

**Report to/Rapport au :**

**Planning Committee  
Comité de l'urbanisme**

**and Council / et au Conseil**

**September 14, 2012  
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CITY WIDE / À L'ÉCHELLE DE LA VILLE

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**SUBJECT: PERMANENT SIGNS ON PRIVATE PROPERTY –  
AMENDMENTS TO PERMIT DIGITAL BILLBOARD SIGNAGE**

**OBJET : ENSEIGNES PERMANENTES SUR LES PROPRIÉTÉS PRIVÉES –  
MODIFICATIONS AFIN DE PERMETTRE DES PANNEAUX  
D'INFORMATION NUMÉRIQUES**

### **REPORT RECOMMENDATIONS**

**That the Planning Committee recommend Council:**

- 1. Amend the Permanent Signs on Private Property By-law 2005-439, as amended, to allow digital billboards, subject to the regulations, substantially in the form as contained in Document 1, effective December 1, 2012; and**
- 2. Close the digital billboard pilot project, and direct the Planning and Growth Management Department to explore other emerging sign technologies with a view to establishing pilot programs if warranted, and return to Council in 2015 with an update on digital billboards and recommendations with respect to other emerging digital technologies in signs.**

## **RECOMMANDATIONS DU RAPPORT**

**Que le Comité de l'urbanisme recommande au Conseil :**

- 1. de modifier le règlement no 2005-439, Règlement sur les enseignes permanentes sur les propriétés privées, pour permettre l'utilisation de panneaux d'affichage numériques à compter du 1er décembre 2012, sous réserve de règlements conformes en substance à ceux figurant dans le Document 1; et**
- 2. de mettre un terme au projet pilote sur les panneaux d'affichage numériques et demande aux Services de l'Urbanisme et de la Gestion de la croissance d'examiner et de mettre à l'essai d'autres nouvelles technologies pour les enseignes; et qu'un compte rendu concernant les panneaux d'affichage numériques ainsi que des recommandations relativement à d'autres technologies numériques émergentes pour les enseignes soient présentés au Conseil en 2015.**

### **EXECUTIVE SUMMARY**

#### **Assumptions and Analysis**

The City of Ottawa currently prohibits digital signage in the Permanent Signs on Private Property By-law 2005-439. In 2010, Council approved a pilot project that allowed the installation of four digital billboard screens on three City-owned properties, and directed staff to evaluate these signs and make recommendations as to whether digital signage should be permitted in Ottawa. The pilot was a response to a number of factors:

- requests from local businesses to use digital signs;
- applications from the sign industry to allow digital billboards;
- a recognition that the City's sign regulations were dated in terms of considering new signage technologies;
- revenue-generation possibilities of leasing City properties for digital billboards;
- opportunities for more effective delivery of public information; and
- the potential to support businesses and economic development.

The evaluation consisted of a review of digital billboard regulations in other municipalities, a literature review, and consultation with residents and stakeholders. It also included a technical review of the pilot digital billboards that included an examination of traffic safety data and operational characteristics, which resulted in numerous modifications since the installation of the signs in March 2011. An analysis was also undertaken to estimate the maximum potential number of digital billboards that could be expected in Ottawa, given the information available. Under the proposed regulations, 22 of the 393 documented conventional billboard faces in the City could be converted to digital.

This multi-faceted evaluation of the digital billboard pilot project has provided the required information to support the recommendation that the Permanent Signs on

Private Property By-law 2005-439 be amended to allow digital billboards, subject to new location and operational restrictions and regulations as further described in this report.

### Financial Implications

The analysis of the existing conventional billboards determined that 22 would be eligible for conversion to digital. The conversion would result in incremental revenues of \$700/year per conversion. The number of conversions per year is unknown and therefore the additional annual revenues cannot be determined at this time. Once determined, the additional revenues will be brought forward in Building Code Services – Other Permits and Compliance Reporting draft operating budget. It is anticipated that the additional revenues in 2013 will be sufficient to fund the \$4,000 one-time cost of the handheld luminance meter required for enforcement.

### Public Consultation/Input

Public consultation for the digital billboard pilot project included: two online surveys, two meetings with stakeholder groups, a presentation to the Business Advisory Committee, and the posting of draft proposals on the project website with email notices to residents and stakeholders who have been involved in the project with an invitation to provide comments. Overall, feedback was mixed; with the majority of comments related to concerns about safety and appearance, and some appreciation for improved aesthetics and public information.

## RÉSUMÉ

### **Hypothèses et analyse**

Actuellement, le règlement n° 2005-439, *Règlement sur les enseignes permanentes sur les propriétés privées*, interdit l'utilisation des panneaux d'affichage numériques à Ottawa. En 2010, le Conseil a approuvé un projet pilote qui autorisait l'installation de quatre panneaux d'affichage numériques sur trois propriétés de la Ville. Le Conseil avait en outre chargé le personnel des Services du Code du bâtiment d'évaluer ces panneaux et de présenter des recommandations indiquant si l'utilisation d'enseignes numériques devait être permise à Ottawa. La tenue de ce projet pilote était attribuable à différents facteurs :

- des demandes de la part d'entreprises locales d'utiliser des enseignes numériques
- des demandes de la part de l'industrie des panneaux d'affichage numériques d'autoriser l'utilisation des enseignes numériques
- la reconnaissance du fait que le moment était venu d'envisager, dans le cadre de la réglementation sur les enseignes de la Ville, l'utilisation de nouvelles technologies en matière de panneaux d'affichage
- la possibilité d'obtenir des recettes par la location de propriétés de la Ville pour l'installation d'enseignes numériques
- des occasions de communiquer plus efficacement les informations au public
- un potentiel pour soutenir des entreprises et le développement économique

L'évaluation consistait en une analyse de la réglementation en matière d'enseignes numériques d'autres municipalités, une revue de la littérature et une consultation auprès de résidents et d'intervenants. L'évaluation comprenait en outre un examen technique des enseignes numériques mises à l'essai qui incluait une analyse de données sur la sécurité routière et de caractéristiques relatives à la fonctionnalité. Cet examen technique a donné lieu à plusieurs modifications depuis l'installation des panneaux d'affichage numériques, en mars 2011. De plus, une analyse a été réalisée pour estimer le nombre maximal d'enseignes numériques pouvant être installées à Ottawa, selon les informations disponibles. Aux termes de la réglementation proposée, 22 des 393 faces d'enseignes traditionnelles recensées à Ottawa pourraient être converties à la technologie numérique. Cette évaluation à multiples facettes du projet pilote sur les panneaux d'affichage numériques a fourni les informations nécessaires pour appuyer la recommandation de modification du règlement n° 2005-439, *Règlement sur les enseignes permanentes sur les propriétés privées*, en vue d'autoriser l'utilisation des enseignes numériques, sous réserve de nouvelles restrictions liées à l'emplacement et au fonctionnement.

### **Répercussions financières**

L'analyse des panneaux d'affichage conventionnels existants a permis de déterminer que 22 seraient admissibles à la conversion au numérique. La conversion à la technologie numérique engendrerait des recettes supplémentaires de 700 \$ par année par conversion. Comme il est impossible de savoir combien de conversions seraient effectuées annuellement, les recettes annuelles supplémentaires ne peuvent donc pas être déterminées à ce stade. Dès que cela sera fait, les recettes supplémentaires seront constatées dans le budget préliminaire de fonctionnement des Services de Code du bâtiment – Autres permis et rapports de conformité. Il est prévu que les recettes supplémentaires en 2013 suffiront à financer le coût unique de 4 000 \$ de l'appareil de mesure/luminancemètre portatif nécessaire à l'application du règlement.

### **Consultation publique et commentaires**

La consultation publique au sujet du projet pilote sur les panneaux d'affichage numériques a été réalisée au moyen de deux sondages en ligne, de deux rencontres avec des groupes d'intervenants, d'une présentation devant le Comité consultatif sur les affaires et par la diffusion de la version provisoire des propositions sur le site Web du projet avec l'envoi, aux résidents et intervenants qui participaient au projet, d'un courriel d'avis et d'une invitation à transmettre des commentaires. Dans l'ensemble, les commentaires reçus sont divisés; la majorité des commentaires font mention d'inquiétudes concernant la sécurité et l'apparence des enseignes ainsi que d'une certaine satisfaction quant à l'amélioration de l'esthétique et de l'information au public.

### **BACKGROUND**

Outdoor commercial advertising has evolved with new technologies in signage, from paintings on barns and buildings to paper posters, neon signs, plastic panels, vinyl posters, and most recently, digital screens. To date, the City of Ottawa has had limited exposure to digital signs because of strict regulations in the Permanent Signs on Private

Property By-law 2005-439 that prohibit electronic and moving images in signs. However, over the last few years, the City has received a number of inquiries about digital signs, and despite the restrictions, a few digital signs have appeared in violation of the By-law. Meanwhile, a digital wall sign on the IKEA building was approved as a variance to By-law 2005-439. Until recently, the City had also been anticipating an application for a digital wall sign at the Ottawa Convention Centre, which would have been assessed as a waiver to By-law 2005-439. But in April 2012 it was announced that this project had been suspended indefinitely.

The current ad-hoc process to consider digital signs that are not allowed in By-law 2005-439 by means of a minor variance application or waiver to the By-law cannot be relied upon to deal with the anticipated growth in applications for new digital signs. Therefore, now is the time to update the City's position with respect to emerging technologies in signage in order to offer greater clarity to businesses and residents.

### 1.1 Digital Sign Technology

Digital sign technology uses electronic screens with light emitting diodes (LED), similar to flat-panel televisions, in order to display computer-programmed content, also called sign copy. The sign copy can be programmed to change at different intervals, and the screen brightness is adjustable according to time of day or night, or ambient light conditions.

Digital technology is used in many different sign types, from small digital message centre signs that display scrolling text or static images, to digital wall signs and digital billboards that display static images or can even feature animation or video. Digital message centre signs tend to be used to complement a larger ground sign as part of on-premise signage, which is directly related to the activity on the site at which the sign is located. For example, some restaurants use a recognizable ground sign for identification purposes, coupled with a smaller message centre sign to advertise specials or information that is specific to that location (see McDonald's sign below). Digital wall signs are also on-premise signs, such as a business logo sign or a screen advertising goods or services sold on site, like the IKEA sign (see image further below). Digital billboards, on the other hand, display off-premise, or third-party advertising that is not related to the site at which the sign is located. Note that digital billboards tend to be stand-alone ground signs, but could also be affixed to a building like a wall sign.



*Images above, from left to right: digital message centre with digital image; digital message centre with scrolling text; digital wall sign; digital billboard.*



*Image above: IKEA digital wall sign (circled), 2685 Iris Street.*

Other types of digital signs are appearing indoors, such as advertisement screens in elevators, or images projected onto interior walls or windows. When used entirely inside buildings, these technologies are not regulated by the City and therefore are not considered in this report.

## 1.2 Current Regulations

Outdoor digital signs generally fall under the City's Permanent Signs on Private Property By-law 2005-439, as amended (henceforth referred to as By-law 2005-439 or the By-law), which regulates sign types and sets out specific parameters on matters such as maximum size, height and placement of signs on a property. Signs are regulated geographically across the city according to five different sign districts that are aligned with the Zoning By-law. For instance, sign regulations are most restrictive in District 1 (e.g. residential area) and least restrictive District 4 (e.g. commercial area). District 5, on the other hand, applies almost exclusively to rural non-residential areas.

By-law 2005-439 does not permit digital signs because of provisions which specifically prohibit electronic messages (Sections 170 (2) and 191) and also because digital signs are not listed as a permitted sign type in Sections 8 and 9 of the By-law. However, the two exceptions are digital scrolling text as part of message centre signs and pre-menu video signs for drive-thru restaurants. If digital signs are to be allowed in Ottawa, the By-law would have to be amended to add new permitted sign types, and include specific provisions regulating their location and operation.

## 1.3 Digital Billboard Pilot Project

On August 24, 2010, City Council waived Section 170(2) of By-law 2005-439 pertaining to illumination restrictions prohibiting electronic messages on billboard signs in order to permit digital LED billboard signs as a pilot project. City Council also directed staff to undertake a review of digital billboard signs, including public consultation and the implementation of the pilot project for a maximum two-year period.

A request for proposal (RFP) was issued for the digital billboard pilot project in the fall of 2010. In January 2011, an agreement was finalized with the successful bidder. Under the pilot project, four digital billboard screens were installed in March 2011 at three locations – two in the City’s designated urban area; and one in a rural location just outside the urban area:

- Tremblay Road at St Laurent Boulevard
- Carling Avenue at Kirkwood Avenue
- Carp Road, southeast of Highway 417

The Tremblay Road at St. Laurent Boulevard location has two billboard screens on one structure facing north and south. The pilot project provided an opportunity to test and review this new technology on City properties in order to consider whether it should be permitted in Ottawa, and if so, under what regulations or standards.



*Images above: four digital billboards in pilot project, from top left to bottom right, 2110 Carp Road; 1443-1447 Carling Ave; 529 Tremblay Road (north-facing); 529 Tremblay Road (south-facing).*

Shortly after installation, a questionnaire was launched and hosted on the project website, [ottawa.ca/digitalbillboards](http://ottawa.ca/digitalbillboards), which remained active until June, 2011. The results of the voluntary questionnaire provided useful guidance that led to some changes to the operation of the billboards in October, 2011. A second questionnaire was conducted the same way, and remained active for the month of November, 2011. It provided additional feedback, which was again used to make changes to the billboards’ operation. The results of the questionnaires are discussed in greater detail in Document 2.

The digital billboard pilot project only dealt with this one type of digital signage. Other types of digital signs are still untested in the city. Given the large number of sign types

that could be converted to digital (e.g. ground signs, wall signs, and message centre signs), further review is required to develop an approach to manage the potential proliferation of digital signs. Therefore only digital billboards are considered in this report. Other types of digital signs are proposed to be considered as part of the next review of digital signage in Ottawa.

#### 1.4 Digital Billboard Regulations in Other Municipalities

The technological evolution to digital signage is taking place in cities throughout the world. Many municipalities already have evaluated digital signs and revised or created new By-laws to regulate their use. Since Ottawa is comparatively late to consider digital signs, this provided the opportunity to conduct an inter-jurisdictional scan, or survey of other municipalities, in order to learn from their experiences and approaches used to regulate digital signs. Highlights of the findings are listed below, and a more detailed summary can be found in Document 3.

Information was collected from 21 municipalities with digital billboard regulations across North America, including 12 Canadian cities. The following were the general findings:

- Digital billboards are typically limited to certain parts of the city, such as commercial zones, industrial areas, or entertainment districts, while they are prohibited from other areas, like residential zones or heritage districts;
- Municipalities commonly use setbacks to buffer digital billboards from sensitive land uses, such as residential areas or schools, complicated traffic areas such as intersections and highway ramps, and from other signs or billboards to separate them to reduce sign clutter;
- Sign brightness thresholds are typically measured in luminance (i.e. nits or candela per square metre), with widely varying limitations – but most commonly addressing night-time brightness;
- All municipalities regulate the minimum dwell time of digital images on digital billboards, which is the minimum duration of a static digital image, and it falls within a range of five to 10 seconds, with six seconds being most common;
- A maximum transition time between images is often specified, and usually limited to a maximum of one second, with many municipalities also prohibiting attention-grabbing effects between images, such as flashing or fading;
- The maximum height and size of signs vary widely by municipality and even location within a municipality, but tend to be smaller in Canadian cities compared to U.S. cities;
- A few municipalities require digital signs to be shut off late at night (e.g. 11 p.m. to 6 a.m.);
- In order to minimize digital sign proliferation, some American cities only allow new digital billboards, or the conversion of conventional billboards to digital billboards, where existing conventional billboards can be removed and replaced with a smaller number of digital billboards; and
- Some jurisdictions prohibit digital billboards altogether for aesthetic reasons, which is discussed in greater detail in the Impact on Public Realm section of the Literature Review in Document 4.

