

Alderney Drive

HOW PEOPLE WALK ON AND AROUND AN URBAN HIGHWAY
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Abstract

Problem, research strategy, and findings: In the 1960s, a short highway was built on the edge of the downtown core of Dartmouth, Nova Scotia. I wanted to find out whether this urban highway affected pedestrians' walking patterns, whether they avoided the busy street or not. To test whether Alderney Drive had an impact on where people walk in Downtown Dartmouth, I did an intercept survey of 92 pedestrians in three locations in the downtown core, using a combination of Likert-scale statements and mapping.

I found that, while respondents said they did not avoid Alderney Drive in their walking, the maps they drew showed a different picture. Only the central two blocks of Alderney Drive (between Portland and Ochterloney Streets) were identified on most respondents' routes, which is a nexus of Dartmouth's public transit (bus routes and the ferry terminal) and the main retail areas of the neighbourhood. Away from the centre, Alderney Drive tended not to be selected by as frequently by respondents, especially where there are no amenities, destinations or sidewalks. It is likely that Alderney was used only where it had a utilitarian function, where it connected pedestrians between A and B, or where there were important amenities nearby such as the library or ferry terminal. Where there is a waterfront trail running in parallel with Alderney Drive, the trail receives the bulk of pedestrian traffic.

Takeaway for practice: Where there is a nicer, safer alternative to a walking route, pedestrians will probably take it. Alderney Drive was built based on the planning trends of the 1960s, and given the city's current planning goals favouring active transportation, it may be worth narrowing Alderney Drive, lowering traffic speeds, and improving sidewalks to make it a better environment for pedestrians. Further study is required of the street's impact on public transit and vehicular traffic. Also it is worth looking at the effects Alderney Drive may have on local businesses as a result of it bypassing the main retail areas of the urban core.

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1 | INTRODUCTION

People choose how and where to walk based not just on need, but on a host of factors: aesthetics, convenience, perception of safety, and various social and health desires. I work at an office in Downtown Dartmouth, Nova Scotia, and to get there, I regularly walk a network of roads and trails which I perceive as unappealing due to the nuisances of traffic (noise, pollution, danger), and due to the few amenities available en route. I wondered if others felt discouraged from walking by this same environment.



Figure 1.1: Alderney Drive crosswalk

Dartmouth has an old town core whose gridiron street pattern had been altered on its edges by an urban highway project in the 1960s (Alderney Drive), and a multi-use complex built in the 1980s and 1990s (Alderney Gate and Alderney Landing). In this report, I used Alderney Drive as the nexus for a study of how people move on foot in Downtown Dartmouth. I wondered whether the wide, busy road, which divides and bypasses the downtown core, is a barrier to people choosing to walk.

Halifax is in the midst of a major planning exercise currently, called the Centre Plan, with the goal of unifying policy and bylaws within the Regional Centre, including the study area of this project. The Centre Plan is still in draft form at the time of writing but contains strong pedestrian-centric goals. This study may be timely to guide the city's priorities for street redesigns in the medium-term. As you'll read below, Alderney Drive has some issues for pedestrian choice, likely sending people on foot looking for alternative routes around and through Downtown Dartmouth.

This report begins with a background on the study area. Then a brief *literature review* identifies some method of studying pedestrian choice, and reveals a few of the city's current pedestrian-oriented planning goals. The chapter on *methods* describes the process of this study in detail, and *findings* highlights the analysis of the data, revealing what is most interesting for planning.

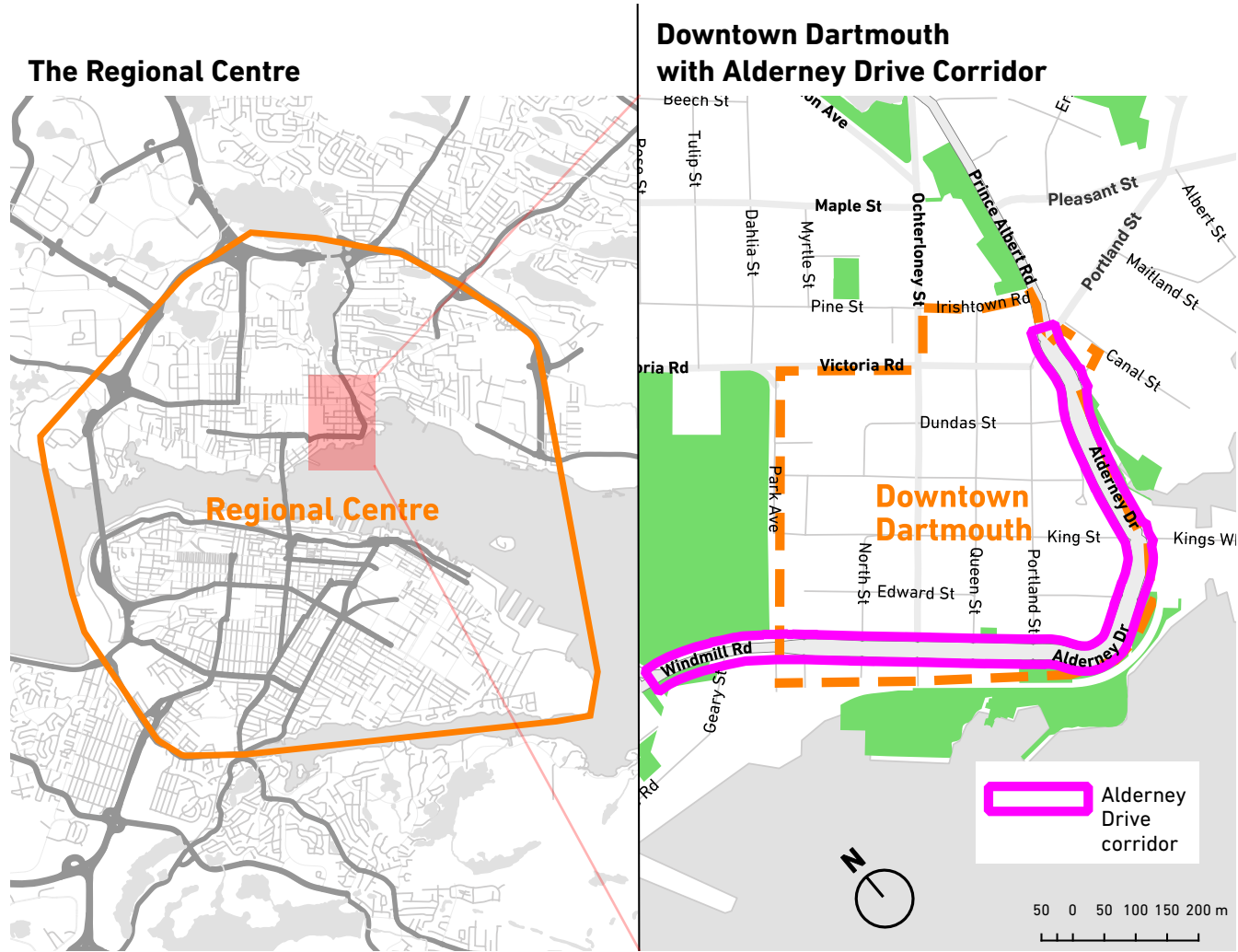


Figure 1.2: Alderney in context

2 | CONTEXT

2.1 Downtown Dartmouth

Dartmouth is an old pre-industrial town, initially settled as a service community for colonial Halifax, the town just across the harbour. Initially Dartmouth was a centre for harvesting lumber, and later, for manufacturing and shipbuilding (Chapman, 1997).



Figure 2.1: Alderney Landing (left) and Alderney Gate (right)

Dartmouth was surveyed in 1750 in a grid pattern, and like many 18th century North American towns, the structure of the place

largely ignores the contours of the landscape. In 1964, the Town of Dartmouth commissioned a comprehensive plan by Norman Pearson Consultants. The plan included recommendations to build an extensive network of highways throughout Dartmouth to service new neighbourhoods being built (Canadian-British Engineering Consultants & Pearson, 1964). Most of the recommended highways were never constructed; Alderney Drive is the only section that was built as suggested, initially called Harbour Drive (figure 2.2).

The mid-point of Alderney Drive is the centre of Dartmouth in many ways. It is a transportation hub: every weekday, 60 ferries and 614 buses (covering twenty bus lines) serve the complex at Alderney Gate/Landing (Halifax Regional Municipality, 2016b). Alderney Drive is also one of the all-day truck routes through Dartmouth (Halifax Regional Municipality, 2012).

Downtown is the only neighbourhood with high job density anywhere in central Dartmouth, with 40–75K jobs/km² (Halifax Regional Municipality, 2016c). It is also a retail centre: a farmers' market anchors Alderney Landing (figure 2.1), and a variety of small shops and restaurants line Portland, Ochterloney, Queen and King streets.

Recommended Highway Network 1964 Dartmouth Plan

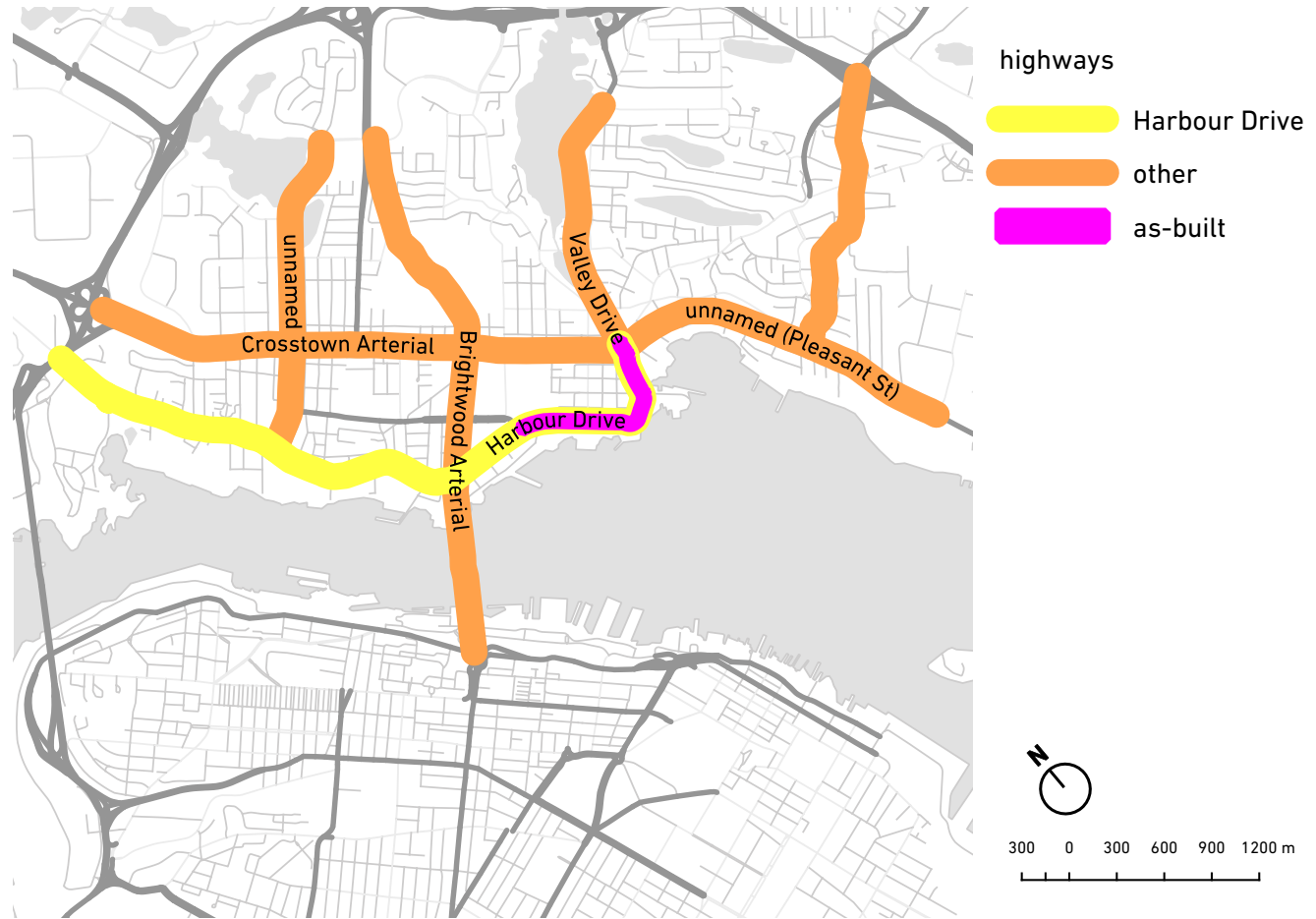


Figure 2.2: Highway system proposed for Dartmouth in 1964 (redrawn from Canadian-British Engineering Consultants and Pearson, 1964)

2.2 Getting around

Residents of the Regional Centre use active transportation (AT) at a much higher rate than NS on the whole: 30% for the former versus 10% for the latter (Davidson, Kuhn, & Terashima, 2015). But Downtown Dartmouth has just half of the Regional Centre's AT use: 16.7% (Davidson et al., 2015). About one third (32%) of residents in Downtown Dartmouth use transit as a main method of transportation (Davidson et al., 2015).

