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Item No. 13.2.1
Transportation Standing Committee
February 22, 2024

TO: Chair and Members of Transportation Standing Committee

[redacted]

SUBMITTED BY:

Hugh Millward, Chair, Active Transportation Advisory Committee

DATE: January 18, 2024

SUBJECT: **CNIB Halifax: Cycling Infrastructure Guidelines**

ORIGIN

January 18, 2024 meeting of Active Transportation Advisory Committee, Item 7.3.1.

LEGISLATIVE AUTHORITY

Active Transportation Advisory Committee Terms of Reference, section 2 Mandate:

The mandate of the Active Transportation Advisory Committee is to advise the Transportation Standing Committee on all matters relating to active transportation in Halifax Regional Municipality, using the Active Transportation Plan as a guide.

2.1 The committee will provide timely advice to the Transportation Standing Committee on matters relating to budget, infrastructure, education, policy and public awareness.

RECOMMENDATION

The Active Transportation Advisory Committee recommends that Transportation Standing Committee direct the Chief Administrative Officer to prepare a staff report to consider examining and expanding upon the recommendations outlined in the “Cycling Infrastructure and People with Sight Loss – Design Challenges and Opportunities at Transit Stops Across Canada” report when installing cycling infrastructure.

BACKGROUND

At the January 18, 2024 meeting of the Active Transportation Advisory Committee, the Committee received a presentation from community presenter, Lui Greco, CNIB Halifax to consider the recommendations outlined in the "Cycling Infrastructure and People with Sign Loss – Design Challenges and Opportunities at Transit Stops Across Canada" as it relates to the installation of cycling infrastructure in Halifax Regional Municipality.

For further information refer to Attachment 1.

DISCUSSION

The Active Transportation Advisory Committee considered the presentation dated January 18, 2024 and approved the recommendation to the Transportation Standing Committee as outlined in this report.

FINANCIAL IMPLICATIONS

No financial implications at this time.

RISK CONSIDERATION

No risk considerations at this time.

COMMUNITY ENGAGEMENT

The Active Transportation Advisory Committee is comprised of 11 citizen members and 1 Councillor. Meetings are live webcast on Halifax.ca. The agenda, reports, video, and minutes of the Committee are posted on Halifax.ca.

ENVIRONMENTAL IMPLICATIONS

No environmental implications were identified.

ALTERNATIVES

The Active Transportation Advisory Committee did not provide alternatives.

ATTACHMENTS

Attachment 1 – Cycling Infrastructure and People with Sight Loss – Design Challenges and Opportunities at Transit Stops Across Canada

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A copy of this report can be obtained online at halifax.ca or by contacting the Office of the Municipal Clerk at 902.490.4210.

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Cycling Infrastructure and People with Sight Loss – Design Challenges and Opportunities at Transit Stops Across Canada

Final Report and Recommendations
September 2023

Produced for:

CNIB FOUNDATION

By:

WSP

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Canada

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The project team would like to further acknowledge:

- The WSP staff from across Canada who conducted the field assessments: Beverly Ng, Brittany Shewchuk, Eva Kwok, Yousteena Bocktor, and Luan Jiang;
- Chantelle Smith and Rob Tobin of the National Council for the Blind of Ireland (NCBI) for sharing resources, feedback, and input throughout the study;
- Translink and Urban Systems for their open exchange of information throughout the project as they work to complete a parallel study, *Inclusive Bus Stops Adjacent to Protected Cycling Infrastructure;*
- The Government of Canada's Active Transportation Infrastructure Fund, which provided the primary source of funding for the study; and
- The individuals who contributed to the study as participants. The contributions of their knowledge and lived experience form the basis of this study and its results.

Foreword

"People with sight loss continue to loudly voice that transportation barriers are among the greatest they face, whether they live in rural or urban environments." – CNIB Safe and Accessible Journeys

Our world is changing rapidly; this is witnessed by the sheer number of transportation options that have been introduced over the last few years. Ridesharing, on-demand transit, multi-use trails and micro-mobility devices are just a few examples.

Canada, and most of the world, has embarked on an aggressive strategy to try and mitigate the climate crisis, looking for viable alternatives to reduce the emission of greenhouse gases. One of these strategies has been to deploy cycling infrastructure along city streets, encouraging safer travel for cyclists. Yet, when this infrastructure intersects with the freedom of movement for vulnerable pedestrians, such as those who are blind, steps must be taken to curtail this inequity. This is what underpins the research outlined in this report. The voices of people who are blind are central to both the methodology and recommendations set out below.

There are an abundance of choices which municipalities have when deploying cycling infrastructure. CNIB would encourage designers, planners and municipalities that planning for the installation of cycling infrastructure that intersects with bus stops that alternate routes should be exhaustively explored. We recognize that balancing the needs of stakeholder groups such as motorists, cyclists, pedestrians and vulnerable pedestrians will require a paradigm shift, but, if done so within an inclusive lens, the end result will bring about communities where everyone can safely live, work and play in with dignity and independence.

Public consultations must become more inclusive of people living with sight loss. Colour maps and drawings cannot be the only tools by which future development initiatives are communicated to citizens.

CNIB would like to thank the research team at WSP in compiling the findings below. Their dedication, professionalism, and vision of communities where everyone can participate fully is our shared passion.

This project was made possible with funding from the Government of Canada's Active Transportation Fund.

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1. Executive Summary

The "island platform transit stop" design, which provides a separated cycling facility that routes cyclists between a bus stop and the sidewalk, is gaining traction in Canada with inclusion in the TAC Geometric Design Guide and several implementations nationwide. For cyclists, this design offers enhanced safety by removing interactions with transit vehicles. For people with sight loss, however, the design introduces various challenges:

- **Finding and Navigating the Bus Stop:** The unconventional layout can be disorienting for people who are blind and lack key tactile or auditory cues that people rely on for navigating bus stops. Many users are unable to identify the stop at all when searching for it, introducing new barriers to transit use for people who are blind.
- **Detecting Cyclists:** Especially in an urban environment, cyclists are difficult to hear above the background noise of automobile traffic and other urban sounds due to their quiet movement, raising safety concerns. As evidenced in the BC Human Rights Tribunal case referenced below, some blind individuals avoid these stops due to fears of undetected cyclists.
- **Negotiating Right-of-Way with Cyclists:** This design often leads to uncertainties in right-of-way, with some studies showing a significant percentage of cyclists failing to yield to pedestrians even when crossings are marked.
- **Expectations:** Since this is a newer design, many transit users aren't prepared to navigate a bike path immediately upon exiting the bus. Some studies suggest pedestrian inattentiveness as a key source of conflict, an assertion that fails to adequately consider the needs of pedestrians with disabilities such as vision loss.

