency. As a result of this increased uncertainty, the number of study sites must be increased to 4 and 5, the number of research participants selected at each site must be increased to 50 and 75, and the duration of measurement for each participant must be increased to 3 and 6. In this study, it is even more important that there are several CEVMS installations at each study site. As was the case for the on-road instrumented vehicle study, each study site needs to include CEVMS installations, standard (non-digital) billboards, objects of casual visual interest (houses, barns, etc.), and natural background control scenery (trees, fields, etc.).

B.2.2 Factors and Measures

As with the on-road instrumented vehicle study, the major factors or independent variables are the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, control settings, etc.) along the driven path. If possible, the CEVMS should be turned off and on or changed in some other way, according to a prearranged experimental design. However, in this instance, the CEVMS would have to be turned off or changed for longer periods of time because it is not certain when the instrumented test vehicles might pass. These are the primary independent variables. Secondary independent variables could include the type of vehicle (sedan, pickup, or SUV) and driver characteristics (age, gender, and route familiarity). In addition, as much as possible, one or more of the primary CEVMS variables of interest to the community concerned with outdoor advertising control should be represented by varying levels in the selection of CEVMS stimuli.

As in the on-road instrumented vehicle study, the primary measure or dependent variable is the frequency, direction, and duration of driver eye glances. The fundamental hypothesis of self-regulated attention which needs to be concentrated on the roadway scene ahead remains the same. As before, if the frequency and duration of eye glances away from the roadway ahead exceed accepted norms or criteria, then driver safety is assumed be compromised. Thus, eye glance behavior is the primary dependent variable in this study, as well. However, the particular unobtrusive and disengaged dashboard-mounted eye-tracking device may not be capable of making as accurate measurements of eye-movements as can other more delicate vehicle-mounted or head-mounted devices which require periodic participant calibration. Consequently, this study method depends more heavily on secondary dependent variables. Safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, conflicts, and erratic maneuvers) become increasingly important in this method. Since the participants will be driving according to their own personal schedules, additional dependent variables may include the time of day (day/night), traffic conditions (peak and nonpeak), in-vehicle distractions (eating and/or cell phone use), and state of fatigue.

B.2.3 Advantages/Disadvantages

The naturalistic driving method possesses one major advantage over the on-road instrumented vehicle method: the driving scenario, driving task, and driving purpose are all completely natural. The research participants drive their own vehicles (or ones loaned to them) on their own personal schedules along personally selected routes to meaningful destinations. Although to a lesser degree, the naturalistic driving method shares another advantage with the on-road instrumented vehicle method: its ability to implement eye-tracking measurements. In fact, the dashboard-mounted eye-tracking device is far less intrusive to the driver than the head-mounted eye-tracking device sometimes employed in the on-road instrumented vehicle method.

Unfortunately, some dashboard-mounted eye-tracking devices may not be as sensitive and accurate as a head-mounted device. Also, they may not be able to track extensive head movements or measure subtle eye glances indicative of unconscious distraction. The useful field of view can also be an issue with certain unobtrusive vehicle-mounted eye-tracking equipment. Consequently, this experimental method may be less effective in its ability to probe the subtle phenomena of unconscious and involuntary distraction as they relate to CEVMS exposure.

Another disadvantage of this method is its inherent lack of structured driving scenarios. Since participants drive whenever and wherever they want, it is difficult to ensure adequate and uniform exposure to CEVMS and other relevant visual stimuli. This lack of experimental control and higher degree of uncertainty necessitate an increase in the number of study sites, research participants, and duration of the study, which negatively impacts the productivity and cost effectiveness of the technique. For example, this method typically requires the instrumentation of a relatively large number of vehicles at any given study site instead of the instrumentation of just one vehicle which is shared by many research participants. Another minor disadvantage is that research participants are aware that they are participating in an experiment, even if the study is minimally intrusive in terms of daily life routine.

B.2.4 Budgetary Cost

A rough budgetary estimate for conducting such a naturalistic driving study is between $2 million and $4 million. The main cost drivers for this method include increasing the number of study sites, installing instruments in a large number of vehicles at a single site, and collecting and analyzing data covering a long period of time. The range in this budgetary estimate relates to the number of study sites, adequacy of the sites, number of vehicles which need to be instrumented at one time, number of research participants, difficulty in obtaining research participants, driving patterns of the research participants, length of the study at any given site, ability to turn the CEVMS off and on, and numerous other factors which cannot be determined without further planning.

B.3 UNOBTRUSIVE OBSERVATION APPROACH

The unobtrusive observation method is different from the on-road instrumented vehicle method and the naturalistic driving method. The major distinction is that no study participants are selected, and all data are obtained from the natural flow of traffic past the CEVMS and other comparison stimuli. The following describes one possible study which might be conducted using this method.

B.3.1 Method

The unobtrusive observation method employs an array of static cameras or other sensors mounted near the locations of the CEVMS and other comparison stimuli. The other sensors may include loops, tubes, or radar to measure vehicle passes and driving parameters. The present report will focus on video recording of traffic. The cameras are capable of recording the behavior of vehicles passing the various relevant visual stimuli as a part of the natural flow of traffic. The drivers are usually completely unaware that their vehicles are being observed. Post-hoc analysis of the video recordings from these cameras can yield data similar to some of that obtained by the on-road instrumented vehicle and naturalistic driving methods, which include vehicle speed, lane position, acceleration, and time. However, the data from distal video cameras are usually far less accurate than what can be collected by instruments onboard the vehicle. Moreover, with present measurement technology, such video recordings cannot yield any data concerning driver eye glance frequency, direction, and duration. The camera arrays are usually left in place for a period of several months to 1 year at each study site. There would typically be three to four such sites in the study. At each study site, separate camera arrays would need to be installed at the locations of all selected CEVMS displays, standard (non-digital) billboards, objects of casual visual interest (houses, barns, etc.), and natural background control scenery (trees, fields, etc.).

B.3.2 Factors and Measures

As in the on-road instrumented vehicle and naturalist driving studies, the major independent variables are the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, etc.) along the driving path. If possible, the CEVMS should be controlled according to a prearranged experimental protocol. However, in this instance, the CEVMS would have to be changed for longer durations because it is possible to predict when vehicles might pass. In addition, one or more of the primary CEVMS variables of interest to the community concerned with outdoor advertising control should be represented by varying levels in the selection of CEVMS stimuli. These constitute the primary independent variables. Since continuous video recording will be employed, the experimenter can decide to select different times of data collection for further analysis. This capability can provide insight into some secondary independent variables such as time of day (day/night) and traffic conditions (peak, nonpeak).

In contrast to the on-road instrumented vehicle and naturalistic driving studies, the primary dependent variable is not driver eye glance behavior. Instead, this study method depends completely on safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, and erratic maneuvers). These are subtle driving behaviors to measure by means of distal cameras mounted along the roadway. Unless the cameras are mounted very high, multiple vehicle images may occlude each other. For a long stretch of roadway, such as might required for CEVMS exposure, a relatively large array of cameras may be needed. Thus, a large amount of data needs to be collected and analyzed in such a study. Automatic machine vision video analysis algorithms can help in the data analysis process, but such algorithms are not yet sufficiently sensitive and robust to reliably identify all of the subtle indicators of driver errors, conflicts, or maladaptive performance which might accompany CEVMS exposure. The use of other sensors instead of or in addition to cameras may mitigate some of these data analysis problems to a certain extent.

B.3.3 Advantages/Disadvantages

The unobtrusive observation method possesses one major advantage over the other two methods: the data are derived from the natural flow of traffic. Other than erecting camouflaged camera arrays at various locations along the roadway, the experimenter does not disturb the natural flow of human driving. As opposed to the other two methods, the vast majority of drivers are completely unaware that they are part of a study depending on how well the camera camouflage works. Other sensors used for this application can also be hidden and made extremely hard to detect. This is the major advantage of the unobtrusive observation method. Another strong advantage is the large number of vehicles which pass by the CEVMS and other comparison stimuli every day. Sample sizes can be relatively large.

Like the other techniques, the unobtrusive observation method has disadvantages as well. First, with present technology, it is not possible to implement eye-tracking measurements in such a study. The inability to measure eye glance behavior makes it difficult to investigate important constructs, like self-regulated attention and unconscious distraction as they relate to CEVMS exposure. The method is left to rely on safety surrogate measures, such as driver errors and maladaptive maneuvers. These relatively subtle pre-crash and near-crash driving behaviors are difficult to measure by means of distal video cameras. Such driving behaviors also occur very seldom and need to be observed over great distances, leading to the necessity to collect large amounts of video data from extended camera arrays over long periods of time. The collection, reduction and analysis of such large amounts of data tend to make this method time-consuming and expensive.

B.3.4 Budgetary Cost

A rough budgetary estimate for conducting such an unobtrusive observation study is between $1 million and $3 million. The main cost drivers for this method include designing camera arrays which can measure subtle vehicle maneuvers, installing camera arrays to record a large extent of roadway for all CEVMS and comparison stimuli, and collecting and analyzing data covering a long period of time. The range in this budgetary estimate relates to the number of study sites, adequacy of the sites, number and location of cameras in an array, method of recognizing safety surrogate measures, length of the study at any given site, ability to turn the CEVMS off and on, and numerous other factors which cannot be determined without further planning.

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HRDS-07/02-09(WEB)E

REGULAR SESSION

EXHIBIT
11/1/11 CC
RS S.A PH

ORDINANCE NO. ____________

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, AMENDING TITLE 14, SIGN ORDINANCE; TO REVISE STANDARDS AND REGULATIONS RELATED TO ELECTRONIC DISPLAY SIGNS (FILE #ZA-11-02).

WHEREAS, the City wishes to enable properties to have signage that is attractive and appropriate while preventing unsafe and unattractive signs; and

WHEREAS, the City has become aware of regulations that prohibit electronic signs with changeable copy in areas of downtown; and

WHEREAS, the City desires to place reasonable size limits on electronic signs with changeable copy in commercial and industrial areas of the city; and

WHEREAS, the City Council and Planning Commission directed staff to prepare amendments to address regulations related to electronic signs with changeable copy; and

WHEREAS, notification of the amendments has been provided on the city website, at city facilities, through a press release, to neighborhood leaders, to affected stakeholders, and to parties who own property affected by the proposed amendments; and

WHEREAS, the Planning Commission and City Council have held duly advertised public hearings on the amendments, with notice provided per the requirements of the Milwaukie Municipal Code and Oregon Revised Statutes;

NOW, THEREFORE, THE CITY OF MILWAUKIE DOES ORDAIN AS FOLLOWS:

Section 1. <u>Findings.</u> Findings of fact in support of the proposed amendments are attached as Exhibit A.

Section 2. <u>Title 14, Sign Ordinance Text Amendment.</u> The Sign Ordinance is amended as described in Exhibit B (underline/strikeout version) and Exhibit C (clean version).

Read the first time on _____, and moved to second reading by _____ vote of the City Council.

Read the second time and adopted by the City Council on _____.

Signed by the Mayor on _____.

____

Jeremy Ferguson, Mayor

ATTEST:

APPROVED AS TO FORM:
Jordan Ramis PC

____
Pat DuVal, City Recorder

____
City Attorney

Document2 (Last revised 2/6/2008)

Recommended Findings in Support of Approval
Land Use File ZA-11-02

1. The City of Milwaukie proposes to amend regulations in Title 14, Sign Ordinance, of the Milwaukie Municipal Code (MMC) The land use application for these amendments are ZA-11-02.

2. The purpose of the proposed code amendments is to address the topic of electronic display signs. Specifically, the proposed amendments would allow electronic display signs in limited area of downtown; limit the maximum size of electronic display signs in commercial and industrial areas outside of downtown, control the illumination and manner of display for electronic display signs, and coordinate review of Milwaukie's sign permit process with the Oregon Department of Transportation's Outdoor Advertising Sign program

3. The proposed amendments are subject to the following provisions of the MMC:
   - MMC Subsection 19.902.5, Zoning Text Amendments
   - MMC Subsection 19.1008, Type V Review Legislative Actions

4. Sections of the Milwaukie Municipal Code or Comprehensive Plan not addressed in these findings are found to be not applicable to the decision on this land use application.

5. Compliance with MMC Subsection 19.902.5, Zoning Text Amendments:

   MMC Subsection 19.902.5.B states that Changes to the Milwaukie Municipal Code described by Subsection 19.902.2.B may be approved if the following criteria are met:

   A. *The proposed amendment is consistent with other provisions of the Milwaukie Municipal Code.*

   The City Council finds that the proposed amendments are consistent with other provisions of the Milwaukie Municipal Code. No conflicts have been identified with the proposed amendments to Title 14 affecting electronic display signs and any other provisions of the Milwaukie Municipal Code.

   B. *The proposed amendment is consistent with the goals and policies of the Comprehensive Plan.*

   The City Council finds that the proposed amendments are consistent with the following portions of the Comprehensive Plan:

   Chapter 4 – Land Use
   ECONOMIC BASE AND INDUSTRIAL/ COMMERCIAL LAND USE ELEMENT
   <u>Objective #11 — Commercial Land Use: Highway Oriented Center; (3)</u> Development and signage orientation, design, and lighting shall not produce adverse impacts upon adjacent residential areas.

The City Council finds that the proposed amendments help to minimize the impacts created by electronic readerboard signage by limiting the overall size, type of display, and illumination allowed for electronic readerboard signs.

Objective #13 — McLoughlin Boulevard: "To provide for limited highway service uses along McLoughlin Boulevard while improving the visual and pedestrian-oriented linkages between downtown and the Willamette River, and making McLoughlin Blvd. more attractive."

The City Council finds that the proposed amendments allow signage that is appropriate for highway service uses along McLoughlin Blvd and allowing for replacement of dated signage with attractive, new, and up-to-date signage.

NEIGHBORHOOD ELEMENT
Goal Statement: To preserve and reinforce the stability and diversity of the City's neighborhoods in order to attract and retain long-term residents and ensure the City's residential quality and livability.

The City Council finds that the proposed amendments support this goal. Areas where electronic readerboard signs are allowed in Milwuakie are often in close proximity to residential neighborhoods. The proposed amendments help to limit the scale and impacts of such signs to ensure that these areas maintain a good residential quality and a high degree of livability.

Chapter 5- Transportation/Public Facilities/Energy Conservation
TRANSPORTATION ELEMENT
Goal 2, Safety: Develop and maintain a safe and secure transportation system.

The City Council finds that the regulations would help to ensure signage that is not distracting or unsafe to persons traveling in the right-of-way.

C. *The proposed amendment is consistent with the Metro Urban Growth Management Functional Plan and relevant regional policies.*

   The City Council finds that there are no portions of the Metro Urban Growth Management Functional Plan or other regional policies that address signage.

D. *The proposed amendment is consistent with relevant State statutes and administrative rules, including the Statewide Planning Goals and Transportation Planning Rule.*

   The City Council finds that the proposed amendments are consistent with Oregon Revised Statute 377 and Oregon Administrative Rule 734 in that they promote coordination between state requirements for permitting outdoor advertising signs and Milwaukie's sign permitting. No other provisions of state statutes or rules have been identified as being applicable to the proposed amendments.

E. *The proposed amendment is consistent with relevant federal regulations*

The City Council finds that there are no relevant federal regulations except those implemented by state statues for signage along roadways that are applicable to the proposed amendments.

6. Compliance with MMC Subsection 19.1008, Type V Review:

   A. Type V Public Notice. The Planning Director notified the City's Neighborhood District Associations on August 15, 2011. On August 12, 2011, 30 days prior to the Planning Commission's first hearing on the amendments, staff posted information about the amendments on the City's website and at 4 City facilities that are open to the public. Staff posted notice 30 days prior to the City Council's hearing at the same facilities and on the website on September 16, 2011. Notice of the proposed amendments were sent to Metro and to the Department of Land Conservation and Development on July 6, 2011. A Measure 56 Notice was sent on August 19, 2011 to property owners for whom the proposed regulations would have an impact on the types of signs allowed.

      The City Council finds that the requirements of MMC 19.1008.3 are met.

   B. Type V Decision Authority; Recommendation and Decision. The Planning Commission conducted a public hearing on September 13, 2011 and prepared a recommendation to City Council. City Council held a public hearing on October 18, 2011 and its decision on the proposed amendments. City Council finds that the requirements of MMC 19.1008. 4 and 5 are met.

7. The proposed amendments were referred to various City departments, governmental agencies, neighborhood district associations (NDA), and stakeholders for review and comment. They were discussed at several Planning Commission and City Council meetings. Additionally, the most up-to-date draft of the proposed code amendments and commentary document was posted on the City's web site starting on August 12, 2011. Public comments received, including any City responses, are summarized in the staff report.

TITLE 14 SIGNS

CHAPTER 14.04 GENERAL PROVISIONS

14.04.020 PURPOSE

The Council of the City of Milwaukie, Oregon, finds and declares that it is necessary to regulate the design, quality of materials, construction, installation, maintenance, electrification, illumination, type, size, number, and location of all signs visible from a right-of-way or lot under other ownership in order to:

A. Protect the health, safety, property and welfare of the public;

B. Promote the neat, clean, orderly and attractive appearance of the community;

C. Provide for the safe installation and maintenance of signs;

D. (Repealed by Ord. 1965);

E. Preserve and enhance the unique scenic beauty of Milwaukie;

F. Accommodate the need of sign installers while avoiding nuisances to nearby properties;

G. Ensure safe construction, location, installation, and maintenance of signs;

H. Prevent proliferation of sign clutter;

I. Minimize distractions for motorists on public highways and streets; ~~and,~~

J. Regulate solely on the basis of time, place, and manner of a sign, not on its content~~.~~ and,

K. Coordinate review of where multiple agencies have review authority for a sign permit.

14.04.030 DEFINITIONS

The following words and phrases where used in this chapter shall, for the purposes of this chapter, have the meanings respectively ascribed to them in this section:

"Dissolve" means the changing of an electronic display by means of varying light intensity or pattern, where one display gradually appears to dissipate or lose legibility simultaneously with the gradual appearance and legibility of a subsequent display.

"Fade" means the changing of an electronic display by means of varying light intensity, where one display gradually reduces intensity to the point of being illegible or imperceptible and the subsequent display gradually increases intensity to the point of being legible or capable of being perceived.

"Prohibited electronic display" means any part of the message or display on an electronic display sign that utilizes the following methods of presentation:

"Flash" means sudden or intermittent electrical illumination.

"Scroll" means the changing of an electronic display by the apparent movement of the visual image, such that a new visual image appears to ascend and descend, or appear and disappear from the margins of the sign in a continuous or unfurling movement.

"Travel" means the changing of an electronic display by the apparent horizontal movement of the visual image.

"Video display" means providing an electronic display in horizontal or vertical formats to create continuously moving images.

~~Sign, Changing (Automatic). "Changing sign (automatic)" means a sign in which the display on the sign face is changed by motors, clockwork, or other mechanical means; or by electric or electronic means, including changes in color or intensity of lights.~~

Sign, Electronic Display. "Electronic display sign" means a sign or portion of a sign on which the message or display is created by bulbs, light emitting diodes, liquid crystal displays, plasma display panels, pixel or sub-pixel technology, or other similar technology.

Sign, Moving. "Moving sign" means a sign with a visible moving part or visible mechanical movement, including signs which move in the wind or forced air, or by motors, clockwork, or other mechanical means.

Sign, Outdoor Advertising. "Outdoor advertising sign" means a sign that meets the definition of Oregon Revised Statute 377.710(2).

"State highway" means the entire width between the boundary lines of every state highway as defined in ORS 366.005, including but not limited to the Interstate System and the federal-aid primary system.

CHAPTER 14.08 ADMINISTRATION AND ENFORCEMENT

14.08.100 Signs Visible from State Highways

A proposed sign that would be visible from a state highway may require a permit from the Oregon Department of Transportation. The Planning Director may require an applicant for a sign that would be visible from a state highway to submit documentation from the Oregon Department of Transportation regarding whether the proposed sign is considered an outdoor advertising sign that requires a permit from the Oregon Department of Transportation and whether the site is legal for an outdoor advertising sign. The Planning Director may withhold issuance of the permit if there is not conclusive evidence that the sign could be approved or could be conditioned to be approved by the Oregon Department of Transportation.

CHAPTER 14.12 SIGNS PROHIBITED OR EXEMPTED

14.12.020 PROHIBITED SIGNS

It is unlawful for any person to install, display or maintain, and no permit shall be issued for the installation, display or maintenance of, any sign or advertising structure falling within any of the following descriptions:

A. Moving signs that change more frequently that once every 10 seconds, revolving signs that rotate at more than 6 revolutions per minute, or signs that move in the wind or by forced air. ~~or flashing signs, or any other sign with a visible moving part or visible mechanical movement, including signs which move in the wind or move or change electrically or electronically.~~ These signs are prohibited in order to prevent unduly distracting or hazardous conditions to motorists, cyclists, or pedestrians. ~~Automatic changing signs that change no more than once every 10 seconds, and revolving signs that revolve at 6 revolutions per minute or less, are exempt from this prohibition. Switching the power for illuminated signs on and off 4 or fewer times in one day does not constitute a flashing sign.~~

R. Electronic display signs that display message or copy using any prohibited electronic display methods, as defined in Section 14.04.030.

CHAPTER 14.16 SIGN DISTRICTS

14.16.060 DOWNTOWN ZONES

No sign shall be installed or maintained in the DC, DS, DO, DR and DOS Zones, except as allowed under Section 14.12.010 Exempted Signs, or as otherwise noted in this section.

H. Illumination

Illuminated signs may be permitted subject to the following:

1. Signs with opaque letters or symbols that are backlit, having a light source behind the opaque area and not directly visible from in front of the sign, are permitted.
2. Par spot or reflective-type bulbs may be used for indirect illumination of the display surface if properly shielded from direct glare onto streets.
3. Awning signs shall not be internally illuminated. Features on an awning sign may be externally illuminated subject to review by the Design and Landmarks Committee, per Section 19.1011 Design Review Meetings, and approval by the Planning Commission, per Section 19.1006 Type III review, according to the following criteria:
    a. Sign lighting should be designed as an integral component of the building and sign composition.
    b. Sign lighting should be designed primarily for the enhancement of the pedestrian environment along adjacent streets and open spaces.
    c. Lighting should contribute to a sign that is architecturally compatible with the character of the area.
4. Sign illumination shall be directed away from, and not be reflected upon, adjacent premises.
5. Internally illuminated cabinet signs are discouraged in the downtown zones. Internal illumination of cabinet signs may be permitted subject to review by the Design and Landmarks Committee, per Section 19.1011 Design Review Meetings, and approval by the Planning Commission, per Section 19.1006 Type III review, according to the following criteria:
    a. The sign should be a unique design that responds to the Milwaukie Downtown Design Guidelines.
    b. The sign copy should be lighter than the sign background.
    c. The sign background should use a predominance of dark color or be opaque when the light source is on.
6. <u>Electronic display signs are permitted for properties that have frontage on SE McLoughlin Blvd. subject to the following standards:</u>
    <u>a. An electronic display sign may be included only as part of a larger sign and the electronic display portion of the sign and is subject to the more restrictive of the following size limitations:</u>
        <u>(1) 25% of the size of the sign face that contains the electronic display sign, abuts the electronic display sign, or is on the same sign structure as the electronic display sign.</u>
        <u>(2) 20 square feet.</u>

b. An electronic display sign shall be primarily visible from and oriented toward SE McLoughlin Blvd, and not toward any other street on which the property has frontage.

c. Illumination for an electronic display sign is subject to the standards of Section 14.24.020.G.1.

d. The manner of display on electronic display signs shall comply with the standards in Section 14.24.020.G.3.

e. Incorporating an electronic display sign within an existing non-conforming sign is allowed subject to the regulations of Section 14.28.020.A.3.b.

CHAPTER 14.24 SIGN CONSTRUCTION, MAINTENANCE, AND LIGHTING

14.24.020 SIGN LIGHTING

A. All lamps or bulbs exposed to direct view shall be limited to 25 watts or less capacity.

B. When neon tubing is employed on the exterior or ~~inferior~~ interior of a sign, the capacity of such tubing shall not exceed 300 milliamperes rating for white tubing nor 100 milliamperes rating for colored tubing.

C. When fluorescent tubes are used for interior illumination of a sign, such illumination shall not exceed illumination equivalent to 800 milliamperes rating tubes behind a Plexiglas face with tubes spaced at least 9 inches apart, center to center.

D. Lighting from any sign may not directly, or indirectly from reflection, cause illumination on other properties in excess of 0.5 foot candles of light.

E. In the event of a conflict between the standards in this section and a specific standard in the regulations for a sign district, the sign district regulations shall prevail.

F. Other types of illumination not described by Subsections 14.24.020.A-C, such as light emitting diodes and other similar technology, are allowed for interior or exterior illumination of a sign if all other regulations of Title 14 are met.

G. Electronic display signs are allowed in the Commercial sign district (Section 14.16.040), and the Manufacturing sign district (Section 14.16.050), subject to the standards below. Electronic display signs are allowed in the Downtown sign district per Subsection 14.16.060.H.6 and the standards below.

Electronic display signs on properties in the Manufacturing Zone M with frontage on McLoughlin Blvd are allowed and are exempt from the standards below. Such signs are subject to the provisions of the Manufacturing sign district (Section 14.16.050) and any applicable provisions of the Oregon Revised Statutes and Oregon Administrative Rules for signage visible from state highways.

1. Illumination.
   a. An electronic display sign may not have an illumination intensity of more than 0.3 foot candles over ambient light, measured at the distance specified by the following calculation:

      Measurement distance = $\sqrt{(\text{sign face area X 100})}$

      The measurement shall be taken as the difference in illumination between the electronic display sign turned off and the electronic display sign displaying either a solid white screen for multicolor displays or a solid single-color screen for single-color display. To the degree practicable, the measuring device shall be parallel to the plane of the sign face and the measurement shall be made from a location that is perpendicular the plane of the sign face. The specified distance shall be the shortest straight-line distance to the sign face, including horizontal and vertical distance from the sign if the sign is elevated.

   b. The sign shall have a mechanism that automatically adjusts the illumination level to comply with the standards in Subsection 14.24.020.G.1.a.

   c. In addition to the standards of Subsection 14.24.020.G.1.a., no electronic display sign shall be brighter than necessary for clear and adequate visibility, or of such brilliance or intensity as to present a hazard to persons traveling in the right of way. Upon notice by the Planning Director that a sign is out of compliance with these standards, the owner or operator of an electronic display sign shall immediately adjust the illumination of the sign.

2. Size. An electronic display sign in the Commercial sign district or Manufacturing sign district may be included only as part of a larger sign and the electronic display portion of the sign and is subject to the more restrictive of the size limitations below. Size regulations for signs in the downtown sign district are as described in Subsection 14.16.060.H.6.
   a. 50% of the size of the sign face that contains the electronic display sign, abuts the electronic display sign, or is on the same sign structure as the electronic display sign.
   b. 50 square feet.

3. Display.

   The message or copy on an electronic display sign is allowed to change no more than once every 10 seconds. The change in message or copy may occur instantaneously or may fade or dissolve with a transition time of no more than 2 seconds between each separate message or display.

H. Shielding.

The purpose of the regulations below is to prevent light pollution from illuminated signs into the sky. The light source for externally illuminated signs with a sign face of 100 square feet or more shall have a cutoff angle of 90 degrees or greater to ensure that lighting is not directed upward.

CHAPTER 14.28 REMOVAL OF SIGNS IN VIOLATION

14.28.020 NONCONFORMING SIGN

A. Time Limit

1. Except as provided in Subsection 14.28.020.A.4, signs that were in compliance with applicable regulations when installed; but that become nonconforming as a result of adoption, modification, or applicability of the City's sign regulations; may remain in place for 10 years after the date they became nonconforming but shall be removed or brought into compliance on or before 10 years plus 1 day of the date they became nonconforming.
2. (Repealed by Ord. 1965)
3. Any sign which is structurally altered, relocated, or replaced shall immediately be brought into conformance with all of the provisions of this chapter~~.~~ , with the following exceptions:
   a. A nonconforming sign in all zones may be maintained or undergo a change of copy or image without complying with the requirements of this chapter.
   b. The inclusion of an electronic display sign within the existing display area of a non-conforming sign is allowed if the addition of the electronic message sign does not cause the sign to go further out of conformance
4. ~~The provisions of this code relating to flashing signs, par spot lights, revolving beacons, revolving signs, banners, streamers, strings of lights, and temporary signs are applicable to all signs, notwithstanding Subsection 14.28.020.A.1~~

TITLE 14 SIGNS

CHAPTER 14.04 GENERAL PROVISIONS

14.04.020 PURPOSE

The Council of the City of Milwaukie, Oregon, finds and declares that it is necessary to regulate the design, quality of materials, construction, installation, maintenance, electrification, illumination, type, size, number, and location of all signs visible from a right-of-way or lot under other ownership in order to:

A. Protect the health, safety, property and welfare of the public;

B. Promote the neat, clean, orderly and attractive appearance of the community;

C. Provide for the safe installation and maintenance of signs;

D. (Repealed by Ord. 1965);

E. Preserve and enhance the unique scenic beauty of Milwaukie;

F. Accommodate the need of sign installers while avoiding nuisances to nearby properties;

G. Ensure safe construction, location, installation, and maintenance of signs;

H. Prevent proliferation of sign clutter;

I. Minimize distractions for motorists on public highways and streets;

J. Regulate solely on the basis of time, place, and manner of a sign, not on its contentand,

K. Coordinate review of where multiple agencies have review authority for a sign permit.

14.04.030 DEFINITIONS

The following words and phrases where used in this chapter shall, for the purposes of this chapter, have the meanings respectively ascribed to them in this section:

"Dissolve" means the changing of an electronic display by means of varying light intensity or pattern, where one display gradually appears to dissipate or lose legibility simultaneously with the gradual appearance and legibility of a subsequent display.

"Fade" means the changing of an electronic display by means of varying light intensity, where one display gradually reduces intensity to the point of being illegible or imperceptible and the subsequent display gradually increases intensity to the point of being legible or capable of being perceived.

"Prohibited electronic display" means any part of the message or display on an electronic display sign that utilizes the following methods of presentation:

> "Flash" means sudden or intermittent electrical illumination.
>
> "Scroll" means the changing of an electronic display by the apparent movement of the visual image, such that a new visual image appears to ascend and descend, or appear and disappear from the margins of the sign in a continuous or unfurling movement.
>
> "Travel" means the changing of an electronic display by the apparent horizontal movement of the visual image.

"Video display" means providing an electronic display in horizontal or vertical formats to create continuously moving images.

Sign, Electronic Display. "Electronic display sign" means a sign or portion of a sign on which the message or display is created by bulbs, light emitting diodes, liquid crystal displays, plasma display panels, pixel or sub-pixel technology, or other similar technology.

Sign, Moving. "Moving sign" means a sign with a visible moving part or visible mechanical movement, including signs which move in the wind or forced air, or by motors, clockwork, or other mechanical means.

Sign, Outdoor Advertising. "Outdoor advertising sign" means a sign that meets the definition of Oregon Revised Statute 377.710(2).

"State highway" means the entire width between the boundary lines of every state highway as defined in ORS 366.005, including but not limited to the Interstate System and the federal-aid primary system.

CHAPTER 14.08 ADMINISTRATION AND ENFORCEMENT

14.08.100 Signs Visible from State Highways

A proposed sign that would be visible from a state highway may require a permit from the Oregon Department of Transportation. The Planning Director may require an applicant for a sign that would be visible from a state highway to submit documentation from the Oregon Department of Transportation regarding whether the proposed sign is considered an outdoor advertising sign that requires a permit from the Oregon Department of Transportation and whether the site is legal for an outdoor advertising sign. The Planning Director may withhold issuance of the permit if there is not conclusive evidence that the sign could be approved or could be conditioned to be approved by the Oregon Department of Transportation.

CHAPTER 14.12 SIGNS PROHIBITED OR EXEMPTED

14.12.020 PROHIBITED SIGNS

It is unlawful for any person to install, display or maintain, and no permit shall be issued for the installation, display or maintenance of, any sign or advertising structure falling within any of the following descriptions:

A. Moving signs that change more frequently that once every 10 seconds, revolving signs that rotate at more than 6 revolutions per minute, or signs that move in the wind or by forced air. These signs are prohibited in order to prevent unduly distracting or hazardous conditions to motorists, cyclists, or pedestrians. R. Electronic display signs that display message or copy using any prohibited electronic display methods, as defined in Section 14.04.030.

CHAPTER 14.16 SIGN DISTRICTS

14.16.060 DOWNTOWN ZONES

No sign shall be installed or maintained in the DC, DS, DO, DR and DOS Zones, except as allowed under Section 14.12.010 Exempted Signs, or as otherwise noted in this section.

H. Illumination

Illuminated signs may be permitted subject to the following:

1. Signs with opaque letters or symbols that are backlit, having a light source behind the opaque area and not directly visible from in front of the sign, are permitted.
2. Par spot or reflective-type bulbs may be used for indirect illumination of the display surface if properly shielded from direct glare onto streets.
3. Awning signs shall not be internally illuminated. Features on an awning sign may be externally illuminated subject to review by the Design and Landmarks Committee, per Section 19.1011 Design Review Meetings, and approval by the Planning Commission, per Section 19.1006 Type III review, according to the following criteria:
   a. Sign lighting should be designed as an integral component of the building and sign composition.
   b. Sign lighting should be designed primarily for the enhancement of the pedestrian environment along adjacent streets and open spaces.
   c. Lighting should contribute to a sign that is architecturally compatible with the character of the area.
4. Sign illumination shall be directed away from, and not be reflected upon, adjacent premises.
5. Internally illuminated cabinet signs are discouraged in the downtown zones. Internal illumination of cabinet signs may be permitted subject to review by the Design and Landmarks Committee, per Section 19.1011 Design Review Meetings, and approval by the Planning Commission, per Section 19.1006 Type III review, according to the following criteria:
   a. The sign should be a unique design that responds to the Milwaukie Downtown Design Guidelines.
   b. The sign copy should be lighter than the sign background.
   c. The sign background should use a predominance of dark color or be opaque when the light source is on.
6. Electronic display signs are permitted for properties that have frontage on SE McLoughlin Blvd. subject to the following standards:
   a. An electronic display sign may be included only as part of a larger sign and the electronic display portion of the sign and is subject to the more restrictive of the following size limitations:
      (1) 25% of the size of the sign face that contains the electronic display sign, abuts the electronic display sign, or is on the same sign structure as the electronic display sign.
      (2) 20 square feet.
   b. An electronic display sign shall be primarily visible from and oriented toward SE McLoughlin Blvd, and not toward any other street on which the property has frontage.
   c. Illumination for an electronic display sign is subject to the standards of Section 14.24.020.G.1.
   d. The manner of display on electronic display signs shall comply with the standards in Section 14.24.020.G.3.

e. Incorporating an electronic display sign within an existing non-conforming sign is allowed subject to the regulations of Section 14.28.020.A.3.b.

CHAPTER 14.24 SIGN CONSTRUCTION, MAINTENANCE, AND LIGHTING

14.24.020 SIGN LIGHTING

A. All lamps or bulbs exposed to direct view shall be limited to 25 watts or less capacity.

B. When neon tubing is employed on the exterior or interior of a sign, the capacity of such tubing shall not exceed 300 milliamperes rating for white tubing nor 100 milliamperes rating for colored tubing.

C. When fluorescent tubes are used for interior illumination of a sign, such illumination shall not exceed illumination equivalent to 800 milliamperes rating tubes behind a Plexiglas face with tubes spaced at least 9 inches apart, center to center.

D. Lighting from any sign may not directly, or indirectly from reflection, cause illumination on other properties in excess of 0.5 foot candles of light.

E. In the event of a conflict between the standards in this section and a specific standard in the regulations for a sign district, the sign district regulations shall prevail.

F. Other types of illumination not described by Subsections 14.24.020.A-C, such as light emitting diodes and other similar technology, are allowed for interior or exterior illumination of a sign if all other regulations of Title 14 are met.

G. Electronic display signs are allowed in the Commercial sign district (Section 14.16.040), the Manufacturing sign district (Section 14.16.050), subject to the standards below. Electronic display signs are allowed in the Downtown sign district per Subsection 14.16.060.H.6 and the standards below.

   Electronic display signs on properties in the Manufacturing Zone M with frontage on McLoughlin Blvd are allowed and are exempt from the standards below. Such signs are subject to the provisions of the Manufacturing sign district (Section 14.16.050) and any applicable provisions of the Oregon Revised Statutes and Oregon Administrative Rules for signage visible from state highways.

1. Illumination.
   a. An electronic display sign may not have an illumination intensity of more than 0.3 foot candles over ambient light, measured at the distance specified by the following calculation:

      Measurement distance = $\sqrt{(\text{sign face area X 100})}$

      The measurement shall be taken as the difference in illumination between the electronic display sign turned off and the electronic display sign displaying either a solid white screen for multicolor displays or a solid single-color screen for single-color display. To the degree practicable, the measuring device shall be parallel to the plane of the sign face and the measurement shall be made from a location that is perpendicular the plane of the sign face. The specified distance shall be the shortest straight-line distance to the sign face, including horizontal and vertical distance from the sign if the sign is elevated.
   b. The sign shall have a mechanism that automatically adjusts the illumination level to comply with the standards in Subsection 14.24.020.G.1.a.
   c. In addition to the standards of Subsection 14.24.020.G.1.a., no electronic display sign shall be brighter than necessary for clear and adequate visibility, or of such brilliance or intensity as to present a hazard to persons traveling in the right of way. Upon notice by the Planning Director that a sign is out of compliance with these standards, the owner or operator of an electronic display sign shall immediately adjust the illumination of the sign.
2. Size. An electronic display sign in the Commercial sign district or Manufacturing sign district may be included only as part of a larger sign and the electronic display portion of the sign and is subject to the more restrictive of the size limitations below. Size regulations for signs in the downtown sign district are as described in Subsection 14.16.060.H.6.
   a. 50% of the size of the sign face that contains the electronic display sign, abuts the electronic display sign, or is on the same sign structure as the electronic display sign.
   b. 50 square feet.
3. Display.

   The message or copy on an electronic display sign is allowed to change no more than once every 10 seconds. The change in message or copy may occur instantaneously or may fade or dissolve with a transition time of no more than 2 seconds between each separate message or display.

H. Shielding.

The purpose of the regulations below is to prevent light pollution from illuminated signs into the sky. The light source for externally illuminated signs with a sign face of 100 square feet or more shall have a cutoff angle of 90 degrees or greater to ensure that lighting is not directed upward.

CHAPTER 14.28 REMOVAL OF SIGNS IN VIOLATION

14.28.020 NONCONFORMING SIGN

A. Time Limit

1. Except as provided in Subsection 14.28.020.A.4, signs that were in compliance with applicable regulations when installed; but that become nonconforming as a result of adoption, modification, or applicability of the City's sign regulations; may remain in place for 10 years after the date they became nonconforming but shall be removed or brought into compliance on or before 10 years plus 1 day of the date they became nonconforming.
2. (Repealed by Ord. 1965)
3. Any sign which is structurally altered, relocated, or replaced shall immediately be brought into conformance with all of the provisions of this chapter , with the following exceptions:
    a. A nonconforming sign in all zones may be maintained or undergo a change of copy or image without complying with the requirements of this chapter.
    b. The inclusion of an electronic display sign within the existing display area of a non-conforming sign is allowed if the addition of the electronic message sign does not cause the sign to go further out of conformance

Oregon Worsted Company

EXHIBIT
11/1/11 CC
RS 5.A PH

Mill End Store

Real Estate

October 28, 2011

City Council
City of Milwaukie

Although I was not present at the first hearing on the proposed new sign code, I have discussed the comments of people that were there and with the help of my staff have the attached proposed Amendment exhibit A to the proposed new code. This will allow existing businesses to adopt energy efficiency technology without loosing identity.

Ithink that ODOT's sign code should be used on Highway 99 not Milwaukie's sign code.

Should you decide to defer your decision for further study, I enclose the Federal Highway Administrative Guidelines, ODOT' Guidelines, the City of Salem and the City of Hillsboro Sign Code.

I think that Salem and Hillsboro reflects Milwaukie's Demographics and would help draft our code.

Thank you for your consideration,

Howard N. Dietrich

P.O. Box 82098 • Portland, OR 97282, USA
Phone: 503-786-1234 • Fax: 503-786-2022

Proposed Solution:

Digital signage is already heavily regulated by the state. The city of Milwaukie's dwell time duration of 10 seconds is longer than the standard set by the FHWA and ODOT, therefore no change is necessary. Limiting the amount of the sign face has also been shown to be unnecessary based on federal and state guidelines and should not be implemented.

The amendments propose allowing existing non-conforming signs to be upgraded as necessary to utilize LED technology. This is critical to allow local businesses the option to modernize their signage and benefit from the advantages.

Roof top signs are the only types of signs in the code that have no size limitation, if the commission is concerned with size of the new sign(s) perhaps implementing a maximum size for roof signs is appropriate.

State routes and surface streets are significantly different, i.e. McLoughlin Blvd vs Main Street. Perhaps the council could defer to the State OMIA sign regulations on State Routes and enact the proposed changes to non-state routes only.

14.28.020 NONCONFORMING SIGN

A.

3

b. Is amended as follows...

The inclusion of an electronic display sign within the existing display area of a nonconforming sign or a sign preexisting the November 2011 amendments is allowed without limitation provided the sign changes no more frequently than every 10 seconds. ~~if the addition of the electronic message sign does not cause the sign to go further out of conformance~~

The addition of the sign face must require and allow a sign to be brought up to 2008 IBC.

Federal Highway Administration Guidelines

Memorandum

U.S. Department of Transportation
Federal Highway Administration

Subject: **INFORMATION:** Guidance on Off-Premise Changeable Message Signs

Date: September 25, 2007

From: Original signed by: Gloria M. Shepherd
Associate Administrator for Planning, Environment, and Realty

In Reply Refer To: HEPR -20

To: Division Administrators
Attn: Division Realty Professionals

Purpose

The purpose of this memorandum is to provide guidance to Division offices concerning off-premises changeable message signs adjacent to routes subject to requirements for effective control under the Highway Beautification Act (HBA) codified at 23 U.S.C. 131. It clarifies the application of the Federal Highway Administration (FHWA) July 17, 1996 memorandum on this subject. This office may provide further guidance in the future as a result of additional information received through safety research, stakeholder input, and other sources.