The rate for walking to work for residents of Downtown Dartmouth is low at 11.5%, almost exactly the rate for residents anywhere in HRM, including areas with much lower residential and job density (Statistics Canada, 2011a, Catalogue no. 92-151-X).

Slope

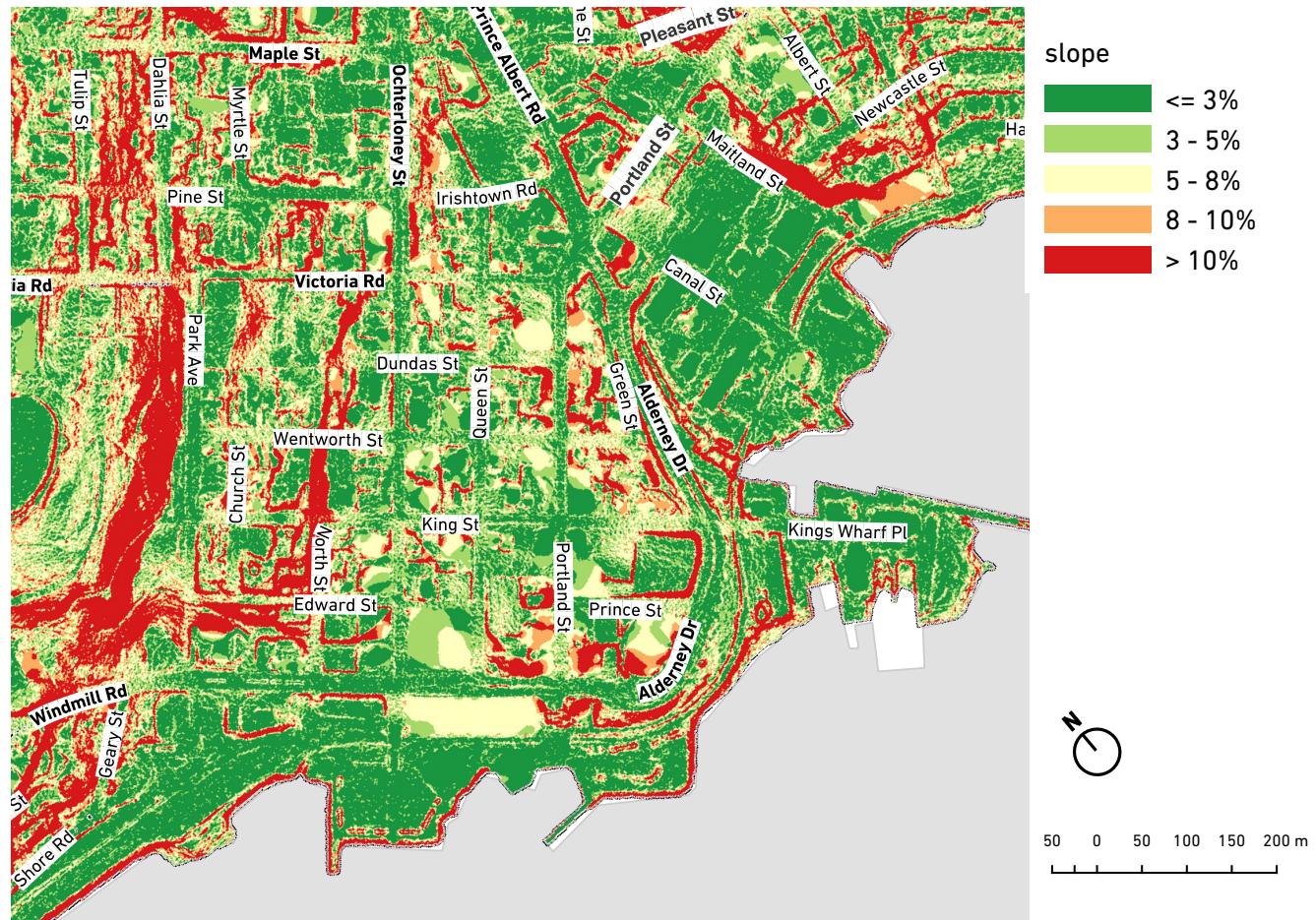


Figure 2.3: A map showing slope in Downtown Dartmouth (Halifax Regional Municipality, 2012)

2.3 Slope

The town is hilly and its different land uses lie at different elevations.



Figure 2.4: King and North streets

The waterfront is 3–7 metres above sea level, retail areas are 14–18 metres up, many residences are 18–24 metres up and the open parkland of the Dartmouth Commons is as high as 40 metres above sea level (Halifax Regional Municipality, 2012). In most cases, the streets are an easily walkable grade, but in many places, steep slopes make walking difficult (see figure 2.3). Most streets are at or below 5% grade, but there are several streets which are 8%, 10% and higher. This presents challenges for walking, especially for people with mobility problems.

King Street at North (figure 2.4) is a perfect example of difficult grade for walking. Alderney Drive does not have any steep grades, except at its western end.

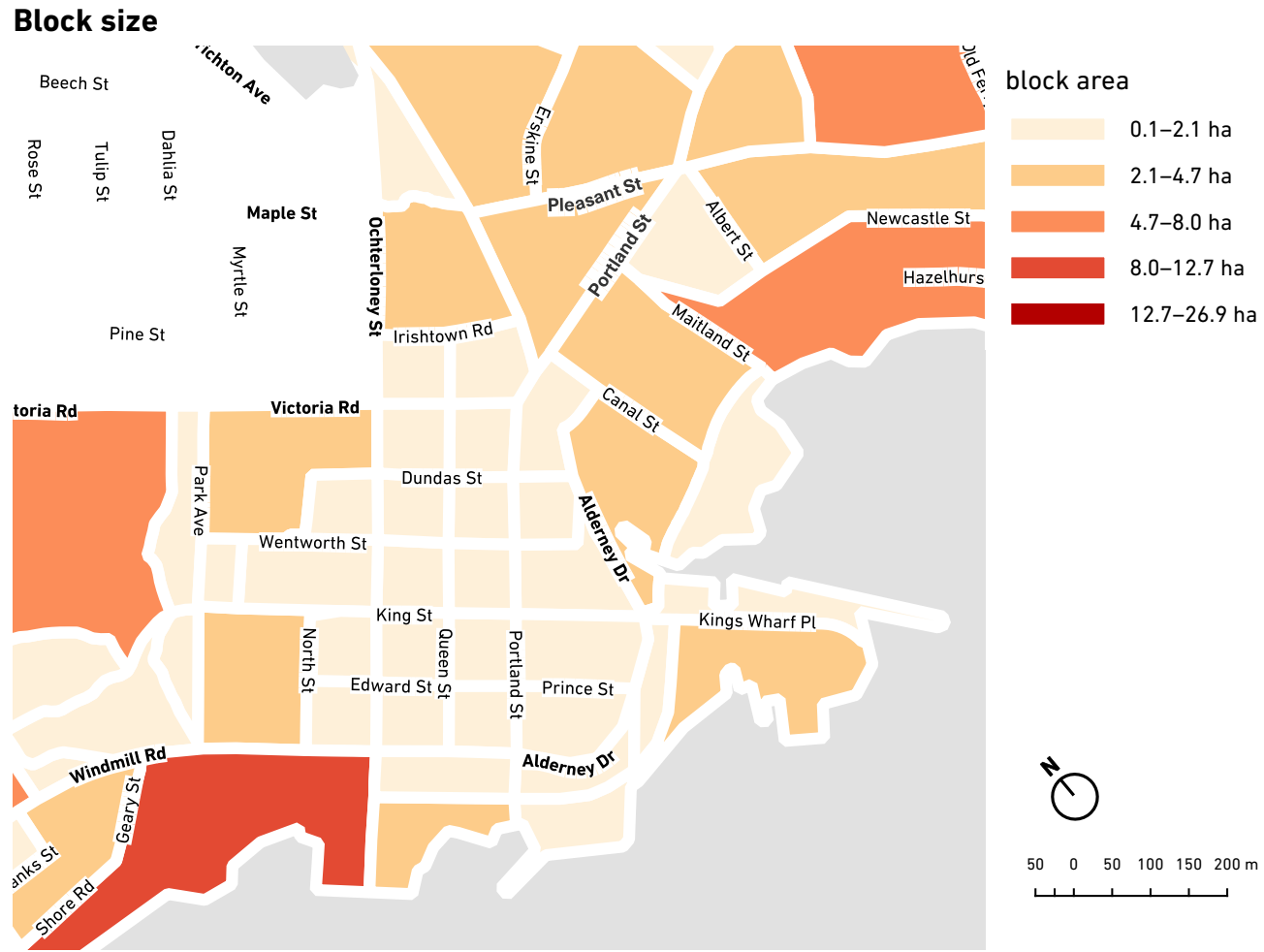


Figure 2.5: Block sizes in Downtown Dartmouth (using data from Halifax Regional Municipality, 2012)

2.4 Blocks and connections

Dartmouth Downtown generally has small block sizes (at or less than one hectare in area), which means that people on foot have many options when deciding what route to walk, and can choose a shorter route. Larger blocks mean more diversions, and less connectivity for pedestrians.

Figure 2.5 displays the study area divided into blocks to show where there is connectivity. I subdivided blocks where there was a clear public pathway that people can cut through, such as alleyways, trails, and public squares. Moving away from the downtown core, block sizes tend to be larger than two hectares, providing fewer options for direct pedestrian routes.

The streets of Downtown Dartmouth are laid out in a grid, with Alderney Drive cutting around the southeast of the grid. The grid is well connected to Alderney Drive to the south, but to the east, connections are spotty. Only King and Prince Streets connect or cross Alderney in clear ways. Pedestrians may use Dundas, Wentworth and Green Streets to connect to Alderney Drive and the waterfront, but it's not clear that it is possible. Wentworth in particular requires pedestrians to use a seemingly private pathway through a residential development in order to continue east.

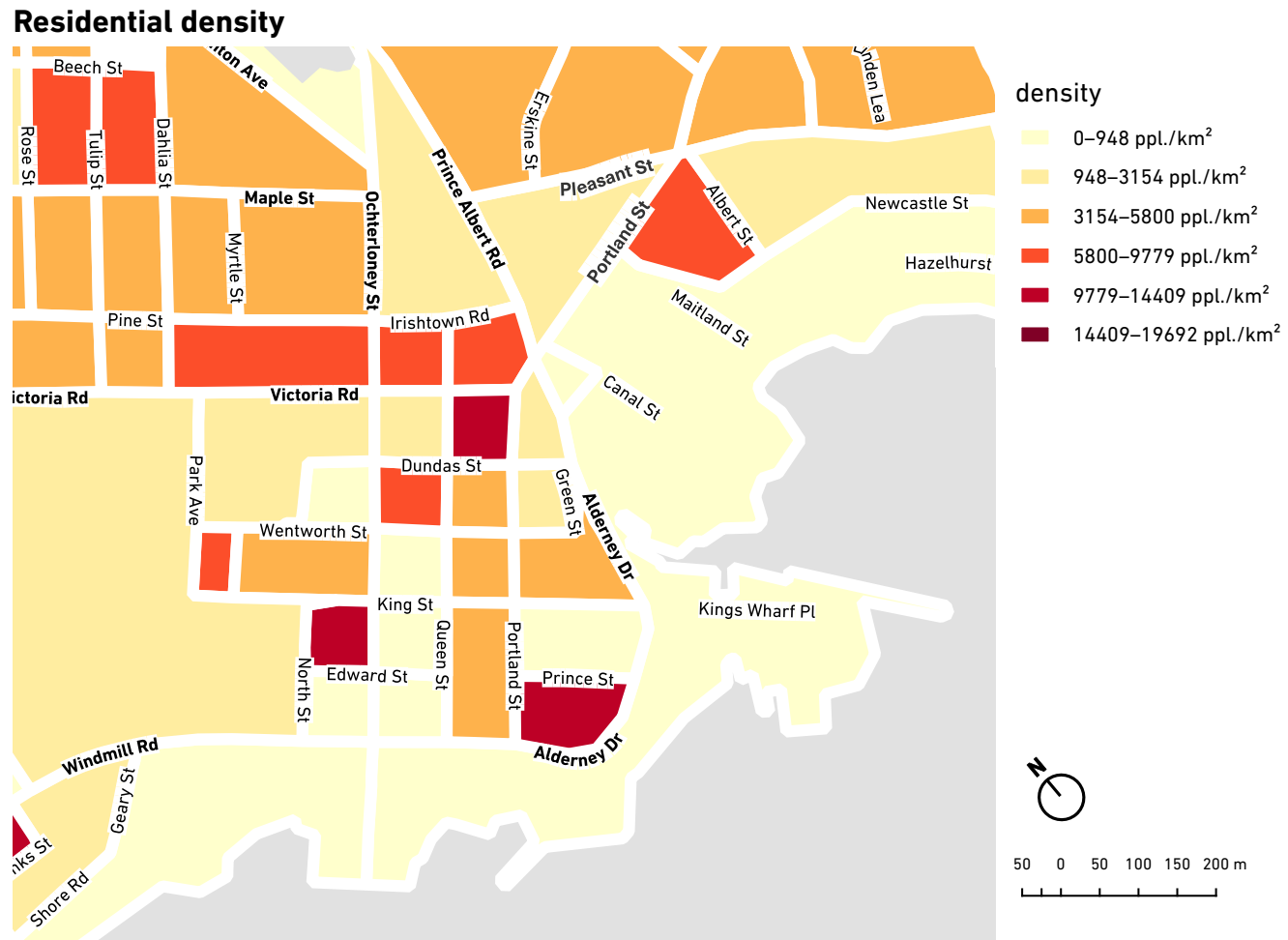


Figure 2.6: Gross residential density (using data from Halifax Regional Municipality, 2012; Statistics Canada, 2011b, Catalogue no. 92-163-X, 2011c, Catalogue no. 92-151-X)