## 1.5 Literature Review

A literature review was undertaken as part of the pilot project to examine the state of the research on digital signage. Academic peer-reviewed journals were relied upon as much as possible, particularly for studies on traffic engineering and human factors engineering, which is a field that combines human kinetics, design, and systems engineering. When academic articles were not available, studies commissioned by government agencies were considered to be more reliable than articles commissioned by the signage industry or lobby groups. Although the literature review examined the broader spectrum of digital signs, most of the information was specific to digital billboards.

Traffic safety is the most common concern around digital signage and makes up the largest body of literature related to digital signs, and particularly digital billboards. Much of the literature on traffic safety attempts to evaluate the potential safety risks posed by driver distraction as a result of digital billboards. Conclusions vary considerably, but generally show some potential for an increase in safety risks that should be mitigated by location and operational restrictions.

The literature review also covers screen brightness and timing of image changes, which is a common concern that relates back to the issue of driver distraction and traffic safety, but also has implications on nearby sensitive land uses and the quality of the public realm. The most reputable study recommends a maximum night-time brightness of 300 cd/m<sup>2</sup>, and a timing of image changes such that no passing driver will see more than one image change. Impacts on the public realm were also examined, such as concerns around sign proliferation and the aesthetic implications of digital signage.

Options to mitigate these impacts are discussed, including strategies from other jurisdictions, a range of location and operational restrictions, replacement ratios that permit digital billboards on the condition of removing conventional billboards, mandatory late-night screen shut-off times, and even the complete prohibition of billboards in some cities and states for scenic and aesthetic reasons. Finally, a section on future directions in signage looks ahead to emerging technologies and comments on the changing nature of the industry and its implications for signage regulations. For a summary of the literature review see Document 4.

## DISCUSSION

### 2.1 Why Consider Digital Billboard Signs?

The digital billboard pilot project was initiated in order to respond to requests from the billboard industry and businesses to allow the use of digital technology in billboard signs. More generally, it stems from a growing recognition that the City's sign regulations are lagging behind technological and business trends. There are also other reasons to consider digital signs, such as support for businesses and economic development and the effective delivery of public information. The merits of each of these two points are discussed below.

### 2.1.1 Support for Businesses and Economic Development

As the costs of digital sign technology continue to decrease, businesses and institutions are increasingly looking to digital signs to serve their various advertising needs. There are clear business advantages to digital signs:

- Efficiency gains through the programming of multiple changing advertisements increases the number of advertisements that can be displayed in a given time period, which increases revenues for sign and property owners and enhances exposure for businesses that use this technology;
- Reduced maintenance costs for sign companies and decreased paper, ink, toner, and glue waste, and less vehicular emissions because signs are remotely programmed and do not require printing of paper or vinyl sign copy and associated labour, vehicles and equipment to manually change and dispose of the advertisements;
- Flexibility advantages by targeting a given audience at a specific time of day (e.g. coffee advertisements in the morning, restaurant advertisements in the evening);
- Just in time information – ability to display up to the minute information, such as available inventory, prices, or special events.

The ability to target advertising is not only favourable to businesses, but also to consumers in general, who stand to benefit from reduced redundancy in advertising and more precise information. For example, a commuter driving home from work has little use for information about a breakfast special at a restaurant, but may benefit from learning about a grocery special or new movie release. Since digital signs offer these advantages to both businesses and consumers, they have the support of many business groups, as well as the City's Economic Development and Innovation Department.

### 2.1.2 Public Information

The ability to quickly and easily change the sign copy, or sign messaging, on digital signs offers the opportunity for municipalities to use a portion of the screen time to deliver public information. This was tested on the existing four digital billboards by requiring that one advertising segment per minute of operation be dedicated to City messages. This free advertising time for the City, which in 2011 was estimated to be valued at about \$70,000, was used to deliver important notices and share information about City programs, such as fire safety messages, public health initiatives, and recreation opportunities.

Digital billboards also can be used to display emergency messages, such as amber alerts or evacuations. The pilot digital billboards can display these types of messages at any time and for any duration necessary, as determined by the Director of Emergency and Protective Services. A similar arrangement is in place in most municipalities with digital billboards. One notable example of this feature occurred in 2007 in Minneapolis,

Minnesota, when a bridge on the I-35W freeway collapsed and within minutes the City was able to display a message on a nearby privately owned digital billboard to alert oncoming motorists.

## 2.2 Technical Review and Testing

The digital billboard pilot project provided the opportunity to undertake a technical review of the safety, brightness, and timing of images on the four existing pilot digital billboards in real-world operating conditions. Staff worked with colleagues in Traffic Management and Operational Support and with the regional representative of Pattison Outdoor Advertising (Pattison) to conduct field tests and review different operational standards on the pilot digital billboards. Pattison co-operated fully with the City's requests and their assistance has resulted in better regulations for the community and the entire outdoor advertising industry. The technical review also benefited from the advice of Ottawa Police Services and from staff in Public Works, and Corporate Partnerships.

### 2.2.1 Traffic Safety

The City is not alone in its concern with the potential traffic safety implications of digital billboards. The Ministry of Transportation (MTO) plays a role in assessing the safety of signs since the Ministry has jurisdiction over signs that are within 400 metres of any limit of a Provincial highway. MTO's Corridor Signing Policy requires those signs to meet Provincial sign policies and obtain a sign permit from the Ministry. This provides an additional layer of review with regards to traffic safety for sites within 400 metres of a Provincial highway, such as all three sites of the pilot digital billboards.

The most important part of the technical review was related to traffic safety. Detailed collision data was obtained to compare the number of collisions in the vicinity of the pilot digital billboards before and after they were installed. The historical data considers collisions at and around the nearest intersection of the pilot digital billboards over a period of 10 years (between 2001-2010) before they were installed. The 2011 data is the only data available since the pilot billboards were installed in March 2011, and the 2012 data is not yet available. However, the 2012 collisions in the vicinity of the pilot digital billboards have been monitored by the City and will be verbally reported at Planning Committee. All data originates from Police Services collision reports and was then collected by the City. Since the original collision reports do not always note the precise location of a collision, for the purposes of this analysis, the intersection collisions capture those incidents that took place directly at the intersection, as well as those collisions that took place on adjacent road segments, roughly within one hundred metres of the intersection.

Note that none of the collisions resulted in a fatality, and 19 per cent resulted in some form of personal injury. The table below summarizes the number of collisions in the vicinity of the nearest intersections to the pilot digital billboards:

<b>Intersection</b>	<b>Range of Number of Yearly Collisions 2001-2010</b> (low to high number of collisions)	<b>Average Number of Yearly Collisions 2001-2010</b> (before installation of digital billboards)	<b>Number of Collisions 2010</b> (last year before installation of digital billboards)	<b>Number of Collisions 2011</b> (after installation of digital billboards)
Carling Ave at Kirkwood Ave	21-34	27	34	30
St Laurent Boulevard at Tremblay Road	7-26	19	23	22
Carp Road at Westbrook Road	1-5	3	3	4

The historical collision data at the intersection of Carling Ave at Kirkwood Ave is quite consistent, with a range of 21 to 34 collisions per year and an average of 27 collisions per year. In 2011, there were 30 collisions, which is higher than the average over the last 10 years, but lower than in 2010 (before the digital billboard was installed) when there were 34 collisions. Collisions at the intersection of St Laurent Boulevard at Tremblay Road during the same period are less consistent, with a wider range of seven to 26 collisions per year and an average of 19 collisions per year. The 2011 data indicates a total of 22 collisions. This is higher than the average over the previous 10 years, but one fewer than in 2010, the previous year when there were no digital billboards at this location. At the intersection of Carp Road at Westbrook Road, the number of yearly collisions between 2001-2010 is consistently much lower, with a range of one to five collisions per year and an average of three collisions per year. In 2011, there were four collisions, which is one more than in 2010 before the pilot billboard was installed.

At all three locations, the number of collisions after the digital billboards were installed are within the historical range, but are also slightly higher than the 10-year average (2001-2010). Perhaps more revealing is the fact that at all three locations, the number of collisions in 2011 is very similar to the number in 2010, with even fewer collisions in 2011 at two of the three locations.

While it is helpful to compare the 2011 collision data with that of the previous 10 years, the 2011 collision data alone can only be considered to be an early indication. It will take multiple years of data since the date of the installation of the digital billboards in order to accurately compare the before and after collision data and draw any correlations or assumptions about the impact of digital billboards on traffic safety. Despite these data limitations, the available traffic safety data to date suggests that the digital billboards have not had a strong effect one way or another on the number of collisions in the vicinity of the intersections closest to the pilot digital billboards.

Nevertheless, the City will continue to collect and monitor the collision data near the digital billboards.

### 2.2.2 Screen Brightness

The brightness of the digital billboard screens was a central part of the technical review. Brightness of digital screens is typically measured in luminance, which refers to the intensity of light that is emitted from a particular area, and is measured in candela per square metre ( $\text{cd/m}^2$ ). When the pilot digital billboards were initially installed, the maximum brightness levels were set to default industry standards of approximately  $6500 \text{ cd/m}^2$  between sunrise and sunset, and  $500 \text{ cd/m}^2$  between sunset and sunrise. Brightness is also controlled with the use of light sensors that automatically adjust to 0.3 foot-candles above ambient light conditions when below these thresholds. The maximum night-time brightness levels since have been reduced three times in response to residents' particular concerns with night-time brightness. First, the brightness was reduced from  $500 \text{ cd/m}^2$  to  $375 \text{ cd/m}^2$  in late October, 2011, then to  $265 \text{ cd/m}^2$  in February, 2012, and once again reduced to  $220 \text{ cd/m}^2$  in April, 2012. That represents a 56 per cent reduction in night-time brightness since the digital billboards were first installed, and is now less bright than the maximum levels recommended by a 2009 study by a lighting expert, Dr. Ian Lewin (see Document 4). In fact, from the survey of other municipalities that was undertaken as part of this study, these night-time brightness levels are now the least bright in Canada. At this brightness level, potential impacts on driver distraction and nearby land uses have been considerably reduced, yet the sign images are still very discernable.

### 2.2.3 Timing of Image Changes

Another important part of the technical review was the establishment of appropriate timing of image changes because it is closely linked to traffic safety and general acceptability of digital billboards. Timing of images is generally considered as two separate issues: the minimum dwell time (MDT), which is the minimum length of time an image or message remains static on a digital sign, and the maximum transition time (MTT), or length of time it takes to change from one image to the next. The purpose of these thresholds is to prohibit rapid changing of images or special effects between images in order to limit driver distraction.

The pilot digital billboards started with a six second MDT and a one second MTT. However, during the first seven months of operation, the billboards also had three separate images per minute of operation that displayed the time and temperature with a dwell time of only two seconds. In November 2011, these short images were removed because they essentially brought the MDT down to two seconds and created unnecessary distractions. However, survey respondents have requested that the time and temperature information be returned, and as a result, it is proposed they be featured simultaneously (e.g. in a footnote) as part of the City messages displayed once per minute of operation. In response to concerns around the potential for driver distraction, in the spring of 2012, the MDT on the pilot digital billboards was increased to 10 seconds, from the previous six seconds. This was determined to be a more appropriate timing that would be less likely to result in driver distraction.

The technical review and testing of the digital billboards demonstrated the value of the pilot project. With the cooperation of the signs owner, Pattison Outdoor Advertising, the City was able to respond to residents' concerns and test different operational characteristics, such as reduced brightness and a lengthened minimum dwell time of static digital images. For additional details on the technical review and testing of the digital billboards, refer to Document 5.

#### 2.2.4 Intersection Location

Police Services has advised that their main concerns about digital billboards are the proximity of the billboards to intersections, the angle at which they are viewed, and the distance from which they are perceived. The Police specifically mentioned that any digital sign at or near an intersection poses a greater risk of distraction, and that intersection related collisions have a higher likelihood of injury because of side impacts and the vulnerability of pedestrians and cyclists. The viewing angle to the billboard was also noted to be important because any sign that is directly facing an intersection may be perceived as important and could compete with traffic signals or signs displaying traffic information. The distance at which the sign is initially perceived also plays a factor, with signs that can be noticed from a greater distance providing less distraction than those that appear suddenly around a corner. It was concluded that digital billboards can be distracting to any driver, but with appropriate mitigation measures, can be made no more distracting than other signs around the city.

#### 2.3 Sign Content

The City does not regulate the content or sign copy (including messaging or colours) of signs, with the exception that billboards on City property are subject to the provisions contained in the Council approved Sponsorship and Advertising policy. The only time the City specifically deals with sign content is if it is determinative of a type of sign. For example, a third party advertisement can only be displayed on billboards, and not on ground signs. While the City can regulate the placement, size, illumination, and type of signs, it must recognize the right to freedom of expression guaranteed by the Canadian Charter of Rights and Freedoms. The advertising industry is also self-regulated through a non-profit body called Advertising Standards Canada, which administers the Canadian Code of Advertising Standards. This code sets the criteria for acceptable advertising and forms the basis for the review and adjudication of consumer and advertising disputes.

#### 2.4 Recommendations

Each of the recommendations are discussed in detail below.

### 2.4.1 Recommendation 1

The evaluation of the digital billboard pilot project has provided practical experience and valuable information needed to make a recommendation on how to regulate this new technology in signage. The examination of By-laws in other municipalities provided a benchmark from which to consider new regulations, while the literature review provided expert opinions that led staff to recommend a careful approach, leading to mitigation measures designed to maintain traffic safety and minimize impacts on sensitive land uses and the public realm.

The technical review and testing of pilot billboards and public feedback helped fine-tune these mitigation measures that resulted in acceptable location and operational restrictions, such as minimum setbacks and maximum brightness regulations. Finally, the traffic safety data indicated that the pilot digital billboards did not so far have a clear impact on the number of nearby traffic collisions.

Therefore, the recommendation to allow digital billboards under strict new regulations is a well-informed, yet cautious position that addresses the potential negative impacts of digital technology in billboards. It allows some opportunities to introduce digital billboards on private properties. This recommendation also supports local businesses who can benefit from improved exposure, and generally contributes to a more modern and urban city image. The recommendation highlights are summarized below:

- limit the use of digital technology in signs to digital billboards that display static images only (no video or animation), with a minimum dwell time of 10 seconds per digital image;
- maximum night-time brightness restrictions that will result in the least bright digital billboards in Canada;
- 100 metre minimum setback to intersections, traffic signals, highway ramps, and rail crossings;
- 300 metre minimum setbacks from sensitive land uses, such as residential and institutional zones, heritage properties, parks, open space and environmental protection zones, and from other digital billboards;
- 500 metre minimum setbacks from parkways and Villages (where village is near the urban boundary); and
- as with conventional billboards, sign permits will be issued for a period of five years, subject to review prior to renewal.

A more detailed discussion about the recommendations is provided below, leading to the amendments to By-law 2005-439, which are identified in bold in Document 1.

### Sign Types

The City is proposing to permit digital billboards, but continue to prohibit other types of digital signage (other than the scrolling text in message centre signs and static digital images in pre-menu video signs for drive-thru restaurants). Since the implementation of the pilot, the City has made a number of operational changes to the billboards to mitigate any negative impacts. As a result, only digital billboards as stand-alone ground

signs will be permitted. Digital billboards affixed to buildings, or digital wall signs, are not permitted at this time because they have not been tested and create concerns around digital sign proliferation and their compatibility with planning objectives.

### Conversion of Conventional Signs to Digital Signs

Currently, conventional billboards are already highly regulated and subject to many location restrictions. The proposed new restrictions for digital billboards, listed below, will further limit potential sites for their installation. An analysis that applies the proposed digital billboard restrictions to existing conventional billboards shows that a relatively small number of these signs would be eligible for conversion to digital billboards in the foreseeable future (see Document 6). Realistically, the number of digital billboards may be even smaller than calculated, since the cost of the technology is still quite high, and only those sites with very high traffic counts would be financially worthwhile from the industry's perspective. Conventional billboard sign owners who wish to convert their billboard to a digital billboard will have to apply for a digital billboard sign permit, which includes a new permit fee.