In 2020, a BC Human Rights Tribunal ruling drew attention to the ways in which the existing design of a floating bus stop in Victoria discriminated against people who are blind, affirming the challenges being faced by visually impaired individuals as new forms of multi-modal infrastructure were planned, designed and implemented. This landmark decision has contributed to a nationwide re-evaluation of bus stop designs by transit agencies, with an increased focus on accessibility.

With the hopes of better understanding the impact of these designs on people with sight loss, CNIB successfully secured a grant from the National Active Transportation Infrastructure Fund in 2022. Using this grant, CNIB partnered with WSP Canada Inc. to study the design's impact on passengers with sight loss. This study aims to determine the effects of island platform transit stop designs on the safety and comfort of people with vision loss, and to make recommendations for future designs and future research topics to strengthen guidance on their implementation.

Figure 1: An island platform bus stop in Victoria that was the subject of a BC Human Rights Tribunal case in 2020. The photo is from 2018, and changes were made to the design following the ruling.

Study Process

Background Review

First, a review of academic literature and existing design guidance was conducted. The background review confirmed that people with sight loss encounter significant challenges at island platform transit stops. They struggle to detect approaching cyclists and have difficulty orienting themselves and navigating the raised platform. Presently, there are inconsistencies in design guidance documents, especially regarding crossings and provisions for people with sight loss, which creates confusion and introduces risk for all users.

A common interaction at these stops involves cyclists and sighted pedestrians using eye contact to determine right-of-way instead of adhering strictly to pedestrian priority. When conflicts arise, "pedestrian inattentiveness" is cited within the existing literature as a common cause of the conflict; however, this explanation overlooks the experiences of those with sight loss who cannot rely on eye contact to negotiate in these situations. Consequently, many people living with sight loss report negative perceptions of cyclist behavior, and some even avoid these crossings due to fear. Available literature highlights the importance of audible cues as a navigation tool for people with sight loss, but the current literature does not make specific reference to audio-based solutions to improve navigation, representing an important gap in the current understanding of these designs.

Evidence from the background review suggests that implementing a strict compliance-based approach for pedestrian priority at bicycle path crossings may not be effective, especially for those with sight loss. Marking crosswalks across the bicycle path can enhance awareness, predictability, and wayfinding, which leads to fewer conflicts. Additional measures such as channelizing pedestrians using furniture or railings, decluttering the platform area, and enhancing sightlines can also bolster safety and user experience.

The design's effectiveness may also depend on location-specific factors, as interactions between pedestrians and cyclists tend to increase with higher bicycle and passenger volumes, as well as more frequent bus services. This suggests the potential value of having distinct design criteria (or seeking alternate design treatments) for high-volume locations.

Field Research

With the base understanding developed in the background review, the project team assembled an inventory of 22 constructed island platform bus stops across Canada and systemically narrowed them down to five sites for field testing with the input of the project’s Advisory Committee. The sites were selected to cover a range of Canadian climate conditions including Vancouver, Calgary, Winnipeg, London, and Montreal. The CNIB recruited between four and six paid participants with sight loss for each site and WSP developed and implemented a standardized testing procedure for the study. In May 2023, participants were asked to identify and navigate through an island platform bus stop, board a transit vehicle, and alight at a similarly designed island platform bus stop downstream.

The field study validated that people with sight loss experience challenges in identifying and negotiating with cyclists when crossing bicycle paths. Participants also experienced a high degree of difficulty identifying and orienting themselves to the bus stops. In many instances, participants passed the bus stop without noticing it, while in others, participants crossed at incorrect locations or encountered difficulty navigating around poles and clutter.

Recommendations

The study concludes by identifying five key elements of the journey where people with sight loss encountered difficulty, along with a list of recommendations for improving the experience, shown in the table below. Three graphical examples providing visual representations of the recommendations are provided below the table.

Challenge	Recommendations
Finding the bus stop	Prioritize consistent placement of bus stops along corridors (e.g., at or near intersections) Prioritize placement of shelters on the platform as this is key for identifying the presence of a bus stop and finding the correct point to wait for a bus. Shelter does not need to be fully enclosed; canopy shelters or benches would accomplish this as well. Provide detectable separation between sidewalk and cycle track (i.e., raised curb or grass buffer) to allow for diverging route to platform to be detectable underfoot. Use pictograms or audio messages on bus furniture provided on sidewalk to direct users to the bus platform.
Orienting and navigating to and from the island platform	Establish a consistent nomenclature for this stop layout to improve ease of communication. Establish a consistent design approach, including the placement of key elements like stop pole, crossing(s), and shelter. Provide a painted crosswalk across bicycle path with attention TWSI at each end. Provide directional TWSI's extending from the crossing to the back of sidewalk and from the crossing to the bus stop pole. Channelize crossings using furniture, railings, etc. Place the bus flag/pole on the platform. Remove / relocate unnecessary clutter from the platform; don't place traffic or signage poles in the path of travel. Provide onboard audible announcements for alighting passengers at stops with island platforms. Provide more education on the use and purpose of directional TWSI's. Encourage the use of GPS-based wayfinding technology to add special instructions for navigating island platform bus stops. When integrated with a signal, raise the bicycle path crossing so that users can detect the curb ramp as the start of the roadway crossing.