2.5 Population and density

Over 5000 people live within 500 metres of the Alderney Drive corridor, in some 3100 dwelling units (Statistics Canada, 2011c, Catalogue no. 92-151-X). Figure 2.6 shows that the retail areas of Downtown Dartmouth (the triangle between Ochterloney and the two sides of Alderney Drive) are relatively low in residential density, though the centre is ringed by higher density areas to the east, west and south.



Figure 2.7: Much of the southeastern side of Downtown Dartmouth is surface parking.

Some of the lower densities in the retail core are the result of vast surface parking lots, especially on the southeastern side (figure 2.7).

2.6 Design

At its western end, where Alderney Drive connects with Wyse Road and Windmill Road near the Dartmouth common, Alderney Drive is four lanes wide, with sidewalks on both sides (figure 2.8). At its centre, in front of Alderney Gate, it grows to six lanes of width: the two outer lanes act as bus lay-bys (figure 2.9).



Figure 2.8: Western end of Alderney Drive (North Street, looking west)



Figure 2.9: Alderney Drive at Queen Street (looking west)



Figure 2.10: Alderney Drive at Portland Street (looking east)

East of Portland Street, Alderney turns into a curvilinear boulevard, with a grassy median (figure 2.10). As it turns northward, it sheds its sidewalks altogether as it passes King Street. From King Street until it reaches the intersection with Prince Albert and the north side of Portland Street, there is no longer a space for pedestrians at all: four lanes of traffic are protected with a narrow concrete curb and a barrier (figure 2.11). It is assumed that pedestrians going north or eastbound will diverge from Alderney at King street, taking one of several meandering routes along the trails, through the parking lot of the Dartmouth Curling Club, and on Canal Street.

Running parallel to Alderney Drive from Portland Street heading northeast is what I'll refer to as the Dartmouth Cove Trail (known in places as the Dartmouth Harbourwalk and the Dartmouth Waterfront Trail). It's a asphalt-paved active transportation route which runs adjacent to an active railway operated by CN.



Figure 2.11: Concrete curb and barrier at Alderney's northern end

2.7 Conclusions

Downtown Dartmouth has some of the components of a neighbourhood conducive to walking, as will be outlined in the next chapter. The neighbourhood has some difficulties of slope, but it has generally small block sizes, good transit coverage and use, and despite some low density blocks, many residents and jobs are concentrated in a small area.

3 | LITERATURE

3.1 Introduction

First, I look briefly at some studies on pedestrian choice: what factors are involved in people choosing to walk over other forms of transportation. The second is a brief look at the planning literature on Downtown Dartmouth and its built form.

3.2 Pedestrian choice

Ewing and Cervero (2010) meta-analyzed transportation studies which link travel mode choice (e.g. transit, automobile, on-foot, bicycle) to the built environment and the structure of streets. They found that increased pedestrian activity is correlated with the existence of commercial areas, open spaces, job density and proximity to schools. Miranda-Moreno, Morency, and El-Geneidy (2011) identified that the highest correlation is between pedestrian activity and proximity to transit. Likewise, a comprehensive study of pedestrian choice by Cerin, Leslie, du Toit, Owen, and Frank (2007) found that having destinations nearby was associated with people choosing to walk. The same study indicated that the most important correlations were with the proximity of workplace, schools and certain types of commercial destinations.

Put another way, people choose to walk where:

- there are things to do nearby;

- people live and work at sufficient density; and
- it's easy to get to other places via transit.

The last factor is not surprising: unless you have a bus stop outside your house, all transit trips begin and end with some amount of walking.

Özbil (2013) introduced the important concept of the “passing trade” where people shop on their way to or from work or other places. It is common in İstanbul, encouraged by mixed use structures, to have commercial spaces on the ground floor, spread throughout neighbourhoods so that shopping can take place while people walk. People will be more likely to choose to walk where there are amenities, such as retail stores. Cerin et al. (2007) also found that certain types of retail amenities tend to be more correlated with walking, especially those where regular visits are likely: coffee shops and groceries had a higher correlation than clothing shops.

Researchers have proposed many objective measures predicting how and where people will choose to walk, including: intersection density (i.e., number of intersections within a boundary), average block length, block area, percentage of four-way intersections, and link-node ratio (an index relating the number of street segments to the number of intersections) (Hajrasouliha & Yin, 2015). Other measures and indices include *pedsheds* (comparing “as the crow flies” distances to actual walking distances), and pedestrian route directness (Chin, Niel, Giles-Corti, & Knuiam, 2008). No measure alone will predict

where people will choose to walk, but places where people have lots of choice (many intersections offering many directions) seem to be preferred by pedestrians over large impermeable blocks, where going in a straight line is the only option.

3.3 Measuring streets

Leslie et al. (2007) state that geographic information systems (GIS) are being used with increasing frequency to analyze and map data based on the above measures. Many of the measures may be derived from existing data generated by governments, especially municipalities, for administrative and planning purposes.

Chin et al. (2008) identify a problem with government-made street datasets: they are designed for automotive traffic modelling and management, and as such, they lack data on non-motorized traffic routes. Some municipalities have trail and sidewalk data, but it is typically less comprehensive. For studies which model foot-traffic and routes, a researcher needs to complement existing spatial data with field surveys. User-sourced datasets such as Open Street Map (OSM) may provide more diverse pathways, including alleyways, trails, lines-of-desire and other routes which municipalities may not recognize officially.

Some researchers employed public-participation GIS (PPGIS), gathering user-sourced data in the field in order to understand pedestrian connectivity (Schlossberg, Johnson-Shelton, Evers, & Moreno-Black, 2015). PPGIS allows researchers to record subjective spatially-referenced notes about user experiences in a study area: e.g. do parents feel safe letting their children use a given crosswalk (Schlossberg et al., 2015)? Objective measures of connectivity can then be compared to the subjective comments of users to find problem areas.

In the case of Halifax Regional Municipality's spatial data, the network of streets and the network of trails are recorded in separate tables with somewhat incompatible data structures (Halifax Regional Municipality, 2012). The two datasets could be combined into a map for visual purposes, but could not be used together, as is, to analyze the pedestrian network.

3.4 Why measure?

Despite regular changes in street commercial activity, street alignments tend to be fixed in structure for long periods of time, in some cases for hundreds of years (Özbil, 2013). Özbil (2013) cites the long-term stability of street layouts as a good reason to give priority to planning layouts instead of worrying about inducing commercial activity: the latter changes easily, but the former resists change.

Several studies used the tools available to compare the performance of neighbourhoods with different forms, including those in Buffalo NY, İstanbul and in smaller cities in Israel (Hajrasouliha & Yin, 2015; Itzhak Omer & Lerman, 2015; Özbil, 2013). It is possible to compare pedestrian connectivity between different neighbourhoods in the same city or to compare neighbourhoods from different cities. Doing so may help learn why some neighbourhoods have lots of pedestrians and others few. According to (Cerin et al., 2007), simply measuring and comparing certain objective variables (such as density, mixed-use, and pedestrian connectivity) can be helpful in planning neighbourhoods which are conducive to walking.

3.5 Planning

The Centre Plan

Halifax Regional Municipality is currently undergoing a comprehensive plan for its Regional Centre, which includes Downtown Dartmouth. The plan is still in draft form, but includes two guiding principles (both derived from Halifax's Regional Plan of 2015) which apply to Downtown Dartmouth and Alderney Drive. The first is about movement:

Integrate land use planning with transportation planning in such a way that alternatives to driving become an easy choice. Transportation options should be efficient, pleasant and readily available. All streets should present an invit-

ing barrier-free environment that considers the comfort, convenience, safety and visual interest of pedestrians.

The Regional Centre, in all ways, should be conducive to, and supportive of, active transportation movement. It should provide people with choices that are viable alternatives to driving (Halifax Regional Municipality, 2016a, p. 5).

The second principle addresses connectivity:

Enhance safe and appealing connections within the Regional Centre including to and from the waterfront, open spaces and neighbourhoods (Halifax Regional Municipality, 2016a, p. 5).

Both principles stress the importance of the pedestrian environment, and the need for more choice in how people move in the city. The plan goes further to say that we are all pedestrians, and as such, pedestrian-focused street design improves the environment for the largest number of people (Halifax Regional Municipality, 2016a).

Downtown Dartmouth

Dartmouth has been planned and studied many times throughout its history, if less frequently than Halifax across the harbour. Cluett (1997) lists 19 plans (including comprehensive plans, development plans, master plans, recreation plans etc.) which guided the City of Dartmouth from the 1960s until 1997. He mentions that Alderney Drive was intended to move greater traffic volumes throughout Dartmouth, but that the wider street made access to the waterfront more difficult. He also identifies the CN Rail marshalling yards as a barrier separating downtown from the waterfront, which is likely still a factor today. I look at just two plans done more recently and their recommendations for the area around Alderney Drive.

- Downtown Dartmouth secondary plan
Downtown Dartmouth has its own secondary plan, updated in 2016. The plan admits that Alderney Drive is “generally seen as

a visual and physical barrier to the waterfront” (Halifax Regional Municipality, 2016d, p. 69):

Its width of four to six lanes, short pedestrian crossing times, and relatively high vehicle speeds are the main contributing factors. While it is necessary for this street to continue to function as an arterial street carrying high volumes of traffic, some changes may be appropriate, such as off-peak parking along the street, reduced speed limits, and longer pedestrian crossing times (Halifax Regional Municipality, 2016d, p. 69).

The plan goes on to recommend doing a transportation study of Alderney Drive and the surrounding area south to Dartmouth Cove. Specifically, the plan asks for the study to include a look at vehicular speed. Alderney Drive bypasses the retail streets of Downtown Dartmouth; the plan also asks whether traffic can be filtered onto the retail streets such as Portland and Ochterloney, to increase business. A consultant prepared the transportation study in 2015, but it has not yet been released to the public.

- **Waterfront Development**

The Waterfront Development Corporation Limited (WDCL), a NS crown corporation that manages strategic waterfront lands, had a master plan prepared for part of the area in 2012. The plan looks at the potential development of former industrial lands to the east of Alderney Drive, in the former estuary of the Sawmill River (The Planning Partnership, CBCL Limited, & BuildGreen Solutions, 2012). Among many recommendations about pedestrian circulation, the report identifies a Alderney Drive as a barrier between downtown and the waterfront. Like the Downtown Dartmouth Secondary Plan, it recommends narrowing Alderney Drive, but goes further to suggest extending the downtown street grid east, beyond Alderney Drive (The Planning Partnership et al., 2012).

3.6 Conclusions

There is a lot of literature on pedestrian choice and how one may measure whether a street and trail network is working or whether it isn't. The literature identifies objective measures which may be derived from existing data sources such as municipal GIS, the federal census and national household survey. One may also generate new data, such as pedestrian counts, to give a baseline of how many people are walking in an area.