### Digital Billboard Sign Permits

New conventional billboards are issued sign permits on a five year basis, with possibility for renewals for additional five-year terms. It is proposed that digital billboard sign permits be issued on the same basis, whereby new digital billboards have to be re-assessed and issued new permits every five years. This prevents legal non-conforming billboards from remaining in place in perpetuity (usually because of new development nearby which results in the reduction of setbacks after the permit is issued) and removes the potential for "grandparenting" of digital billboards. In addition, if a digital billboard is determined to be a public safety hazard by the Director of Building Code Services, it can be required to be removed at the sign owner's expense at any time, even before the end of the five year permit term. A digital billboard may be considered to be a public safety hazard if it has been, or has a strong potential to be, a primary cause of a traffic accident.

### Location Restrictions

In addition to the location prohibitions for conventional billboards in By-law 2005-439 (e.g. residential, institutional and open spaces, business parks, and Traditional Mainstreets and Villages designated in Official Plan), digital billboards will not be permitted in the following locations:

- Heritage properties designated under Part IV (individual designation) or Part V (heritage conservation district) of the *Ontario Heritage Act*.
- Hydro corridors – most are zoned O1P, which is subject to a 300 metre setback for digital billboards because some of these spaces are important for recreational or ecological purposes.
- Rural areas – digital billboards prohibited in rural agricultural, commercial and industrial zones (AG, VM, RU, RC, RG, RH, ME and MR zones) with the

exception that digital billboards would be allowed in rural commercial (RC), rural general industrial (RG), and rural heavy industrial (RH) zones on Carp Road, between Highway 417 and Rothbourne Road. A digital billboard has been piloted in this area but not in other rural areas, it is adjacent to the urban boundary, and in addition, there are streetlights along this short section of Carp Road, which reduces the night-time visual impact of digital billboards compared to darker rural roads where digital billboards have not been tested.

Even if a digital billboard is permitted in a particular location (i.e. zone designation), it will be subject to setbacks which may then prohibit its installation on that property. Detailed setbacks for digital billboards were first proposed in a Draft Proposals document that was posted online for a four week comment period in May and June 2012. The “lightshed” concept was introduced, which specifies a cone-shaped area of impact from a proposed digital billboard, within which the presence of certain sensitive land uses would mean that a digital billboard would not be permitted. The length of the lightshed from a digital billboard was initially suggested to be set at 200 metres. But this resulted in concerns from residents, particularly around the visual distraction of the changing of images within this distance from a digital billboard. The difference between a setback of 200 metres and 300 metres was evaluated and it was determined that there was merit in increasing the lightshed to a distance of 300 metres so as to further minimize potential impacts on residential properties. The increase in this setback also reduces the number of conventional billboards that could be converted to digital billboards. A description of the setbacks methodology is described in Document 5, and the full list of setbacks that apply to digital billboards is noted below:

- Lightshed setback that extends 300 metres at a 140 degree angle from each vertical edge (perpendicular to the ground) of a digital billboard screen, plus a 30 metre, 360 degree radius setback from the following:
  - lots zoned residential (R1-R5, RR, RU, RM)
  - lots zoned institutional (I1, I2, RI)
  - heritage properties designated under Part IV (individual designation) or Part V (heritage conservation district) of the *Ontario Heritage Act*
  - Federally designated heritage buildings and National Historic Sites, including the Parliamentary Precinct, Confederation Square, and the Rideau Canal system
- 300 metre, 360 degree radius setback from:
  - other digital billboards (e.g. any two digital billboards must be at least 300 metres apart, and at least 150 metres away from any conventional billboard, as currently required in the By-law)
  - parks, open space, and environmental protection zones (O1 and EP zones)
- 500 metre, 360 degree radius setback:
  - Villages designated in the Official Plan
  - roadways (parkways) identified in By-law 2005-439, Part 11, Section 166 (e.g. Sir John A. Macdonald Parkway, Colonel By Drive), as currently required for conventional billboards)
- Any part of a digital billboard must be located a minimum of 3 metres from any front or rear property line, and any a lot line abutting a street. This is an increase

over the requirements for conventional billboards, which must be a minimum of 1.5 metres from a side or rear lot line and 2 metres from a property line abutting a street.

- Other minor setbacks that deal with the exact location of signs on a property, such as the minimum distance from an interior side property line, and the edge of a driveway, lane or aisle, are proposed to remain the same for digital billboards as for conventional billboards in the By-law.

### Sightlines to Traffic Signals

As pointed out by Police Services and staff in Traffic Management and Operational Support, the positioning of a digital billboard in relation to the road can have an impact on driver distraction and traffic safety. Billboards that are located too close to an intersection or placed at a curve in the road have the potential to be visible by the driver of a motor vehicle as they approach or cross an intersection. This can result in a situation where a digital billboard essentially competes with traffic signals or other traffic information signs, which would be detrimental to traffic safety. As a result, it is recommended that digital billboards be sited and angled in a way that they will not interfere with drivers' sightlines to traffic signals at intersections, to the satisfaction of the Director of Building Code Services. It is recommended that a new setback be introduced specifically for digital billboards such that a minimum 100 metre, 360 degree radius setback would be required from intersections and highway ramps (the nearest intersection of the prolongation of the curb lines), traffic signals (e.g. traffic lights, pedestrian crossings), and at-grade rail crossings.

### Viewing Angle

Digital billboards are designed to be viewed from a maximum angle of 140 degrees from each edge of the screen (see in Document 5: Digital Billboard Setback Methodology). Some of the proposed setbacks are based on the area of visual impact of the screens, which relies on this 140 degree viewing angle and a 300 metre distance from the screen. Therefore, it is important that a maximum 140 degree viewing angle is in place and consistent across all digital billboards. Where a digital billboard has a visual impact beyond 140 degrees from each vertical edge of the screen, the sign owner will be required to install a louver, or blinder, that will limit the maximum viewing angle to 140 degrees from each vertical edge of the billboard. To clarify, the vertical edges of the screen are perpendicular to the ground – and typically considered the right and left side of the billboard, not the top or bottom.

### Operational Restrictions

Digital billboards will be subject to the following operational restrictions:

- Display static images only – no animation, video, movement, or flashing effects are permitted. The use of odours, gases, pyrotechnics, or interactive devices will also be prohibited.
- Operate at a maximum brightness of 6000 cd/m<sup>2</sup> between sunrise and sunset, and a maximum brightness of 220 cd/m<sup>2</sup> between sunset and sunrise. Sunrise

and sunset times will be determined according to the National Research Council of Canada Sunrise/Sunset Calculator:

<http://www.nrcnrc.gc.ca/eng/services/hia/sunrise-sunset.html>.

- In addition to the maximum brightness thresholds, all digital billboards will have to be equipped with ambient light sensors that automatically adjust the brightness levels to no more than 0.3 foot candles above ambient light conditions.
- The transition time between images will have to be instantaneous (less than one second), with no transition effects between images.
- The minimum dwell time of each and any image will be exactly 10 seconds (for a total of six images per minute of operation).
- Sequential images or messages (e.g. back-to-back 10 second images that form one continual advertisement), whether on the same digital billboard, or on more than one digital billboard in a row, will be prohibited.

Given these new location and operation restrictions, including the increase in the lightshed setback from the originally proposed 200 to 300 metres, the digital billboard screens will be allowed to operate 24 hours per day, seven days per week.

#### Emergency and City Messaging

The City is seeking an agreement with digital billboard sign companies to ensure access to screen time for emergency and City messages for any future digital billboards at no cost to the City, as has been the case with digital billboards on City property.

#### Electricity

The electrical supply lines to any digital billboard must be located underground. In some cases, the Director of Building Code Services may approve alternate arrangements for electricity supply.

#### Enforcement

The operational restrictions placed on digital billboards will be enforced by By-law and Regulatory Services Officers. It is expected that the most common need for enforcement action will be related to the operation, rather than the location of these signs, primarily to verify the brightness of the screens and the timing of image changes. The brightness will be verified with a handheld luminance meter (i.e. "nit gun"), which will be purchased at a cost of approximately \$4,000 (see Hiscocks, 2011 in Literature Review References at the end of Document 4), the cost to be offset through digital billboard sign permit fees. By-Law and Regulatory Services has been briefed on this issue and have had the opportunity to test a borrowed luminance meter from the pilot billboards' manufacturer. The timing of image changes will be measured with equipment that is already available, such as a stopwatch or video camera. Another anticipated need for enforcement will be to address the operation of digital signs that are not currently permitted (e.g. digital message centre signs that show changing images or animation).

Failure to comply with any of the digital sign regulations may result in fines for offences, such as exceeding the maximum screen brightness or displaying images that change too quickly. The City could also order the signs to be removed at the sign owner's expense. If the signs are not removed, the City will have the signs removed and invoice the sign owner by adding those costs to their tax roll.

#### Digital Billboard Permit Fee

The existing billboard sign permit fee is \$1,800 per sign face, as set out in By-law 2005-439. The new digital billboard permit fee must also account for the additional staff time required to investigate, evaluate, enforce, and monitor digital billboards. Therefore, the new digital billboard permit fee is proposed to be set at \$2,500 per sign face.

#### Minor Variances

Minor variance applications for digital billboards will continue to follow the sign minor variance process that is currently in place, including consultation with adjacent residents and businesses. Any minor variances to the 100 metre setback to intersections, highways ramps, traffic signals, or rail crossings will be subject to review by City staff in Traffic Management and Operational Support, as well as staff in Roads, Traffic, Operations and Maintenance Branch. The existing sign minor variance application fee is \$1,725, as set out in By-law 2005-439. Given the anticipated additional staff time required to process a sign minor variance application for a digital billboard compared to a conventional billboard, a new sign minor variance for digital billboards is proposed, with a fee set at \$2,500.

#### Amendments to By-law 2005-439

The amendments proposed will be primarily limited to the billboard section of the By-law (Part 11). However, there will also be a few other technical amendments to other sections of the By-law in order to add clarity or specificity, as described in Document 1.

#### 2.4.2 Recommendation 2

Since the City has completed the review of the digital billboard pilot project and amendments are being proposed to By-law 2005-439, it is recommended that the pilot project be closed. The four digital billboards that were part of the pilot will remain in place and will be re-assessed at the end of their five year sign permit in 2016, should there be a request for renewal of the permit.

It is recommended that staff return to Council in 2015 with an update on digital billboards. At that time, the City will benefit from the availability of more detailed empirical data of traffic safety incidents near the City's digital billboard sites, and will have had more experience with digital technology in signs. Since there are new studies initiated on an on-going basis in this emerging field, another reason to revisit the regulations in 2015 is that by then, the Transportation Association of Canada (TAC) will have released a digital signs report with guidelines for municipalities.

The TAC is a non-profit association that acts as a national transportation centre of expertise and is comprised of government transportation departments, municipalities, private sector engineering and consulting firms, academic institutions and trade associations. TAC sponsors transportation research and develops technical guidelines and best practices. A study concerning digital signs will be undertaken with the terms of reference to be finalized in the fall of 2012. The \$125,000 study, of which the City of Ottawa has contributed \$10,000, is titled "Digital and Projected Advertising Display Synthesis of Practices and Application Guideline". Once available, the report and guideline will be reviewed by staff in Traffic Management and Operational Support Branch and Building Code Services Branch in order to determine the need for any modifications to the City's regulations.

It is recommended that staff explore other emerging digital sign technologies, with the potential of establishing other pilot projects, and report back to Council at the same time as the update on digital billboards in 2015. Potential technologies to explore include digital message centre signs with changing digital images, digital projection signs, and urban digital screens in public gathering spaces. There is already growing pressure from businesses and the sign industry to allow these new signs and additional research and testing is needed to determine whether these technologies should be considered, and if so, how they should be regulated.

### RURAL IMPLICATIONS

This report recommends that digital billboards not be permitted in the rural area, primarily in order to maintain the rural character of these areas. In addition, since rural roadways often do not have streetlights and are generally darker than those in the urban area, it is expected that digital billboards would have a greater visual impact in the rural areas at night because of the higher contrast between the lit screens and the surrounding darkness.

The only exception to this recommendation is one short corridor on Carp Road between Highway 417 and Rothbourne Road. This section of roadway is adjacent to the urban area, is characterized by industrial land uses, has streetlights, and has had a pilot digital billboard in place since March, 2011.

### CONSULTATION

Consultation on the digital billboard pilot project began with a media release and an online questionnaire in the spring of 2011, followed by a second questionnaire in November 2011. The first questionnaire received 349 responses, and second received 234 responses. These surveys indicated that respondents were almost equally divided on whether or not they want the City to permit digital billboards. The main concerns were safety and appearance, while top benefits listed were aesthetics and public information. The most commonly desired restrictions were on brightness and hours of operation. Detailed information on the questionnaires, including a breakdown of response rates by ward, can be found in Document 2.

Meetings with targeted stakeholder groups, including industry and business groups, and representatives from interested community groups, took place in January 2012. Feedback from these meetings was posted on the project website to allow each group and the general public the opportunity to view the comments of the groups. The comments revealed a number of concerns from community groups, including potential impacts on residential areas and on the quality of the public realm, and requests for more strict regulations or the complete prohibition of digital signs. The industry and business groups, on the other hand, wanted to see digital signs treated the same way as conventional signs, including reducing some of the initially proposed location and operational restrictions.

The local business community had opportunities to provide input into this study. First, outdoor advertising companies and a representative from all Business Improvement Areas were invited to attend the January 2012 stakeholder meetings. They were then contacted in May 2012 with an invitation to comment on the draft proposals that were posted on the City website at [ottawa.ca/digitalbillboards](http://ottawa.ca/digitalbillboards) and [ottawa.ca/panneaunumerique](http://ottawa.ca/panneaunumerique) in May 2012 for a four week comment period. Although there was a limited response from local businesses, they seemed to be generally supportive of the City's approach to regulating digital billboards, and some inquired about advertising opportunities. Further business input was sought through a presentation to the Business Advisory Committee in April 2012. This presentation resulted in suggestions from local business leaders who sit on the Business Advisory Committee, such as encouraging the City to explore the possibility of allowing additional types of digital signs and in more locations.

All residents who provided contact information during the course of their participation in any of the consultation events, including the questionnaires, were notified of this web posting in May 2012 and invited to provide any further feedback. These consultations provided residents and stakeholders with an opportunity to comment on the draft proposals before they were revised and finalized as recommendations in this report. A total of 99 comments were received between May 16 - June 15, 2012. These comments were overwhelmingly negative in nature and identified concerns such as driver distraction, traffic safety, aesthetic impacts, sign brightness, setback distances, timing of image changes, and environmental considerations. More detailed consultation results can be found in Document 2.

### COMMENTS BY THE WARD COUNCILLORS

Councillors were circulated with information that was posted on the new project website in March 2011. An update document was circulated to Councillors in October 2011, with an overview of results of the spring 2011 questionnaire and the changes that had been made to the operation of the billboards. These changes included the first reduction in night-time screen brightness and modifications to the timing of images to remove the most quickly changing images.

## LEGAL IMPLICATIONS

There are no legal impediments to implementing the recommendations of this report.

## RISK MANAGEMENT IMPLICATIONS

There is a risk that despite the proposed mitigation measures, digital billboards could still pose a distraction to drivers and may contribute to traffic accidents, although no conclusive study or any of the City's data to date have confirmed this possibility. This is why a cautious approach is being taken for the time being, in particular the requirement that the billboards be set back 100 metres from intersections, that the maximum night-time brightness levels be set at 220 cd/m<sup>2</sup> which are the lowest in Canada, and that the minimum 10 second dwell time of the images is equal with the highest in Canada.