Interactions with Cyclists: Detecting approaching cyclists	Promote good sightlines between cyclists and passengers. Avoid placing ads in shelters that block sightlines at crossings. Provide pavement markings oriented to pedestrians encouraging looking left and/or right (applicable to people with low vision). Develop a system of technology that provides auditory or tactile feedback to pedestrians when a cyclist is approaching.
Interactions with Cyclists: Negotiating right of way with approaching cyclists	Provide painted crosswalk with "yield to pedestrians" signage to establish pedestrian priority. Remove sightline obstructions and clutter to maximize visibility. Provide signage and consider flashing beacons to highlight the crossing to cyclists. Provide raised crossings, sharp tapers, or narrowed bike path to slow cyclists and increase awareness. When integrated with signalized intersections, include the bicycle path crossing in the signalized portion of the crosswalk. Restrict use of this design when highly complex conditions are present (e.g., steep grades, two-way cycle tracks, downtown environment, transit station, etc.)
Boarding and alighting	Paint platform curbs yellow to help identify the edge of the platform.

The study includes the identification of factors that, when present, increase the risk of conflicts between cyclists and pedestrians (including people with sight loss). These are:

- High volumes of pedestrians (e.g., downtown environment)
- High volumes of cyclists (e.g., major cycling route)
- High frequency of bus service (e.g., 10 or more buses per hour)
- Two-way cycling facility
- Downhill grade on cycling approach (e.g., 2% or greater)

Especially in these situations, consideration should be given to adding a controlled crossing (e.g., flashing beacon or accessible pedestrian signal) or removing the conflict altogether, such as by moving the bus stop or route, or relocating the cycling facility.

Three graphical examples are provided below, as visual representations of some of the recommendations from the table.

Example #1: Far Side of Intersection, Typical Conditions

This example conveys a common situation where a bus stop is located immediately downstream of a signalized intersection. It is assumed that none of the heightened risk factors described in Example #2 are present.

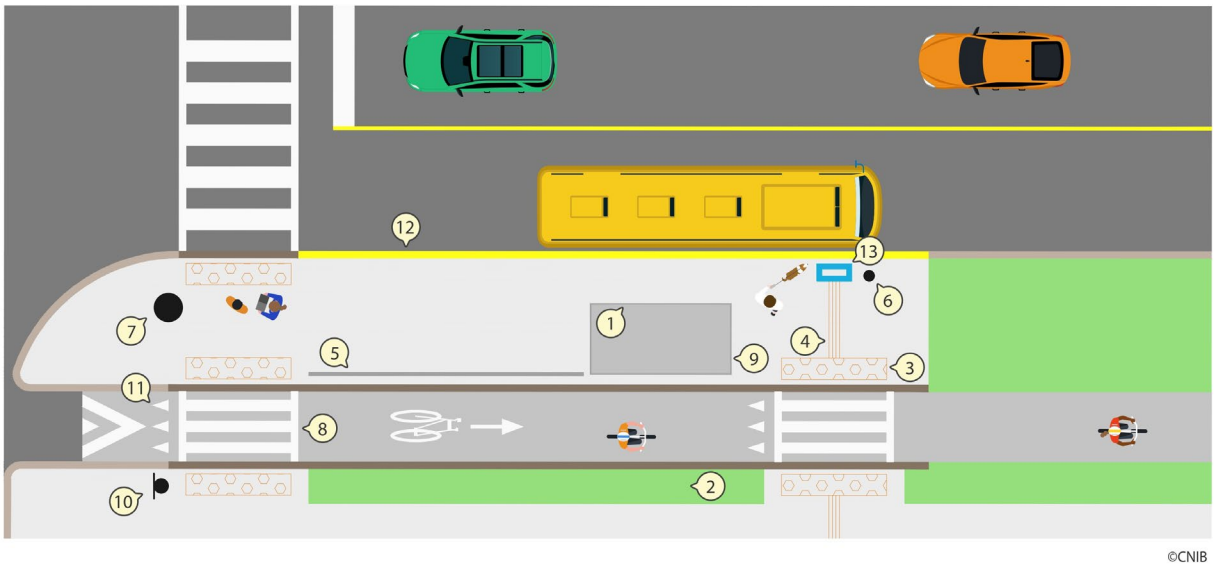

Figure 2: Example #1, Far side of intersection, typical conditions. The guidance associated with each callout number is as follows:

1. *Prioritize placement of shelters on the platform*
2. *Provide detectable separation between sidewalk and cycling facility (grass buffer shown as example)*
3. *Provide a painted crosswalk across the cycling facility with attention TWSI at each end*
4. *Provide directional TWSI's extending from the crossing to the back of sidewalk and from the crossing to the bus stop pole*
5. *Channelize crossings using furniture, railings, etc.*
6. *Place the bus flag/pole on the platform*
7. *Remove / relocate unnecessary clutter from the platform; place traffic and signage poles outside of the path of travel*
8. *When integrated with a signal, raise the bicycle path crossing so that users can detect the curb ramp as the start of the roadway crossing*
9. *Promote good sightlines between cyclists and passengers. Avoid placing ads in shelters that block sightlines at crossings*
10. *Provide "yield to pedestrians" signage to establish pedestrian priority*
11. *Provide raised bicycle crossings, sharp tapers, or narrowed bike path to slow cyclists and increase awareness*
12. *Paint platform curbs yellow to help identify the edge of the platform*
13. *Consider blue square (or equivalent) as a landmark for guiding passengers to and from TWSI's*

Example #2: Near Side of Intersection, Two-way Bicycle Path (Heightened Risk Situation)

This example conveys a heightened risk situation where transit passengers cross a two-way cycling facility to reach the bus platform.