Plans for the Regional Centre (currently in draft form) and for Downtown Dartmouth both recognize the importance of pedestrian circulation (Halifax Regional Municipality, 2016a, 2016d). The former does so positively, assuming good pedestrian circulation as an essential aspect of an appealing neighbourhood. The latter negatively singles out Alderney Drive for alteration, identifying issues with its vehicle-centric design. The WDCL master plan confirms the Downtown Dartmouth plan, suggesting design elements which may bring Downtown Dartmouth and its waterfront closer together.

The Downtown Dartmouth and WDCL plans matched my own thinking as I began this study, stating that people avoided Alderney Drive because of its design (Halifax Regional Municipality, 2016d). I wanted to confirm that assumption on a subjective basis by asking pedestrians whether they actually perceived Alderney Drive as a problem. In the next chapter I outline the method by which I did so.

4 | METHOD

The pedestrian-choice literature cited above uses measured variables or indices to correlate built-environment with pedestrian activity in an area. I wanted to look at the issue subjectively: to ask people walking in Dartmouth whether they find the area appealing to walk in, and to find out where they choose to walk.



Figure 4.1: Three survey locations

Instead of the PPGIS approach, as proposed by Schlossberg et al.

(2015) above, I went with an “analog” approach: I stopped and asked people on the street. I intercepted people who were walking, getting verbal consent to record answers to a few questions and to get respondents to draw on maps. The three locations where I intercepted people (figure 4.1) were all within a few hundred metres of Alderney Drive. I selected the three locations to capture information from people who may have been walking for various reasons:



Figure 4.2: Site AG—Joe Howe Park (Alderney Gate)

Site AG—Alderney Gate Alderney Gate is a multi-purpose complex,

comprising the Alderney ferry terminal, farmers' market, the Alderney branch library, a theatre, and many offices. I include facilities within Alderney Landing, connected by a pedway, though nominally a separate facility. It also abuts a busy bus stop serving 20 bus routes. Dark nooks in front of Alderney Gate made it hard to meet the eyes of people passing. This made it difficult to ask potential respondents to stop. I found a more appropriate spot opposite Alderney Gate, in the small *Joe Howe Park* (figure 4.2). Unlike the façade of Alderney Gate, which has wide overhangs, Joe Howe Park was exposed to the sun and people passed me directly there, on the sidewalk. I spoke with respondents at site AG only on weekdays.



Figure 4.3: Site PK—Portland Street at King

Site PK—Portland at King Street Portland was a busy street for pedestrians. I chose it because it has the largest concentration of street-level retail businesses in Dartmouth, and I expected that most people walking there did so because of the retail. I stood at the northwest corner of Portland at King Street (figure 4.3). I spoke with people at site PK only on weekdays.



Figure 4.4: Site DC—Dartmouth Cove trailhead

Site DC—Dartmouth Cove trailhead Adjacent to the ferry terminal is the head of the Dartmouth Cove trail (figure 4.4), which runs along the rail corridor. I chose this spot because I expected it to have a larger proportion of recreational walkers, whereas the other two spots were likely to yield people walking for practical reasons. At this location, I spoke with respondents on weekdays and on the weekend.

4.1 Filter

All the respondents were walking when I stopped them to chat. The first question of the survey filtered for regular walkers; I asked respondents whether they regularly walked in Downtown Dartmouth. If a respondent was a tourist or visitor to Dartmouth, I aborted the survey, and likewise if the person didn't walk at least on a weekly basis.

Several people said "no" when asked if they walked. I pressed them to be sure that they were being frank, and it usually became clear that they do, in fact, walk regularly. These people had a strictly recre-

ational definition of “walking” in mind: they didn’t consider it walking to travel 2–3 blocks between their office and where they ate lunch.

4.2 Survey

I asked each participant seven questions, and then asked them to draw their main routes on a map of the area. I began by asking the respondents what methods of transportation they use regularly, in addition to walking: bike, bus, ferry or car.

Likert-scale questions

I read statements to participants, who indicated whether they “strongly agreed”, “agreed”, “are neutral”, “disagreed” or “strongly disagreed”. I was looking for perception of the area around Alderney Drive. Did participants walk on and use Alderney Drive, or did they avoid it altogether? The statements were as follows:

1. Alderney Drive is Downtown Dartmouth’s “main strip”
2. The waterfront and Downtown Dartmouth are well connected to each other
3. Downtown Dartmouth is easy to get to on foot from other places
4. Alderney Drive separates downtown Dartmouth from the waterfront
5. I often spend time in the open spaces or businesses on Alderney Drive
6. Alderney Drive is an appealing place to walk
7. I avoid Alderney Drive when deciding how to travel on foot

Mapping

I asked each participant to draw their normal walking routes on a map of Downtown Dartmouth. They were guided to draw lines indicating

their routes, and to use an ‘x’ to indicate common destinations. I asked participants to choose trails and routes in parking lots and alleys, and not to stick only to sidewalks. I tried not to guide respondents in their choices, but did encourage them to draw more by asking “does that represent all of your normal routes” when they indicated they were finished. Where respondents needed help orienting themselves to landmarks, I would identify some common places in the neighbourhood. Respondents didn’t see maps made by previous respondents: each received a new map on which to draw.

Process

Each survey took 4–10 minutes to do, depending on the participant. Many respondents were in a hurry at first, but warmed up after doing the survey; a surprising number were happy to chat afterwards. Naturally, weather and time of day played a part in the willingness of pedestrians to stop and contribute a few minutes; it was much easier to stop people on warm, sunny days, especially on the weekend.

4.3 Post-processing

I put survey responses into a database (PostgreSQL) for storage and processing. I digitized respondents’ maps in QGIS and stored them as geospatial data in the same database as the survey questions (PostGIS Development Team, 2016; QGIS Development Team, 2016).

Each respondent’s data was recorded as faithfully as possible by eye, though impossible routes (e.g. through buildings) were adjusted to take the nearest open pathway. For convenience, I used several lines to digitize each person’s route. To avoid giving weight to any specific pathway as digitized, I amassed each respondent’s lines into a single feature in the database (a *polyline* in GIS parlance) representing a respondent’s entire map.

Points of interest given by each respondent were likewise recorded as given, as much as possible. While most respondents used small circles or ‘x’s to indicate their points, some drew large circles which

needed interpretation when digitizing: e.g. when the entire waterfront is encircled, was the respondent selecting the ferry terminal, the playground area, the parking lot, or something else? When the selection was not clear, I added several points within the respondent's circle to indicate likely points of interest.

I processed Likert-scale data in *R*, a statistical analysis program, generating the charts below using the Likert package (Bryer & Speerschnieder, 2015; R Core Team, 2016).

5 | FINDINGS

Analyzing the data, I was most struck by the disconnect between the answers in the Likert-scale questions, and between what people were drawing on the maps. In the former, people said they did not dislike Alderney Drive, nor did they deliberately avoid it. The maps showed that respondents' use of Alderney Drive to be rather limited; they only walked on a few blocks of it. Not quite half of all respondents walked on the two central blocks of Alderney Drive. Less than 5% of respondents walked where Alderney Drive has no sidewalks.

5.1 Modal split

The first question in the survey asked whether the respondent regularly walks in Downtown Dartmouth. For those that said "no", I aborted the survey. For those that answered "yes", I asked what other methods of transport they used regularly.

Table 5.1: How respondents get around (all survey locations)

Foot	Ferry	Bus	Bicycle	Car
100%	66.7%	48.6%	18.3%	57.8%

Most respondents selected at least one other method of transportation other than walking.

