

# **MOVING FORWARD**

## **Opportunities for Vancouver's** **Digital Wayfinding Map**

---

**Robert W. White**, UBC SCARP MSc Planning Candidate  
2014 Greenest City Scholars Program

Mentors: Catherine Neill & Jenniffer Sheel

Prepared for: City of Vancouver Engineering Services, Streets Activities

Delivered: August 15, 2014

# 1

# EXECUTIVE SUMMARY

When the City of Vancouver adopted the Greenest City 2020 Action Plan in 2010, it made a commitment to become the greenest city in the world within 10 years. Around the same time, in an effort to encourage more residents and visitors to explore the city on foot, information kiosks, or 'map stands', were installed across the city displaying neighbourhood maps and destinations. A pilot project in 2012 informed a system-wide refresh of these map stands to correct out-of-date information and to implement new best practices in pedestrian wayfinding design. One of the assets created as a result of this refresh was a custom, digital map of Vancouver.

This report identifies opportunities for the new digital wayfinding map with a particular emphasis on its potential to encourage more walking trips throughout the city.

A review of Vancouver's relevant local policies highlights actions supporting improvements to pedestrian wayfinding, walkability, health, and the continued release of freely accessible 'open data.' Existing literature covering active transportation, urban wayfinding, and mobile wayfinding tools forms a foundation for lessons learned from a peer wayfinding review covering London, New York, Toronto, Helsinki, Edmonton, Melbourne, and the University of British Columbia. Exploratory interviews with City employees, project partners,

software developers, and academics refine potential uses of the map, and helped gauge interest in becoming more involved with the project moving forward.

The report concludes with the following recommendations:

- Create a standardized template for Development Permit Application signage
- Build guidelines for new walking route maps
- Produce a line of map-branded merchandise
- Release of a public wayfinding map Application Programming Interface (API)
- Pursue the creation of an online Map Maker application
- Embed standardized interactive maps onto the City's website
- Support the planning and execution of a map-focused Hackathon event

Thanks to the previous investment into the creation of the digital wayfinding map, Vancouver now has access to a tremendous new asset with a wide range of potential benefits. If the City decides not to pursue any additional applications for the new map, it will miss out on a number of opportunities to set a new precedent for wayfinding and civic mapping. The investment has been made, and now is the time to continue moving forward.

## Acknowledgements

I would like to specifically thank Catherine Neill, Jenniffer Sheel, and Ian MacPhee for their ongoing guidance and assistance in completing this report. This small Wayfinding Group at the City of Vancouver created a comfortable and cheerful working environment in which to conduct my research, and I greatly valued their time and expertise. Their hard work and dedication is contributing to the green, livable, and lovable city I'm proud to call home.

# CONTENTS

<b>1. Executive Summary</b>	<b>1</b>
<b>2. Introduction</b>	<b>3</b>
2.1 The Greenest City Scholar Program	4
<b>3. Background</b>	<b>5</b>
3.1 An Introduction to Wayfinding	6
3.2 Vancouver Wayfinding Overview	11
3.3 Supporting Plans & Strategies	15
<b>4. Research Design</b>	<b>19</b>
4.1 Research Questions	20
4.2 Research Objectives	20
4.3 Research Methods	21
4.4 Research Limitations	22
<b>5. Discussion of Findings</b>	<b>23</b>
5.1 Literature Review	24
5.2 Wayfinding Peer Review	28
5.3 Summary of Interview Findings	33
5.4 Current Mapping at the City.	35
<b>6. Recommendations</b>	<b>39</b>
6.1 Recommended Opportunities	40
6.2 Static Products	40
6.3 Interactive Products	44
6.4 Easy Wins	49
6.5 Implications of Inaction	49
<b>7. Conclusions</b>	<b>50</b>
7.1 Summary of Research	50
7.2 Moving Forward	50
<b>8. Works Cited</b>	<b>51</b>
<b>9. Appendix</b>	<b>55</b>



# INTRODUCTION

2

SOUTH GRANVILLE

FAIRVIEW



Fig. 1: 2014 UBC Greenest City Scholars

## 2.1 THE GREENEST CITY SCHOLAR PROGRAM

---

In 2014, the City of Vancouver partnered with the University of British Columbia's Sustainability Initiative for the 5th year in a row on its Greenest City Scholar program. This program sponsors graduate students currently enrolled in Masters or PhD programs at UBC to work with mentors at the City of Vancouver to advance Vancouver's Greenest City goals. In total, 16 projects were accepted; each in response to one of the 10 goals outlined in the Greenest City 2020 Action Plan.

Within the City of Vancouver's Engineering Services department, the Wayfinding Group in the Streets Activities branch submitted a project proposal for a student to assist with wayfinding research. The accepted project proposal, titled "Assessment of a new wayfinding system and identification of opportunities for further development," tasked the student

with investigating potential future applications of a digital wayfinding map. The research was intended to help justify the extension of the wayfinding project's continued roll-out in different forms on-street and outline strategies to receive the greatest benefit from the digital investment.

An assessment of the new wayfinding system was not planned to be included in this report, as the system roll-out was delayed beyond the research completion date. The report instead focuses on providing recommended future directions and uses of the digital wayfinding map while continuing to support the Greenest City goal of Green Transportation.

# BACKGROUND

3



## 3.1 AN INTRODUCTION TO WAYFINDING

---

“To become completely lost is perhaps a rather rare experience for most people in the modern city. We are supported by the presence of others and by special way-finding devices: maps, street numbers, route signs, bus placards,” notes Kevin Lynch in his pioneering ‘The Image of the City’. “But let the mishap of disorientation occur, and the sense of anxiety and even terror that accompanies it reveals to us how closely it is linked to our sense of balance and well-being” (Lynch, 1960)

### Wayfinding is a four-stage process:

1. **Orient** oneself in a building or environment in relation to a destination.
2. **Determine a path** leading to that destination.
3. **Monitor** the progress to ensure the destination is growing nearer.
4. **Recognize** when the destination has been reached.

Over 50 years ago, Lynch coined the term ‘way-finding’ to refer to systems that help people navigate the world around them based on sensation and memory. His research found people formed individually-customized mental maps to paint a picture of the physical world, often based around five consistent elements: paths, edges, districts, nodes, and landmarks (Lynch, 1960). The combination of these features resulted in a mental map that clarified the urban fabric, and allowed participants to develop a stronger pattern of their movements around the city.

Fig. 2: Lynch's mental map building blocks



Recognizing the benefit of extracting these mental maps and applying them to the physical world, a number of researchers and designers began to install urban wayfinding systems to assist pedestrian movements through complex environments. Key components of these physical systems included kiosks displaying illustrated street maps, or poles with directional signage pointing towards certain landmarks or destinations. Soon cities, business associations, and tourism agencies began providing printed maps to guide visitors around unfamiliar parts of town.



Fig. 3: Walk!Philadelphia pedestrian directional signs

### 3.1.1 Walk!Philadelphia

In 1995, during a period of significant residential and commercial redevelopment, the City of Philadelphia launched Walk!Philadelphia. This pedestrian wayfinding system, the largest of its kind in North America with over 1,000 signs throughout the downtown core, would help pedestrians navigate the changing city. The design incorporated Lynch's research by dividing a map of the downtown core into four colour-coded districts. Colour-coded directional signs located at each intersection augmented the 'disk maps' and pointed the way to major landmarks, retail areas, and other nearby destinations. The system supported pedestrians by providing information about their current location and directions to common destinations, creating a sense of comfort and support to dispel fears of getting lost and encourage more curiosity and exploration. Pedestrians would learn through using the system that another sign is always just around the corner.

Fig. 4: Legible London 'monolith' map stand



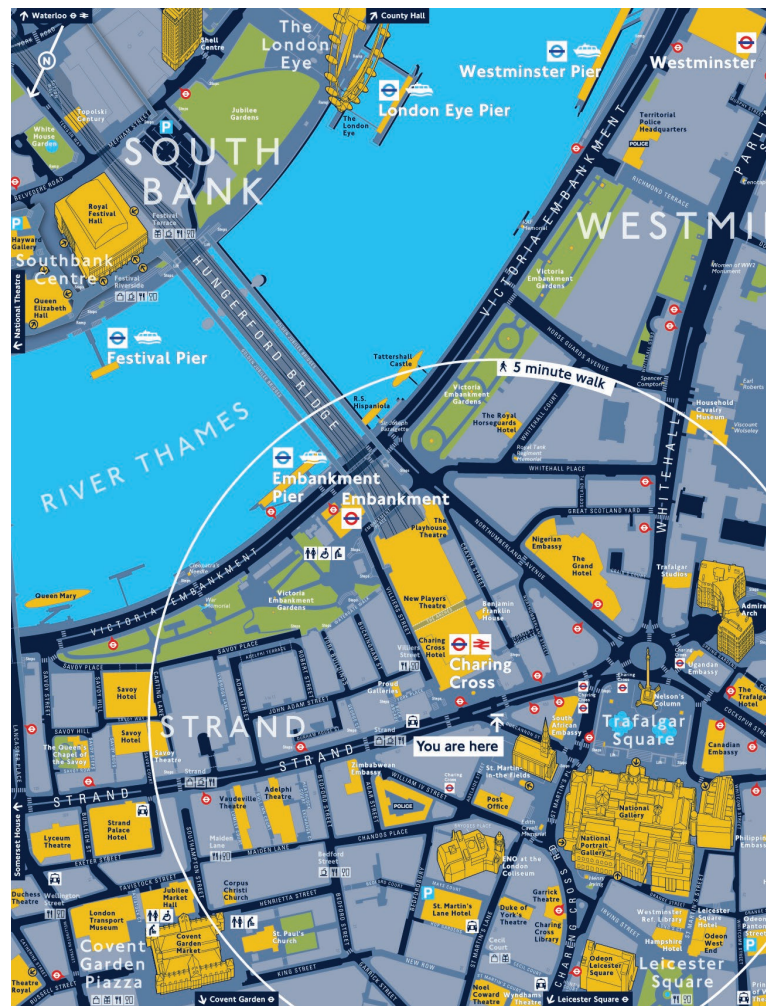
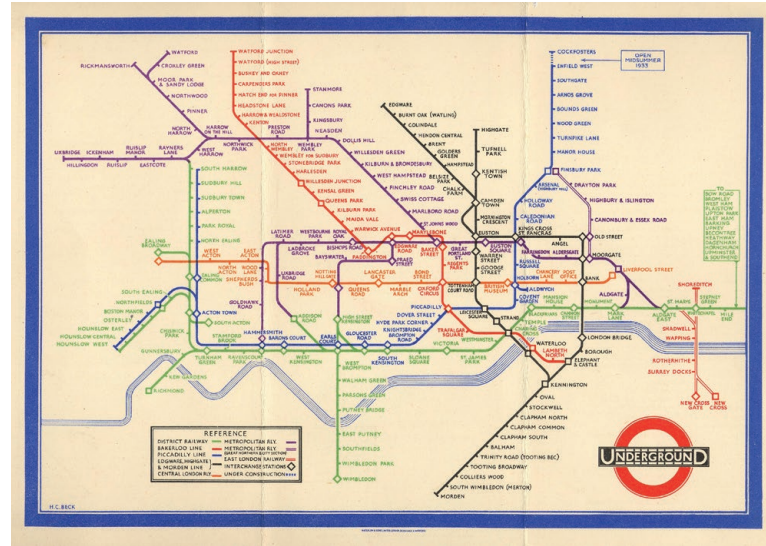
### 3.1.2 Legible London

Around a decade later, Transport for London was looking for ways to help solve increasing congestion on London's Underground subway network. They recognized that as many as 18,000 passengers a day used the train when their journeys could be made more quickly on foot (Buchanan, 2007) – the challenge was how to communicate that finding to the public, thereby encouraging more riders to walk to their destinations instead. In 2006, the precedent-setting 'Legible London – A Wayfinding Study' report was published by UK-based Applied Information Group (now Applied Wayfinding). The study proposed a citywide pedestrian wayfinding scheme to help make London one of the world's most walking-friendly cities by 2015.



Just as Harry Beck's ground-breaking London Underground map helped people navigate the complex subway network below ground, Legible London proposed a thoughtfully-designed city map system to help navigate the city fabric above ground. The new system would correct mental map assumptions resulting from use of Underground map, which graphically distorted the geography between stations often making the distance appear much greater. The new system was rolled out on a family of physical street furniture pieces - 'monoliths' and 'miniliths' - which displayed the new map featuring the street network, area names, landmark destinations, and walking time radii from the map stand location. Additional 'finger poles' provided small flags pointing to nearby destinations. One of the defining features of Legible London, following the precedent set by Walk!Philadelphia, was the shift away from a north-orientation on the maps to an 'ahead up' orientation - where the map content would be oriented to the same direction the map stand was facing. This resulted in a much more intuitive wayfinding experience for users.

Fig. 5, top right: Beck's 1933 London Underground map.  
 Fig. 6, bottom left: Legible London 'minilith'.  
 Fig. 7, bottom right: Legible London 'Finder' map.



### 3.1.3 Digital Developments in Wayfinding

Within the last decade, a number of other cities have implemented or are currently pursuing pedestrian wayfinding strategies including Glasgow, Bristol, New York City, Sydney, Melbourne, Edmonton, Helsinki, and Vancouver.