Pursuant to 23 CFR 750.705, a State DOT is required to obtain FHWA Division approval of any changes to its laws, regulations, and procedures to implement the requirements of its outdoor advertising control program. A State DOT should request and Division offices should provide a determination as to whether the State should allow off-premises changeable electronic variable message signs (CEVMS) adjacent to controlled routes, as required by our delegation of responsibilities under 23 CFR 750.705(j). Those Divisions that already have formally approved CEVMS use on HBA controlled routes, as well as those that have not yet issued a decision, should re-evaluate their position in light of the following considerations. The decision of the Division should be based upon a review and approval of a State's affirmation and policy that: (1) is consistent with the existing Federal/State Agreement (FSA) for the particular State, and (2) includes but is not limited to consideration of requirements associated with the duration of message, transition time, brightness, spacing, and location, submitted for FHWA approval, that evidence reasonable and safe standards to regulate such signs are in place for the protection of the motoring public. **Proposed laws, regulations, and procedures that would allow permitting CEVMS subject to acceptable criteria (as described below) do not violate a prohibition against "intermittent" or "flashing" or "moving" lights as those terms are used in the various FSAs that have been entered into during the 1960s and 1970s.**

This Guidance is applicable to conforming signs, as applying updated technology to nonconforming signs would be considered a substantial change and inconsistent with the requirements of 23 CFR 750.707(d)(5). As noted below, all of the requirements in the HBA and its implementing regulations, and the specific provisions of the FSAs, continue to apply.

Background

The HBA requires States to maintain effective control of outdoor advertising adjacent to certain controlled routes. The reasonable, orderly and effective display of outdoor advertising is permitted in zoned or unzoned commercial or industrial areas. Signs displays and devices whose size, lighting and spacing are consistent with customary use determined by agreement between the several States and the Secretary, may be erected and maintained in these areas (23 U.S.C. § 131(d)). Most of these agreements between the States and the Secretary that determined the size, lighting and spacing of conforming signs were signed in the late 1960's and the early 1970's.

On July 17, 1996, this Office issued a Memorandum to Regional Administrators to provide guidance on off-premise changeable message signs and confirmed that FHWA has "always applied the Federal law 23 U.S.C. 131 as it is interpreted and implemented under the Federal regulations and individual Federal/State agreements.". It was expressly noted that "in the twenty-odd years since the agreements have been signed, there have been many technological changes in signs, including changes that were unforeseen at the time the agreements were executed. While most of the agreements have not changed, the changes in technology require the State and FHWA to interpret the agreements with those changes in mind". The 1996 Memorandum primarily addressed tri-vision signs, which were the leading technology at the time, but it specifically noted that changeable message signs "regardless of the type of technology used" are permitted if the interpretation of the FSA allowed them. Further advances in technology and affordability of LED and other complex electronic message signs, unanticipated at the time the FSAs were entered into, require the FHWA to confirm and expand on the principles set forth in the 1996 Memorandum.

The policy espoused in the 1996 Memorandum was premised upon the concept that changeable messages that were fixed for a reasonable time period do not constitute a moving sign. If the State set a reasonable time period, the agreed-upon prohibition against moving signs is not violated. Electronic signs that have stationary messages for a reasonably fixed time merit the same considerations.

Discussion

Changeable message signs, including Digital/LED Display CEVMS, are acceptable for conforming off-premise signs, if found to be consistent with the FSA and with acceptable and approved State regulations, policies and procedures.

This Guidance does not prohibit States from adopting more restrictive requirements for permitting CEVMS to the extent those requirements are not inconsistent with the HBA, Federal regulations, and existing FSAs. Similarly, Divisions are not required to concur with State proposed regulations, policies, and procedures if the Division review determines, based upon all relevant information, that the proposed regulations, policies and procedures are not consistent with the FSA or do not include adequate standards to address the safety of the motoring public. If the Division Office has any question that the FSA is being fully complied with, this should be discussed with the State and a process to change the FSA may be considered and completed before such CEVMS may be allowed on HBA controlled routes. The Office of Real Estate Services is available to discuss this process with the Division, if requested.

If the Division accepts the State's assertions that their FSA permits CEVMS, in reviewing State-proposed regulations, policy and procedures for acceptability, Divisions should consider all relevant information, including but not limited to duration of message, transition time, brightness, spacing, and location, to ensure that they are consistent with their FSA and that there are adequate standards to address safety for the motoring public. Divisions should also confirm that the State provided for appropriate public input, consistent with applicable State law and requirements, in its interpretation of the terms of their FSA as allowing CEVMS in accordance with their proposed regulations, policies, and procedures.

Based upon contacts with all Divisions, we have identified certain ranges of acceptability that have been adopted in those States that do allow CEVMS that will be useful in reviewing State proposals on this topic. Available information indicates that State regulations, policy and procedures that have been approved by Divisions to date, contain some or all of the following standards:

- Duration of Message
  - Duration of each display is generally between 4 and 10 seconds – 8 seconds is recommended.
- Transition Time
  - Transition between messages is generally between 1 and 4 seconds – 1-2 seconds is recommended.
- Brightness
  - Adjust brightness in response to changes in light levels so that the signs are not unreasonably bright for the safety of the motoring public.
- Spacing
  - Spacing between such signs not less than minimum spacing requirements for signs under the FSA, or greater if determined appropriate to ensure the safety of the motoring public.
- Locations
  - Locations where allowed for signs under the FSA except such locations where determined inappropriate to ensure safety of the motoring public.

Other standards that States have found helpful to ensure driver safety include a default designed to freeze a display in one still position if a malfunction occurs; a process for modifying displays and lighting levels where directed by the State DOT to assure safety of the motoring public; and requirements that a display contain static messages without movement such as animation, flashing, scrolling, intermittent or full-motion video.

Conclusion

This Memorandum is intended to provide information to assist the Divisions in evaluating proposals and to achieve national consistency given the variations in FSAs, State law, and State regulations, policies and procedures. It is not intended to amend applicable legal requirements. Divisions are strongly encouraged to work with their State in its review of their existing FSAs and, if appropriate, assist in pursuing amendments to address proposed changes relating to CEVMS or other matters. In this regard, our Office is currently reviewing the process for amending FSAs, as established in 1980, to determine appropriate revisions to streamline requirements while continuing to ensure there is adequate opportunity for public involvement.

For further information, please contact your Office of Real Estate Point of Contact or Catherine O'Hara (Catherine.O'Hara@dot.gov).

Oregon Department of Transportation Guidelines

Enrolled
Senate Bill 639

Sponsored by COMMITTEE ON BUSINESS, TRANSPORTATION AND ECONOMIC DEVELOPMENT (at the request of Clear Channel Outdoor Advertising)

CHAPTER ....

AN ACT

Relating to outdoor advertising signs; creating new provisions; amending ORS 377.710, 377.720, 377.750 and 377.767; and prescribing an effective date.

Be It Enacted by the People of the State of Oregon:

SECTION 1. ORS 377.710 is amended to read:

377.710. As used in ORS 377.700 to 377.840 unless the context otherwise requires:

(1) "Back-to-back sign" means a sign with multiple display surfaces mounted on a single structure with display surfaces visible to traffic from opposite directions of travel.

(2) "Commercial or industrial zone" means an area, adjacent to a state highway, that is zoned for commercial or industrial use by or under state statute or local ordinance.

(3) "Council" means the Travel Information Council created by ORS 377.835.

(4) "Cutout" means every type of display in the form of letters, figures, characters or other representations in cutout or irregular form attached to and superimposed upon a sign.

(5) "Department" means the Department of Transportation.

(6) "Digital billboard" means an outdoor advertising sign that is static and changes messages by any electronic process or remote control, provided that the change from one message to another message is no more frequent than once every eight seconds and the actual change process is accomplished in two seconds or less.

[*(6)*] **(7)** "Director" means the Director of Transportation.

[*(7)*] **(8)** "Display surface" means the area of a sign available for the purpose of displaying a message.

[*(8)*] **(9)** "Double-faced sign" means a sign with multiple display surfaces with two or more separate and different messages visible to traffic from one direction of travel.

[*(9)*] **(10)** "Erect" means to construct, build, assemble, place, affix, attach, create, paint, draw or in any way bring into being or establish.

[*(10)*] **(11)** "Federal-aid primary system" or "primary highway" means the federal-aid primary system in existence on June 1, 1991, and any highway that is on the National Highway System.

[*(11)*] **(12)** "Freeway" means a divided arterial highway with four or more lanes available for through traffic with full control of access and grade separation at intersections.

[*(12)*] **(13)** "Governmental unit" means the federal government, the state, or a city, county or other political subdivision or an agency thereof.

[*(13)*] **(14)** "Interstate highway" or "interstate system" means every state highway that is a part of the National System of Interstate and Defense Highways established pursuant to section 103(c), title 23, United States Code.

[*(14)*] **(15)** "Logo" means a symbol or design used by a business as a means of identification of its products or services.

[*(15)*] **(16)** "Logo sign" means a sign located on highway right of way on which logos for gas, food, lodging and camping are mounted.

[*(16)*] **(17)** "Maintain" includes painting, changing messages on display surfaces, adding or removing a cutout or display surface of the same dimensions, replacing lights or the catwalk, making routine repairs necessary to keep the sign in a neat, clean, attractive and safe condition, and allowing the sign to exist.

[*(17)*] **(18)** "Main traveled way" means the through traffic lanes, exclusive of frontage roads, auxiliary lanes and ramps.

[*(18)*] **(19)** "Motorist informational sign" means a sign erected in a safety rest area, scenic overlook or sign plaza and maintained under the authority of ORS 377.700 to 377.840 to inform the traveling public about public accommodations, services for the traveling public and points of scenic, historic, cultural, scientific, outdoor recreational and educational interest.

[*(19)*] **(20)** "Nonconforming sign" means a sign that complied with ORS 377.700 to 377.840 when erected, but no longer complies with ORS 377.700 to 377.840 because of a later change in the law or in the conditions outside of the owner's control. An unlawfully located or maintained sign is not a nonconforming sign.

[*(20)*] **(21)** "Outdoor advertising sign" means:

(a) A sign that is not at the location of a business or an activity open to the public, as defined by the department by rule; or

(b) A sign for which compensation or anything of value as defined by the department by rule is given or received for the display of the sign or for the right to place the sign on another's property.

[*(21)*] **(22)** "Protected area" means an area located within 660 feet of the edge of the right of way of any portion of an interstate highway constructed upon any part of right of way, the entire width of which was acquired by the State of Oregon subsequent to July 1, 1956, and which portion or segment does not traverse:

(a) A commercial or industrial zone within the boundaries of a city, as such boundaries existed on September 21, 1959, wherein the use of real property adjacent to the interstate highway is subject to municipal regulation or control; or

(b) Other areas where land use, as of September 21, 1959, is established as industrial or commercial pursuant to state law.

[*(22)*] **(23)** "Reconstruct" means replacing a sign totally or partially destroyed, changing its overall height or performing any work, except maintenance work, that alters or changes a sign that lawfully exists under ORS 377.700 to 377.840.

[*(23)*] **(24)** "Relocate" includes, but is not limited to removing a sign from one site and erecting a new sign upon another site as a substitute therefor.

[*(24)*] **(25)** "Relocation credit" means a credit for future relocation of a permitted outdoor advertising sign issued in lieu of a relocation permit under ORS 377.767.

[*(25)*] **(26)** "Relocation permit" means a permit to relocate a sign under ORS 377.767, whether issued in a lieu of a current sign permit or a relocation credit.

[*(26)*] **(27)** "Rest area" means an area established and maintained within or adjacent to a state highway right of way by or under public supervision or control for the convenience of the traveling public, and includes safety rest areas, scenic overlooks or similar roadside areas.

[*(27)*] **(28)** "Scenic byway" means a state highway or portion of a state highway designated as part of the scenic byway system by the Oregon Transportation Commission or Federal Highway Administration of the United States Department of Transportation.

[*(28)*] **(29)** "Secondary highway" means any state highway other than an interstate highway or primary highway.

[*(29)(a)*] **(30)(a)** "Sign" means any sign, display, message, emblem, device, figure, painting, drawing, placard, poster, billboard or other thing that is designed, used or intended for advertising purposes or to inform or attract the attention of the public.

(b) "Sign" includes the sign structure, display surface and all other component parts of a sign.

(c) When dimensions of a sign are specified, "sign" includes panels and frames and both sides of a sign of specified dimensions or area.

[*(30)*] **(31)** "Sign area" means the overall dimensions of all panels capable of displaying messages on a sign structure.

[*(31)*] **(32)** "Sign plaza" means a structure erected and maintained by or for the department or the Travel Information Council, adjacent to or in close proximity to a state highway, for the display of motorist information.

[*(32)*] **(33)** "Sign rules for protected areas" means rules adopted by the department applicable to signs displayed within protected areas.

[*(33)*] **(34)** "Sign structure" or "structure" means the supports, uprights, braces, poles, pylons, foundation elements, framework and display surfaces of a sign.

[*(34)*] **(35)** "State highway," "highway" or "state highway system" means the entire width between the boundary lines of the right of way of every state highway, as defined by ORS 366.005, and the interstate system and the federal-aid primary system.

[*(35)*] **(36)** "Tourist oriented directional sign" means a sign erected on state highway right of way to provide business identification and directional information for services and activities of interest to tourists.

[*(36)*] **(37)** "Traffic control sign or device" means an official route marker, guide sign, warning sign, or sign directing or regulating traffic, which has been erected by or under the order of the department.

[*(37)*] **(38)** "Travel plaza" means any staffed facility erected under the authority of the Travel Information Council to serve motorists by providing brochures, displays, signs and other visitor information and located in close proximity to a highway.

[*(38)*] **(39)** "Tri-vision sign" means a sign that contains display surfaces composed of a series of three-sided rotating slats arranged side by side, either horizontally or vertically, that are rotated by an electromechanical process and capable of displaying a total of three separate and distinct messages, one message at a time, provided that the rotation from one message to another message is no more frequent than every eight seconds and the actual rotation process is accomplished in four seconds or less.

[*(39)*] **(40)** "V-type sign" means two signs erected independently of each other with multiple display surfaces having single or multiple messages visible to traffic from opposite directions, with an interior angle between the two signs of not more than 120 degrees and the signs separated by not more than 10 feet at the nearest point.

[*(40)*] **(41)** "Visible" means capable of being seen without visual aid by a person of normal visual acuity, whether or not legible from the main traveled way of any state highway.

SECTION 2. ORS 377.720 is amended to read:

377.720. A sign may not be erected or maintained if it:

(1) Interferes with, imitates or resembles any traffic control sign or device, or attempts or appears to attempt to direct the movement of traffic.

(2) Prevents the driver of a motor vehicle from having a clear and unobstructed view of traffic control signs or devices or approaching or merging traffic.

(3) Contains, includes or is illuminated by any flashing, intermittent, revolving, rotating or moving light or moves or has any animated or moving parts. This subsection does not apply to:

(a) A traffic control sign or device.

(b) Signs or portions thereof with lights that may be changed at intermittent intervals by electronic process or remote control that are not outdoor advertising signs.

(c) A tri-vision sign, except that a tri-vision sign may not be illuminated by any flashing, intermittent, revolving, rotating or moving lights.

(d) A digital billboard, only if the digital billboard:

(A) Is not illuminated by a flashing light or a light that varies in intensity;

(B) Has a display surface that does not create the appearance of movement;

(C) Does not operate at an intensity level of more than 0.3 foot-candles over ambient light as measured at a distance of:

(i) 150 feet, if the display surface is 12 feet by 25 feet;

(ii) 200 feet, if the display surface is 10.5 feet by 36 feet; or

(iii) 250 feet, if the display surface is 14 feet by 48 feet;

(D) Is equipped with a light sensor that automatically adjusts the intensity of the billboard according to the amount of ambient light;

(E) Is designed to either freeze the display in one static position, display a full black screen or turn off in the event of a malfunction;

(F) If available where the digital billboard is located, uses renewable energy resources to power the digital billboard, including but not limited to the following:

(i) Wind energy;

(ii) Solar photovoltaic and solar thermal energy;

(iii) Wave, tidal and ocean thermal energy;

(iv) Geothermal energy; and

(v) The purchase of carbon credits; and

(G) If wind energy is used, as specified in subparagraph (F)(i) of this paragraph, uses moving parts for the purpose of generating the wind energy to power the billboard.

(4) Has any lighting, unless such lighting is so effectively shielded as to prevent beams or rays of light from being directed at any portion of the main traveled way of a state highway, or is of such low intensity or brilliance as not to cause glare or to impair the vision of the driver of a motor vehicle or otherwise to interfere with the operation thereof.

(5) Is located upon a tree, or painted or drawn upon a rock or other natural feature.

(6) Advertises activities that are illegal under any state or federal law applicable at the location of the sign or of the activities.

(7) Is not maintained in a neat, clean and attractive condition and in good repair.

(8) Is not able to withstand a wind pressure of 20 pounds per square foot of exposed surface.

(9) Is on a vehicle or trailer that is located on public or private property. This subsection does not apply to a vehicle or trailer used for transportation by the owner or person in control of the property.

SECTION 3. ORS 377.750 is amended to read:

377.750. (1) For the purpose of applying the spacing provided by subsection (2) of this section:

(a) Distances shall be measured lineally along the highway and parallel to the center line of the highway.

(b) A back-to-back sign, **digital billboard,** double-faced sign, V-type sign or tri-vision sign shall be considered one sign.

(c) Distance from an interchange shall be measured from a point departing from or entering onto the main traveled way.

(2) Except as provided in subsection (3) of this section, minimum spacing between outdoor advertising signs shall be:

Type of highway where erected	Minimum space between signs on same side of highway (in feet)	Minimum space from interchange (in feet)
Interstate Highway		
Inside cities	500	None
Outside cities	2,000	500
Freeway		
Inside cities	500	None
Outside cities	1,000	500
Other state highway		
Inside cities	100	None
Outside cities	500	None

(3) A nonconforming outdoor advertising sign in existence on May 30, 2007, may continue to deviate from the spacing limitations established in this section until the sign is reconstructed or relocated, at which time the sign shall comply with the spacing limitations established in this section.

SECTION 4. ORS 377.767 is amended to read:

377.767. A permit or a relocation credit shall be issued for the relocation of a permitted outdoor advertising sign lawfully located within a commercial or industrial zone in existence on May 30, 2007, if the site lease for the sign is terminated for any reason. The existing outdoor advertising sign may be relocated within any commercial or industrial zone if the new sign and the new site comply with ORS 377.700 to 377.840, and upon the following conditions:

(1) The outdoor advertising sign that is relocated may not have a sign size larger than that specified in the permit for the sign located on the site on which the lease was terminated. However, an outdoor advertising sign with 250 square feet or more of display surface on one side may be increased to the maximum size allowed by ORS 377.700 to 377.840 if the relocated sign is not visible from Interstate Highway 5, Interstate Highway 205, or Interstate Highway 84. A single-faced sign may be relocated as a back-to-back sign.

(2) The site for the relocated sign is not within the distances set forth below, on the same side of the highway, from a site from which an outdoor advertising sign was purchased pursuant to the provisions of ORS 377.700 to 377.840.

Types of Highway	Distance in Either Direction from Site
Interstate	2,000 feet
Freeway	1,000 feet
Other State Highway	500 feet

(3) If an outdoor advertising sign is relocated within a commercial or industrial zone that first came into existence after January 1, 1973, the site shall be within 750 feet of a developed commercial or industrial area, as measured parallel to the centerline of the highway. For purposes of this subsection, "developed commercial or industrial area" includes only the land occupied by a building, parking lot, storage area or processing area of a commercial or industrial use and on the same side of the highway.

(4) A permit may not be issued to relocate an outdoor advertising sign more than 100 miles from the existing site of the sign as of May 30, 2007, as measured along public streets, roads or highways between that site and the proposed new site. For relocation credits that exist as of May 30, 2007, a permit may not be issued to relocate an outdoor advertising sign more than 100 miles from the existing site of the sign as of September 1, 1977, as measured along public streets, roads or highways between that site and the proposed new site.

(5) Outdoor advertising signs may not be relocated to a scenic byway. If a portion of a highway is no longer designated as a scenic byway, as provided by state and federal law, an outdoor advertising sign may be relocated to that portion subject to ORS 377.700 to 377.840 and 377.992 and any other limitations provided by law.

[*(6) If the outdoor advertising sign being relocated is relocated as a tri-vision sign, the applicant shall obtain three equivalent permits or relocation credits and the sign must meet all requirements of this section.*]

[*(7) If the outdoor advertising sign being relocated is relocated as a back-to-back tri-vision sign or V-type tri-vision sign, the applicant shall obtain six equivalent permits and the sign must meet all requirements of this section.*]

SECTION 5. Sections 6 and 7 of this 2011 Act are added to and made a part of ORS 377.700 to 377.840.

SECTION 6. (1) As used in this section:

(a) "Bulletin" means an outdoor advertising sign with a display surface that is 14 feet by 48 feet.

(b) "Poster" means an outdoor advertising sign with a display surface that is 12 feet by 25 feet.

(2) If an outdoor advertising sign being relocated is relocated as a digital billboard or if an outdoor advertising sign being reconstructed is reconstructed as a digital billboard, an applicant for a permit under ORS 377.725 must exchange the following in order to receive one permit for a digital billboard:

(a) An applicant with 10 percent or less of the total number of relocation credits in existence on the date the Department of Transportation receives the application for a digital billboard permit shall either remove one existing outdoor advertising sign and retire the permit for that sign or retire one relocation credit. The permit or relocation credit retired must be for signs with a display surface of at least 250 square feet.

(b) An applicant with more than 10 percent of the total number of relocation credits in existence on the date the department receives an application for a digital billboard permit shall:

(A) For a digital billboard that is a bulletin:

(i) Remove two existing bulletins, retire the permits for those bulletins and retire three relocation credits;

(ii) Remove one existing bulletin and two existing posters, retire the permits for the bulletin and posters and retire three relocation credits; or

(iii) Remove four existing posters, retire the permits for those posters and retire three relocation credits.

(B) For a digital billboard that is a poster:

(i) Remove two existing posters, retire the permits for those posters and retire three relocation credits; or

(ii) Remove one existing bulletin, retire the permit for the bulletin and retire three relocation credits.

(3) The relocation credits retired under subsection (2)(b) of this section must be for signs with a display surface of at least 250 square feet.

(4) Notwithstanding ORS 377.759 and 377.762, an owner that removes an outdoor advertising sign under this section is not entitled to a relocation credit.

(5) When calculating the number of relocation credits an owner possesses, the department shall consider the total number of relocation credits owned by any corporate entity held in common ownership with the owner in order to determine how many outdoor advertising signs the owner must remove and how many relocation credits the owner must retire to receive a permit to erect a digital billboard.

(6) The department shall cancel the relocation credits and permits submitted under this section upon issuance of a permit to erect a digital billboard.

(7) Two permits for a digital billboard are required to erect a back-to-back or V-type digital billboard.

(8) The first time an owner uses a permit to erect a digital billboard, the permit is not restricted by the provisions of ORS 377.767 (4).

(9) The department shall issue one digital billboard relocation credit for each digital billboard that is removed. A digital billboard relocation credit may be used only to erect a digital billboard and may not be used to erect any other type of outdoor advertising sign.

(10) Except as provided in subsection (8) of this section, an outdoor advertising sign that is being relocated as a digital billboard must meet all requirements of ORS 377.767.

SECTION 7. (1) The Department of Transportation shall work together with the Travel Information Council, the Office of Emergency Management, the Department of State Police, the Secretary of State and owners of digital billboards to develop a public notification plan for the purpose of using digital billboards to display notifications to the traveling public related to civic activities and public safety. Public notifications include but are not limited to information about the Government Waste Hotline established under ORS 177.170, elections, voter registration, Amber Alerts and natural disasters and other emergencies.

(2) The Department of Transportation, in coordination with the Office of Emergency Management, the Department of State Police, the Secretary of State and owners of digital billboards, shall prepare a written public notification plan. In preparing the plan, the Department of Transportation shall address:

(a) The criteria to be applied in determining when it is appropriate to request that an owner of a digital billboard display a public notification.

(b) The procedures used to determine the expiration of a notification and to recall the request once the information is no longer needed.

SECTION 8. (1) The Travel Information Council shall study and make recommendations on the following:

(a) How to prioritize public notifications made under section 7 of this 2011 Act.

(b) How to encourage the display of public notifications on digital billboards.

(2) The council shall submit a report, and may include recommendations for legislation, to the interim committees of the Legislative Assembly related to transportation no later than September 1, 2012.

SECTION 9. Section 8 of this 2011 Act is repealed on January 2, 2013.

SECTION 10. This 2011 Act takes effect on the 91st day after the date on which the 2011 regular session of the Seventy-sixth Legislative Assembly adjourns sine die.

City of Salem Sign Code

62.065. Materials.

(a) Materials for construction of signs shall be of the quality and grade as specified for buildings and structures pursuant to SRC Chapter 56.

(b) Except for lamps, tubes, bulbs, or neon tubing, no glass shall be used in the face of any sign. (Ord No. 167-68; Ord No. 4-08)

62.070. Noncombustible and Combustible Materials.

(a) Roof signs, wall signs, projecting signs, and signs on marquees shall be constructed of noncombustible materials except for nonstructural trim, display surfaces and cutouts which may be constructed of wood, metal, approved plastics, or any combination thereof. Except as provided in subsection (b) of this section, only metal and approved plastics shall be used in construction of electronic display signs, internally illuminated signs, and externally illuminated signs.

(b) The Director may approve the use of combustible materials for covering, erecting a facade on, or ornamenting a sign structure for an electronic display sign, internally illuminated sign, and externally illuminated sign, provided that:

(1) The use of such materials is permitted in the Fire Zone in which the sign is located or proposed to be located.

(2) There is no load-bearing member of the sign structure constructed of combustible materials.

(3) There is no substantial fire or electrical safety hazard. (Ord No. 191-70; Ord No. 44-88; Ord No. 1-09)

62.075. Sign Supports.

Unless approved by the Director pursuant to SRC 62.120, the supports of all signs shall be placed in or upon private property. (Ord No. 167-68; Ord No. 54-83; Ord No. 51-96; Ord No. 39-2003; Ord No. 4-08)

62.085. Electric Sign Construction.

(a) Electronic display signs, internally illuminated signs, and externally illuminated signs shall be permanently and rigidly affixed to the sign structure, building, or other structure. Electric signs may be mechanically activated for animation, but may not be wind-activated.

(b) The bottom of electronic display signs, internally illuminated signs, and externally illuminated signs and outline lighting enclosures shall not be less than sixteen feet above areas accessible to vehicles; provided, however, the bottom of such signs and enclosures may be less than sixteen feet above areas accessible to vehicles where such enclosures are protected from physical damage.

(c) Every electronic display sign, internally illuminated sign, and externally illuminated sign shall have placed, within easy view, a laboratory label from an approved testing agency. (Ord No. 191-70; Ord No. 54-83; Ord No. 4-08; Ord No. 1-09)

62.090. Electronic Display Signs.

(a) No electronic display sign in a Residential zone may be erected without first obtaining a conditional use permit, as provided in SRC 62.375.

(b) No electronic display sign shall be allowed within a historic district.

(c) All electronic display signs shall meet the following standards:

(1) Zones.

(A) In all Industrial zones, Public zones, and Commercial zones, other than the Commercial Office Zone, the change from one electronic display to another electronic display shall be no more frequent than once every eight seconds, except changes to correct hour-and-minute or temperature information, which may change no more often than once every three seconds.

(B) In all Residential zones and in the Commercial Office Zone, the change from one electronic display to another electronic display shall be no more frequent than once every hour, except changes to correct hour-and-minute or temperature information, which may change no more often than once every three seconds.

(2) Change of Display. The actual change of display for an electronic display sign shall be completed in two seconds or less. Displays may change by dissolve, fade, or by instantaneous change from one static display to another, but shall remain as a static display after completing the change, and, once changed, shall remain static until the next change. Unless specifically authorized by this Chapter, scrolling, travel, and video display are prohibited.

(3) Brightness. All electronic display signs must be constructed, operated, or otherwise function in such a way as to not exceed the provisions of this paragraph.

(A) At the time of installation, electronic display signs may be illuminated to a degree of brightness that is no greater than 7,500 nits between sunrise and sunset and that is no greater than 1,000 nits between sunset and sunrise; provided that an electronic display sign comprised solely of one color shall not exceed the following levels:

(i) For a display comprised of red only, 3,150 nits between sunrise and sunset, and 450 between sunset and sunrise;

(ii) For a display comprised of green only, 6,300 nits between sunrise and sunset, and 900 nits between sunset and sunrise;

(iii) For a display comprised of amber only, 4,690 nits between sunrise and sunset, and 670 nits between sunset and sunrise.

(B) All electronic display signs must be maintained and operated to meet the following brightness standards:

(i) No sign shall be brighter than is necessary for clear and adequate visibility.

(ii) No sign shall be of such intensity or brilliance as to impair the vision of a motor vehicle driver with average eyesight or to otherwise interfere with the driver's operation of a motor vehicle.

(iii) No sign shall be of such intensity or brilliance that it interferes with the effectiveness of an official traffic sign, device or signal.

(C) The person owning or controlling an electronic display sign must adjust the sign to meet the brightness standards in accordance with the Director's instructions. The adjustment must be made immediately upon notice of non-compliance from the Director. The person owning or controlling the sign may appeal the Director's determination to the Hearings Officer, using the contested case procedures set forth in SRC Chapter 20J.

(D) All electronic display signs must be equipped with a mechanism that automatically adjusts the brightness in response to ambient conditions and equipped with a means to immediately turn off the display if it malfunctions, and the sign owner or operator must immediately turn off the sign or lighting when notified by the Director that it is not complying with the standards in this section.

(d) Notwithstanding any other provision in this chapter, a municipal corporation providing transit services within the corporate limits of the City may erect one electronic display sign in each of the corporation's transit stops, which shall be limited to two square feet in area, screened from adjacent residential properties, and used only for the transmission of public information by the corporation. (Ord No. 1-09)

62.095. General Illumination Standards.

(a) No sign shall be erected or maintained which, by use of lights or illumination creates an unduly distracting and hazardous condition to a motorist, pedestrian, or the general public or which may be confused with or construed as a traffic control device.

(b) No exposed reflective type bulb, par spot, or incandescent lamp that exceeds twenty-five watts, shall be exposed to direct view from a public street, but may be used for indirect light illumination of a display surface.

(c) Neon tubing employed on the exterior or interior of a sign shall not exceed 300 milliamperes rating for white tubing or 100 milliamperes rating for any colored tubing.

(d) When fluorescent tubes are used for interior illumination of a sign, the florescent tubes shall not exceed:

(1) Within Residential zones, illumination equivalent to 425 milliampere rating tubing behind a plexiglass face, with tubes spaced at least seven inches, center to center.

(2) Within Commercial, Industrial and Public zones, illumination equivalent to 800 milliampere rating tubing behind a plexiglass face spaced at least nine inches, center to center.

(e) The light source for an internally illuminated sign may be comprised of light emitting diodes, so long as the light emitting diodes are used for illumination only, do not create an electronic display or effect, and conform to the brightness limitations set forth in SRC 62.090(b)(4). (Ord No. 167-68; Ord No. 173-71; Ord No. 1-09)

62.100. Permit Fees. The application for a sign permit shall be accompanied by a fee as prescribed by resolution of the council. Where the permit is for additions to or deletions from an existing sign and no substantial structure alteration is made, the fee shall apply to the sign area of the portion added to or deleted from the sign. (Ord No. 167-68; Ord No. 173-71; Ord No. 49-81; Ord No. 54-83; Ord No. 76-84; Ord No. 56-86; Ord No. 44-88; Ord No. 51-91; Ord No. 51-96)

62.115. Temporary Signs, Generally.

(a) Lawn signs shall not exceed a height of thirty inches above grade and may be displayed a maximum of two, sixty-day continuous periods per year. Rigid signs shall not exceed a height of six feet above grade and may be displayed a maximum of one year. Temporary signs shall not be attached to fences, trees, shrubbery, utility poles, or like items and shall not obstruct or obscure permanent signs on adjacent premises. The date of erection or placement of lawn signs shall be clearly noted on signs or sign posts or the earliest date of erection certified to in writing by the sign erector to the Director.

(b) No temporary sign shall be internally illuminated or be illuminated by external light source primarily intended for the illumination of the temporary sign.

(c) Except as provided in SRC 62.350 and SRC 62.520, no temporary sign shall project over public property or extend into any landscaped area.

(d) No temporary sign shall be erected or maintained which, by reason of its size, location, or construction constitutes a hazard to the public.

(e) Except for temporary sign displays, no temporary sign shall be located in a vision clearance area, established pursuant to SRC 76.170. In addition, no temporary sign exceeding four square feet in area and resting upon or supported by the ground shall be located within an area bounded by a street front property line and a line drawn parallel thereto ten feet inside the property line if there is an entrance or exit from the street crossing such property line. (Ord No. 167-68; Ord No. 162-69; Ord No. 173-71; Ord No. 49-81; Ord No. 186-82; Ord No. 54-83; Ord No. 79-87; Ord No. 92-94; Ord No. 4-08)

ADVERTISING SIGNS

62.507. Construction Requirements for Outdoor Advertising Signs. Outdoor advertising signs shall have all metal structures; provided, however, that the display surface or display surfaces and the stringers used for the support of the display surfaces may be of other materials. In all other respects, construction and maintenance of outdoor advertising signs shall conform to the requirements of this Chapter. (Ord No. 56-69; Ord No. 54-83)

62.508. Prohibited Outdoor Advertising Signs. No outdoor advertising sign:

(a) Shall be located with any Urban Renewal Project Area.

(b) Shall be located within the Willamette Greenway boundary established by SRC 141.040.

(c) Shall be located on the roof of any building or structure.

(d) Shall be erected or maintained in a vision clearance area established by this code or within three feet of a street front property line, or within the special setback area established by the Salem Zoning Ordinance whichever is greater, except as provided in SRC 62.5191.

(e) Shall project over public property.

(f) Shall be animated or rotate nor shall any animated or rotating parts be used; provided, however, that animated devices giving only the time or temperature are permitted.

(g) Shall be erected within 200 feet of the Civic Center which area is bounded by Trade Street on the north, Liberty Street on the east, Leslie Street on the south and Commercial Street on the west.

(h) Shall be erected within 200 feet of the Capital Mall as that area is defined in ORS 276.010.

(i) Shall be located in a residential, commercial office, commercial neighborhood, or public zoning district, as those districts are designated in the Salem Zoning Ordinance.

(j) Shall be erected or maintained within five feet of a side lot line. (Ord No. 56-69; Ord No. 108-75; Ord No. 54-83; Ord No. 35-06)

62.509. Back-To-Back and Double Faced Outdoor Advertising Signs. Outdoor advertising signs with display surfaces placed back-to-back on the same structure and in a parallel plane are permitted. Multiple display surfaces are permitted on the same sign structure facing in the same direction provided that no such display surface exceeds 200 square feet in sign area. (Ord No. 56-69; Ord No. 54-83)

62.511. Wall Mounted Outdoor Advertising Signs. Wall mounted outdoor advertising signs shall conform to the same requirements as wall signs contained in SRC 62.400; provided, however, that no wall mounted outdoor advertising sign shall project above eave line of the roof of a building. (Ord No. 56-69; Ord No. 54-83)

62.512. Underground Wiring. Where underground electric service is provided by the utility company, all illuminated outdoor advertising signs shall be serviced by underground service utilities. (Ord No. 56-69; Ord No. 54-83)

62.513. Outdoor Advertising Sign, Size Limited.

(a) Maximum sign area of an outdoor advertising sign shall be limited to 300 square feet; provided, however, that notwithstanding their size, the following outdoor advertising signs may be repaired, replaced or relocated to any otherwise lawful location:

(1) The outdoor advertising sign located on the west line of Commercial Street SE, 175 feet south of Ferry Street;

(2) The outdoor advertising sign located on the south line of State Street, 160 feet west of 14th Street; and

(3) The outdoor advertising sign located on the east line of Portland Road NE, 250 feet south of Beech Street NE.

(b) Maximum height of the display surface and border and trim of an outdoor advertising sign shall be 14 feet including border and trim.

(c) Maximum height to the top of the permanent portion of an outdoor advertising sign shall not exceed 35 feet above the grade below the sign, provided, however, that lawfully erected signs erected prior to April 28, 1969 within the city limits or in areas later annexed to the City may have up to 10 percent additional height if such signs do not violate any other provisions of this Chapter.

(d) Outdoor advertising signs primarily to be viewed from the Interstate 5 Freeway shall not exceed 40 feet in height measured from the top of the sign to the grade below the sign. (Ord No. 56-69; Ord No. 54-83)

62.514. Cutouts on Outdoor Advertising Signs. Cutouts may be attached to an outdoor advertising sign and may add up to 25 percent additional sign area. Such cutouts may project three feet above or two feet to either side or below the display surface of an outdoor advertising sign. Cutouts shall be limited to one cutout per outdoor advertising sign or one unit on each facing of a back-to-back sign. Such cutout shall be one integral unit and shall not project beyond the sign in more than one horizontal and one vertical plane. (Ord No. 56-69; Ord No. 54-83)

62.515. Setback from R, CN, P, and CO Districts. No outdoor advertising sign shall be located within 100 feet of a residential, commercial neighborhood district, public, or commercial office district, or within 200 feet of an occupied residential structure fronting on the same street. (Ord No. 56-69; Ord No. 54-83)

62.518. Spacing and Density Requirements for Outdoor Advertising Signs.

(a) For the purposes of this section, back-to-back V structured outdoor advertising signs are considered as a single sign.

(b) No outdoor advertising sign shall be erected or maintained within 500 feet of another outdoor advertising sign located on the same side of a street or highway.

(c) No outdoor advertising sign shall be erected or maintained within 250 feet of another outdoor advertising sign located on the opposite side of a street or highway.

(d) In addition to the requirements of subsections (a) and (b) of this section, no more than three outdoor advertising signs may be erected or maintained along both sides of a street or highway within a 1,000 foot lineal distance. (Ord No. 56-69; Ord No. 54-83; Ord No. 89-89)

62.519. Measurements. For the purposes of applying the spacing and density limitations and setbacks from a residential, commercial neighborhood, or commercial office district, all distances shall be measured parallel to the centerline of the street or highway from the leading edge of the sign face. (Ord No. 56-69; Ord No. 54-83; Ord No. 89-89)

62.5191. Special Setbacks. Outdoor advertising signs 300 square feet in area or less may be located in a special setback area as provided in SRC 62.300. (Ord No. 54-83)

SIGNS IN THE CENTRAL BUSINESS DISTRICT

62.520. Signs in the Central Business District.

(a) Except as provided in this section, signs in the Central Business (CB) district shall be the same as those permitted in commercial or industrial districts.

(b) Freestanding signs in the CB district.

(1) The height of a freestanding sign is limited to twenty feet plus one additional foot for

City of Hillsboro Sign Code

11.32.150 Billboard districts

The following billboard standards apply in the Sunset Highway and TV Highway billboard sign districts and control over any inconsistent requirement in the underlying sign district that are otherwise applicable to the property on which a billboard is located:

A. Billboards must be located within the boundaries of the Sunset Highway and TV Highway billboard districts with no more than:

1. 16 approved billboard permits at any one time for the TV Highway billboard district, which may also be tri-vision or electronic message signs. The number of billboard permits for the TV Highway billboard district may be increased by the number of billboards located on land designated industrial or commercial in the comprehensive plan, located adjacent to the Tualatin Valley Highway, and annexed to the city after September 1, 2000.

2. Two approved billboard permits, or one if for a tri-vision or electronic message sign, at any one time for the Sunset Highway billboard district.

B. The sign area of a billboard may not exceed 300 square feet per sign face except under HMC 11.32.280(M)(4). The sign area may be increased an additional 20 percent for a sign that is irregular in form and projects beyond the outer dimensions of the signboard, frame or cabinet. Each side of a double-faced billboard is a separate sign face for the purpose of sign area limitations.

C. Billboards may be double-faced, allowing sign copy on two sides of a supporting structure, provided the two sides are parallel within a deviation of 10 degrees.

D. Building height zoning limitations apply to billboards. Billboards on property zoned M-2 Industrial may not exceed 45 feet in sign height.

E. Within the TV Highway billboard district, billboards may not be located within 150 linear feet from the property line of any residentially zoned property on the same side of the highway as the proposed billboard site.

F. Billboards are subject to the separation requirements established by state statute and rules.

G. Within the TV Highway billboard district, a billboard permit holder may file a consolidation application to combine two billboards with areas less than 300 square feet into one billboard with an area less than 700 square feet. The number of billboard permits allowed within the TV Highway billboard district shall be permanently decreased by the number of consolidated permits issued.

11.32.230 Electronic message and tri-vision signs

Electronic message and tri-vision signs must:

A. Have a rate of change from one sign copy to the next no more frequent than eight seconds and the change must be accomplished in no more than four seconds or be turned off during the change interval;

B. Have a display that holds in a static position after completing the horizontal travel or vertical scroll;

C. Not have sign copy that appears to flash, undulate, pulse, or portray explosions, fireworks, flashes of lights, blinking of chasing lights, move toward or away from the viewer, expand, contract, bounce, rotate, spin, twist or otherwise portray graphics or animation; and

D. Not be illuminated to a degree of brightness that is greater than necessary for adequate visibility or exceed 8,000 nits or equivalent candelas during daylight hours or 1,000 nits or equivalent candelas between dusk and dawn.

EXHIBIT
11/1/11 CC
RS 5.A PH

Lisa Batey
11912 SE 19th Avenue
Milwaukie, Oregon 97222

Milwaukie City Council
10722 SE Main Street
Milwaukie, Oregon 97222

November 1, 2011

RE: Supplemental Information on Jurisdictions to Ban Electronic Billboards

Dear Mayor Ferguson and Council Members:

I write you on my own behalf, and am not representing the views of the Planning Commission (but am copying the other members for their information). I wanted to share some supplemental information as you consider the proposed amendments to the Milwaukie Sign Code at tonight's meeting. Specifically, attached are a series of newspaper articles on the growing number of cities to ban such signs, as well as a 2009 report from the Federal Highway Administration.

To the extent you have the contrary impression from your first hearing, I would point you to that FHA report, which is considered the most comprehensive federal study to date, and which makes no specific finding about driver distraction from electronic billboards, but says in several places that there is no conclusive evidence *either* way. E.g., page 39, "[t]he conclusion of the literature review is that the current body of knowledge represents an inconclusive scientific result with regard to demonstrating detrimental driver safety effects due to [electronic billboard] exposure." Interestingly, however, the attached *USA Today* article quotes a study done by an association of state transportation officials that determines that electronic billboards "attract drivers' eyes away from the road for extended, demonstrably unsafe periods of time."

The attached articles also reflect that so far this year the cities of Tacoma, Salt Lake City, and St. Petersburg, Florida have joined the ranks of cities banning electronic billboards. And other cities, like Phoenix, allow them along interstate freeways but not elsewhere.

Some cities have allowed electronic billboards only if multiple regular billboards are removed. For example, Albuquerque allows electronic billboards in restricted corridors, but requires three conventional billboards to be taken down for each electronic one erected. *See* http://www.abqjournal.com/main/2011/10/18/news/council-approves-new-sign-rules.html. But as noted in one of the attached articles, the St. Petersburg City Council declined a deal that would have removed 80 traditional billboards to allow for six digital ones.