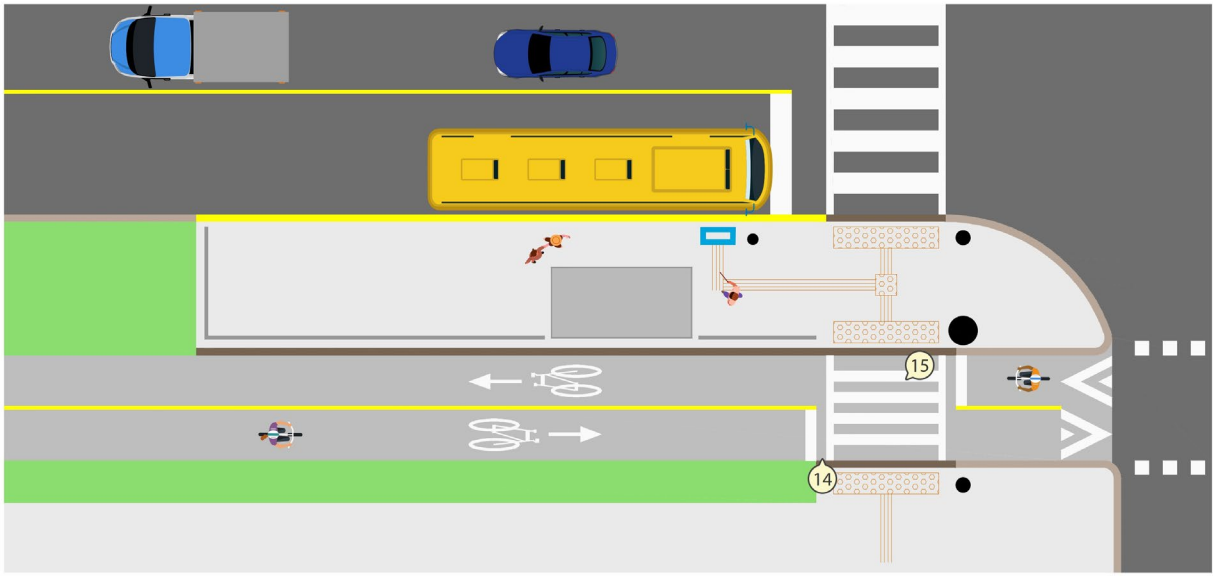

Figure 3: Example #2, Near side of intersection, two-way bicycle path (heightened risk situation). The following factors, when present, increase the risk of conflicts between cyclists and pedestrians (including people with sight loss): high volume of pedestrians (e.g., downtown environment), high volume of cyclists (e.g., major cycling route), high frequency of bus service (e.g., 10 or more buses per hour), two-way cycling facility, downhill grade on cycling approach (e.g., 2% or greater). The guidance associated with each callout number is as follows:

14. *In heightened risk situations, consideration should be given to adding a controlled crossing (e.g., flashing beacon or accessible pedestrian signal) or removing the conflict altogether, such as by moving the bus stop or route, or relocating the cycling facility*
15. *When integrated with signalized intersections, include the bicycle path crossing in the signalized portion of the crosswalk*

Example #3: Constrained Application

This example conveys a commonly-encountered situation where insufficient boulevard space is available to accommodate all of the desired elements.

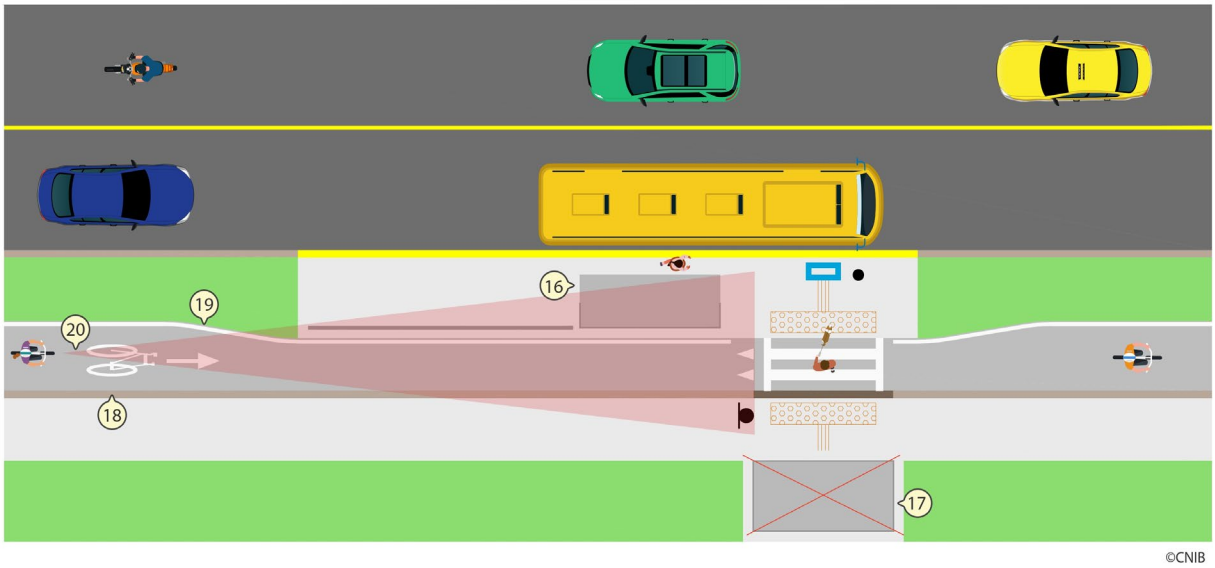

Figure 4: Example #3, constrained application. The guidance associated with each callout number is as follows:

16. *In constrained applications, provide narrower canopy shelters or benches on the platform to support wayfinding*
17. *Avoid locating shelters behind the sidewalk as they may mislead passengers about the stop layout. If shelter must be located behind sidewalk, consider providing braille sign or audible announcement providing information about the layout*
18. *Provide detectable separation between sidewalk and cycling facility (50-70 mm high curb shown as example)*
19. *Provide raised crossings, sharp tapers, or narrowed bike path to slow cyclists and increase awareness (taper and narrowed bike path shown)*
20. *Promote good sightlines between cyclists and passengers. For example, on flat grades at 20 km/h, a cyclist needs to see a crossing pedestrian 20 m in advance of the crossing in order to stop in time*

The full list of recommendations was shared with both the project Advisory Committee and a subset of study participants for feedback. Key themes raised by municipal staff include addressing space constraints (particularly platform width) and the importance of enclosed shelters for passenger comfort in certain climates. While TWSI are currently not being implemented consistently across Canada, there is a collective desire to do so. Study participants generally agreed with the recommendations and continued to emphasize the concern of not being able to detect approaching cyclists.