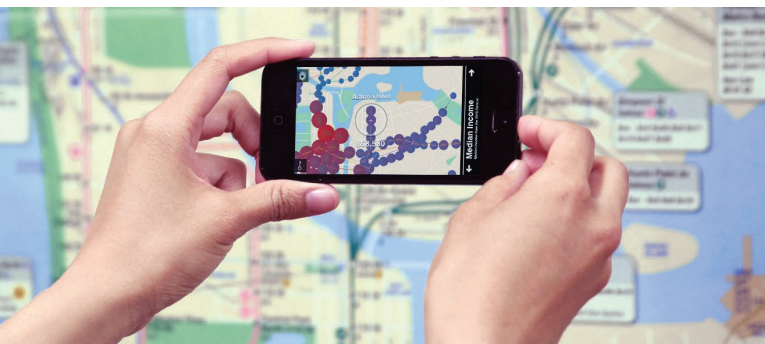
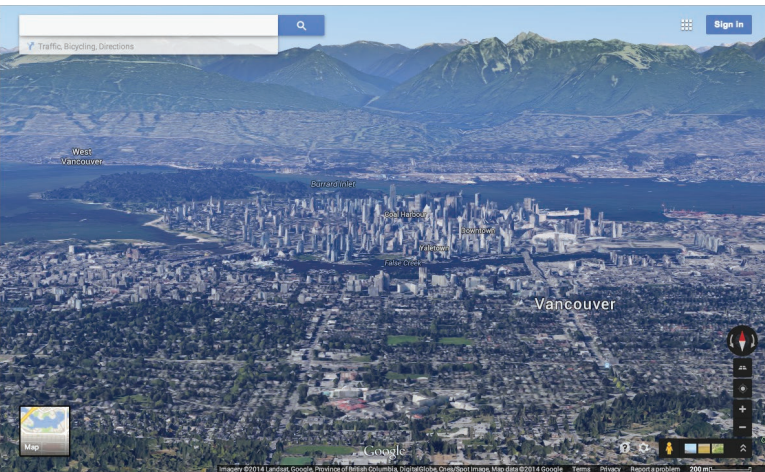
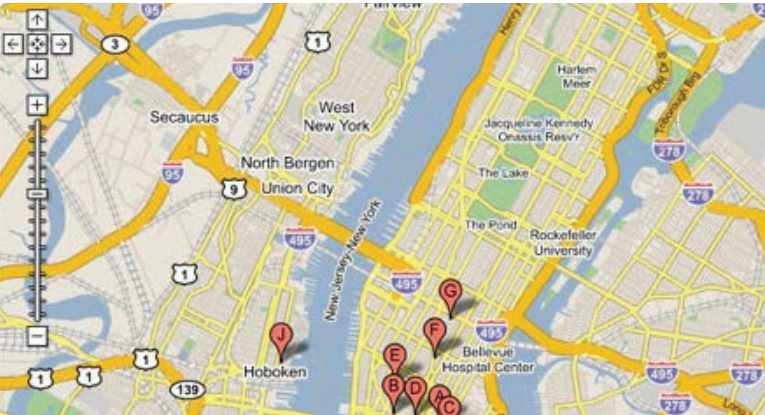


Fig. 8, top: Google Maps, circa 1995  
Fig. 9, middle: Google Maps Earth View, circa 2014  
Fig. 10, bottom: Tunnel Vision augmented reality app

While these advancements have been happening, another sort of wayfinding movement has grown. Launched in 2005, Google Maps has revolutionized the way we understand the physical world around us. Building off advancements made by Yahoo Maps and MapQuest in the late 1990s, Google Maps provided unprecedented detail, incorporating satellite imagery, and more recently, vector-based street and building data. Shortly after it launched, a programmer hacked into the map in order to display map-based Craigslist apartment listings through the San Francisco Bay Area with his HousingMaps demo (Ratliff, 2007). When Google got word, Paul Rademacher was hired and the Google Maps code was opened up to the public for anyone to build upon. However, Google's commercialized system isn't always the most accurate. The addition of mapped business listings in the 2000s, for example, has seen mixed reviews particularly when businesses shut down but their Google Maps presence remains.

Today we enjoy the luxury of having maps instantly at our fingertips in a variety of smart phone applications – providing directions, access to high-resolution satellite imagery, street-level photographs, and even full 3D modelled environments – accessed through an array of interactions including voice, touch and gesture-based interfaces, and augmented reality (AR) devices. Exploding in popularity with the 2007 release of the Apple iPhone and similar smart phone devices, AR wayfinding applications overlay visual data onto a live view of whichever direction the device's camera is pointed. A 'Tunnel Vision' app developed by Bill Meier in 2014, for example, displays live train locations and other information when users point their devices at maps in New York's subway system.

### 3.1.4 Back to the Basics

As these maps and their applications become more detailed and more complex, one of the most basic benefits of wayfinding systems begins to resurface – its role in making complex information so clear and legible it virtually fades into the background.

When executed poorly, pedestrians become separated from their experience of navigating the city and can become confused, frustrated, or lost. Their mental map might not have a chance to develop, resulting in a lack of memory and understanding of the urban environment around them. When executed well, wayfinding systems give pedestrians the confidence to navigate without fear while encouraging curiosity and exploration. They have the feeling of arriving at their destination without any sense of anxiety, and feeling more informed about the journey.

This pleasant, intuitive orientation and navigation is the goal of any good pedestrian wayfinding system. A well-designed system integrating physical, print, digital, and smart phone applications can work seamlessly to enhance the real-world experience of navigating a city. The starting point for many cities is the physical map stands, and it's what the City of Vancouver focused on for their first major pedestrian wayfinding project in the late 2000s.

## 3.2 VANCOUVER WAYFINDING OVERVIEW



Fig. 11: Original 2010 map stand in the South Granville area

In anticipation of the Vancouver 2010 Winter Olympic Games, the City of Vancouver, here on referred to as the City or CoV, began to install pedestrian wayfinding map stands to provide walking information for residents and visitors looking for Olympic venues and other destinations. An existing 20-year street furniture contract with CBS-JC Decaux, which included a provision for map stands, supported the installation of approximately 200 map stands and poster units across the city. A consultant was hired to design and produce map content for each stand, and local business improvement associations (BIAs) included their own content on one side of the stands to convey the local character of their neighbourhoods. This street furniture contract provided the opportunity for free content upgrades by the City every 3 years, not including printing costs, to ensure the information remained current.

### 3.2.1 Pilot Launch

Recognizing the instrumental role of pedestrian wayfinding to promote walkability throughout the city, a pilot wayfinding study was launched in 2012 in partnership with TransLink, the Downtown Vancouver Business Improvement Association (DVBIA), and the City to test the performance of an integrated system. The pilot focused on updating the existing map stand content to provide more consistent, legible, and up-to-date map content to help pedestrians understand their environment better. The prototype maps displayed features like more accurate locations of sidewalks and steps, walking times from the map stand, and corner retail labels, and made use of the 'ahead up' best-practice to orient the maps towards the user's perspective.

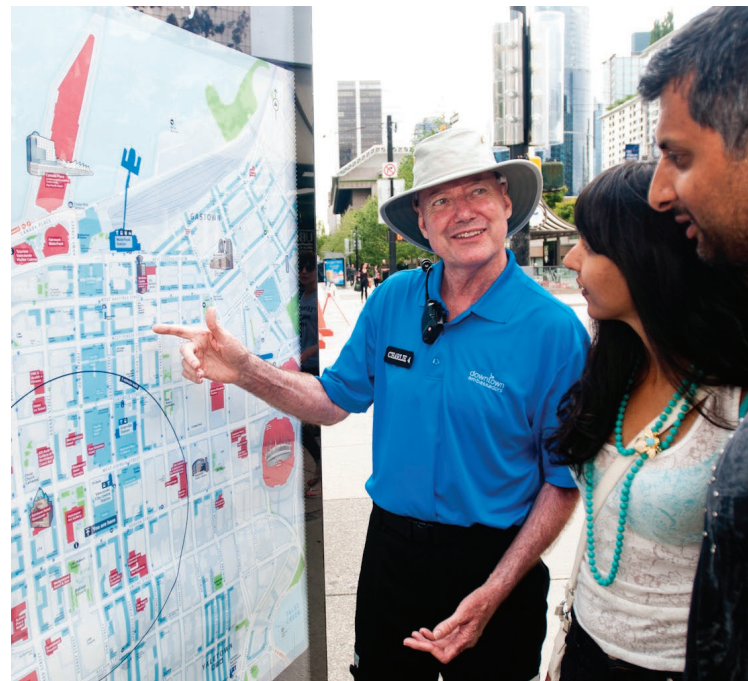


Fig. 12: DVBIA survey of a 2012 poster case pilot map

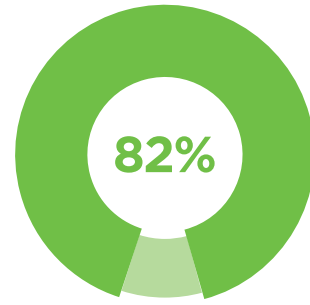
Located near Granville and Georgia in Vancouver's downtown core, a few prototype map stands were installed to demonstrate the potential of the new system and provide an opportunity to evaluate their performance. Separate surveys conducted by the City and the DV BIA revealed a number of findings, a few of which are displayed to the right.



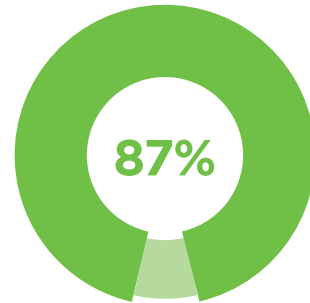
Fig. 13: A 2012 pilot map stand in the downtown core.

### 3.2.2 Vancouver's New Wayfinding Strategy

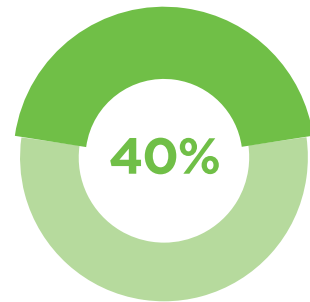
Following the success of the pilot the City made the decision to roll-out the new system across the city and contracted Applied Wayfinding, the company behind Legible London, to produce the new design strategy and implement the new system. A project administrator was appointed and an internal working group was set up at the City to connect Engineering, Planning, Park Board, IT, and Corporate Communications departments.



People who were more likely to walk after consulting the map.



People who found the 'ahead up' format easy to use.



People who wanted a printed map in addition to the physical map stand.



Fig. 14, above top: The new 'Planner' map  
 Fig. 15, above bottom: The new 'Finder' map

One of the assets produced in this new wayfinding project was a geo-referenced database system, here on referred to as the digital wayfinding map, hosted by the Living Map Company subcontracted by Applied. The creation of this digital wayfinding map supported a process to automate the 'ahead up' map orientations for display on both sides of the approximately 200 map stands throughout the city. Each side of the stand would display a high-level 'Planner' map showing the map stand's context within the larger city, along with a more detailed 'Finder' map focused on the local area. A zoomable webviewer was created to provide online access to the map to support accuracy checks of the data represented.

This digital wayfinding map opened up an additional avenue to make use of the map investment beyond physical or printed wayfinding artifacts – digital map applications. Data licensing agreements (DLAs) were signed with the project partners to extend the use of the map and allow external agencies to make use of the map content beyond artifacts like TransLink’s ‘Walking From Here’ maps in local SkyTrain stations, and the DVBIA’s tear-off ‘Downtown Walking Map’. The DLAs would allow the partners to develop the digital potential even further.

In addition to the partner-produced products, the digital wayfinding map also allowed the City to create more consistent graphics internally, such as the updated Cycling Map. A publicly-released application programming interface (API) was proposed by Applied as one of the project deliverables, which would give software developers the ability to develop software applications incorporating the map content, such as real-time transit maps or user-maintained event maps.

Other uses of the digital wayfinding map could include interactive kiosks, broadcast information signage, or smart phone applications, but its potential reaches far further. This beautifully-designed digital map has the potential to be used for broader mapping and communications applications.

The purpose of this research is to identify some of these opportunities by learning from peer wayfinding projects, and to provide justification for additional investment supported by existing literature and policy.



Fig. 16, top: Detail of TransLink Walking From Here map  
 Fig. 17, middle: Detail of DVBIA Downtown Walking Map  
 Fig. 18, bottom: Detail of Cycling in Vancouver map

## 3.3 SUPPORTING PLANS & STRATEGIES

---

The City's updated wayfinding project is supported by a number of existing policies and strategies including the **Greenest City 2020 Action Plan**, the **Transportation 2040 Plan**, the **Digital Strategy**, the forthcoming **Healthy City Strategy**, the **Metro Vancouver Regional Growth Strategy**, the **Vancouver Tourism Master Plan**, and the **TransLink Wayfinding Standards Manual**. The Engaged City Task Force Quick Stats Report also has the potential to support additional opportunities for the digital wayfinding map.

### 3.3.1 Greenest City 2020 Action Plan

Council approved Vancouver's Greenest City 2020 Action Plan (GCAP) in 2010. It builds upon previous work by the Greenest City Action Team, who research best practices from leading green cities around the world, and established the goals and targets that would make Vancouver the world's Greenest City. Together, the 10 goals outlined in the plan address carbon, waste, and ecosystems focus areas.

GCAP **Goal 4** intends to make walking, cycling, and public transit preferred transportation options, and is supported by 2 actions:

1. Make the majority (over 50%) of trips by foot, bicycle, and public transit.
2. Reduce average Distance Driven per resident by 20% from 2007 levels.

One of the key strategies identified is to make active transportation choices such as walking and cycling feel safe, convenient, comfortable and fun for all ages and abilities.

As of the 2012-2013 Implementation Update, 44% of trips within the city are made on foot, bicycle, and public transit. Some of the identified successes which contributed to this increased mode share include the adoption of the Transportation 2040 Plan described below, and the completion of the first phase of the Comox-Helmecken Greenway.

The current 44% walking mode-share is up from 33% in 1994, and 40% in 2008 - with approximately 18% walking and cycling, and 22% transit. Due to challenges securing funding and a dependence on external organizations such as TransLink, the focus for meeting the remaining 6% walking and cycling mode is to encourage more cycling through the city and to create safe, convenient, and enjoyable walking experiences.

### 3.3.2 Transportation 2040

Approved by Council in 2012, the Transportation 2040 Plan outlines a number of actions making reference to wayfinding and publishing open data for developers. Open data comes into play when considering the release of the digital map assets to the public through an Application Programming Interface (API).





These key actions are identified below:

**Walking (W) 1.7.1:** Expand and maintain a pedestrian wayfinding system that is consistent, legible, and user-friendly. Provide data in an open format to support third-party mobile application development.

**Cycling (C) 1.4.2:** Produce and regularly update a citywide cycling map, including a digital version. Provide route information in an open format to support third-party mobile application development.

Vancouver's wayfinding map can help to achieve these goals by updating and maintaining the content in existing map stands located throughout the city, and by providing digital access to the data displayed in the maps. Overlaying transit data on the maps, and incorporating the maps into a future Public Bike Share program under development will also help to achieve these goals.

### 3.3.3 Digital Strategy

Recognizing the role for a comprehensive digital strategy to connect residents, businesses, and government, a city-wide Digital Strategy was adopted by Council in 2013. This strategy outlines a number of necessary initiatives for Vancouver to reach the desired state of a more digitally 'connected' city. Initiatives under Engagement + Access and Economy, are:

**Initiative 2:** Enhance the open data program (Identify key City problems that could be resolved by open data and/or open API solutions). Next steps include:

1. Identify key City problems that could be resolved by open data and/or open API solutions
2. Embrace open APIs into open data
3. Support the open data community through an online forum where new data sets, ideas, visualizations and proof of concepts can be discussed

**Initiative 7:** With partners, support an agile proof of concept program. Next steps for this program include:

1. Establish a framework for proof of concepts (PoCs) to demonstrate innovation within the community
2. Identify partners that can assist with implementation and evaluation of the program
3. Conduct a pilot PoC to test the framework and monitoring process

These initiative would allow entrepreneurs to utilize municipal asset(s) to demonstrate innovation in the local digital economy.