Apart from the safety issues, I think it is also relevant to consider the issue of visual clutter. Do we want Milwaukie to look like stretches of Highway 99E further to our south or like 82nd Avenue? I, for one, would prefer the model of Lake Oswego, where the sign code disallowing signs mounted on poles (to say nothing of billboards) was upheld all the way to the Supreme Court. Compare the drive through Lake Grove (Boone's Ferry Road) to the one through Oak Grove in terms of visual clutter and distraction. On the subject of visual clutter, I would suggest that you take a look at the webpage of Scenic America, www.scenic.org, which reports on efforts to curtail the proliferation of billboards, whether electronic or traditional. For instance, the Missouri legislature recently abandoned efforts to override the Governor's veto of a pro-billboard bill.

In sum, the trend appears to be toward curtailing billboards generally, and electronic billboards in particular. From my discussions with a handful of Milwaukie residents, I believe that if more people were aware of the issue, there would be general support for the code package forwarded to you by the Planning Commission. But because of the nature of what was intended as a narrowly-crafted interim sign code amendment, broad consultation with neighborhood associations has not occurred. If you think the Planning Commission recommendation does not represent the views of the wider community, I would encourage you enact an interim moratorium on any additional electronic billboards, to preserve the status quo while consultation with neighborhood associations on a permanent code provision can occur.

Sincerely,

Lisa M. Batey

cc: Bill Monahan, City Manager
Pat Duval, Recorder
Katie Mangle, Planning Director
Planning Commission members

More cities ban digital billboards

Updated 3/24/2010, Larry Copeland, USA TODAY
http://www.usatoday.com/news/nation/2010-03-22-visual-soup_N.htm

[see map showing locations of bans at that site as well]

As the USA cracks down on texting while driving, more than a dozen cities around the nation have banned what some consider a growing external driving distraction: digital billboards.

Digital billboards change images every four to 10 seconds, flashing multiple messages from one or more advertisers on the same sign. Opponents such as John Regenbogen of Scenic Missouri deride them as "television on a stick."

Several communities have banned digital billboards outright, the most recent being Denver earlier this month. Other places have put a moratorium on them pending a federal study on whether they distract drivers. At least two other cities and two states are studying moratoriums.

"The digital billboards are a distraction," says Fred Wessels, an alderman in St. Louis, which just approved a one-year moratorium on new such signs in that city.

"If they weren't distracting, they wouldn't be doing their job," says Max Ashburn, spokesman for Scenic America, a national non-profit group that seeks to limit billboards.

Research on the issue is mixed. A Virginia Tech Transportation Institute study in 2007, financed by the billboard industry, found that they aren't distracting. A review of studies completed last year for the American Association of State Highway and Transportation Officials, however, concluded that they "attract drivers' eyes away from the road for extended, demonstrably unsafe periods of time."

"There's no doubt in my mind that they are not a driving distraction," says Bryan Parker, an executive vice president for Clear Channel Outdoor, which owns about 400 digital billboards. He cites industry-sponsored studies of collisions before and after digital billboards were installed in Albuquerque, Cleveland, and Rochester, Minn., that found no correlation.

"We've looked at that very carefully," says Bill Ripp, vice president of Lamar Advertising, which owns 159,000 billboards, 1,150 of them digital. "We don't want to cause any unsafe conditions for drivers."

Digital billboards are a fast-growing segment of the outdoor advertising market. Since a federal rule against them was eased in 2007, the number of digital billboards has more than doubled to about 1,800 of 450,000 total billboards. At least 39 states allow them. They cost an average $200,000 to $300,000 apiece, according to the industry group Outdoor Advertising Association of America.

In 2007, the Federal Highway Administration relaxed a rule against digital billboards, saying they don't violate the 1965 Highway Beautification Act's ban on "intermittent," "flashing" or "moving" lights. FHWA is researching the signs, using eye-trackers inside volunteers' vehicles to determine whether drivers look at the billboards and for how long. The study is to be completed this summer.

There is little current data on whether greater distractions for drivers come from in-vehicle or external factors. The Department of Transportation, which is leading the national push against texting while driving, says that 5,870 people were killed in distracted driving crashes in 2008. But the agency has not determined how many of those deaths involved an electronic device, another distraction such as eating or tuning the radio, or something outside the vehicle.

City council passes code that bans digital billboards

http://tacoma.komonews.com/news/politics/658605-city-council-passes-code-bans-digital-billboards
Tuesday, August 9th, 2011, 7:23pm

The Tacoma City Council has approved a new city code that bans digital billboards and requires the removal of existing non-confirming billboards.

The council, with a 7-to-1 vote, passed the measure on Tuesday. One council member was absent.

The decision is the latest development in that more than decade-old battle between the city of Tacoma and media giant Clear Channel Outdoor.

The fight began in 1997 when the council enacted an ordinance requiring "non-compliant" signs to be phased out over the following 10 years. The media company had until August 2007 to remove the non-compliant billboards. But when 2007 came, Clear Channel, instead of removing the billboards, filed a lawsuit against the city, claiming it was forced to enter litigation to protect its constitutional rights.

The city of Tacoma last year entered a preliminary settlement agreement under which Clear Channel could begin installing digital billboards in exchange for the removal of a certain number of existing billboards with each sign.

But following a public outcry over the issue, the city council made the decision against Clear Channel.

It is worth noting that digital billboards are known to be immensely profitable. The billboards, however, face fierce opposition from people who say they are ugly, distracting and dangerous.

All non-conforming billboards must be taken down by March of next year.

Salt Lake City Council bans electronic billboards

BY DEREK P. JENSEN, The Salt Lake Tribune

http://www.sltrib.com/sltrib/news/51617372-78/billboards-council-electronic-ban.html.csp

First published Apr 12 2011 10:42PM, Updated Apr 27, 2011 02:05AM

Utah's powerful billboard industry, which sees its future in electronic signs, suddenly has a blackout zone — Salt Lake City.

By unanimous vote, the City Council elected Tuesday to ban any new electronic billboard or the conversion of existing billboards to digital along all major roadways throughout the state's capital.

Urged by Mayor Ralph Becker to take action, the council agreed — in the face of heated billboard-industry pressure — that glowing, image-swapping signs are a public-safety distraction to freeway drivers. At the same time, the council agreed to revisit the new ordinance (along with new studies on the impact of e-billboards) and perhaps make tweaks within nine months.

Council Chairwoman Jill Remington Love said the prohibition is not meant to disparage billboard companies, particularly Young Electric Sign Company — a "great, corporate citizen" with a near-60-year legacy. Instead, Love said, the ban will give City Hall an opportunity to look at "how do we showcase our skyline and how do we showcase our mountains? We are the capital city and we are a beautiful city. For me, while there may be studies that show that billboards may not be a distraction, it's just common sense. ... I don't need studies to tell me that."

Becker, who called it a "passionate subject," said the restriction is important for Utah's progressive capital community. "We have a new form of billboards and we don't have standards, really, for that," the mayor said. "We need to get a handle on that before we're overwhelmed by electronic billboards."

The city's blackout will not affect its six existing electronic billboards. Neither will it impact digital business signs, though the Mayor's Office insists regulations on those so-called "on-premise" signs must be contemplated soon.

A team of billboard executives waited patiently for hours before Tuesday's vote. They filed out without addressing the council.

"The ban on billboards is bad for business and at a bad time for the economy," YESCO Vice President Jeff Young said. "It's a scary, scary thing."

Young insisted his industry already is heavily regulated and said he hopes city officials will loosen the restriction over the next nine months.

On Monday, Downtown Alliance Chairman Vasilios Priskos and Executive Director Jason Mathis sent Love a letter calling for a postponed vote until the city can "create a truly comprehensive plan governing billboards."

Councilman Soren Simonsen also pointed out the usefulness of e-billboards for Amber Alerts. The controversial signs, he said, have probably saved more people through Amber Alerts than they have harmed.

Still, he supported the ban, saying he wants to take seriously how the "visual clutter" impacts the image of the city at its gateways.

"That could really have a lot do to with how we perceive ourselves as a community."

Earlier this week, Senate President Michael Waddoups, R-Taylorsville, said the city's ban could likely end up at the Legislature next year. "I don't know how it would turn out — I'd like to think we'd be accommodating to business," he told The Tribune.

YESCO, Reagan Outdoor Advertising and others now have the rest of the year to convince the city their buzzing billboards aren't that bad.

Durham Council votes unanimously against digital billboards
By Lisa Sorg, Indy Weekly, 02 Aug 2010

http://supportdurhambillboardban.com/results.html

It wasn't the dozen pairs of blinking sunglasses or the parade of nonprofit groups pleading their cases, but a photo of the R. Kelly Bryant Jr. Bridge that may have made the biggest impact on the Durham City Council's vote on digital billboards.

The graceful pedestrian bridge, which spans N.C. 147, serves as the eastern gateway to Durham and joins northern and southern neighborhoods that had been fractured by the highway. And posted near one of its ends is a billboard advertising the Dixie Gun & Knife Show happening this weekend in Raleigh.

The clash of these two landmarks underscored public and council concerns about the impact of digital billboards on aesthetics and property values—without any proven benefits to offset these social and financial costs. After more than three hours of public hearing and discussion, Durham City Council voted unanimously, 7-0, to keep the current billboard ordinance, which prohibits digital billboards.

Councilmembers had received more than 1,000 e-mails from the public in favor of keeping the current ordinance, which does not allow digital billboards. Less than 10 e-mails asked for a change to permit them.

"This issue has united Durham like no other," said Councilman Mike Woodard, shortly before voting to keep the current ordinance.

One of the 1,000 e-mails was from the bridge's namesake, who asked that Council keep the current ordinance.

"What are we going to do about that billboard?" asked Councilman Howard Clement.

Lewis Cheek, an attorney for K&L Gates, the firm representing Fairway Outdoor Advertising, noted erroneously that only by changing the ordinance could that billboard come down.

Councilwoman Diane Catotti contradicted Cheek, noting that the billboard could indeed be dismantled under the current ordinance—it just couldn't be replaced.

"Durham has nothing to gain from [the change]," Catotti added.

St. Pete council rejects digital billboards

By Michael Van Sickler, Saint Petersburg Times Staff Writer
In Print: Friday, August 19, 2011

http://www.tampabay.com/news/st-petersburg-council-rejects-digital-billboard-deal/1186802

ST. PETERSBURG — After more than three years of negotiations, digital billboards were rejected by the City Council in a vote early this morning.

Council Chair Jim Kennedy and council members Wengay Newton, Steve Kornell, Herb Polson and Karl Nurse rejected a deal to remove 80 traditional billboards and replace six regular billboard faces with six digital billboard faces. It would have included $2.1 million worth of advertising space over 20 years for city public service announcements.

Overall, it would have meant 6.4 square feet of traditional billboard faces would be replaced with one square foot of digital, which wasn't enough for dozens of residents who spoke in opposition to the deal.

"I can turn off my television, but I can't turn off a billboard," said Bill Bucolo, a Park Street neighborhood resident. "They are going to pollute our airspace and no one will be able to turn them off."

A far smaller number of residents who spoke Thursday said they supported the plan because it meant fewer overall billboards. And some said they liked how the billboards looked.

"I'm less concerned with the narrow view of some residents who are anti-billboard and more concerned with people who don't have jobs," said David McKalip, a neurological surgeon. "These boards promote business in a low-cost way."

Beginning under then-Mayor Rick Baker, city attorneys had been negotiating with billboard companies to allow the digital signs, a new generation in outdoor advertising. The new signs use screens that advertise messages that change frequently, some every 10 seconds. That makes the signs more profitable for the billboard companies,

But some say the ads, because they are brighter, are more dangerous and distracting for motorists and annoying for nearby homes.

Digital billboards have already been permitted in Tampa, Pinellas and Hillsborough counties, Pinellas Park and South Pasadena.

But the signs have run into sustained opposition from the Council of Neighborhood Associations in St. Petersburg. Members of the group have written letters and made phone calls to council members.

During an Aug. 4 public hearing where 20 people spoke against the plan to allow the signs along Interstate 275 and its feeder streets, the council voted 5-3 to allow the deal to move forward, with Kennedy, Kornell and Nurse voting against it.

Some who allowed the deal to move to Thursday's second hearing, however, said they could only do so if it was changed to allow a "sunset clause" that would require the signs to come down at a later date.

Clear Channel Outdoor, which had previously objected to such a clause, agreed to take the digital signs down in 20 years and replace them with traditional signs.

"Part of our calculation was that was what it would take to get this plan done," said Todd Pressman, a local lobbyist for Clear Channel.

That wasn't good enough, however, for CONA officials, who said it wasn't an actual sunset clause because Clear Channel got to replace the signs.

"A 'sunset' is that the signs come down — period," said Travis Jarman, a CONA representative.

In a discussion that last about three hours, Kennedy and Polson said it would be more effective to review the city's entire sign ordinance, which is scheduled next month, before recommending changes to a portion of it by allowing digital billboards.

"If we're going to do this, we should look at the entire ordinance," Kennedy said.

Kornell said he disapproved of the way the council learned what the deal was. He said that, beginning under Baker, administrative staff met with Clear Channel representatives, and excluded residents from participating.

"I won't accept any deals that come out like that," he said. "That's not democracy."

Nurse and Newton seemed more conflicted and didn't explain why they voted against the deal.

Council members Leslie Curran, Jeff Danner and Bill Dudley voted to approve the plan.

Dudley said he believed in free enterprise. A supporter of red light cameras because he thinks it makes streets safer, Dudley dismissed concerns that digital billboards were distracting.

"A pretty girl walking down the street is distracting, too," he said. "Let's outlaw that, too."

Danner said there was a threat the state would now pass a more onerous law that would allow Clear Channel to erect more digital billboards.

"We have an opportunity to rid our city of blight," Danner said. "The harm is to do nothing."

Curran said the deal, far from being negotiated in a backroom, had been put together quite openly.

Afterward, Pressman said he didn't know what Clear Channel would do next except for maintain its existing inventory of billboards. He said unlike other jurisdictions in Tampa Bay that have recently approved the billboards, St. Petersburg proved to be quite different.

"The citizen input was higher than we saw elsewhere," Pressman said. "It was a matter of emotion overcoming facts."

Maureen Stafford, who helped lead CONA to defeat the deal, said afterward that it was far from a victory.

"It's not a win," she said. "I hope we can use this neighborhood energy that we showed on this issue and move forward and remove existing billboards."

The Effects of Commercial Electronic Variable Message Signs (CEVMS) on Driver Attention and Distraction: An Update

PUBLICATION NO. FHWA-HRT-09-018

FEBRUARY 2009

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296

FOREWORD

The Highway Beautification Act of 1965 outlined control of outdoor advertising, including removal of certain types of advertising signs, along the Interstate Highway System and the existing Federal-aid primary roadway system. Since that time, most States have evolved a body of legislation and/or regulations to control off-premise outdoor advertising (billboards), and many local governments have developed similar rules.

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 (DBB) and Electronic Billboards (EBB).

The present report reviews research concerning the possible effects of CEVMS used for outdoor advertising on driver safety, including possible attention and distraction effects. The report consists of an update of earlier published work, an investigation of applicable research methods and techniques, recommendations for future research, and an extensive bibliography. 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.

Michael F. Trentacoste
Director, Office of Safety
Research and Development

Gerald Solomon
Director, Office of Real Estate
Services

TECHNICAL REPORT DOCUMENTATION PAGE

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9. Performing Organization Name and Address Human Centered Systems Team Office of Safety Research and Development Federal Highway Administration 6300 Georgetown Pike McLean, VA 22101-2296		10. Work Unit No. 11. Contract or Grant No.
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15. Supplementary Notes FHWA Contracting Officer's Technical Representative (COTR): Thomas M. Granda, Safety Research and Development, FHWA		

16. Abstract

The present report reviews research concerning the possible effects of Commercial Electronic Variable Message Signs (CEVMS) used for outdoor advertising on driver safety. Such CEVMS displays are alternatively known as Electronic Billboards (EBB) and Digital Billboards (DBB). The report consists of an update of earlier published work, a review of applicable research methods and techniques, recommendations for future research, and an extensive bibliography. The literature review update covers recent post-hoc crash studies, field investigations, laboratory investigations, previous literature reviews, and reviews of practice.

The present report also examines the key factors or independent variables that might affect a driver's response to CEVMS, as well as the key measures or dependent variables which may serve as indicators of driver safety, especially those that might reflect attention or distraction. These key factors and measures were selected, combined, and integrated into a set of alternative research strategies. Based on these strategies, as well as on the review of the literature, a proposed three stage program of research has been developed to address the problem.

The present report also addresses CEVMS programmatic and research study approaches. In terms of an initial research study, three candidate methodologies are discussed and compared. These are: (1) an on-road instrumented vehicle study, (2) a naturalistic driving study, and (3) an unobtrusive observation study. An analysis of the relative advantages and disadvantages of each study approach indicated that the on-road instrumented vehicle approach was the best choice for answering the research question at the first stage.

17. Key Words Commercial Electronic Variable Message Signs, CEVMS, Digital Billboards, DBB, Electronic Billboards, EBB, Driver Attention, Driver Distraction, Driver Safety, Outdoor Advertising		18. Distribution Statement No restrictions. This document is available through the National Technical Information Service, Springfield, VA 22161.	
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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)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		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)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		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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1.0 INTRODUCTION

The present report reviews research concerning the possible effects of Commercial Electronic Variable Message Signs (CEVMS) used for outdoor advertising on driving safety. The report consists of an update of earlier published work by Farbry et al., which consists of an investigation of applicable research methods and techniques, recommendations for future research, and an extensive bibliography.[1] The Federal Highway Administration (FHWA) has evaluated possible safety effects of CEVMS in two previous studies. The first study was completed in 1980 and the second in 2001.[1,2] Since then, CEVMS technology has evolved, in particular the expanded use of digital Light Emitting Diode (LED) arrays, as well as the implementation of new programmable formats and messages. The present report concentrates on identifying potential factors that may contribute to determining whether there are any significant safety concerns or distraction effects with regards to CEVMS used for outdoor advertising. Throughout the present report, the acronym CEVMS will be employed to refer to both the singular and plural case.

1.1 BASIC RESEARCH QUESTION

The basic research question being addressed in this report is whether the presence of CEVMS along the roadway is associated with a reduction in driving safety for the public. Increases in vehicle crashes along a certain portion of the roadway are generally regarded as an indication of a possible safety concern. Thus, the measurement of crash rates in the vicinity of CEVMS in comparison with crash rates at matched control locations without CEVMS is one possible way to determine possible safety impacts. But, the crashes are rare multicausal events which are difficult to measure. Therefore, measurements of driving behavior in near-crash situations are sometimes taken as a substitute for crashes. These safety surrogate measures may then be generalized to other driving behaviors that represent possible precursors of crashes—like sudden braking, sharp swerving, or traffic conflicts—even though no crash occurs. Usually, because these safety surrogate measures are more frequent and easier to measure, they are often employed instead of or in addition to crashes. Thus, determining the frequency of occurrence of certain relevant safety surrogate driving behaviors in the vicinity of CEVMS in comparison with the frequency of occurrence of such behaviors at matched control locations without CEVMS is another possible way to determine possible safety impacts. The validity of using such safety surrogate measures rests on the assumption that they are related to actual vehicle crashes, which seems intuitively reasonable but has not been conclusively demonstrated.

There is another approach to determining the possible safety impact of CEVMS. This approach is based upon the abstract psychological constructs of driver attention and distraction. A driver must devote a certain amount of attention to the driving task at hand, and sufficient distraction from that driving task could be associated with the higher risk of a crash. The measurement of driver eye glance behavior is often taken as an indirect indicator of attention. Thus, the driver's eye glances should be concentrated in the region of the roadway ahead, and any frequent or long eye glances away from this region toward other objects, including CEVMS, could be regarded as an indication of possible driver distraction. If the eye glances toward a certain object and away from the roadway ahead are sufficiently frequent or sufficiently long to exceed criteria established for safe driving, this outcome can be taken as an indication of a possible safety impact. The validity of using eye glance behavior measures in this manner rests on two assumptions: that eye glances are related to attention and/or distraction and that there are generally accepted safety criteria for excessive eye glances away from the roadway ahead. These assumptions are not universally accepted.

In summary, the basic research question is whether the presence of CEVMS along the roadway is associated with a reduction in driving safety for the public. The three fundamental methods for answering this question include if there is an increase in crash rates in the vicinity of CEVMS, if there is an increase in near-crashes or safety surrogate measures in the vicinity of CEVMS, and if there are excessive eye glances away from the roadway ahead in the vicinity of CEVMS.

1.2 SCOPE

In this report, a CEVMS will be defined as a self-luminous advertising sign which depicts any kind of light, color, or message change which ranges from static images to image sequences to full motion video. The CEVMS may also be referred to as an Electronic Billboard (EBB) or a Digital Billboard (DBB). The present report concentrates on the possible effects of CEVMS on driver attention, driver distraction, and roadway safety. The report is divided into 10 sections: Introduction, Literature Review Update, Key Factors and Measures, Research Strategies, Future Research Program, Recommended First Stage Study, Conclusions, References, Bibliography, and Appendices.

Investigating the possible safety effects of CEVMS is sufficiently complex so that no single experiment will answer all of the relevant scientific and engineering questions. The present report outlines a top-level broad program of potential future research, and it defines in greater detail three possible studies, any one of which could serve as a possible first step. After these discussions, a course of action is recommended. Although off-premise advertising signs constitute the main focus of FHWA attention, the influence of on-premise advertising signs will also be considered to create a more comprehensive and consistent research approach.

In parallel with the present project, a related study is being performed under National Cooperative Highway Research Program (NCHRP) Project 20-7 (256), titled "Safety Impacts of the Emerging Digital Display Technology for Outdoor Advertising Signs." Both the present project and the NCHRP study begin with the understanding that, despite years of research, there have been no definitive conclusions about the presence or strength of adverse safety impacts from CEVMS. The two projects differ in three significant ways. First, the NCHRP study is undertaking a broad, critical review of the research literature in this field. The present project is more focused on literature update oriented toward the identification of suitable independent and dependent variables for future research. Second, the NCHRP study is reviewing current regulations and guidelines for the control of roadside advertising that may exist in foreign countries to assess their applicability to U.S. highways and streets. Aside from mention in the literature review update portion, the present report does not directly address regulations and guidelines. Third, the NCHRP study will synthesize current research results and current regulations and guidance to recommend how State and local governments might enact reasonable temporary guidance for the control of CEVMS within their own jurisdictions. Such guidance may be applicable on an interim basis pending the outcome of future, more conclusive research outlined in the present project. As a result, such interim guidance may need to change as new technical information is developed. The present report does not provide guidance to States on the control of CEVMS.

2.0 LITERATURE REVIEW UPDATE

2.1 BACKGROUND

The research that addresses the possible safety and distraction effects of outdoor advertising billboards has been extensive and long standing. Dating back to the 1930s, this research reached a peak in the 1950s and 1960s. Research continued at low ebb through the 1980s, and then all but ceased. With the advent of newer billboard technologies (e.g., lamp matrix, rotating disc, tri-vision, and, most recently, LED) and with the corresponding questions raised by regulators, safety researchers, and the public, research has increased again since the turn of the century. These newer billboard technologies, especially the LED technology, ushered in the increasing use of CEVMS for on-premise and off-premise advertising. The current research focuses on information that has become available since the publication of the most recent FHWA report, but it also includes earlier relevant studies not previously identified.(1) The present review is organized into five major categories according to the research context for the study: post-hoc crash studies, field investigations, laboratory investigations, previous literature reviews, and reviews of practice. The categories that contain empirical data have a brief discussion of potential methodological problems inherent in the types of studies characteristic of that category.

2.2 POST-HOC CRASH STUDIES

Post-hoc crash studies review police traffic collision reports or statistical summaries of such reports 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.

A number of studies have been conducted over the years using the crash methodology. Three such studies were not reviewed in prior FHWA studies. In a study similar to that conducted in the 1970s in Massachusetts, the Freeway Operations Unit of the Wisconsin Department of Transportation (WisDOT) analyzed bidirectional crashes on I-94 near an electronic billboard with a 5.0 s message dwell time.(3,4) Crash rate data were collected for 3 years prior to and 3 years after sign operation began. For eastbound traffic, total crashes increased 36 percent over the 3 year post operational period compared to the baseline preoperational condition. In addition, side-swipe crashes increased 8 percent, and rear-end crashes increased 21 percent. For westbound traffic, total crashes increased 21 percent, sideswipe crashes increased 35 percent, and rear-end crashes increased 35 percent. The authors of the WisDOT study concluded that, "it is obvious that the variable message sign has had an effect on traffic, most notably in the increase of the side-swipe rate" (p. 3).(4)

Stutts et al. conducted an analysis of several crash data reporting systems to identify major sources of driver distraction and the relative importance of different types of distraction as contributing factors in motor vehicle crashes.(5) Distraction was described as one form of inattention, and it has been implicated as a factor in more than half of the police reported inattention crashes identified by the National Highway Transportation Safety Administration.(6) In this study, 8.3 percent of drivers involved in police-reported crashes were identified as distracted, but 35.9 percent of these crashes were coded as "unknown." For this and other reasons, it is believed that the reported percentage of distraction-related crashes substantially under-represents the true statistics.[5] Among the types of distractions coded in the database, the largest contributor (29.4 percent) was "outside person, object, or event," and the second largest (25.6 percent) was "other."

Smiley et al. studied the relationship between video advertising signs and motor vehicle crashes at downtown intersections and on the freeway.[7] Crash data were analyzed from three intersections before and after the introduction of video advertising signs. When the three intersections were evaluated individually, two demonstrated increases in both total and rear-end crashes; the third showed no significant increase in such crashes. The authors believe that the lack of statistical significance may be due to the small number of crashes identified. For the freeway environment, crash data on the video approach was compared to crash data for three non-video approaches, one of which was deemed the most comparable (control) segment. For this comparison, the authors report a negligible increase in injury collision crash frequencies on the video approach.

Following the design of their earlier study on conventional billboards, Tantala and Tantala analyzed police accident reports in the vicinity of seven digital billboards on interstate highways near Cleveland, OH.[8] Both their current and earlier studies were sponsored by the outdoor advertising industry. Reported crashes were analyzed for a period of 18 months prior to and after the conversion of these billboards from conventional to digital. They found essentially no statistically significant differences in crash rates before and after the conversion.

Unfortunately, all post-hoc crash studies are subject to certain weaknesses, most of which are difficult to overcome. For example, the vast majority—more than 80 percent in one study—of accidents 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, researchers need to collect comparable data in such studies before and after the change and in the after phase at equivalent but unaffected roadway sections. Last, 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. For a more specific analysis of some possible design and methodological concerns with the study by Tantala and Tantala, see Wachtel.[8,9]

2.3 FIELD INVESTIGATIONS

The spectrum of field investigations related to roadway safety is broad. It includes unobtrusive observation, naturalistic driving studies, on-road instrumented vehicle investigations, test track experiments, driver interviews, surveys, and questionnaires. Klauer et al., in one of several papers to emerge from a National Highway Traffic Safety Administration (NHTSA) project known as the "100-Car Naturalistic Driving Study," provides preliminary information about the role of driver inattention in crashes and near-crashes.[10] Although the study did not specifically address CEVMS, it represents an important methodology for investigating driver distraction. Their results show that 78 percent of crashes and 65 percent of near-crashes included driver inattention and/or distraction as a contributing factor. This contribution from inattention and distraction is larger, by a factor of three, than previous research has indicated. The authors believe that the "100-Car Naturalistic Driving Study" provides the first direct link (i.e., without reliance on crash surrogate measures) showing distraction/inattention as a contributing factor to motor vehicle crashes. In another variant of the "100-Car Naturalistic Driving Study," Klauer et al. identifies four specific unsafe behaviors that contributed to crashes and near-crashes.(11) One of these, inattention and/or distraction, is of direct relevance to the present project. This term is operationally defined by Klauer et al. as a driver looking away from the forward roadway for greater than 2.0 s. Under these conditions, the odds of a crash or near-crash are nearly twice those than when the driver attends to the forward roadway. The study stresses the importance of including near-crashes in the database for two reasons. First, the kinematics of crashes and near-crashes are similar, meaning they involved comparable levels of driver emergency actions, such as swerving and hard braking. Second, 83 percent of the crashes in this study were not reported to the police. Thus, the study indicates that relying on crash statistics alone will substantially underreport crashes due to inattention and/or distraction.

Lee, McElheny, and Gibbons undertook an on-road instrumented vehicle study on interstate and local roads near Cleveland, OH.(12) The project, conducted on behalf of the outdoor advertising industry, looked at driver eye 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). Performance measures, such as speed maintenance and lane keeping, were also recorded. Although the major data collection was done in daylight, a small pilot study was conducted at night. One of the key questions that the study sought to answer was whether longer glances consisting of over 1.6 s were associated more with any of the event types.(12) This question is based on findings from various studies, including the "100-Car Naturalistic Driving Study," which indicates that longer glances away from the road are associated with higher crash rates.(13) In discussing their results, the authors state, "...the distributions of glance duration were similar across all event types, and there was no obvious pattern of longer glances being associated with any of the event types" (p. 59).(13) The findings from the nighttime pilot study led to, "the overall conclusion, supported by both the eye glance results and the questionnaire results, that the digital billboards seem to attract more attention than the conventional billboards and baseline sites (as shown by a greater number of spontaneous comments regarding the digital billboards and by longer glances in the direction of these billboards" (p. 10).(13) However, in view of the small number of participants, these data were not analyzed. The authors suggest that at least some of these findings, "would show statistical significance" if a larger study were to be conducted (p. 64).(13)

Beijer, Smiley, and Eizenman, working on behalf of the Government of Toronto, Canada, evaluated driver eye glances toward four different types of roadside advertising signs on roads in the Toronto, Canada area.(14) The study employed an on-road instrumented vehicle approach with a head-mounted eye-tracking device. Active signs—all but traditional billboards—consistently received longer glances and more total glances than fixed signs. The study found that 22 percent of all glances were defined as long or greater than 0.75 s. Since 22 of the 25 subjects made at least one long glance at an advertising sign, the authors conclude that, "distraction...was not just an isolated incidence" (p. 101).(14) The authors suggest that active signs may result in greater distraction than past studies of the effects of commercial signing might indicate.

After a previous study raised concerns about the number and duration of glances made to video advertising signs along an expressway in Toronto, Canada, Smiley et al. conducted another study at the request of the city government.[7,15] Five different measures were taken, including eye movements, traffic conflicts, traffic speed and headway, crash data, and public surveys. The crash data results were described earlier. The results from the other measures were mixed. All of the video signs attracted attention; the probability of a driver's looking at such a sign upon approach was nearly 50 percent. The average glance duration was 0.5 s, similar to those for official traffic signs. However, one-fifth of the video sign glances lasted longer than 0.75 s, and some lasted as long as 1.47 s, which were considered unsafe amounts of time. About 38 percent of glances at the video billboards were made when headways were 1.0 s or less, and 25 percent of the glances took place when the signs were more than 20 ° off the line-of-sight. These glances were also considered to be unsafe. According to the study, glances at static billboards and bus shelter ads were made at even greater angles and shorter headways.

It is noteworthy that the earlier study that led to this research, also evaluating a video billboard on an expressway in Toronto, Canada, produced dramatically different results. This study found five times the number of glances per subject and three times the glance duration than did the later 2004 study.[15] Smiley et al. attribute these differences to the longer sight distance available for the sign in the earlier study, the uninterrupted view, and the location of this sign on a curve.[7]

Smiley et al. also employed safety surrogate measures of conditions which might be precursors of a possible crash.[7] The study measured these safety surrogate indicators by means of the unobtrusive observation method. The drivers of the vehicles were not aware that they were being observed. In this context, the study measured traffic conflicts, vehicle speed, and vehicle headway. When comparing video and non-video approaches at the same intersection, at one intersection the authors found no differences in traffic conflicts; however, at the other, they found a significant increase in drivers who applied their brakes without cause on the video approach. Given the comparability of sites, they concluded, "the only reason that could be found for increased braking....was the presence of the video sign" (p. 108).[7] The speed and headway data were inconclusive.

In addition, Smiley et al. employed a "public" survey method to determine whether video advertising might be considered to have "a negative effect on traffic safety" (p. 110).[7] Participants in the survey were approached at three intersection sites which had video advertising. Of the 152 persons surveyed at the 3 locations, 65 percent felt that video advertising signs had a negative effect on the ability of a driver to attend to pedestrians and cyclists. Furthermore, 59 percent of the people said that as drivers, their attention was drawn to such signs, while 49 percent of those felt that such signs had a negative effect on traffic safety. A surprisingly large number of people—9 out of 152—stated that they personally had experienced near-crashes, and 2 had experienced actual rear-end crashes that they associated with video advertising signs. In addition, 86 percent of the respondents suggested that restrictions should be placed on those types of signs, such as their locations and brightness.

Three of the field investigations of CEVMS effects mentioned earlier employ indirect measures of driver attention (eye glances) in the context of an on-road instrumented vehicle experimental approach. Although CEVMS stimuli are real, the experimental approach suffers from a degree of artificiality in its implementation. The research participants usually drive in an experimental vehicle along a route which is contrived for experimental purposes, and the route does not serve a useful purpose in their daily lives. The research participants sometimes drive with an experimenter present in the instrumented vehicle, and they sometimes wear a head-mounted eye-tracking device. Two of the three studies cited used a somewhat intrusive but more accurate head-mounted eye-tracking device. One study used a less obtrusive but also less accurate vehicle-mounted eye-tracking device, where cameras were mounted in the vehicle cab. Although the research participants were not told the purpose of the investigation, the participants were definitely aware that they were participating in a driving experiment of some kind, and they may not have exhibited entirely natural behaviors as a result. Furthermore, eye glance behavior is difficult to measure, and it is not easy to relate directly to attention and distraction. For a more specific analysis of some further design and methodological concerns with the Lee et al. study cited above, see Wachtel.(12,9)

The unobtrusive observation method employed in the field by Smiley et al. to collect safety surrogate measures of potential crashes (e.g., sudden braking, inadequate headway, etc.) does not create an artificial environment for the driver.(7) Usually, the sensing devices (loop detectors, remote cameras, or posted human observers) are hidden in the environment, and they are not noticed by the drivers. There is no problem of artificiality; the drivers in the study are not even aware that they are part of a study. However, the safety surrogate variables being measured are usually infrequent, often multicausal, comparatively subtle, and difficult to measure. For CEVMS, these variables can also occur over great distances, adding to the difficulty in accurately and reliably capturing data relating to these variables.

Finally, the public survey method employed by Smiley et al. collected the opinions, attitudes, and feelings of passersby at intersections with video advertising signs.(7) The results, while interesting as a measure of public sentiment, are difficult to relate to the basic research question of determining whether there are any significant distraction effects or concrete safety concerns with regards to CEVMS used for outdoor advertising.

2.4 LABORATORY INVESTIGATIONS

Laboratory investigations related to roadway safety can be classified into several categories: driving simulations, non-driving simulator laboratory testing, and focus groups.

For one such investigation, a non-driving simulator laboratory testing environment was used.(16) For this study, researchers filmed a 27 minute drive and had 200 licensed drivers view the film while their eye movements were recorded. Billboards generated greater levels of visual attention than suggested by measures of recall. Billboards were viewed by individuals whether they were in the "target" audience or not and regardless of whether the billboard was of high or low interest. In addition, billboards located close to official highway signs received more attention than those that were farther away.

In a driving simulation laboratory, Crundall et al. compared street level advertisements (SLAs), such as those on bus shelters, to raised level advertisements (RLAs), which include elevated ads on poles or streetlights.(17) The study was based on the understanding that, in undemanding situations, drivers have spare attentional capacity; however, when cognitive demands increase, spare capacity diminishes. As a result, eye movements must focus on the driving task at hand.

Based on their prior research, Crundall et al. believe that if an advertisement is within the driver's visual field during a search for hazards, it will attract visual fixations and distract attention needed to safely perform the driving task.[17] Because the most relevant information for hazard detection is distributed along a horizontal plane, the authors believe that the majority of visual fixations will fall within this plane when the driver is looking for driving-relevant information. Thus, if an advertisement is located within this window, it will receive more fixations than will advertisements located outside this window. The principal research hypotheses tested were that during conditions when drivers were looking for hazards, SLAs would receive the most attention. When spare capacity was greater, the attention given to RLAs would increase. The results supported these hypotheses. A post-drive survey showed that SLAs were judged more hazardous than RLAs.

Young and Mahfoud used a driving simulator in which subjects drove three routes in the presence and absence of billboards.[18] The presence of billboards adversely affected driving performance in terms of lateral control and crashes. Billboards also had an adverse impact on driver attention in terms of the number of glances made to them, and they were associated with a higher subjective mental workload. In addition, the recall of official road signs was adversely affected by billboards, which the authors interpreted to mean that drivers were attending to billboards instead of relevant road signs. The authors reached a "persuasive overall conclusion that advertising has adverse effects on driving performance and driver attention" (p. 18).[18]

In a recent study using a driving simulator, Chan and her colleagues compared the impacts of in-vehicle versus external-to-vehicle distractors on performance of inexperienced versus experienced drivers.[19] The authors were particularly concerned with young, novice drivers because of the elevated crash risk for this segment of the driving population. They were also concerned because the researchers believed that distraction could adversely affect the novice drivers' poorly developed hazard detection and avoidance skills. Chan et al. theorized that external distraction may be more harmful than internal distraction because when drivers are looking within the vehicle, it should be obvious to them that they are not processing relevant roadway information. However, when drivers are looking at sources outside the vehicle, it is likely that the forward roadway is still somewhere within the field of view. Thus, it may not be obvious to drivers (particularly inexperienced drivers) that this important information is not being fully processed since it is peripheral, unattended, or both.

Chan et al. were primarily interested in the longest glances away from the forward roadway since these have been implicated in prior studies (e.g., Horrey and Wickens[20]) as major contributors to crashes. Thus, they used as their dependent measure the maximum time that drivers spent continuously looking away from the forward roadway during a specific distraction task. In terms of in-vehicle distractors, as hypothesized, inexperienced drivers showed a consistent pattern of looking away from the roadway for longer periods of time than experienced drivers. However, the findings about external distractions were quite different and unexpected in two key ways. There was very little difference in the duration of distraction episodes between the experienced and inexperienced drivers, and the maximum distraction durations were significantly longer for the out-of-vehicle tasks than for the in-vehicle tasks. The two experience groups showed little differences in the percentage of distraction episodes longer than 2.0 s, 2.5 s, and 3.0 s, in all cases longer for the external than for the in-vehicle distractors. The study also demonstrated that, "drivers are more willing to make extended glances external to the vehicle than internal to the vehicle" (p. 17).[19] Chan et al. conclude that, "it is likely that our out-of-vehicle tasks (which not only engage attention but also draw the eyes and visual attention away from in front of the vehicle) would have quite significant detrimental effects on processing the roadway in front of the vehicle" (p. 22).[19]

Three of the laboratory investigations of possible distraction effects mentioned above employ indirect measures of driver attention (eye glances) in the context of a driving simulation experimental approach. The interactive driving simulator approach offers considerable experimental control over stimulus parameters, like the size, number, proximity, and change rate of CEVMS or other advertising display. The simulator is also well suited for executing parametric studies of the effects of these variables on possible driver distraction. However, the approach suffers from all of the sources of artificiality found in the on-road instrumented vehicle approach for conducting field research mentioned earlier. Also, the approach adds the important source of virtual driving as opposed to real driving. Although the vehicle cab of the driving simulator may have certain degrees of motion (pitch, roll, heave, etc.) to enhance the sense of virtual driving, the vehicle cab does not move down the roadway. The visual scene passes by while the driver and vehicle remain stationary. This degree of artificiality requires considerable adaptation on the part of the research participants, most of whom need some amount of training to become accustomed to the differences between driving in a simulator and driving on a real road. Moreover, 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.

One laboratory investigation had research participants watch films of driving scenes containing billboards while their eye movements were being recorded.[16] This study represents an example of a non-driving simulator laboratory method. It suffers from all of the aforementioned limitations of laboratory CEVMS or billboard research. In addition, it does not measure the participants' response while engaged in a driving task.

2.5 PREVIOUS LITERATURE REVIEWS

Garvey summarizes the literature on sign visibility, legibility, and conspicuity on behalf of the advertising industry.[21] One of his recommendations bears on the issue of distraction from billboards. He suggests that signs need not be detectable at distances greater than the minimum required legibility distance. Specifically, he states, "if a sign is detected before it is legible, the driver will take numerous glances at the sign in attempts to read it" before it becomes legible, and "these momentary diversions are inefficient and potentially dangerous" (p. 1).[21]

Cairney and Gunatillake, working on behalf of the Government of Victoria, Australia, undertook a review of the literature with the goal of generating recommendations for guidelines for the control of outdoor advertising in that State.[22] They cited two prior reviews by Wachtel and Netherton in the United States and by Andreassen in Australia as the basis of their review.[2,23] Since these earlier studies, the technology used for the display of roadside advertising and the addition of in-vehicle distractors has changed. Cairney and Gunatillake conclude that the principal concern remains the effects that a sign may have on a driver's visibility of other road users, the roadway, and traffic control devices, particularly at high-demand locations, such as interchanges. They suggest several research approaches, including case studies, site investigations, and laboratory simulations to address these newer technologies. They conclude that the best of the studies conducted to date demonstrate that when all confounding variables are controlled statistically, sites with advertising signs have higher crash rates than sites without them. However, large, well-controlled studies will be required to detect significant effects because the effect size is small. They further conclude that changeable message signs may have a more direct bearing on crash rate than static signs. The findings of the study suggest that unregulated roadside advertising has the capability of creating a significant safety problem. The conclusions from their review run counter to Andreassen's conclusion that, "there is no current evidence to say that advertising signs, in general, are causing accidents" (p. 4).[23]

On behalf of the Scottish government, Wallace undertook the most extensive and critical review of the literature since the two earlier FHWA studies.[24] The study concludes that driver distraction from attention-getting sources can occur even when the driver is concentrating on the driving task. Furthermore, there is abundant evidence that billboards can function as distractors, particularly in areas of visual clutter. Billboards can distract in "low information" settings, and distraction from external factors is likely to be underreported and underrepresented in crash databases.