## FINANCIAL IMPLICATIONS

The analysis of the existing conventional billboards determined that 22 would be eligible for conversion to digital. The conversion would result in incremental revenues of \$700/year per conversion. The number of conversions per year is unknown and therefore the additional annual revenues cannot be determined at this time. Once determined, the additional revenues will be brought forward in Building Code Services – Other Permits and Compliance Reporting draft operating budget. It is anticipated that the additional revenues in 2013 will be sufficient to fund the \$4,000 one-time cost of the handheld luminance meter required for enforcement.

## ACCESSIBILITY IMPACTS

There are no accessibility implications associated with this report.

## ENVIRONMENTAL IMPLICATIONS

The environmental implications of digital billboards are discussed below, including issues of energy consumption, waste management, light pollution, and overall environmental impacts.

### Energy Consumption

There were both concerns and compliments about the environmental impacts of digital billboards in the responses to the City's surveys. The primary environmental concern with digital billboards is with energy consumption. Digital billboards are typically lit by light emitting diodes, or LEDs. This type of lighting is known to be much more energy efficient than incandescent bulbs, and can be even more efficient than fluorescent or metal halide (i.e. streetlight) lights. Billboard manufacturers are quick to point out the energy efficiency of digital billboards on a lighting intensity per watt basis compared to other lighting sources, or on a per-ad basis compared to conventional billboards. However, the vast size of digital billboards and the fact that they typically operate 24 hours per day results in considerable electricity consumption. Each pilot billboard at

three locations in Ottawa operates at an average power consumption of 1.8 kWh, which is just over four times that of a conventional lit billboard, or four of the brightest City streetlights (0.4 kWh).

In an effort to promote energy conservation, the City considered a requirement to completely shut off all digital billboards late at night, such as between 11 p.m. and 6 a.m. But the billboard screens operate at a much lower brightness between sunset and sunrise, and as a result, the overall energy saved from turning off the screens while they are at their dimmest would be minimal.

### Waste Management

Another environmental issue that was raised was the waste caused by the frequent printing and disposal of conventional billboard sign copy – and its associated paper, vinyl, ink, toner, and glue consumption and disposal. Since the conventional billboard signs are regularly replaced, there are also vehicular emissions from their shipping, installation, and maintenance. Therefore the digital billboards may present an advantage in terms of physical waste and vehicular emissions associated with a billboard over its lifecycle.

Yet another issue with digital billboards is the disposal and recycling of electronic waste at the end of the billboard lifecycle. While this is a legitimate concern, this is addressed through Provincial Legislation, a regulation and program known as the *Waste Diversion Act*, the Ontario Waste Electrical and Electronic Equipment Regulation, and the Ontario Waste Electrical and Electronic Equipment Program Plan.

### Light Pollution

One of the concerns around digital signage is its potential contribution to light pollution. This phenomenon is described as wasted artificial light that alters the natural light levels in the outdoor environment. Although the study of light pollution is still in its early days and the impacts of this problem are not fully understood (Deda et al, 2007), light pollution is widely blamed for interfering with astronomical observatories, disrupting ecological processes, and contributing to health concerns, such as visual fatigue and sleep loss (Karol et al, 2010; Longcore and Rich, 2004). In terms of environmental impact, light pollution has been found to alter the development cycle of plants and the normal night-time behaviour of numerous animal species, particularly birds and amphibians. For example, birds flying into light can lose their visual cues to the horizon and experience spatial disorientation and artificial light at night can attract frogs and insects and increase their chance of predation (Deda et al, 2007; Teikari, 2007).

Given these potential impacts, it is important to know how much digital billboards actually contribute to light pollution. In one study, Lewin (2009) determined that in one urban square mile with one very large conventional lit billboard, the vast majority of light pollution is a product of urban development (e.g. roadway and parking lot lighting, homes and offices), and less than four per cent can be attributed to billboards. Nevertheless, it would seem prudent to provide a setback or buffer between digital billboards operating at night and sensitive land uses that may contain vulnerable

species. Another approach used in a few municipalities is a requirement to turn off digital signs for certain periods of the night. For instance, the City of Edmonton requires signs abutting or adjacent to natural areas or parks to be de-energized daily between 12:00 p.m. and 5:00 a.m. In Ottawa, the pilot digital billboards operate 24 hours per day, but at a much lower night-time brightness: 220 cd/m<sup>2</sup> versus 400 cd/m<sup>2</sup> in Edmonton. Nevertheless, to achieve a similar intent, the City will require a minimum 300 metre buffer between a digital billboard and any park, open space, or element of the City's natural heritage system.

## Environmental Impacts

Overall, the environmental impacts of digital billboards comes down to a trade-off between different types of impacts: increased energy consumption and the need for the eventual recycling of electronic parts; compared to the consumption and waste associated with the use of paper, vinyl, ink, glue, and toner for conventional billboards. There is also the vehicular emissions associated with the delivery and maintenance of paper or vinyl ad copy of conventional billboards; versus digital billboards' contribution to light pollution and potential negative effects on wildlife.

The balance of this trade-off depends partly on the electricity sources (e.g. coal or hydroelectricity) in a particular province, which largely determines the air emissions related to that electricity. In Ontario, the electricity mix is known to be relatively green compared to the rest of North America, with an electricity source mix of 33 per cent nuclear, 27 per cent natural gas, 23 per cent hydroelectricity, 13 per cent coal, and 4 per cent wind (IESO, 2011). It could be argued that the environmental impact of the increased electricity consumption from new (approximately 1.8 kWh) or converted (an additional 1.4 kWh) digital billboards in Ottawa would be relatively minor, given the relatively small number of new digital billboards that are expected (see Document 6), compared to other new sources of electricity demand in a growing city (e.g. new housing, offices, schools). Although it is difficult to compare different types of environmental impacts, when the added electricity impact of digital billboards is compared to the waste and emissions impact of conventional billboards, it appears that the environmental implications of digital billboards in Ottawa are no worse than those of conventional billboards.

## TECHNOLOGY IMPLICATIONS

There are no technology implications associated with this report.

## TERM OF COUNCIL PRIORITIES

The recommendations in this report meet the following City strategic objectives:

- EP3, Support growth of local economy
- SE2, Improve operational performance

### SUPPORTING DOCUMENTATION

- Document 1 Amendments to the Permanent Signs on Private Property By-law  
2005-439
- Document 2 Public Consultation
- Document 3 Inter-jurisdictional Scan: Digital Signage Regulations in Other  
Municipalities
- Document 4 Literature Review
- Document 5 Digital Billboard Setback Methodology
- Document 6 Conversion of Conventional Billboards to Digital Billboards Eligibility  
Review

### DISPOSITION

Upon approval, the Building Code Services Branch together with the City Clerk and Solicitor's Department to bring forward the necessary By-law amendments before Council for enactment.

City Operations, Emergency and Protective Services department, By-law and Regulatory Services branch will apply for set fines in relation to the offences created by the new provisions in the By-law.

**AMENDMENTS TO THE PERMANENT SIGNS  
ON PRIVATE PROPERTY BY-LAW 2005-439**

DOCUMENT 1

The recommendations in this report require revisions to the Permanent Signs on Private Property By-law 2005-439, which are shown in bold, and summarized as follows:

- Part 1 is to be amended by adding definitions for “digital billboard sign”, “radius setback” and “lightshed setback”.
- Part 2, Section 8 is to be amended to add “digital billboard sign” as a sign type.
- Part 5, Section 44, Table 6 is to be amended to add new fees for “Digital Billboard Sign Permit” and “Digital Billboard Sign Minor Variance Application”; both in the amount of \$2,500.
- Part 6, Section 61 is to be amended to add “digital billboard sign” as an off-premises sign.
- Part 11 is to be amended so that it only addresses billboard signs and digital billboard signs, re-organizes and re-numbers sections of the By-law and adds regulations for digital billboard signs.
- Part 11, Sections 178 to 186M are to be re-numbered as follows:
  - Part 11A is to deal with street ad signs and directional farm signs, beginning at section 178 and ending at 186D;
  - Part 11B is to deal with rural business/industrial park directional sign regulations, beginning at section 186E and ending at 186I;
  - Part 11C is to deal with village pedestrian directional sign regulations, beginning at section 186J and ending at 186M.
- Part 13 is to be amended to add minor details to Sections 204 c) and 205 b) to clarify how a sign is determined to be in an unsafe condition.

**PART 1 - DEFINITIONS AND INTERPRETATION**

**New DEFINITIONS**

**“digital billboard sign” means a large, outdoor, off-premises advertising sign that displays information or images on a digital or electronic screen that is mounted on a structure fixed to the ground; (*panneau d’affichage numérique*)**

**“Director of By-law Services” means the person in the office of the Chief of By-law and Regulatory Services in the Emergency and Protective Services Department of the City of Ottawa or authorized subordinates or assistants; (*directeur des Services des règlements municipaux*)**

**“radius setback” means a 360 degree circular setback around a billboard sign, with the size of the setback area determined by the length of the radius of the**

circle; (*retrait sur un rayon*)

“lightshed setback” means a cone-shaped area of visual impact that establishes the setback from a digital billboard sign; (*retrait protégée de la lumière*)

Illustration of lightshed setback:



## PART 2 – ADMINISTRATION

8. The sign classes referred to in Section 7 are further divided into the following sign types:

- (a) canopy sign;
- (b) ground sign;
- (c) projecting sign;
- (d) wall sign;
- (e) billboard sign;
- (f) street ad sign,
- (g) development sign;
- (h) directional development sign;
- (i) directional farm sign;
- (j) rural business/industrial park directional sign; and
- (k) village pedestrian directional sign;
- (l) digital billboard sign.

## PART 5 – FEES, CHARGES AND REFUNDS

44. In Table 6:

- (a) Column I sets out the type of application; and
- (b) Column II sets out the fee that shall accompany the application:

TABLE 6 - FEES AND CHARGES

I TYPE OF APPLICATION	II FEE
Sign Permit	\$320.00
Sign Permit – ePortal	\$300.00
Billboard Sign Permit	\$1,800.00
<b>Digital Billboard Sign Permit</b>	<b>\$2,500.00</b>
Street Ad Sign Permit	\$640.00
Encroachment Permit	\$280.00
Encroachment Permit Renewal	\$110.00
Sign Minor Variance Application	\$1,725.00
<b>Digital Billboard Sign Minor Variance Application</b>	<b>\$2,500.00</b>
Impound and Storage Fees	\$150.00 per month
Directional Development Sign	\$320.00

## PART 6 – GENERAL PROVISIONS

61. Every owner of a permanent sign shall ensure that the sign that is erected complies with the following rules:

- (a) every sign other than a directional farm sign, directional development sign, billboard sign **and a digital billboard sign** shall be an on-premise sign;
- (b) a directional farm sign, a billboard sign, **a digital billboard sign** and a directional development sign shall be an off-premises sign, and
- (c) a mural sign and a street ad sign may be either an on-premises or an off premises sign.

PART 11 - BILLBOARD SIGN AND **DIGITAL BILLBOARD SIGN** REGULATIONSRULES APPLICABLE TO ALL BILLBOARD SIGNS **AND DIGITAL BILLBOARD SIGNS****BILLBOARD SIGN AND DIGITAL BILLBOARD SIGN PERMIT**

159. (1) A billboard **or digital billboard** sign permit is valid for a duration of up to five years from the date the sign permit is issued.
- (2) No owner of a billboard **or digital billboard sign** shall fail to remove the sign, including the structure and electrical supply, from the premises within 30 days of expiry of the permit.

- (3) A permit for a billboard **or digital billboard** sign, which has or is about to expire may, subject to the provisions of this By-law in effect at the time, be renewed for a further duration of up to five years, upon submission of a new billboard **or digital billboard** sign permit application as if it was an original application.

### **BILLBOARD SIGN AND DIGITAL BILLBOARD SIGN LOCATION RESTRICTIONS**

160. No person shall erect or cause to be erected or maintain a billboard sign **or digital billboard sign** within 500 metres of the following roadways:

- (a) Airport Parkway
- (b) Aviation Parkway
- (c) Colonel By Drive
- (d) **Sir John A. Macdonald (formerly Ottawa River) Parkway**
- (e) Queen Elizabeth Driveway
- (f) Rockcliffe Parkway
- (g) Vanier Parkway
- (h) Stittsville Main Street, between Fernbank Road. and Hazeldean Road.

161. No person shall erect or cause to be erected or maintain a billboard **or digital billboard sign** any closer than 500 metres from a Village as designated in the Official Plan.

162. No person shall erect or cause to be erected or maintain a billboard **or digital billboard sign** within 15 metres of any identification ground sign, including a street ad sign.

### **BILLBOARD SIGN AND DIGITAL BILLBOARD SIGN HEIGHT, SIZE AND ILLUMINATION RESTRICTIONS**

In Table 30 of Section 163,

- (a) Column I sets out the aspect of the sign that is regulated; and
- (b) Column II sets out the regulation.

163. No person shall erect or cause to be erected or maintain a billboard sign **or a digital billboard sign** unless it complies with the regulations set out in Table 30 as follows:

Table 30 – BILLBOARD SIGN AND DIGITAL BILLBOARD SIGN HEIGHT, SIZE AND ILLUMINATION RESTRICTIONS	
I Aspect Regulated	II Regulation
Minimum area	9 m <sup>2</sup>
Maximum area	18.6 m <sup>2</sup>
Minimum clearance between underside of structure and grade	2.5 metre
Maximum clearance between underside of structure and grade	4.5 metre
Maximum height	8 metre
Illumination	External or internal

164. Despite the definition of “grade” in Section 1, “grade” in respect of a billboard or digital billboard sign, means the average of,

- (a) the mean elevation of the natural or finished level of the ground at the base of a sign, and
- (b) the crown of the street at the nearest point to the sign.

## RULES APPLICABLE TO BILLBOARD SIGNS ONLY

### BILLBOARD SIGN GENERAL PROVISIONS

165. (1) A billboard sign shall be either a wall sign or a ground sign.
- (2) No person shall erect or cause to be erected or maintain a billboard sign that is not either a wall sign or a ground sign.

### BILLBOARD SIGN LOCATION AND POSITIONING RESTRICTIONS

166. A billboard sign is permitted in Sign District 4 and the following zones in Sign District 5: RC (rural commercial), RG (rural general industrial), and RH (rural heavy industrial).

167. A billboard sign is permitted in the O1P Subzone of the Zoning By-law for a period of up to five years if:

- (a) it is abutting at least one zone that is listed under Sign District 4;
- (b) the Hydro corridor is at least 30 metres wide;
- (c) the sign is located at least 60 metres away from an adjacent residential or environmental zone; and,
- (d) the sign complies with the other provisions of this By-law pertaining to billboard signs.

168. No person shall erect or cause to be erected or maintain a billboard sign within 30 metres of a lot having on it:

- (a) a building designated under Part IV of the *Ontario Heritage Act*; or
- (b) a building shown on the heritage reference list as a Category 1,

Category 2 or Category 3 building.

- 168A. Where a billboard sign is visible from a residential use in a residential zone and there is no visible obstruction or barrier provided by an existing building or structure that would mitigate the impact of the billboard and its illumination, the owners of the billboard sign shall ensure that the sign is at least 300 metres from the lot having on it that residential use.

**BILLBOARD OPERATIONAL RESTRICTIONS**

- 169.
- (1) Where a billboard sign is externally illuminated, the owner of the sign shall ensure that the lamping of the billboard sign is shielded so as to prevent the light from spilling over on to or reaching a residential use.
  - (2) No person shall erect or cause to be erected or maintain a billboard sign that is illuminated by or contains flashing, intermittent illumination, rotating or changing light, beam or beacon or contains readograph or electronic messages.
- 170.
- (1) Despite Section 163, where a part of the message component of a billboard sign extends beyond the ordinary rectangular shape of the sign face of a standard rectangular billboard, the sign face area of that sign may be increased by up to 5 per cent.
  - (2) A billboard sign with sign copy that changes mechanically shall not be considered to be an animated sign for the purpose of this By-law.