### 3.3.4 Healthy City Strategy (DRAFT)

The City is currently working on Vancouver's Healthy City Strategy, to be presented to Council in the fall of 2014. A number of goals within the strategy will be in support of enhancing pedestrian environments, such as:

**Goal 8:** Active Living and Getting Outside, which has targets around ensuring all Vancouver residents live within a certain walking distance from a park or green space by 2020, and to increase the percentage of Vancouver residents who meet Canadian Physical Activity Guidelines by 25% over 2014 levels.

**Goal 11:** Getting Around, which has the target of making over 50% of trips on foot, bike, or transit by 2020 as also supported by Greenest City 2020 Action Plan Goal 4.

Once the Healthy City Strategy has progressed closed towards its completion, these goals will need to be revisited to ensure the finalized strategy maintains the relevant supporting policy directions described above.

### 3.3.5 Metro Vancouver Regional Growth Strategy

Within Metro Vancouver's Regional Growth Strategy, adopted in 2011, lies **Goal 4**, which aims to develop complete communities. This goal is supported by the following actions and strategies:

**4.2.4** Include policies within municipal plans or strategies, that may be referenced in the Regional Context Statements, which:

- c) provide public spaces and other place-making amenities for increased social interaction and community engagement;
- d) support active living through the provision of recreation facilities, parks, trails, and safe and inviting pedestrian and cycling environments.

Regional Growth Strategy **Goal 5**, Support Sustainable Transportation Choices, also supports the wayfinding project:

**5.1.6** Adopt Regional Context Statements which:

- c) identify policies and actions to manage and enhance municipal infrastructure to support transit, multiple-occupancy vehicles, cycling and walking.



### 3.3.6 Vancouver Tourism Master Plan

Completed in 2013, the Vancouver Tourism Master Plan provides recommendations in eight key areas of focus, including: visitor experience design, tourism infrastructure development, and transportation. Within the **Visitor Experience Design** area of focus, two specific recommendations incorporate wayfinding:

**Digital Visitor Experience:** With the proliferation of smart phones, Wi-Fi access is becoming increasingly valued by travellers... Accessible Wi-Fi corridors are also integral to enabling visitors to access and use new wayfinding, augmented reality and activity booking applications currently being developed by Vancouver’s leading digital businesses.

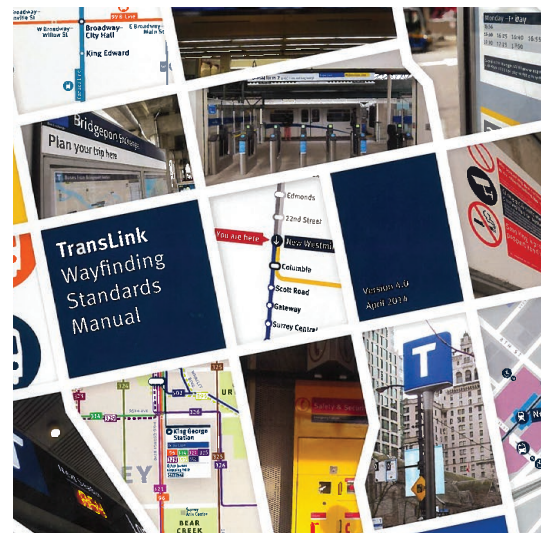
**Wayfinding:** Visitor wayfinding requirements can be identified, compiled, and communicated to organizations and agencies tasked with improving general city-wide and transportation-specific systems. Wayfinding efforts should include signage and mobile applications.



### 3.3.7 TransLink Wayfinding Standards Manual

Prior to the Vancouver 2010 Winter Olympics, TransLink began installing wayfinding prototype products at select SkyTrain stations in Vancouver and Richmond, such as the prominent new blue and white “T” signs. Since then, their wayfinding strategy, outlined in the Wayfinding Standards Manual, has expanded to include journey planning information walls providing content like Metro Vancouver Transit, Buses From Here, and Walking From Here maps.

This manual outlines a series of principles to ensure a consistent transit wayfinding experience is implemented throughout Metro Vancouver.



### 3.3.8 Policy Conclusions

The identified plans and strategies support future applications of the digital wayfinding map in one form or another. As a result, three actions areas can be identified. Each of these actions are supported by the final recommendations presented in section 6 of this report:

- Continue working towards providing information on safe, secure, convenient, and comfortable walking routes throughout the city;
- Continue to invest in public realm infrastructure to provide access to this information in the physical urban environment;
- Continue to release open datasets and APIs and support data consumption and interpretation in digital environments.



# RESEARCH DESIGN

4

## 4.1 RESEARCH QUESTIONS

---

In order to identify opportunities for future uses of Vancouver's new digital wayfinding map, a number of research questions were developed to target separate but related areas of research. The intent of the general research questions was to more fully understand the role of wayfinding with regards to encouraging more active transportation trips, and to identify current trends in pedestrian wayfinding design. More specific research questions pertaining to Vancouver's wayfinding project aimed to identify procedures and frameworks to support the wayfinding project in the future.

### 4.1.1 General Questions

1. What impact does wayfinding have on walking?
2. What other ideas are there for Wayfinding/Walkability?
3. What are the emerging best practices in Wayfinding?
4. What are the emerging tools associated with Wayfinding?
5. What lessons can be learned from interactive/digital wayfinding maps (hospitals, airports, shopping malls)

### 4.1.2 Vancouver-Specific Questions:

1. What are the best options for leveraging the CoV map database?
2. Who are the potential groups/organizations for developing this internally and externally?
3. What is the best system to receive back data from the contractor, Applied?
4. How should we make this information available to the BIA's/public?
5. What is the cost-benefit of delivering this for the City?

## 4.2 RESEARCH OBJECTIVES

---

Based on these research questions, a set of objectives were proposed as outlined below:

- Review wayfinding best practices by learning from peer cities pursuing similar pedestrian wayfinding initiatives to encourage more active transportation trips.
- Identify and evaluate emerging technologies to support digital mapping and wayfinding.
- Identify and evaluate internal opportunities for the digital wayfinding map currently under development.
- Identify and evaluate opportunities for partner organizations to contribute to the development and public use of the wayfinding map.
- Recommend specific directions the City can pursue to make use of the current wayfinding map investment.

## 4.3 RESEARCH METHODS

---

Exploratory interviews, an introductory literature review, and a wayfinding peer review were conducted in order to identify best practices and inform the final research recommendations. The majority of the research was conducted alongside the Wayfinding group within the City's Engineering Services department to understand the history of wayfinding at Vancouver, and understand the nature of the relationships involved in moving it forward.

### 4.3.1 Exploratory Interviews

The starting point for the project focused on exploratory interviews with a variety of stakeholders ranging from City Hall staff members, the project partners, external contractors, researchers, app developers, and engaged community members.

The interview questions focused on the participants' understanding of wayfinding in general, of Vancouver's wayfinding system, and what they envisioned as the future of wayfinding and maps. Interviews were recorded with written notes, thematically analyzed for recurring messages, and summarized based on the identified themes.

### 4.3.2 Literature Review

The literature review focused on walking and active transportation research relevant to mapping, urban wayfinding, mobile wayfinding tools, and digital mapping solutions. Literature produced more recently was weighted more heavily when considering proposed recommendations, as digital wayfinding is a fairly new focus of research and technological advancements are continually changing its landscape.

### 4.3.3 Wayfinding Peer Review

A number of cities and organizations currently pursuing wayfinding projects were contacted in order to gather an idea of best practices and industry standards, and simply to inquire about the future ideals each of these areas envisioned for their wayfinding projects. Many projects were selected based upon prior relationships with the City, while others were added which met criteria around geographic location, language, the type of wayfinding system being installed, and the role of digital mapping with regards to the system.

## 4.4 RESEARCH LIMITATIONS

---

The condensed timeframe for the study over 3 summer months meant many potential interviewees or peer project contacts were on vacation or otherwise unavailable. As well, the new wayfinding map could not be assessed due to the map content roll-out occurring after the study period.

There is little pre-existing research on the role of digital wayfinding maps to increase walking trips. As well, the definition of specific methods to measure and evaluate the performance of pedestrian wayfinding systems with relation to active transportation is largely unexplored despite the literature review, interviews, and discussions with peer city representatives.

A final research limitation was the complex partnership structure of the wayfinding project, described in the Background section of this report, and the corresponding set of contracts and agreements. A substantial amount of time was required to understand the nature of these relationships, particularly the role of Applied moving forward. The research required maintaining a positive working relationship with Applied while at the same time producing unbiased recommendations from an external point of view. Confidential information relevant to these relationships required sensitivity and discretion.



# DISCUSSION OF FINDINGS

5

ENGLISH BAY



## 5.1 LITERATURE REVIEW

---

Cities came about at the crossroads of communities. Markets sprouted up, buildings and services followed, and towns, villages, cities, and mega regions developed. Horses, bikes, trains, and cars helped everyone get around, but even today every trip begins and ends with a walk.

A comprehensive land use plan and set of urban design standards are required components to create an environment supportive of walking trips. The addition of a wayfinding system adds clarity to that physical environment. To fully present the diversity of wayfinding opportunities, literature was reviewed according to four major themes: **active transportation**, **urban wayfinding**, **mobile wayfinding tools**, and **digital mapping applications**.

---

### 5.1.1 Active Transportation

As identified in a 2004 Health Canada report on theory-based leisure-time walking research, “nearly 60 percent of Canadians are not active enough to reap the health benefits of regular exercise. The direct cost to our health-care system of these sedentary lifestyles is estimated to be over \$2 billion annually.” (Cournea & Plotnikoff, 2004). This estimated \$2 billion cost shouldn’t be overlooked, particularly when the evidence is clear that interventions that encourage walking can lead to sustainable increases in physical activity. In fact, active transportation can also help achieve the daily physical requirements set out by Health Canada.

Canada couldn’t be more ready for a shift in levels of physical activity. It’s estimated that one-third of Canadian children and adolescents are either overweight or obese (Shields, 2010). Educating parents and encouraging active commutes to school is an easy way to support healthier lifestyle choices specifically for youth with benefits to health, safety, and overall wellbeing (Davison et al, 2008; Larouche et al, 2014). “Brisk walking has the greatest potential for increasing overall activity levels of a sedentary population,” explain Melvyn Hillsdon and Margaret Thorogood in their 1996 ‘A systematic review of physical activity promotion strategies’ (Hillsdon & Thorogood, 1996).

Beyond the numerous benefits to our physical and mental health, walking around our own neighbourhoods allows us to nurture relationships with our neighbours, discover new local treasures, and feel more connected to the community in which we live. Bringing maps into the equation only makes this prospect more exciting, particularly when they’re beginning to convey information like the most beautiful or happiest routes (Quercia et al, 2014).

In 2006, as part of the Vancouver Park Board’s Vancouver Active Communities Initiative, a series of ‘Step Out’ walks were developed. Over 20 different walks around the city were identified and grouped into categories like Destination Walks, Park Trails & Walks, Local Theme Walks, Art and Culture Walks, and 2010 Winter Games Walks. Each walk featured the route mapped onto an aerial photo, the walking distance in kilometres and miles, the number of steps an average person will make, whether or not the route is accessible, and links to walking challenges and other resources. These walks were retired after the Vancouver 2010 Winter Olympics and didn’t transition over to the new Vancouver website when it was redesigned in 2012.

Around the same time, a 2012 study by McNeill and Emmons found that neighbourhood walking maps effectively increased levels of physical activity in low-income neigh-

bourhoods. Additionally, the maps provided the added benefit of introducing participants to previously unknown assets in their communities, highlighting the time-saving benefits of walking versus waiting for infrequent buses, and producing a more positive perception of the neighbourhood for its residents. (McNeill & Emmons, 2012).

Maps and walking routes were also brought together in an earlier study from Seattle on the 'Active Seattle Neighbourhoods on Foot' walking map series, which highlighted neighbourhood assets to encourage residents to rely less on automobile transportation. The maps became a community organizing tool, and supported other initiatives like the 'On the Cart' project, which provided small carts to enable residents to make more trips on foot to their local grocer (Deehr & Shumann, 2009). A final study, specific to older adults, found that neighbourhood walking maps combined with education on how to overcome barriers, such as heavy traffic and the presence of hills, found 75% of participants planned to continue walking at their current level or higher (Rosenberg et al, 2009). The use of walking maps as a physical activity prescription tool is an exciting new direction.

## 5.1.2 Urban Wayfinding

The world of urban wayfinding is fascinating and rapidly changing. Urban wayfinding projects, informed by other wayfinding systems such as those found in airports, convention centres, or transit networks, require a greater level of expertise and experimentation than their interior counterparts.

When users might be as diverse as long-time adult residents, children, visiting tour groups, or business owners, the creation of design guidelines can become an overwhelming prospect and time-consuming process. Before starting a wayfinding project, it's necessary to know the outcome will be worth the time and resources allocated. After all, Applied themselves acknowledge "it's worth noting that when lost, the quickest strategy is to ask for help." (Fendley, 2009). So how can a wayfinding system offer a better alternative? Richard J. Jackson and Stacy Sinclair outlined it quite well in 'Designing Healthy Communities':

"Most living things must be able to figure out how to get to and away from places. When we lose our way-finding ability, we are at the least very uncomfortable... When we walk into the ruins of ancient cities in countries such as Greece, we find that we know exactly where we are going, even if it is our first time there. A lot of thought was put into those buildings and the city plan." (Jackson & Sinclair, 2012).

It's not often that our present-day cities were designed in such a way as to support this intuitive wayfinding. Instead, we need wayfinding signage to fill in the gaps to teach people the shape of the city and the relationships between places. These systems "reduce the effort required by the user whenever possible," and "provide a guide to the streets, rather than a scaled version of reality." (Fendley, 2009). Focusing on simplifying the amount of information provided, it's been found that generalized wayfinding maps are more effective for navigation purposes than satellite or aerial maps (Dillemuth, 2005)

The benefits reach further than simply allowing users to reach their destinations. Developing a better cognitive map, or mental image of the local environment, may be one reason to encourage active travel and exploration (Mondschein et al, 2013). Allowing residents to build their own mental picture of the city will enhance their spatial knowledge and support smarter decision-making in the event of emergencies or disaster.