The Dutch National Road Safety Research Institute reviewed the recent literature for the Dutch authorities and emphasized some of the stronger, more consistent points made in other studies, such as billboards should not be placed near challenging road settings, especially at or near intersections. Also, they should not resemble official traffic signs in pattern or color.[25] Furthermore, dynamic signs that display motion or include moving parts should not be permitted. A key conclusion was that, "precisely in a dangerous situation it is important for the driver to have his attention on the road; an advertising billboard can slow the driver's reaction time, which increases the chance of a crash" (p. 2).[25]

The WisDOT sponsored a study which summarizes available information about the safety impacts of outdoor electronic billboards and tri-vision signs.[26] Similar to Crundall, et al. and Wallace, the authors of this study determined that greater visual complexity associated with a high-volume location, such as intersections, required drivers to search the environment more than at lower-volume locations.[17,26] The authors stated, "it can be conjectured that additional visual stimuli such as billboards may add additional demand to driver workload in high-volume intersections" (p. 6).[26]

Bergeron, on behalf of the Government of Quebec, Canada, re-reviewed many of the studies originally examined by Wachtel and Netherton and added reviews of several studies conducted subsequent to 1980.[2,27] His findings and conclusions, similar to those of other researchers, indicate that attentional resources needed for the driving task are diverted by the irrelevant information presented on advertising signs. This distraction leads to degradation in oculomotor performance, which adversely affects reaction time and vehicle control capability. The study concludes that when the driving task imposes substantial attentional demands that might occur on a heavily traveled, high-speed urban freeway, billboards can create an attentional overload that can have an impact on micro and macroperformance requirements of the driving task.

2.6 REVIEWS OF PRACTICE

Bergeron also performed a site review at a major elevated expressway in Montreal, Canada, which was proposed for two future billboards.[28] By reviewing the scene and considering various parameters such as traffic volumes, road geometry, and traffic control devices, Bergeron concludes that this 1.1 km section was already causing excessive cognitive demands, particularly for the many unfamiliar drivers. He concluded that the billboards would be inadvisable for several reasons. First, the location creates a substantial demand on drivers' mental workloads because of its complex geometry, heavy traffic, high traffic speeds, merging and diverging traffic, and the presence of signs and signals that require drivers to make rapid decisions. Also, at the perceptual level, the billboards would add confusion to the visual environment, thus impairing drivers' visual search, tracking, and reaction time. In addition, at an attention level, billboards could distract drivers. Last, the billboards could add to a driver's mental workload in a setting where workload is already quite high. In a road situation such as this one, Bergeron concludes that the billboard is a "useless drain on limited attentional resources" (p. 5), and it could lead to reduced performance through inattention errors by overloading the driver's information processing abilities.[28]

du Toit and Coetzee address the current regulatory process for advertising signs visible from national roads.[29] The authors report that the South African government engages in careful scrutiny of proposed advertising signs before they are approved for use. All applications receive a desktop review followed by a site visit. If a decision cannot be made at this point, the authorities evaluate crash statistics for the proposed location to determine that if it is hazardous. Key questions asked as part of the review include the following:

- Will the proposed sign obscure the view of an official road sign?
- Will the sign cause a disruption of information flow to the driver?
- Will the sign's location distract the driver's attention at merge/diverge areas, curves, and interchanges?

A clear system exists in South Africa that requires certain spacing between road signs, particularly those that are close to interchanges; proposed advertising signs must fit within the parameters. This system, as codified in the South African Road Traffic Signs Manual (SARTSM), is intended, "to allow adequate time for the driver to read, interpret and react on the information on the road sign" (p. 7).[29] The authors report that for a recent review period, 86.7 percent of all applications were rejected. Of those, 40.8 percent were rejected because the advertisement was too close to existing road signs, 20 percent were rejected because the sign disrupted the flow of information to the driver, and 7.5 percent were rejected because the sign was too close to a ramp gore.

As a result of his work cited immediately above, Coetzee reviewed literature, performed a regulatory analysis, and recommended changes to regulations for outdoor advertising control in South Africa.[30] Although superficially similar to regulations in the United States, billboard control in South Africa goes much further, regulating the design and amount of information (in bits) that can be displayed on a given sign, as well as the proximity of two or more advertising signs to one another and to road features, such as official signs and interchanges. In South Africa, message sequencing, visual clutter, and sign size are restricted for different display technologies. This document includes a description of the terms *critical event* and *critical zone*, and it demonstrates how regulations would control advertising signs in these applications. Coetzee finds support from the earlier work of Ogden and the experiments of Johnston and Cole, concluding that, whereas drivers may be able to ignore advertisements when the driving task requires attention, it is possible that an attention-getting sign can assume primary importance and interfere with not only any spare capacity that a driver might have but also the information processing capacity reserved for primary task performance.[31,32] The danger arises, according to Coetzee, when processing the information on the advertisement interferes with the driver's principal vehicle control task in situations that demand attention and rapid reactions.[30] The Coetzee report is the only work in the present review of the literature that has attempted to establish the parameters of billboard location and content based on theories of information processing and cognitive demand.

2.7 CONCLUSIONS FROM LITERATURE REVIEW

2.7.1 Basic Research Question

The basic research question being addressed in the present report is whether the presence of CEVMS used for outdoor advertising is associated with a reduction in driving safety for the public. When regarded from a scientific perspective, the present literature review does not provide an adequate answer to this question. The studies reviewed are inconclusive.

The present literature review reveals a disjointed array of isolated studies revealing sometimes contradictory and inconclusive results. Some studies show statistically significant driver safety concerns or distraction effects, but not all levels of distraction have negative safety impacts. Some studies go one step further and compare a statistically significant distraction with a criterion level of distraction claimed to represent the threshold of negative safety performance. This approach represents a substantial improvement, but it depends heavily upon the veridicality of the chosen criterion level of distraction. Other studies show no statistically significant safety or distraction effects at all, or they show mixed results. Some studies which show no statistically significant safety or distraction effects have been demonstrated to have serious flaws in their experimental and/or statistical designs. These studies are often plagued with two intrinsic methodological problems. First, they may not have sufficient measurement accuracy and precision to distinguish CEVMS distraction from noise in the data. Second, they may not have sufficient statistical power to reveal a small but important distraction effect which may really exist; i.e., they have not sampled enough events, drivers, or conditions to demonstrate an effect which may be obscured by variability due to sampling. In summary, from the perspective of strict statistical hypothesis testing, the present literature review is inconclusive with regard to demonstrating a possible relationship between driver safety and CEVMS exposure. From this perspective, the more stringent restrictions on the placement of billboards found in other countries might be regarded as a conservative precautionary measure, erring on the side of protecting public health from a possible but unproven threat and not as a response to an established driving safety hazard. That is not to say that such a conservative approach is inappropriate, but it should be acknowledged as such.

The present literature review does reveal a preponderance in the number of studies (5:1) which show some driver safety effects due to traditional billboards and CEVMS in comparison with the number of studies that show no driver safety effects at all due to these stimuli. In addition, four other studies show mixed results. Three lists were prepared below to demonstrate this outcome. These lists included only empirical research studies, regardless of the methodology employed. Studies that reviewed literature or practice were not included unless they also contained an original research component. Studies previously reviewed in the earlier FHWA projects were also not included.

The following research studies reported potential adverse safety effects for all dependent measures:

- Wisconsin Department of Transportation.(4)
- Young.(16)
- Crundall, et al.(17)
- Young and Mahfoud.(18)
- Chan, et al.(19)

The research study by Tantala and Tantala(8) reported no adverse safety effect on any dependent measure.

The following research studies reported potential adverse safety effects using some dependent measures and no effects using other dependent measures:

- Lee, McElheny, and Gibbons.(12)
- Beijer, Smiley, and Eizenman.(14)
- Beijer.(15)
- Smiley et al.(7)

Such an outcome could lead one to conclude that there is more evidence for a possibly meaningful negative safety impact than evidence against such an impact. This conclusion is not warranted for at least two reasons. First, a simple tally of the number of studies which support a given research hypothesis compared with the number of studies which do not support the hypothesis may be misleading. Such a tally neglects to weight the various studies for their intrinsic strength of experimental design, statistical power, and care of execution. One strong landmark study with a robust experimental design and a sufficiently large sample of cases or drivers can topple a host of weaker investigations with fewer credentials. Yet, credentialing and weighting studies can become a subtle and subjective matter. It is difficult to judge studies on their relative strengths because it requires experience and judgment. While it may be relatively easy to identify the champion study and give that study a strong weighting, it is more difficult to evaluate the weaker studies at the middle and bottom of the list.

Second, there is a strong propensity in scientific research to search for differences. The current Western model of reductionist scientific inquiry, coupled with its reliance on the paradigm of parametric statistics, is aligned against supporting the null hypothesis. This hypothesis states that there are no observed differences between two or more different treatments, i.e., that matters under scientific scrutiny are due to chance. This propensity to search for differences is so strong that when anticipated results are small or subtle, researchers often seek out conditions in nature that are worst case examples to find any affect at all. This causes the results to suffer from a lack of generalization when the entire population becomes the frame of reference. Thus, the present literature review acknowledges a possible natural and intrinsic bias toward including more studies that show a possible distraction effect of CEVMS exposure than studies that do not. Once these two considerations are recognized—a lack of weightings for comparing studies and a propensity to emphasize differences—the present literature review realigns to its original inconclusive outcome. In summary, present scientific techniques are not adapted to providing proof that CEVMS do not distract drivers; they only afford opportunities to demonstrate that they do distract drivers and possibly to what extent. If the demonstrated extent of distraction is minor and below the accepted criterion to interfere with safe driving, then the safety impact may be considered negligible.

2.7.2 Methodological Implications

The inconclusive literature review findings suggest the need for carefully controlled and methodologically sound investigations of the relationships between CEVMS, driver distraction, and safety. The review also suggests several factors that need to be considered in future research. One plausible model posits that drivers often have spare attentional capacity, and they can afford to divert their visual attention away from the driving task to look at objects irrelevant to the driving task, such as CEVMS. According to this model, when driving demand increases because of fixed hazards (such as dangerous roadway geometry or complex interchanges) or transient hazards (such as slowing traffic, vehicle path intrusion, or adverse weather), spare capacity is reduced or eliminated, and the driver devotes more capacity to the driving task. In this model, driver workload emerges as an important issue. By applying this model, in some countries, outdoor advertisements are not allowed in areas where known fixed hazards exist. Such locations include, but are not limited to, sharp horizontal or vertical curves and areas where high cognitive demand is imposed by the roadway, traffic, or environment, like intersections, interchanges, and locations of merging or diverging traffic. In some countries, billboards are also not allowed where they might interfere with the processing of important information from official road signs. These prohibitions do not in themselves prove that distraction is worse in high driver workload situations. However, they do point to the need to consider conditions of differing driver workload in an effective future research program on possible safety effects from CEVMS exposure.

When scanning for hazards, drivers' eye movements tend to fall within a horizontal window centered on the focus of expansion in the forward view. This focus of expansion is related to the visual flow of the moving scene where points and objects all emerge from a single point. Because an attention-getting billboard may be able to attract a driver's glance even unintentionally, a CEVMS that falls within this scanning pattern can interrupt the pattern and cause a distraction at an inopportune time. Furthermore, research suggests that the distraction from a roadside billboard may be unconscious. Consequently, drivers may not be aware that they are being distracted, and they are unable to verbalize that any distraction occurred. Although where someone's eyes look may not be the same as where his or her attention is focused, a theoretical connection may be implied. Through this connection, measurements of eye glance behavior permit the researcher to gain potential entrance into this realm of unconscious allocation of attention. This allocation of attention should play an important role in an effective program for future research.

In addition, it cannot be assumed that all CEVMS are equal, even those of the same size, height, and LED technology to display their images. The impact of a CEVMS in an undeveloped area with relatively low levels of nighttime ambient lighting may be quite different from that of a CEVMS in a more urban context among other buildings and structures in an area with high nighttime illumination levels. Furthermore, characteristics of the CEVMS displays may, in and of themselves, lead to measurable differences in distraction, such as information density, colors of figure and background, character size and font, and message content. These characteristics cannot be assumed to be equivalent for purposes of comparisons. One possible solution to this problem may be for future research studies to exercise a certain degree of experimental control over the CEVMS message itself. This may require a deeper level of cooperation with the billboard industry than has been encountered in previous studies. Such increased cooperation could be beneficial in establishing a collaborative research environment among industry, government, and university stakeholders.

Finally, a frequently changing CEVMS, which can generally be seen long before it can be read, raises a particular concern for distraction. This is because drivers may continue to glance at the CEVMS to observe changes in varying content with various sizes of lettering until the sign content can be read. The implication here is that future studies may need to embrace longer viewing distances.

3.0 KEY FACTORS AND MEASURES

The study of possible CEVMS effects on driver safety represents a complex research endeavor. There are numerous key factors affecting a driver's response to CEVMS. Many of these influential factors may be designated as independent research variables in need of specification or control within a given research design. Likewise, there are numerous inferred measures of driver safety which may serve as possible dependent variables for observation and measurement. Depending upon the specific research design, some of these independent and dependent variables may swap places.

3.1 KEY FACTORS (INDEPENDENT VARIABLES)

For classification purposes, the key factors, or major independent variables, may be categorized into various types. The list of key factors shown below gives some of the independent variables which might be considered in the study of possible safety effects of CEVMS. These key independent variables were selected from a more comprehensive analysis by means of a process to be described later. This analysis grouped all of the independent variables into five major categories according to source as follows:

- Billboard.
- Roadway.
- Vehicle.
- Driver.
- Environment.

After this initial analysis, a subsequent evaluation selected only the most important, or key, factors or variables. Each category lists the key independent variables which belong to that category. The lists below contain independent variables from four of the five above mentioned categories. The vehicle category is missing because all of the variables belonging to that category were eliminated in the selection process. For cross reference purposes, the decimal number shown in brackets to the right of each variable gives the outline number from the more detailed analysis upon which the selection was based (see table 1 in appendix A). In parentheses to the right of certain variables are given some examples and explanations which serve to clarify that particular variable.

The following are the key factors relating to the billboard:

- Location [1.1] (lat./long., GPS, mile marker, survey location, reference location).
- Sight distance [1.1.3].
- Resolution [1.2.3] (dpi, LEDs/inch, crispness).

- Luminance [1.2.4] (brightness).
- Contrast ratio [1.2.4].
- Day/night settings [1.2.4].
- Change rate [1.3.2] (image changes).
- Dwell time [1.3.2].
- Change time [1.3.2].
- Sequencing [1.3.2] (apparent motion).
- Full motion video [1.3.4].
- Engagement value [1.3.5] (ability to hold attention).
- Message [1.4].

The following are the key factors relating to the roadway:

- Category [2.1.1] (two-lane rural, collector, arterial, freeway).
- Geometry [2.2.2] (curve radius: horizontal, vertical).
- Intersection [2.2.3] (signalized, stop controlled).
- Interchange [2.2.4].
- Exit [2.2.4].
- Entrance [2.2.4].
- Merge [2.2.4].
- Gore [2.2.4].
- Traffic [2.3] (average daily traffic, peak traffic, level of service).

The following are the key factors relating to the driver:

- Age [4.1].
- Gender [4.1].
- Demographics [4.1].

- Years driving [4.2].
- Route familiarity [4.2].
- State [4.3] (alert, fatigue, alcohol, drugs).

The following are the key factors relating to the environment:

- Visual clutter [5.1.1].
- Nearby billboards [5.1.1].
- Ambient lighting [5.1.1].
- Official signs [5.2] (illuminated, luminous (VMS), retro-reflective).
- On-premise signs [5.3] (conventional, tri-vision, digital, full motion video).

The combined list of key factors given above represents a subset of the most influential independent variables in terms of importance to a future program of research. This subset of variables was selected from a more extensive list of the major independent variables which might play a role. As mentioned previously, the list of all major independent variables may be found in outline form in table 1 in appendix A. The bracketed decimal numbers in the list of key factors refer to the corresponding outline numbers in table 1. In addition, the table cites some of the advantages and disadvantages of employing that particular variable. The combined list of key factors presents the 32 variables which were judged to be the most influential variables from table 1.

The more comprehensive and detailed analysis represented in table 1 identifies considerably more possible independent variables. The approximately 60 types of variables listed in the table are further broken down into 185 specific subtypes or levels of independent variables which could play an important role in studying the possible effects of CEVMS on driver distraction and roadway safety. It is encouraged to carefully examine the many independent variables and their advantages and disadvantages, as described in table 1 in appendix A, to gain a greater appreciation of the complexity of the research problem. With such a profusion of important factors affecting the study of CEVMS effects, no single experiment could possibly answer all of the relevant scientific or engineering questions.

The key independent variables were selected from the expanded list represented in table 1 by three senior research psychologists, all coauthors of the present report and familiar with CEVMS research. The criterion for selection was the importance of that factor in conducting research on CEVMS effects. Thus, the list of key factors indicates critical independent variables which need to be considered in any proposed program of research. The brightness and crispness, or photo realism, of the CEVMS images are extremely important. Any image changes, apparent motion or video motion in the CEVMS, and location parameters are also critical factors. The next level of importance relates to environmental factors. Two distinct classes of variables must be taken into account: general visual clutter and the presence of other off-premise commercial CEVMS (nearby billboards). In particular, compelling information from CEVMS used for advertising may conflict with important roadway safety information conveyed by nearby traffic control devices (official signs). The question should also be raised concerning possible enhanced distraction caused by the urgency of Amber Alerts and other public safety messages displayed on CEVMS. Any contextual links among the messages from several sequential CEVMS, as well as any specific user interactions with the CEVMS must be taken into account. Factors to consider for drivers include their familiarity with the driving route and the expected presence or absence of CEVMS. Lastly, the complexity of the roadway geometry and the volume of traffic are likely to play significant roles.

3.2 KEY MEASURES (DEPENDENT VARIABLES)

The study of driver safety is a complex area of investigation. There are numerous objective, inferred, and subjective measures of driver behavior which might serve as dependent variables in a program of proposed research on the possible safety effects of CEVMS. As demonstrated in the discussion concerning independent variables, the key measures or dependent variables may be categorized into types. The list of key measures shown below gives 28 key measures, or dependent variables, which might be considered possible safety effects of CEVMS. As was the case for the list of key factors (independent variables), the list of key measures represents a down selection from a more extensive list of the major dependent variables of interest (see table 2 in appendix A). The dependent variables are grouped into the following four major categories:

- Vehicle behavior.
- Driver and vehicle interactions.
- Driver attention and distraction.
- Crashes.

The structure of the list of key measures for dependent variables is similar to that for the list of key factors for independent variables. In the case of dependent variables, the major variable categories of driver and vehicle interactions and crashes found in table 2 are missing from the list of key measures below because all of the variables belonging to these two categories were eliminated in the selection process.

Key measures relating to vehicle behavior are as follows:

- Speed [1.1] (continuous, exceeding speed, speed variance).
- Lane position [1.2] (continuous, lane excursions, lane variance).
- Acceleration [1.3] (longitudinal, lateral, heave).
- Other vehicle interactions [1.4].
- Headway [1.4.1] (time to collision).

- Gap acceptance [1.4.2] (merge, passing).
- Conflicts [1.4.3] (near-crashes).
- Violations [1.4.4] (red light running, failure to yield, failure to stop).
- Errors [1.4.5] (missed exit, wrong lane).
- Timing [1.4.6] (late movements, premature movements).
- Infrastructure interactions [1.5].
- Response to roadway geometry [1.5.1] (swerves, sudden braking).
- Response to traffic control devices [1.5.2] (misses, delays).
- Pedestrian interactions [1.5.3] (yields).

Key measures relating to driver attention/distraction are as follows:

- Eye glance behavior [3.1.1] (number and duration of glances, glance object).
- Distractor performance [3.1.2] (secondary task).
- Visual occlusion [3.1.3].
- Feature detection [3.1.4].
- Feature recognition [3.1.5].
- Driver workload [3.1.6] (task performance).
- Head turning [3.1.7].
- Driver errors [3.1.8].
- Reaction time [3.1.9] (perception-reaction time).
- Surprise [3.2.1] (orienting response).
- Conspicuity [3.2.2] (attention grabbing).
- Search patterns [3.2.3].
- Capacity [3.2.4] (self-regulated attention, spare capacity).
- Subjective measures [3.3].

As mentioned above, the more detailed analysis underlying the combined list of key measures shown above may be found in table 2 in appendix A. Table 2 for the dependent variables has the same general structure as table 1 for the independent variables. The approximately 65 types of dependent variables listed in table 2 are further broken down into 105 specific subtypes or levels of variables which could play an important role in measuring the possible effects of CEVMS on driver distraction. As noted before, it is encouraged to carefully examine the many dependent variables and their advantages and disadvantages, as described in table 2 in appendix A, to gain a greater appreciation of the wide variety of ways that driver safety can be measured as they relate to possible influences from CEVMS. With so many potential measurement techniques available, care must be taken in selecting appropriate dependent variables for any proposed program of research.

Only the key dependent variables are listed in the combined list of 28 key measures given above. They were selected by the same process used to select the key independent variables in the list of key factors. As indicated before, the criterion for selection was importance in conducting research on CEVMS effects. Thus, the list of key measures indicates critical measures which need to be considered in future research. Eye glance behavior can serve as a particularly important potential indicator of specific visual distractions. The concept of self-regulated attention is very important for establishing excessive levels of distraction, despite difficulties in establishing a criterion threshold. This concept refers to attention that is under the driver's conscious control, as opposed to involuntary attention, which may compel the driver to glance away from the road for an excessive amount of time. Increases in driving conflicts and errors are likewise effective measures of safety. The next level of importance relates to other observations of vehicle behaviors, including determinations of acceleration, lane position, and speed. Similarly important infrastructure interactions, such as driver responses to roadway geometry and traffic control devices, need to be considered.

4.0 RESEARCH STRATEGIES

To successfully investigate the potential safety effects of CEVMS, the key factors (independent variables) and key measures (dependent variables) described in the previous section need to be selected, combined, and integrated into an effective research strategy. There are a number of possible research strategies that could address the basic research question. The list of recommended research strategies shown below lists eight key research approaches that might be considered. This list was generated from a more comprehensive and detailed analysis of the research strategies which might be of interest. This comprehensive analysis of research strategies was divided into six major groups (see table 3 in appendix A). The first group focuses on observing or counting actual motor vehicle crashes as they might occur or have occurred in the field. This field portion includes retrospective crash data base studies. The second group entails observing motor vehicle crashes as they might occur in a driving simulator. The third group involves observing safety surrogate measures as they might actually occur in the field. The fourth group focuses on observing safety surrogate measures as they might occur in a driving simulator. The fifth and sixth groups relate to social surveys and analytical studies. In this instance, the down-selection process eliminated all research strategies concerning crashes, social surveys, and analytical studies. Within the parentheses next to each strategy are some selected advantages and disadvantages associated with using that type of strategy in conducting research.

Only the key strategies are shown in the list of recommended research strategies. They were selected by the same process used to select the key independent and dependent variables, with one important exception. This exception involves the incorporation of several assumptions which were derived from the antecedent analysis of potential independent and dependent variables. First, the brightness, sharpness, photo realism, and visual context of the CEVMS are extremely important. Since these characteristics are difficult to reproduce in a laboratory, laboratory methods tended to be judged low. In addition, certain participant-related variables, in particular eye glance behavior, are highly effective measures of distraction and workload. Any research method that supported the measurement of such variables tended to be judged high. Last, crash data involve rare events with multiple causal factors, making them difficult to measure. The CEVMS technology is too new to have an adequate crash heritage. In general, crash estimation methods tended to be judged low.

After incorporation of the above assumptions, the following final list of recommended research strategies was developed. This final list included strategies from only two of the original six groups of strategies.

The recommended research strategies for the safety surrogate field group include the following:

- Unobtrusive observation [3.1] (natural driving context/no eye glance data, expensive).
- Naturalistic driving [3.2] (natural driving context/insensitive eye glance data, expensive).
- On-road instrumented vehicle [3.3] (experimental control, sensitive eye glance data, efficient, cost effective/artificial drive purpose).

- Closed-course test track [3.4] (stimulus control, efficient, cost effective/out of context driving).

- Commentary driving [3.5] (easy/artificial response, interfere with driving).

- Non-vehicle based field testing [3.6] (easy/artificial, out of context).

The recommended research strategies for the safety surrogate laboratory group include the following:

- Driving simulator [4.1] (experimental control, sensitive eye glance data, efficient/limited stimulus, artificial).

- Non-simulator laboratory [4.2] (relatively easy/artificial, out of context).

The more detailed analysis underlying the above combined list of recommended research strategies may be found in table 3 in appendix A. In the table, the more comprehensive analysis of research strategies is further broken down into approximately 55 specific categories and 165 subtypes or levels of these categories. The reader is encouraged to carefully examine the many strategies and their advantages and disadvantages, as described in the table, to gain a greater appreciation of the wide variety of potentially relevant research methods which might be employed to study possible CEVMS effects.

Table 3 can be used to discriminate among potential candidate research strategies. Certain research strategies can be eliminated from further consideration. Analytical studies cannot fill knowledge gaps and consequently often fall prey to reliance on unfounded assumptions. Social surveys are based on memory and opinion, and they are generally administered far from the event of interest both in terms of time and space. Crash rates, whether observed in the field or in the laboratory, represent extremely rare events, which are often the result of multiple complex causes and thereby difficult to evaluate. CEVMS technology has not been deployed long enough to accumulate a sufficient number of proximal motor vehicle crashes to make reliable estimates concerning population crash statistics in the field. Driving simulators used to measure safety surrogates have the advantage of careful control over stimulus parameters and testing conditions, but they suffer the disadvantage of being unnatural and artificial. More importantly, driving simulators have difficulty reproducing the luminance contrast and bright photorealism of the new CEVMS technology. In a similar manner, the closed-course test track and non-vehicle based field testing techniques represent a comparatively artificial and out-of-context experimental environment even though they are conducted in the field. Finally, commentary driving also affords natural billboard stimuli, but the driving task becomes somewhat artificial.

The three research strategies which were judged to be the most effective were the on-road instrumented vehicle, the naturalistic driving, and the unobtrusive observation method, which were all used to measure driver distraction and safety surrogates. Thus, the outcome of the present investigation of research strategies recommends three primary candidates for consideration in any program of future research to study the possible effects of CEVMS on driver distraction and roadway safety. Each of the three study methods represented has its own unique advantages and disadvantages. All three of these top candidate research strategies should be considered in developing any future research program on CEVMS effects. They provide the basis for selecting a recommended first stage study in such a program.

This is not to say that other research strategies do not have a significant role to play in a comprehensive research program directed toward a common goal. For example, if significant negative CEVMS safety effects have already been found using one of the primary research strategies, subsequent driving simulator experiments might be employed to systematically vary certain billboard location, timing, or spacing parameters in a controlled and consistent manner to establish billboard placement guidance. In addition, combinations of research strategies can result in synergistic efficiency. For example, both the unobtrusive observation and the naturalistic driving methods naturally support the simultaneous collection of crash, near-crash, or safety surrogate data. The analysis of crash data will also be needed to relate measures of driver distraction to more direct determinants of roadway safety.

5.0 FUTURE RESEARCH PROGRAM

As stated previously, it is not possible to answer all of the critical questions concerning possible attention, distraction, and safety impacts from CEVMS in a single experiment. Instead, a carefully crafted program of research needs to be conceived and implemented to embrace a series of interrelated experiments and studies directed at answering different facets of this complex issue. This section describes the important elements of a recommended research program. This research program is broadly defined to provide a background and context for more concrete alternative first stage studies outlined in section 6.0. This section describes a long-range multistudy research program covering a number of years. Section 6.0 will outline three methods for implementing the first stage of that program.

5.1 STAGES

The proposed research program would have the following three stages:

- Stage 1—The attention and distraction effects of CEVMS would be investigated to determine whether any observed or measured distractions due to CEVMS is sufficient to interfere with attentional criteria for safe driving. This stage is directed at discovering whether or not distraction from CEVMS represents a potential driving hazard. Initial CEVMS parameters must be chosen carefully so as not to bias the result from the outset.
- Stage 2—If potential interfering distraction is observed, it would be necessary to investigate the relationship between the observed distraction and various CEVMS parameters (e.g., luminance, change rate, distance, CEVMS spacing, engagement level of sign content, and road geometry) to determine possible limitations on CEVMS deployment and operation which might reduce distraction to noninterfering levels. This stage is directed at developing empirical data to support the development of possible restrictions or regulation of CEVMS to reduce potential driving hazards.
- Stage 3—As related to CEVMS, researchers would have to investigate the relationship between distraction, defined in terms of eye glance behavior and safety surrogate measures (driving conflicts, errors, etc.), and safety, defined more directly in terms of crashes, fatalities, injuries, and property damage. This stage focuses on validating the eye glance and safety surrogate measures used to infer attention and distraction effects of CEVMS through the primary safety criterion of protecting life, health, and property.

The above stages of the proposed research program are to be pursued sequentially. The initial stage is directed at determining whether or not a potentially harmful CEVMS distraction effect exists. To demonstrate such a distraction effect, an independent and objective threshold criterion of excessive distraction must be employed. If no potentially harmful distraction is shown, at least as far as driving safety is concerned, there would be little need to pursue the second stage of developing a basis for regulating CEVMS or the third stage of relating CEVMS distraction to more direct measures of safety (crashes). If potentially harmful distraction is shown in the first stage, the second and third stages would be implemented in order. The order of the last two stages may appear to be reversed. Normally, it would seem desirable to establish a relationship between CEVMS distraction and crashes before developing a basis for regulation. However, in this instance, the LED-based digital CEVMS technology is so new that it will not be possible to reliably measure crashes for some time. Meanwhile, if possible distraction is shown, the community of practitioners engaged in outdoor advertising control will need near-term technical information on the luminance, contrast, change rates, and spacing of CEVMS to minimize that distraction. For this reason, the stages have been proposed in the order given above.

5.2 APPROACH

The literature review update in section 2.0 points to some important principles that should be incorporated into the proposed program of research to enhance the probability that the program can successfully achieve its goals. These principles can be regarded as lessons learned from the experience of previous research. First, empirical studies should employ CEVMS stimuli, as well as a variety of comparison stimuli, including standard (non-digital) billboards, built objects of casual visual interest (e.g., houses, barns), and natural background control scenery (e.g., trees, fields). This principle establishes a relevant visual context against which to contrast CEVMS stimuli. Next, empirical studies should be constructed so as to compare the effects of CEVMS and the effects of the various comparison stimuli. This principle implies that some measurable (statistically significant) effect should be demonstrated for as many of the comparison stimuli as possible, at least for the standard billboards. It is necessary to show some distraction effect for both CEVMS and standard billboards relative to a baseline to be sure that the study is not just measuring random noise in the data. In addition, for the case of distraction and safety surrogate performance measures, the measured effects of CEVMS and standard billboards need to be compared with each other and with an independently determined criterion of potentially harmful consequences. The application of this criterion needs to incorporate the concept of self-regulated attention, as indicated in section 3.0. Last, to the degree possible, direct experimental control should be exerted over the CEVMS stimuli. In the first stage of determining a meaningful distraction effect, this control can be limited to turning the CEVMS on and off for predetermined periods according to a strict experimental protocol. In the second stage of establishing possible parameter limitations, this control may need to be expanded to changing the luminance, message change rate, or some other CEVMS characteristic according to an experimental protocol.

These four principles define the basic approach for implementing the proposed research program. They provide guidance and direction to the proposed program. It should be emphasized that only a systematic multiyear broad program of research can adequately answer the important questions posed by the community interested in outdoor advertising control concerning the possible distraction effects and safety implications of CEVMS. No single experiment can provide the solution. It should also be emphasized that all stages of the research program must be sensitive to the practical needs of the outdoor advertising community, which includes highway engineers, traffic engineers, the outdoor advertising industry, environmental advocates, and outdoor advertising regulators. Even though the second stage is where most of these practical needs are addressed, at all stages of the research, investigators need to try to provide practical information on the luminance, contrast, change rate, display size, display spacing, or other parameters over which the outdoor advertising community could possibly exert some control. Administrators concerned with issuing permits for billboards need practical engineering results to assist them in there daily jobs.

5.3 STRUCTURE

As outlined above, the proposed research program consists of three stages. The first stage focuses on determining the potential existence of harmful distraction effects due to CEVMS. The second stage involves determining limitations or restrictions to CEVMS parameters which could reduce or eliminate the implied potentially harmful distracting effects. The third stage focuses on relating the reduction in implied potentially harmful distraction to actual safety benefits of decreasing crashes, fatalities, injuries, and property damage on the roadway. The sections below describe these stages in more detail.

5.3.1 Stage 1—Determination of Distraction

The first stage, to determine the potential existence of harmful CEVMS distraction, may be implemented in many different ways. According to the analysis of research strategies in section 4.0, the three most effective approaches are the on-road instrumented vehicle, the naturalistic driving, and the unobtrusive observation methods.

The on-road instrumented vehicle method is sensitive to a wide range of variables, including accurate eye glance measurements. It affords the opportunity to ensure that the test participants drive by many CEVMS and comparison sites in a structured and reproducible manner.

The naturalistic driving method is similar to the on-road instrumented vehicle technique, but it has less control since the test participants drive their own vehicles according to their own personal daily schedules. As a result, the participants may pass few, if any, billboards. Furthermore, the naturalistic driving method has difficulty supporting accurate eye glance measurements, and it requires considerably more effort and expense. However, the naturalistic driving method is less artificial and has a high degree of face validity.

Although the unobtrusive observation method also involves considerable effort and expense, the data collected are based on the observation of vehicles rather than individual drivers. The unobtrusive observation method is the least artificial of the three because with this technique, research participants are generally unaware of being observed.

This first stage of the research program would employ one or more of these study approaches as a first step. A single method could be selected, or more than one approach could be combined. For example, the on-road instrumented vehicle and the unobtrusive observation method could make an effective combination, but the cost would be high. In either case, this first stage should also be designed to answer, at least in a preliminary manner to whatever degree possible, some of the practical questions of interest to the community concerned with outdoor advertising control.

5.3.2 Stage 2—Basis for Regulation

If the results of the first stage reveal a CEVMS driver distraction effect sufficient for public concern, then the second stage of the proposed research program would be implemented to provide an initial technical basis for possible regulation. This stage would consist of a series of eye glance and safety surrogate evaluations in the field and in the laboratory designed to investigate the various parameters of CEVMS which contribute to driver distraction. Although field methods can capture the realism of the CEVMS stimulus, they do not allow the researcher to independently vary a variety of CEVMS parameters one at a time so as to isolate the effect of that variable, as some of the laboratory techniques would. For example, this second stage might begin with attempts to estimate the gross effects of certain salient CEVMS parameters in the field. Throughout this section, the brightness of the CEVMS will be used as an example, but the approach can be adapted to many other relevant CEVMS characteristics. For example, many current CEVMS displays adjust their brightness for day and night. If the outdoor advertising industry would agree to adjust the brightness of several installations both during the day and at night for the purposes of experimentation, partial estimates of the effects of brightness on eye glance behavior might be elaborated for selected luminance levels.

To obtain a more complete functional relationship between eye glance distraction and CEVMS luminance, a test track or driving simulator experiment might be devised. If it were possible to erect an experimental CEVMS installation at a test track location, the test track experiment would have realistic brightness and contrast levels, as well as controlled exposure conditions. However, it would suffer from a highly constrained and unnatural driving environment. The driving simulator experiment could easily portray a wide variety of driving environments with realistic contexts, but it would suffer from a severely restricted range of luminance and contrast ratios. Nonetheless, to overcome these disadvantages, correction factors or transformations might be applied to the test track data to account for discrepancies in level of attention and to the driving simulator data to account for photometric discrepancies. The incorporation of such correction factors or transformations to relate test track and laboratory data to driving data on real roads underscores the necessity of conducting a combination of field and laboratory testing environments in this stage of the proposed research program. Some degree of field validation needs to be a part of any laboratory component of the research during this stage.

This second stage of the research program must be designed to answer, to the degree possible, the practical questions of the community interested in outdoor advertising control. This is the stage of research which addresses functional relationships regarding the effects of CEVMS luminance (brightness), change rates, size, display spacing, and other variables on driver distraction and roadway safety. These functional relationships could subsequently be translated by outdoor advertising administrators and regulators into concrete rules which protect the safety of the driving public while at the same time allowing commercial growth and the rights of the outdoor advertising industry. To be fully successful, this stage of the research program must be pursued with active participation from all stakeholders, which include industry, environmentalists, researchers, and regulators alike.

5.3.3 Stage 3—Relationship to Crashes

The third stage of the proposed research program relates changes in potentially harmful distraction effects due to various CEVMS parameters to changes in actual roadway safety (crashes and their consequent fatalities, injuries, and property damage). This stage is directed at validating the earlier findings with regard to CEVMS distraction based on eye glance and safety surrogate measures in the context of retrospective crash data. This stage of the program would likely employ the Empirical Bayes, or Bayesian, method of analyzing crash statistics. The Bayesian approach formally incorporates prior knowledge into the process of current research, and it translates probabilistic calculations into statements of belief concerning statistical hypotheses in place of the classical confidence interval concept employed in parametric statistics. The Empirical Bayes method also incorporates the crash history of other control sites with similar traits to account for extraneous factors which may be influencing the crash data at the site of interest. In short, the Empirical Bayes method possesses distinct statistical advantages over the naïve before/after technique and even the before/after technique with a simple control. The Empirical Bayes method is well suited for the task of estimating vehicle crash rates along different stretches of roadway, including those stretches with CEVMS. The prediction of baseline crash rates, and their potential increase or decrease with the introduction of CEVMS, is essential to this final stage of the proposed research program. This final stage should also be designed to answer, to whatever degree possible based on crash statistics, some of the practical questions of interest to the community concerned with outdoor advertising control. Because of the low numbers of crashes and their susceptibility to multiple determining causes, considerable effort, time, and expense will likely have to be expended on this final stage.

6.0 RECOMMENDED FIRST STAGE STUDY

The first stage of the research program, determination of distraction, provides the context for selecting the recommended next study. The first goal of this stage of the program is to determine whether any observed or measured distraction due to CEVMS is sufficient to interfere with attentional criteria for safe driving. The second goal is to provide some preliminary practical technical information that could be of help to the community interested in outdoor advertising control. This goal could consist of furnishing initial indications of the possible distraction effects produced by one or more of the concrete variables over which the community might exert some control, such as luminance (brightness), change rate, display size, and display spacing. According to the analysis summarized in section 4.0, to provide an initial answer to these types of questions, the three most effective research strategies are the on-road instrumented vehicle, the naturalistic driving, and the unobtrusive observation methods. In the present section, one possible preliminary study is briefly described using each of these three approaches. A more detailed description of each study approach is given in appendix B. This detailed description includes more specific information on the general method, factors and measures employed, advantages and disadvantages, and budgetary cost. After project initiation, a more comprehensive work plan and more in-depth budget will need to be developed. That comprehensive work plan should receive inputs from all of the important stakeholders in CEVMS research, which include industry, environmentalists, researchers, and regulators alike. After careful and thorough deliberation, the final details of that comprehensive work plan and budget may differ considerably from what is suggested in this section or in appendix B.

6.1 SUMMARY OF STUDY APPROACHES

6.1.1 On-Road Instrumented Vehicle

The on-road instrumented vehicle method employs an instrumented vehicle which is brought to the study site. The study site is a location where there are one or more CEVMS installations along a public access roadway. Each research participant drives the instrumented vehicle along a prescribed route, which includes CEVMS installations, standard (non-digital) billboards, objects of casual visual interest (e.g., houses and barns), and natural background control scenery (e.g., trees and fields). Each participant completes several such drives. The instrumented vehicle is capable of measuring vehicle speed, vehicle lane position, longitudinal acceleration, lateral acceleration, GPS time and position, and driver eye glance direction and duration. The instrumented vehicle is also equipped with accurate vehicle-mounted or head-mounted eye-tracking equipment, video cameras (forward and cab views), and a voice recorder. The major independent variable in the study is the presence or absence of CEVMS and other comparison visual stimuli along the driving path. If possible, the CEVMS should be capable of being turned off and on or changing along some other dimension like luminance or change rate, according to a prearranged experimental design. Other important independent variables are the time of day (day/night), traffic conditions (peak, nonpeak) and driver variables (age, gender, and route familiarity). The primary dependent variables are the frequency, direction, and duration of driver eye glances. Secondary dependent measures are safety surrogate indicators associated with driver errors and other measures of driver performance, such as speed changes, headway, lane deviation, and traffic conflicts. A rough budgetary estimate for conducting such an on-road instrumented vehicle study is between $400,000 and $800,000 (see appendix B for more details).

6.1.2 Naturalistic Driving

The naturalistic driving method employs a standardized instrument package which is installed in each participant's own private vehicle or in a vehicle loaned to the participant. The participant's vehicle appears and performs as it normally would. Participants drive their vehicles as part of their daily life routines, making control of CEVMS exposure difficult. The instrument package is capable of measuring speed, lane position, acceleration, GPS time and position, driver eye glance frequency, direction, and duration. However, because of the unobtrusive nature of the experimental technique, this method cannot support the use of accurate head-mounted or vehicle-mounted eye-tracking equipment. Once the participant's vehicle has been instrumented, data are collected by means of automatic wireless downloads without participant awareness or involvement. The major independent variable is the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, control settings, etc.) along the driven path. If possible, the CEVMS should be controlled according to a prearranged experimental protocol. Secondary independent variables could include the type of vehicle (sedan, pickup, or SUV) and driver characteristics (age, gender, and route familiarity). The primary measures or dependent variables are the frequency, direction, and duration of the driver's eye glances. However, as a result of the lower degree of accuracy in eye movement recording, this study method depends more heavily on secondary dependent variables. Safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, conflicts, and erratic maneuvers) are of increased importance in this method. Additional dependent variables may include the time of day (day/night), traffic conditions (peak, nonpeak), in-vehicle distractions (eating, cell phone use), state of fatigue, etc. A rough budgetary estimate for conducting such a naturalistic driving study is between $2 million and $4 million (see appendix B for more details).

6.1.3 Unobtrusive Observation

The unobtrusive observation method employs an array of static cameras or other sensors mounted near the locations of the CEVMS and other comparison stimuli. The cameras are capable of recording the behavior of vehicles passing the various relevant visual stimuli as a part of the natural flow of traffic. The drivers are usually completely unaware that their vehicles are being observed. Post-hoc analysis of the video recordings from these cameras can yield data similar to some of that obtained by the on-road instrumented vehicle and naturalistic driving methods including vehicle speed, lane position, acceleration, and time. However, the data from distal video cameras are usually far less accurate and reliable than what can be collected by instruments on board the vehicle. Moreover, with present measurement technology, such video recordings cannot yield any data concerning driver eye glance movements. The major independent variable is the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, etc.) along the driving path. If possible, the CEVMS should be controlled according to a prearranged experimental protocol.

Some secondary independent variables might include the time of day (day/night) and traffic conditions (peak, nonpeak). This study method depends completely on safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, and erratic maneuvers), and it requires a large camera array over a long distance recording for extended periods, as well as extensive data analysis. A rough budgetary estimate for conducting such an unobtrusive observation study is between $1 million and $3 million (see appendix B for more details).

6.2 COMPARISON OF STUDY ALTERNATIVES

This section has introduced and described three different candidate approaches for the recommended next study, which include the on-road instrumented vehicle method, the naturalistic driving method, and the unobtrusive observation method. Each study method would be capable of addressing the two-part basic research question to determine whether any observed or measured distraction due to CEVMS is sufficient to interfere with attentional criteria for safe driving, and to provide some preliminary practical technical information that could be of help to the community interested in outdoor advertising control. However, each method has certain advantages and disadvantages with regard to its ability to address these two questions.