The study concludes with recommendations for further research. While this study validates the need for more tools allowing people with sight loss to detect oncoming cyclists, the project team was unable to identify any successful techniques in practice. Further work should be undertaken by researchers and/or practitioners to identify technology or auditory based solutions. Another key knowledge gap commonly experienced by municipalities is how to address constrained situations where there is insufficient space for a full-size island platform. Further study should be conducted on the performance of constrained designs to understand the impacts of various trade-offs (for example, providing a narrow platform compared to providing no platform at all).

2. Introduction

Study Context

The “island platform transit stop” is an emerging design treatment where a separated cycling facility diverts around a bus stop, routing cyclists between the bus stop and the sidewalk. This design results in a bus passenger waiting area adjacent to the road where pedestrians must cross a bicycle path to get to the adjacent sidewalk. The treatment has recently been introduced into cycling design manuals across Canada, including the TAC Geometric Design Guide for Canadian Roads, and many are in the design phase or have been built across Canada to-date.

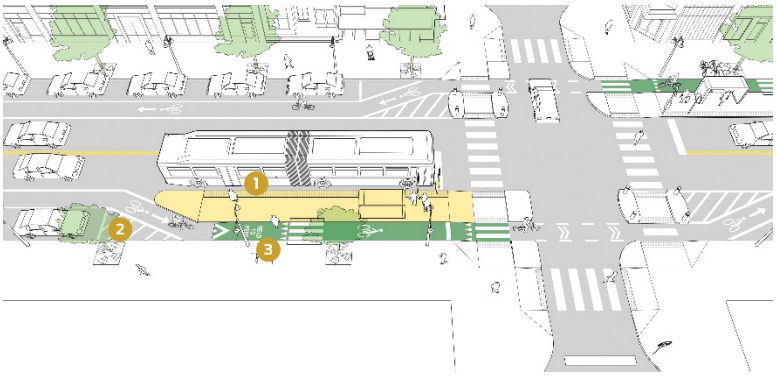

Figure *5*: Schematic example of an island boarding transit stop (Source: NACTO)

From a cycling perspective, the island platform transit stop is seen as an improvement to comfort and safety as it eliminates conflicts between cyclists and transit vehicles; in the absence of this design a bus would otherwise need to pull into the cycling facility to access the curb. For people who are blind, however, this design presents significant challenges, namely:

- **Detectability:** While a sighted pedestrian may have relative ease in scanning for and yielding to cyclists, someone with sight loss may have significant challenges recognizing and responding to an oncoming cyclist. Cyclists make very little noise when travelling, making it difficult to detect if a cyclist is approaching and whether they have stopped or are slowing down. In the case Canadian Federation of the Blind v. City of Victoria[1], a witness of the Complainant living with sight loss reported avoiding using floating bus stops due to fears of a collision with a cyclist and inability to detect them.
- **Ambiguous right-of-way:** The design typically involves an informal “negotiation” between pedestrians and cyclists at the crossing point. Even where pavement markings are provided to designate right-of-way to pedestrians, evidence from some designs suggests cyclist yielding rates may be suboptimal, potentially due to insufficient direction to cyclists of the expected behaviour. For example, a recent study from Nanjing, China[2] found that in 37% of interactions involving pedestrians and cyclists at island platform transit stops, it was the pedestrian – rather than the cyclist – who adjusted their path to avoid a conflict. Another study from London, UK[3]

[1] Reasons for Decision: Canadian Federation for the Blind v. City of Victoria (2020)
[2] Analysis of the Characteristics and Number of Bicycle–Passenger Conflicts at Bus Stops for Improving Safety (Nanjing, China, 2019)
[3] Bus Stop Bypasses: Analysis of pedestrian and cyclist behaviour via video (London, UK, 2018)

found that only 40% of cyclists gave way to pedestrians during interactions at bus stop crossing points, even when crossings were marked.

- **Expectations:** Due to the emerging nature of this design treatment, transit passengers typically do not expect to encounter a bicycle path after exiting the vehicle and may not scan for conflicts before crossing. The London, UK based study[4] cited "pedestrian inattentiveness" as a common factor in near-miss events between pedestrians and cyclists. This allocation of blame onto the person walking does not account for people with disabilities, including cognitive impairments, vision loss or other conditions that could make it nearly impossible for a pedestrian to remain 'attentive' according to this definition.
- **Wayfinding:** Pedestrians who are blind are accustomed to having direct access to the sidewalk after exiting a transit vehicle; adding a bicycle path between the two may be disorienting and requires additional consideration for wayfinding measures such as directional tactile walking surface indicators (TWSI). A London, UK study[5] involving accompanied visits of people with disabilities to island platform transit stops found that people who are blind or partially sighted reported difficulties in understanding the layout and instructing their guide dog.

The challenges associated with this design have not gone unnoticed. In 2020, a judge at the BC Human Rights Tribunal ruled in favour of Oriano Belusic and the Canadian Federation of the Blind in that the City of Victoria discriminated against people who are blind by introducing floating bus stops along Pandora Avenue in Victoria. While the full implications of this ruling are still being understood, the result sent ripples across Canada, leading many transit agencies to further scrutinize the accessibility of their own bus stop designs. There is a growing interest among municipalities for guidance for island platform transit stops that addresses their accessibility challenges.

In the 2022 CNIB Clearing Our Path Summit, a discussion panel focusing on island platform transit stops garnered a significant amount of discussion, including concerns about the design from people with sight loss, and frustrations about the lack of lessons learned being shared at the national level. Following this discussion, the CNIB submitted a grant application to the National Active Transportation Infrastructure Fund in March 2022, and the requested funding was awarded to the CNIB in Summer 2022.

With the awarded grant, the CNIB hired WSP Canada Inc. to complete this study assessing how the design of the island platform transit stop impacts the experience, comfort, and safety of those living with sight loss. Specifically, this study aimed to answer the question: "How do the various design features of island platform transit stops affect the safety and security of transit passengers living with sight loss?" The question is answered through the combination of a literature review and field study.

The study was overseen by the CNIB and guided by an Advisory Committee comprised of municipal staff from across Canada.