### 5.1.3 Mobile Wayfinding Tools

Encouraging the development of mental maps in a wayfinding context means limiting the amount of information provided to the user. In her 2005 'Map Design Evaluation for Mobile Display' study, Julie Dillemuth found that participants using a generalized map to navigate yielded faster travel speed and fewer navigation errors than those using an aerial photograph (Dillemuth, 2005). This is the area where global positioning system (GPS) applications thrive, since they're often designed to have as little visual clutter as possible.

"As people increasingly use mobile phone technology to build community and create connectivity, reliance on it for wayfinding purposes is sure to grow," states David Gibson in 'The Wayfinding Handbook'. But those pursuing mobile wayfinding applications must use discretion, because due to "the evolution of hardware, the increasing use of [GPS], and the growth of wireless networks, the mobile wayfinding device is one of the field's most rapidly evolving new territories." (Gibson, 2009).

Evolving technological advances may be enticing but can make for risky investment particularly in the public sector, as was seen a few years ago when Toronto began to install interactive wayfinding kiosks (Kupferman, 2011). An additional hazard begins to present itself in recent findings that show users begin to rely more heavily on access to information services when they're readily available, resulting in deficits to their spatial knowledge and mental maps (Mondschein et al, 2013).

If this delicate line can be managed, exciting applications remain possible. Recent research into mobile augmented reality (AR) applications has demonstrated promising benefits in mobile AR usage. The findings noted specific navigation tasks performed with mobile AR resulted in better performance when compared to using a paper map, when more complex environments are employed. (Goldiez, 2007)

#### 5.1.4 Digital Mapping Applications

No discussion of digital applications should be had without making mention of the digital divide, described by Statistics Canada as “the gap between information and communications technology (ICT) ‘haves’ and ‘have-nots’ [serving] as an umbrella term for many issues, including infrastructure and access to ICTs, use and impediments to use, and the crucial role of ICT literacy and skills to function in an information society.” (Sciadas, 2001). Although 86% of BC households are now connected to the internet, just 62% of the national lowest income quartile have internet access. (The Canadian Internet, 2014)

That said, those who do have internet access are becoming more and more involved in content generation rather than simply consuming content. ‘Prosumers,’ as they’re termed, can today make their own geo-referenced data and information while contributing to corporate map production and data tracking (Faby et al, 2010). Some of these are result of developer ‘mashup’ projects, combining different types of data to produce new applications, but many are a result of crowd-sourcing and tracking social media applications.

Apps like Foursquare and Swarm focus on allowing people to check-in to real-world destinations, using the GPS technology embedded into smart phones to geo-locate the user and match their location with nearby destination listings. Users can view maps, based on MapBox, Google Maps, or similar device-specific, vectorized mapping solutions like iMaps to view their check-ins or see the destinations friends have recently visited.

Other web apps like Walkonomics, CrowdSpot, or PlaceSpeak make use of online map-based citizen participation to solicit interactive feedback on neighbourhood planning projects or to brainstorm locations for future community-building interventions. As the public grows more accustomed to producing content on the web, opportunities begin to present themselves to encourage individually tailored way-finding solutions, which have shown promise for changing physical activity patterns. These solutions can not only be perfectly customized for individual users, but they are also highly cost-effective. (Williams et al, 2008; Marcus et al, 2007)).

## 5.1.5 Literature Conclusions

These findings suggest there are multiple different types of opportunities for Vancouver's digital wayfinding map such as printed walking routes to encourage more walking trips, further roll-out of wayfinding signage around the city, or more digitally interactive options. The wayfinding peer review to follow looks further into these directions with a specific focus on real-world applications.

## 5.2 WAYFINDING PEER REVIEW

---

A number of peer municipalities or organizations pursuing similar urban wayfinding projects were reviewed. These cases were selected based upon an existing list developed by the wayfinding team, with additional selection criteria including population, language, geographic location, the type of wayfinding system being installed, and the role of digital mapping with regards to the system. Based on these criteria, projects from the following locations were selected for comparison.



1. London, UK
2. Helsinki, Finland
3. Melbourne, Australia
4. University of British Columbia, Canada
5. Edmonton, Canada
6. Toronto, Canada
7. New York City, USA

The cases were compared across an array of criteria divided into an easy-to-understand hierarchy of where, when, why, who, how, how much, what, and what next and findings were grouped thematically. After all, in order to best understand the possibilities for moving forward with Vancouver’s wayfinding strategy, it’s important to know the direction in which other wayfinding initiatives are moving.

### 5.2.1 Digital Wayfinding

Vancouver is near the leading edge of pursuing digital options in urban wayfinding. London, with its influential Legible London project, paved the way for subsequent cities pursuing modern map-based wayfinding projects. Applied, the firm behind London’s project and the contractors hired by Vancouver, have gone on to work with a number of other clients including Heathrow Airport, the City of Glasgow, the University of British Columbia (UBC), and the City of Edmonton.

In 2010, the City of Toronto, working with Astral Media, began to install interactive “InfoTogo” wayfinding kiosks in the downtown core. Only five kiosks were installed due to a number of issues including the rapid adoption of smart phones between the time the project began in 2007, to installation in 2010; the effect of harsh winter climates on the touch-screen technology and the accumulation of dust and debris; and the overwhelming presence of advertising which some believe obscured the very presence of the wayfinding aspect of the kiosks. Toronto City Council voted to discontinue the project the following year (Kupferman, 2011).

Through 2008 and 2009, 250 two-sided digital kiosks were installed throughout the City of Helsinki, including indoor kiosks in Helsinki-Vantaa International Airport and 25 shopping centres. This system, produced by Symbicon, featured animated advertising and often suffered similar problems or receptions from the public as Toronto’s interactive kiosks due to harsh weather conditions.



Fig. 19: Rendering of Urbanflow on the streets of Helsinki

In 2011, Nordkapp and Urbanscale worked with the City of Helsinki to conceive and design the Urbanflow interactive wayfinding prototype. The new project aimed to inform local citizens about daily disruptions or events, and provide easy-to-understand information about places, services, and modes of transportation to tourists. The final proposed product was a large interactive touch-screen map – the content and design of which changed based on the location, time of day, current events, and so forth. The screen would encourage users to learn more about specific destinations or events, find precise directions, and even print out a small directions receipt to carry with them.

In late 2013, a simplified version of the Urbanflow proposal was rolled out on one side of the outdoor interactive kiosks, displaying a simplified wayfinding map along with news, events, and weather information in Finnish, Swedish, Russian, and English.

New York City is currently working on plans to incorporate real-time transit information into their street furniture currently displaying their new wayfinding map, but the two will remain separate components. UBC tested prototype wayfinding kiosks a number of years ago but the project was not pursued. There is renewed interest from UBC Parking and Security to install interactive wayfinding kiosks in parking garages on campus but it is only a conceptual direction at this point in time.

Moving to more mobile or web-based options, the interactive Heathrow Airport project allows users to navigate

the airport via interactive physical kiosks, or a desktop and mobile-supportive web interface. Users can select different floors and terminals, and view details on the available shops and services pictured.

The 'Walk Brighton' app is a similar project, which provides access to three categories of information: Attractions, Shopping, and Nightlife. Selecting each category alters the visual information on the map and results in an enjoyable experience for users. A particular highlight is the 'Nightlife' view of Brighton Pier, with its illuminated rides and attractions. These web-based solutions proved to be significantly lower priced than interactive kiosk infrastructure.

Fig. 20: A New York City wayfinding stand with real-time bus data



Fig. 21: Detail of Heathrow Airport's interactive map

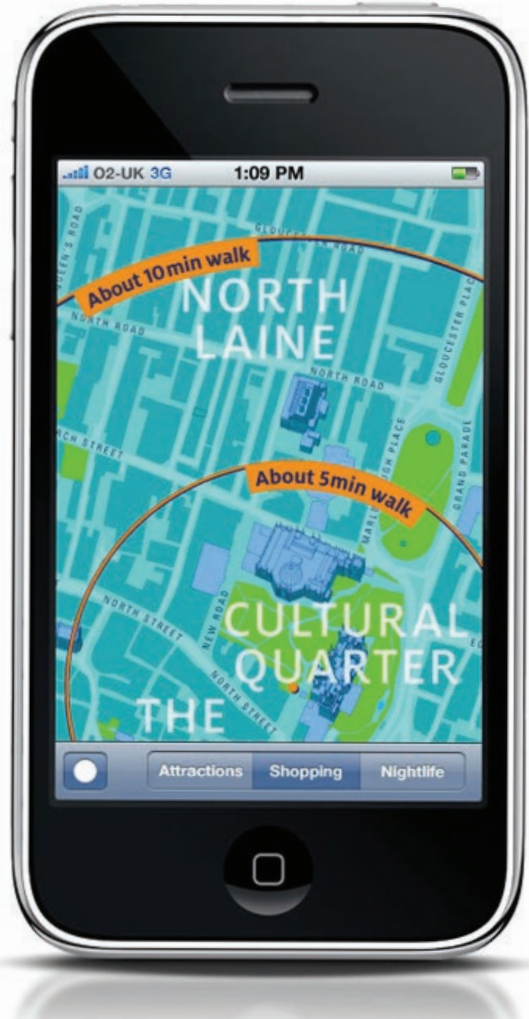


Fig. 22: The Walk Brighton iPhone app

## 5.2.2 Ownership and Monitoring

In many of the cities contacted, the municipal transportation department was in charge of the maintenance of the wayfinding project. This was the case with London's Transport for London, New York's Department of Transportation, and Toronto's Pedestrian Projects manager in the Transportation Services. Wayfinding design is a practice at the crossroads of transportation, communication, design, and psychology so it's often difficult for transportation departments to fully manage a wayfinding project on their own particularly when developing a digital strategy. In the case of Melbourne, Tourism Melbourne is spearheading their wayfinding strategy, and the City of Edmonton's Community Services in charge of the Walkable Edmonton strategy.

UBC Campus and Community Planning, on the University Endowment Lands at the tip of Vancouver's Burrard Peninsula, implemented a new wayfinding system for the globally recognized university in 2012 after contracting Applied to produce design guidelines. UBC produced their wayfinding map in-house to fulfill a pre-existing institutional agreement with a software provider. An automated system was built and student employees were hired to populate the maps with data. This arrangement resulted in a system owned and maintained by UBC, while also supporting student work learn positions. At this time no follow-up evaluation has been made to determine whether the system has met its goals of increasing clarity of navigating the 4km<sup>2</sup> campus, but inquisitive attention from local municipalities has been seen as a positive outcome.

Auckland, New Zealand, outside of the selected peer projects identified, recently installed a camera-based pedestrian counter system to track the number of pedestrian trips through 20 intersections around Auckland. The project was initiated back in 2012 by Heart of Auckland, downtown Auckland's business association, as a way to understand how foot traffic might be impacted by 'Heart of the City' events. The data is displayed on an intuitive web application

allowing users to view pedestrian counts by intersection and compare counts across intersections over time – as far back as July, 2012.

Steer Davies Gleave completed an evaluation in May of 2014 to review the current state of the Legible London project. The Evaluation 2013/14 Report found that the awareness of the wayfinding scheme in Central London increased from 52% in 2010 to 82% in 2013. In addition, the local signage was found to increase the respondents' confidence to explore from 60% to 90% in the same period, and the helpfulness of the signage to wayfind around an area increased from 65% to 94%.

The study also found 63% of those who were aware of the wayfinding maps expressed confidence in finding their way, compared to 32% of those unaware of the maps expressing confidence (Legible London 2013/14 Report, 2014).

Studies like these are beginning to provide real data on the role of wayfinding, and as these systems are in place longer, it is hoped that future research will produce similarly positive findings.



Fig. 23: Heart of Auckland's Pedestrians in the City tool



### 5.2.3 Lessons and Challenges

Collecting quantitative data to evaluate wayfinding projects, with respect to its impact on walkability and the local economy, is not an area most peers are currently focusing on. A number of cities identified the value in monitoring the projects once installation is complete, however few have yet defined a rigorous method to collect accurate and relevant data. Rather, they're focusing resources on designing and implementing their new physical wayfinding systems.

Securing funding was a common challenge across the projects reviewed. It was found that American cities had an easier time receiving funds from the federal government – funding that isn't available to Canadian cities. Most of the projects reviewed involved partnerships with local business associations or tourism groups to provide data and funding, among other types of support. In Vancouver's case, data licencing agreements (DLAs) provide the option for project partners to develop their own digital applications using Vancouver's map, supporting continued financial investment.

New York City's wayfinding system was initiated in response to the increasing number of wayfinding signage applications from different business improvement associations around the city. These business groups financially supported the projects' roll-out on the physical map stands – a similar case across many of the peer cities, including London, Toronto, and Edmonton.

A final lesson learned from analyzing the peer wayfinding projects is the conclusion that few areas are implementing digital wayfinding schemes, or using their wayfinding investments to support additional policies beyond active transportation-related policies.

The City of London uses its wayfinding map as a communication tool to distribute additional information across the city, such as street closures or new development applications. The City of New York uses its wayfinding map as a continuation of the NYC Subway brand, even incorporating a project-specific modification of the classic Helvetica font, 'HelveticaDOT'.

These additional uses are an excellent way to take advantage of the existing investment, and identify exciting new possibilities for the City of Vancouver's digital wayfinding map to set a new standard for the intersection of pedestrian wayfinding and digital mapping.

## 5.3 SUMMARY OF INTERVIEW FINDINGS

---

Starting from the recommendations of the research mentors, interview participants were selected based on their current or potential involvement with the project, or those who were identified as knowledge experts in the fields of wayfinding, software development, or urban informatics. This included City employees in departments ranging from Engineering Services to Web Operations, project partners including DV BIA and TransLink, and representatives from international design firms focusing on wayfinding. A full list of interview participants is located in the Appendix.

Three key themes emerged from the interviews: **Wayfinding Maps as a Communication Tool**, **Reluctance to pursue High-Tech Infrastructure**, and **Opportunity for Community Engagement**.

### 5.3.1 Wayfinding Maps as Communication Tool

A surprising number of internal interviewees were unaware of the City of Vancouver's wayfinding project. Right away, this informed directions for final recommended uses of the digital wayfinding map as a communication tool. An example of the map was provided, and ideas for additional uses were brainstormed.

Some of the common concepts included using the map to:

- Convey information on street closures or events;
- Act as the official map base for any City mapping needs for distribution to the public; or
- Inform people about their neighbourhoods in the form of architectural tour routes, community garden locations, or pedestrian-activated lights and crosswalk maps for safe walking to school routes.