The on-road instrumented vehicle method was judged the best, having the advantage of being sensitive to a wide range of participant variables, including accurate eye glance measurements with real CEVMS stimuli in natural settings. The degree of experimental control afforded by this method makes it the most productive of the three. Driving scenarios can be selected with a number of CEVMS and standard billboard stimuli along a single drive, which can be repeated both within and across research participants. To the degree that accurate measurements of visual distraction and eye glance behavior are pivotal dependent variables, the on-road instrumented vehicle method has the clear advantage. The high degree of experimental control ensures that exposure to CEVMS and to comparing visual stimuli is uniform and consistent. The on-road instrumented vehicle approach is the most productive research method for producing quality data in the shortest amount of time for the least cost.

The naturalistic driving method was judged the second best, offering some similar advantages to the on-road instrumented vehicle method. However, it suffered from less experimental control over CEVMS exposure, less ability to capture participant-related variables, and more logistical complication and expense. Both of these methods are somewhat related from the perspective of the research participant. In both cases, the research participant is driving in an instrumented vehicle on a real road. Both allow the determination of driver eye glance behavior to some degree, but the increased level of experimental control exercised in the on-road instrumented vehicle method gives this technique a distinct advantage, both in terms of more accurate eye glance measurements and more consistent driver exposure.

Finally, unobtrusive observation of safety surrogate measures involves no direct contact with the driver, thus preserving a completely natural driving environment. However, this method is not sensitive to participant variables. In particular, it is not possible to measure eye glance behavior with this method. This method depends solely on safety surrogate measures. Furthermore, since these safety surrogate measures are relatively subtle to detect at a distance, this method can be costly and time-consuming to implement.

The on-road instrumented vehicle method has a strong advantage in productivity and efficiency. The major advantage of the other two methods is the natural and unobtrusive nature of the study procedure from the perspective of the research participants. However, some degree of artificiality may be a small price to pay to gain the cost effectiveness of the on-road instrumented vehicle method. In the final analysis, the present report recommends the on-road instrumented vehicle method as the best choice for the first stage study. This recommendation is made on the basis of scientific merit, timeliness of producing a meaningful result, and cost.

7.0 CONCLUSIONS

The present report reviews the possible safety effects of CEVMS. The report consists of an update of earlier published work, an investigation of applicable research methods and techniques, recommendations for future research, and an extensive reference list and bibliography. The literature review update covers recent post-hoc crash studies, field investigations, laboratory investigations, previous literature reviews, and reviews of practice. The conclusion of the literature review is that the current body of knowledge represents an inconclusive scientific result with regard to demonstrating detrimental driver safety effects due to CEVMS exposure. This outcome points toward the importance of conducting carefully controlled and methodologically sound future research on the issue.

The present report also analyzes the key factors or independent variables affecting a driver's response to CEVMS and the key measures or dependent variables which serve as indicators of driver safety. These key factors and measures are selected, combined, and integrated into a set of optimal research strategies. Based on these strategies, as well as on lessons learned from the literature review update, a proposed long-term program of research has been developed to address the problem. This research program consists of three stages, which include determination of distraction, basis for possible regulation, and relationship of distraction to crashes.

The present report only addresses the first stage of the proposed research program in detail. For this first stage, three candidate studies, which are an on-road instrumented vehicle study, a naturalistic driving study, and an unobtrusive observation study, have been introduced and compared. An analysis of the relative advantages and disadvantages of each study indicate that the on-road instrumented vehicle study is the best choice as the recommended first stage in answering the basic research question.

APPENDIX A—EXPANDED TABLES

A.1 KEY FACTORS (INDEPENDENT VARIABLES)

Table 1. Expanded key factors (independent variables).

Variable	Ref. #	Advantages	Disadvantages
1.0 Billboard			
1.1 Location	8, 129, 38, 15, 44, 32		
1.1.1 Lat./long.; GPS; mile marker; survey location; reference location; mobile	13, 53, 160	Important to define stimulus; Easy to measure.	Likely to require travel expenses.
1.1.2 Distance from roadway; setback			Less important.
1.1.3 Sight distance; visual occlusions; distance first detected	13, 53	Determines exposure time.	
1.1.4 Orientation; angle to road; side of road; two-sided	144		Less important.
1.2 Display	144		
1.2.1 Type: Conventional; Digital; Tri-vision	125, 48	Digital type stands out.	Tri-vision likely to disappear.
1.2.2 Size; length; height; visual angle; mounting height	129, 32	Off-premise sizes somewhat standard.	On-premise sizes variable.
1.2.3 Resolution; dpi; LEDs/in	95, 48, 53	Crispness (sharpness) of image important.	
1.2.4 Luminance; contrast ratio; day/night settings	48, 53, 144	Brightness (luminance) extremely important.	Night setting may depend upon background illumination.
1.3 Dynamics	31		

Variable	Ref. #	Advantages	Disadvantages
1.3.1 Type: static; changing	158, 129, 26	Changing images extremely important. Static serves as control.	
1.3.2 Change rate; dwell time; change time; sequencing	48, 50, 158, 94	Change pattern important. Easy to measure.	
1.3.3 Special effects: wipe, dissolve, scintillate		Adds to uniqueness and conspicuity.	More difficult to measure.
1.3.4 Full motion video	125, 126	Full motion video extremely compelling.	Difficult to specify exact content seen.
1.3.5 Engagement value: ability to hold attention		Important overall distraction variable	Difficult to measure; requires subjective rating.
1.3.6 Sound			
1.4 Message	129, 44, 144, 53		
1.4.1 Type: text; graphics; mixed; targeted	32, 31	Particular message may be secondary.	
1.4.2 Text: word count; font size; color; content; legibility; affect	32, 48		Many variations. Less important.
1.4.3 Graphics: size; complexity; color; content; affect	31, 50		Difficult to specify. Many varieties.
1.4.4 Public safety alerts		Social benefit.	May be more distracting than advertising.
1.4.5 Interactive: encourages driver response		Interactive may require more attention.	
2.0 Roadway			
2.1 Type			

Variable	Ref. #	Advantages	Disadvantages
2.1.1 Category: two-lane rural; collector; arterial; freeway	13, 15 71, 54	Important determinate of driver workload.	Many variations even in single category.
2.1.2 Lanes: number; width; markings; medians; shoulders; rumble strips			Less important.
2.1.3 Speed: posted; advisory; 85^{th} percentile; median	50	Changes urgency of correct driving responses.	
2.1.4 Condition: dry, wet, ice, rain; oil slick		Important to driver control over vehicle.	
2.1.5 Traction: coefficient of friction			
2.2 Complexity	15		
2.2.1 Tangent: level; grade			Less important.
2.2.2 Curve: horizontal; vertical	13, 44, 118	May place sudden demand on driver attention.	
2.2.3 Intersection: signalized; stop controlled	129, 38, 48	Increased driver workload.	Wide variety of intersection complexities.
2.2.4 Interchange: exit, entrance, merge, gore	26, 44, 32, 48	Controlled access. More carefully engineered.	
2.2.5 Driveway; entrance			Less important.
2.2.6 Lane change: merge; diverge; lane drop		May place sudden demand on driver attention.	
2.2.7 Other: bicycle lane; fire house			Less important.
2.3 Traffic	158, 38, 15, 113,		

Variable	Ref. #	Advantages	Disadvantages
2.3.1 Average daily traffic; peak traffic; level of service	118	Likely to increase driver workload.	
2.3.2 Traffic mix: cars, trucks, buses, motorcycles			Less important.
2.3.3 Pedestrians			Mainly only in urban settings.
3.0 Vehicle	59		
3.1 Type: automobile; SUV; truck; motorcycle		Motorcycle has least obstructed view.	
3.2 Condition: response; vehicle dynamics			Hard to determine in field.
3.3 Windshield: size; tinting; field of view		Defines some stimulus exposure characteristics.	
4.0 Driver	10		
4.1 Characteristics: age; gender; demographics	53, 23, 12, 54		Less important.
4.2 Experience: years driving; route familiarity	15, 100	Route familiarity extremely important.	
4.3 State: alert; fatigue; alcohol; drugs			Difficult to measure.
4.4 Distractions: conversation; eating; cell phone	24, 90, 25		
5.0 Environment			
5.1 Visual—general	113		
5.1.1 Visual clutter; nearby billboards; ambient lighting	160, 15, 32, 44	Complexity of visual environment extremely important.	Difficult to specify.

Variable	Ref. #	Advantages	Disadvantages
5.1.2 Day/night viewing: dawn; dusk; sun-glare	53	Nighttime viewing of bright images important.	
5.1.3 Visual flow			Less important.
5.2 Official signs	160, 2, 26, 100		
5.2.1 Type: regulatory, advisory, navigational	94	Regulatory most important.	
5.2.2 Location: left, right, overhead	44, 15	Billboard can conflict with sign.	
5.2.3 Lighting: illuminated; luminous (VMS); retro-reflective		Luminous (VMS) signs most important.	
5.2.4 Density: number in view, type mix	15		Many variations in urban settings.
5.2.5 Dynamics: change rate; motion; video		Extremely important point of possible conflict.	Motion and video not yet allowed.
5.2.6 Message: text; graphics			Less important
5.3 On-premise signs			
5.3.1 Type: conventional; Tri-vision; digital; full motion video	144	Digital and video most important.	Tri-vision likely to disappear.
5.3.2 Location: left, right, high, low	144		
5.3.3 Lighting: illuminated; luminous; LED	144	Bright, high resolution very compelling.	Difficult to measure.
5.3.4 Density: number in view, type mix		Can add to visual clutter.	Many variations possible.
5.3.4 Dynamics: change rate; motion; video; sound	144	Extremely important variable.	

Variable	Ref. #	Advantages	Disadvantages
5.3.5 Message: text; graphics; interactive		Interactive important.	Text and graphics less important.
5.4 Geographic	15		
5.4.1 Population: urban; suburban; rural	13, 71	Can affect visual clutter.	Many variations.
5.4.2 Terrain: mountain; valley; desert; hilly; near water		Can affect driver workload.	Many variations.
5.4.3 Area: city; state; region			Less important.
5.5 Meteorological			
5.5.1 Temperature; humidity; cloud cover	53		Less important.
5.5.2 Precipitation: rain; snow; fog; ice; visibility	53	Can affect driver workload.	

A.2 KEY MEASURES (DEPENDENT VARIABLES)

Table 2. Expanded key measures (dependent variables).

Variable	Ref. #	Advantages	Disadvantages
1.0 Vehicle Behavior	48		
1.1 Speed	125, 50		
1.1.1 Continuous		More accurate profile.	Large amounts of data. Expensive.
1.1.2 Discrete locations		Less data.	Cheaper.
1.1.3 Speed exceedances: high; low		Distraction indicator.	
1.1.4 Speed variance		Distraction indicator.	Best with continuous data.
1.2 Lane position	161, 48, 54		
1.2.1 Continuous		More accurate profile.	Large amounts of data. Expensive.
1.2.2 Discrete locations		Less data.	Cheaper.
1.2.3 Lane excursions: right; left	23	Distraction indicator.	More difficult to measure.
1.2.4 Lane variance		Distraction indicator.	Best with continuous data.
1.3 Acceleration	48, 54		
1.3.1 Longitudinal: hard braking; delayed acceleration; braking without cause		Excellent surrogate for distraction.	
1.3.2 Lateral: swerves	39	Good surrogate for distraction.	
1.3.3 Heave: bumps	125, 48		Not important.
1.4 Other vehicle interactions	39		

Variable	Ref. #	Advantages	Disadvantages
1.4.1 Headway (car following); time to collision	125, 48, 118	Good surrogate for distraction.	
1.4.2 Gap acceptance: merge; passing		Good surrogate for distraction.	Difficult to measure.
1.4.3 Conflicts; near-crashes	125	Extremely important measure.	
1.4.4 Violations: red light running; failure to yield; failure to stop			Low probability events.
1.4.5 Errors: missed exit; wrong lane		Good surrogate for distraction.	
1.4.6 Timing: late movements; premature movements			Difficult to measure.
1.5 Infrastructure interactions			
1.5.1 Response to roadway geometry: swerves; sudden braking	118, 15	Surrogate for distraction.	
1.5.2 Response to traffic control devices: misses, delays	15	Surrogate for distraction.	
1.5.3 Pedestrian interactions; yields			Only in urban settings.
1.6 Signals	39		
1.6.1 Brake light	125	Indication of sudden deceleration.	
1.6.2 Turn signals			Less important.
1.6.3 Other: backup lights			Not important.

Variable	Ref. #	Advantages	Disadvantages
2.0 Driver/Vehicle Interactions			
2.1 Steering			
2.1.1 Gross movements: curves; turns		Surrogate for distraction.	
2.1.2 Fine movements: lane keeping	60		Difficult to measure.
2.2 Throttle			
2.2.1 Pedal press; pedal position; duration			Less important.
2.2.2 Pedal release; duration			Less important.
2.3 Brake	125		
2.3.1 Pedal press; duration; excursion		Surrogate for distraction.	
2.3.2 Pedal release			Less important.
2.4 Shift (manual only)			
2.4.1 Gear selection (speed)			Not important.
2.4.2 Gear transitions (shifts)			Not important.
2.5 Displays	154		
2.5.1 Speedometer		Secondary visual distractor.	
2.5.2 Other: gauges; radio			Less important.
2.6 Other controls	154, 25		
2.6.1 Safety: windshield wipers; instrument lights; horn; turn signals	54		Less important, except turn signals.

Variable	Ref. #	Advantages	Disadvantages
2.6.2 Entertainment: radio; CD player	48, 24, 54	Secondary distractor.	
2.6.3 Auditory/vocal: voice actuated	154		Low probability of occurrence.
3.0 Driver Attention / Distraction	79, 113, 32, 146, 145		
3.1 Objective measures	129		
3.1.1 Eye glance behavior: eye movements; number of glances; duration of glances; glance object	129, 42, 125, 53, 160, 83, 161, 78	Excellent measure of unconscious attention / distraction.	Delicate, expensive equipment. Difficult to calibrate. Expensive to analyze data.
3.1.2 Distractor performance; secondary task	83, 53	Excellent measure of distraction.	Can increase risk in field experiments. Can be artificial.
3.1.3 Visual occlusion	15	Good measure of distraction.	Can increase risk in field experiments. Unnatural driving task.
3.1.4 Feature detection	48		
3.1.5 Feature recognition	48	Good measure.	
3.1.6 Driver workload; task performance	38, 15, 113	Excellent indicator of distraction.	Complicated to measure.
3.1.7 Head turning	78	Easy to measure.	Less important.
3.1.8 Driver errors	83	Excellent measure of distraction.	Many varieties. Low probability of occurrence.
3.1.9 Reaction time; perception-reaction time	15	Good indicator of distraction.	Difficult to measure.
3.2 Inferred measures			
3.2.1 Surprise; orienting response			Difficult to measure.

Variable	Ref. #	Advantages	Disadvantages
3.2.2 Conspicuity; attention grabbing			Difficult to measure.
3.2.3 Search patterns	15	Indicative of visual hypotheses.	
3.2.4 Capacity: self-regulated attention; spare capacity	15	Extremely important concept.	Hard to establish criterion threshold.
3.3 Subjective measures	161		
3.3.1 Conversational drive		Good possible method.	Lots of extraneous data.
3.3.2 Rating scale		Inexpensive.	Imprecise.
3.3.3 Questionnaire		Inexpensive.	Imprecise.
3.3.4 Survey	125	Relatively inexpensive.	Sampling frame difficult.
3.3.5 Focus group		Small sample. Lots of data.	Confounding social variables.
4.0 Crashes	158, 125, 26, 44, 128, 161, 95, 121		
4.1 Type: head-on; sideswipe; rear-end; backing; run-off-road; pedestrian	39	Very important discriminator variable. Related to ultimate goal.	Rare events. Many contributing factors. Difficult to estimate statistically.
4.2 Severity: fatal; injury; property damage; unreported		Important to determine impact.	Rare events. Many factors. Difficult to estimate statistically.
4.3 Method of measurement			Rare events. Hard to estimate.
4.3.1 Direct observation: simulator; field camera	42	Best studied in simulator. No chance of injury.	
4.3.2 Before/after study	39, 158	Most common study type.	No control site. Regression toward mean.

Variable	Ref. #	Advantages	Disadvantages
4.3.3 Before/after with control		Control adds rigor.	Regression toward mean.
4.3.4 Before/after/before		More convincing causal effect.	Regression toward mean.
4.3.5 Regression model		Directly account for multiple factors	Large amounts of data on many variables
4.3.6 Empirical Bayes		Control for regression toward mean.	More complicated statistical model.
4.3.7 Full Bayes		More complete treatment of conditional probabilities.	Not widely used.

A.3 KEY RESEARCH STRATEGIES

Table 3. Expanded key research strategies.

Method	Ref. #	Advantages	Disadvantages
1.0 Crashes: Field	97, 95, 21		
1.1 Unobtrusive observation			
1.1.1 Participant: random, uncontrolled; usually unknown	49	No sampling bias.	Do not know participant sample.
1.1.2 Experimenter: usually absent; remote observation; unknown to participant	49	No artificial participant behaviors due to experimenter.	
1.1.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	49	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
1.1.4 Responses: crashes; antecedent vehicle behaviors; rare; few participant variables	49	Directly related to the safety goal.	Extremely rare events; insensitive to participant variables.
1.1.5 Scenario: natural route and purpose; uses own vehicle	49	Completely natural experimental context; uses own vehicle.	Long-term monitoring required.
1.2 Naturalistic driving			
1.2.1 Participant: selected, sampled	79, 78, 42	Know participant sample.	Possible sampling bias.
1.2.2 Experimenter: absent; remote observation; known to participant	79, 78, 42		Possible artificial participant behaviors.
1.2.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	79, 78, 64, 42	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
1.2.4 Responses: crashes; antecedent vehicle and participant behaviors; rare	79, 78, 64, 42	Directly related to ultimate goal; sensitive to some participant variables.	Extremely rare events; difficult to collect adequate sample of crashes.

Method	Ref. #	Advantages	Disadvantages
1.2.5 Scenario: natural route and trip purpose; uses own vehicle	79, 78, 64, 42	Mostly natural experimental context; uses own or borrowed vehicle.	Participant aware of test status; may be injured or killed; vehicle may be damaged or destroyed; expensive.
1.3 Retrospective database: fatal, injury, property damage	87, 49, 128, 14, 58,	Directly related to ultimate goal.	Crashes are rare events; difficult to estimate.
1.3.1 Before-after study	158, 1, 130	Most common study type.	No control site; regression toward mean.
1.3.2 Before-after study with control	120	Control adds rigor.	Regression toward mean.
1.3.3 Before-after-before study		More convincing causal effect.	Regression toward mean.
1.3.4 Regression model		Directly account for multiple factors.	Large amounts of data on many variables.
1.3.5 Empirical Bayes		Control for regression toward mean.	More complicated statistical model.
1.3.6 Full Bayes		More complete treatment of conditional probabilities.	Not widely used.
2.0 Crashes: Laboratory			
2.1 Driving simulator			
2.1.1 Participant: selected, sampled	70	Know participant sample.	Possible sampling bias.
2.1.2 Experimenter: remotely present, unobtrusive observation	70	More experimenter control.	Possible artificial participant behaviors.
2.1.3 Stimuli: simulated, artificial; consistent, controlled	70	Extremely repeatable stimulus conditions.	Artificial stimuli; hard to simulate conspicuity and legibility.

Method	Ref. #	Advantages	Disadvantages
2.1.4 Responses: programmed crashes; antecedent participant and vehicle behaviors; can be more frequent crashes	70	Some control over crashes; can program more frequent crash opportunities.	Lack of negative consequences can unnaturally alter frequency of crashes.
2.1.5 Scenario: contrived route, artificial; unnatural vehicle and environment; safe from harm	70	Control over driving scenario; participant safe from harm.	Unnatural vehicle and environment; artificial scenario; simulator sickness.
2.2 Non-simulator laboratory	87		
2.2.1 Crash scenarios: movies, pictures, acting out		Relatively easy; less resources.	Artificial, out-of-context testing environment.
2.2.2 Crash reconstructions: questionnaires, focus groups		Relatively easy; focus groups more expensive.	Artificial, out-of-context testing environment; focus group social biases.
3.0 Safety Surrogate: Field	34, 85		
3.1 Unobtrusive observation			
3.1.1 Participant: random, uncontrolled; usually unknown	15	No sampling bias.	Do not know participant sample.
3.1.2 Experimenter: usually absent; remote observation; unknown to participant	15	No artificial participant behaviors due to experimenter.	
3.1.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	15	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.1.4 Responses: crash precursors; antecedent vehicle behaviors; more frequent; few participant variables	15	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators; insensitive to participant variables.
3.1.5 Scenario: natural route and trip purpose; uses own vehicle	15	Completely natural experimental context; uses own vehicle.	
3.2 Naturalistic driving			

Method	Ref. #	Advantages	Disadvantages
3.2.1 Participant: selected, sampled	79, 78, 42	Know participant sample.	Possible sampling bias.
3.2.2 Experimenter: absent; remote observation; known to participant	79, 78, 42		Possible artificial participant behaviors.
3.2.3 Stimuli: natural, ordinary, in context; variable, uncontrolled	79, 78, 42	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.2.4 Responses: crash precursors; antecedent vehicle and participant behaviors; more frequent events	79, 78, 42	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators.
3.2.5 Scenario: natural route and trip purpose; uses own vehicle	79, 78, 118, 42	Mostly natural experimental context; uses own or long-term borrowed vehicle.	Participant aware of test status; may be injured or killed; vehicle may be damaged or destroyed; expensive.
3.3 On-road instrumented vehicle	14		
3.3.1 Participant: selected, sampled	54, 18	Know participant sample.	Possible sampling bias.
3.3.2 Experimenter: present; direct observation and interaction	83	More experimenter control; increased experiment safety.	Possible artificial participant behaviors.
3.3.3 Stimuli: selected; natural, in context	83, 18	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.3.4 Responses: crash precursors; antecedent vehicle and participant behaviors; more frequent	54, 18	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators.
3.3.5 Scenario: natural route, artificial trip purpose; uses experimental vehicle	54, 83, 18	Semi-natural experimental context; more safe.	Artificial trip purpose; unfamiliar vehicle.
3.4 Closed-course test track			

Method	**Ref. #**	**Advantages**	**Disadvantages**
3.4.1 Participant: selected, sampled	136	Know participant sample.	Possible sampling bias.
3.4.2 Experimenter: present; direct observation and interaction	136	More experimenter control; increased experiment safety.	Possible artificial participant behaviors.
3.4.3 Stimuli: selected; out of context	136	Semi-natural stimuli.	Stimuli not uniform; some possible control.
3.4.4 Responses: crash precursors; antecedent vehicle and participant behaviors; more frequent	136	More frequent events than crashes; can collect more data with less risk.	Crash precursors only indirect indicators.
3.4.5 Scenario: unnatural route, artificial trip purpose; uses experimental vehicle	136	Low probability of harm to participant or vehicle.	Unnatural experimental context.
3.5 Commentary driving			
3.5.1 Participant: selected, sampled	36	Know participant sample.	Possible sampling bias.
3.5.2 Experimenter: present; direct observation; extensive interaction	36	More experimenter control; increased experiment safety.	Possible artificial participant behaviors.
3.5.3 Stimuli: selected; natural, in context	36	Natural stimuli.	Stimuli not uniform; e.g., weather effects.
3.5.4 Responses: extensive driver commentary; running verbal description; crash precursors observable		Collect large amounts of data; direct observation of gross attention.	Commentary could interfere with driving task; artificial task.
3.5.5 Scenario: natural route, artificial trip purpose		Semi-natural experimental context; more safe.	Artificial trip purpose.
3.6 Non-vehicle based field testing			
3.6.1 Roadside interviews	14, 125, 85	Relatively easy; less resources.	Artificial, distal testing environment.

Method	Ref. #	Advantages	Disadvantages
3.6.2 Fuel station, nearby mall interviews		Relatively easy; less resources.	Artificial, out-of-context testing environment.
4.0 Safety Surrogate: Laboratory	36		
4.1 Driving simulator			
4.1.1 Participant: selected, sampled	161, 4, 70, 82	Know participant sample.	Possible sampling bias.
4.1.2 Experimenter: remotely present, unobtrusive observation	161, 4, 70, 82	More experimenter control.	Possible artificial participant behaviors.
4.1.3 Stimuli: simulated, artificial; consistent, controlled	161, 4, 70, 82	Extremely repeatable stimulus conditions.	Artificial stimuli; hard to simulate conspicuity and legibility.
4.1.4 Responses: programmed crash precursors; antecedent participant and vehicle behaviors; can have more frequent events	10, 82, 4	Some control over near-crashes; can program more frequent near-crash opportunities.	Lack of negative consequences can unnaturally alter frequency of near-crashes.
4.1.5 Scenario: contrived route, artificial; unnatural vehicle and environment; safe from harm	161, 4, 70, 82	Control over driving scenario; participant safe from harm.	Unnatural vehicle and environment; artificial scenario; simulator sickness.
4.2 Non-simulator laboratory	75		
4.2.1 Pre-crash scenarios: movies, pictures, acting out	160, 36	Relatively easy; less resources.	Artificial, out-of-context testing environment; weak response measure.
4.2.2 Pre-crash reconstructions: questionnaires, focus groups	36	Relatively easy; focus groups more expensive.	Artificial, out-of-context testing environment; weak response measure; focus group social biases.
5.0 Social Survey	14, 125		
5.1 Telephone survey		Less resources; personal interviewer; more flexible.	Out of context; opinions only; more labor intensive; smaller scale.

Method	**Ref. #**	**Advantages**	**Disadvantages**
5.2 Mail survey		Less resources; standardized; larger scale.	Out of context; opinions only.
5.3 E-mail survey		Less resources; standardized; large scale.	Out of context; opinions only; internet user bias.
6.0 Analytical Study			
6.1 Literature review	53, 38, 26, 129, 52	Benefit from previous knowledge and mistakes.	Based on old information; abstract; hard to apply.
6.2 Review of practice	15, 44	Socially oriented, practical, legal.	Based on old information; not scientific; possibly misleading.
6.3 Deductive-inductive reasoning study	26	Less resources; no need for new data.	Must often make dangerous assumptions; cannot fill in knowledge gaps.

APPENDIX B—DETAILED DESCRIPTION OF STUDIES

B.1 ON-ROAD INSTRUMENTED VEHICLE APPROACH

The most effective research strategy to emerge from the analysis undertaken in section 6.0 is the on-road instrumented vehicle method. The following describes one possible study which might be conducted using this method.

B.1.1 Method

The on-road instrumented vehicle method employs an instrumented vehicle which is brought to the study site, along with a crew of about two or three researchers. The study site is a location where there is at least one CEVMS installation along a public access roadway. Preferably, there would be several CEVMS installations at the location so that a single test driving scenario might pass a few different CEVMS in the course of about half an hour of driving. The investigation should include at least two or three study sites which already have CEVMS in place. At each study site, approximately 20 to 30 research participants would be recruited from the local area.

Each research participant would drive the instrumented vehicle along a prescribed route, which includes CEVMS installations, standard (non-digital) billboards, human-constructed objects of casual visual interest (houses, barns, etc.), and natural background control scenery (trees, fields, etc.). Each drive takes less than 1 hour (preferably about 30 minutes), and each participant would return for several drives on different days. Other aspects would vary as well, such as the time of day, traffic density, and CEVMS conditions (e.g., CEVMS turned on versus CEVMS turned off). Each participant would complete between three and six such drives. The instrumented vehicle and crew would usually remain at a given study site for about 1 to 2 months. The crew would consist of an experimenter and a safety observer, who would both be present in the instrumented vehicle. The safety observer would also serve as a research assistant or technician. The instrumented vehicle is capable of measuring vehicle speed, vehicle lane position, longitudinal acceleration, lateral acceleration, GPS time and position, and driver eye glance direction and duration. The instrumented vehicle is also equipped with accurate vehicle-mounted or head-mounted eye-tracking equipment, video cameras (forward and cab views) and a voice recorder.

B.1.2 Factors and Measures

The major factors or independent variables in the study are the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, etc.) along the driving path. If possible, the CEVMS should be capable of being turned off and on or changed along some other dimension like luminance or change rate, according to a prearranged experimental design. The period of time that the CEVMS is off or changed could be kept relatively brief and carefully controlled since the study will follow a strict protocol. Other important independent variables are the time of day (day/night), traffic conditions (peak and nonpeak), and driver variables (age, gender, and route familiarity). One or more of the primary CEVMS variables of interest to the community concerned with outdoor advertising control should be represented by varying levels along the driving route (e.g., different degrees of luminance, change rate, or display spacing) as much as possible. Direct experimental control would be preferable to site selection in this regard.

The primary measure or dependent variable in this study is the frequency, direction, and duration of driver eye glances, which serves as an indication of visual attention and distraction. The fundamental hypothesis is that drivers have limited attention; they self-regulate their attention to perform demanding tasks. In the case of the driving task, a certain proportion of their attention needs to be concentrated on the roadway scene ahead. To the degree that eye glance behavior can serve as a measure of visual attention, eye glances need to be concentrated on the roadway ahead. If the frequency and duration of eye glances away from the roadway ahead exceed accepted norms or criteria for keeping a driver's eyes on the road, then driver safety may be compromised. Thus, eye glance behavior is the primary dependent variable in the study. Eye glance behavior has an intuitive connection to visual attention and is sensitive to subtle visual search strategies, including those which are below the level of conscious awareness (see section 2.7.2). Depending upon the type of eye glance measuring instrumentation selected, the act of measuring eye glance behavior may prove to be a more or less significant distraction to the driver in itself. This experimentally-induced artifact can be controlled by selecting a minimally intrusive measurement method or by ensuring adequate adaptation to the instrumentation on the part of the research participant.

This study includes another class of secondary dependent variables. These are safety surrogate measures associated with driver errors and other measures of driver performance, such as speed changes, headway, lane deviation, and traffic conflicts. These secondary variables can be measured by instrumentation in the vehicle in terms of speed, acceleration, and lane position. These secondary variables can also be directly observed and noted by the experimenter and/or safety observer in the instrumented vehicle for later analysis in terms of sudden braking, inadequate headway, swerving, and conflicts. Thus, events indicative of possible driver error or other maladaptive behavior can be flagged by human observers. Also, for these events, only objective vehicle performance data needs to be analyzed, saving considerable effort and expense by eliminating the need to analyze large amounts of continuous vehicle performance data.

B.1.3 Advantages/Disadvantages

One advantage of this method is its ability to implement accurate eye-tracking measurements which afford the opportunity to observe subtle and often unconscious eye movements. This ability to measure unconscious eye movements correlates with unconscious distraction facilitates incorporation of the notion of self-regulated attention into the experimental paradigm. When a driver is attempting to concentrate on the roadway ahead, a distractor, which unconsciously diverts attention away from the roadway against the driver's will, may have a more severe safety consequence than a distractor which can be maintained under conscious and voluntary control. Thus, in addition to being able to measure distraction which is both conscious and voluntary, accurate eye-tracking determinations have the potential to probe other phenomena, such as unconscious and involuntary distraction as they relate to CEVMS exposure.

Another advantage of this method is the ability to structure driving scenarios to have an appropriate number of CEVMS, standard billboard, and other visual stimuli all located on a controlled course, which all research participants drive in a consistent manner. The ability to choose and structure the test drive assures adequate and uniform exposure to CEVMS and other relevant visual stimuli. The ability to exert experimental control is a valuable asset to this method. It facilitates a clean and robust statistical analysis of the data because all of the participants are exposed to all of the experimental conditions the same number of times in a relatively controlled manner. Experimental control ensures a high level of CEVMS exposure, thereby contributing to the productivity and cost effectiveness of this technique.

However, examined from a different perspective, such a degree of experimental control may also be regarded as a disadvantage. A certain amount of artificiality is introduced into the driving situation thereby. Research participants are definitely aware that they are participating in a controlled experiment, driving someone else's car on a contrived route which does not serve a personal purpose related to daily life. In addition, with the experimenter riding along with the participants in the vehicle, there may be a tendency for the participants to try to please the experimenter and to drive in some unnatural way. The introduction of eye-tracking equipment adds to the artificiality of the situation. Wearing head-mounted eye-tracking gear definitely represents unnatural driving attire. However, most research participants rapidly adapt to the gear with time, and they often report that they are unaware of its presence after a short drive. Vehicle-mounted eye-tracking equipment can be far less intrusive, although the tedious calibration procedures and the presence of the cameras in the car remind participants that their head and eye movements are constantly being monitored. These are all valid experimental concerns; however, none of these interventions is likely to profoundly alter the driving behavior, much less the eye glance movements, of the research participants, as long as they are not informed of the purpose of the study. The enhanced experimental efficiency that this approach has to offer far outweighs its artificiality drawbacks.

B.1.4 Budgetary Cost

A rough budgetary estimate for conducting such an on-road instrumented vehicle study is between $400,000 and $800,000. The main cost drivers for this method are the eye glance measuring technology and the crew needed to implement the experiment at the study sites. The range in this estimate relates to the number of study sites, adequacy of the sites, length of the experimental drive, number of experimental drives, number of research participants, difficulty in obtaining research participants, ability to turn the CEVMS off and on, and numerous other factors which cannot be determined without further planning.

B.2 NATURALISTIC DRIVING APPROACH

The naturalistic driving method is similar to the on-road instrumented vehicle method. The major difference is that the participants drive their own vehicles (or loaned vehicles) for their own personal purposes. The method typically employs a large number of such vehicles. The following describes one possible study which might be conducted using this method.

B.2.1 Method

The naturalistic driving method employs a standardized instrument package which is installed in the participant's own private vehicle or in a vehicle loaned to the participant. The installation is made as unobtrusive as possible so that the participant's vehicle appears and performs as it normally would. The instrument package is capable of measuring many of the same variables as the on-road instrumented vehicle, such as speed, lane position, acceleration, GPS time and position, driver eye glance frequency, direction, and duration. The instrument package is also connected to the vehicle data bus so that additional vehicle-related measures of engine, braking, and steering performance are also recorded. However, because of the unobtrusive nature of the experimental technique, this method cannot support the use of extremely accurate head-mounted or vehicle-mounted eye-tracking equipment. In the present state of technology, these accurate eye movement instruments involve careful calibration procedures with the driver. With this method, the eye-tracking system is mounted in the dashboard in a manner which involves little or no driver interaction. Once the participant's vehicle has been instrumented, data are collected by means of automatic wireless downloads without participant awareness or involvement. The instrumentation is left in the vehicle for a period of 3 to 6 months, during which time the participant drives the vehicle for normal personal or business use.

The fact that participants drive their own vehicles for their own use reduces control and adds uncertainty to the study. It is difficult to control where the participants are going to drive and when. The study site must be selected carefully so that participants are likely to drive by at least some of the target CEVMS installations. The participants must be selected carefully so that they are likely to take the selected roadway with some reasonable frequency. As a result of this increased uncertainty, the number of study sites must be increased to 4 and 5, the number of research participants selected at each site must be increased to 50 and 75, and the duration of measurement for each participant must be increased to 3 and 6. In this study, it is even more important that there are several CEVMS installations at each study site. As was the case for the on-road instrumented vehicle study, each study site needs to include CEVMS installations, standard (non-digital) billboards, objects of casual visual interest (houses, barns, etc.), and natural background control scenery (trees, fields, etc.).

B.2.2 Factors and Measures

As with the on-road instrumented vehicle study, the major factors or independent variables are the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, control settings, etc.) along the driven path. If possible, the CEVMS should be turned off and on or changed in some other way, according to a prearranged experimental design. However, in this instance, the CEVMS would have to be turned off or changed for longer periods of time because it is not certain when the instrumented test vehicles might pass. These are the primary independent variables. Secondary independent variables could include the type of vehicle (sedan, pickup, or SUV) and driver characteristics (age, gender, and route familiarity). In addition, as much as possible, one or more of the primary CEVMS variables of interest to the community concerned with outdoor advertising control should be represented by varying levels in the selection of CEVMS stimuli.

As in the on-road instrumented vehicle study, the primary measure or dependent variable is the frequency, direction, and duration of driver eye glances. The fundamental hypothesis of self-regulated attention which needs to be concentrated on the roadway scene ahead remains the same. As before, if the frequency and duration of eye glances away from the roadway ahead exceed accepted norms or criteria, then driver safety is assumed be compromised. Thus, eye glance behavior is the primary dependent variable in this study, as well. However, the particular unobtrusive and disengaged dashboard-mounted eye-tracking device may not be capable of making as accurate measurements of eye-movements as can other more delicate vehicle-mounted or head-mounted devices which require periodic participant calibration. Consequently, this study method depends more heavily on secondary dependent variables. Safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, conflicts, and erratic maneuvers) become increasingly important in this method. Since the participants will be driving according to their own personal schedules, additional dependent variables may include the time of day (day/night), traffic conditions (peak and nonpeak), in-vehicle distractions (eating and/or cell phone use), and state of fatigue.

B.2.3 Advantages/Disadvantages

The naturalistic driving method possesses one major advantage over the on-road instrumented vehicle method: the driving scenario, driving task, and driving purpose are all completely natural. The research participants drive their own vehicles (or ones loaned to them) on their own personal schedules along personally selected routes to meaningful destinations. Although to a lesser degree, the naturalistic driving method shares another advantage with the on-road instrumented vehicle method: its ability to implement eye-tracking measurements. In fact, the dashboard-mounted eye-tracking device is far less intrusive to the driver than the head-mounted eye-tracking device sometimes employed in the on-road instrumented vehicle method.

Unfortunately, some dashboard-mounted eye-tracking devices may not be as sensitive and accurate as a head-mounted device. Also, they may not be able to track extensive head movements or measure subtle eye glances indicative of unconscious distraction. The useful field of view can also be an issue with certain unobtrusive vehicle-mounted eye-tracking equipment. Consequently, this experimental method may be less effective in its ability to probe the subtle phenomena of unconscious and involuntary distraction as they relate to CEVMS exposure.

Another disadvantage of this method is its inherent lack of structured driving scenarios. Since participants drive whenever and wherever they want, it is difficult to ensure adequate and uniform exposure to CEVMS and other relevant visual stimuli. This lack of experimental control and higher degree of uncertainty necessitate an increase in the number of study sites, research participants, and duration of the study, which negatively impacts the productivity and cost effectiveness of the technique. For example, this method typically requires the instrumentation of a relatively large number of vehicles at any given study site instead of the instrumentation of just one vehicle which is shared by many research participants. Another minor disadvantage is that research participants are aware that they are participating in an experiment, even if the study is minimally intrusive in terms of daily life routine.

B.2.4 Budgetary Cost

A rough budgetary estimate for conducting such a naturalistic driving study is between $2 million and $4 million. The main cost drivers for this method include increasing the number of study sites, installing instruments in a large number of vehicles at a single site, and collecting and analyzing data covering a long period of time. The range in this budgetary estimate relates to the number of study sites, adequacy of the sites, number of vehicles which need to be instrumented at one time, number of research participants, difficulty in obtaining research participants, driving patterns of the research participants, length of the study at any given site, ability to turn the CEVMS off and on, and numerous other factors which cannot be determined without further planning.

B.3 UNOBTRUSIVE OBSERVATION APPROACH

The unobtrusive observation method is different from the on-road instrumented vehicle method and the naturalistic driving method. The major distinction is that no study participants are selected, and all data are obtained from the natural flow of traffic past the CEVMS and other comparison stimuli. The following describes one possible study which might be conducted using this method.

B.3.1 Method

The unobtrusive observation method employs an array of static cameras or other sensors mounted near the locations of the CEVMS and other comparison stimuli. The other sensors may include loops, tubes, or radar to measure vehicle passes and driving parameters. The present report will focus on video recording of traffic. The cameras are capable of recording the behavior of vehicles passing the various relevant visual stimuli as a part of the natural flow of traffic. The drivers are usually completely unaware that their vehicles are being observed. Post-hoc analysis of the video recordings from these cameras can yield data similar to some of that obtained by the on-road instrumented vehicle and naturalistic driving methods, which include vehicle speed, lane position, acceleration, and time. However, the data from distal video cameras are usually far less accurate than what can be collected by instruments onboard the vehicle. Moreover, with present measurement technology, such video recordings cannot yield any data concerning driver eye glance frequency, direction, and duration. The camera arrays are usually left in place for a period of several months to 1 year at each study site. There would typically be three to four such sites in the study. At each study site, separate camera arrays would need to be installed at the locations of all selected CEVMS displays, standard (non-digital) billboards, objects of casual visual interest (houses, barns, etc.), and natural background control scenery (trees, fields, etc.).

B.3.2 Factors and Measures

As in the on-road instrumented vehicle and naturalist driving studies, the major independent variables are the presence or absence of CEVMS and other comparison visual stimuli (standard billboards, buildings, etc.) along the driving path. If possible, the CEVMS should be controlled according to a prearranged experimental protocol. However, in this instance, the CEVMS would have to be changed for longer durations because it is possible to predict when vehicles might pass. In addition, one or more of the primary CEVMS variables of interest to the community concerned with outdoor advertising control should be represented by varying levels in the selection of CEVMS stimuli. These constitute the primary independent variables. Since continuous video recording will be employed, the experimenter can decide to select different times of data collection for further analysis. This capability can provide insight into some secondary independent variables such as time of day (day/night) and traffic conditions (peak, nonpeak).

In contrast to the on-road instrumented vehicle and naturalistic driving studies, the primary dependent variable is not driver eye glance behavior. Instead, this study method depends completely on safety surrogate measures associated with driver errors and other measures of driver performance (headway, lane deviation, and erratic maneuvers). These are subtle driving behaviors to measure by means of distal cameras mounted along the roadway. Unless the cameras are mounted very high, multiple vehicle images may occlude each other. For a long stretch of roadway, such as might required for CEVMS exposure, a relatively large array of cameras may be needed. Thus, a large amount of data needs to be collected and analyzed in such a study. Automatic machine vision video analysis algorithms can help in the data analysis process, but such algorithms are not yet sufficiently sensitive and robust to reliably identify all of the subtle indicators of driver errors, conflicts, or maladaptive performance which might accompany CEVMS exposure. The use of other sensors instead of or in addition to cameras may mitigate some of these data analysis problems to a certain extent.

B.3.3 Advantages/Disadvantages

The unobtrusive observation method possesses one major advantage over the other two methods: the data are derived from the natural flow of traffic. Other than erecting camouflaged camera arrays at various locations along the roadway, the experimenter does not disturb the natural flow of human driving. As opposed to the other two methods, the vast majority of drivers are completely unaware that they are part of a study depending on how well the camera camouflage works. Other sensors used for this application can also be hidden and made extremely hard to detect. This is the major advantage of the unobtrusive observation method. Another strong advantage is the large number of vehicles which pass by the CEVMS and other comparison stimuli every day. Sample sizes can be relatively large.