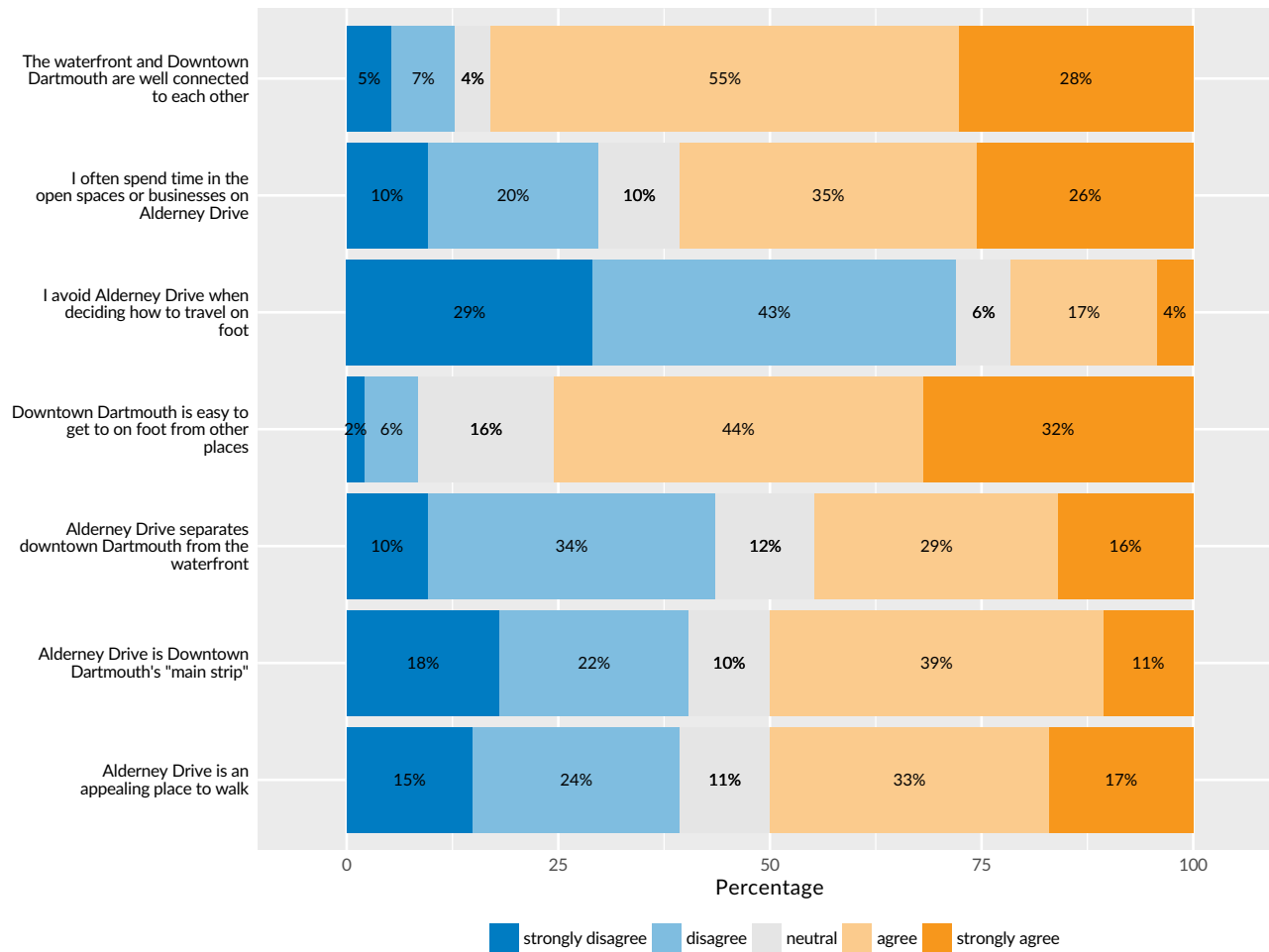


Figure 5.1: Aggregation of Likert-scale questions at all three survey locations

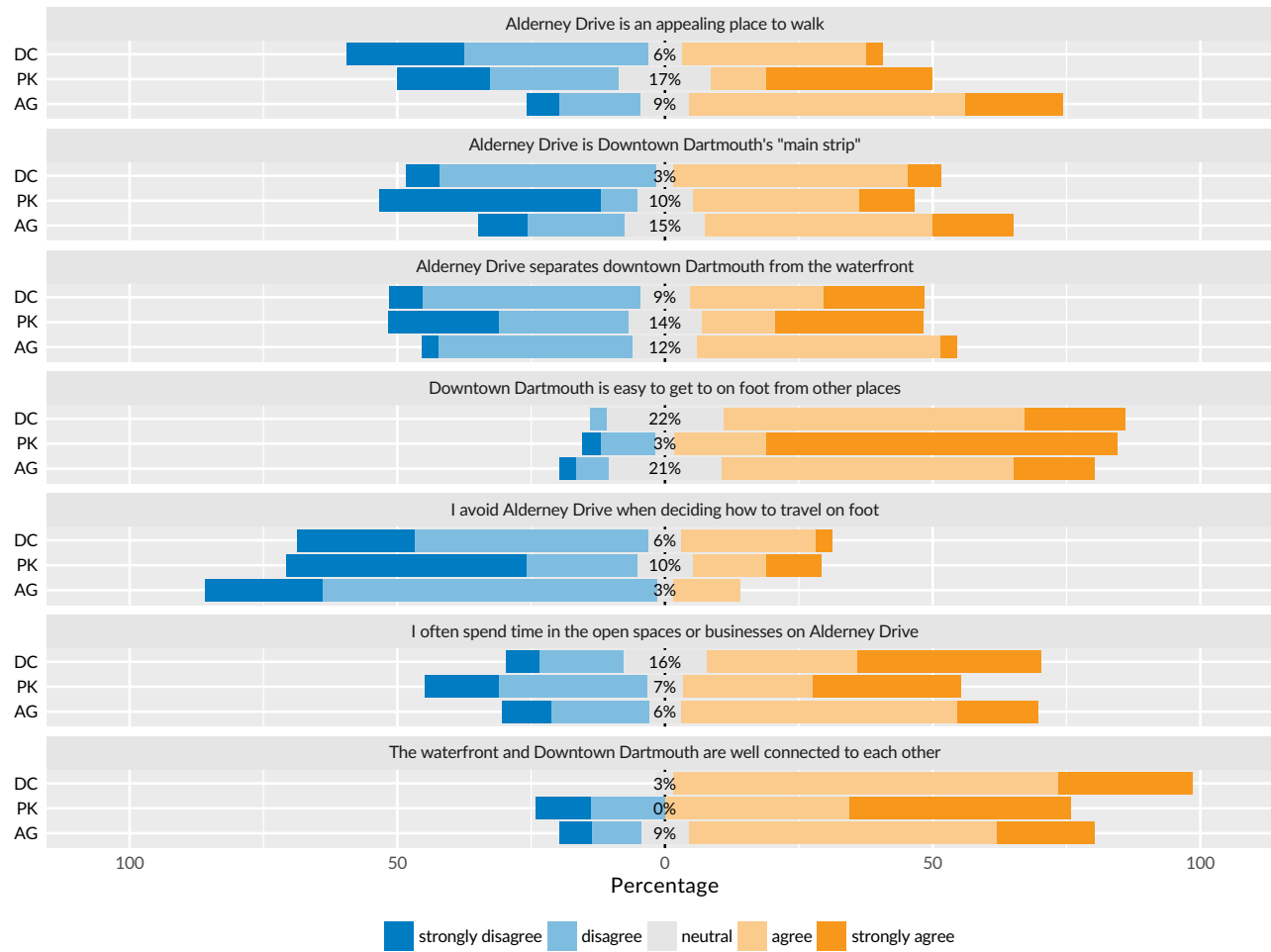


Figure 5.2: Likert-scale questions grouped by survey location

5.2 Perceptions of Alderney Drive

Respondents' answers to the Likert-scale questions were telling. Contrary to my expectations, by and large people didn't feel that Alderney Drive was a barrier. Half of respondents thought that downtown and the waterfront are well connected to each other, and few people (21%) said they avoid Alderney Drive when deciding how to travel on foot (figure 5.1). A majority regularly uses the businesses and open spaces on Alderney Drive, with many agreeing that the street is Downtown Dartmouth's "main strip".

When grouping answers from different survey locations, there were a few differences of opinion (figure 5.2). People surveyed at Dartmouth Cove were the most likely to agree that downtown and the waterfront are well connected to each other, with almost no one disagreeing. The same set of respondents agreed that Alderney Drive is an appealing place to walk.

At location AG, I spoke with respondents on the sidewalk of Alderney Drive itself. People there were charitable to the street they stood on. Location AG respondents were most likely to agree that Alderney Drive is an appealing place to walk and that the street is Downtown Dartmouth's main strip (figure 8.2). They were the least likely to agree that they avoided Alderney Drive when deciding how to walk.

People responding at location PK were more likely to disagree that Alderney Drive is Downtown Dartmouth's "main strip". Anecdotally, many respondents argued that Portland Street is Dartmouth's main strip, not Alderney Drive. The bulk of respondents at this location agreed that they spend time on Alderney Drive, but more people disagreed with the statement than at the other two locations.

For a more detailed look, each survey location appears in an individual graph in the appendix as figures 8.1, 8.2 and 8.3.

What people answered about how they felt in the Likert-scale questions did not entirely line up with what they drew on maps.

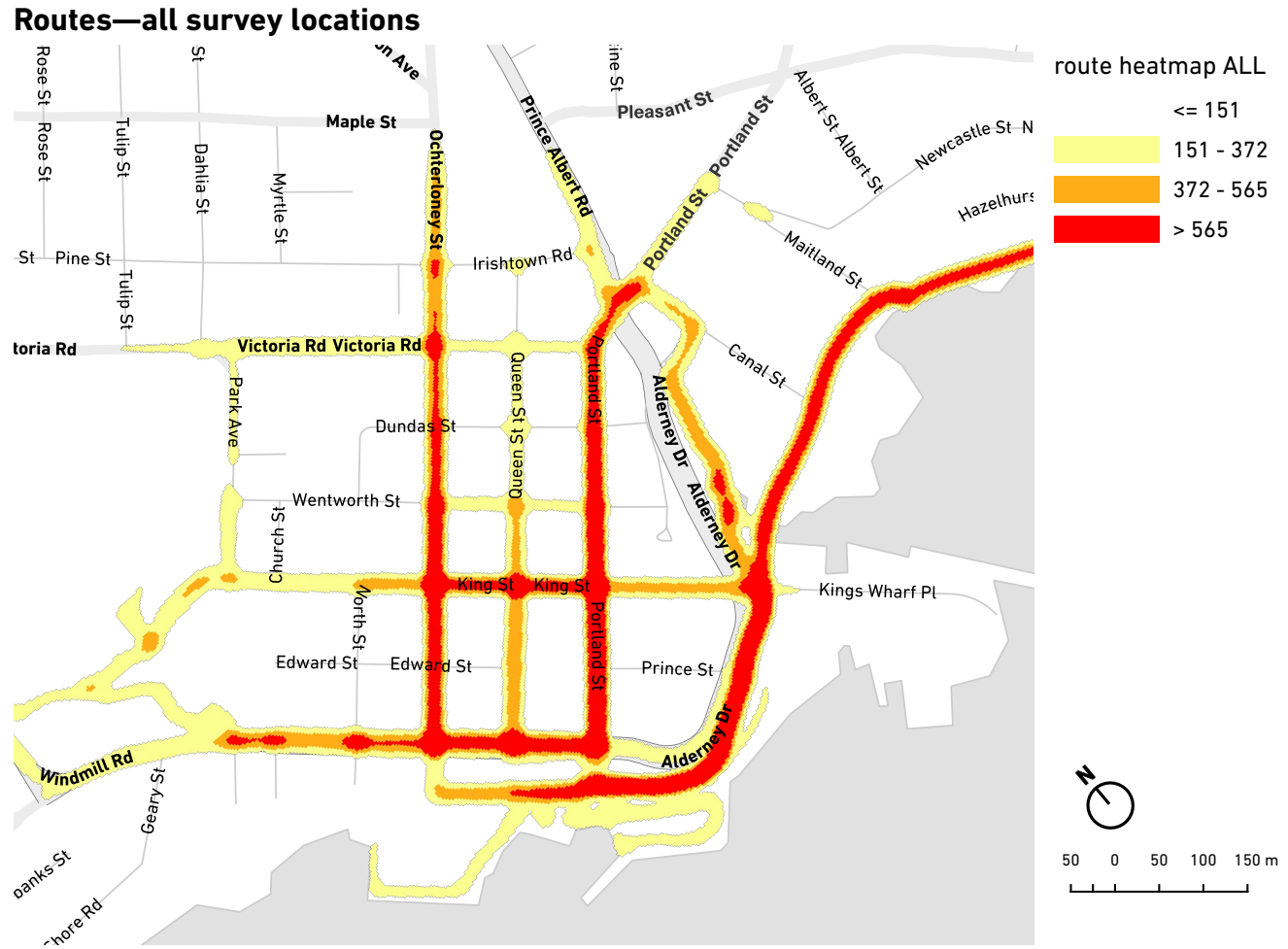


Figure 5.3: Heatmap showing all respondents' routes (using base data from Halifax Regional Municipality, 2012)

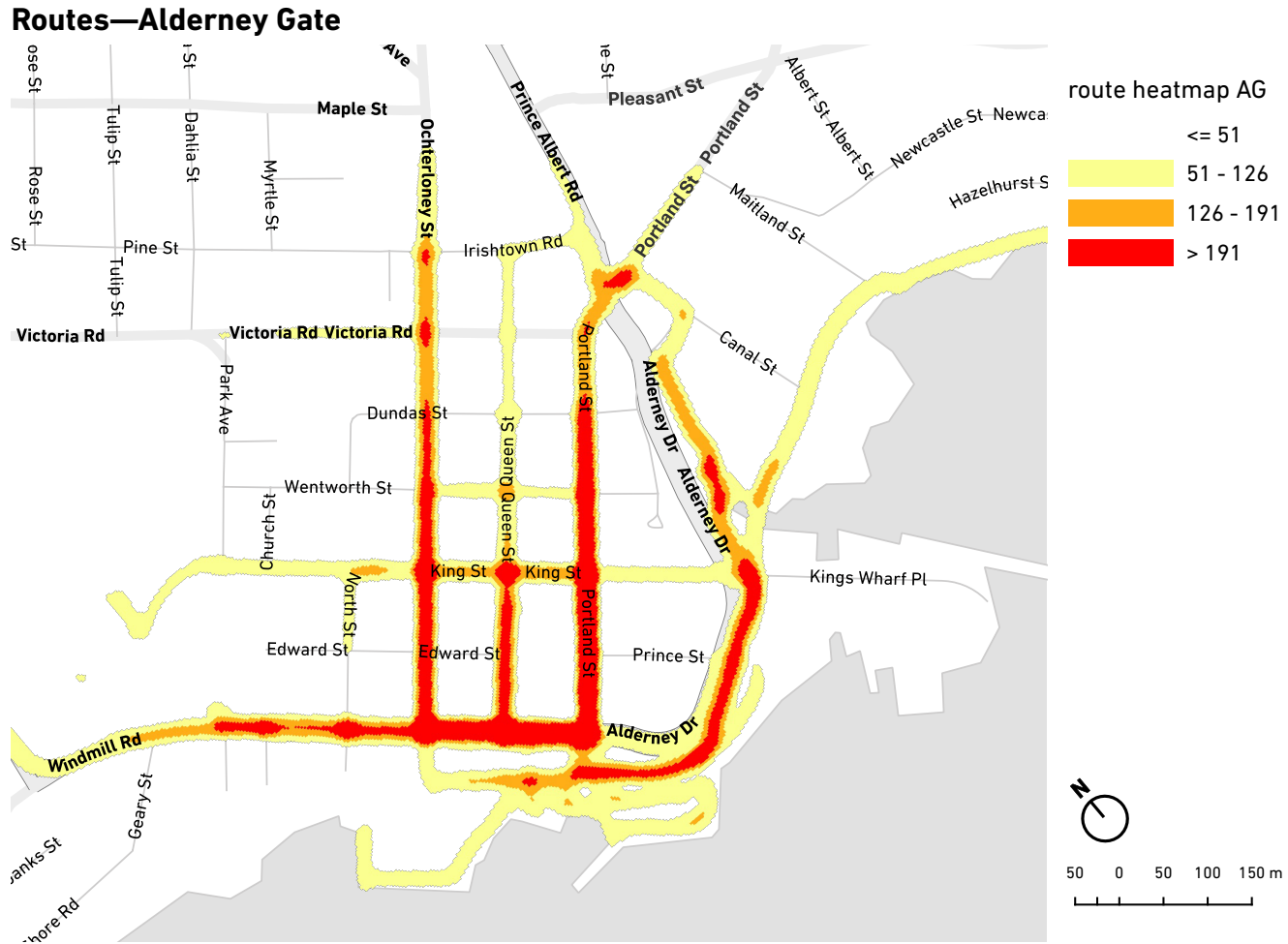


Figure 5.4: Heatmap of respondents' routes at AG—Alderney Gate (using base data from Halifax Regional Municipality, 2012)