A particular area identified for potential implementation was the City's website. Recent efforts have been made to increase the level of interactivity of the maps provided while also increasing the consistency. For instance, a number of different mapping solutions are currently used to create maps for display on the City's website, as outlined later in this report.

### 5.3.2 Reluctance to pursue High-Tech Infrastructure

When beginning to compile a research plan and conduct initial exploration into the capabilities of technology to support urban movement and navigation, high-tech projects were highly appealing. ‘Smart City’ movements are increasing as computing is becoming more ubiquitous and the ‘Internet of Things’, the trend towards providing network connectivity in everyday products, is growing. Publications like ‘Melbourne Smart City’ paint a picture of a beautifully seamless urban experience filled with relevant data visualizations. It seemed reasonable that any recommendations coming out of this research would support products like interactive physical wayfinding kiosks, or large-scale digital signage broadcasting real-time data on routes, closures, commercial hours, and so forth.



Fig. 24: Workshop visualization from Melbourne Smart City

As a result of the exploratory interviews, it was found costly products like these remain unreasonable investments for the public sector. The benefits to people, businesses, and the civic brand do not justify the resources and maintenance required to implement these high-tech wayfinding schemes particularly in light of the fast-paced, ongoing advancements in computing technology (Moore, 1965).

These conclusions helped to refine the final recommendations presented later on in this report. It’s important to re-evaluate this direction at a later date in the event that certain new technologies present themselves at a price-point more favourable for public sector investment, or the City opts to set a new precedent for the display of digital wayfinding data in the urban environment.

### 5.3.3 Opportunity for Community Engagement

Perhaps the most exciting interview discussions focused on the role of the digital wayfinding map to increase community engagement. Using the map as a communication tool, particularly when integrating it into the City’s website, affords the option to add an additional layer of interactivity. This could take the form of ‘crowd-sourced’ projects like community asset-mapping applications or physical infrastructure issue reporting.

Designed to be as clear and legible as possible, the map could be much more easily consumed by diverse audiences when compared to other mapping solutions provided by the City, such as VanMap, which is the City’s online geographic information system (GIS) mapping tool explained in more detail in the next section. The digital wayfinding map could be printed and brought to neighbourhood planning open houses to solicit feedback on proposed transportation improvements, zoning areas and developments, or the proposed location of city services and amenities such as pools and libraries. It could also allow residents to identify previously undocumented assets within their communities.

Because the City owns the data and map brand, the digital wayfinding map affords a layer of trust above and beyond what other mapping solutions can provide. Whether being used for communication or engagement, the map offers significant potential for development beyond the existing wayfinding project. The investment has been made, the asset has been created, so now is the time to take advantage of it.

## 5.4 CURRENT MAPPING AT THE CITY

A significant number of maps are currently being produced by City employees for distribution both internally and externally. Some of the internal maps might include neighbourhood land use plans, transportation plans, asset management maps, and so forth. Maps distributed to the public include application development permit notification signs, community engagement workshop artifacts, and bicycle network maps, among others. A future mobile 3-1-1 app, allowing citizens to access City services on their smartphone, may also incorporate a map allowing users to report issues such as graffiti or potholes.

A number of different mapping solutions are utilized in order to produce or distribute these maps. Listed in no particular order, these are **VanMap**, **MapInfo**, **3D Mapping Software**, **Google Maps**, and **Adobe Illustrator**.

### 5.4.1 VanMap

Made available to the public in 2001, VanMap is the City of Vancouver's Web-based GIS map system that pulls together information and data from a variety of sources, and puts it into maps users can view, save or print out.

Layers such as property lines, zoning information, water mains, or addresses can be turned on and off with the click of a button. VanMap is essentially a reference tool.

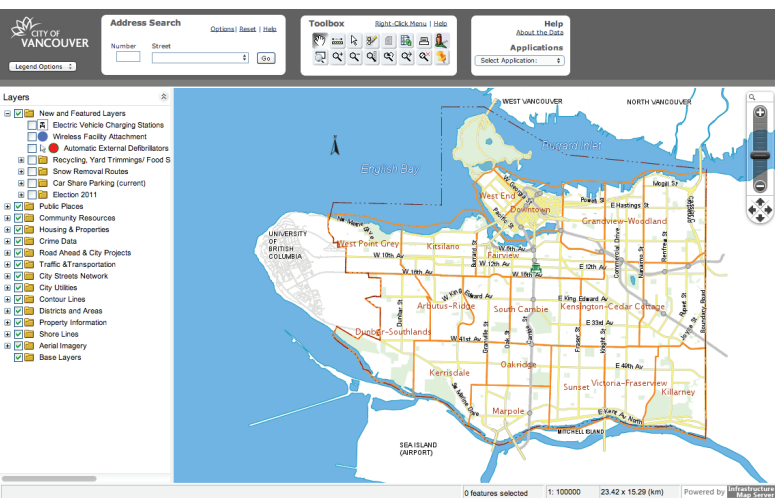


Fig. 25: The public VanMap screen showing default layers

#### Advantages:

- Provides access to very accurate geospatial data owned and maintained by the City.
- Users can display or hide types of information by turning on or off different data layers.
- Specific data can be found quickly and easily.

#### Disadvantages:

- A significant amount of technical information is available which may confuse novice users.
- The application runs quite slow and times out after a short period of time, requiring the user to restart the program.
- The map styling can't be customized before saving or printing, and the default maps aren't particularly attractive or engaging.

## 5.4.2 MapInfo

MapInfo is a software package used internally by City departments. Created by Pitney Bowes, the software allows City staff members to manipulate GIS data layers and produce visually-refined maps. It's primarily used to interpret data and run queries.

### Advantages:

- MapInfo is a popular software application targeting advanced users.
- Users are able to analyze a significant amount of data and save data for use in other applications.

### Disadvantages:

- The level of visual customization of the mapped data is limited.
- Without a template the maps are not consistent among users.
- Due to limited licenses and a steep learning curve for City employees not familiar with GIS applications, not many employees are able to take advantage of MapInfo's potential.

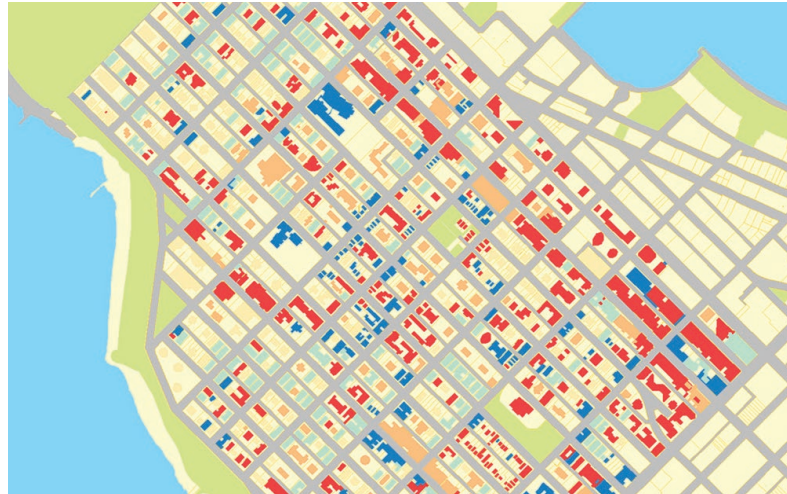


Fig. 26: Buildings in the West End colour-coded by age

## 5.4.3 3D Mapping Software

Since the 1980s a number of 3D maps of the City of Vancouver have been created at varying levels of detail. These maps ranged from data created manually in software like 3D Studio Max, to a more recent 3D scan of the city using LIDAR technology – a remote sensing technology that uses a laser to illuminate objects then analyzes the reflected light – and finalized in Autodesk Infrastructure Modeler. The 3D Vancouver maps are not currently available for use, though efforts are being made to establish a system to allow access to the map internally.

### Advantages:

- More and more applications are headed towards the inclusion of 3D city data. If Vancouver aims to lead the way with wayfinding, there's the potential to incorporate this data into future digital wayfinding map applications.
- The 3D map is complete citywide at varying levels of detail, so further time and resources aren't a required pre-requisite for its use.

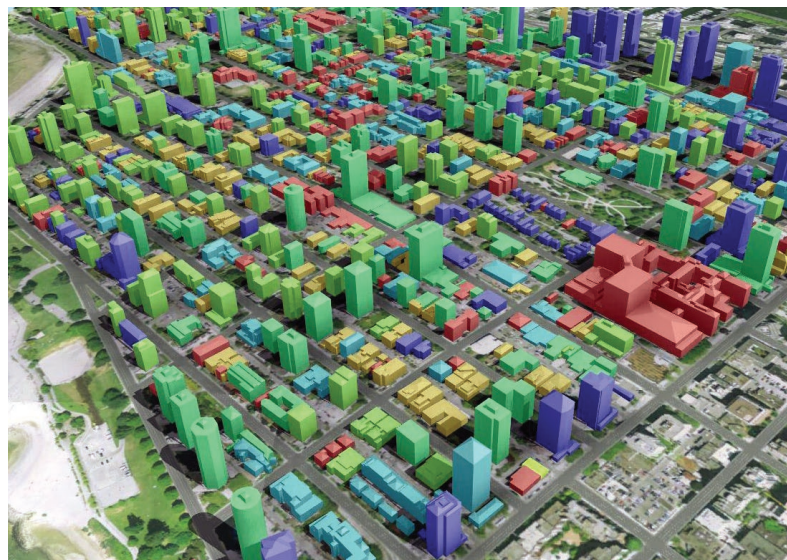


Fig. 27: Buildings in the West End colour-coded by age, in 3D

### Disadvantages:

- Only one staff member currently has access to the maps, which need to be rendered as image files in order to be distributed.
- The process of updating the map data to match current conditions of the ever-changing built-environment could be costly or time-intensive, and may require new software applications.

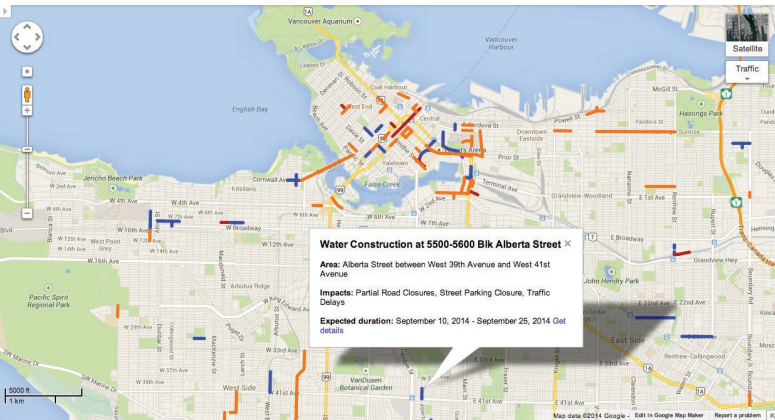


Fig. 28: The Road Ahead map identifying current road projects

### Advantages:

- Many web users are already quite familiar interacting with the user-friendly Google Maps.
- It is the industry leader for providing directions from origin to destination.
- It provides access to additional map-related features like Street View and a 3D Earth view.
- Creating new data layers with the Google Maps Engine to embed on the City's website is quick and intuitive.

### Disadvantages:

- The City has very little control over the data appearing on Google Maps. This can result in out-dated information being displayed well before its expiration date, and has implications for when major capital projects are completed.
- The interface is not customizable, and allowable data types are limited.



Fig. 28: Downtown public spaces in the Transportation 2040 plan

## 5.4.4 Google Maps

On the City's website, Google Maps is often used to convey interactive data, or information which might have an additional level of data attached. Both Google Maps and the Google Maps Engine are currently used.

Some of these uses include the Road Ahead map identifying current roadwork underway around the City, or a map identifying different districts within the West End neighbourhood.

## 5.4.5 Adobe Illustrator

Adobe Illustrator, part of the Adobe Creative Studio product suite, affords City employees the ability to create and modify vector-based map files. Examples of this include the route to school maps, or a variety of maps included in the Transportation 2040 plan. These maps are often saved as image files or PDFs, and do not support user interaction.

### Advantages:

- Custom maps can be created fairly quickly with differing levels of information in a very visually compelling manner.
- Users have complete freedom over the style, size, shape, and graphic elements of the maps and other content types.

### Disadvantages:

- Maps created by City employees do not follow a standard template, so their look and scale can differ greatly.
- Due to limited licenses, most City employees do not have access to Illustrator.
- A significant amount of skill is required to use the software to create or modify maps.

## 5.4.6 Living Map Webviewer

To support the development of the new digital wayfinding map, a webviewer was created by Applied and hosted by the Living Map Company. This webviewer, similar to Google Maps, allows users to pan and zoom to different levels of content. The internal Wayfinding group made use of the webviewer to confirm data accuracy prior to production of the printed map stand content.

### Advantages:

- The webviewer allows users to view the digital wayfinding map at multiple zoom levels from any internet-enabled device.
- This visually-appealing, custom application could be developed further.