Like the other techniques, the unobtrusive observation method has disadvantages as well. First, with present technology, it is not possible to implement eye-tracking measurements in such a study. The inability to measure eye glance behavior makes it difficult to investigate important constructs, like self-regulated attention and unconscious distraction as they relate to CEVMS exposure. The method is left to rely on safety surrogate measures, such as driver errors and maladaptive maneuvers. These relatively subtle pre-crash and near-crash driving behaviors are difficult to measure by means of distal video cameras. Such driving behaviors also occur very seldom and need to be observed over great distances, leading to the necessity to collect large amounts of video data from extended camera arrays over long periods of time. The collection, reduction and analysis of such large amounts of data tend to make this method time-consuming and expensive.

B.3.4 Budgetary Cost

A rough budgetary estimate for conducting such an unobtrusive observation study is between $1 million and $3 million. The main cost drivers for this method include designing camera arrays which can measure subtle vehicle maneuvers, installing camera arrays to record a large extent of roadway for all CEVMS and comparison stimuli, and collecting and analyzing data covering a long period of time. The range in this budgetary estimate relates to the number of study sites, adequacy of the sites, number and location of cameras in an array, method of recognizing safety surrogate measures, length of the study at any given site, ability to turn the CEVMS off and on, and numerous other factors which cannot be determined without further planning.

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EXHIBIT
11/1/11 CC
RS 6.B

Toward A New
Excellence
North Clackamas Schools

SABIN-SCHELLENBERG PROFESSIONAL TECHNICAL CENTER

Karen L. Phillips, *Principal*
503-353-5940
Christopher C. Statham, *Assistant Prinicpal*
503-353-5921
Suzie Peachin, *Assistant Principal*
503-353-5901

To: Milwaukie City Council
From: North Clackamas School District and the Sabin-Schellenberg Professional Technical Center
Date: October 28, 2011
Re: Educational Cable Access

The North Clackamas School District and the Sabin-Schellenberg Professional Technical Center have partnered with the City of Milwaukie to provide educational cable programming to the citizens of Milwaukie for several years. We believe this has been a mutually beneficial partnership and are interested in continuing this relationship to provide these services.

We are aware of the fact that the City of Milwaukie is considering ending their current cable access programming services agreement with Willamette Falls TV and possibly entering into an agreement with a different PEG access organization - MACC. Should this happen, we hope to continue our current relationship with the City, and are interested as well in exploring a limited expansion of the services provided by the School District and the Sabin-Schellenberg Center.

Should the City decide to change service providers, the continuation of educational cable programming to the citizens of Milwaukie by the North Clackamas School District and the Sabin-Schellenberg Professional Technical Center would require PEG funding to help support this programming. If the City continues to have PEG funds available, the City could direct them to North Clackamas and Sabin-Schellenberg Center in order for us to continue to provide educational programming to the citizens of Milwaukie.

Thus, we encourage the City of Milwaukie to request PEG fund availability for the purpose of partnering with the North Clackamas School District and the Sabin-Schellenberg Professional Technical Center in any cable franchise agreement they may enter into. Such an agreement will insure the continuation of educational cable access programming by local students to the citizens of Milwaukie.

Thank you for considering our request.

Sincerely,

Karen Phillips

Karen Phillips

AGENDA

MILWAUKIE CITY COUNCIL
NOVEMBER 1, 2011

MILWAUKIE CITY HALL	**2113th MEETING**
10722 SE Main Street	

REGULAR SESSION – 7:00 p.m.

		Page No.
1.	**CALL TO ORDER** **Pledge of Allegiance**	
2.	**PROCLAMATIONS, COMMENDATIONS, SPECIAL REPORTS, AND AWARDS**	
	A. Recognize Off Going Riverfront Board Members	
3.	**CONSENT AGENDA** *(These items are considered to be routine, and therefore, will not be allotted Council discussion time on the agenda. The items may be passed by the Council in one blanket motion. Any Council member may remove an item from the "Consent" portion of the agenda for discussion or questions by requesting such action prior to consideration of that portion of the agenda.)*	
	A. Appointment of Sine Campbell as a Member at Large to the Milwaukie Public Safety Advisory Committee (PSAC) – Resolution	**2**
	B. City Council Minutes: **1. Study Session Minutes of September 27 2011** **2. Work Session Minutes of October 4, 2011** **3. Regular Session Minutes of October 4, 2011**	**4**
	C. OLCC Application for Gramma's Corner Restaurant	**17**
4.	**AUDIENCE PARTICIPATION** *(The Presiding Officer will call for statements from citizens regarding issues relating to the City. Pursuant to Section 2.04.140, Milwaukie Municipal Code, only issues that are "not on the agenda" may be raised. In addition, issues that await a Council decision and for which the record is closed may not be discussed. Persons wishing to address the Council shall first complete a comment card and return it to the City Recorder. Pursuant to Section 2.04.360, Milwaukie Municipal Code, "all remarks shall be directed to the whole Council, and the Presiding Officer may limit comments or refuse recognition if the remarks become irrelevant, repetitious, personal, impertinent, or slanderous." The Presiding Officer may limit the time permitted for presentations and may request that a spokesperson be selected for a group of persons wishing to speak.)*	
5.	**PUBLIC HEARING** *(Public Comment will be allowed on items appearing on this portion of the agenda following a brief staff report presenting the item and action requested. The Mayor may limit testimony.)*	
	A. Sign Code Amendments: Electronic Display Signs (File #ZA-11-02) – Ordinance (Continued from October 18, 2011) **Staff: Ryan Marquardt, Assistant Planner**	

6. **OTHER BUSINESS** *(These items will be presented individually by staff or other appropriate individuals. A synopsis of each item together with a brief statement of the action being requested shall be made by those appearing on behalf of an agenda item.)* **22**

   A. **Energy Savings Projects – Resolution** **23**
      Staff: Jon LeBaron, Operations Director
   B. **Decision on Metropolitan Area Communication Commission Membership – Resolution** **75**
      Staff: JoAnn Herrigel, Community Services Director
   C. **Board, Commission, and Committee Alternate Program – Resolution** **83**
      Staff: Teri Bankhead, Assistant to the City Manager
   D. **Council Reports**

7. **INFORMATION**

8. **ADJOURNMENT**

<u>Public Information</u>

- **<u>Executive Session</u>**: The Milwaukie City Council will meet in executive session immediately following adjournment of the regular session pursuant to ORS 192.660(2)(i) to review and evaluate the job performance of the chief executive officer.
- All discussions are confidential and those present may disclose nothing from the Session. Representatives of the news media are allowed to attend Executive Sessions as provided by ORS 192.660(3) but must not disclose any information discussed. No Executive Session may be held for the purpose of taking any final action or making any final decision. Executive Sessions are closed to the public.
- The Council requests that all pagers and cell phones be either set on silent mode or turned off during the meeting.

3.
CONSENT AGENDA

Agenda Item: 3.A.
Date: November 1, 2011

COUNCIL AGENDA ITEM SUMMARY

Issue/Agenda Title: Appointment of Sine Adams as an at-large member to the Milwaukie Public Safety Advisory Committee (PSAC)

Prepared By: Teri Bankhead
Dept. Head Approval: Bill Monahan
City Mgr. Approval: Bill Monahan
Reviewed by City Manager: October 7, 2011

Issue Before The Council
PSAC currently has two at-large member vacancies. Sine Adams is recommended for Council consideration for appointment to one vacancy.

Staff Recommendation
Accept the Mayor's recommendation to appoint Sine Adams to PSAC

Key Facts & Information Summary
PSAC is an 11 member committee comprised of four at-large members and one member from each of the City's seven Neighborhood District Associations, for a total of 11. There are currently two at-large member vacancies. Sine Adams has applied for and was interviewed by Mayor Ferguson, Councilor Hedges, and Police Chief Robert Jordan, who recommend appointment to PSAC.

Other Alternatives Considered
n/a

City Council Goals
n/a

Attachment List
Resolution

Fiscal Notes
n/a

RESOLUTION NO. ____________

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, APPOINTING SINE ADAMS AS AN AT-LARGE MEMBER TO THE PUBLIC SAFETY ADVISORY COMMITTEE.

WHEREAS, a vacancy exists on the Public Safety Advisory Committee for an at-large member; and

WHEREAS, Milwaukie Municipal Code Section 2.24.020(B) provides for appointment of members of the Milwaukie Public Safety Advisory Committee "by the council;" and

WHEREAS, Sine Adams possesses the necessary qualifications to serve on the Committee and has indicated her desire to serve.

Now, therefore, the City of Milwaukie, Oregon resolves as follows:

SECTION 1: That Sine Adams is appointed to the Milwaukie Public Safety Advisory Committee as an at-large member.

SECTION 2: That her term of appointment shall commence immediately and shall expire through June 30, 2013.

SECTION 3: This resolution takes effect immediately upon passage.

Introduced and adopted by the City Council on November 1, 2011.

____

Jeremy Ferguson, Mayor

ATTEST:

____

Pat DuVal, City Recorder

APPROVED AS TO FORM:

Jordan Ramis PC

____

City Attorney

MINUTES
MILWAUKIE CITY COUNCIL STUDY SESSION
SEPTEMBER 27, 2011

Mayor Ferguson called the study session to order at 5:00 p.m.

Council Present:	Mayor Ferguson, Councilors Greg Chaimov, Joe Loomis, and Dave Hedges
Excused:	Councilor Mike Miller
Staff Present:	City Manager Bill Monahan, Assistant to the City Manager Teri Bankhead, City Recorder Pat DuVal, Library Director Joe Sandfort, Planning Director Katie Mangle, Senior Planner Susan Shanks, and Community Development & Public Works Director Kenny Asher
Media:	Molly Harbarger, *The Oregonian*

Board, Commission, and Committee Alternate Program and Appointment Process

Mr. Monahan gave a brief outline of the concerns, and **Mayor Ferguson** summarized the current interview process.

Councilor Hedges was concerned the process had not been followed in the most recent round of interviews and that different people had participated.

Mayor Ferguson discussed the procedure for Public Safety Advisory Committee (PSAC) appointments.

Mr. Monahan did not recommend a background check process without having applicants sign a waiver. The group thought a Council interview of at-large applicants was appropriate.

Library Task Force Update and Library Facility Options

Present: Ed Zumwalt, Scott Churchill, Tom Hogan, Library Director Joe Sandfort, Library Circulation Supervisor Nancy Wittig

The group reviewed its work to date and wanted to ensure the Council felt things were going in the right direction. Results of the first survey would be available shortly.

Mayor Ferguson discussed a recent conversation with Paul Savas about the possibility of sharing a municipal and justice court facility.

Councilor Hedges reported the Neighborhood District Association (NDA) leadership was meeting tomorrow and had some additional thoughts on the format of their meetings.

The group discussed attendance at the League of Oregon Cities (LOC) Conference.

Residential Standards Project Briefing: Multi-Family Development

Present: Planning Commissioners Chris Wilson, Mark Gamba, Clare Fuchs, Lisa Batey, Scott Churchill, Russ Stoll, Planning Director Katie Mangle and Senior Planner Susan Shanks, and Kenny Asher

Ms. Shanks referred to the packet and map of multi-family zones. The community says it wants better design controls and standards for the future. She summarized the outreach efforts that included surveys and focus groups and addressed the project goals.

Ms. Mangle discussed available land that might be used differently and gave an overview of the application process and design principles that addressed livability, compatibility, safety, functionality, and sustainability. She noted that density targets and goals did not presume a lot of development in neighborhoods.

Ms. Shanks discussed how one might transition between higher and lower density zones. Where and how one might apply transition standards next to a lower density zone? Should multi-family be sensitive when adjacent to a single-family zone?

Councilor Chaimov would appreciate hearing comments from those living in affected neighborhoods.

Mr. Gamba spoke to the apartment building across the street from the Pond House and how it would be more pleasing to use architectural features and perhaps a step back or set back to open up the space.

Mr. Churchill observed there was a good blend of multi-family and historic structures in Portland's NW 23rd Avenue area.

Ms. Batey commented on infill housing and building heights and noted how well she thought some of them worked.

Ms. Fuchs said Washington County dealt with issues through screening and buffering.

Councilor Chaimov liked the idea of transitioning from zone to zone though he would not wish to impose additional requirements if single family residences were in multi-family zones.

Ms. Shanks discussed design elements on all sides of the development and step backs.

Mr. Gamba wanted to keep in mind cottage clusters and row houses. Could the City say in transition areas these were the preferred development-sized lots?

Mr. Churchill discussed context and economic viability. One can achieve massing but was it the right scale? It was important to contextually respect the adjacent property.

Councilor Hedges asked why the City was trying to fit more people into the zones.

Mr. Gamba responded there were no zoning changes; certain areas had been zoned multi-family for decades. Certain standards may make development costly and result in the developers' being more thoughtful and careful.

Ms. Fuchs said it was important that the development looked good.

Councilor Loomis hoped to achieve standards that were palatable to the most citizens.

Councilor Hedges did not like telling people how to live their lives, but high quality development would keep Rockwood out and property values up. He did not wish to see Milwaukie cheapened.

Ms. Shanks commented on the broad spectrum of opinion and finding moderate ground to encourage quality development but not pricing Milwaukie out of the market.

Ms. Fuchs added condos and apartments allow for homeownership and gave younger people a chance.

Ms. Batey observed housing trends indicated people were often renters by choice.

Ms. Mangle commented on the need to acknowledge the existing fabric and development while not precluding further development. She announced the October 20 open house.

Mayor Ferguson adjourned the study session at 7:47 p.m.

Respectfully submitted,

____

Pat DuVal, Recorder

MINUTES

MILWAUKIE CITY COUNCIL WORK SESSION

OCTOBER 4, 2011

Mayor Ferguson called the work session to order at 5:00 p.m. in the City Hall Conference Room.

Council Present:	Council President Greg Chaimov and Councilors Dave Hedges, Joe Loomis, and Mike Miller
Staff Present:	City Manager Bill Monahan, Assistant to the City Manager Teri Bankhead, City Attorney Tim Ramis, Recorder Pat DuVal, Human Resources Director Cynthia Trosino, Finance Director Casey Camors, and Community Services Director JoAnn Herrigel
Media:	Molly Harbargar, *The Oregonian*

City Manager's Report

Ms. Trosino provided information to the City Council in preparation for Mr. Monahan's annual performance review. The group agreed on timelines and scheduled an executive session on October 25.

Mr. Monahan updated the City Council on a fence related issue in the vicinity of the Walk Safely Milwaukie Program Home Avenue walking path project. He handed out documents from the public commenting on the proposed Metropolitan Area Communication Commission (MACC) agreement and the proposed procurement exemptions related to the Bring it Back Project.

Mr. Asher and **Ms. Mangle** provided updates from the Community Development Department including the Dark Horse Comics relocation/real estate study and the Oregon Department of Transportation (ODOT)/minor league baseball project.

Ms. Mangle reported there was a steady stream of land use and development review applications. The permitting portion of the Light Rail Bridge over Kellogg Creek was underway, and the Jackson Street final elements would be in place by mid-October.

Joint Session with Budget Committee to Review Quarterly Financial Report through the fourth quarter ended June 30, 2011

Present: Budget Review Board members Gabe Storm, John Fox, Jon Stoll, and Ronn Palmer.

Ms. Camors distributed the Adopted Budget and the Budget Manual. She outlined the challenges including recalibration of the fund transfers, reduction in the number of funds, and dramatic reduction in interest income. The Comprehensive Annual Financial Report was due at the end of December. The estimated $12.6 million ending fund balance was actually $13.4 million. She reviewed the fund revenues and expenditures.

Mr. Stoll asked what could be done about the water fund shortfall.

Ms. Camors replied there was a water rate increase scheduled, and more frequent reporting to departments would help them monitor revenues and expenditures more closely. She commented briefly on the Comcast litigation and indicated she would do more research on the matter and report back.

Councilor Chaimov noted the State had appealed the decision to the Supreme Court.

The City Council took a brief recess beginning at 5:50 p.m.to read materials handed out at the session. Mayor Ferguson reconvened the work session 6:05 p.m.

Discussion of Metropolitan Area Communication Commission (MACC) Membership

Ms. Herrigel provided information on the non-binding letter of interest that was a signal to MACC that the City was interested in knowing more about the terms of membership. On October 18 she would address the City Council at a work session to discuss the actual terms and consider the proposed elements and how the City and affected entities would be impacted by MACC membership. The MACC Board would decide on November 16, 2011 to ratify the agreements with each of the jurisdictions. She described the ascertainment process.

She reviewed concerns expressed by Deborah Barnes of the Sabin Schellenberg Center related to education in the North Clackamas School District. She summarized how the franchise fees and public education and government (PEG) fees were used including the fiber network between City facilities, an education grant program which will be on the table after 2014, and government or public capital reserve to do such things as camera and sound system upgrades. PEG fees were not guaranteed in the future. Ms. Herrigel noted the future of Willamette Falls TV (WFTV) was not clear both in terms of the access studio and the organization. She noted the City had a lot of equipment at the Willamette Falls studio and that there was a concern about videography services. She explained that PEG fees could only be used for capital and that the Comcast managed network was an agreement between Comcast and the City. She indicated she would prepare a response to Mr. Wickham's memo regarding service issues for the City Council.

Councilor Hedges asked what happened to the PEG fees of current MACC members.

Ms. Herrigel understood they were pooled but wanted to get more information before asking the City Council to move forward.

Councilor Miller asked what would happen to the City's two channels.

Ms. Herrigel thought that and such things as availability of air time would be negotiated issues.

Councilor Loomis understood Milwaukie had a studio in the City limits for a period of time.

Ms. Herrigel replied there had been a studio on Lake Road, but it had little use and was eventually closed. The question was how many people watched programs on cable versus the City website.

Councilor Hedges asked what other options there would be if WFTV did go away.

Ms. Herrigel responded equipment would have to be moved back to City Hall plus there was the videography issue.

Allyn Sumers and **Deborah Barnes** and **Paul Manda** of Sabin Schellenberg Center discussed the curriculum and educational investment in the community.

Ms. Barnes described the Sabin-Schellenberg program that provided hands-on experience for college credit. She urged keeping the lines of communication open with the public.

Mayor Ferguson discussed possible options if WFTV were to close including MACC and the School District.

Councilor Hedges' main concern was continuing to operate the channels, and he asked if there might be more money available through MACC.

Mayor Ferguson asked what had been purchased with the grant money in the past.

Ms. Barnes replied funds were used to purchase state of the art equipment similar to that used by the University of Oregon. She added the graduation rate was 97%, so there was an investment in more than a piece of equipment.

Councilor Miller observed from his family's experience, Sabin Schellenberg offered excellent programs.

The group agreed to have a further conversation about what the District could deliver if given the opportunity.

Mayor Ferguson adjourned the work session at 6:39 p.m.

Respectfully submitted,

____
Pat DuVal, Recorder

CITY OF MILWAUKIE
CITY COUNCIL MEETING
OCTOBER 4, 2011

CALL TO ORDER

Mayor Ferguson called the 2111th meeting of the Milwaukie City Council to order at 7:00 p.m. in the City Hall Council Chambers.

Present: Mayor Ferguson, Council President Greg Chaimov and Councilors Dave Hedges, Joe Loomis, and Mike Miller

Staff present: City Manager Bill Monahan, Assistant to the City Manager Teri Bankhead, City Attorney Tim Ramis, City Recorder Pat DuVal, Public Affairs Coordinator Grady Wheeler, Community Development/Public Works Director Kenny Asher, Police Chief Bob Jordan, Community Services Director JoAnn Herrigel

PLEDGE OF ALLEGIANCE

PROCLAMATIONS, COMMENDATION, SPECIAL REPORTS AND AWARDS

None scheduled.

CONSENT AGENDA

It was moved by Councilor Hedges and seconded by Councilor Chaimov to adopt the consent agenda as presented. Motion passed with the following vote: Councilors Hedges, Loomis, Miller, and Chaimov and Mayor Ferguson voting "aye." [5:0]

A. City Council Minutes:
   1. August 16, 2011 work session;
   2. August 30, 2011 study session;
   3. September 6, 2011 regular session; and
   4. September 20, 2011 regular session

B. <u>Resolution No. 87-2011</u>: A Resolution of the City Council of the City of Milwaukie, Oregon, Approving the Award of a Contract for the Home Avenue Sidewalk Improvements; and

C. OLCC Application – Milwaukie Kitchen and Wine, 10610 SE Main Street – new outlet

AUDIENCE PARTICIPATION

Kathy Heintz, Milwaukie, a 25-year resident, resided at Wilma Court and Home Avenue for 11 years. There was a fence on her property when she purchased it, and although it did not interfere with the Home Avenue walking path project, she was cited by Milwaukie Code Enforcement after the matter had been discussed at the Hector Campbell Neighborhood District Association (NDA) meeting. The issue was neither on the agenda nor was the discussion or decision included in the meeting minutes. She was appealing to the City Council and explained it would be a significant hardship for her to move the fence. It did not jeopardize the Walk Safely Milwaukie Project.

Mayor Ferguson said he and Mr. Monahan would follow up with Ms. Heintz.

Mr. Monahan explained code compliance was a complaint-driven process.

John Semau, Milwaukie, raised concerns with the Lake Road Project. He now has no sense of privacy and was concerned about safety. The curb was approximately 10-feet from his deck, and if a vehicle went out of control, it could come into his backyard.

Mayor Ferguson offered to have a follow up conversation with Mr. Semau.

Les Poole, Clackamas County, provided copies of the final environmental impact statement (FEIS) and discussed the grave legal concerns he had with the area south of Lake Road. He was hoping to circumvent issues for TriMet. There is a 5-1/2 acre park right under the light rail track that created a major impact. This project was not really taking enough cars off the road.

Mayor Ferguson recessed the regular City Council meeting at 7:16 p.m.

PUBLIC HEARING

Chair Ferguson convened the Local Contract Review Board (LCRB) and called the public hearing on the proposal to allow the special class exemption for the direct award of the contracts for the feasibility of the "Bring it Back" project to order at 7:17 p.m.

The purpose of the hearing was to consider a resolution approving class exemption under Local Contract Review Board Rule 10.115 upon making certain findings.

Mr. Ramis told the Board that the question involved the contract procedures and related issues and options. Two findings the City Council had to make were that the process would not limit competition, and the process could reasonably be expected to result in substantial saving for the City.

Audience Testimony

Jean Baker, Milwaukie, felt environmental issues should be addressed early in process through an environmental impact study. She had concerns about the combined noise level from the baseball stadium, MAX, and Hwy 99E. It was unconscionable to move forward without clearly identifying when the noise impacts would be studied. She also encouraged the Council to adopt reasonable noise standards for the City.

Mr. Ramis responded it might be premature to bring someone in to study sound before the land use process in which technical disciplines would be brought on board. The key issue in this action was the procurement process and how a contract was issued although Ms. Baker's concerns were certainly relevant to the project. He recommended the exempt approach as being justified; it did not limit competition, and the City would not suffer loss of competition. Mr. Asher felt the informal process resulted in lower costs.

Correspondence: **Leslie Schockner** submitted comments to the City Council dated October 4, 2011, via email.

Chair Ferguson closed the public testimony portion of the hearing at 7:35 p.m.

Councilor Chaimov understood these companies had been thoroughly vetted. This was a unique situation of which the City should take advantage.

It was moved by Board Member Chaimov and seconded by Board Member Loomis to adopt the resolution approving class exemption under Local Contract Review board Rule 10.115 for contract related to determining feasibility of the "Bring it Back" Baseball Project. Motion passed with the following vote: Councilors Hedges, Loomis, Miller, and Chaimov and Mayor Ferguson voting "aye." [5:0]

RESOLUTION NO. 88-2011:

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, ACTING AS THE LOCAL CONTRACT REVIEW BOARD, APPROVING CLASS EXEMPTION UNDER RULE 10.115 FOR CONTRACTS RELATED TO DETERMINING FEASIBILITY OF THE "BRING IT BACK" BASEBALL PROJECT

Chair Ferguson adjourned the Local Contract Review Board meeting at 7:36 p.m.

Mayor Ferguson reconvened the City Council regular session at 7:37 p.m.

OTHER BUSINESS

A. Approval of Contracts for "Bring it Back" Baseball Campaign

Mr. Asher provided the staff report in which the City Council was requested to authorize the City Manager to enter into contracts to bring minor league baseball to the City of Milwaukie. He gave an overview of the project, the advisor and services, fiscal impacts, and the staff recommendation and alternatives. The idea of baseball in Milwaukie had been in the exploratory mode for about one year. This action would allow the City to move forward with public outreach that includes a communication strategy with the public and baseball and business entities. He reviewed the recommended phased approach that included intervals at which the Council would determine if the City should move forward on the project or opt out. They needed to develop a strategy for how the site would be used and what activities would be allowed. In December or January City Council would have a good idea about the feasibility of the site. After that project costs would be estimated and communicated to the public. He discussed the subsequent agreements, finance plans, and a likely bond measure.

He gave an overview of the recommended advisors and the proposed areas of responsibility. Phase I, site feasibility, would include communications strategist, architect and engineering experts, and project management. Other advisors may be needed at some point, but to Mr. Asher this was the best team to start the project. The recommended firms were Innovative Campaign Strategies, 360 Architecture, and Capital Project Consultants.

The fiscal impact would be limited to the Community Development Department budget with the effect of slowing down some of the other projects in its work plan. The cost of Phase I was approximately $85,000. He noted it was probably not realistic to think a team might step in and share costs. The advisors have discounted their rates, and the architects would defer costs depending on the success of the effort. He discussed the alternatives to moving forward with the recommendation.

Mayor Ferguson noted several people wished to comment on this matter and that Ms. Baker's earlier comments would be considered.

Ginger Plov, Milwaukie, lived near Roswell Street and could already hear Sckavone Field. She wanted to see the money directed toward something that would help the neighborhood. The noise level would be incredible, and she was concerned about reduced livability. She was concerned about the community and felt this project was being rushed, with little communication about what was being planned.

Mayor Ferguson responded the Council's goal was active community engagement.

John Plov, Milwaukie, would be living near light rail and now a baseball stadium. It seemed backwards to issue contracts before deciding if it was good for the community and if people, particularly the Roswell neighborhood, really wanted a stadium before spending any money.

Jim Sanders, Milwaukie, Ardenwald resident, noted Milwaukie still had to pay for light rail, and everyone was in the midst of economic difficulties. This project would have to be bonded, and neighborhood serenity would be destroyed. He suggested remodeling Sckavone Field.

Chantelle Gamba, Historic Milwaukie NDA, saw a disparity between what she read and conversations she has had with neighbors. She felt this project was being rushed. Light rail was forced down people's throats, and the same thing was happening with baseball. This was a bitter pill. She felt the City needed to garner support by being more conservative and encouraging outreach before spending $85,000 on something that did not have popular support.

Mark Gamba, Milwaukie, understood from discussions with people that thoughts were beginning to gel. The project would probably neither damage nor save Milwaukie. A single-A ballpark would probably not pencil out, but a multi-use facility might.

Councilor Hedges asked the costs of the projects being put on hold to do the feasibility study.

Mr. Asher replied he had no staff to work on the Kellogg for Coho Initiative, so that project would limp along. The Commercial Core Enhancement Program (CCEP) including urban renewal planning using a Metro Grant would consume a lot of staff time from some source. Other areas that would suffer were Main Street organization and activity, business relations, and light rail business relocation work. A number of grants had been secured, but there was a problem with workload and staff capacity.

Councilor Miller asked when citizens would have the opportunity to weigh in on this project.

Mr. Asher replied if the City Council approved the proposed contracts then some communication work would begin in the neighborhoods this month.

Councilor Loomis observed these were all issues with which the consultants could help the City Council come to its decisions. He knew it would be a financial challenge to make this project happen, and it would depend on our citizens and other partners. He felt the City was taking measured steps to do it right. The success of the project depended on the City Council's using information from the public and being above board and transparent. People were supportive of the idea but had questions and issues. He felt these were good initial steps with periodic off-ramps.

Councilor Hedges attended numerous NDA meetings over the past 6 months and had talked about baseball making clear this was a feasibility study. The City Council had checkpoint opportunities to pull the plug if necessary. Milwaukie citizens would have the final say on whether to go ahead with the project or not. In the neighborhood meetings, he heard 100% support to go ahead with feasibility study. He was also concerned someone would get the $10,000 win bonus which made it appear to be a fight between City Council and staff versus the public. He had always promised citizen involvement, and the City Council was now looking at spending $300,000 of citizen money although he originally had in his mind $100,000. Citizens needed to be in from the beginning to make a decision when the time came.

Councilor Miller echoed Councilor Hedges' comments. For him the first step was to give citizens a right to say what they thought, or the project would fail. The City Council needed a clear understanding of what citizens will support and for how much.

Councilor Loomis said that was what these contracts were about. If the polling says residents did not think baseball was a good idea, then pull the plug. The City Council needed to show leadership and that in their hearts they believed. A majority of people he talked to were excited about the baseball project, but he would pull the plug if the public did not support it. He believed this was a catalyst to getting other things done.

Councilor Chaimov said even though this was being called a stadium, people were clear they wanted it to be a multi-use facility. He hoped this would be a heavily used facility by the community. A vast majority of those with whom he talked were very excited and saw this as the City's best chance to make Milwaukie a community with sidewalks and other amenities using resources the City did not already have. It was not the Council's intent to have the desires of the majority of citizens go unheeded if the project made neighborhoods unpleasant places to live.

Councilor Hedges asked if it was correct the City was not locked into one year's work and could pull out.

Mr. Asher replied that was correct.

Mr. Ramis suggested not using the word "campaign" as it might imply voter strategy.

It was moved by Councilor Chaimov and seconded by Councilor Loomis to adopt the resolution authorizing the City Manager to execute contracts with a team of advisors to support the goal of attracting minor league baseball to the City of Milwaukie. Motion passed with the following vote: Councilors Hedges, Loomis, Miller, and Chaimov and Mayor Ferguson voting "aye." [5:0]

RESOLUTION 89-2011:

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, AUTHORIZING THE CITY MANAGER TO EXECUTE CONTRACTS WITH PROFESSIONAL ADVISORS TO ASSIST WITH ACHIEVING THE COUNCIL GOAL OF ATTRACTING MINOR LEAGUE BASEBALL TO THE CITY OF MILWAUKIE

B. Photo Radar Update

Chief Jordan provided an update and timeline on what had occurred since photo radar was last discussed and asked the City Council to adopt findings related to the negative impacts of speeding issues in the City of Milwaukie. Annie Burton and Jeff Linman of Milwaukie High School would discuss the education element and audio-video tutorial.

He referred to a number of graphs showing numbers of citations issued on Hwys 99E and 224, van locations, and rates of photo radar citation issuance. He reviewed the amount of revenue generated.

Ms. Burton, Milwaukie High School, discussed the basic outline of the tutorial.

Chief Jordan said the High School would be reimbursed for its work on the video from the traffic assessment fund. He noted an intangible of this project was that police officers were working with high school students on a traffic safety project.

Mayor Ferguson was excited about the program, and this was how he had envisioned solutions to the concerns he expressed earlier this year.

It was moved by Councilor Hedges and seconded by Councilor Chaimov to adopt the resolution continuing photo radar enforcement under new technology, making findings, and ratifying prior determinations. Motion passed with the following vote: Councilors Hedges, Miller, and Chaimov and Mayor Ferguson voting "aye" and Councilor Loomis voting "no." [4:1]

RESOLUTION 90-2011:

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, CONTINUIING PHOTO RADAR ENFORCEMENT UNDER NEW TECHNOLOGY, MAKING FINDINGS, AND RATIFYING PRIOR DETERMINATIONS

C. Letter of Interest – Metropolitan Area Communication Commission Membership – Resolution

Ms. Herrigel briefly reviewed the proposed action that would authorize the Mayor to sign a letter to the Metropolitan Area Communication Commission (MACC) indicating the City's interest in becoming a member. She noted this was not a binding document but rather a discussion opener. She outlined the timelines and proposed City Council deliberations and a decision on November 1.

The City Council felt many of the questions had been answered during the work session

Councilor Hedges recommended continuation to another date as he felt there were some outstanding issues to be resolved prior to sending the letter of intent.

Councilor Chaimov understood the letter of interest needed to be sent in order to find out the terms and information needed for a thorough comparison of services. He shared Councilor Hedges' concerns and felt the citizens were happy with their current services.

It was moved by Councilor Loomis and seconded by Mayor Ferguson to adopt the resolution authorizing the Mayor to sign a letter to the Metropolitan Area Communication Commission asking that the City be considered for membership.

Councilor Loomis agreed with Councilor Hedges' comments and felt the School District could potentially prepare a viable proposal. The letter of interest was one of the pieces that needed to be in place to have all the information critical to the final decision.

Councilor Miller supported the resolution as long as it did not change what was being done.

Motion passed with the following vote: Councilors Loomis, Miller, and Chaimov and Mayor Ferguson voting "aye" and Councilor Hedges voting "no." [4:1]

Mayor Ferguson recused himself from the remainder of the session citing a potential conflict of interest as a TriMet employee. Before leaving, he made a number of announcements.

Council President Chaimov presided over the remainder of the meeting.

D. TriMet Funding

Council President Chaimov gave a brief background on the matter and announced there was a meeting scheduled with TriMet to discuss long-term funding options.

There was no discussion and no motions at this time.

E. Council Reports

Council President Chaimov and Councilors provided a update on meetings they attended on behalf of the City and upcoming community events. Several commented on the recent Annual League of Oregon Cities Conference.

ADJOURNMENT

It was moved by Councilor Hedges and seconded by Councilor Miller to adjourn the meeting. Motion passed with the following vote: Councilors Hedges, Loomis, Miller, and Chaimov voting "aye." [4:0].

Council President Chaimov adjourned the regular session at 9:11 p.m.

Respectfully submitted,

____

Pat DuVal, Recorder

Agenda Item: 3.C.
Meeting Date: 11/1/11

Milwaukie Police Department

To:	Mayor Ferguson and Milwaukie City Council
	Through: Bill Monahan, City Manager
From:	Bob Jordan, Chief of Police
Date:	October 17, 2011
Subject:	**O.L.C.C. Application – Gramma's Corner Restaurant – 10880 SE McLoughlin Blvd.**

Action Requested:

It is respectfully requested the Council approve the O.L.C.C. Application To Obtain A Liquor License from Gramma's Corner Restaurant - 10880 SE McLoughlin Blvd.

Background:

We have conducted a background investigation and find no reason to deny the request for liquor license.

The Planning Department has determined that the business requesting a liquor license is allowed by the Zoning Code to operate in the proposed location as a legal nonconforming use.

POLICE DEPARTMENT
3200 SE Harrison Street
Milwaukie, Oregon 97222
P) 503 786 7400 / F) 503 786 7426
www.cityofmilwaukie.org

OREGON LIQUOR CONTROL COMMISSION
LIQUOR LICENSE APPLICATION

Application is being made for:

LICENSE TYPES
- [x] Full On-Premises Sales ($402.60/yr)
  - [x] Commercial Establishment
  - [ ] Caterer
  - [ ] Passenger Carrier
  - [ ] Other Public Location
  - [ ] Private Club
- [x] Limited On-Premises Sales ($202.60/yr)
- [ ] Off-Premises Sales ($100/yr)
  - [ ] with Fuel Pumps
- [ ] Brewery Public House ($252.60)
- [ ] Winery ($250/yr)
- [ ] Other: ____________

ACTIONS
- [x] Change Ownership
- [ ] New Outlet
- [x] Greater Privilege
- [ ] Additional Privilege
- [ ] Other ________

90-DAY AUTHORITY
- [ ] Check here if you are applying for a change of ownership at a business that has a current liquor license, or if you are applying for an Off-Premises Sales license and are requesting a 90-Day Temporary Authority

APPLYING AS:
- [ ] Limited Partnership
- [x] Corporation
- [ ] Limited Liability Company
- [ ] Individuals

CITY AND COUNTY USE ONLY

Date application received: ____________

The City Council or County Commission:

____
(name of city or county)

recommends that this license be:
- [ ] Granted
- [ ] Denied

By: ____________________
(signature) (date)

Name: ____________________

Title: ____________________

OLCC USE ONLY

Application Rec'd by: Patty Rhodes

Date: 10/14/11

90-day authority: ☐ Yes ☐ No

1. Entity or Individuals applying for the license: [See SECTION 1 of the Guide]

① ~~Athena Shaffer~~ ③ ____________
② Gramma's Corner Restaurant Inc. ④ ____________

2. Trade Name (dba): Grammas Corner Restaurant ~~Inc~~

3. Business Location: 10880 McLoughlin Blvd. milwaukie clackamas or 97222
(number, street, rural route) (city) (county) (state) (ZIP code)

4. Business Mailing Address: 10880 McLoughlin Milwaukie Or 97222
(PO box, number, street, rural route) (city) (state) (ZIP code)

5. Business Numbers: (9713405163) ~~my cell~~ old business ~~#~~
(phone) (fax)

6. Is the business at this location currently licensed by OLCC? ☒ Yes ☐ No

7. If yes to whom: Mekong Thai Cuisine Type of License: Limited on Premises

8. Former Business Name: ____________

9. Will you have a manager? ☐ Yes ☒ No Name: Self
(manager must fill out an Individual History form)

10. What is the local governing body where your business is located? Milwaukie
(name of city or county)

11. Contact person for this application: Athena Shaffer 503 891 2751 (cell#)
(name) (phone number(s))

7749 SE Harmony Dr — —
(address) (fax number) (e-mail address)

I understand that if my answers are not true and complete, the OLCC may deny my license application.

Applicant(s) Signature(s) and Date:

① [signature] Date 10 13 11 ③ ____________ Date ______
② ____________ Date ______ ④ ____________ Date ______

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OREGON LIQUOR CONTROL COMMISSION

CORPORATION QUESTIONNAIRE

- **See section 2 of Guide for help with this form**

Please Print or Type

Corporation Name: Gramma's Corner Restaurnt Inc Year Incorporated: 11

Trade Name (dba): Gramma's corner Restaurnt

Business Location Address: 10880 SE McLoughlin BlvD

City: Milwaukie Or ZIP Code: 97222

List Corporate Officers:

(name)	(title)
Athena Shaffer	Owner

List Board of Directors:

(name) NA

List Stockholders: (Note: If any stockholder is another legal entity, that entity may also need to complete another Corporation Questionnaire. See Liquor License Application Guide for more information.)

Stockholders:	Number of Shares Held:
NA	

Number of Stock Shares:
Issued:
Unissued:
Total Shares Authorized to Issue:

Server Education Designee: ______ **DOB:** ______

(See Liquor License Application Guide for more information)

I understand that if my answers are not true and complete, the OLCC may deny my license application.

Officer's Signature: [signature] (name) Owner (title) **Date:** 10 13 11

1-800-452-OLCC (6522)

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(rev. 12/07)

OREGON LIQUOR CONTROL COMMISSION
BUSINESS INFORMATION

Please Print or Type

Applicant Name: Athena Shaffer Phone: 503 891 2751

Trade Name (dba): ~~10880 Mc~~ Gramma's Corner Restaurant Inc

Business Location Address: 10880 Mc loughlin BLVD.

City: Milwaukie Or ZIP Code: 97222

DAYS AND HOURS OF OPERATION

Business Hours:			Outdoor Area Hours:		
Sunday	8 Am to	12 Am	Sunday	8 AM to	12 AM
Monday	6 Am to	230 AM	Monday	6 AM to	2:30 AM
Tuesday	6 Am to	230 AM	Tuesday	6 AM to	2:30 AM
Wednesday	6 Am to	230 AM	Wednesday	6 AM to	2:30 AM
Thursday	6 Am to	230 AM	Thursday	6 AM to	2:30 AM
Friday	6 Am to	230 AM	Friday	6 AM to	2:30 AM
Saturday	8 Am to	230 AM	Saturday	8 AM to	2:30 AM

The outdoor area is used for:

☐ Food service Hours: 7 AM to 230 AM

☐ Alcohol service Hours: 7 Am to 230 AM

☐ Enclosed, how ______

The exterior area is adequately viewed and/or supervised by Service Permittees.

______ (Investigator's Initials)

Seasonal Variations: ☐ Yes ☒ No If yes, explain: ______

ENTERTAINMENT

Check all that apply:

☐ Live Music
☐ Recorded Music
☐ DJ Music
☐ Dancing
☐ Nude Entertainers
☒ Karaoke
☐ Coin-operated Games
☒ Video Lottery Machines Have Not App. yet
☐ Social Gaming
☐ Pool Tables
☐ Other: ______

DAYS & HOURS OF LIVE OR DJ MUSIC

Sunday	to	
Monday	to	
Tuesday	to	
Wednesday	to	
Thursday	to	
Friday	9 Pm to	2 AM
Saturday	9 Pm to	2 AM

SEATING COUNT

Restaurant: 41 Outdoor: ______

Lounge: ______ Other (explain): ______

Banquet: ______ Total Seating: 41

OLCC USE ONLY

Investigator Verified Seating: ____(Y) ____(N)

Investigator Initials: ______

Date: ______

I understand if my answers are not true and complete, the OLCC may deny my license application.