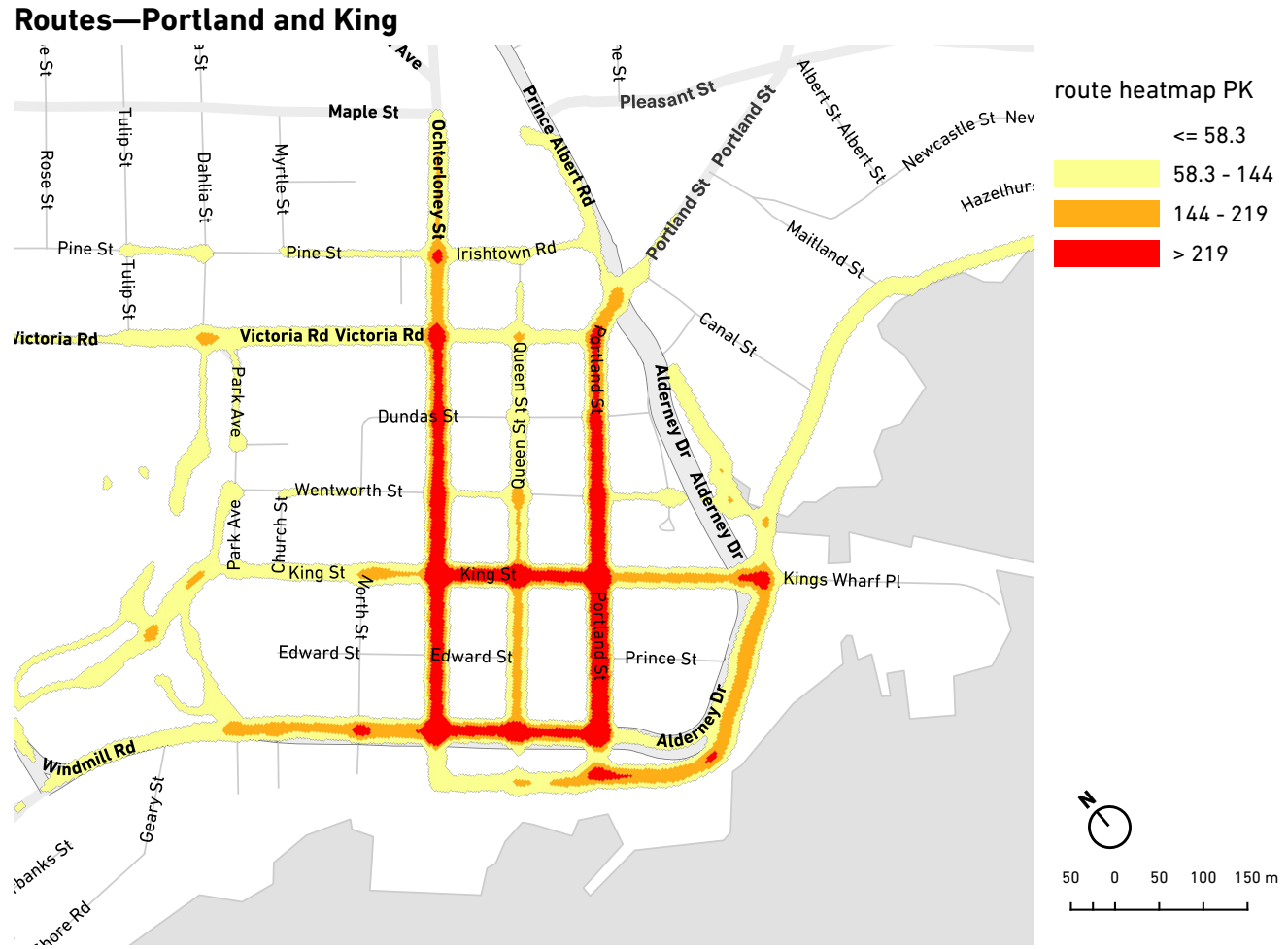


Figure 5.5: Heatmap of respondents' routes at PK—Portland and King Streets (using base data from Halifax Regional Municipality, 2012)

Routes—Dartmouth Cove

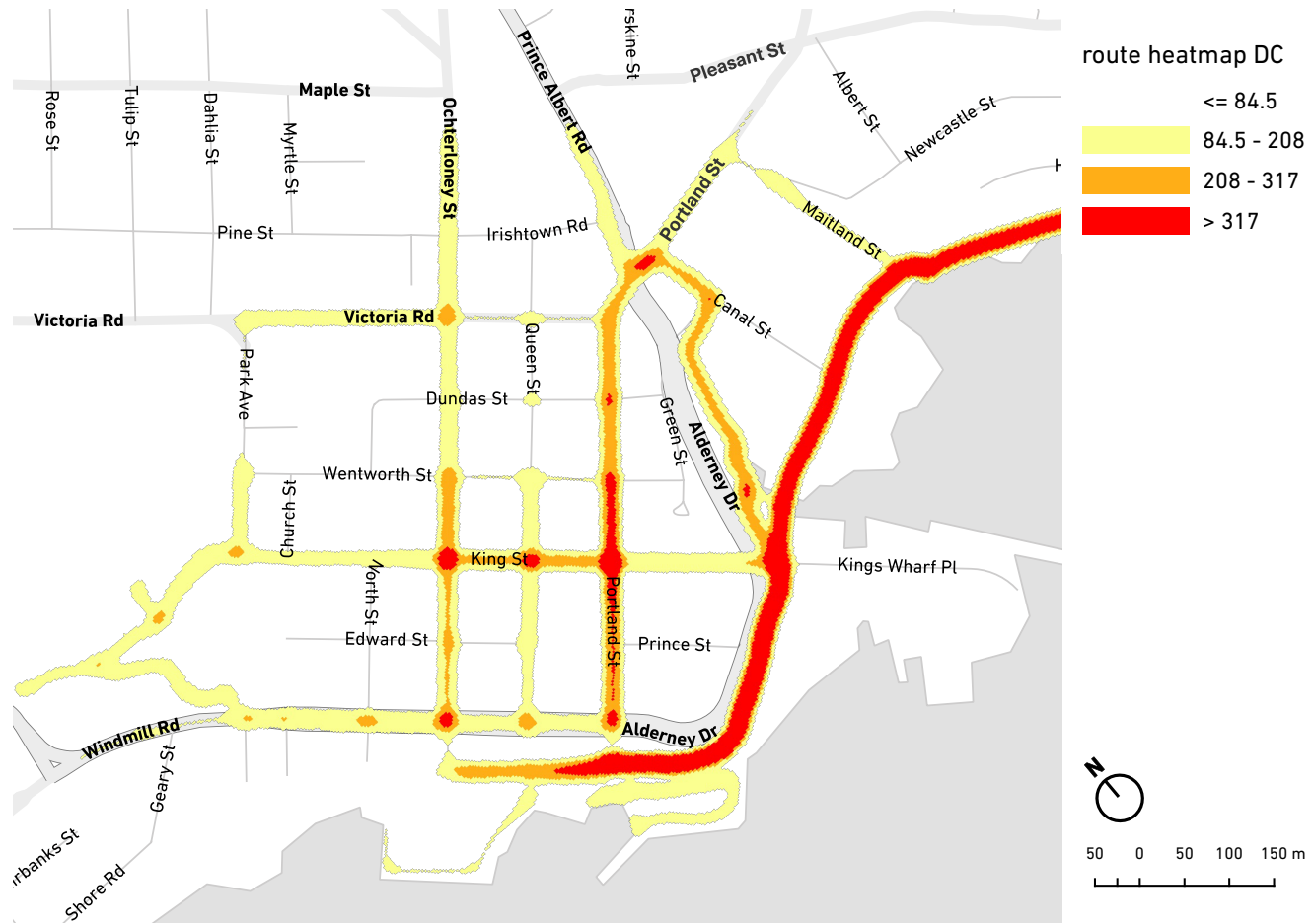


Figure 5.6: Heatmap of respondents' routes at DC—Dartmouth Cove trailhead (using base data from Halifax Regional Municipality, 2012)

5.3 Where do people walk?

Ninety-two respondents drew a total of 220 kilometres of routes around downtown Dartmouth, showing on average about two kilometres of walking routes per person. Some people were generous: one respondent drew 8.6 kilometres of routes.

People largely walk where there are things to do. Figure 5.3 shows the concentrations of peoples' walking patterns:

- along the major retail strips: Portland St. and Ochterloney;
- where there are important amenities: e.g. the Alderney Library;
- at transit hubs;
- at the playgrounds and coastal walking areas; and
- along trails.

(Please note that the heatmap legend shows an intensity level generated by an algorithm; the numbers are not a representation of the number of respondents who selected a route.)

Respondents frequently selected the 3 blocks between Portland and Ochterloney streets. West of Ochterloney Street, Alderney diminishes in importance until it turns into Windmill Road. Going east, Alderney Drive almost disappears from the heatmap entirely. The Dartmouth Cove trail, which runs parallel with Alderney Drive east of Portland Street is the preferred route for respondents by far. Alderney Drive north of Prince Street but south of Victoria is was little used by respondents, having no sidewalk.

If we show respondents who were surveyed only at location AG (Alderney Gate, figure 5.4), the results are similar, but concentrated even more around a few blocks of Alderney Drive, Portland, Queen, Ochterloney, the ferry terminal and the Dartmouth Cove trail. Respondents at this location travelled extensively in the centre, but not as far afield.

Respondents at the corner of Portland and King streets were less interested in the Dartmouth Cove trail, congregating around the retail

areas along Portland, Ochterloney and King streets (figure 5.5). This fit my expectation that walkers on Portland Street would be retail-focused and less interested in recreation.

The last heat map of routes, showing data from respondents at the Dartmouth Cove trailhead, is the most striking (figure 5.6). The focal points within the retail areas of Downtown Dartmouth includes some of Portland at King Street. The strongest concentration is along the Dartmouth Cove trail itself, suggesting that respondents also fit the profile I expected at this location: many preferred to walk recreationally along the coastal trail, with fewer entering downtown at all. There are few retail amenities along the trail itself: the farmers' market at Alderney Landing and the coffee shop at King's Wharf. The Dartmouth Cove respondents, oddly, were the least likely to say that they avoided walking on Alderney Drive (see figure 8.3), even though their maps showed the opposite.

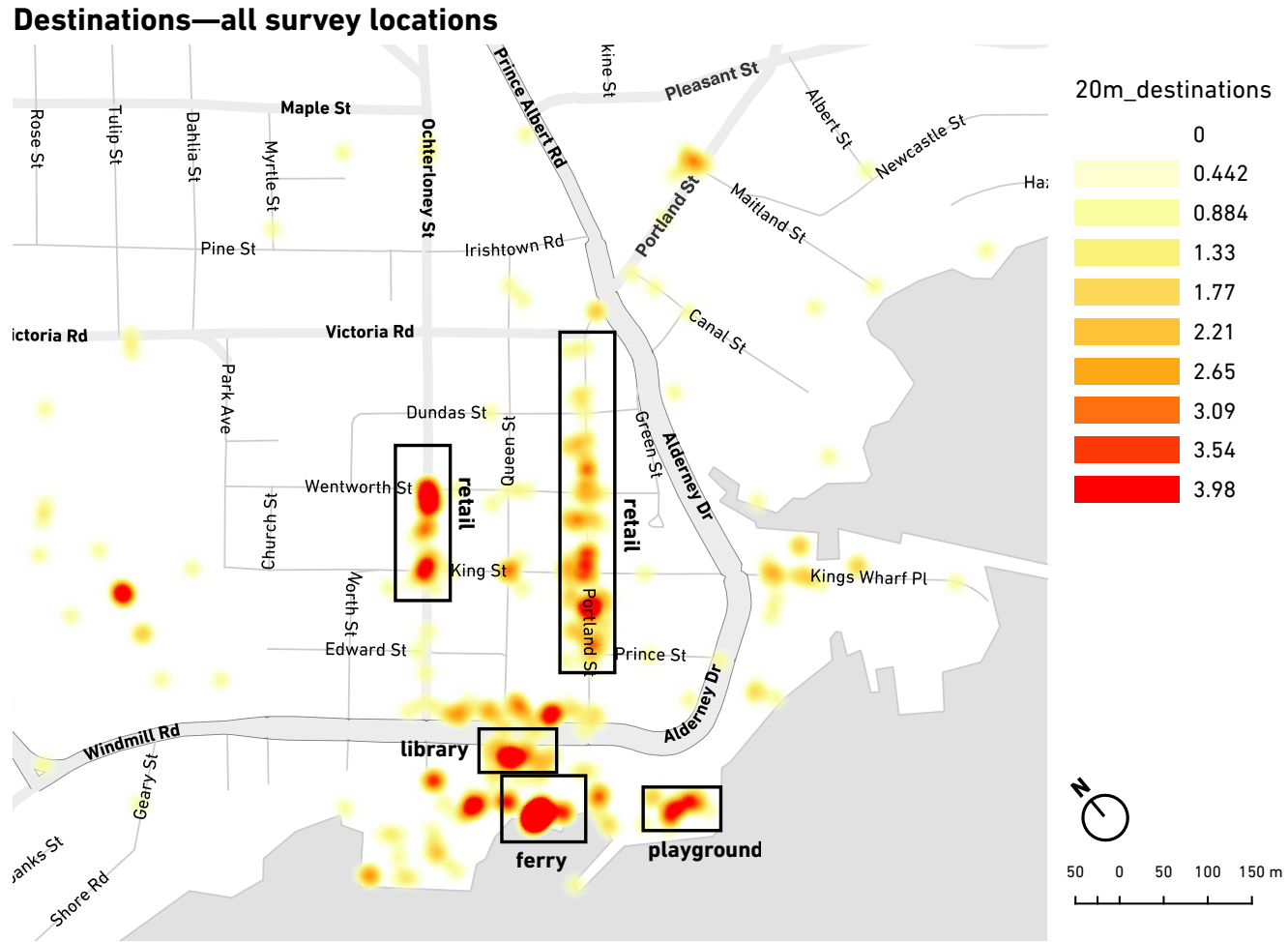


Figure 5.7: Map showing destinations marked by all respondents (using base data from Halifax Regional Municipality, 2012)

5.4 Where are people are going to/coming from?

Figure 5.7 is a heatmap of destinations identified by respondents at all survey locations. Respondents identified a total of 328 points of interest in the study area. The most frequently selected destinations form five distinct clusters:

1. Alderney Gate (including bus and ferry terminals, library, offices)
2. Portland St. retail
3. Ochterloney St. retail
4. Ferry Terminal Park playground
5. Dartmouth Commons

There are wide areas where respondents selected no destinations at all, including along Alderney Drive east (between Prince Street and Portland Street on the north side of downtown), the King's Wharf Marina, along the CN rail yards west of downtown, and in the residential neighbourhoods northeast of downtown (North, Edward, Wentworth streets).