### Disadvantages:

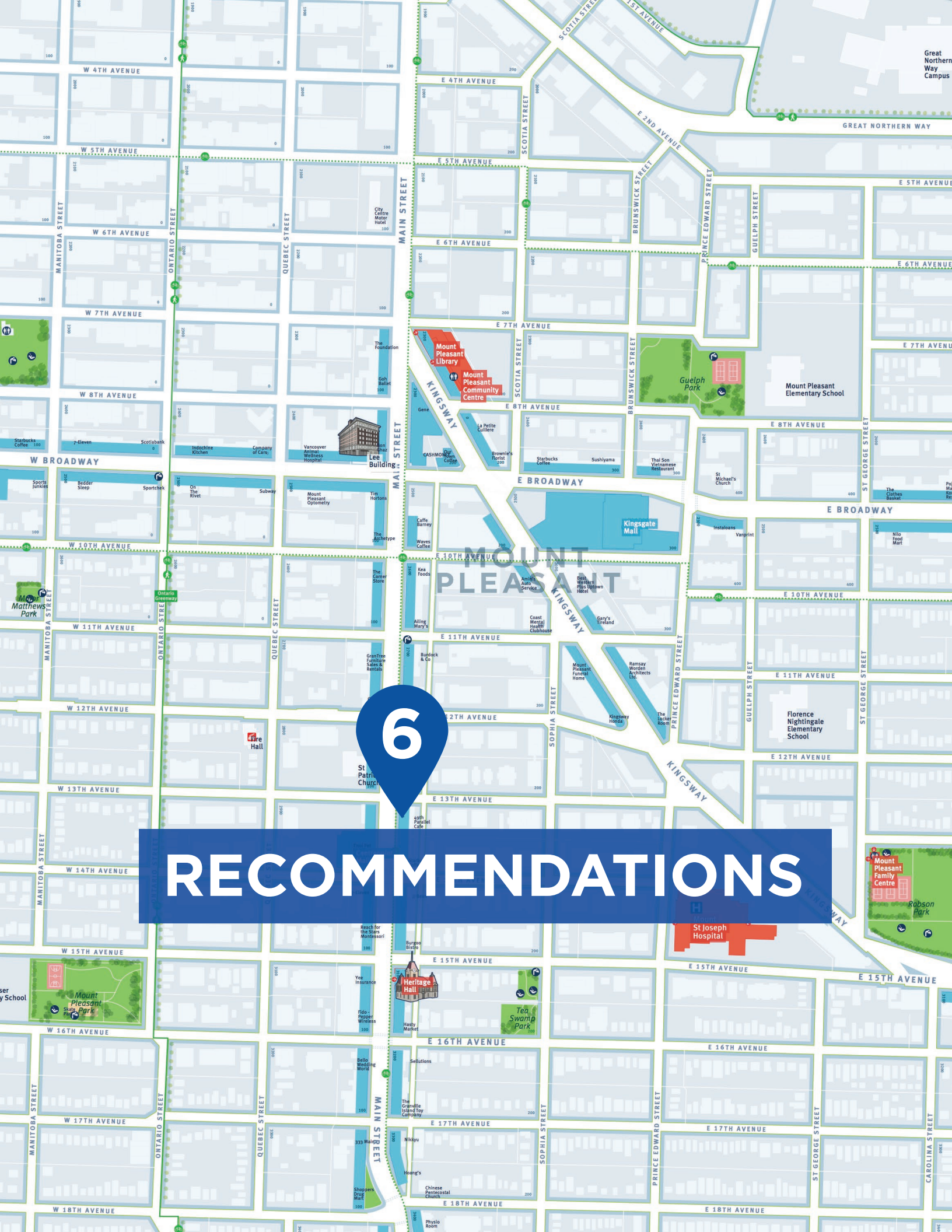
- The webviewer currently has restricted access only for those with a username and password.
- The new digital wayfinding map at the finder level, the highest level of zoom, is limited to the metro core and major commercial areas throughout the rest of the City, resulting in blank areas lacking visual data.
- There is no way to overlay additional data onto the map without sending the data directly to Applied.
- To open up access externally, DLAs would need to be signed, and guidelines for use developed.

## 5.4.7 Current Mapping Conclusions

As reviewed, a number of different mapping solutions are currently in use at the City. Rather than contributing to the complexity of mapping solutions, the addition of a digital wayfinding map creates the opportunity to combine a number of these different tools into one well-maintained, simplified, and visually-engaging solution. The map could support a more cohesive visual design of official City communications and engagement documents and has the potential to reach more residents and visitors by becoming a trusted, accessible, and interactive source of official City data.



Fig. 30: The downtown core at the Planner map zoom level



Great Northern Way Campus



# RECOMMENDATIONS





## 6.1 RECOMMENDED OPPORTUNITIES

---

Based on the above findings, a number of recommended opportunities have been identified. These are grouped into **static products**, and **interactive products**. A concept illustration, incorporating the digital wayfinding map, accompanies each opportunity along with defined actions and benefits, a rough timeline, estimated costs, proposed ownership and key partners, implementation approach, evaluation measures, and easy-wins.

## 6.2 STATIC PRODUCTS

---

Focusing on printed or image-based opportunities, the following proposed static products make use of the digital wayfinding map as a powerful tool in the City's branding and corporate communications toolbox. Learning from Legible London, where the map has been rolled out to as many departments as possible, using the City's new map wherever other maps are displayed in official pieces of signage or communication will help build trust and confidence in the map content.

This approach, when combined with the maps displayed in the physical map stands around the city, will allow the public to begin recognizing the map as an official communication base and begin to form instant associations with the map.

The recommended static products are new **Development Application Signs**, **Walking Tour Maps**, and **Branded Merchandise**.

# DEVELOPMENT APPLICATION NO. DE417537

## 5 Expo Boulevard (International Village Elementary School)

have received a Development Application from Francl Architects to develop a 3-storey elementary school at the above-noted address.

proposed elementary school is permitted under the site's existing CD-1 (265) zoning and it was anticipated when the International Village site was rezoned. The new elementary school will accommodate kindergarten to grade seven students, as well as before and after school care. The proposal includes:

- Floor area of approximately 48,491 sq. ft.;
- Building height of approximately 53 ft.;
- 28 off-street parking spaces; and
- Proposed student pick-up and drop-off along Expo Boulevard and Keefer Place.



FURTHER INFORMATION MAY BE OBTAINED AT:  
[vancouver.ca/devapps](http://vancouver.ca/devapps)

PROJECT FACILITATOR'S OFFICE  
3<sup>RD</sup> FLOOR, EAST WING, CITY HALL, PHONE 604.871.6036



Fig. 31: Development Application Sign concept

### 6.2.1 Development Application Signs

One of the key recommendations from the 2013 Engaged City Task Force Quick Stats Report was the redesign of development project signage. It was noted the current signs use small fonts and overly technical language. The design was changed to feature easy-to-understand language and details, improved visuals including a site sketch or rendering and an improved map, and information on how residents can give input online or in person. A prototype sign was installed in 2013 at 720 - 730 E Hastings, but this design could easily benefit from the standardized use of the digital wayfinding map.

**Action:** Integrate the wayfinding map as a base layer for the site-specific map displayed on development application signage.

**Benefit:** This will enhance the visual accessibility of the signage, identify pedestrian infrastructure like existing sidewalks, and build on the consistency and trust built into the wayfinding map.

**Timeline:** 1-2 Months

**Estimated Cost:** Staff hours required to implement new design template

**Ownership:** CoV Corporate Communications / CoV Engagement / CoV Community Services Group

**Implementation:** Provide map base layer to the graphic designer, and review proposed design with Corporate Communications and Engagement.

**Evaluation:** Type of public response (positive or negative); interest from other municipalities.



Fig. 32: Strathcona architectural walking tour concept

## 6.2.2 Walking Route Maps

Existing literature reviewed previously in this report identified the potential for printed walking maps to encourage more active lifestyles and result in a number of health benefits. Building off previous investments into the Best Route to School maps, or the Park Board’s Step Out walks, it is recommended that the digital wayfinding map be used as a base upon which this existing content can be added. The routes are already determined, and landmarks, walking distances, and other data have already been produced. This is an easy win with a big impact.

**Action:** Build design guidelines or templates to support creation of consistent walking maps.

**Benefit:** Bringing these walking maps back to life and plotting their routes on top of the new wayfinding map will respect the work that went into producing previous walking route maps; respond to and help support Vancouver’s GCAP green transportation goals and Healthy City goals; and provide a low-cost and beautiful new way for visitors to discover the city for the first time, and let residents rediscover their own neighbourhoods.

**Timeline:** 1-3 Months

**Estimated Cost:** Necessary staff hours to build design guidelines.

**Ownership:** CoV Active Transportation / CoV Corporate Communications + **Key Partners:** Park Board

**Implementation:** Allocate staff hours or hire a temporary employee to identify key partners, build design guidelines, and create and potential map template files. Work with key partners to ensure resulting maps adhere to the guidelines and convey appropriate amounts of information.

**Evaluation:** Number of template requests, number of maps produced, type of public response.



Fig. 33: Map-branded shower curtain & ceramic cup concept

### 6.2.3 Branded Merchandise

During anecdotal experiences trying to locate City-branded merchandise, and as a result of a number of interview discussions, it was identified that branded products could be a low cost option with a favourable return on investment. Thanks to the beautiful design of the digital wayfinding map, it's not only helpful when finding directions, but it's also a beautiful work of civic art. The City does not currently produce or sell branded merchandise – perhaps this is the time to start.

**Action:** Produce and market a line of City of Vancouver map-branded merchandise, such as:

- Design a map-branded umbrella to help residents and visitors get around on rainy days.
- Continue the tongue-in-cheek nod to Vancouver's reputation as Canada's "wet coast" city by applying the map to a line of rain boots.
- Create shower curtains displaying the entire city, or popular neighbourhoods, highlighting the distinct character of the neighbourhood along with local landmarks and destinations.
- Wrap it around an insulated or ceramic coffee mug to let residents enjoy a morning brew at the park and follow a new route home afterwards.

**Benefit:** Additional advertising for the City of Vancouver, increased civic pride, increased reputation as a City that knows how to have fun, and potential financial profit.

**Timeline:** 4 – 12 months to release first product line.

**Estimated Cost:** \$5,000-\$10,000 for design production plus undetermined amount per product item.

**Ownership:** CoV Corporate Communications / CoV City Manager's Office

**Implementation:** Source local manufacturer possibilities, complete or contract out finalized artwork to appear on various products, and determine pricing structure and method of distribution. Spacing Toronto is in the process of opening a storefront in Toronto to sell urban-oriented merchandise, such as subway station buttons. Contact Spacing Vancouver to inquire about a similar program here, and provide the digital wayfinding map and support to see the project implemented.

**Evaluation:** Number of items sold; amount of interest in bulk orders; number and type of knock-off products designed.

## 6.3 INTERACTIVE PRODUCTS

---

A number of different actions can be taken to make the most of the existing investment and work towards Vancouver becoming a leader in urban wayfinding, digital mapping, and online civic user experience. Since wayfinding is a complex spatial activity, the proposed recommendations ensure the user remains engaged in the real world environment whenever possible (Li & Willis, 2006). As such, and due to the high costs and rapid obsolescence of high-tech physical infrastructure, no interactive kiosks or broadcasted signage actions have been recommended at this time.

The recommended interactive products are a **Wayfinding Map API**, an **Online Map Maker**, a **Vancouver Website Map**, and a **Mapathon/Design Jam**.

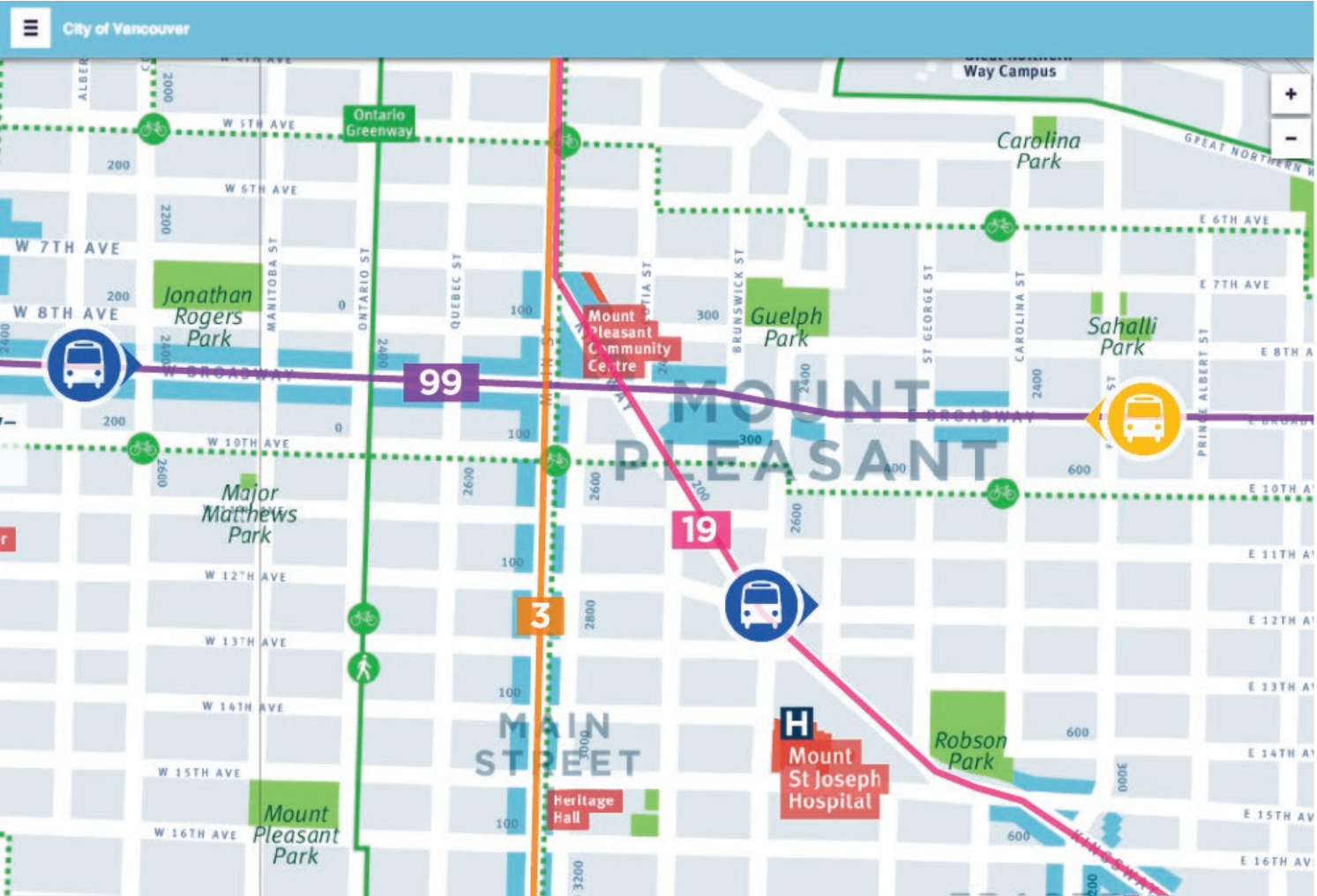


Fig. 34: Wayfinding Map API live bus concept

### 6.3.1 Wayfinding Map API

Within the existing contract with Applied, an API option has been proposed and the costs have been determined. For a minimal investment, the City could open the door to a new way to explore the further potential of the wayfinding map. This recommendation would likely be required for recommendation 6.3.2 Online Map Maker, and would be a prerequisite for pursuing recommendations 6.3.3 Vancouver Website Map, 6.3.4 Mapping Hackathon.

**Action:** Work with Applied to release a public API of the map.

**Benefit:** Supporting existing Digital Strategy policies, the release of an API will give internal and external developers the ability to add additional information onto the current map. This will encourage creative thinking and innovation, and give residents a feeling of ownership and increased familiarity with the map.