[4] Ibid

[5] Bus Stop Bypasses: Accompanied visits of people with disabilities to Bus Stop Bypasses (London, UK, 2018)

Definitions

When discussing the design of island platform transit stops and their impact on people living with sight loss, it is important to have a standard set of terms that can be used throughout the report. For the purposes of this report, we use the terms “people who are blind”, “people who are partially sighted” and “people with sight loss” to refer to the range of people who report a disability related to their ability to see. It is important for practitioners to understand that people with sight loss have a wide variety of abilities and needs, and that there is no ‘one size fits all’ definition that reflects the lived experience of people with sight loss.

The terms used in this report are listed below for clarity and consistency.

Sight Loss Terminology

- **People who are completely blind:** typically use a cane or guide dog or both and have no ability to see.
- **People who are partially sighted:** typically people with central vision who can see some colour, contrast or movement.
- **People with peripheral vision:** people who have lost their central vision and rely on peripheral vision.
- **Shorelining:** a technique where people with sight loss use a cane, their feet, or partial vision to detect and follow the edge of a path of travel**.**
- **Echolocation:** a technique used by some people who are blind to understand their surroundings by listening to the echoes of sounds they make. This skill allows them to detect objects and navigate their environment more effectively.

Accessibility Elements

WSP’s literature review identified a number of accessibility elements related to the design of island platform bus stops:

- **Tactile Walking Surface Indicators (TWSI)** provide visual contrast and tactile feedback detectable underfoot to provide information to people with sight loss. Attention TWSI’s are used to indicate a hazard, while directional TWSI’s are used to indicate the directionality of a path of travel.
- **Channelization** involves the use of fencing or other vertical elements along one or both sides of the bicycle path to physically direct transit passengers to designated crossings.
- **Tactile delineation** involves the use of a cane-detectable treatment to separate facilities for walking and cycling, typically in the form of a grass or landscaped buffer or a curb.
- **Crosswalks** painted across the bicycle path in the form of zebra markings reinforce priority for pedestrians at crossings and can be seen by people with some vision due to their high contrast.
- **Accessible pedestrian signals (APS)** are signals with push buttons that emit audible tones to aid people with sight loss in navigating intersections. They emit a locator tone to help find the button as well as a crossing tone to indicate when the crossing is active.

3. Background Review

To inform the development of recommendations for island platform transit stop planning and design, it is helpful to first understand the current state of understanding around these installations as well as the existing research into how they operate. Guided by these objectives, this review summarizes the existing available literature with a focus on:

1. What types of challenges are being experienced by people with vision loss?
2. What design guidance is currently available?
3. What consistencies, discrepancies, and gaps exist in the current design guidance?
4. What empirical studies have been completed on island platform transit stops?
5. What is currently known about the behaviour of cyclists and pedestrians at island platform transit stops, and the factors that influence this?

To respond to these questions, this review summarizes the findings of the widely publicized BC Human Rights Tribunal case in which island platform bus stops were central to the complaint and the subsequent finding of violation. Second, a review of recently published design guidance is conducted to identify the current state of design practice. Third, available academic studies are reviewed to summarize the experience of island platform bus stops in operation. Finally, this literature review presents a series of conclusions and proposed design solutions to address key problems for people living with sight loss, which has been further refined at subsequent stages of this study through field research, dialogue and consultation with key stakeholders.

BC Human Rights Tribunal

In 2020, a judge at the BC Human Rights Tribunal ruled in favour of Oriano Belusic and the Canadian Federation of the Blind, finding that the City of Victoria had discriminated against people who are blind by introducing floating bus stops along Pandora Avenue in Victoria, one of which is shown in **Figure 3**. The ruling served to demonstrate the care and attention that must be paid when designing new infrastructure, leading many municipalities and transit agencies to integrate a stronger accessibility lens when designing new places where people on bikes and people walking or wheeling interact.

Figure *6*: Island platform bus stop on Pandora Avenue in Victoria, BC (photo from 2018 prior to Human Rights Tribunal ruling)

In the judge's reasons for decision, published November 13, 2020, the key design challenge of the bus stop in question was that people with vision loss are unable to see an approaching cyclist on the Pandora Bikeway, and that ambient urban noise from the street eliminates people's ability to hear the approach of a bicycle.

In their review of interventions presented to the court, the judge commented:

- Moving the bikeway to the other side of the street, or removing the floating island were not recommended as they would cause undue hardship for the City (in the case of the former) and create a significant safety hazard for cyclists (in the case of the latter).
- The installation of an audible flashing yellow beacon was prescribed by the court and was said to provide reasonable accommodation to the issue but that may no longer be sufficient in future if better solutions arise.
- Other solutions raised including under/overpass and crossing guards were deemed to be not practical.
- Rumblestick technology, which could provide an audible warning that a cyclist has stopped, was not available technology at the time but may be a reasonable accommodation when available.

In short, the Tribunal ruling provided suggestions for how existing designs could be retrofitted to provide reasonable accommodation for people living with vision loss but stopped short of making prescriptive recommendations about design features that could improve the operation of floating island platform stops for all users. It is this gap that this project aims to fill, providing recommendations for how user conflict can be mitigated through design in these important infrastructure improvements.

Existing Design Guidance

WSP reviewed design guidance for island platform bus stops from four manuals representing the latest best practice in facility design: three guides from Canada and one from the United States. The design guides reviewed were:

- Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (2017), Section 5.7.4 Bikeway Facilities at Transit Stops
- Ontario Traffic Manual (OTM) Book 18 (2021): Cycling Facilities, Section 7.1.1 Island Boarding Transit Stop
- British Columbia Active Transportation Design Guide (2019): Section H.1 Multi-Modal Integration
- Alameda and Contra Costa (AC) Transit Multimodal Corridor Guidelines (2018)

The key findings from the comparison are grouped by topic and discussed below.

Naming

A comparison of guidance is provided in *Table 1*. The nomenclature used to describe this design varies significantly between jurisdictions.