Applicant Signature: [signature] **Date:** 10 13 11

1-800-452-OLCC (6522)

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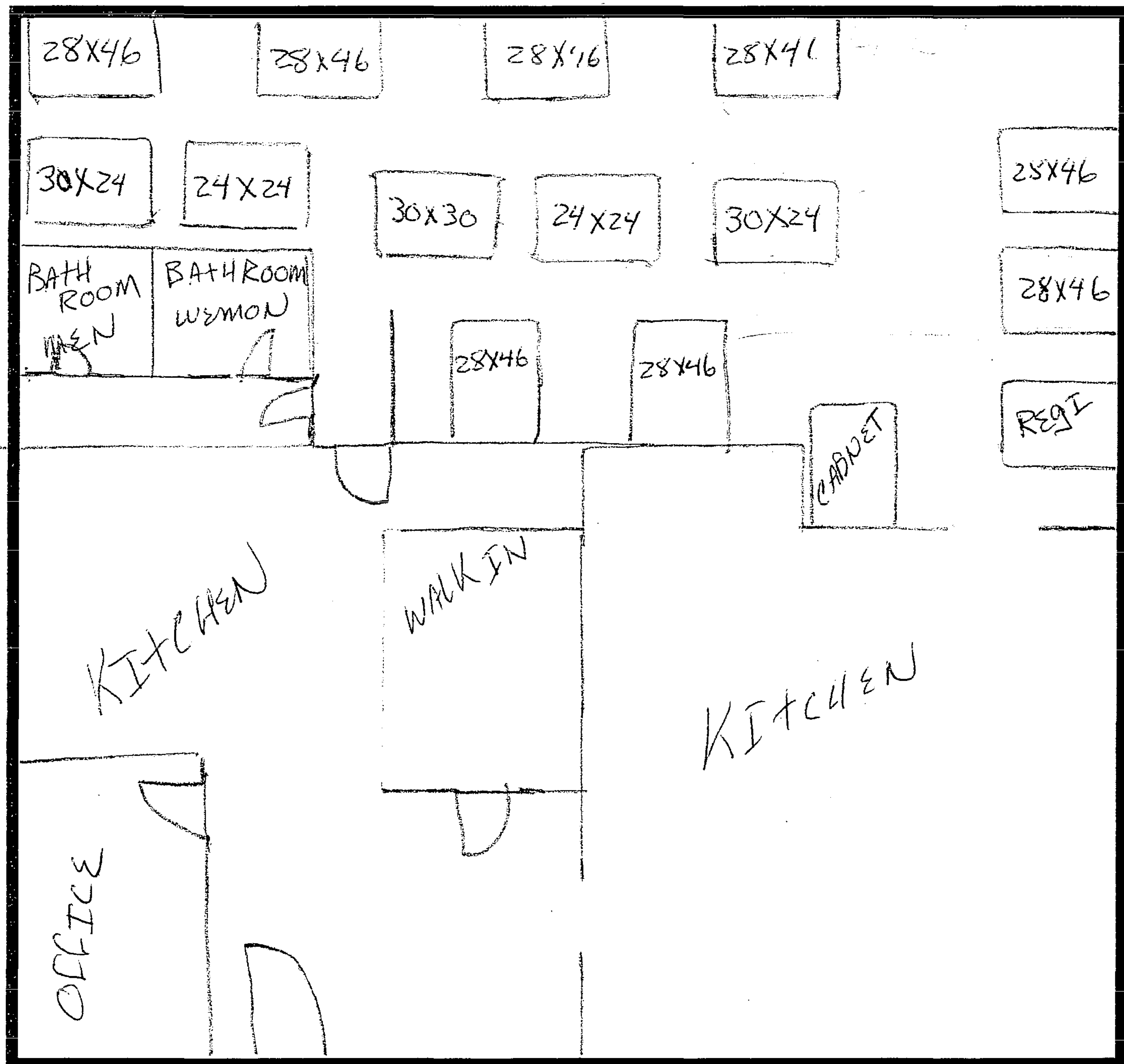
(rev. 12/07)

OREGON LIQUOR CONTROL COMMISSION
FLOOR PLAN

- **<u>Your floor plan must be submitted on this form.</u>**
- Use a separate Floor Plan Form for each level or floor of the building.
- Applicants must provide a sketch that shows the specific area of the premises (e.g. dining area, bar, lounge, kitchen and restrooms). Full On-Premises (commercial establishments) applicants must also show dining tables. See example on back.



Athena Shaffer
Applicant Name

Gramma's Corner
Trade Name (dba):

Milwaukie OR
City and ZIP Code

..........OLCC USE ONLY..........
MINOR POSTING ASSIGNMENT(S)

Date:____________ Initials:____________

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(rev. 12/07)

6.
OTHER BUSINESS

Agenda Item: 6.A.
Meeting Date: 11/1/11

COUNCIL AGENDA ITEM SUMMARY

Issue/Agenda Title: Energy Savings Projects

Prepared By: Jon LeBaron
Dept. Head Approval: Kenny Asher
City Manager Approval: Bill Monahan
Reviewed by City Manager:

ISSUES BEFORE THE COUNCIL
Energy Efficiency and Conservation Block Grant IGA with Clackamas County

STAFF RECOMMENDATION
1. Authorize the City Manager to enter into an IGA between the City of Milwaukie and Clackamas County Department of Sustainability to conduct energy efficiency improvement projects using American Recovery and Reinvestment Act funds.
2. Authorize expenditures from the Facilities Department repair fund to prefund the projects.
3. Approve the transfer of the grant and incentive money the City receives to the Facilities Department repair fund.

KEY FACTS & INFORMATION SUMMARY
Clackamas County is providing $100K Federal grant money for the City to conduct ten energy saving projects, such as adding insulation to City buildings. The City would fund the projects through the facility repair budget and receive full reimbursement from the county. The City Manager requires authorization to enter into an agreement with Clackamas County.

OTHER ALTERNATIVES CONSIDERED
1. Specify specific projects to be completed.
2. Not approve this action.

CITY COUNCIL GOALS
Not applicable.

ATTACHMENT LIST
IGA between Clackamas County and City
Resolution

FISCAL NOTES

Signing the IGA with Clackamas County obligates the City to complete the specified projects during the current fiscal year. These projects were not designated as Capital Improvement Projects (CIPs) for the current fiscal year. The facilities department will pay for the projects out of the facility repair fund. The City will file documents with Clackamas County and the Energy Trust of Oregon upon completion of the projects for reimbursement of money expended.

To: Mayor and City Council

Through: Bill Monahan, City Manager
Kenneth Asher, Community Development and Public Works Director

From: Jon LeBaron, Operations Director

Subject: Energy Efficiency Grant IGA with Clackamas County and Approval to Perform Energy Retrofit Projects

Date: November 1, 2011

ACTION REQUESTED

1. Authorize the City Manager to enter into an IGA between the City of Milwaukie and Clackamas County Department of Sustainability to conduct energy efficiency improvement projects using American Recovery and Reinvestment Act funds.
2. Authorize expenditures from the Facilities Department Repair Fund to pre-fund the projects.
3. Approve the transfer of the grant and incentive money the City receives to the Facilities Department Repair Fund.

HISTORY OF PRIOR ACTIONS AND DISCUSSIONS

There have been no prior actions or discussion relating to this request.

BACKGROUND

In January 2011, Clackamas County contacted the City of Milwaukie concerning Energy Efficiency and Conservation Block Grant (EECBG) funding available to cities located within Clackamas County. These funds are from the American Recovery and Reinvestment Act of 2009 (ARRA), which were given to Clackamas County to perform energy efficiency upgrades in publicly owned facilities. The U.S. Department of Energy gave $800,000 to Clackamas County, of which $550,000 was used internally. Clackamas County obtained approval from the Federal Government to offer the remaining $250,000 to cities within its boundaries for use on city owned facilities. The City of Milwaukie's Facilities Department identified ten energy efficiency projects within

City campuses. The City filled out the Clackamas County grant application and was approved for reimbursement of several energy efficiency projects, totaling $100,000.

The IGA with Clackamas County identifies two phases. In Phase, 1 reimbursement will be made to the City after completing $50,000 worth of energy efficiency projects, and have submitted the reimbursement paperwork to the county. Upon completion of Phase 1, the City will then be eligible for Phase 2 reimbursement of up to an additional $50,000 towards further energy efficiency projects. Clackamas County requires prompt submittal of expenditure receipts, and no less than monthly. The City will receive the reimbursements within two to four weeks. We plan to draw the upfront funds from the Facility Repair budget, which is $210K for FY12. This budget line is used for facility repair service calls that are not normally covered by standing contracts, such as HVAC. The size of the budget is based on historical expenditures in this category.

The following ten energy efficiency projects have been identified by the City of Milwaukie Facilities Department based on EECBG guidelines, Oregon Energy Trust audits, and a 2009 Facility Condition Assessment conducted by Faithful+Gould:

Project	Result	Cost
1. Replace metal halide and high pressure sodium outdoor lighting with electrodeless induction lamps at City Hall, Library, Pond House, Public Service Facility (JCB), and Public Safety Building.	These lamps will reduce energy use by approximately 40%.	$41,000
2. Replace rooftop RTU-5 HVAC at the Public Safety Building with a high efficiency HVAC unit.	The replacement will save the City approximately 27% over the current unit.	$13,000
3. Replace gas furnace at the Public Safety Building.	We are replacing the current 80% efficiency unit with a 95% efficiency unit.	$6,500
4. Replace the large water heater with a tankless unit at the Public Safety Building.	We are replacing the current 50% efficient unit with an 80% efficient unit.	$11,000
5. Replace the small water heater with a tankless unit at the Public Safety Building.	We are replacing the current 50% efficient unit with an 80% efficient unit.	$4,500
6. Seal HVAC air ducts in the attic space at City Hall.	Approximate 10% decrease in energy consumption.	$4,000
7. Add additional insulation in the attic space at City Hall.	Approximate 10% decrease in energy consumption.	$4,000
8. Add additional insulation in the attic space at the Pond House.	Approximate 10% decrease in energy consumption.	$4,000
9. Replace JCB administration building water heater with a tankless unit.	We are replacing the current 50% efficient unit with an 80%	$8,000

	efficient unit.	
10. Replace the water heater in the JCB Operations building with a tankless water heater.	We are replacing the current 60% efficient unit with an 80% efficient unit.	$8,000
Total		**$110,000**

The Energy Trust of Oregon has incentive money available for completed energy efficiency projects in the state of Oregon. Most of the projects qualify for the incentive money. As the projects are completed, the City will apply for the incentive money. The City anticipates receiving $10,000 of incentive money from the Energy Trust of Oregon.

CONCURRENCE

The Operations Director, Community Development Director, and City Manager all agree these projects would be beneficial to the City of Milwaukie. Staff believes these energy efficiency projects are an opportunity to upgrade existing equipment and reduce energy consumption. Without the financial help of the Clackamas County grant and Energy Trust of Oregon incentives, the City would not be able to accomplish these projects. *Council is still reviewing the IGA.*

FISCAL IMPACT

Signing the IGA with Clackamas County obligates the City to complete the specified projects during the current fiscal year. These projects were not designated as Capital Improvement Projects (CIPs) or named as specific items in the Facility Repair budget for the current fiscal year, so there is no direct facility maintenance savings. However, several of the projects replace equipment that is beyond its service life, so there are indirect savings for items that are being replaced which might have failed in the future. The Facilities department will pay for the projects out of their Facility Repair fund. The City will file documents with Clackamas County and the Energy Trust of Oregon upon completion of the projects for full reimbursement of money expended.

WORK LOAD IMPACTS

These projects exceed the Facilities staff capacity to conduct the work in-house. Facilities will hire outside contractors to complete the projects. Facilities intends to use existing contracts for all the projects except for the lighting project. This likely will require a new contract to be approved by Council.

ALTERNATIVES

1. Approve this action.
2. Specify specific projects to be completed.
3. Deny this action.

ATTACHMENT

1. IGA between Clackamas County and City
2. Resolution

<table>
<tr><td colspan="3">CLACKAMAS COUNTY, OREGON
SUB-RECIPIENT AGREEMENT 12-001
Project Name: City of Milwaukie
Project Number: 70004</td></tr>
<tr><td colspan="3">This Agreement is between Clackamas County, Oregon, acting by and through its Department of Sustainability and the City of Milwaukie (Sub-Recipient).</td></tr>
<tr><td>Sub-Recipient Data</td><td colspan="2">Clackamas County Data</td></tr>
<tr><td>Program Administrator: Willie Miller</td><td>Grant Accountant: Elaine Yan</td><td>Project Officer: Susan Ziolko</td></tr>
<tr><td>City of Milwaukie
10722 SE Main St.
Milwaukie, Oregon 97222
(503) 786-7621
millerw@ci.milwaukie.or.us</td><td>Clackamas County – Finance
2051 Kaen Road
Oregon City, OR 97045
503-742-5435
eyan@co.clackamas.or.us</td><td>Clackamas County – Sustainability
150 Beavercreek Road
Oregon City, OR 97045
503-742-4455
susanz@co.clackamas.or.us</td></tr>
<tr><td>DUNS: 002005155</td><td></td><td></td></tr>
</table>

RECITALS

1. The American Recovery and Reinvestment Act of 2009, Pub. L. 111-5 (ARRA) was enacted by the U.S. Congress to create jobs, promote economic recovery and provide investments needed to increase economic efficiency that will provide long-term economic benefits. ARRA was enacted to preserve and create jobs and promote economic recovery, assist those most impacted by the recession, provide investments needed to increase economic efficiency by spurring technological advances in science and health, invest in transportation, environmental protection, and other infrastructure that will provide long-term economic benefits, stabilize state and local government budgets, all in order to minimize and avoid reductions in essential services and counterproductive state and local tax increases.

2. Clackamas County (County) desires to have its participating cities therein share in the benefits of the U.S. Department of Energy Efficiency and Conservation Block Grant to promote local family-supporting jobs through energy efficiency upgrades to participating city facilities, resulting in energy savings and decreased operating expenses while reducing greenhouse gas emissions and contributing to national energy independence.

3. The City of Milwaukie wishes to participate with the County to share in the benefits and realize the advantages indentified in the previous section

NOW THEREFORE, according to the terms of this Sub-Recipient Agreement (Agreement) the County and the City agree as follows:

AGREEMENT

1. **Term and Effective Date.** This Agreement shall be effective as of the date it is executed and shall expire on **June 30, 2012**, unless sooner terminated or extended pursuant to the terms hereof.

2. **Scope of Work.** The Scope of Work is described in the attached Exhibit A: Scope of Work. The City agrees to perform the Project in accordance with the terms and conditions of this Agreement and its Exhibits.

3. **Standards of Performance.** The City shall perform all activities and programs in accordance with the requirements set forth in this Agreement, its Exhibits, and all applicable laws and regulations. Furthermore, the City shall comply with the requirements of the EECBG Award DE-EE0000924/001, that is the source of the grant funding, in addition to compliance with requirements of Title 10 of the *Code of Federal Regulations*, Part 600, Sub-Part C. A copy of the EECBG grant award has been provided to the City, which is attached to and made a part of this Agreement by this reference, including the Exhibit D: EECBG Award Special Terms and Conditions.

4. **Grant Funds**. The County's funding for this Agreement is the American Recovery Reinvestment Act funded Energy Efficiency and Conservation Block Grant (CFDA 81.128) issued to the County by the U.S. Department of Energy. The maximum, not to exceed, grant amount that the County will pay is **$50,000.** Upon successful implementation of the initial $50,000; and additional $50,000 may be available upon request. This is a cost reimbursement grant and disbursements will be made in accordance with the schedule and requirements contained in Exhibit B: Required Financial Reporting Reimbursement Request and Exhibit C: Required Performance Reporting;. Failure to comply with the terms of this Agreement may result in withholding of payment.

5. **Amendments.** The terms of this Agreement shall not be waived, altered, modified, supplemented, or amended, in any manner whatsoever, except by written instrument signed by both parties. **The City must submit a written request including a justification for any amendment to the County in writing at least forty five (45) calendar days before this Agreement expires.** No payment will be made for any services performed before the beginning date or after the expiration date of this Agreement. If the maximum compensation amount is increased by amendment, the amendment must be fully effective before the City performs work subject to the amendment.

6. **Termination.** This Agreement may be terminated by the mutual consent of both

parties or by a party upon written notice from one to the other. This notice may be transmitted in person, by mail, facsimile, or by e-mail. If this Agreement is terminated under this Section 6, the County shall pay the City for unpaid approved invoices and for authorized and approved expenses incurred under this Agreement through the date of the termination of the Agreement but not yet billed.

7. **Funds Available and Authorized.** The County certifies that it has sufficient funds currently authorized for expenditure to finance the costs of this Agreement within the current fiscal year budget. The City understands and agrees that payment of amounts under this Agreement is contingent on the County receiving appropriations or other expenditure authority sufficient to allow the County, in the exercise of its reasonable administrative discretion, to continue to make payments under this Agreement.

8. **Administrative Requirements**. The City agrees to its status as a Sub-Recipient, and accepts among its duties and responsibilities the following:

   a) **Financial Management.** The City as Sub-recipient shall comply with 2 CFR Part 225, *Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments* (OMB Circular A-102), and agrees to adhere to the accounting principles and procedures required therein, use adequate internal controls, and maintain necessary sources documentation for all costs incurred. In addition, the Sub-Recipient agrees to comply with the standards set forth in 10 CFR 600.220.

   b) **Cost Principles.** The City as Sub-Recipient shall administer the award in conformity with OMB Circular A-87 *Cost Principles for State, Local and Indian Tribal Governments*. These principles must be applied for all costs incurred whether charged on a direct or indirect basis.

   c) **Period of Availability.** City as Sub-Recipient may charge to the award only allowable costs resulting from obligations incurred during the funding period.

   d) **Other Incentives.** Matching funds are not required from the City as Sub-Recipient; however, it is expected that the City will participate fully in additional incentives provided through the Energy Trust of Oregon. The County will reimburse costs after eligible incentives have been secured by the City.

   e) **Payment.** The City as Sub-Recipient must submit a final request for payment no later than fifteen (15) days after the end date of this Agreement. Routine requests for reimbursement should be submitted as specified in Exhibit B.

   f) **Suspension and Debarment.** The City as Sub-Recipient shall comply with 2 CFR 180 and 901. This common rule restricts sub-awards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in Federal assistance programs or activities. The City is responsible for further requiring the inclusion of a similar term or condition in any subsequent lower tier covered transactions. The City may access the Excluded Parties List System at http://www.epls.gov.

g) **Lobbying.** The City as Sub-Recipient agrees that no portion of the Federal grant funds will be used to engage in lobbying of the Federal Government or in litigation against the United States unless authorized under existing law and shall abide by OMB Circular A-87, which prohibits the use of Federal grant funds for litigation against the United States. In addition, the Sub-Recipient certifies that it does not and will not engage in lobbying activities as defined in Section 3 of the Lobbying Disclosure Act.

h) **Audit**. The City as Sub-Recipient shall comply with the audit requirements prescribed in the Single Audit Act Amendments and revised OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations".

i) **Monitoring.** The City as Sub-Recipient agrees to allow access to conduct site visits and inspections of financial records for the purpose of monitoring. The County, the federal government, and their duly authorized representatives shall have access to such financial records and other books, documents, papers, plans, records of shipments and payments and writings of Sub-Recipient that are pertinent to this Agreement, whether in paper, electronic or other form, to perform examinations and audits and make excerpts and transcripts.

j) **Record Retention**. The City as Sub-Recipient will retain and keep accessible all such financial records, books, documents, papers, plans, records of shipments and payments and writings for a minimum of five (5) years, or such longer period as may be required by applicable law, following final payment and termination of this Agreement, or until the conclusion of any audit, controversy or litigation arising out of or related to this Agreement, whichever date is later.

9. **Additional U.S. Department of Energy Requirements**.

a) **Public Policy**. The City as Sub-Recipient expressly agrees to comply with all public policy requirements, laws, regulations, and executive orders issued by the Federal government, to the extent they are applicable to the Agreement: (i) Titles VI and VII of the Civil Rights Act of 1964, as amended; (ii) Sections 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Americans with Disabilities Act of 1990, as amended; (iv) Executive Order 11246, as amended; (v) the Health Insurance Portability and Accountability Act of 1996; (vi) the Age Discrimination in Employment Act of 1967, as amended, and the Age Discrimination Act of 1975, as amended; (vii) the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended; (viii) all regulations and administrative rules established pursuant to the foregoing laws; and (ix) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations; and 2 CFR Part 225 as applicable to INSERT NAME HERE (City). Additional requirements are specified in Exhibit D: EECBG

Award Special Terms and Conditions, section 17, 18, and 30 and in 10 CFR Part 600 Subpart C.

b) **ARRA**. The City as Sub-Recipient agrees to comply with all ARRA requirements as specified in Exhibit D: EECBG Award Special Terms and Conditions, sections 24-30.

10. **General Agreement Provisions**.

a) **Indemnification.** Subject to the limitations of Oregon laws, including but not limited to the Oregon Tort Claims Act and the Oregon Constitution, the County and the City shall hold harmless, defend and indemnify each other, and their respective directors, officers, agents and employees, against all losses, damages, liability, claims, demands, actions, suits, costs, expenses and judgments (including court and appeal costs, and attorney fees and costs) to the extent arising directly or indirectly out of either party's performance of the services, activities or work conducted pursuant to this Agreement. The indemnification obligation stated herein will survive the termination or expiration of the Agreement. The parties' liability to each other under this Agreement shall be limited to actual damages. In no event shall either party be liable to the other for any other damages, whether characterized as general, special, direct, indirect, consequential, punitive, or otherwise.

b) **Assignment.** This Agreement may not be assigned in whole or in part with the express written approval of the parties hereto.

c) **Independent Status.** The City is independent of the County and will be responsible for any federal, state, or local taxes and fees applicable to payments hereunder.

d) **Notices.** Any notice provided for under this Agreement shall be effective if in writing and (1) delivered personally to the addressee or deposited in the United States mail, postage paid, certified mail, return receipt requested, (2) sent by overnight or commercial air courier (such as Federal Express), (3) sent by facsimile transmission, with the original to follow by regular mail; or, (4) sent by electronic mail with confirming record of delivery confirmation through electronic mail return-receipt, or by confirmation that the electronic mail was accessed, downloaded, or printed. Notice will be deemed to have been adequately given three days following the date of mailing, or immediately if personally served. For service by facsimile or by electronic mail, service will be deemed effective at the beginning of the next working day.

e) **Costs and Attorneys' Fees.** If any action or proceeding is brought to enforce this Agreement, the prevailing party shall be entitled to all costs incurred, including without limitation, reasonable attorneys' fees in any dispute resolution proceeding, trial, appeal, or in bankruptcy court.

f) **Governing Law.** This Agreement is made in the State of Oregon, and shall be governed by and construed in accordance with the laws of that state. Any litigation between the County and the City arising under this Agreement or out of work performed under this Agreement shall occur, if in the state courts, in the Clackamas County court having jurisdiction thereof, and if in the federal courts, in the United States District Court for the State of Oregon.

g) **Severability**. If any provision of this Agreement is found to be illegal or unenforceable, this Agreement nevertheless shall remain in full force and effect and the provision shall be stricken.

h) **Counterparts.** This Agreement may be executed in any number of counterparts, all of which together will constitute one and the same agreement. Facsimile copy or electronic signatures shall be valid as original signatures.

i) **Third Party Beneficiaries**. Except as expressly provided in this Agreement, there are no third party beneficiaries to this Agreement. The terms and conditions of this Agreement may only be enforced by the parties.

j) **Headings.** Headings and captions of this Agreement's sections and paragraphs are only for convenience and reference. These headings and captions shall not affect or modify this Agreement's terms or be used to interpret or assist in the construction of this Agreement.

k) **Survival.** Sections 8 at (h), (i), and (j) and 10 at (a), (d), (e), (f), (i), (j), (k), and (l) shall survive any expiration or earlier termination of this Agreement.

l) **Binding Effect.** This Agreement shall be binding on all parties hereto, their heirs, administrators, executors, successors and assigns.

(Signature Page Attached)

SIGNATURE PAGE TO SUB-RECIPIENT AGREEMENT
CLACKAMAS COUNTY AND THE CITY OF MILWAUKIE

AGREED as of the Effective Date.

CLACKAMAS COUNTY	CITY OF MILWAUKIE.
By: ______________________________	By: ______________________________
Title	Title
By: ______________________________	By: ______________________________
Title	Title
Dated: ____________________	Dated: ____________________

- Exhibit A: Scope of Work
- Exhibit B: Required Financial Reporting and Reimbursement Request
- Exhibit C: Quarterly/Final Performance Report
- Exhibit D: EECBG Award DE-EE0000924/001 Special Terms & Conditions

ATTACHMENT 1 - EXHIBIT A
Scope of Work

PROJECT NAME: Public Building Retrofits	*AGREEMENT #12-001*
SUB-RECIPIENT: City of Milwaukie	

County's responsibilities.

Clackamas County Office of Sustainability agrees to:

- Be a fiscal sponsor of the energy efficiency projects listed below.
- Inform cities of all applicable Federal regulations and program guidance documents and special terms and conditions of the EECBG award
- Complete federal reports for the grant award for the cities

City's responsibilities.

The City agrees to:

- Be considered a sub-recipient of the EECBG awarded to Clackamas County and follow federal purchasing and reporting guidelines for sub-recipients.
- Provide a DUNS number and CCR registration to Clackamas County
- Follow city procurement guidelines
- Apply for incentives from Energy Trust of Oregon for eligible projects
- Encourage vendors and contractors providing goods and services to provide invoices every 2 weeks, at a minimum; and invoice Clackamas County as soon as administratively possible, at a minimum once per month.
- Ensure that bids from vendors include provisions for Davis Bacon/Buy American Act per attachment D.
- Report performance metrics per attached Reporting Exhibit C on a quarterly basis.

Project description:

1. Replace all metal halide and high pressure sodium outdoor lighting, with electrodeless induction lamps at City Hall, Ledding Library, Pond House, Public Service Facility (JCB), and Public Safety Building.
2. Replace the roof-top RTU-5 HVAC at the Public Safety Building, with a high efficiency HVAC unit.
3. Replace the gas furnace at the Public Safety Building.
4. Replace the large water heater with a tankless unit at the Public Safety Building.
5. Replace the small water heater with a tankless unit at the Public Safety Building.
6. Seal supply HVAC air ducts in the attic space at City Hall.
7. Add additional insulation in the attic space at City Hall.
8. Add additional insulation in the attic space at the Pond House.
9. Replace the Public Service Facility (JCB-Admin.) administration building water heater, with a tankless unit.
10. Replace the Public Service Facility (JCB-Ops.) operations building water heater, with a tankless unit.

ATTACHMENT 1 - EXHIBIT B
Consisting Of Two Parts
Required Financial Reporting and Reimbursement Request

PROJECT NAME: Public Building Retrofits	*AGREEMENT #*
SUB-RECIPIENT: City of Milwaukie	

INVOICING

1. The City as Sub-Recipient may submit multiple requests for cost reimbursement but **reimbursement requests must be submitted no less frequently than monthly**. The invoices must describe all work performed with particularity, including by whom it was performed, and must itemize and explain all expenses for which reimbursement is claimed. Invoices must be submitted with the ARRA EECBG Grant Agreement Expenditures Report (see attached).

2. **Final invoices for reimbursement of expenses occurring in a County fiscal year (July 1 - June 30) must be received no later than the following July 15th. In addition, for quarterly reporting purposes, monthly invoices need to be received no later than October 6th, 2011, January 6th, 2012, April 6th, 2012, and July 6th, 2012.**

3. Payments will be based on reimbursement of actual costs authorized by this Agreement. Supporting documentation must be provided for expenses for which reimbursement is claimed and for all match expenses reported. Documentation required includes personal service cost detail, services and supplies cost detail, copies of paid contract and equipment invoices.

4. Invoices must be sent to **Clackamas County, Attn: Susan Ziolko** at 150 Beavercreek Road, Oregon City, OR 97045 or by e-mail at susanz@co.clackamas.or.us. Invoices are subject to the review and approval by the Project Officer. Payment is contingent on compliance with all terms and conditions of this Agreement, including reporting requirements.

Clackamas County ARRA EECBG Sub-Recipient Agreement

ATTACHMENT 1 - EXHIBIT B
Consisting Of Two Parts
Required Financial Reporting and Reimbursement Request

PROJECT NAME: City of Milwaukie	**AGREEMENT PERIOD**
GRANT AGREEMENT NUMBER:	**From: 07/15/2011 To: 06/30/2012**
NAME/ADDRESS/PHONE NUMBER OF SUB-RECIPIENT: **INSERT PARTICULARS OF CITY HERE**	**CURRENT EXPENDITURE PERIOD** **From: To:**
	TOTAL ENERGY TRUST OF OREGON INCENTIVES **$**
	TOTAL GRANT AMOUNT:

EXPENDITURE SUMMARY	**ARRA EECBG Grant Expenditures**		
	a	**b**	**a + b = c**
	Previously Reported	**Current Period**	**Cumulative to Date**
Total			

Clackamas County and the Federal government retain the right to inspect all financial records and other books, documents, papers, plans, records of shipments and payments and writings of the City as Sub-Recipient that are pertinent to this Agreement.

CERTIFICATION

I certify that this report is true and correct to the best of my knowledge and that all expenditures reported have been made in accordance with the budget and other provisions contained in the Agreement.

Signature **Title** **Date**

ATTACHMENT 1 - EXHIBIT B
Consisting Of Two Parts
Required Financial Reporting and Reimbursement Request

ATTACHMENT 1 - EXHIBIT C
Required Performance Reporting

1. The City as Sub-Recipient must submit progress reports on a quarterly basis, to the Project Officer, no later than October 15, 2011, January 15, 2012, April 15, 2012 and July 15, 2012. Included in the report will be the following metrics:
   (a) Number of buildings retrofitted
   (b) Square footage of buildings retrofitted
   (c) Details on what the retrofits were
   (d) Number of exterior lights purchased

2. The City as Sub-Recipient must submit a Final Performance Report no later than July 31, 2012.

All reports must include the above information. The reports may be provided electronically. In addition to the metrics in section 1, all reports must contain a discussion on each of the following:

- A comparison of actual accomplishments to the outputs /outcomes established in the Project description above for the period.
- The reasons for slippages if established outputs/outcomes were not met.
- Other pertinent information on the progress of the Project.

In addition to the Quarterly and Annual Performance Reports, the Sub-Recipient must notify Clackamas County ARRA EECBG Project Officer of developments that have a significant impact on the Grant support activities. The Sub-Recipient must inform Clackamas County ARRA EECBG Project Officer as soon as problems, delays or adverse conditions become known which will materially impair the ability to meet the outputs/outcomes specified above. This notification shall include a statement of the action taken or contemplated and any assistance needed to resolve the situation.

SPECIAL TERMS AND CONDITIONS

Table of Contents

1. RESOLUTION OF CONFLICTING CONDITIONS

Any apparent inconsistency between Federal statutes and regulations and the terms and conditions contained in this award must be referred to the DOE Award Administrator for guidance.

2. AWARD AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of the Assistance Agreement, plus the following:

a. Special Terms and Conditions.

b. Attachments:

Attachment Number	Title
1.	Statement of Project Objectives
2.	Federal Assistance Reporting Checklist and Instructions
3.	Budget Pages (SF 424A)

c. DOE Assistance Regulations, 10 CFR Part 600 at http://ecfr.gpoaccess.gov.

d. Application/proposal as approved by DOE.

e. National Policy Assurances to Be Incorporated as Award Terms in effect on date of award at http://management.energy.gov/business_doe/1374.htm.

3. ELECTRONIC AUTHORIZATION OF AWARD DOCUMENTS

Acknowledgement of award documents by the Recipient's authorized representative through electronic systems used by the Department of Energy, specifically FedConnect, constitutes the Recipient's acceptance of the terms and conditions of the award. Acknowledgement via FedConnect by the Recipient's authorized representative constitutes the Recipient's electronic signature.

4. PAYMENT PROCEDURES - ADVANCES THROUGH THE AUTOMATED STANDARD APPLICATION FOR PAYMENTS (ASAP) SYSTEM

a. Method of Payment. Payment will be made by advances through the Department of Treasury's ASAP system.

b. Requesting Advances. Requests for advances must be made through the ASAP system. You may submit requests as frequently as required to meet your needs to disburse funds for the Federal share of project costs. If feasible, you should time each request so that you receive payment on the same day that you disperse funds for direct project costs and the proportionate share of any allowable indirect costs. If same-day transfers are not feasible, advance payments must be as close to actual disbursements as administratively feasible.

c. Adjusting payment requests for available cash. You must disburse any funds that are available from repayments to and interest earned on a revolving fund, program income, rebates, refunds, contract settlements, audit recoveries, credits, discounts, and interest earned on any of those funds before requesting additional cash payments from DOE.

d. Payments. All payments are made by electronic funds transfer to the bank account identified on the ASAP Bank Information Form that you filed with the U.S. Department of Treasury.

5. CEILING ON ADMINISTRATIVE COSTS

a. Local government and Indian Tribe Recipients may not use more than 10 percent of amounts provided under this program, or $75,000, whichever is greater (EISA Sec 545 (b)(3)(A)), for administrative expenses, excluding the costs of meeting the reporting requirements under Title V, Subtitle E of EISA. These costs should be captured and summarized for each activity under the Projected Costs Within Budget: Administration.

b. Recipients are expected to manage their administrative costs. DOE will not amend an award solely to provide additional funds for changes in administrative costs. The Recipient shall not be reimbursed on this project for any final administrative costs that are in excess of the designated 10 percent administrative cost ceiling. In addition, the Recipient shall neither count costs in excess of the administrative cost ceiling as cost share, nor allocate such costs to other federally sponsored project, unless approved by the Contracting Officer.

6. LIMITATIONS ON USE OF FUNDS

a. By accepting funds under this award, you agree that none of the funds obligated on the award shall be expended, directly or indirectly, for gambling establishments, aquariums, zoos, golf courses or swimming pools.

b. Local government and Indian tribe Recipients may not use more than 20 percent of the amounts provided or $250,000, whichever is greater (EISA Sec 545 (b)(3)(B)), for the establishment of revolving loan funds.

c. Local government and Indian tribe Recipients may not use more than 20 percent of the amounts provided or $250,000, whichever is greater (EISA Sec 545 (b)(3)(C)), for subgrants to nongovernmental organizations for the purpose of assisting in the implementation of the energy efficiency and conservation strategy of the eligible unit of local government or Indian tribe.

7. REIMBURSABLE FRINGE BENEFIT COSTS

a. The Recipient is expected to manage their final negotiated project budgets, including their indirect costs and fringe benefit costs. DOE will not amend an award solely to provide additional funds for changes in the indirect and/or fringe benefit costs or for changes in rates used for calculating these costs. DOE recognizes that the inability to obtain full reimbursement for indirect or fringe benefit costs means the Recipient must absorb the underrecovery. Such underrecovery may be allocated as part of the Recipient's cost share.

b. If actual allowable fringe benefit costs are less than those budgeted and funded under the award, the Recipient may use the difference to pay additional allowable direct costs during the project period. If at the completion of the award the Government's share of total allowable costs (i.e., direct and indirect), is less than the total costs reimbursed, the Recipient must refund the difference.

8. INDIRECT COSTS ARE NOT REIMBURSABLE

The budget for this award does not include indirect costs. Therefore, these expenses shall not be charged to nor reimbursement requested for this project nor shall the indirect and fringe benefit costs from this project be allocated to any other federally sponsored project. In addition, indirect costs or fringe benefits shall not be counted as cost share unless approved by the Contracting Officer. This restriction does not apply to subawardees' indirect or fringe benefit costs.

9. PRE-AWARD COSTS

You are entitled to reimbursement for costs incurred on or after February 17, 2009, as authorized by the pre-award costs letter dated July 28th, 2009, if such costs are allowable in accordance with the applicable Federal cost principles referenced in 10 CFR Part 600.

10. USE OF PROGRAM INCOME

If you earn program income during the project period as a result of this award, you may add the program income to the funds committed to the award and used to further eligible project objectives.

11. STATEMENT OF FEDERAL STEWARDSHIP

DOE will exercise normal Federal stewardship in overseeing the project activities performed under this award. Stewardship activities include, but are not limited to, conducting site visits; reviewing performance and financial reports; providing technical assistance and/or temporary intervention in unusual circumstances to correct deficiencies which develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the award objectives have been accomplished.

12. SITE VISITS

DOE's authorized representatives have the right to make site visits at reasonable times to review project accomplishments and management control systems and to provide technical assistance, if required. You must provide, and must require your subawardees to provide, reasonable access to facilities, office space, resources, and assistance for the safety and convenience of the government representatives in the performance of their duties. All site visits and evaluations must be performed in a manner that does not unduly interfere with or delay the work.

13. REPORTING REQUIREMENTS

a. Requirements. The reporting requirements for this award are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to this award. Failure to comply with these reporting requirements is considered a material noncompliance with the terms of the award. Noncompliance may result in withholding of future payments, suspension or termination of the current award, and withholding of future awards. A willful failure to perform, a history of failure to perform, or unsatisfactory performance of this and/or other financial assistance awards, may also result in a debarment action to preclude future awards by Federal agencies.

b. Additional Recovery Act Reporting Requirements are found in the Provision below labeled: "REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT."

14. PUBLICATIONS

a. You are encouraged to publish or otherwise make publicly available the results of the work conducted under the award.

b. An acknowledgment of DOE support and a disclaimer must appear in the publication of any material, whether copyrighted or not, based on or developed under this project, as follows:

   Acknowledgment: "This material is based upon work supported by the Department of Energy [National Nuclear Security Administration] [add name(s) of other agencies, if applicable] under Award Number(s) [enter the award number(s)]."

   Disclaimer: "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

15. FEDERAL, STATE, AND MUNICIPAL REQUIREMENTS

You must obtain any required permits, ensure the safety and structural integrity of any repair, replacement, construction and/or alteration, and comply with applicable federal, state, and municipal laws, codes, and regulations for work performed under this award.

16. LOBBYING RESTRICTIONS

By accepting funds under this award, you agree that none of the funds obligated on the award shall be expended, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

17. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) REQUIREMENTS

You are restricted from taking any action using Federal funds, which would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to DOE providing either a NEPA clearance or a final NEPA decision regarding this project. Prohibited actions include*:* Under Activity #7 – Solar Electric Systems at County Facilities, the installation of solar photovoltaic electric panels at ground locations are bounded by terms contained with the SOW where ground mounted units cannot exceed the established 60 KW threshold. Ground mounted units exceeding the 60 KW threshold will need to be considered and reviewed as a separate action under NEPA. This restriction does not preclude you from:

Activity #2 – Green Building Incentives Program
Activity #3 – Energy Efficiency on Main Street
Activity #4 – Education & Outreach
Activity #5 – Public Building Retrofit Demonstration
Activity #6 – Revolving Loan Fund Pilot
Activity #7 – Solar Electric Systems at County Facilities

All of the listed activities are Categorical Exclusions under A11, A9, B5.1, or B5.2.

If you move forward with activities that are not authorized for Federal funding by the DOE Contracting Officer in advance of the final NEPA decision, you are doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share.

If this award includes construction activities, you must submit an environmental evaluation report/evaluation notification form addressing NEPA issues prior to DOE initiating the NEPA process.

18. HISTORIC PRESERVATION

Prior to the expenditure of Project funds to alter any historic structure or site, the Recipient or subrecipient shall ensure that it is compliant with Section 106 of the National Historic

Preservation Act (NHPA), consistent with DOE's 2009 letter of delegation of authority regarding the NHPA. Section 106 applies to historic properties that are listed in or eligible for listing in the National Register of Historic Places. If applicable, the Recipient or subrecipient must contact the State Historic Preservation Officer (SHPO), and the Tribal Historic Preservation Officer (THPO) to coordinate the Section 106 review outlined in 36 CFR Part 800. SHPO contact information is available at the following link: http://www.ncshpo.org/find/index.htm. THPO contact information is available at the following link: http://www.nathpo.org/map.html . Section 110(k) of the NHPA applies to DOE funded activities.

If applicable, the Recipient or subrecipient certifies that it will retain sufficient documentation, to demonstrate that the Recipient or subrecipient has received required approval(s) from the SHPO or THPO for the Project. Recipients or subrecipients shall avoid taking any action that results in an adverse effect to historic properties pending compliance with Section 106. The Recipient or subrecipient shall deem compliance with Section 106 of the NHPA complete only after it has received this documentation. The Recipient or subrecipient shall make this documentation available to DOE on DOE's request (for example, during a post-award audit).

19. WASTE STREAM

The Recipient or subrecipient certifies that it will create or obtain a waste management plan addressing waste generated by a proposed Project prior to beginning work for that Project. This waste management plan will describe the Recipient's or subrecipient's plan to dispose of any sanitary or hazardous waste (e.g., construction and demolition debris, old light bulbs, lead ballasts, piping, roofing material, discarded equipment, debris, and asbestos) generated as a result of the proposed Project. The Recipient or subrecipient shall ensure that it will comply with all Federal, state and local regulations for waste disposal. The Recipient or subrecipient shall make the waste management plan and related documentation available to DOE on DOE's request (for example, during a post-award audit).

20. DECONTAMINATION AND/OR DECOMMISSIONING (D&D) COSTS

Notwithstanding any other provisions of this Agreement, the Government shall not be responsible for or have any obligation to the Recipient for (i) Decontamination and/or Decommissioning (D&D) of any of the Recipient's facilities, or (ii) any costs which may be incurred by the Recipient in connection with the D&D of any of its facilities due to the performance of the work under this Agreement, whether said work was performed prior to or subsequent to the effective date of the Agreement.

21. SUBGRANTS AND LOANS

a. The Recipient hereby warrants that it will ensure that all activities by sub-grantee(s) and loan recipients to accomplish the approved Project Description or Statement of Project

Objectives are eligible activities under 42 U.S.C. 171534(1)-(13). State recipients hereby warrant that they will ensure that all activities by sub-grantee(s) and loan recipients pursuant to 42 U.S.C. 17155(c)(1)(A) to accomplish the approved Project Description or Statement of Project objects are eligible activities under 42 U.S.C. 171534(3)-(13).

b. Upon the Recipient's selection of the sub-grantee(s) and loan recipients, the Recipient shall notify (i.e. approval not required) the DOE Contracting Officer with the following information for each, regardless of dollar amount:
   - Name of Sub-Grantee
   - DUNS Number
   - Award Amount
   - Statement of work including applicable activities

   State recipients shall notify the DOE Contracting Officer with the above information within 180 days of the award date in Block 27 of the Assistance Agreement Cover Page.

c. In addition to the information in paragraph b. above, for each sub-grant and loan that has an estimated cost greater than $2,000,000, the recipient must submit for approval by the Contracting Officer, a SF424A Budget Information – Nonconstruction Programs, and PMC 123.1 Cost Reasonableness Determination for Financial Assistance (available at http://www.eere-pmc.energy.gov/forms.aspx).

22. JUSTIFICATION OF BUDGET COSTS

a. In the original application, the recipient did not provide sufficient information to justify the approval or release of funds for the proposed activities. In order to receive reimbursement for the costs associated with the activities listed in the approved Statement of Project Objectives (SOPO), a justification for all proposed costs must be submitted to the DOE Contracting Officer.

b. The Recipient must provide justification for the following costs:

   Personnel Costs:
   The Recipient must submit cost justification for the following personnel costs: $44,124 (Activity #4 – Outreach and Education) for approval by the Contracting Officer.

   Fringe Benefit Costs:
   When the Recipient submits a cost justification for the above listed personnel costs: The corresponding Fringe Benefit costs for Activity #4: Outreach and Education totaling $8,560 will be released.

   Contractual Costs:
   1. The recipient shall provide the following information for each individual or company that will receive EECBG funding, regardless of dollar amount:
   - Name

- DUNS Number
- Award Amount
- Statement of work including applicable activities
- NEPA documentation, as applicable

2. In addition to the information in paragraph 1. above, for each individual or company that has an estimated cost greater than $2,000,000, the Recipient must submit a separate SF424A Budget Information – Nonconstruction Programs, and Budget Justification. The DOE Contracting Officer may require additional information concerning these individuals or companies prior to providing written approval.

Other Direct Costs:
The Recipient must submit cost justification for the following other direct costs: Activity #3: Energy Efficiency on Main Street Program, $155,000; and Activity #6: Revolving Loan Fund Pilot, $631,824 for approval by the Contracting Officer.

c. Upon written notification and/or approval by the Contracting Officer, the Recipient may then receive payment for the activities listed in the approved SOPO for allowable costs incurred in accordance with the payment provisions contained in the Special Terms and Conditions of this agreement. These written notifications and/or approvals will be incorporated into the award by formal modification at a future date.