**BILLBOARD DISTRICT REGULATIONS**

**SIGN DISTRICT 4**

- 171.
- (1) No person shall erect or cause to be erected or maintain a billboard sign unless it has a minimum setback of:
    - (a) 150 metres from the nearest part of any other billboard sign;
    - (b) 2 metres from a lot line abutting a street;
    - (c) 1 metre from every driveway, lane or aisle;
    - (d) 1.5 metres from a side lot line or a rear lot line;
    - (e) 30 metres from a residentially zoned lot; and
    - (f) 30 metres from a lot having on it an institutional use in an institutional zone.
  - (2) Despite subsection 1 (a), no person shall erect or cause to be erected or maintain a billboard sign unless it has a minimum setback of 1000 m from the nearest part of any other billboard sign if it is visible from any other billboard sign located on a premises zoned RU, RC, RG, RH, AG, ME, MR, VM in the Zoning By-law;

- (3) For the purposes of subsection (2), the visibility shall be determined by the Director.

171A. Despite Section 171 (1)(b), where a billboard sign is within 30 metres of a building on an abutting lot and the building,

- (a) fronts onto the same street as the billboard sign; and
- (b) is set back a greater distance than 2 metre from the lot line abutting a street,

the owner of the billboard sign shall ensure that the billboard sign is set back the same distance as the building from the lot line abutting a street.

#### SIGN DISTRICT 5

172. (1) Every owner of a billboard sign shall ensure that the billboard sign has a separation distance of 2,500 metre from any other billboard sign in any direction, measured from the nearest part of any billboard sign.
- (2) Despite subsection (1), the owner of a billboard sign may reduce the separation distance between billboard signs to a minimum of 1000 m if the billboard sign is not visible from any other billboard sign in any direction measured from the nearest part of the billboard sign.
- (3) No owner of a billboard sign shall reduce the separation distance between billboard signs to less than 1000 m if the billboard sign is not visible from any other billboard sign in any direction measured from the nearest part of the billboard sign.
- (4) For the purposes of subsections (2) and (3), the visibility shall be determined by the Director.

172A. No person shall erect or cause to be erected or maintain a billboard sign unless it has a minimum:

- (a) setback from any lot line abutting a street of 12 metre;
- (b) setback from any other lot line of 1.5 metre;
- (c) setback of 1 metre from every driveway, lane or aisle;
- (d) separation distance between any building or structure and the billboard sign is equal to the height of the billboard sign; and
- (e) setback of 300 metre from a residentially zoned lot.

172B. Despite clause 172A, where a billboard sign is within 30 metre of a building on an abutting lot and the building,

- (a) fronts onto the same street as the billboard sign, and
- (b) is set back a greater distance than 12 metre from the lot line abutting a street,

the owner of the billboard sign shall ensure that the billboard sign is set

back the same distance as the building from the lot line abutting the street.

## **RULES APPLICABLE TO DIGITAL BILLBOARD SIGNS ONLY**

### **DIGITAL BILLBOARD SIGN LOCATION AND POSITIONING RESTRICTIONS**

173. (1) A digital billboard sign is permitted in Sign District 4 and the following zones in Sign District 5: the RC (rural commercial), RG (rural general industrial), and RH (rural heavy industrial) zones fronting on Carp Road, between Highway 417 and Rothbourne Road.
- (2) Despite the provisions in Section 159 (1), if a digital billboard sign is determined to be a public safety hazard by the Director, the owner shall turn off the sign immediately upon receiving a Notice of Violation from the Director, and shall remove the digital billboard sign at the owner's expense within 30 days of receiving the Notice of Violation despite the term of the permit. A digital billboard may be considered to be a public safety hazard if it has been, or has a strong potential to be, a primary cause of a traffic collision.
174. No person shall erect or cause to be erected or maintain a digital billboard sign unless,
- (a) it has a minimum 100 metre setback from intersections as defined by the nearest intersection of the prolongation of the curb lines, and the nearest curb of a highway ramp, traffic signals, and at-grade rail crossing signals;
  - (b) it is sited and angled in a way that it will not interfere or compete with drivers' sightlines to traffic signals at intersections, to the satisfaction of the Director;
  - (c) it has a lightshed setback that extends 300 metres at a 140 degree angle from each vertical edge (perpendicular to the ground) of a digital billboard screen, and a 30 metre radius setback from the following:
    - (i) lots zoned residential (R1-R5, RM, RR, RU)
    - (ii) lots zoned institutional (I1, I2, RI)
    - (iii) heritage properties designated under Part IV (individual designation) or Part V (heritage conservation district) of the *Ontario Heritage Act*
    - (iv) Federally designated heritage buildings and National Historic Sites, including the Parliamentary Precinct, Confederation Square, and the Rideau Canal system;
  - (d) 300 metre radius setback from:
    - (i) other digital billboards; and
    - (ii) parks, open space, and environmental protection zones (O1 and EP zones);

- (e) 150 metre radius setback from a billboard sign; and
- (f) any part of a digital billboard has a minimum setback of,
  - (i) 3 metres from any front or rear property line, or any lot line abutting a street;
  - (ii) 1.5 metres from an interior side property line; and
  - (iii) 1.5 metres from any driveway, lane or aisle.

#### **DIGITAL BILLBOARD OPERATIONAL RESTRICTIONS**

175. No person shall erect, cause to be erected, or maintain a digital billboard that:
- (1) displays or uses animation, video, movement, flashing effects, odours, gases, pyrotechnics, or interactive devices;
  - (2) has a transition time between images that is more than one second, or that has any transition effects between images;
  - (3) has a minimum dwell time of less than 10 seconds for any image; and
  - (4) displays sequential images or messages that form one continual advertisement, whether on the same digital billboard, or on more than one digital billboard in a row.
176. No person shall erect, cause to be erected or maintain a digital billboard that,
- (1) has any part of a digital billboard sign that exceeds a luminance of 6000 cd/m<sup>2</sup> between sunrise and sunset, and 220 cd/m<sup>2</sup> between sunset and sunrise. Sunrise and sunset times shall be determined according to the National Research Council of Canada Sunrise/Sunset Calculator:  
<http://www.nrc-cnrc.gc.ca/eng/services/hia/sunrise-sunset.html>.
  - (2) is equipped without an ambient light sensor that automatically adjusts the brightness levels to no more than 0.3 foot candles above ambient light conditions.
177. (1) Every owner of a digital billboard shall ensure that the electrical wiring carrying the power supply to a digital billboard is located underground. The Director may approve alternate arrangements for electricity supply.
- (2) No person shall erect or cause to be erected or maintain any illuminated sign, or any portion thereof, that is not visibly identified by the sign installer's or manufacturer's identification tag, including any applicable Canadian Standards Association and electrical safety authority certification tags.

## PART 13 - ENFORCEMENT ENTRY

## UNSAFE SIGN

204. A sign is unsafe if,
- (a) it is structurally inadequate or faulty,
  - (b) it is in a condition that could be hazardous to the health or safety of any person, or
  - (c) it is located **or operated** so as to cause a hazard or obstruction **to the safety of any person.**

## NOTICE OF VIOLATION

205. (1) Where a sign,
- (a) is not erected or maintained,
    - (i) in compliance with a provision of this By-law, or
    - (ii) in accordance with condition of a permit issued under this By-law, or
  - (b) is in an unsafe condition,

the Director, **the Director of By-law Services**, or an Officer may make a Notice of Violation, requiring the contravener to remove the sign or correct the violation and bring the sign into conformity in the manner and within the time specified in the Notice.

- (2) The Notice of Violation referred to in subsection (1) shall be served on the owner or persons whom the Director, **the Director of By-law Services**, or an Officer believes is contravening this By-law.

**PUBLIC CONSULTATION**

## DOCUMENT 2

The consultations on the digital billboards pilot project provided three separate opportunities, spaced evenly over the course of one year, for the public to voice their opinions. Each of these consultations are described below, along with a summary of the feedback that was received.

**Questionnaires**

Public consultation began in the spring of 2011 with the launch of a questionnaire intended to gauge the opinions of interested residents, which coincided with the installation of the pilot billboards. A follow-up questionnaire was launched on November 1, 2011. The questionnaires were not scientific studies and were not intended to capture a representative sample, as it was voluntarily accessed on the City website.

The website address for the questionnaires was advertised on the digital billboards and made available on [www.ottawa.ca/digitalbillboards](http://www.ottawa.ca/digitalbillboards) and [ottawa.ca/panneauxnumerique](http://ottawa.ca/panneauxnumerique) between March and June, 2011. The questionnaires gathered a total of 583 responses (349 in the spring, 234 in November), which were organized by Ward, which was determined by the voluntary disclosure of respondents' address or postal code. The following table provides an overview of the questionnaire response rate for each Ward:

<b>Digital Billboards Questionnaire: Responses by Ward</b>				
Response Area	Spring Questionnaire		November Questionnaire	
	Number of Responses	Per cent of Responses	Number of Responses	Per cent of Responses
Orléans, Ward 1	9	2.4	4	1.7
Innes, Ward 2	11	3.0	2	0.9
Barrhaven, Ward 3	12	3.2	3	1.3
Kanata North, Ward 4	14	3.8	9	3.8
West Carleton-March, Ward 5	11	3.0	6	2.6
Stittsville, Ward 6	21	5.6	8	3.4
Bay, Ward 7	7	1.9	5	2.1
College, Ward 8	7	1.9	8	3.4
Knoxdale-Merivale, Ward 9	7	1.9	8	3.4
Gloucester-Southgate, Ward	1	0.3	3	1.3
Beacon Hill-Cyrville, Ward 11	6	1.6	3	1.3
Rideau-Vanier, Ward 12	11	3.0	8	3.4
Rideau-Rockcliffe, Ward 13	9	2.4	4	1.7
Somerset, Ward 14	11	3.0	10	4.3
Kitchissippi, Ward 15	43	11.6	24	10.3
River, Ward 16	16	4.3	7	3.0
Capital, Ward 17	13	3.5	11	4.7

Alta Vista, Ward 18	10	2.7	5	2.1
Cumberland, Ward 19	7	1.9	6	2.6
Osgoode, Ward 20	5	1.3	0	0.0
Rideau-Goulbourn, Ward 21	5	1.3	3	1.3
Gloucester-South Nepean,	18	4.8	6	2.6
Kanata South, Ward 23	10	2.7	3	1.3
Out of town	6	1.6	0	0.0
Unspecified	102	27.4	88	37.6
<b>TOTAL</b>	<b>372</b>	<b>100</b>	<b>234</b>	<b>100</b>

By far the highest number of respondents, other than the unspecified responses, came from Kitchissippi Ward. Other wards with relatively high response rates included Stittsville, Gloucester-South Nepean, Kanata North, Capital, River, and Somerset. It appears that in general, the higher response rates were from wards where residents would tend to travel by one of the pilot billboards.

The questionnaire results reveal that respondents are quite divided on whether or not they want the City to permit digital billboards. For instance, in the second questionnaire, after considering the changes to the screen brightness and timing of messages; 56 per cent of respondents considered the digital billboards to be “not acceptable”, compared to 41 per cent of respondents who thought they were “acceptable”. Overall, the main concerns were safety and negative appearance, while top benefits were aesthetics (more attractive) and the ability to post or view public information. The most commonly desired restrictions were on brightness and hours of operation. An open question that provided the opportunity for additional comments generated more than twice as many negative comments as positive comments, once again primarily related to driver distraction and safety and perceptions of negative appearance.

### **Stakeholder Meetings**

In January, 2012, two meetings were held for targeted stakeholder groups: one with industry and business groups, and a second with representatives from interested community groups. A total of 36 individuals were invited to attend the industry and business groups event, and a total of 14 attended. A total of 185 community leaders were invited and a total of 14 attended the meeting for community groups. The initial draft proposals were presented to each group individually, followed by a facilitated discussion.

Feedback from these meetings was recorded and posted on the project website to allow each group and the general public the opportunity to view all comments. This feedback revealed a number of concerns from community groups; notably the potential for impacts on residential properties, the public realm, and the environment, as well as requests for more research, better consultation, and generally more strict regulations or the complete prohibition of digital signs. The industry and business groups, on the other hand, requested the same regulations for digital signs as for conventional signs, including the same five year sign permit period, and was generally in favour of fewer restrictions in order to let the market dictate the operational characteristics of digital billboards.

## **Feedback on Draft Proposals**

The draft proposals were posted on the project website on May 16, 2012 and made available for comments until June 15, 2012. All residents and stakeholders who had previously provided comments or attended one of the consultation sessions were sent a notice by email and invited to submit comments. Various media reported on the draft proposals, including CBC radio and television, CTV television, 1310 news, as well as online articles by CBC, OpenFile Ottawa, and Yahoo News.

It is clear that some of the feedback was in response to specific items in the draft proposals document, while other input was based on media coverage, which tended to be brief. As a result, it seemed that the media coverage was helpful in bringing attention to the issue and encouraged input, but it also brought about many comments that were based on assumptions or misinterpretations about the proposals. Nevertheless, all feedback was valued and considered while crafting the final recommendations.

A total of 99 additional comments, separate from the survey results, were received, nearly all by email. Approximately 87 per cent of the messages received were negative in nature, while 13 per cent were positive. The feedback touched on a variety of issues related to the draft proposals, including driver distraction and traffic safety, aesthetics, sign brightness, setback distances, timing of image changes, and environmental considerations. The specific issues noted in the feedback are listed below, with the numbers in bracket indicating the number of times that issue was raised by respondents.

### **Driver Distraction and Traffic Safety**

- Digital signs are distracting (50)
- The sign at Carling and Kirkwood is placed near a busy and complex intersection that is an inappropriate location for a digital billboard (9)
- They are counterproductive to road safety and inconsistent with other efforts to reduce distracted driving (6)
- The rapid change in light intensity from one image to another is a form of distraction (4)
- Cyclists and pedestrians are put at risk with every new distraction for motorists (3)

### **Sign Appearance**

- Digital signs are visually unappealing/eyesore/ a pollution of the landscape (29)
- They will detract from the beauty of Ottawa (20)
- They look modern/clean/attractive (5)
- Digital billboards make Ottawa look like Las Vegas (3)
- Electronic billboards degrade environments by commercializing public spaces (2)
- They only serve to push private interests into public spaces (2)
- They have no place in a pedestrian landscape
- The natural environment should always trump the commercial one in a city that values quality of life - especially for the nation's capital

### **Sign Brightness**

- The digital billboards are too bright at night (3)
- No need for more bright lights all over the city
- Putting limits on the brightness, or having them shut off at midnight, is not a solution
- They should be restricted to areas that will minimize their visual intrusion and light pollution
- The proposed night-time brightness of 220 cd/m<sup>2</sup> is reasonable
- The colours are bright but the light is not overpowering at night

### **Setback Distances**

- The proposed setbacks are inadequate (4)
- Do not permit digital signage in designated heritage districts (2)
- Given that the current bylaw for illuminated signs doesn't allow an illuminated billboard that is directly visible from a residentially zoned lot that is 300 metres or less away, there certainly should not be less restrictive provisions for digital billboards (2)
- Setbacks less than 500 metres will have negative impacts on residential and parkland uses
- The suggested 100 metre setback from intersections is insufficient to ensure that digital billboards do not become a traffic hazard

### **Environmental Issues**

- Digital billboards contribute to unwanted light pollution (6)
- They waste electricity (3)
- It's a greener alternative than having to regularly print new ads and send someone out to post them (3)
- The digital billboards go against the impression of Ottawa being an eco-friendly city

### **Timing of Images**

- The change of display should be quite slow (much slower than every 10 seconds) so that drivers passing are not distracted by the changes (2)
- The transition time from one image to another should be more gradual/smooth (2)
- Support the proposed 10 second dwell time
- The sign should change images a bit quicker

### **Permit Length**

- The proposal to issue five-year permits for digital billboards is a mistake (2)
- Five years is unacceptable in terms of waiting to deal with situations that could need to be re-considered (2)

### **Shut-Off Period**

- Support for a shut down period between 11pm and 6 am (4)

### **Generally Opposed**

- Please do not allow digital billboards in Ottawa (23)
- Take them down (7)
- Raise my taxes if you must but leave our city streets uncluttered (4)
- This is a ridiculous way for the city to raise money (3)
- Please do not let the short-term lure of money lead to bad public policy - ban them, or at the least, severely restrict their use
- Do not want my family to be bombarded with flashy advertising
- Retailers have numerous other advertising choices and do not need another means to force their products down our throats
- We are not this desperate for extra revenue

### **Generally Supportive**

- Support the draft proposals for the digital billboards (3)
- Ottawa has moved into the 21st century with these signs (2)
- Please continue to pursue the placement of these signs if it means heading off tax increases
- This is a change I welcome - I think it is a positive step for Ottawa
- Please don't abandon this project before it's hardly gotten underway! New technology takes time
- These signs make us feel like a big city and add to the overall experience of being in a big city
- It's about time Ottawa began to look like a modern cosmopolitan city
- Happy to see our City finally allowing different types of advertising opportunities

**INTER-JURISDICTIONAL SCAN: DIGITAL SIGNAGE  
REGULATIONS IN OTHER MUNICIPALITIES**

DOCUMENT 3

**Methodology**

During 2010 and 2011, information was collected on digital signage regulations from North American cities that had experience with digital billboards. Some of those municipalities were contacted for follow-up telephone interviews in order to get additional information. The tables below show the questions and answers that resulted from this exchange of information.