Table *1*: Comparison of name used to describe island platform transit stops

	Transportation Association of Canada (TAC)	**Ontario Traffic Manual (OTM)**	**British Columbia (BC)**	**Alameda and Contra Costa (AC)**
Name used to describe island platform transit stops	Bicycle bypass at transit stop	Island boarding transit stop	Floating transit stop	Separated bikeway between the curb and a general traffic lane

Platform Dimensions

A comparison of guidance is provided in *Table 2*. All guides specify a minimum platform width of 2.4-2.5m. While TAC does not specify a preferred width, it does indicate that the island should be large enough in length and width to hold waiting riders and accommodate users of mobility devices. BC and AC prefer a 3.0m wide platform while OTM mentions that the platform should be wide enough to hold the anticipated volume of waiting passengers and that a 3.0 to 3.5m platform provides a more comfortable amount of space for passengers.

Table *2*: Comparison of platform dimensions

	TAC	OTM	BC	AC
Minimum platform width	2.5m	2.5m	2.5m	8’ (2.4m)
Preferred platform width	Not specified	3.0-3.5m	3.0m	10’ (3.0m)
Added considerations	‘Island should be large enough in length and width to hold waiting riders and accommodate users of mobility devices	3.0-3.5m provides a more comfortable amount of space for passengers		Wide enough such that furnishing elements should be at least one foot from the edge of the bike facility

Design of Bikeway Crossings

A comparison of guidance is provided in *Table 3*. All documents specify that pedestrians should be directed to cross the bikeway to reach the island platform at specific points and that priority should be given to pedestrians at these locations. BC and AC both prefer the use of two crossings to improve pedestrian flow. All guidelines recommend the use of signage facing cyclists to reinforce this priority, although the sign types are inconsistent. OTM, BC, and AC mention the importance of visually contrasting materials to distinguish the bicycle lane from the adjacent transit stop platform and sidewalk, while BC and AC suggest a green surface treatment optionally.

TAC, BC, and AC mention the importance of considering sightlines when placing pedestrian crossings. All guides mention the benefit of using railings or furniture to channelize pedestrians to use the designated crossings, while discouraging crossing outside of the designated crosswalks, to improve predictability.

Table 3: Comparison of bikeway crossing designs

	TAC	OTM	BC	AC
Number of crossings	One very wide crossing	One	At least two are preferred	Two
Markings for crossing	Clearly mark the crossing with pavement treatments	Painted crosswalk and a yield line facing people riding bikes	Crosswalks with optional yield line in advance of crossing	Designated crosswalks with the use of yield markings
Signage for crossing	Signage recommended but type not specified	"Bicycles Yield to Pedestrians" sign (Ra-16 OTM) should be placed to face cyclists.	Add "Yield to Pedestrians" sign (MUTCDC RB-39) for people cycling approaching the floating transit stop	Optional "Bike Yield to Pedestrians" (MUTCD R9-6) sign
Bicycle facility distinction		Bicycle lane surface should visually contrast from adjacent transit stop and sidewalk	Bicycle lane surface should visually contrast from adjacent transit stop and sidewalk. Optional green pavement markings to create additional contrast.	Consistent use of green coloured pavement to delineate bicycle zone or use of different coloured materials.
Sightlines	Improve sightlines near the stop		Locate crosswalks to provide clear sightlines	Locate crosswalks to maximize visibility
Channelization	Consider railings to channelize the pedestrian crossing and a raised crossing for cyclists to slow users on approach.	Railings or other landscaping may be placed to channel pedestrians across the cycling facility.	Amenities such as a shelter or bench can be sited between the two crossings to direct pedestrians to the preferred crossing locations.	Optional lean rails deter transit passengers from crossing the bicycle facility in non-designated spots.

Placement of Shelters

A comparison of guidance is provided in *Table 4*. All guidelines prefer that shelters be located on the island platform itself. OTM and AC require a minimum 0.3m offset between the edge of the bikeway and any shelter (BC requires 0.5m), and BC and OTM requires a minimum clear width of 1.5m along the roadside edge of the platform for circulation (AC requires 1.2m min). OTM notes that on islands less than 3.0m wide it may be preferrable to place the shelter adjacent to the sidewalk rather than on the island.

Table 4: Comparison of shelter placement

	TAC	OTM	BC	AC
Placement of shelters	Placed on the island.	Placed on the island preferred. On islands less than 3.0m wide, may be preferrable to place shelter off the island	Placed on the island, between the two crossings	Optional bus shelter on island, between the two crossings
Clear widths		1.5m clear width at front of boarding island, 0.5m (min 0.3m) clear width adjacent to bike lane	1.5m clear width at front of boarding island, 0.5m clear width adjacent to bike lane	4’ (1.2m) min clear width at front of boarding island, 1’ (0.3m) clear width adjacent to bike lane

Bicycle Traffic Calming Suggestions

A comparison of guidance is provided in *Table 5*. TAC suggests a raised crossing to slow approaching cyclists. OTM suggests that a sharper taper bending around the island will encourage cyclists to slow on the approach. BC suggests physically narrowing the bicycle facility to as low as 1.5m at locations where people might be cycling at high speeds to encourage slowing down.

Table *5*: Comparison of bicycle traffic calming strategies

	TAC	OTM	BC	AC
Bicycle traffic calming suggestions	Raised crossing	Sharper bikeway taper (1:3)	Narrow bike lane width to min 1.5m	

Provisions for People with Sight Loss

A comparison of guidance is provided in *Table 6*. TAC does not mention any specific design provisions for people with sight loss. AC, BC, and OTM all require the use of tactile walking surface indicators (TWSI) at designated crossings of cycle tracks.

OTM, BC, and AC provide differing guidance on the use of tactile guidance surfaces; OTM recommends they be placed on the sidewalk to guide users to the crossing, BC recommends they be placed on the platform to guide users to the front door, and AC recommends placing them along the bike lane to guide users to the designated crossing.

OTM and BC also speak to delineation between the sidewalk and cycling facility at bus stops. OTM recommends a detectable and colour-contrasting delineator, while BC recommends a detectable edge.