**Timeline:** 2 months (for internal use) – 1 year (for full public release)

**Estimated Cost:** \$13,200/year for API setup and management, \$1,500/month for Living Map product license, plus unknown cost to make API available for public use.

**Ownership:** Applied / CoVIT

**Implementation:** Work with Applied to define the specific API structure and determine an ongoing agreement, provide access to the API via the City’s Open Data webpage.

**Evaluation:** Number of API users; number of API calls; number of registered applications.

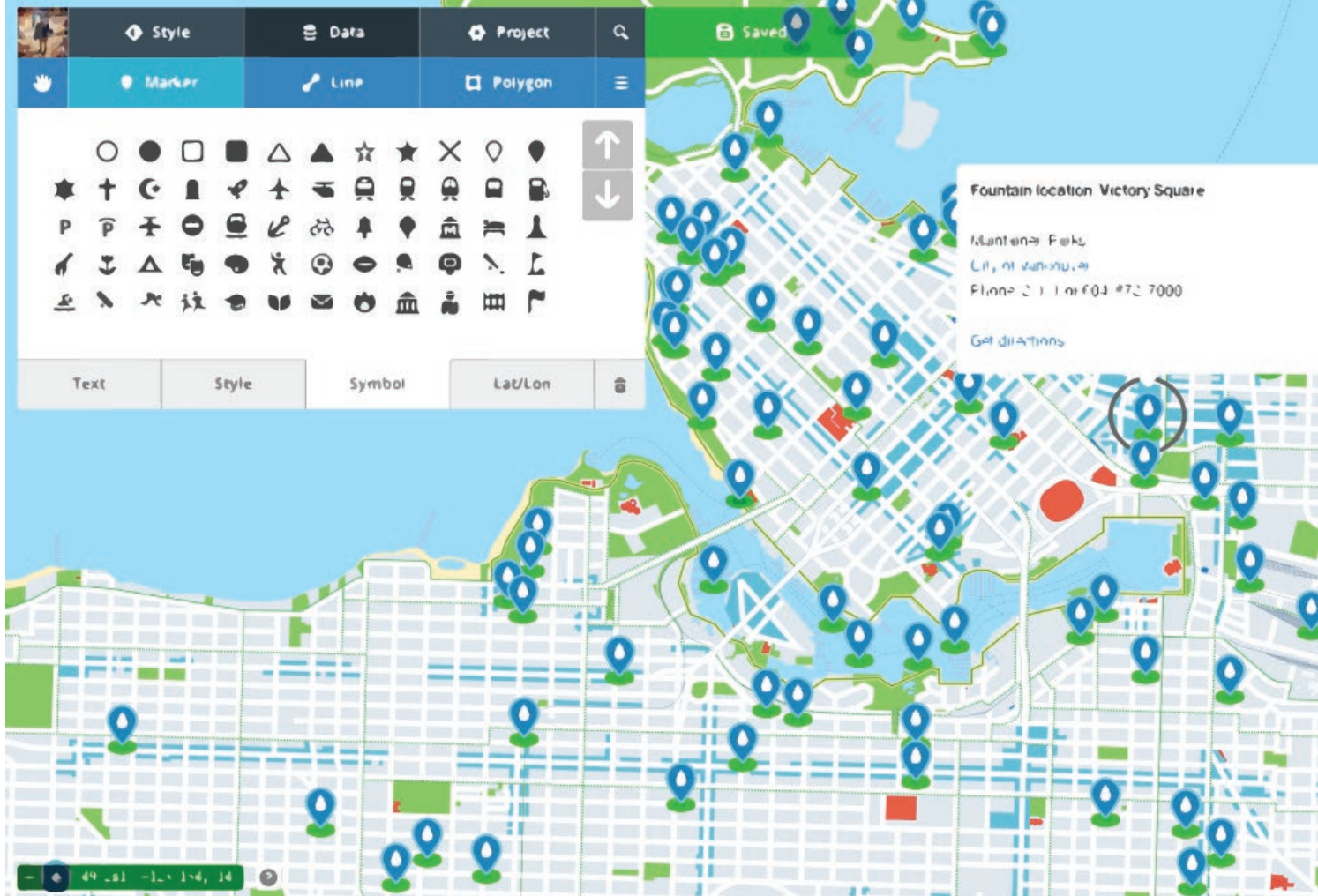


Fig. 35: Online Map Maker concept showing water fountains

### 6.3.2 Online Map Maker

Applied could be contracted to produce a web-based map maker similar to Google Maps Engine or Mapbox – both very intuitive applications providing a quick and easy way to add data to interactive maps. The current publishing agreement with Applied includes a system whereby Applied could be contracted to produce additional on-demand map products, such as the Vancouver Cycle Network map, using an in-house PDF maker. The concept above is based on the Mapbox.com interface.

**Action:** Pursue the creation of a web-based map maker through Applied or by contracting another third-party developer.

**Benefit:** City staff and the general public could conceptualize and produce their own online map to communicate civic information, ideas, or simply express themselves in a map-based format. Depending on the ease of use, the map could become the go-to standard for staff looking to create clear, legible, consistent maps for distribution.

**Timeline:** 6-12 months

**Estimated Cost:** \$10,000 - \$30,000 plus ongoing maintenance costs.

**Ownership:** Applied / CoVIT

**Implementation:** Contact Applied to inquire about possibility to develop online map maker application. If API supports it, pursue an open request for proposals to encourage local software developers to build the application. Complete simple reference handbook for employees, and distribute the software across the CoV network.

**Evaluation:** Number of maps produced using the map maker; number of positive responses from internal and external users.



Fig. 36: 'My Mapcover' embedded homepage map concept

### 6.3.3 Vancouver Website Map

Currently a number of different map types are available through the City's website. These include but are not limited to downloadable PDFs, static image files, interactive maps, and embedded Google maps. Making use of the map API in an interactive web-based environment would provide the opportunity to increase consistency across all maps displayed on the website. It could also present localized services and information to users based on their current location. These could include garbage and recycling pickup schedules, nearby community centres or libraries, street closures, neighbourhood planning sessions, and so on.

**Action:** Embed the interactive wayfinding map with appropriate information layers in every area of Vancouver.ca where a different type of map is currently displayed.

**Benefit:** Increasing consistency across as many mediums as possible would further the perception of the map as the official City map, while also supporting a more consistent brand experience.

**Timeline:** 6-12 months

**Estimated Cost:** Cost of creating API from recommendation 6.3.1 and staff time to integrate the map API into the website and add/maintain data layers.

**Ownership:** CoV IT / CoV Web Operations

**Implementation:** Work with Applied to confirm API structure and method of implementation. Determine all areas on the City's website where maps are displayed and prioritize order of map replacement. Produce new maps, and embed the new maps on the website.

**Evaluation:** Difference in number of pageviews for pages containing the new map; number of map downloads; number of positive responses from website visitors.



### 6.3.4 Mapathon/Design Jam

The final recommended option for the map is to incorporate it into a hackathon (hacking marathon) event. Hackathons grew in popularity from their beginnings as programming mashups in 1999 and have since become well supported by the open data and open government movements. A Yahoo Open Hack event in 2012 had over 700 attendees (Johnson, 2012). On February 23, 2013, the City of Vancouver held an open data hackathon in conjunction with the third annual International Open Data Day to celebrate the release of the City's expanded open data catalogue.



Fig. 37: 2013 Vancouver Hackathon final presentations

Code for America, a non-profit that helps residents and governments harness technology to solve community problems, has supported a number of civic hackathon events with outcomes as well known as Textizen, a civic dialogue platform that allows residents to connect with a mix of offline outreach and online engagement; Streetmix, an interactive street section builder that helps community members mock-up the streets they'd like to live on; and The Daily Brief, which allows users to explore and filter 311 service requests by neighbourhood, service name, and status.

Using the wayfinding map API published by Applied, as per recommendation 6.3.1 Wayfinding Map API, a 'Mapathon' event could invite community members and app developers to participate in an idea generation and prototyping event to produce possible map applications or directions. The event would include tutorial sessions to explain how certain aspects of the map could be interacted with. Challenges could be proposed for participants to respond to, such as 'Create an application to encourage more people to walk' or 'Build a game to teach residents about your neighbourhood'. Since hackathons range from a few hours, to 24 hours, to entire weekends, the proposed 'Mapathon' would be a two-day event with the first 'Design Jam' day focusing on concepts and tangible prototyping, and the second 'MapHack' day focusing on programming and digital prototyping.

**Action:** Hold a hackathon event to produce prototype applications for the wayfinding map.

**Benefit:** New relationships could be formed between residents and app developers, useful application concepts could be identified, and potential application products could be created. These outcomes would allow the map to reach new audiences and further the goal of using it as a civic-branding tool.

**Timeline:** 3-6 Months

**Estimated Cost:** \$5,000-\$10,000 for event facilitation, food, documentation, etc. plus an undetermined amount for a trial version of the API from Applied.

**Ownership:** CoV IT / CoV Digital Strategy

**Implementation:** Dedicate staff hours to coordinate with interested outside parties to plan the event and secure sponsors. CityStudio has expressed interest in providing a space to hold the event. The Vancouver Economic Commission has expressed interest in being involved with logistics. The Vancouver Design Nerds have expressed interest in facilitating and documenting the 'design jam' portion of the event.

**Evaluation:** Number of participants; level of participant satisfaction; number of projects; quality of outcomes.

## 6.4 EASY WINS

---

Following these recommendations, a number of simple low-cost, high-benefit actions should be taken by the City to begin making use of the digital wayfinding map and pave the way for additional investment. These 'easy wins' are as follows:

- Build awareness of and momentum for the new digital wayfinding map by highlighting the project across the City's communication channels (website, social media accounts, internal CityWire, etc.) in conjunction with the new map content being installed into the physical map stands.
- Make use of the map to display locations participating in the upcoming Doors Open event, or polling centres for the November municipal election.
- Produce a few sample, updated Step Out or Best Route to School walking maps focusing on some of the City's most popular areas and distribute them throughout City Hall, Vancouver Public Library branches, Community Centres, and other neighbourhood information centres.

## 6.5 IMPLICATIONS OF INACTION

---

Although the digital wayfinding map was created primarily to support current and future updates to Vancouver's physical wayfinding system, a number of consequences will occur in the event the City chooses not to pursue additional opportunities for the map. These include, but are not limited to:

- Missed opportunities to bring the City closer to meeting its related GCAP, Transportation 2040, Digital Strategy, and Healthy City Strategy goals.
- A greater risk of map data becoming out-of-date between now and the next map stand content refresh in three years due to a lack of maintenance and dedicated staff resources.
- Ongoing funds allocated to the storage and infrastructure maintenance of the digital wayfinding map won't result in any additional benefit.
- The likelihood that map production at the City will continue to become more decentralized and inconsistent, requiring more staff time dedicated to reproducing similar base-map content across departments.



# CONCLUSIONS

## 7.1 SUMMARY OF RESEARCH

---

The recommendations and easy wins suggested previously outline a number of alternative directions to make use of the digital wayfinding map the City of Vancouver has invested into over the past year. These recommendations were based on a review of existing literature, a wayfinding peer study, and a series of exploratory interviews. They respond to existing plans and policies adopted by the City, not limited to the Greenest City 2020 Action Plan.

Each of the recommendations, if implemented, would make a positive contribution to mapping at the City, and increase awareness of Vancouver's beautiful new wayfinding map. The map and its possibilities should be communicated broadly to refine its benefits to the City's brand, residents, visitors, and the broader public. If a department intends to create a map, they should know this solution exists and should have the tools and knowledge on hand to produce a consistently branded map efficiently and effectively.

## 7.2 MOVING FORWARD

---

This research was conducted with a focus specific to the current digital wayfinding project at the City of Vancouver. Future research should focus on evaluating the performance of Vancouver's digital wayfinding map once it has been installed in the physical map stands around the city, and further refine the potential for the recommended opportunities to enhance civic engagement and participation. There are as of yet unknown links between wayfinding, public mapping, and walkability, and additional research could begin to tie these areas together.

Vancouver's digital wayfinding map is a tremendous asset for the City and has great potential for advancing Vancouver's Greenest City goal of increasing the number of walking trips. The map has the potential to amplify Vancouver's image as Canada's beautifully green, livable, compact, and forward-thinking west coast city. While pedestrian wayfinding systems worldwide have only just begun to gain popularity within the last 10 years, the timing is right for Vancouver to take this opportunity to set a new global precedent.

The tools are at hand, and the path has become clear.

It's time to lead the way forward.



## WORKS CITED

Alliance, B. H. L. (2007). Physical activity strategy. Vancouver: BC Healthy Living Alliance, 15.

Buchanan, Colin (2007). Legible London Initial Business Case (Unpublished).

Badger, Emily. (2012, Jan. 31) "The Surprisingly Complex Art of Urban Wayfinding." CityLab. The Atlantic. Retrieved July 16, 2014. <<http://www.citylab.com/design/2012/01/surprisingly-complex-art-wayfinding/1088/>>.

Buchanan, P., & Gay, N. (2009). Making a case for investment in the public realm. Proceedings of the ICE-Urban Design and Planning, 162(1), 29-34.

Cunningham, G., & Michael, Y. L. (2004). Concepts guiding the study of the impact of the built environment on physical activity for older adults: a review of the literature. American Journal of Health Promotion, 18(6), 435-443.

Davison, K. K., Werder, J. L., & Lawson, C. T. (2008). Peer reviewed: Children's active commuting to school: Current knowledge and future directions. Preventing chronic disease, 5(3).

Deehr, R. C., & Shumann, A. (2009). Active Seattle: achieving walkability in diverse neighborhoods. American journal of preventive medicine, 37(6), S403-S411.10

Dillemuth, J. (2005). Map design evaluation for mobile display. Cartography and Geographic Information Science, 32(4), 285-301.

Faby, H., & Koch, A. (2010, June). From maps to neo-cartography. In Proceedings of the 3rd International Conference on Cartography & GIS, Nessebar.

Fendley, T. (2009). Making sense of the city: A collection of design principles for urban wayfinding. Information Design Journal, 17(2), 91-108.

Freundschuh, S. M., Neil, J. S., & Paul, B. B. (2001). Wayfinding and navigation behavior. in-Chief: Neil J. Smelser, & Paul B. Baltes (Eds.), International encyclopedia of the social & behavioral sciences, 16391-16394.

Gibson, D. (2009). The wayfinding handbook: information design for public places. Princeton Architectural Press.