<b>1. Are digital signs limited to certain types of signs (e.g. ground signs, wall mounted signs or third party billboards)?</b>	
<b>Kingston</b>	Digital signs fall under the same classification as conventional billboards
<b>Toronto</b>	Yes; limited to electronic static or moving copy, and digital billboards
<b>Hamilton</b>	Yes; limited to ground signs
<b>Kitchener</b>	Yes; limited to ground signs, fascia signs and billboards
<b>Winnipeg</b>	Yes; prohibited on mobile signs
<b>Saskatoon</b>	Yes; Electronic message centers only permitted in certain types of signs
<b>Vancouver</b>	Vancouver has five high definition digital video signs - three of which are on lands not within the city's jurisdiction (i.e. First Nations, Federal or Provincial). The remaining two high definition digital signs were site specific applications to amend the Sign By-law, with a negotiated public benefits package where the City receives a percentage of air time to advertise non-profit/cultural events.
<b>Seattle</b>	Yes; but off premise message board advertising forms are prohibited
<b>Atlanta</b>	Yes; limited to a changing sign display and electronically changed signs

<b>2. Are digital signs limited to certain parts of the city or to certain land uses?</b>	
<b>St. John's</b>	Yes; All signs are prohibited on land owned by the City of St. Johns
<b>Kingston</b>	Yes; Not permitted in residential zones
<b>Toronto</b>	Yes; night-time operation is limited to the Gardiner and Dundas Square Special Sign Districts
<b>Hamilton</b>	Yes; if the same size as regular billboards
<b>Kitchener</b>	Yes
<b>Winnipeg</b>	Yes; Electronic message boards are only permitted in specific zoning districts
<b>Saskatoon</b>	Yes; Electronic Message Centers (EMC) are only permitted in specific zoning districts. Permitted in almost all commercial and industrial zones

<b>Edmonton</b>	Digital displays are only permitted in specific zoning districts
<b>Vancouver</b>	An animated sign or a flashing sign is only permitted on Granville Street, between West Hastings Street and Nelson Street on a building face which fronts a street, excluding a lane, and only if any lighting associated with the sign is directed only toward Granville Street.
<b>Surrey</b>	Only permitted on City-owned lots
<b>Seattle</b>	Yes; video display signs are prohibited in residentially zoned areas, the historical district, the Preservation District or the Shoreline environment
<b>Phoenix</b>	Yes
<b>Atlanta</b>	Yes; changing or illuminated signs permitted in residential zones.
<b>Miami</b>	No sign is illuminated unless such sign is specifically authorized by the regulations for the district in which erected (i.e. digital signs are permitted by district).
<b>Boston</b>	Electronic signs are permitted in the Theatre District, Lansdowne Street Entertainment District and the Seaport Convention Center District.

<b>3. Does your municipality have a By-law in place regarding digital signage?</b>	
<b>Toronto</b>	Yes; By-law No. 196-2010 Chapter 694 Signs, General
<b>Hamilton</b>	Yes
<b>London</b>	Yes; Section 9.1 of Sign By-law
<b>Winnipeg</b>	Yes; Bylaw 200/2006
<b>Saskatoon</b>	Yes; Zoning bylaw amendments, Appendix A Sign Regulations
<b>Vancouver</b>	Yes; Sign By-law No.6510
<b>Surrey</b>	Yes; By-law No. 13656 Surrey Sign By-law
<b>Seattle</b>	Yes; SMC 23.55.005 Video display methods (Land use By-law)
<b>Phoenix</b>	Yes; Section 705.B.3.C.13 (Electronic Message Displays)
<b>San Antonio</b>	Yes; By-law 2007-12-06-1247
<b>Chicago, Atlanta, Boston</b>	Yes

<b>3.a) Does the By-law address sign luminance?</b>	
<b>Kingston</b>	No
<b>Toronto</b>	Yes
<b>Kitchener</b>	Yes; No sign within 30 metres of a residential zone can be illuminated between 10 pm and 6 am
<b>London</b>	Pulsating or variable intensity illumination is prohibited. Flashing sign face area is included within the maximum sign face area of the sign type and must not exceed 50 per cent of the maximum sign face area permitted.
<b>Winnipeg</b>	Yes; Sign may not operate between the hours of 10pm and 6 am
<b>Saskatoon</b>	No.
<b>Calgary</b>	Only internal, direct, indirect, and exposed bulbs are allowed for illumination, using incandescent, fluorescent, or neon lighting. Interim regulations limit screen brightness to 5,000 nits sunrise to

	sunset and 500 nits from sunset to sunrise and requiring each sign have an ambient light metre which cannot allow the ambient light to rise more than 6.5 lux.
<b>Surrey, Seattle, Phoenix, San Antonio</b>	Yes
<b>Atlanta</b>	Yes; All signs must adjust brightness as ambient light levels change
<b>Boston</b>	Yes; Limited to hours of operation (7 a.m. - 2 a.m.)

<b>3.b) If yes, what are the maximum luminance thresholds during the day and at night?</b>	
<b>St. John's</b>	Signs may have a maximum illumination level of 1,500 lumens
<b>Toronto</b>	The luminance must not exceed 5000 cd/m <sup>2</sup> between sunrise and sunset and 500 cd/m <sup>2</sup> between sunset and sunrise. The luminance must not increase the light levels within 10 metres of all points of the sign face by more than 6.5 lux above the ambient lighting level. No sign can be illuminated between the hours of 11 p.m. and 7 a.m. unless located in the following special sign districts: Downtown Yonge Street, Dundas Square, or Gardiner Gateway. Some types of uses are exempt from the above, such as hospitals, public transit facilities, fire, rescue, etc. The light must not project onto any adjacent premises located in an R, RA, CR, I, or OS sign district.
<b>Calgary</b>	Maximum luminance of 7,500 nits from sunrise to sunset and a maximum of 500 nits from sunset to sunrise as determined by the National Research Council of Canada. The sign must not increase the light levels around the digital display by more than 5.0 LUX above the ambient light level.
<b>Edmonton</b>	Brightness levels must not exceed 0.3 foot-candles above ambient light conditions when measured from the sign face at its maximum brightness, between sunset and sunrise, and must not exceed 400 nits when measured from the sign face at its maximum brightness, between sunset and sunrise, at those times determined by the Sunrise / Sunset calculator from the National Research Council of Canada.
<b>Surrey</b>	Maximum 280 nits between sunset and sunrise.
<b>Seattle</b>	Between dusk and dawn the video display must be limited to 500 nits when measured from the sign face at its maximum brightness.
<b>Los Angeles</b>	No sign can be arranged and illuminated in such a manner as to produce a light intensity of greater than three-foot candles above ambient lighting, measured at the property line of the nearest residentially zoned property.
<b>Phoenix</b>	Maximum brightness is 300 nits from dusk to dawn.
<b>Greenville</b>	Digital signs require automatic brightness adjustment according to ambient light conditions.

<b>Atlanta</b>	Illumination prohibited from 11 p.m. until sunrise on directly illuminated signs where the total light sources on any face exceeds 150 watts.
<b>Boston</b>	Electronic signs are limited to hours of operation between 7:00 a.m. and 2:00 a.m. and otherwise at night not exceed 500 cd/m <sup>2</sup> .

<b>3.c) Does the By-law regulate the degree of animation of the signs (e.g. scrolling text, static images, or video)?</b>	
<b>Kingston, Toronto, Hamilton, Kitchener, Greenville, Winnipeg</b>	Static images only
<b>Seattle</b>	There must be 20 seconds of still image or blank screen following every message using a video display method.
<b>San Antonio</b>	Regulation is subject to the size of the sign.
<b>Atlanta</b>	Static images and scrolling text.

<b>3.d) Does the By-law stipulate minimum setbacks from specific districts, traffic lights or pedestrian crosswalks or from other signs?</b>	
<b>Kingston</b>	Yes; the same rules that exist for billboards pertain to digital billboards
<b>Toronto</b>	Yes
<b>Hamilton</b>	Yes, if same size as a regular billboard
<b>Kitchener</b>	23 metres from street intersection or traffic lights, 100 m from a residentially zoned lot
<b>London</b>	Illumination is restricted to various areas and sign types – e.g. 100 m from residential zone
<b>Winnipeg</b>	100 feet from a pedestrian crosswalk or traffic signals
<b>Saskatoon</b>	15 meters from a residential zone 200 metres from another billboard facing the same direction on the street
<b>Calgary</b>	Prohibited in residential areas unless permission is granted and regulated within the Circa 1912 Theme Area.
<b>Edmonton</b>	Animated signs are specified in the sign schedule. The illumination may not project onto surrounding residential areas.
<b>Seattle</b>	The sign must be at least 35 feet in any direction from any other sign that uses video. When located within 50 feet of a lot in a residential zone, any part of the sign using a video display method is oriented so that no portion of the sign face is visible from an existing or permitted principal structure on that lot.
<b>Phoenix</b>	100ft from another sign, lights and crosswalk 100 ft from a residential zone
<b>Greenville</b>	4500 feet from another billboard facing the same direction
<b>San Antonio</b>	2,000 feet from another sign on the same side of the road
<b>Atlanta</b>	Changing signs must be 5,000 ft away from another changing sign on the same side of the road if visible or on an interstate or highway.

	2,500 feet from a changing sign on the same side of arterial connector street
<b>Boston</b>	150 feet from residential zone Setback from other signs such as pedestrian crosswalk

**3.e) Does the By-law regulate the duration and transition of messages? If so, what is the minimum dwell time (seconds) of images/advertisements/messages and what is the maximum transition time (seconds) between each different image/advertisement/message?**

<b>Toronto</b>	10 second minimum dwell time
<b>Kingston</b>	5 second minimum dwell time
<b>Kitchener</b>	6 second minimum dwell time
<b>Winnipeg</b>	6 second minimum dwell time, 1 second maximum transition time
<b>Saskatoon</b>	6 second minimum dwell time
<b>Calgary</b>	10 second minimum dwell time
<b>Seattle</b>	20 second minimum dwell time, 2 second maximum transition time
<b>Phoenix</b>	8 second minimum dwell time
<b>Greenville</b>	8 second minimum dwell time, 1 second maximum transition time
<b>San Antonio</b>	10 second minimum dwell time, 1 second maximum transition time
<b>Atlanta</b>	10 second minimum dwell time, 2 second maximum transition time

**3.f) Does the By-law contain size or height restrictions for signs?**

<b>Toronto</b>	Vertical clearance 2.5 metres from ground
<b>Hamilton</b>	Yes, same as regular billboards
<b>Kitchener</b>	Yes, same regulation that applies to a digital billboard
<b>Saskatoon</b>	Maximum height 15 metres, maximum size of 23 m <sup>2</sup>
<b>Surrey</b>	Maximum height of the sign is 7.62 metres (25 feet.) Maximum sign area must not exceed 21.5 square metres (230 square feet.). The maximum total area for a multi-faced electronic message board sign must not exceed 43 square metres (460 square feet.)
<b>Seattle</b>	Maximum height for any sign using a video display method must be 15 feet above existing grade. Pole signs using a video display method must be at least 10 ft above the ground. The sign area is less than or equal to 1000 sq. in. and no single dimension of the sign exceeds 3 feet
<b>Greenville</b>	Size: 672 ft <sup>2</sup> Height: 40 feet
<b>San Antonio</b>	672 square feet (14 x 48)
<b>Boston</b>	Should not exceed 550 square feet or 1/5 <sup>th</sup> of the frontage of the building

**3.g) Does the By-law address sign aesthetics?**

<b>Kingston, Saskatoon, Surrey, Seattle, San Antonio</b>	Not specifically
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<b>Boston</b>	Yes, design guidelines are enforced in order to maintain aesthetics within the city.
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<b>3.h) Is there an enforcement process?</b>	
<b>Toronto</b>	Enforcement is in place for new signs operating outside of the current By-law. Past concerns were heard as part of consultation.
<b>Kitchener</b>	Yes
<b>Saskatoon</b>	Yes - foot candle/lux meter.
<b>Calgary</b>	City has received complaints regarding illumination but enforcement staff are not yet trained to use light metres. So far the City has only been able to get letters from the sign operators saying they are operating within their conditions.
<b>Edmonton</b>	Enforcement is done on a complaint basis. City is looking to add additional brightness restrictions specifically for digital signs into Zoning By-law.
<b>San Antonio</b>	Yes

### **Additional Information: Replacement Ratios**

In some American cities where sign proliferation has become a concern, digital billboards are only permitted on the condition that they replace a greater number of existing conventional billboards. This strategy is typically referred to as a 'replacement ratio', which ranges from a low of one removed conventional billboard per new digital billboard, to a high of 10 removed conventional billboards per new digital billboard. The most common replacement ratio seems to be three conventional billboards removed for every one new digital billboard installed. This seems to be a recent phenomenon that has been brought to city councils as revisions to existing digital sign By-laws. Replacement ratios are currently in place in the following cities: San Antonio, Arlington, Dallas, and Irving in Texas; Tampa, St Petersburg, and Orlando in Florida; Gulfport, Mississippi; Cheyenne, Wyoming; and Philadelphia, Pennsylvania.

Note that replacement ratios are not required by any Canadian municipality. It seems that they were put in place in order to address problems with billboard proliferation that resulted from weak sign By-laws. Ottawa has had strong By-laws regulating billboards and generally does not have a problem with excessive billboard signage. Replacement ratios could also be difficult to apply consistently for all new digital billboard applications. For instance, it may be possible for an established billboard company in Ottawa to remove some existing conventional billboards in order to install a new digital billboard, but this arrangement would be impossible for a company that does not have existing conventional billboards. This could lead to an un-level playing field, where some regulations only apply to certain companies. Therefore, replacement ratios are not recommended at this time in Ottawa.