Block-by-block use of Alderney Drive

— % of respondents per block

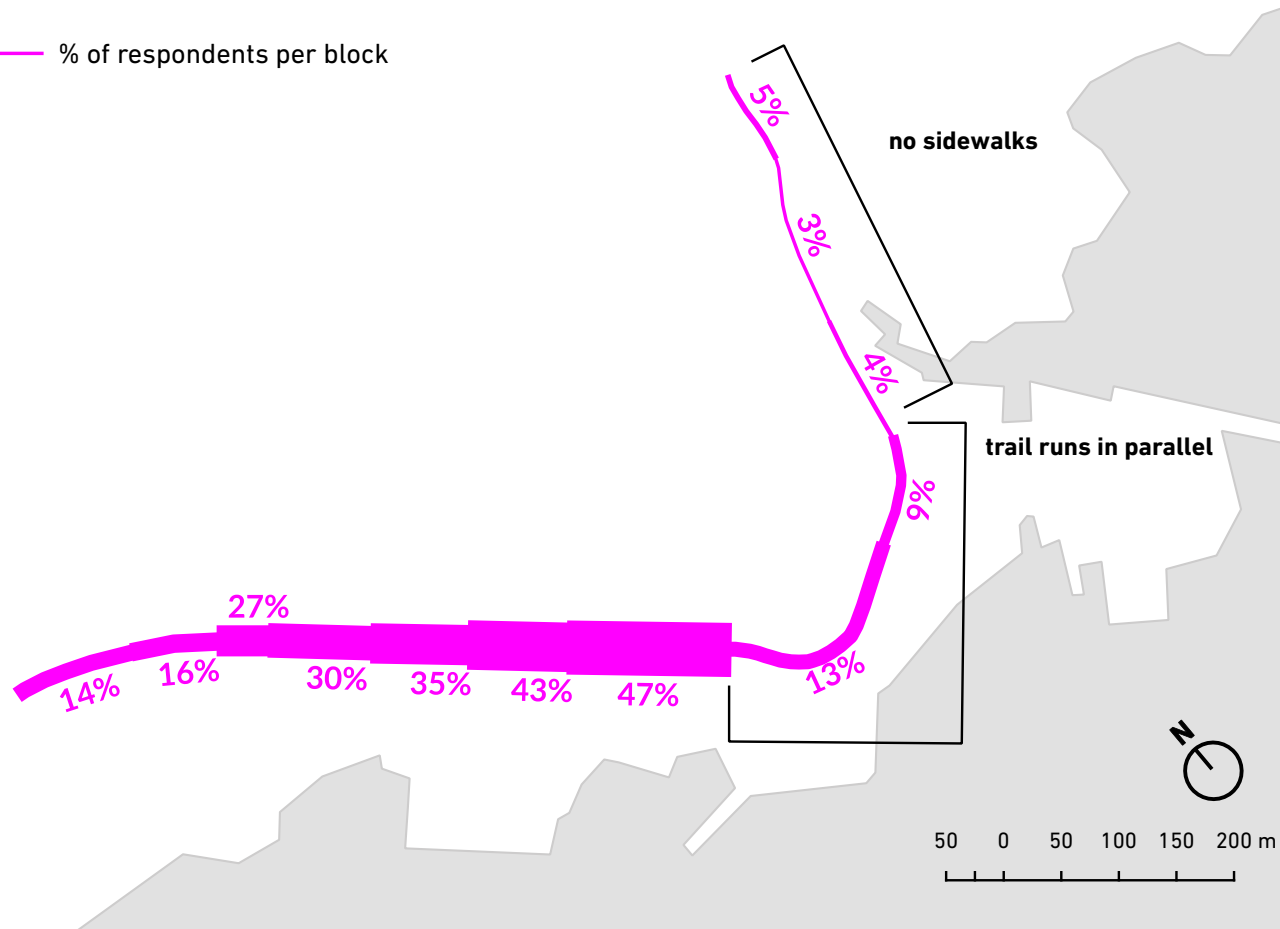


Figure 5.8: How large a proportion of respondents selected each block of Alderney Drive?

5.5 How much of Alderney Drive do people use?

It would be impossible to derive from these data that people avoid Alderney Drive entirely: only 22% of respondents say that they avoid it when deciding where to walk. The picture of the street is, however, complex. If I were to isolate Alderney Drive, most people tend only to walk on a few blocks. I analyzed Alderney Drive by itself, asking how many respondents selected each block. As is clear in figure 5.8, most respondents only walk on the most central blocks of Alderney. The blocks to the north (where there are no sidewalks) are seldom selected at all. Also significant is that the most commonly selected blocks (Ochterloney–Queen and Queen–Portland) were only selected by less than half of respondents. While I could not say that respondents are avoiding Alderney Drive, it would be hard to make the case that people found it appealing: it is more likely that people choose it because it is one of the few routes available to get them to one destination or another.

5.6 Other notes

Despite the rigidity of the Likert-scale questions, many respondents wanted to express other opinions about walking in Dartmouth, or other issues of planning unrelated to this study. People who found Alderney Drive to be a barrier of some kind were more likely to want to stop and chat in greater detail, sometimes about other issues.

There were a few peripheral issues which came up during the surveys. Many respondents complained about wind effects of the large buildings which line Alderney Drive, making walking difficult especially in winter. Respondents at the Dartmouth Cove location complained about being blocked by trains passing through Alderney Landing, and also about a newly installed fence which keeps people from crossing the railroad tracks abutting Ferry Terminal Park. I wasn't looking at specific barriers or nuisances in this study, but any further study should take such complaints into account.

6 | LIMITATIONS

6.1 Survey design

After doing a few intercept surveys, I had a sense for which questions worked and which did not. The Likert-scale questions I composed were general questions, intended to gauge how respondents felt about walking on and around Alderney Drive. Had I asked questions about specific nuisances (noise, pollution, perceived danger from traffic, etc.), I expect that I would have received more negative feelings about Alderney Drive.

Some of my Likert statements could have been phrased differently for clarity. I often had to explain the statements before respondents were able to respond. It would have been nice to do a pilot of 5–10 surveys to test out questions and process before doing the bulk of the surveys.

6.2 Map design

I deliberately left buildings off the map given to respondents to draw on. I did not want respondents to select specific places of business or to identify their own homes. If I had marked essential destinations such as the ferry terminal and library, it would have sped up the survey process; I regularly had to identify landmarks and important destinations to respondents.

6.3 Respondent filtering

My results are likely be skewed in favour of people who were comfortable walking in Downtown Dartmouth, as I only surveyed people who had already chosen to walk. Speaking with non-walkers in Dartmouth might have revealed different feelings about Alderney Drive and the surrounding streets and trails. Similarly, I did not stop drivers or cyclists to see what they felt about Alderney Drive, though many of the respondents in this study used other methods of transportation regularly.

The surveys took place during the daytime, mostly on weekdays in the early fall. Would respondents have given different opinions in the dead of winter, or during the early morning or evening? It would be impossible to find respondents willing to stop and chat late at night or in the cold, but opinions given only on warm days may skew the results in favour of positive feelings.

Collecting demographic information such as gender, age, income or education levels might have given some insight into how different groups of people answer, but it was not practical to do so in this study. For people to volunteer to answer questions on the sidewalk, the survey needed to be as brief as possible.

6.4 Analysis

Respondents' routes were adjusted to fit known routes in existing data: the nearest street centreline or a trail in the municipal GIS data. Where a respondent selected an unknown route (an alley, or path across a field) I digitized freehand. There is a chance that I missed a non-standard pathway (e.g. an alleyway or route across a field) by adjusting the data to fit known routes.

7 | CONCLUSIONS

It's not clear from the results here that people avoid walking on Alderney Drive entirely or consciously. It does follow that people are choosing Alderney Drive only for utilitarian purposes: the street connects people between A and B, or to common destinations such as the library or ferry terminal. When a nicer route exists, such as the Dartmouth Cove trail, or when an amenity-rich street is available (Portland St.), people choose the former or latter over Alderney Drive.

I did not ask people who avoided Alderney Drive why they did so, nor did I ask those that only selected a few blocks of the street on maps why they did not use the rest. A future study might ask people about specific factors that may cause them not to walk on Alderney Drive at all, or as little as possible, such as:

- noise;
- pollution; or
- perceived danger from traffic.

In this study I focused on the pedestrian appeal of Alderney Drive. Future studies should focus on other aspects of Alderney Drive, including an analysis of whether it needs to be as wide as it is. Based on the results from this study, considering a redesign, as suggested in the Downtown Dartmouth Secondary Plan and the WDCL Master Plan for Dartmouth Cove may be warranted. Further study is required in a few areas: would reducing Alderney Drive to two lower-speed lanes make any difference to car or bus flow? If Alderney was reintegrated

to Downtown Dartmouth's street grid, would it increase the number of people visiting retail areas of Downtown Dartmouth? Should we reconsider the wisdom of running a highway through a downtown area?

The middle of Alderney Drive, at Portland, Queen and Ochterloney Streets, has so many active destinations and amenities in a short distance: the library, ferry terminal, farmers' market, trails, parks, playgrounds, nearby restaurants and cafés, people living and working, several transit options, and the harbourfront close by. Thousands of people pass through this nexus of Downtown Dartmouth on foot daily, but during my time surveying and observing there, it never once looked or felt busy. Currently, it's a place that people walk through to get elsewhere. Future designs of the street should make Alderney Drive feel as central to life in Dartmouth, as it is in fact.

8 | APPENDIX

Responses to Likert-scale questions at each survey location appear below.