23. ADVANCE UNDERSTANDING CONCERNING PUBLICLY FINANCED ENERGY IMPROVEMENT PROGRAMS

The parties recognize that the Recipient may use funds under this award for Property-Assessed Clean Energy (PACE) loans, Sustainable Energy Municipal Financing, Clean Energy Assessment Districts, Energy Loan Tax Assessment Programs (ELTAPS), or any other form or derivation of Special Taxing District whereby taxing entities collect payments through increased tax assessments for energy efficiency and renewable energy building improvements made by their constituents. The Department of Energy intends to publish "Best Practices" or other guidelines pertaining to the use of funds made available to the Recipient under this award pertaining to the programs identified herein. By accepting this award, the Recipient agrees to incorporate, to the maximum extent practicable, those Best Practices and other guidelines into any such program(s) within a reasonable time after notification by DOE that the Best Practices or guidelines have been made available. The Recipient also agrees, by its acceptance of this award, to require its sub-recipients to incorporate to the maximum extent practicable the best practices and other guideline into any such program used by the sub-recipient.

24. SPECIAL PROVISIONS RELATING TO WORK FUNDED UNDER AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (May 2009)

Preamble

The American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, (Recovery Act) was enacted to preserve and create jobs and promote economic recovery, assist those most impacted by the recession, provide investments needed to increase economic efficiency by spurring technological advances in science and health, invest in transportation, environmental protection, and other infrastructure that will provide long-term economic benefits, stabilize State and local government budgets, in order to minimize and avoid reductions in essential services and counterproductive State and local tax increases. Recipients shall use grant funds in a manner that maximizes job creation and economic benefit.

The Recipient shall comply with all terms and conditions in the Recovery Act relating generally to governance, accountability, transparency, data collection and resources as specified in Act itself and as discussed below.

Recipients should begin planning activities for their first tier subrecipients, including obtaining a DUNS number (or updating the existing DUNS record), and registering with the Central Contractor Registration (CCR).

Be advised that Recovery Act funds can be used in conjunction with other funding as necessary to complete projects, but tracking and reporting must be separate to meet the reporting requirements of the Recovery Act and related guidance. For projects funded by sources other than the Recovery Act, Contractors must keep separate records for Recovery Act funds and to ensure those records comply with the requirements of the Act.

The Government has not fully developed the implementing instructions of the Recovery Act, particularly concerning specific procedural requirements for the new reporting requirements. The Recipient will be provided these details as they become available. The Recipient must comply with all requirements of the Act. If the recipient believes there is any inconsistency between ARRA requirements and current award terms and conditions, the issues will be referred to the Contracting Officer for reconciliation.

Definitions

For purposes of this clause, Covered Funds means funds expended or obligated from appropriations under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5. Covered Funds will have special accounting codes and will be identified as Recovery Act funds in the grant, cooperative agreement or TIA and/or modification using Recovery Act funds. Covered Funds must be reimbursed by September 30, 2015.

Non-Federal employer means any employer with respect to covered funds -- the contractor, subcontractor, grantee, or recipient, as the case may be, if the contractor, subcontractor, grantee, or recipient is an employer; and any professional membership organization, certification of other professional body, any agent or licensee of the Federal government, or any person acting directly or indirectly in the interest of an employer receiving covered funds; or with respect to covered funds received by a State or local government, the State or local government receiving the funds and any contractor or subcontractor receiving the funds and any contractor or subcontractor of the State or local government; and does not mean any department, agency, or other entity of the federal government.

Recipient means any entity that receives Recovery Act funds directly from the Federal government (including Recovery Act funds received through grant, loan, or contract) other than an individual and includes a State that receives Recovery Act Funds.

Special Provisions

A. Flow Down Requirement

Recipients must include these special terms and conditions in any subaward.

B. Segregation of Costs

Recipients must segregate the obligations and expenditures related to funding under the Recovery Act. Financial and accounting systems should be revised as necessary to segregate, track and maintain these funds apart and separate from other revenue streams. No part of the funds from the Recovery Act shall be commingled with any other funds or used for a purpose other than that of making payments for costs allowable for Recovery Act projects.

C. Prohibition on Use of Funds

None of the funds provided under this agreement derived from the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may be used by any State or local government, or any private entity, for any casino or other gambling establishment, aquarium, zoo, golf course, or swimming pool.

D. Access to Records

With respect to each financial assistance agreement awarded utilizing at least some of the funds appropriated or otherwise made available by the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, any representative of an appropriate inspector general appointed under section 3 or 8G of the Inspector General Act of 1988 (5 U.S.C. App.) or of the Comptroller General is authorized --

(1) to examine any records of the contractor or grantee, any of its subcontractors or subgrantees, or any State or local agency administering such contract that pertain to, and involve transactions that relate to, the subcontract, subcontract, grant, or subgrant; and

(2) to interview any officer or employee of the contractor, grantee, subgrantee, or agency regarding such transactions.

E. Publication

An application may contain technical data and other data, including trade secrets and/or privileged or confidential information, which the applicant does not want disclosed to the public or used by the Government for any purpose other than the application. To protect such data, the applicant should specifically identify each page including each line or paragraph thereof containing the data to be protected and mark the cover sheet of the application with the following Notice as well as referring to the Notice on each page to which the Notice applies:

Notice of Restriction on Disclosure and Use of Data
The data contained in pages ---- of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data here to the extent provided in the award. This restriction does not limit the Government's right to use or disclose data obtained without restriction from any source, including the applicant.

Information about this agreement will be published on the Internet and linked to the website www.recovery.gov, maintained by the Accountability and Transparency Board. The Board may exclude posting contractual or other information on the website on a case-by-case basis when necessary to protect national security or to protect information that is not subject to disclosure under sections 552 and 552a of title 5, United States Code.

F. Protecting State and Local Government and Contractor Whistleblowers.

The requirements of Section 1553 of the Act are summarized below. They include, but are not limited to:

Prohibition on Reprisals: An employee of any non-Federal employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing, including a disclosure made in the ordinary course of an employee's duties, to the Accountability and Transparency Board, an inspector general, the Comptroller General, a member of Congress, a State or Federal regulatory or law enforcement agency, a person with supervisory authority over the employee (or other person working for the employer who has the authority to investigate, discover or terminate misconduct), a court or grant jury, the head of a Federal agency, or their representatives information that the employee believes is evidence of:

- gross management of an agency contract or grant relating to covered funds;
- a gross waste of covered funds;
- a substantial and specific danger to public health or safety related to the implementation or use of covered funds;
- an abuse of authority related to the implementation or use of covered funds; or
- as violation of law, rule, or regulation related to an agency contract (including the

competition for or negotiation of a contract) or grant, awarded or issued relating to covered funds.

Agency Action: Not later than 30 days after receiving an inspector general report of an alleged reprisal, the head of the agency shall determine whether there is sufficient basis to conclude that the non-Federal employer has subjected the employee to a prohibited reprisal. The agency shall either issue an order denying relief in whole or in part or shall take one or more of the following actions:

- Order the employer to take affirmative action to abate the reprisal.
- Order the employer to reinstate the person to the position that the person held before the reprisal, together with compensation including back pay, compensatory damages, employment benefits, and other terms and conditions of employment that would apply to the person in that position if the reprisal had not been taken.
- Order the employer to pay the employee an amount equal to the aggregate amount of all costs and expenses (including attorneys' fees and expert witnesses' fees) that were reasonably incurred by the employee for or in connection with, bringing the complaint regarding the reprisal, as determined by the head of a court of competent jurisdiction.

Nonenforceability of Certain Provisions Waiving Rights and remedies or Requiring Arbitration: Except as provided in a collective bargaining agreement, the rights and remedies provided to aggrieved employees by this section may not be waived by any agreement, policy, form, or condition of employment, including any predispute arbitration agreement. No predispute arbitration agreement shall be valid or enforceable if it requires arbitration of a dispute arising out of this section.

Requirement to Post Notice of Rights and Remedies: Any employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, shall post notice of the rights and remedies as required therein. (Refer to section 1553 of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, www.Recovery.gov, for specific requirements of this section and prescribed language for the notices.).

G. <u>Reserved</u>

H. <u>False Claims Act</u>

Recipient and sub-recipients shall promptly refer to the DOE or other appropriate Inspector General any credible evidence that a principal, employee, agent, contractor, sub-grantee, subcontractor or other person has submitted a false claim under the False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict of interest, bribery, gratuity or similar misconduct involving those funds.

I. <u>Information in Support of Recovery Act Reporting</u>

Recipient may be required to submit backup documentation for expenditures of funds under the Recovery Act including such items as timecards and invoices. Recipient shall provide copies of backup documentation at the request of the Contracting Officer or designee.

J. Availability of Funds

Funds obligated to this award are available for reimbursement of costs until 36 months after the award date.

K. Additional Funding Distribution and Assurance of Appropriate Use of Funds

Certification by Governor – For funds provided to any State or agency thereof by the American Reinvestment and Recovery Act of 2009, Pub. L. 111-5, the Governor of the State shall certify that: 1) the state will request and use funds provided by the Act; and 2) the funds will be used to create jobs and promote economic growth.

Acceptance by State Legislature -- If funds provided to any State in any division of the Act are not accepted for use by the Governor, then acceptance by the State legislature, by means of the adoption of a concurrent resolution, shall be sufficient to provide funding to such State.

Distribution -- After adoption of a State legislature's concurrent resolution, funding to the State will be for distribution to local governments, councils of government, public entities, and public-private entities within the State either by formula or at the State's discretion.

L. Certifications

With respect to funds made available to State or local governments for infrastructure investments under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, the Governor, mayor, or other chief executive, as appropriate, certified by acceptance of this award that the infrastructure investment has received the full review and vetting required by law and that the chief executive accepts responsibility that the infrastructure investment is an appropriate use of taxpayer dollars. Recipient shall provide an additional certification that includes a description of the investment, the estimated total cost, and the amount of covered funds to be used for posting on the Internet. A State or local agency may not receive infrastructure investment funding from funds made available by the Act unless this certification is made and posted.

25. REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT

(a) This award requires the recipient to complete projects or activities which are funded under the American Recovery and Reinvestment Act of 2009 (Recovery Act) and to report on use of Recovery Act funds provided through this award. Information from these reports will be made available to the public.

(b) The reports are due no later than ten calendar days after each calendar quarter in which the Recipient receives the assistance award funded in whole or in part by the Recovery Act.

(c) Recipients and their first-tier subrecipients must maintain current registrations in the Central Contractor Registration (*http://www.ccr.gov*) at all times during which they have active federal awards funded with Recovery Act funds. A Dun and Bradstreet Data Universal Numbering System (DUNS) Number (*http://www.dnb.com*) is one of the requirements for registration in the Central Contractor Registration.

(d) The recipient shall report the information described in section 1512(c) of the Recovery Act using the reporting instructions and data elements that will be provided online at *http://www.FederalReporting.gov* and ensure that any information that is pre-filled is corrected or updated as needed.

26. NOTICE REGARDING THE PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS -- SENSE OF CONGRESS

It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available under this award should be American-made.

*Special Note: Definitization of the Provisions entitled, "REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009" and "REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009" will be done upon definition and review of final activities.

27. REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

(a) *Definitions.* As used in this award term and condition—

(1) *Manufactured good* means a good brought to the construction site for incorporation into the building or work that has been—

(i) Processed into a specific form and shape; or

(ii) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

(2) *Public building and public work* means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties,

breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.

(3) *Steel* means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) *Domestic preference.* (1) This award term and condition implements Section 1605 of the American Recovery and Reinvestment Act of 2009 (Recovery Act) (Pub. L. 111–5), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States except as provided in paragraph (b)(3) of this section and condition.

(2) This requirement does not apply to the material listed by the Federal Government as follows:

To Be Determined

(3) The award official may add other iron, steel, and/or manufactured goods to the list in paragraph (b)(2) of this section and condition if the Federal Government determines that—

(i) The cost of the domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the cost of the overall project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) *Request for determination of inapplicability of Section 1605 of the Recovery Act* . (1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(3) of this section shall include adequate information for Federal Government evaluation of the request, including—

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;

(B) Unit of measure;

(C) Quantity;

(D) Cost;

(E) Time of delivery or availability;

(F) Location of the project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(3) of this section.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, and/or manufactured goods material shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods is noncompliant with section 1605 of the American Recovery and Reinvestment Act.

(d) *Data.* To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the Recipient shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	**Unit of measure**	**Quantity**	**Cost (dollars)***
Item 1:			
Foreign steel, iron, or	________	________	________

manufactured good			
Domestic steel, iron, or manufactured good	_________	_________	_________
Item 2:			
Foreign steel, iron, or manufactured good	_________	_________	_________
Domestic steel, iron, or manufactured good	_________	_________	_________

List name, address, telephone number, email address, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

*Include all delivery costs to the construction site.

28. REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

(a) *Definitions.* As used in this award term and condition—

Designated country — (1) A World Trade Organization Government Procurement Agreement country (Aruba, Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Republic of), Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United Kingdom;

(2) A Free Trade Agreement (FTA) country (Australia, Bahrain, Canada, Chile, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Israel, Mexico, Morocco, Nicaragua, Oman, Peru, or Singapore); or

(3) A United States-European Communities Exchange of Letters (May 15, 1995) country: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom.

Designated country iron, steel, and/or manufactured goods — (1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a manufactured good that consist in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different manufactured good distinct from the materials from which it was transformed.

Domestic iron, steel, and/or manufactured good — (1) Is wholly the growth, product, or manufacture of the United States; or

(2) In the case of a manufactured good that consists in whole or in part of materials from another country, has been substantially transformed in the United States into a new and different manufactured good distinct from the materials from which it was transformed. There is no requirement with regard to the origin of components or subcomponents in manufactured goods or products, as long as the manufacture of the goods occurs in the United States.

Foreign iron, steel, and/or manufactured good means iron, steel and/or manufactured good that is not domestic or designated country iron, steel, and/or manufactured good.

Manufactured good means a good brought to the construction site for incorporation into the building or work that has been—

(1) Processed into a specific form and shape; or

(2) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

Public building and *public work* means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) *Iron, steel, and manufactured goods.* (1) The award term and condition described in this section implements—

(i) Section 1605(a) of the American Recovery and Reinvestment Act of 2009 (Pub. L. 111–5) (Recovery Act), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States; and

(ii) Section 1605(d), which requires application of the Buy American requirement in a manner consistent with U.S. obligations under international agreements. The restrictions of section 1605 of the Recovery Act do not apply to designated country iron, steel, and/or manufactured goods. The Buy American requirement in section 1605 shall not be applied where the iron, steel or manufactured goods used in the project are from a Party to an international agreement that obligates the recipient to treat the goods and services of that Party the same as domestic goods and services. This obligation shall only apply to projects with an estimated value of $7,443,000 or more.

(2) The recipient shall use only domestic or designated country iron, steel, and manufactured goods in performing the work funded in whole or part with this award, except as provided in paragraphs (b)(3) and (b)(4) of this section.

(3) The requirement in paragraph (b)(2) of this section does not apply to the iron, steel, and manufactured goods listed by the Federal Government as follows:

To Be Determined

(4) The award official may add other iron, steel, and manufactured goods to the list in paragraph (b)(3) of this section if the Federal Government determines that—

(i) The cost of domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, and/or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the overall cost of the project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) *Request for determination of inapplicability of section 1605 of the Recovery Act or the Buy American Act.* (1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(4) of this section shall include adequate information for Federal Government evaluation of the request, including—

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;

(B) Unit of measure;

(C) Quantity;

(D) Cost;

(E) Time of delivery or availability;

(F) Location of the project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(4) of this section.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, or manufactured goods shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other appropriate actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds, as appropriate, by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods other than designated country iron, steel, and/or manufactured goods is noncompliant with the applicable Act.

(d) *Data.* To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the applicant shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	**Unit of measure**	**Quantity**	**Cost (dollars)***

Item 1:			
Foreign steel, iron, or manufactured good	________	________	________
Domestic steel, iron, or manufactured good	________	________	________
Item 2:			
Foreign steel, iron, or manufactured good	________	________	________
Domestic steel, iron, or manufactured good	________	________	________

List name, address, telephone number, email address, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

*Include all delivery costs to the construction site.

29. WAGE RATE REQUIREMENTS UNDER SECTION 1606 OF THE RECOVERY ACT

(a) Section 1606 of the Recovery Act requires that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to the Recovery Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code.

Pursuant to Reorganization Plan No. 14 and the Copeland Act, 40 U.S.C. 3145, the Department of Labor has issued regulations at 29 CFR parts 1, 3, and 5 to implement the Davis-Bacon and related Acts. Regulations in 29 CFR 5.5 instruct agencies concerning application of the standard Davis-Bacon contract clauses set forth in that section. Federal agencies providing grants, cooperative agreements, and loans under the Recovery Act shall ensure that the standard Davis-Bacon contract clauses found in 29 CFR 5.5(a) are incorporated in any resultant covered contracts that are in excess of $2,000 for construction, alteration or repair (including painting and decorating).

(b) For additional guidance on the wage rate requirements of section 1606, contact your awarding agency. Recipients of grants, cooperative agreements and loans should direct their initial inquiries concerning the application of Davis-Bacon requirements to a particular federally assisted project to the Federal agency funding the project. The Secretary of Labor retains final coverage authority under Reorganization Plan Number 14.

30. RECOVERY ACT TRANSACTIONS LISTED IN SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS AND RECIPIENT RESPONSIBILITIES FOR INFORMING SUBRECIPIENTS

(a) To maximize the transparency and accountability of funds authorized under the American Recovery and Reinvestment Act of 2009 (Pub. L. 111–5) (Recovery Act) as required by Congress and in accordance with 2 CFR 215.21 "Uniform Administrative Requirements for Grants and Agreements" and OMB Circular A–102 Common Rules provisions, recipients agree to maintain records that identify adequately the source and application of Recovery Act funds. OMB Circular A–102 is available at *http://www.whitehouse.gov/omb/circulars/a102/a102.html.*

(b) For recipients covered by the Single Audit Act Amendments of 1996 and OMB Circular A–133, "Audits of States, Local Governments, and Non-Profit Organizations," recipients agree to separately identify the expenditures for Federal awards under the Recovery Act on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SF–SAC) required by OMB Circular A–133. OMB Circular A–133 is available at *http://www.whitehouse.gov/omb/circulars/a133/a133.html.* This shall be accomplished by identifying expenditures for Federal awards made under the Recovery Act separately on the SEFA, and as separate rows under Item 9 of Part III on the SF–SAC by CFDA number, and inclusion of the prefix "ARRA-" in identifying the name of the Federal program on the SEFA and as the first characters in Item 9d of Part III on the SF–SAC.

(c) Recipients agree to separately identify to each subrecipient, and document at the time of subaward and at the time of disbursement of funds, the Federal award number, CFDA number, and amount of Recovery Act funds. When a recipient awards Recovery Act funds for an existing program, the information furnished to subrecipients shall distinguish the subawards of incremental Recovery Act funds from regular subawards under the existing program.

(d) Recipients agree to require their subrecipients to include on their SEFA information to specifically identify Recovery Act funding similar to the requirements for the recipient SEFA described above. This information is needed to allow the recipient to properly monitor subrecipient expenditure of ARRA funds as well as oversight by the Federal awarding agencies, Offices of Inspector General and the Government Accountability Office.

31. DAVIS-BACON ACT AND CONTRACT WORKHOURS AND SAFETY STANDARD ACT

Definitions: For purposes of this provision, "Davis Bacon Act and Contract Work Hours and Safety Standards Act," the following definitions are applicable:

(1) "Award" means any grant, cooperative agreement or technology investment agreement made with Recovery Act funds by the Department of Energy (DOE) to a Recipient. Such Award must require compliance with the labor standards clauses and

wage rate requirements of the Davis-Bacon Act (DBA) for work performed by all laborers and mechanics employed by Recipients (other than a unit of State or local government whose own employees perform the construction) Subrecipients, Contractors, and subcontractors.

(2) "Contractor" means an entity that enters into a Contract. For purposes of these clauses, Contractor shall include (as applicable) prime contractors, Recipients, Subrecipients, and Recipients' or Subrecipients' contractors, subcontractors, and lower-tier subcontractors. "Contractor" does not mean a unit of State or local government where construction is performed by its own employees."

(3) "Contract" means a contract executed by a Recipient, Subrecipient, prime contractor, or any tier subcontractor for construction, alteration, or repair. It may also mean (as applicable) (i) financial assistance instruments such as grants, cooperative agreements, technology investment agreements, and loans; and, (ii) Sub awards, contracts and subcontracts issued under financial assistance agreements. "Contract" does not mean a financial assistance instrument with a unit of State or local government where construction is performed by its own employees.

(4) "Contracting Officer" means the DOE official authorized to execute an Award on behalf of DOE and who is responsible for the business management and non-program aspects of the financial assistance process.

(5) "Recipient" means any entity other than an individual that receives an Award of Federal funds in the form of a grant, cooperative agreement, or technology investment agreement directly from the Federal Government and is financially accountable for the use of any DOE funds or property, and is legally responsible for carrying out the terms and conditions of the program and Award.

(6) "Subaward" means an award of financial assistance in the form of money, or property in lieu of money, made under an award by a Recipient to an eligible Subrecipient or by a Subrecipient to a lower-tier subrecipient. The term includes financial assistance when provided by any legal agreement, even if the agreement is called a contract, but does not include the Recipient's procurement of goods and services to carry out the program nor does it include any form of assistance which is excluded from the definition of "Award" above.

(7) "Subrecipient" means a non-Federal entity that expends Federal funds received from a Recipient to carry out a Federal program, but does not include an individual that is a beneficiary of such a program.

(a) Davis Bacon Act

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and, without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, *provided* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The Contracting Officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the Contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *provided* that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The Department of Energy or the Recipient or Subrecipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the Contract, the Department of Energy, Recipient, or Subrecipient, may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The Contractor shall submit weekly for each week in which any Contract work is performed a copy of all payrolls to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit the payrolls to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit them to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a “Statement of Compliance,” signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the

classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 3729 of title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Department of Energy or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees—

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.

(6) Contracts and Subcontracts. The Recipient, Subrecipient, the Recipient's, and Subrecipient's contractors and subcontractor shall insert in any Contracts the clauses contained herein in(a)(1) through (10) and such other clauses as the Department of Energy may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of the paragraphs in this clause.

(7) Contract termination: debarment. A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Recipient, Subrecipient, the Contractor (or any of its subcontractors), and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No Contractor or subcontractor contracting for any part of the Contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The Department of Energy or the Recipient or Subrecipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
(4) Contracts and Subcontracts. The Recipient, Subrecipient, and Recipient’s and Subrecipient’s contractor or subcontractor shall insert in any Contracts, the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(5) The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the Contract for all laborers and mechanics, including guards and watchmen, working on the Contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records to be maintained under this paragraph shall be made available by the

Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Department of Energy and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

(c) Recipient Responsibilities for Davis Bacon Act

(1) On behalf of the Department of Energy (DOE), Recipient shall perform the following functions:

(i) Obtain, maintain, and monitor all Davis Bacon Act (DBA) certified payroll records submitted by the Subrecipients and Contractors at any tier under this Award;

(ii) Review all DBA certified payroll records for compliance with DBA requirements, including applicable DOL wage determinations;

(iii) Notify DOE of any non-compliance with DBA requirements by Subrecipients or Contractors at any tier, including any non-compliances identified as the result of reviews performed pursuant to paragraph (ii) above;

(iv) Address any Subrecipient and any Contractor DBA non-compliance issues; if DBA non-compliance issues cannot be resolved in a timely manner, forward complaints, summary of investigations and all relevant information to DOE;

(v) Provide DOE with detailed information regarding the resolution of any DBA non-compliance issues;

(vi) Perform services in support of DOE investigations of complaints filed regarding noncompliance by Subrecipients and Contractors with DBA requirements;

(vii) Perform audit services as necessary to ensure compliance by Subrecipients and Contractors with DBA requirements and as requested by the Contracting Officer; and

(viii) Provide copies of all records upon request by DOE or DOL in a timely manner.

(d) Rates of Wages

The prevailing wage rates determined by the Secretary of Labor can be found at http://www.wdol.gov/.

RESOLUTION NO. ____________

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, TO EXECUTE AN INTERGOVERNMENTAL AGREEMENT BETWEEN THE CITY OF MILWAUKIE AND CLACKAMAS COUNTY FOR AN ENERGY EFFICIENCY AND CONSERVATION BLOCK GRANT [EECBG].

WHEREAS, the City desires to reduce energy consumption and realize reduce energy costs; and

WHEREAS, Clackamas county is offering the City of Milwaukie $100,000 of Energy Efficiency and Conservation Block Grant (EECBG) funding; and

WHEREAS, the city of Milwaukie has identified projects that qualify for such funding;

NOW, THEREFORE, BE IT RESOLVED that the City Manager is authorized to enter into an agreement with Clackamas County to conduct these projects, subject to the terms in the agreement, and that the City is authorized to fund the projects form the Facilities Repair Fund with the understanding that Clackamas County will reimburse all funds.

Introduced and adopted by the City Council on .

This resolution is effective on .

____
Jeremy Ferguson, Mayor

ATTEST:

APPROVED AS TO FORM:
Jordan Ramis PC

____
Pat DuVal, City Recorder

____
City Attorney

Document3 (Last revised 09/18/07)

Agenda Item: 6.B.
Meeting Date: 11/1/11

COUNCIL AGENDA ITEM SUMMARY

Issue/Agenda Title: Metropolitan Area Communication Commission Membership

Prepared By: JoAnn Herrigel
Dept. Head Approval: JoAnn Herrigel
City Manager Approval: Bill Monahan
Reviewed by City Manager: October 19, 2011

ISSUE BEFORE THE COUNCIL
Approve a resolution requesting Milwaukie's membership in the Metropolitan Area Communication Commission.

STAFF RECOMMENDATION
Staff recommends approval of the resolution.

KEY FACTS & INFORMATION SUMMARY
MACC has provided the City with draft IGA elements and requested Milwaukie's decision before November 9, 2011 to allow time for MACC staff to prepare a staff report for their Commission for consideration at their November 16, 2011 meeting.

OTHER ALTERNATIVES CONSIDERED
City staff management of franchise negotiations and PEG access programming.

CITY COUNCIL GOALS
None associated with this action.

ATTACHMENT LIST
Resolution
MACC membership IGA elements
Comparison table

FISCAL NOTES
MACC membership would result in the City paying MACC 28% of our annual Comcast franchise fee and, following the adoption of a new cable franchise in 2014, conveying all of our PEG fee funds to MACC for pooling with other MACC member community PEG funds.

To: Mayor and City Council

Through: Bill Monahan, City Manager

From: JoAnn Herrigel

Subject: MACC membership

Date: November 1, 2011

ACTION REQUESTED

Approve a resolution requesting membership in the Metropolitan Area Communication Commission (MACC.)

HISTORY OF PRIOR ACTIONS AND DISCUSSIONS

October 4, 2011 Council approved a resolution authorizing the Mayor to sign a letter requesting that MACC consider Milwaukie as a full member jurisdiction.

October 18, 2011 Council met with staff in work session to discuss MACC membership issues and alternatives.

BACKGROUND

The Metropolitan Area Communication Commission and Milwaukie have had a relationship for almost 10 years through an intergovernmental agreement through which MACC provides certain cable franchise administrative services for the City. The current agreement provides the City certain services including, but not limited to:

- Day to day customer response regarding technical or billing problems with cable service.
- Financial auditing of franchise required payments.
- Monitoring of Comcast contract obligations to Milwaukie and regulatory follow-up where necessary.
- Technical assistance with legal and financial issues regarding Comcast's relationship with and obligations to the City.
- In addition to assisting the City with cable-related issues, MACC staff also provides support and information regarding other City franchise issues related to Qwest and provides telecommunication-related legislative monitoring during legislative sessions.

For this work, the City makes an annual payment to MACC of twenty-three percent (23%, or about $57,000) of its Comcast franchise fees.

The agreement between the City and MACC does not provide for the more complex, time consuming, and costly task of the negotiation and renewal of its franchise agreement with Comcast. It also does not provide for management services for Public, Educational and Government (PEG) access programming. The City currently contracts with Willamette Falls TV, for about $50,000/year, for Public and Government access program management.

At the October 18 Council meeting, staff shared with Council a table outlining staffing, financial and logistical impacts of MACC membership. This table compared MACC membership to City-coordinated Comcast cable franchise negotiations and Public, Educational and Government Access programming and channel management. This table is attached here for reference.

Following the October 18 work session, MACC conveyed to the City the attached list of elements of an IGA they would propose to sign with the City. If the proposed elements meet with Council's approval, MACC staff would meet with their Commission on November 16 to request authorization to: 1) Formalize an IGA with Milwaukie, and 2) Take that IGA to all 15 MACC member communities for approval over the following months. The intent would be to have all prospective member IGAs completed by the spring of 2012 in time to begin the ascertainment process for the Comcast franchise negotiations.

Council should note that City staff may conduct additional meetings regarding this action following the submittal of this staff report. Any proposed changes to this staff report or the attachments will be passed on to Council as soon as possible.

CONCURRENCE
The City Manager, the Community Services Director and the Finance Director encourage Council's approval of the attached resolution

FISCAL IMPACT
MACC membership would result in the City paying MACC 28% (18% for franchise administration and 10% for PEG management) of our annual Comcast franchise fee and conveying all of our PEG fee funds to MACC for pooling with other MACC member community PEG funds.

WORK LOAD IMPACTS
MACC membership would reduce staff time spent on Comcast franchise negotiations from .50 to .10 FTE per year for at least two years. Longer term, coordination of Public, Government and Educational access program management would be minimized.

ALTERNATIVES
Deny approval of the attached resolution and direct staff to allocate City staff time to Comcast negotiations and PEG access management or pursue some other course of action.

ATTACHMENTS
1. Resolution
2. Draft IGA elements
3. Table comparing MACC and City management

ATTACHMENT 1

RESOLUTION NO. ____________

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON requesting membership in the Metropolitan Area Communication Commission (MACC.)**.**

WHEREAS, the Metropolitan Area Communication Commission (MACC) and Milwaukie have had a relationship for almost 10 years through an intergovernmental agreement; and

WHEREAS, MACC has provided certain cable franchise administrative services for the City including franchise fee auditing, customer service and monitoring of Comcast franchise responsibilities; and

WHEREAS, the City of Milwaukie is interested in joining MACC as a full member jurisdiction in order to benefit from all of MACC member services; and

NOW, THEREFORE, BE IT RESOLVED that the City of Milwaukie formally requests inclusion as a member of the Metropolitan Area Communication Commission (MACC.)**.**

Introduced and adopted by the City Council on November 1, 2011.

This resolution is effective on November 1, 2011.

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Jeremy Ferguson, Mayor

ATTEST:

APPROVED AS TO FORM:
Jordan Ramis PC

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Pat DuVal, City Recorder

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City Attorney

ATTACHMENT 2

Following is a list of elements that MACC would propose to include in an Intergovernmental agreement with the City:

City Allocation
In lieu of the obligations of the Member Jurisdictions set forth in Exhibit A of the MACC IGA, the City agrees to allocate twenty eight percent (28%) of its franchise fees for both MACC administration and support for PEG Access. The City and MACC agree that this amount approximates the contribution made by Member Jurisdictions as set forth in Exhibit A of the MACC IGA. The City will direct the cable operator(s) to remit all franchise fees to MACC, which may retain twenty eight percent (28%) of the franchise fees and shall within 30 days from the due date of the cable operator(s)' payment, forward the remainder to the City .

Additional Costs
The City agrees to pay any and all costs associated with restructuring physical telecommunications equipment, specifically any necessary connections between City facilities and the cable system(s) to enable the cablecast of PEG programming to and from MACC's facility and/or the cable operator.

Government Meeting Coverage
MACC agrees to provide staff necessary to produce live coverage of up to a combined total of four City Council meetings and work sessions per month at no cost to the City, provided that the meetings are held at facilities with cameras and other necessary equipment. MACC agrees to produce additional meetings beyond that required in the previous sentence at a cost of $ 35.00 per hour, provided that MACC receives sufficient advance notice and a trained staff person is available. If two staff persons are required, the hourly rate above will be $ 55.00.

Video Production Services
MACC routinely provides each member jurisdiction with a number of video productions highlighting events or aspects of the jurisdiction, usually referred to as "deliverables." The City will be offered a number of these "deliverables" on the same proportionate basis (according to franchise fees produced within the jurisdiction) as other MACC jurisdictions. For FY 12, MACC will provide up to one (1) deliverable to the City.

Effective Date
This Agreement shall take effect only after an affirmative recommendation from the MACC Commission and the unanimous consent of all Member Jurisdictions as required by Sections 4.D(2) and 6.B of the MACC IGA. This Agreement shall take effect on the date of last signature below, provided that the requirements in the preceding sentence have been met.

Term and Termination
Consistent with Section 6 of the MACC IGA, this agreement is perpetual and shall remain in effect until (i) the MACC IGA is terminated as provided therein; (ii) the City withdraws from MACC as provided in Sections 4.D and 6.D of the MACC IGA; or (iii) the MACC IGA is amended to include the City as a party thereto and such amendment is duly executed by the City

ATTACHMENT 3

Following is a table comparing the costs of MACC membership to the City's costs without MACC membership. These costs assume a two year negotiation process, which is optimistic. They also assume the maximum staff time, annual franchise fees of $240,000, and PEG revenue of $58,000. Totals reflect the sum of the red highlighted numbers.

(The table presented at the October 18 meeting mistakenly included 5 quarterly payments – and so, was not typical. This table has been adjusted to reflect "typical" annual franchise and PEG fee revenue.

	City Controlled	**MACC Membership**
Cost of Negotiations	$50,000 total (at least) ($25,000/yr – 2 years) (Technical and Legal Consultants)	$43,200/year (18% of franch fee)
On-going Franchise Admin	$55,200/year to MACC 23% of franch fee (unless taken on by staff)	Included in 18%
FTEs to monitor negotiations	.25-.50 FTE/year $67.47/hour = $70,169/yr Other projects displaced	.10 FTE/year $67.47/hour $ 14,034 /yr No projects displaced
Government Access Services (City meeting coverage)	If WFTV stays open –City to pay $30,000/yr to WFTV, renegotiate with WFTV to cover City Council and all other City meetings	No cost for Council Mts Plan Com and other $35.00 /hour (Approx - $5,320/yr)
Government Broadcast	Live and replayed regularly	May be live and replayed regularly
Public Access Studio use and programming	If WFTV stays open – City to use Or City facility and pay $20,000/yr or renegotiate If no WFTV – either drop	Use studio in Beaverton Programming on Public Access Channels

	programming or identify new studio, relocate feed and contract for studio and programming operation (cost unknown)	$24,000 (10% of franchise fee)
PEG Fees	Kept by City – used for Gov, Pub and Educ capital equip	Given to MACC and polled with other member community PEG funds. Designated PEG access providers would apply for grants.
Educational Access	Same as now	Same as now
Educational Grant	$20,000/yr from PEG	$20,000/yr from other source (Fran Fee or general fund)
TOTALS	**$ 220,369/year (all)** **$150,200 (w/o staff hrs)**	**$ 106,554 /year (all)** **$92,520 (w/o staff hrs)**

Agenda Item: 6.C.
Meeting Date: 11/1/11

COUNCIL AGENDA ITEM SUMMARY

Issue/Agenda Title: Boards, Commissions, and Committees Alternate Program

Prepared By: Teri Bankhead
Dept. Head Approval: Bill Monahan
City Manager Approval: Bill Monahan
Reviewed by City Manager: 10/24/11

Issue Before the Council
Council is considering creating a program whereby alternates may be selected from an interview pool for a board, commission or committee. The alternate would serve in a non-voting capacity alongside the active board members, would stay informed of board issues and would become familiar with the board and the City in order to learn and become better prepared to serve the board should they be later appointed to serve as a voting member.

Staff Recommendation
Staff recommends establishing this program that would permit alternates to participate in boards, commissions and committees.

Key Facts & Information Summary
Council and staff realize the value of having committed citizens who are willing to volunteer their time and experience for a City board. There may be times that there are more qualified applicants than positions available. In these situations when one or more applicants not appointed to a board is qualified, the availability of an alternate program would allow one additional person to still participate on a board, commission or committee. Alternates could serve as non-voting members who would receive meeting packet materials, be invited to attend meetings and functions, remain current on board issues, and gain knowledge of the board and the City. Over time, the experience as an alternate would prepare them to fill a vacancy should a vacancy occur during their term as alternate.

If both the Council and the alternate feel the board is a good fit for them, then Council could consider them for the next vacancy, whether mid-term or at term expiration. Council could decide whether this is in the form of immediate appointment or through a competitive outreach and interview process. The alternate appointment would be for one year with the option for Council to consider additional time, depending on the board term limits.

Other Alternatives Considered
Council may decide to leave the board, commission, and committee appointment process as is and not create a program to select alternates.

City Council Goals
Goal 7: Improve collaboration between Council, Boards, Commissions, Committees, and Neighborhood District Associations
Goal: Cultivate other avenues of two-way communication between City and citizens

Attachment List
1. Staff Report
2. Resolution

Fiscal Notes
Minimal additional staff time for alternate scheduling, resolution preparation and database management

To: Mayor and City Council

Through: Bill Monahan, City Manager

From: Teri Bankhead, Asst. to the City Manager

Subject: Boards, Committees and Commissions Alternate Program

Date: November 1, 2011

Action Requested

Approve the attached resolution establishing an alternate program for Boards, Commissions and Committees ("Board").

History of Prior Actions and Discussion

September 20, 2011: During discussion of appointing members to the Budget Committee, Mayor Ferguson explained that there were more applicants than there were vacancies. He raised the idea of creating an alternate program for Boards, Commissions and Committees. Council asked staff to place this on the work session for September 27 for further discussion.

September 27, 2011: Council briefly discussed creating an alternate program whereby applicants who interviewed for a board vacancy, yet were not selected, could be considered by Council as an alternate. Council asked staff to research this, including what programs other cities might have, and to bring more information back at a future work session.

Background

The City has nine boards, commissions and committees in addition to the City Council. While recruiting qualified and available volunteers is often challenging, there are times when there are more qualified applicants for a board vacancy than there are positions available. The Budget Committee, for example, had three openings in 2011, and there were initially seven applicants. After two withdrew their applications, the remaining five were interviewed. Council and staff realize the value of having committed citizens who are willing to volunteer their time and experience to a City board. While there may be times that all qualified applicants are appointed to a board, at other times there might be more qualified candidates than openings. Establishing an alternate program would allow one additional person to still participate in a board, commission or committee, although in a limited capacity. Alternates could serve as non-voting members, attend meetings and functions, remain current on board issues, and gain knowledge of the board and the City. Over time the person's participation would prepare them to fill a vacancy when one becomes available. If both the Council and the alternate determine the board is a good fit for them, then Council could consider them for the next vacancy, whether mid-term or at term expiration. Council could decide whether this is in the form of immediate appointment or through a competitive outreach and interview process. <u>The alternate appointment would be for one year. The Mayor, with board input, may extend the alternate's term in consideration that most boards have term limits of two years, the Budget Committee has three year terms and the Planning Commission has four year terms</u>.

Council asked staff to research if other cities have a similar program. Staff contacted some colleagues in other cities and placed a request on the Emerging Local Government Leaders listserv and received a number of responses. Ten cities responded as well as Clackamas County. Most cities do not have such a process, however, the cities that do have similar programs are Tigard, Sandy and Lake Oswego. West Linn is also developing a Leadership Academy that would serve to recruit and train citizens to help prepare them for board and committee involvement.

Tigard: The alternate serves a one year term, and participates in all aspects of the committee except voting. If a vacancy occurs, the alternate fills the remainder of the vacated term. If term limits are applicable, the completion of a vacated term does not count as the first term. At the end of the year term (assuming no vacancies need to be filled during the year), this provides a chance for the committee and citizen to see if they would be a good fit for each other when the next interviews are held the following year. Generally, they have to reapply. This is not a written rule and there have been exceptions to the general practice.

Lake Oswego: As part of the board appointment process, up to two alternates are selected. They are included in the appointment resolution and are asked to serve if a vacancy comes up during the year. They are only "active" for one year. At the next regular recruitment they have to reapply just as any other applicant.

Sandy: There is an alternate to the Planning Commission. This person has no voting authority but occasionally will comment on issues that come before the Commission. Sandy does not have a specific policy governing alternates, however, they indicate they would most likely have the alternate reapply at the end of a term. This might also depend on how much interest was received from other community members for the vacancy.

Concurrence
City Manager concurs with and is familiar with such a program.

Fiscal Impact
n/a

Work Load Impacts
There would be minimal impact on the Assistant to the City Manager's workload, which would require additional time for alternate scheduling, to draft resolutions and manage the board database.

Alternatives

1. Do not create an alternate program and continue to advertise and recruit applicants as vacancies become available.

Attachments

1. Resolution

ATTACHMENT 2

RESOLUTION NO. ____________

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON, ESTABLISHING A PROGRAM TO SELECT ALTERNATES FOR BOARDS, COMMISSIONS AND COMMITTEES ("BOARD").

WHEREAS, Milwaukie Charter Section 26 provides that "the mayor, with consent of Council, shall appoint the various committees provided for under the rules of the council or otherwise and fill all vacancies in committees of the council from that body;" and

WHEREAS, vacancies for boards, commissions and committees are advertised in the Milwaukie Pilot, on the City website, through neighborhood district associations, word of mouth, and other community connections; and

WHEREAS, there are occasions where the number of member applications received exceeds the number of vacant positions on a board, commission or committee; and

WHEREAS, City Council recognizes the importance and value of citizen participation in its boards and wants to continue to encourage involvement in City activities; and

WHEREAS, the City of Milwaukie City Council proposes to establish a program whereby qualified individuals who apply for a board vacancy yet are not selected for appointment, may instead be appointed to such board as an alternate to serve for one year in a non-voting capacity, with the Mayor's discretion and board input to extend the alternate's appointment term; and

WHEREAS, an alternate may be considered to fill a vacancy on a board mid-term or at term expiration, as recommended by the Mayor and with board member input.

NOW, THEREFORE, the City Council of the City of Milwaukie, Oregon resolves that:

Section 1: An alternate program for boards, commissions and committees is established. An alternate will serve a board in a non-voting capacity and is expected to attend board meetings and keep informed of board issues.

Section 2: An alternate will serve one year, however, this term may be extended at the discretion of the Mayor with board input.

Section 3: An alternate may be appointed to a board vacancy mid-term or at term expiration, at the discretion of the Mayor with board input.

Section 4: This resolution takes effect immediately upon passage.

Introduced and adopted by the City Council on November 1, 2011.

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Jeremy Ferguson, Mayor

ATTEST:

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Pat DuVal, City Recorder

APPROVED AS TO FORM:
Jordan Ramis PC

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City Attorney