Goldiez, B. F., Ahmad, A. M., & Hancock, P. A. (2007). Effects of augmented reality display settings on human wayfinding performance. *Systems, Man, and Cybernetics, Part C: Applications and Reviews, IEEE Transactions on*, 37(5), 839-845.

Golledge, R. G. (Ed.). (1999). *Wayfinding behavior: Cognitive mapping and other spatial processes*. JHU Press.

Hegarty, M., Richardson, A. E., Montello, D. R., Lovelace, K., & Subbiah, I. (2002). Development of a self-report measure of environmental spatial ability. *Intelligence*, 30(5), 425-447.

Hillsdon, M., & Thorogood, M. (1996). A systematic review of physical activity promotion strategies. *British journal of sports medicine*, 30(2), 84-89.

Ishikawa, T., Fujiwara, H., Imai, O., & Okabe, A. (2008). Wayfinding with a GPS-based mobile navigation system: A comparison with maps and direct experience. *Journal of Environmental Psychology*, 28(1), 74-82.

Jackson, R. J., & Sinclair, S. (2012). Designing healthy communities. *Health Affairs*, 31, 4.

Jacobs, J. (1961). *The death and life of great American cities*. Random House LLC.

Jeanne Sholl, M. (1988). The relation between sense of direction and mental geographic updating. *Intelligence*, 12(3), 299-314.

Jennings, K. (2012). *Maphead: Charting the Wide, Weird World of Geography Wonks*. Simon and Schuster.

Jobst, M. (2009). Neo-cartographic interlacement as barrier for Cartographic Heritage. *e-Perimtron*, 4(4), 212-220.

Johnson, Pushpalee. (2012). Purple in Bangalore – Inside Yahoo! Open Hack India 2012.. YDN Blog. Yahoo Developer Network. Retrieved July 29, 2014. <<http://developer.yahoo.com/blogs/ydn/purple-bangalore-inside-yahooo-open-hack-india-2012-52837.html>>.

Kelly, C. E., Tight, M. R., Hodgson, F. C., & Page, M. W. (2011). A comparison of three methods for assessing the walkability of the pedestrian environment. *Journal of Transport Geography*, 19(6), 1500-1508.

Krug, S. (2000). *Don't make me think!: a common sense approach to Web usability*. Pearson Education India.

Kupferman, S. (2011). How the iPhone destroyed Astral's InfoToGo pillars. *City\_Local News. The Grid*. Retrieved August 5, 2014. <<http://www.thegridto.com/city/local-news/how-the-iphone-destroyed-astrals-infotogo-pillars/>>.

Lancaster, T., Tatebe, K., Welk, E., & Williams, C. (2008). *YouMap Vancouver Neighbourhood Amenity Mapping Project*. Vancouver City Planning Commission. Retrieved July 28, 2014. <[http://built4change.vancouverplanning.ca/wp-content/uploads/2008/12/youmap\\_report2008.pdf](http://built4change.vancouverplanning.ca/wp-content/uploads/2008/12/youmap_report2008.pdf)>.

Larouche, R., Faulkner, G. E., Fortier, M., & Tremblay, M. S. (2014). Active Transportation and Adolescents' Health: The Canadian Health Measures Survey. *American journal of preventive medicine*, 46(5), 507-515.

Legible London Evaluation 2013/14 Report. (2014, March). Steer Davies Gleave. Transport for London. Retrieved August 5, 2014. <<http://www.tfl.gov.uk/cdn/static/cms/documents/legible-london-evaluation-summary.pdf>>.

Li, C., & Willis, K. (2006, September). Modeling context aware interaction for wayfinding using mobile devices. In *Proceedings of the 8th conference on Human-computer interaction with mobile devices and services* (pp. 97-100). ACM.

Liarokapis, F., Brujic-Okretic, V., & Papakonstantinou, S. (2006). Exploring urban environments using virtual and augmented reality. *Journal of Virtual Reality and Broadcasting*, 3(5), 1-13.

Liben, L. S., Kastens, K. A., & Stevenson, L. M. (2002). Real-world knowledge through real-world maps: A developmental guide for navigating the educational terrain. *Developmental Review*, 22(2), 267-322.

Lynch, K. (1960). *The image of the city* (Vol. 11). MIT press.

Marcus, B. H., Lewis, B. A., Williams, D. M., Dunsiger, S., Jakicic, J. M., Whiteley, J. A., ... & Parisi, A. F. (2007). A comparison of Internet and print-based physical activity interventions. *Archives of Internal Medicine*, 167(9), 944-949.

McNeill, L. H., & Emmons, K. (2012). GIS walking maps to promote physical activity in low-income public housing communities: a qualitative examination. *Preventing chronic disease*, 9.

- Moore, G. E. (1965). Cramming more components onto integrated circuits.
- Mondschein, A., Blumenberg, E., & Taylor, B. D. (2013). Going Mental: Everyday Travel and the Cognitive Map. *ACCESS Magazine*.
- Montello, D. R., Waller, D., Hegarty, M., & Richardson, A. E. (2004). Spatial memory of real environments, virtual environments, and maps. *Human spatial memory: Remembering where*, 251-285.
- Quercia, D., Schifanella, R., & Aiello, L. M. (2014). The shortest path to happiness: Recommending beautiful, quiet, and happy routes in the city. *To Appear*.
- Ratliff, E. (2007). How Google Maps is changing the way we see the world. *Whole Earth*, 1(5), 5.
- Rosenberg, D., Kerr, J., Sallis, J. F., Patrick, K., Moore, D. J., & King, A. (2009). Feasibility and outcomes of a multilevel place-based walking intervention for seniors: a pilot study. *Health & place*, 15(1), 173-179. 13
- Sciadas, G. (2001). Digital Divide in Canada. *Statistics Canada*.
- Shields, M., & Tremblay, M. S. (2010). Canadian childhood obesity estimates based on WHO, IOTF and CDC cut-points. *International Journal of Pediatric Obesity*, 5(3), 265-273.
- Speck, J. (2013). *Walkable city: How downtown can save America, one step at a time*. Macmillan.
- Steinfeld, A., Zimmerman, J., Tomasic, A., Yoo, D., & Aziz, R. D. (2011). Mobile transit information from universal design and crowdsourcing. *Transportation Research Record: Journal of the Transportation Research Board*, 2217(1), 95-102.
- Timpf, S. (2006). Wayfinding with mobile devices: decision support for the mobile citizen. In *Frontiers of Geographic Information Technology* (pp. 209-228). Springer Berlin Heidelberg.
- The Canadian Internet. (2014). CIRA. Retrieved July 29, 2014. <<http://cira.ca/factbook/2014/the-canadian-internet.html>>.
- Williams, D. M., Matthews, C., Rutt, C., Napolitano, M. A., & Marcus, B. H. (2008). Interventions to increase walking behavior. *Medicine and science in sports and exercise*, 40(7 Suppl), S567.

# 9 APPENDIX

## Definition of Terms

**Active transportation** is a mode of transport using human muscle power, such as walking or riding a bicycle.

**Augmented Reality (AR)** is a software application which overlays virtual data onto an live video of the real world, often in a handheld device.

**Application Programming Interface (API)** is an interface programmers use to interpret and build upon application data.

**Crowd-sourced** is the process of inviting a wide range of people to contribute time, information, or expertise to solve a problem, often very quickly.

**Geo-referenced database** is a digital map filled with specific data sets, owned by the Living Map Company.

**Geographic Information System (GIS)** is a data management system used to capture, , manage, retrieve, analyze, and display spatial information.

**Global Positioning System (GPS)** is a satellite-based geographic navigation system, used to determine the location of a device on or near the Earth.

**Greenest City Action Plan (GCAP)** is the City of Vancouver's Greenest City 2020 Action Plan approved by Council in 2010.

**Hackathon** is an event where computer programmers rapidly create prototype applications in response to a challenge or release of new data.

**Internet of Things** is a term describing the trend towards more everyday objects having network connectivity to send and receive data over the internet.

**Mashup** is a type of software application which combines two previously unrelated sets of data to solve a particular problem or create a new opportunity.

**Open data** or **open format** is data provided in an easily-accessible format, often so programmers can create applications to interact with or display the data in a visual way.

**Prosumer** is a "professional customer" who plays a part in the design, manufacture, or development of an existing product or service.

**Smart city** is a term used to refer to cities that make use of open data to communicate various information to the public, often in real-time.

**Wayfinding** is the process of orienting oneself and navigating through a physical environment.



## Participants

This research was made possible thanks to the participation and support of the following individuals. Thank you again for lending your time, knowledge, and expertise.

Exploratory interview participants are marked in **bold**.

1. Adrian Bell, Applied Wayfinding
2. Adrian Sinclair, Museum of Vancouver
3. **Amanda Mitchell, City of Vancouver, Public Engagement**
4. **Andrew Patton, Gastown Gazette**
5. Angie Nicolas, UBC Greenest City Scholar
6. **Anthony Aisenberg, CrowdSpot**
7. Ashley Lowcock, UBC Greenest City Scholar
8. **Becky Potvin, City of Vancouver, Web Operations**
9. Ben Acornley, Applied Wayfinding
10. Brent Dozzi, City of Vancouver, Neighbourhood Parking and Transportation
11. Cameron Barker, City of Vancouver, Planning and Development
12. Camille Lefrancois, UBC Greenest City Scholar
13. **Carol Noble, City of Vancouver, IT**
14. Catherine Neill, City of Vancouver, Streets Activities
15. **Charles Montgomery, Author, "Happy City"**
16. Chris Ronson, City of Toronto, Department of Transportation
17. Christa Brown, UBC Greenest City Scholar
18. Dan Campbell, City of Vancouver, IT
19. Dan Hill, City of Sound
20. **Danielle Bauer, Cygnus Group**
21. Glen Chua, UBC Greenest City Scholar
22. **Gregory Dreicer, Museum of Vancouver**
23. Helen Hardwick, City of Melbourne, Tourism Melbourne
24. Ian Hosler, City of Edmonton, Community Services
25. Ian MacPhee, City of Vancouver, Transit Projects and Policy
26. **Ivy Haissell, Downtown Vancouver Business Improvement Association**
27. Jared Korb, Vancouver Design Nerds
28. Jasmine Lam, City of Vancouver, Streets Activities
29. Jayme Cochrane, Slant Design
30. Jennifer Wahl, City of Vancouver, Sustainability
31. Jenniffer Sheel, City of Vancouver, Streets Activities
32. Jessie Adcock, City of Vancouver, Digital Strategy
33. Jet Bertheux, Applied Wayfinding
34. **Jhenifer Pabillano, City of Vancouver, Communications**
35. **John Moreau, City of Vancouver, Web Operations**
36. Katherine O'Callaghan, City of Vancouver, Sustainability
37. Keltie Craig, City of Vancouver, Sustainability
38. Keri Tyler, City of New York, Department of Transportation
39. Kristin Lantz, Museum of Vancouver

- 40. Krisztina Kassay, City of Vancouver, Streets Activities
- 41. Laura Ng, Vancouver Coastal Health
- 42. **Lena Soots, CityStudio**
- 43. **Linda Low, City of Vancouver, Open Data**
- 44. Mark Milinkovic, City of Melbourne, Property Services
- 45. Marten Sims, Vancouver Design Nerds
- 46. **Nena Vukojevic, University of British Columbia**
- 47. **Phil Kehres, TransLink Regional Transportation Authority**
- 48. **Ryan Betts, Bazinga!**
- 49. Ryan Davis, UBC Greenest City Scholar
- 50. **Sam Coultrip, City-ID**
- 51. Sami Niemelä, Nordkapp
- 52. Scot Hein, University of British Columbia
- 53. Scott Edwards, City of Vancouver, Streets Activities
- 54. Scott Erdman, City of Vancouver, Planning and Development
- 55. Steve Chou, City of Vancouver, Streets Activities
- 56. **Tadgh Healy, City of Vancouver, Digital Strategy**
- 57. **Tim Fendley, Applied Wayfinding**
- 58. Tracy Vaughan, City of Vancouver, Public Engagement
- 59. Travis Kirton, Slant Design
- 60. Wendy Feuer, City of New York, Department of Transportation
- 61. Will Dunn, City of Vancouver, Active Transportation

## List of Figures

- 1. Greenest City Scholars photo, Jennifer Wahl
- 2. Kevin Lynch wayfinding diagram, Kevin Lynch
- 3. Walk!Philadelphia 'disk map', L&H Signs
- 4. Legible London 'monolith', Applied Wayfinding
- 5. London Underground Map, Harry Beck
- 6. Legible London 'minilith', Applied Wayfinding
- 7. Legible London Finder Map, Applied Wayfinding
- 8. Google Maps, circa 1995, Google
- 9. Google Maps Earth View, circa 2014, Google
- 10. Tunnel Vision augmented reality app, Bill Lindmeier
- 11. Original 2010 map stand in South Granville, Robert White
- 12. DVBIA survey of a 2012 pilot map, DVBIA
- 13. 2012 Pilot map stand downtown, City of Vancouver
- 14. The new 'Planner' map, City of Vancouver
- 15. The new 'Finder' map, City of Vancouver
- 16. Detail of TransLink Rapid Transit Network (RTN) map, TransLink
- 17. Detail of DVBIA Downtown Walking Map, DVBIA
- 18. Detail of Cycling in Vancouver map, City of Vancouver
- 19. Rendering of Urbanflow on the streets of Helsinki, Nordkapp
- 20. A New York City wayfinding stand with real-time bus data, NYC DOT

21. Detail of Heathrow Airport's interactive map, Applied
  22. Walk Brighton iPhone App, Amy Cooper Wright
  23. Heart of Auckland's Pedestrians in the City tool, Heart of Auckland City
  24. Workshop visualization from Melbourne Smart City, Arup
  25. The default, public VanMap screen, City of Vancouver
  26. West End buildings by age, Dan Campbell
  27. 3D West End buildings by age, Dan Campbell
  28. Road Ahead map, City of Vancouver
  29. Downtown public spaces in Transportation 2040, City of Vancouver
  30. Downtown Planner map, Living Map Company
  31. Proposed Development Application Signage concept, Robert White
  32. Proposed Strathcona walking tour map concept, Robert White
  33. Proposed branded shower curtain and coffee cup concept, Robert White
  34. Proposed digital API concept, Robert White
  35. Proposed digital Map Maker concept, Robert White
  36. Proposed 'My Mapcouver' concept, Robert White
  37. Vancouver's 2013 Hackathon final presentations, Linda Low
- Additional Figure:** Vancouver 'Finder' map draft, current as of 2014-07-18, is displayed on section title pages.