### **Summary: Digital Signage Regulations in Other Municipalities**

- Digital signs are generally limited to digital billboard ground signs.
- Digital billboards are typically limited to certain parts of the city, such as commercial zones or entertainment districts, or prohibited from certain areas like residential zones or heritage districts.
- Digital billboard By-laws include common restrictions found in nearly all cities, such as on maximum luminance, minimum dwell time of images, setbacks from residential zones, maximum height and size, and in some cases limited hours of operation.
- Sign brightness thresholds are measured in illumination (i.e. lux or foot-candles), or luminance (i.e. candela per square metre). Maximum thresholds vary, but the most common restriction is 500 cd/m<sup>2</sup> (or nits) for night time operation (sunset to sunrise).
- In almost all cases, digital signage By-laws include setbacks – most commonly from residential areas, but also from traffic lights, pedestrian crosswalks, schools, and other signs or billboards.
- Most municipalities regulate the duration and transition of images/messages, with a minimum dwell time range between five and 10 seconds, and minimum transition time between one and two seconds.
- Most municipalities also have restrictions on the height and size of signs but they vary widely.
- Only one city (Boston) has a By-law in place that addresses the aesthetics of digital signs.
- Less than half the municipalities have an enforcement processes in place, but all are reactive in nature and only two (Saskatoon and Toronto) currently use a device to measure sign brightness (lux meter in Saskatoon, luminance meter used by consultants in Toronto).
- In order to minimize sign proliferation, some American cities only allow the introduction of digital billboards, or the conversion of conventional billboards to digital billboards, where existing conventional billboards can be removed and replaced with a smaller number of digital billboards.

## **LITERATURE REVIEW**

DOCUMENT 4

The purpose of the literature review was to obtain up-to-date information and analysis on digital sign technologies, particularly from peer-reviewed academic sources. Most of the research to date has been focussed on traffic safety, notably from the field of transportation engineering, but also includes studies from related disciplines, such as human factors engineering and lighting sciences. As a result, the literature review begins with an in-depth consideration of studies on the effects of digital signage on traffic safety, followed by brightness, timing of images, impact on the public realm, and future directions in signage.

The validity and reliability of the studies in the literature review is of utmost importance. For this reason, studies that are perceived as biased – generally those funded by industry or stakeholder groups – have been omitted. This applies primarily to studies on traffic safety and brightness of signs, since there is very little academic research on the remaining topics. For those later topics of timing of images, impact on the public realm, and future directions, the information presented is mainly a discussion about the need to consider these issues, some consideration of how they are handled in other jurisdictions, and potential changes that can be anticipated in signage.

### **Traffic Safety**

The most common concern around digital signage is the safety risk posed by the potential increase in driver distraction. This issue has received considerable attention in recent years, consistent with the ban, in many jurisdictions, of the use of mobile electronic devices while driving. While driver distraction tends to focus on in-vehicle tasks, external sources of visual distraction are also a concern. In fact, according to research conducted by the U.S. National Highway Traffic Safety Administration (Wang et al., 2000, in FHWA, 2001), distraction by sources external to the vehicle, including people, events and objects, accounted for 3.2 per cent of automobile crashes.

The risk of driver distraction is thought to be higher with digital signage compared to conventional signage because of the greater brightness and changing images of the signs. While it may seem intuitive that digital signs lead to driver distraction, studies to date have found this link to be problematic to measure and accurately determine. First, there is the problem of isolating the impact of signage on traffic safety because there are so many other factors that contribute to traffic accidents (Birdsall, 2008, page 24). For instance, if an accident occurs near a billboard, it is not possible to attribute the accident solely to the billboard and not to one of dozens of other factors that may have contributed to the accident, such as weather or road conditions, vehicle performance, or operator error. Driver distraction is further complicated by people's adaptive behaviour to familiar scenes, whereby familiarity with routes and signs tends to result in fewer and shorter glances to signs, and therefore to less distraction (Beijer, Smiley and Eizenman, 2004; FHWA, 2001). Unfortunately, many of the studies are sponsored by either outdoor advertising industry groups or anti-billboard groups, and tend to promote one point of view (Wachtel, 2007; FWA, 2009, Wachtel, 2009).

One clearly agreed-upon finding of the safety research is that dynamic or moving (e.g. video) signs are more distracting than signs with static images (Beijer, Smiley and Eizenman, 2004; Dewar and Olsen, 2007). Otherwise, reliable information about the relationship between digital signs and safety seems to be limited to a few critical reviews of existing literature that are sponsored by government agencies. One of these reputable studies is a 2009 Federal Highway Administration (FHWA) investigation that sought to determine whether the presence of commercial electronic variable message signs (CEVMS), or digital billboards, is associated with a reduction in driving safety for the public. The study notes the difficulty of measuring driver distraction caused by signage and the actual safety risk it creates. For instance, distraction is usually measured by the number and duration of eye movements towards signs and the effects this has on driving performance. The authors point to various studies that do and do not demonstrate statistically significant safety or distraction effects caused by the digital signs. However, the authors caution that not all levels of distraction have negative safety effects and determine that “the present literature is inconclusive with regard to demonstrating a possible relationship between driver safety and CEVMS exposure” (FHWA, 2009).

Another reputable critical review of the literature is a 2009 peer-reviewed study by Jerry Wachtel, prepared for the National Cooperative Highway Research Program for the American Association of State Highway and Transportation Officials. The study acknowledges that this issue is very difficult to study because every billboard, road, and driver is different. Even studying the same digital billboard is difficult because drivers will experience differences in content, brightness, graphics, colours, font sizes, and font styles. As a result, the author admits that “it is difficult if not impossible to design and conduct a research study whose results can be applied with confidence to digital billboards as a whole” (Wachtel, 2009). Nevertheless, the author concludes that “roadside digital advertising attract drivers’ eyes away from the road for extended, demonstrably unsafe periods of time” (Wachtel, 2009).

Despite these safety concerns, a few months after this report was released in 2009, Wachtel delivered a presentation to the American Association of State Highway and Transportation Officials Subcommittee on Traffic Engineering in Manchester, New Hampshire, in which he suggested mitigation measures that would alleviate those safety concerns:

“If a digital billboard was set to a luminance level appropriate to the ambient environment in which it is viewed, and if the message change interval was such that no driver saw more than one image change, and if we ensured that location restrictions were truly enforced, then we should not be particularly concerned about safety impacts due to distraction” (Wachtel, June 2009).

Wachtel elaborates on these points in a more recent article in the American Planning Association magazine (Wachtel, 2011). He points to the potential distraction hazards caused by digital billboards, and the reluctance of billboard companies in U.S. cities to make modifications that would make them more acceptable. Despite these warnings, Wachtel asks: “Is it possible to erect and operate a digital billboard consonant with traffic safety? Our research suggests that the answer is yes”. The author recommends

mitigation measures for four digital billboard characteristics: control screen brightness, lengthen image dwell times, keep messages simple, and prohibit message sequencing. Note that three of these four suggestions have been addressed in the recommendations in this report; while the other, keeping messages simple, is certainly valid but outside the jurisdiction of the City.

Researchers Deward and Olson (2007) suggest similar location and operational restrictions, and Horrey and Wickens (2007) qualify that these types of precautions should not be targeted to average drivers, but rather to the drivers with the poorest performances. If digital signs are to be permitted in Ottawa, these mitigation measures, such as appropriate screen brightness levels and timing of message durations, along with location restrictions, must be addressed. Each one is discussed below.

## **Brightness**

The brightness of digital signage is a primary concern because we know that eyes are drawn to bright objects, which is a phenomenon called phototaxis. This explains why sign brightness can play an important part in driver distraction and traffic safety. Brightness of digital signs also has implications for community aesthetics and impacts on sensitive land uses, such as residential neighbourhoods.

Measuring brightness can be done in various ways, with different units of measurement and scientific devices. The brightness of digital screens is typically measured in luminance, which refers to the intensity of light that is emitted from a particular area, and is measured in candela per square metre ( $\text{cd/m}^2$ ). It is often common to measure luminance in a unit of measurement called nits, which is equal in value to, and interchangeable with candela per square metre ( $\text{cd/m}^2$ ). In other words, one nit equals one  $\text{cd/m}^2$ . Luminance is measured with a device called a luminance meter, or nit gun, which looks like a radar gun that police use to measure the speed of moving vehicles. Another less common way to measure brightness is by illumination, which is the amount of light that falls onto a surface and is measured in lux or foot-candles. However, measuring screen brightness is more reliable using luminance ( $\text{cd/m}^2$  or nits) rather than illumination (lux or foot-candles), because the measurement of luminance is more accurate since it does not detect background light from other sources, like streetlights or car headlights.

Sign brightness is typically regulated by specifying a maximum threshold of luminance that the light should not surpass. For images on digital signs, maximum brightness level is not uniform, but varies by colour. White is always brightest, followed by shades of red. As a result, the maximum brightness levels essentially only target the brightest colour, white, with the understanding that all other colours will be less bright. To put these brightness restrictions into perspective, a scan of brightness restrictions on digital signage in other North American cities reveals that day-time brightness tends to be regulated by light sensors on the digital billboards that set the brightness of the screen to a maximum of 0.3 foot-candles above ambient light conditions. The most common brightness restrictions are night-time luminance thresholds with a range between 280  $\text{cd/m}^2$  and 500  $\text{cd/m}^2$ .

Like the research on the traffic safety, research on sign brightness is often sponsored by groups with a vested interest in a particular outcome, which makes it challenging to find reputable recommendations. For instance, groups such as Scenic America often cite an unpublished 2010 paper led by Christian B. Luginbuhl, an astronomer at the U.S. Naval Observatory Flagstaff Station in Arizona. Luginbuhl and colleagues argue that brightness limits should be set according to a maximum safe contrast ratio between a subjected point of brightness and the average brightness level of the general surroundings, which is cited at 20:1. Since a typical lit roadway has a luminance of approximately one nit, the authors claim the luminance of lit signs, including digital signs, should not exceed approximately 20 nits, or 100 nits in an urban environment (Luginbuhl et al, 2010, Scenic America, 2011). However, basing this calculation on a value of one nit for a lit roadway could only be accurate if measuring the light being reflected from a road surface, as opposed to measuring the light from the light source, and assuming that there are no other sources of light in the surroundings. But through lighting field tests in Ottawa, it has been determined that a green light on a traffic control device has a luminance of about 1000 nits, a red light about 1800 nits, a regular streetlight approximately 2000 nits, and car headlights between 3400-4000 nits, not to mention other various artificial outdoor lights in a city. Therefore this argument based on contrast ratios that begin with baseline assumptions of one nit leading to a 20 nit recommendation, or five nits for the 100 nit recommendation, is in our opinion based on false assumptions and cannot be relied upon when determining appropriate brightness levels for digital signage.

The most reputable studies on this matter appear to be conducted by Dr. Ian Lewin, an internationally recognized lighting expert and consultant, and past president of the Illuminating Engineering Society of North America (IESNA). In a 2009 study specifically aimed at developing lighting specifications for digital billboards, Lewin considered factors such as ambient lighting levels, billboard size, and viewing distances to translate the luminance of a billboard to the illumination that is perceived at the eye of a viewer, in order to develop a proposed standard for the maximum digital billboard luminance. The recommendations were based on low ambient light conditions, and provide an example of suburban or rural residential areas. It is explained that by using these limitations, the specifications are very stringent because any billboards that meet the limits under these ambient light conditions will be satisfactory in areas of higher ambient light, such as urban residential or commercial areas. The size of digital billboards that he uses that is most relevant to Ottawa is a 11 x 22 foot billboard, which translates to about 22.5 m<sup>2</sup>, which is a bit larger than the pilot digital billboards, at 18.5 m<sup>2</sup> (the maximum size of billboards permitted in the City's By-law 2005-439). This study recommends a maximum night-time brightness of 300 nits (or cd/m<sup>2</sup>). At this brightness, Lewin states that "digital billboards will be brighter, but only slightly brighter, than the maximum luminance of conventional billboards" (Lewin, 2009).

In conclusion, the most reliable direction from the literature review on screen brightness suggests that digital billboards should operate at a maximum night-time brightness of 300 cd/m<sup>2</sup>. However, other factors will have to be considered, such as brightness tests on the City's pilot billboards and input from stakeholders and residents.

## **Timing of Image Changes**

Little research is available on the subject of the timing of image changes on digital signs. One of the few concrete recommendations was noted earlier in the traffic safety discussion, in which Wachtel suggests that no moving car see more than one image change. Of course this would depend on the sightlines between cars and billboards, as well as the speed and flow of traffic. Most North American cities have established regulations that vary from a minimum of five to 10 second minimum dwell time and a maximum transition time from “instantaneous” to one second. A minimum dwell time of six seconds is most common, but a few municipalities – including Toronto – currently require 10 seconds. For more information, see the Inter-Jurisdictional Scan Summary Report, Document 3. In Ontario, the Ministry of Transportation has a much longer MDT standard of 180 seconds, or three minutes, for digital billboards that can be viewed from Provincial highways. This is the MDT standard adopted for the IKEA digital wall sign. However, it is understood that this three minute minimum dwell time policy is under review.

## **Impact on Public Realm**

One of the major concerns about digital signage, and particularly digital billboards, is their compatibility with sensitive land uses, such as residential dwellings or schools, and more generally, their potential impacts on the public realm. These concerns are often related to the proliferation of signs and the impact this could have on neighbourhood and city-wide aesthetics.

To address these potential impacts, municipalities typically regulate the location and operation of signage by placing restrictions on their potential location, size, brightness, programming, and setbacks to other uses or features. It is common to prohibit some signs, such as digital billboards, from areas of a city with a strong aesthetic character such as heritage districts, around cultural or iconic landmarks, or along certain traditional mainstreets. In some cities, such as Austin and San Antonio in Texas, Vancouver, and Toronto, digital signs are only permitted in special sign districts. San Antonio and Dallas, Texas, and Asheville, North Carolina go a step further by only allowing digital signs on the condition that a greater number of conventional billboards be removed in order to reduce the total number of billboards in the city (Morris, 2008). In the state of Michigan and the cities of San Francisco, California, Denver, Colorado, and Tacoma, Washington, there is currently a moratorium on digital signs. In the following jurisdictions, all billboards are prohibited for aesthetic or scenic reasons: Hawaii, Alaska, Vermont, and Maine, as well as Washington DC, and Victoria, BC. The City of Sao Paulo, Brazil also bans all outdoor advertising for aesthetic reasons.

Some municipalities have used the approval of digital billboards as a means of minimizing sign clutter and the impact of conventional billboards on the public realm. This has been accomplished through the use of replacement ratios that require a sign company to remove a certain number of conventional billboards for every new digital billboard that is approved. For more information on this strategy, see the Inter-jurisdictional Scan in Document 3. Other attempts to mitigate potential impacts of digital signage on the public realm have led some municipalities to require digital billboards to be shut off at night. For example, the City of Toronto requires all digital signs outside

two special sign districts to be shut off between 11 p.m. and 6 a.m. Similarly, the City of Winnipeg requires digital message centre signs to be shut off between 10 p.m. and 6 a.m., and the City of Edmonton requires digital billboards facing parks to be shut off between midnight and 5 a.m. It has been determined that this approach is not necessary in Ottawa. Compared to these other Canadian municipalities, the proposed regulations for digital billboards require lower brightness levels at night and greater setbacks from residential areas and parks, open space and environmental protection zones.

### **Future Directions in Signage**

Digital technology is evolving at a rapid pace. As a result, regulations aimed at digital signage are directed at a moving target. While LED screens appear to be the most recent technological advancement in signage, it is difficult to predict what other technologies may appear on the horizon. It is likely that within the next decade or so, we will see more energy and cost-efficient technologies replace the latest generation of digital sign technology. For example, we may see increased use of electronic paper, like that used in e-readers (e.g. Kindle or Kobo), or organic light emitting diode (OLED) screens that have the promise of being simpler, thinner, lighter, more flexible, and energy-efficient than existing digital screens. How these technologies will change outdoor advertising can only be a guess, but in all likelihood, one major implication may be the potential to place signage in new locations that are currently not possible or generally cost prohibitive, such as digital screens imbedded inside windows, built into building facades, or strung up along thin wires without the need for heavy duty supports.

Already, we are beginning to see new innovations like rear projection displays that use a computer and projector to beam digital images onto the rear surface of a specialized film that displays the image like a screen. These films are typically placed on the inside of a store window to display on-premise advertisements, but have the potential to act as wall signs. Another emerging advancement is interactive signs that communicate directly with people by picking up information from the global positioning system (GPS) in their mobile phones or the radio frequency identification chips (RFID) in car keys or other electronic devices in order to more specifically target their audience.