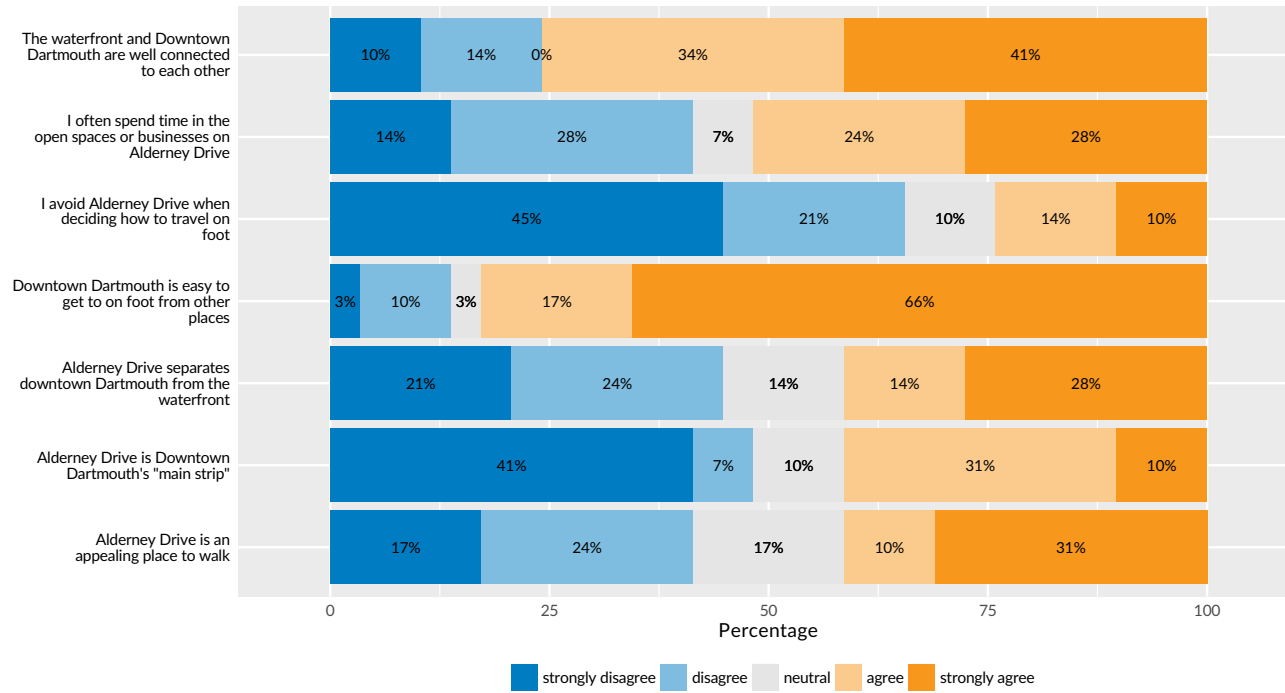


Figure 8.1: Likert-scale questions, at Portland St. survey location

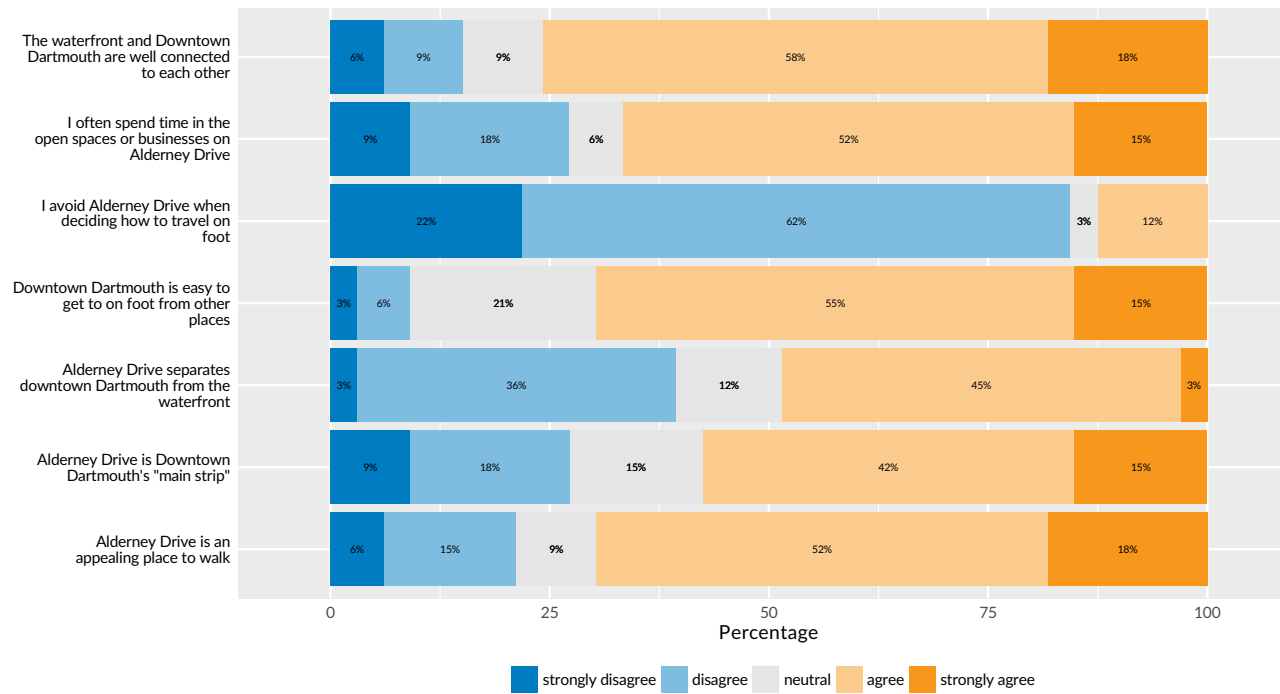


Figure 8.2: Likert-scale questions, at Alderney Gate survey location

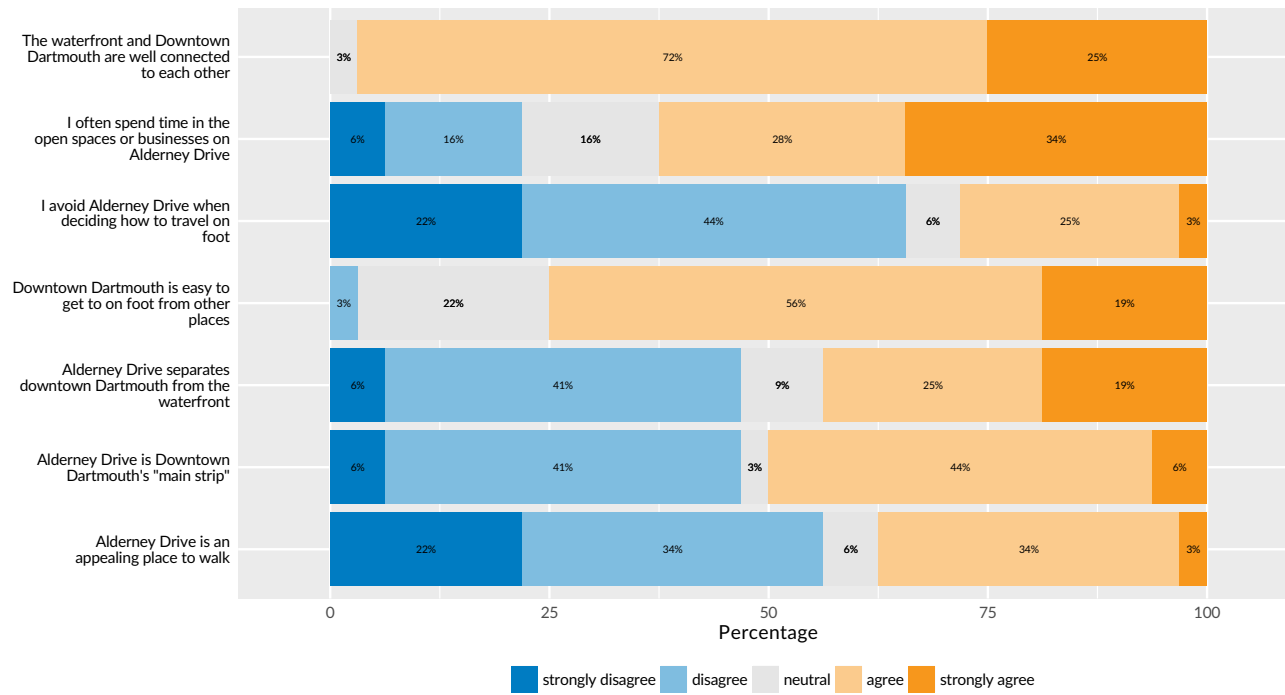


Figure 8.3: Likert-scale questions, at Dartmouth Cove trail survey location

9 | REFERENCES

- Bryer, J. & Speerschneider, K. (2015). *Likert: functions to analyze and visualize likert type items*. R package version 1.3.3. Retrieved from <https://CRAN.R-project.org/package=likert>
- Canadian-British Engineering Consultants & Pearson, N. (1964). *City of Dartmouth urban renewal study*. City of Dartmouth.
- Cerin, E., Leslie, E., du Toit, L., Owen, N., & Frank, L. D. (2007). Destinations that matter: associations with walking for transport. *Health & Place, 13*(3), 713–724. doi:10.1016/j.healthplace.2006.11.002
- Chapman, H. (1997). *White shirts with blue collars*. Dartmouth Historical Association.
- Chin, G. K., Niel, K. P. V., Giles-Corti, B., & Knuiiman, M. (2008). Accessibility and connectivity in physical activity studies: the impact of missing pedestrian data. *Preventative Medicine, 46*(1), 41–45. doi:10.1016/j.ypmed.2007.08.004
- Cluett, G. A. (1997). *Downtown Dartmouth and waterfront, reassessing history for the future* (master's thesis, Technical University of Nova Scotia, Halifax NS).
- Davidson, T., Kuhn, P., & Terashima, M. (2015). *Regional Centre sub-geographies: researching indicators to support evidence-based planning within the Regional Centre*. Dalhousie. Retrieved from <http://www.halifax.ca/boardscom/documents/Sub-Geographies.pdf>
- Ewing, R. & Cervero, R. (2010). Travel and the built environment. *Journal of the American Planning Association, 76*(3), 265–294. doi:10.1080/01944361003766766
- Hajrasouliha, A. & Yin, L. (2015). The impact of street network connectivity on pedestrian volume. *Urban Studies, 52*(13), 2483–2497. doi:10.1177/0042098014544763
- Halifax Regional Municipality. (2012, April 1). HRM geodatabase.
- Halifax Regional Municipality. (2016a, October 19). Draft Centre Plan October 2016. Retrieved from http://centreplan.ca/s/HRM-CentrePlanPolicies_161028-1-sgjl.pdf
- Halifax Regional Municipality. (2016b, November 18). HRM transit static scheduling data. Retrieved from http://www.halifax.ca/metrotransit/GoogleTransitFeed/google_transit.zip
- Halifax Regional Municipality. (2016c, May 1). Map - Dartmouth employment density. Retrieved from <http://shapeyourcityhalifax.ca/centre-plan/documents/3368/download>
- Halifax Regional Municipality. (2016d, September 10). *Secondary planning strategy for Downtown Dartmouth*. Halifax Regional Municipality. Retrieved from <http://www.halifax.ca/planning/documents/DowntownDartmouthSPS.pdf>
- Itzhak Omer, Y. R. & Lerman, Y. (2015). The impact of planning on pedestrian movement: contrasting pedestrian movement models in pre-modern and modern neighborhoods in Israel.

- International Journal of Geographical Information Science*, 29(12), 2121–2142. doi:10.1080/13658816.2015.1063638
- Leslie, E., Coffee, N., Frank, L., Owen, N., Bauman, A., & Hugo, G. (2007). Walkability of local communities: using geographic information systems to objectively assess relevant environmental attributes. *Health & Place*, 13(1), 111–122. doi:10.1016/j.healthplace.2005.11.001
- Miranda-Moreno, L. F., Morency, P., & El-Geneidy, A. M. (2011). The link between built environment, pedestrian activity and pedestrian–vehicle collision occurrence at signalized intersections. *Accident Analysis and Prevention*, (43), 1624–1634. doi:10.1016/j.aap.2011.02.005
- Özbil, A. (2013). Modeling walking behavior in cities based on street network and land-use characteristics: the case of Istanbul. *METU Journal of the Faculty of Architecture*, 30(2), 17–33. doi:10.4305/METU.JFA.2013.2.2
- PostGIS Development Team. (2016). PostGIS spatial database extender. Open Source Geospatial Foundation Project. Retrieved from <http://www.postgis.net>
- QGIS Development Team. (2016). QGIS geographic information system. Open Source Geospatial Foundation Project. Retrieved from <http://qgis.osgeo.org>
- R Core Team. (2016). *R: a language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. Retrieved from <https://www.R-project.org/>
- Schlossberg, M., Johnson-Shelton, D., Evers, C., & Moreno-Black, G. (2015). Refining the grain: using resident-based walkability audits to better understand walkable urban form. *Journal of Urbanism*, 8(3), 260–278. doi:10.1080/17549175.2014.990915
- Statistics Canada. (2011a). 2011 National Household Survey (NHS) profiles files / profile of Census Subdivisions. Total employed population aged 15 years and over with a usual place of work or no fixed workplace address by mode of transportation; both sexes (v1665) and walked; both sexes (v1669). Using CHASS (distributor). Retrieved from <http://dc1.chass.utoronto.ca.ezproxy.library.dal.ca/cgi-bin/census/2011nhs/retrieveCensus.cgi>
- Statistics Canada. (2011b). Dissemination block boundary file, 2011 census. Retrieved from http://www.statcan.gc.ca/cgi-bin/IPS/display?cat_num=92-163-X
- Statistics Canada. (2011c). Geographic attribute file, 2011 census. Retrieved from http://www.statcan.gc.ca/cgi-bin/IPS/display?cat_num=92-151-X
- The Planning Partnership, CBCL Limited, & BuildGreen Solutions. (2012). *Dartmouth Cove comprehensive plan*. Halifax Regional Municipality. Halifax. Retrieved from <http://my-waterfront.ca/wp/wp-content/uploads/2015/09/DartmouthCove-Part1-GuidingPlan-1.pdf>