The rapid evolution of digital sign technology suggests that municipalities will have to revisit their regulations more frequently than they have in the past in order to maintain up-to-date sign regulations.

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## **DIGITAL BILLBOARD SETBACK METHODOLOGY**

DOCUMENT 5

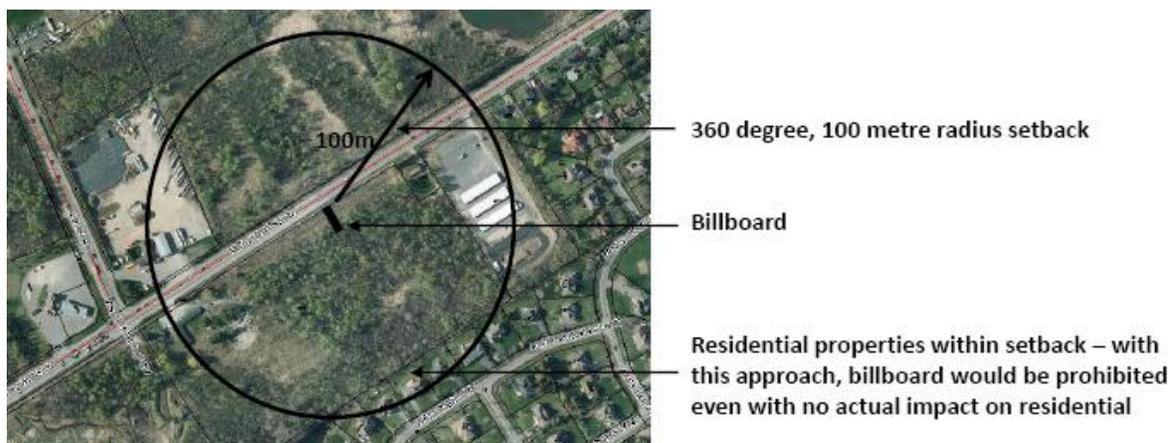
The City already has a number of required setbacks for conventional billboards in By-law 2005-439, which establish minimum distances that create a buffer between billboards and potentially incompatible features or land uses. These setbacks are in place primarily to promote safety and minimize visual impacts, such as sign proliferation or excessive light spill-over into residential areas. Setbacks from billboards are measured from any part of the billboard to the nearest part of a feature, such as the edge of property line.

Given the potential for greater visual impacts from digital billboards compared to conventional billboards, a number of new setbacks are proposed for digital billboards. For almost every setback category, the setbacks for digital billboards are considerably increased. Besides providing a greater buffer between digital billboards and features or buildings, this has the effect of reducing the potential locations in which they could be installed or converted from conventional billboards. The proposed setbacks specific to digital billboards are described below.

### **1. Setbacks From Residential**

The setback from residential for a digital billboard is the minimum distance that is required between any part of a billboard and a lot containing a residential use in a residential zone (R1-R5, RR, RU, V1-V3). The zone must be specified because the setback is not intended to apply to a residential use on a non-residential lot, such as apartment dwellings located on commercially zoned properties.

Typically, municipalities use a radius approach that establishes a 360 degree buffer based on a straight distance in any direction from a billboard. The radius approach is a crude way to establish a setback because it does not specifically address the visual impact. For instance, a billboard with one face will have an impact on less than half of the 360 degree radius around that billboard. Supposing that a residential use is located 90 metres away on the back side of that billboard, the 100 metre minimum radius setback would prohibit that billboard, even though there would be no impact on that residential use. The image below offers a hypothetical example that illustrates the main drawback of the radius approach.



The City of Ottawa establishes setbacks from residential lots for conventional billboards in a different way, with two separate criteria. The first is where a billboard is not visible from the residential use (i.e. house, apartment), and the second where a billboard is visible from a residential use. This approach is an improvement over the radius approach because it is more specific and considers the actual impact of the billboards (see example below), however it is more difficult to administer.



Billboard is visible from residential lot on left – minimum setback is 300 metres

Billboard is not visible from residential lot on right – minimum setback is 30 metres

Adopting this setback approach for digital billboards would be problematic to verify and enforce. For instance, there would be cases where a digital billboard is partially visible, such as a portion of the screen or a very wide angle to the screen, from a window of a residence, particularly in mid and high-rise dwelling units that have sight-lines over low-rise residential units. Verifying these cases would necessitate entrance into residential units, taking of photographs for documentation, and making subjective decisions about whether a billboard screen is considered to be visible or not. This is not a practical or cost-effective approach to enforce billboard setbacks.

A better approach should be established for residential setbacks from new digital billboards, which would combine the ease of administration of a radius approach with the specificity of the visible/not visible approach. The proposed approach for digital billboards achieves these objectives using two main strategies. First, by establishing a distance at which the visual impacts of digital billboards is considered to be acceptable. Second, by creating a setback based on this distance, but only for the area that would actually be impacted (not the full 360 degrees as in the radius approach).

Even though digital billboards would most likely be installed on arterial roads dominated by commercial and industrial uses, the setback distance must consider a worst case scenario, where a 18.5 square metre digital billboard operating at 220 cd/m<sup>2</sup> at night is directly facing a residential dwelling unit. The setback distance must buffer the residence from unreasonable visual impacts that would negatively affect residents' quality of life. Based on site investigations, it was originally proposed that this distance be set at 200 metres. The image below provides a sense of the visual impact of one of the pilot digital billboards at night, at a distance of 200 metres. At this distance, the digital billboard appears as one of many lights in

the urban landscape and is not expected to result in excessive illumination spilling over onto residential lots.



*Image above: night-time photograph of south-facing digital billboard on St Laurent Boulevard at Tremblay Road, taken from a distance of 200 metres – March 2012.*

However, during the consultation on these draft proposals, concerns were raised about this setback distance. In particular, there was uneasiness about the changing of images on the digital billboard screen, which draws the eye even at a distance of 200 metres. As a result, it is suggested that the appropriate minimum distance for a setback from sensitive land uses be extended from 200 metres to 300 metres. The image below shows the same billboard as above, taken at a distance of 300 metres.



*Image above: night-time photograph of south-facing digital billboard on St Laurent Boulevard at Tremblay Road, taken from a distance of 300 metres – March 2012.*

Digital billboards are designed to be viewed from a maximum angle of 140 degrees from the edge of the screen. It is therefore possible to determine the area of visual impact, which extends 300 metres out from the digital billboard screen, up to an angle of 140 degrees on each side. Where a digital billboard has a visual impact beyond 140 degrees, the sign owner will be required to install a louver, or blinder, that will limit the maximum viewing angle to 140 degrees from each edge of the billboard. The result is a “lightshed” area of visual impact that establishes the residential setback from each existing or potential digital billboard. Quite simply, if there is a residentially zoned lot (R1-R5, RR, RU, RM) within a 300 metre lightshed, a digital billboard would not be permitted. This methodology will only be used for some digital billboard setbacks, while the existing setbacks in By-law 2005-439 will continue to apply for conventional billboards.

The following illustration provides an approximation of these setbacks based on a 300 metre lightshed of impact, 140 degrees from each edge of the billboard, for a hypothetical proposed conversion of a double-sided conventional billboard to a double-sided digital billboard. The image below shows that the top lightshed, with the top lightshed that does not contain any residential properties, and therefore could (subject to other setbacks) result in the conversion of the north-facing side of the billboard to a digital billboard. The bottom lightshed, on the other hand, does contain residentially zoned properties (in this case an R3Y zone), and therefore the south-facing side of the billboard could not be converted to a digital billboard.

Even if there are no residential lots in the lightshed setback area, there is the potential for a residential lot to be outside this setback, but quite close to a digital billboard. The current setbacks for conventional billboards address this by additionally requiring a 30 metre setback to any billboard, even if it is not visible from a residential lot. It is proposed that this remain in place for digital billboards.



*Image above: example of a proposed lightshed setback, extending 140° from each vertical edge of a double-sided billboard, and a 30 metre radius setback.*

Residential uses in commercial, mixed-use, or industrial zones are excluded from this setback (with the exception of the traditional mainstreet zone, where digital billboards are not permitted at all). In the case of industrial areas, residential uses are simply not permitted. Many commercial or mixed-use zones, on the other hand, tend to be within 300 metres of residential zones, and this would therefore preclude the location of a digital billboard in those areas. These mixed-use areas also tend to be located in lively urban neighbourhoods that are already exposed to elevated levels of light, and as a result, do not require the same extensive setbacks as other residential neighbourhoods.

## **2. Setbacks from Institutional**

Setbacks from institutional uses are similar to residential setbacks, but instead of providing a buffer from lots zoned residential, they separate digital billboards from lots zoned institutional (I1, I2, or RI), which permit uses such as schools or places of worship. The concern in these situations is mostly focused on distraction and land use compatibility. For instance, a digital billboard immediately beside a school could be a distraction for students, or could be visually incompatible beside a place of worship. It is proposed that the institutional setbacks use the same “lightshed” principle described above as with setbacks from residential – a 300 metre distance at an angle of 140 degrees from each edge of a billboard, plus a 30 metre radius setback, regardless of whether an institutional lot falls within a digital billboard lightshed.

## **3. Setbacks from Heritage**

Digital billboards are proposed to be prohibited on a lot designated under Part IV or Part V of the *Ontario Heritage Act*, including lots in Heritage Conservation Districts that are listed in Annex 4 of the Official Plan. Lightshed setbacks from heritage buildings or areas are intended to further protect heritage buildings or districts from the potential visual impacts of a digital billboard. For instance, these setbacks are intended to prevent unreasonable distraction from a nearby important heritage landmark. Currently, conventional billboards must be located at least 30 metres away from a lot that contains a designated heritage building. For digital billboards, it is proposed that the setbacks from buildings designated under Part IV or Part V of the *Ontario Heritage Act*, including from the lands and buildings in Heritage Conservation Districts listed in Annex 4 of the Official Plan, be set to the same distance and area as the setbacks from residential and institutional described above. That is, a lightshed setback with a length of 300 metres, with an area determined by an angle of 140 degrees from each edge of a billboard. In addition, a 30 metre radius setback from a heritage lot, regardless of whether it falls within a digital billboard lightshed. The same setbacks will apply to Federally designated heritage buildings and National Historic Sites, including the Parliamentary Precinct, Confederation Square, and the Rideau Canal system.

#### **4. Setbacks from Other Digital Billboards**

Minimum distances between billboards are intended to prevent excessive sign proliferation. This is particularly important to apply to digital billboards as these setbacks also limit the potential for successive digital billboards to display synchronized advertisements that could be highly distracting and lead to traffic safety concerns. As a result, digital billboards will be separated from each other with a 300 metre radius setback. This is double the 150 metre minimum distance separation that currently exists for conventional billboards.

#### **5. Setbacks from Parks, Open Space and Environmental Protection Zones**

Setbacks are required from parks, open space and environmental protection zones in order to minimize impacts on wildlife and to ensure the ongoing enjoyment of these spaces by all users. Since the visual impacts of digital billboards in Ottawa (to a maximum size of 18.5 square metres operating at a maximum night-time brightness of 220 cd/m<sup>2</sup>) become acceptable at a distance of 300 metres or greater, it is proposed that setbacks from these features (zoned O1 and EP in the City's Zoning By-law) be set to 300 metres. This is a new setback requirement, as there is no such setback requirement for conventional billboards.

#### **6. Setbacks from Intersections, Traffic Signals, Highways Ramps, and Rail Crossing Signal**

Setbacks from digital billboards are not only established for certain land uses, but also for roadway features such as intersections, traffic signals (e.g. pedestrian crossings), highway on- and off-ramps, and at-grade rail crossings. These setbacks are meant to prevent driver distraction that could be caused by digital billboards located at critical road junctions where there tends to be an elevated risk of collisions with pedestrians, cyclists, or other vehicles.

Ottawa Police Services and Traffic Management and Operational Support Branch have identified the section of roadways within 100 metres of an intersection as having an increased risk of collisions. Since one of the primary objectives of this setback is to reduce the risk of collisions at intersections, it is proposed that for traffic safety reasons, intersection-related setbacks (including any intersection, traffic signal, highway ramp, and rail crossing signal) should be set at 100 metres. For the purposes of measuring this setback, an intersection is defined as the nearest intersection of the prolongation of the curb lines, and a highway ramp is measured by the nearest curb of a highway ramp. The setback distance from these features is also consistent with the Ministry of Transportation setback for all billboards from at-grade intersections involving a Provincial highway.

The existing pilot digital billboards currently do not meet these setbacks from intersections. However, under the current agreements, these billboards will remain in place until the end of their five year sign permit in 2016. At that time, if the sign owner wishes to keep the signs in the same locations, a minor variance application

will be required. The City would then re-assess these digital billboard locations, including an assessment from a traffic safety perspective.

## **7. Setbacks from Parkways, Villages**

Billboards are currently required to be located a minimum of 500 metres from the 11 villages designated in the City's Official Plan and the eight parkways (e.g. Sir John A. Macdonald Parkway, Colonel By Drive) identified in By-law 2005-439. Setbacks from these villages and parkways are intended to preserve the unique character of these areas. It is believed that the existing setback distance from parkways and villages is still adequate for digital billboards, and as a result, these setbacks are proposed to remain at 500 metres. Note that this setback from villages will only apply to those located very close to the urban boundary, since digital billboards are not permitted in the rural area.

## **8. Other Setbacks**

Currently, conventional billboards are required to be located a minimum of 1.5 metres from a side or rear property line, and 2 metres from a front property line. It is proposed that any part of a digital billboard be located a minimum of 3 metres from any property line. Other smaller-scale setbacks that deal with the exact location of signs on a property, such as the minimum distance to the edge of a driveway, are proposed to remain the same for digital billboards as for conventional billboards in the By-law.

**CONVERSION OF CONVENTIONAL BILLBOARDS  
TO DIGITAL BILLBOARDS ELIGIBILITY REVIEW**

DOCUMENT 6

The proposed various restrictions on digital billboards will limit the number of new digital billboards that could be installed in the City (both conversions from conventional billboards or new sites). Given the large upfront investment required for digital billboards, the sign industry is primarily interested in placing these signs in high traffic areas that maximize exposure. Since most of these high profile sites where billboards are permitted are already occupied by conventional billboards, it is expected that most applications for digital billboards will be through the conversion of existing conventional billboards. In order to determine the number of potentially new digital billboard signs, an analysis was undertaken whereby the proposed location restrictions for digital billboards were applied, including zoning and required setbacks, to all existing conventional billboards.

The City has documented 393 conventional billboard faces inside City limits. The first analysis of these conventional billboards has determined that of those conventional billboard faces, 22 would be eligible for conversion to digital. In summary, this analysis results in the potential for 22 digital billboard faces from existing conventional billboards, not including the existing four digital billboards that were part of the pilot project and two that are located (under Federal jurisdiction) at the Macdonald-Cartier International Airport. Staff are currently evaluating City-owned lands for additional billboards under the Billboard Advertising Program, and some of those sites may be eligible for digital billboards, subject to individual approval by the specific ward Councillors.

This analysis provides a rough estimate of anticipated digital billboards in Ottawa. It is possible that this estimate is low, since there are a small number of sites that do not meet the setbacks and are not currently considered to be eligible for conversion to digital, but could have circumstances where a minor variance may be granted. There is also the possibility that new sites for digital billboards may be found where conventional billboards do not currently exist. On the other hand, the estimate could be high because some of the eligible locations are on roadways that do not carry sufficient traffic volume to generate the exposure needed to interest billboard companies in installing a digital billboard, given the large upfront investment required for these expensive signs. Therefore, the estimate of up to 22 potential digital billboards is the most reasonable approximation available at this time. If these signs are permitted under the proposed restrictions, it is expected that there would be a gradual installation of these signs because of the high costs involved in purchasing and installing digital billboards.