Table *6*: Comparison of provisions for people with sight loss

	TAC	OTM	BC	AC
Detectable warning surface		Placed on each side of crossing	Placed on each side of crossing	Placed on each side of crossing
Tactile directional indicator		A tactile directional indicator TWSI oriented perpendicular to the pedestrian route on the sidewalk should indicate the crossing location	Longitudinal tactile warning strips can be used to direct passengers to the front door of the bus	Detectable longitudinal panels can be embedded along the bike lane to guide visually impaired pedestrians to the designated bike lane crossing
Delineation between platform/sidewalk and bicycle facility		Where the cycle track and sidewalk are at the same elevation and abutting one another, a detectable and colour-contrasting delineator should separate the cycle track and sidewalk	A detectable edge treatment should be applied along the length of the sidewalk grade bicycle lane that bypasses the floating transit stop to provide tactile warning for people who are visually impaired	

Conclusions

There are significant inconsistencies across existing design guidance documents. Going forward, standardizing elements of island platform transit stops could significantly improve their legibility. Specific areas where a consistent design approach is still needed include:

- The naming convention for this type of bus stop
- The number and placement of pedestrian crossings, and the design of signage instructing cyclists to yield to pedestrians at these crossings
- Guidance on measures to reduce bicycle travel speeds at the yield area
- Design measures to assist people with sight loss in orienting themselves

Empirical Studies

Design guidelines are based on best practice and sound engineering judgement, but when designs are deployed in the real-world people sometimes respond in unpredictable ways. Academic studies can be used to better understand what features of a design are working as planned, and what may need to be revised. To better inform this project's methodology and outcomes, it is important to have a strong understanding of similar research projects evaluating these designs. This section summarizes academic studies of operational island platform bus stops in Nanjing, China and London, UK.

London, United Kingdom

Island platform transit stops are referred to as "Bus Stop Bypasses" in the UK and have been implemented at several locations in London along high-volume bikeways, providing an opportunity to study their performance in environments with high levels of cycling and pedestrian activity. In 2018, Transport for London commissioned a study of their performance via the Transport Research Laboratory. The study consisted of several parts, two of which were reviewed by the project team:

- Published Project Report PPR853: Accompanied visits of people with disabilities to Bus Stop Bypasses
- Published Project Report PPR854: Analysis of Pedestrian and Cyclist Behaviour via Video
- Published Project Report PPR855: Surveys of Pedestrians and Cyclists

In **TRL Report PPR853**, researchers visited a series of Bus Stop Bypasses (BSB's) with people from four disability groups, including 18 blind or partially sighted participants. The study sought to understand how people with disabilities experienced BSB's compared to traditional bus stops in terms of finding the bus stop, boarding the bus, and alighting from the bus. Participants were asked to report their comfort and perceived safety, difficulties that arose, and suggestions for improvements.

The study reported that people who are blind or partially sighted were the most impacted group by the design and had difficulties with understanding the layout, not being able to instruct their assistance dog, and having trouble detecting oncoming cyclists.

The study compared users' comfort at BSB's with zebra crossings (which included TWSI's) to BSB's with uncontrolled crossings (which had no TWSI) and found stops with zebra crossings were marginally preferred by participants, and that the TWSI with the zebra crossings was useful in helping blind and partially sighted participants locate the crossing.

The study's suggestions for improvements for the benefit of those who are blind or partially sighted included:

- Adding a guidance TWSI across the sidewalk to guide pedestrians to the bike path crossing
- Audible announcements on buses that those exiting will be doing so across a cycle track (which could be enacted for a limited amount of time when a new stop is created)
- Ensuring that design guidance is consistent in the layout of BSB including the design of the crossing, bus pole, and shelter
- Avoiding clutter in the area of the crossings which could cause blind and partially sighted people to miss the crossing

Finally, the study indicated that cyclists not stopping for disabled people is a key issue and that "it is clear from comments that many disabled people have a poor perception of cyclist behaviour which

would limit their feelings of safety (and by extension may reduce their propensity to travel). Separate work might be undertaken to improve this".

The report for the study included the study's methodology and questionnaire used. This methodology was referenced when developing the research methodology for this project.

TRL Reports PPR854 and PPR855 focused on understanding the general interactions between pedestrians and cyclists at BSB's in London. PPR854 included video analysis of interactions, while PPR855 included surveys of users.

While the study found that interactions are typically very minor and the majority of cyclists passed through the BSB without interacting with pedestrians, the study found the more serious interactions (of which a limited sample of 30 were observed) to be largely due to pedestrian inattentiveness, local features constraining movements or visibility, and crowding at the stops. Inattentiveness can be further deconstructed as pedestrians being unaware of the threat of oncoming cyclists and not taking appropriate precautions. In the context of this project, it is important to distinguish that for a person with sight loss, being unaware of an oncoming cyclist, especially in a noisy urban environment, will be a default condition. The goal of this study, therefore, is to develop a stronger understanding of how people with sight loss can feel more comfortable at these locations.

Other study findings included:

- Cyclist speed was not impacted by the presence of a zebra crossing.
- Sites with zebra crossings had a small but statistically significant increase in the proportion of cyclists giving way to pedestrians.
- Sites with zebra crossings had a higher rate of pedestrians using the designated crossing(s)
- Cyclists' average speed at the BSB does not appear to be correlated to a higher level of interactions with pedestrians.
- The presence of Belisha beacons (an amber-coloured globe lamp atop a tall black and white striped pole, commonly used to mark pedestrian crossings of roads in the UK), increased the likelihood of people crossing in the designated area, although about half of bus passengers continued to cross outside of the designated area.
- When interactions between pedestrian and cyclists occurred, at sites with Zebra crossings, pedestrians gave way to cyclists 53% of the time.

Nanjing, China

Two separate studies were conducted at island platform transit stops in Nanjing, China using video analysis:

- Analysis of the Characteristics and Number of Bicycle–Passenger Conflicts at Bus Stops for Improving Safety (Published in MDPI Sustainability journal, 2019)
- Observational study on multi-type conflicts between passengers and cyclists at the bus stop – A case study in Nanjing (Published in Travel Behaviour and Society journal, 2022)

Key findings from these studies include:

- Bicycle-passenger conflicts at island platform bus stops were most greatly influenced by bicycle volume, bus passenger volume, and passenger crossing time (which is defined as the duration of

time in given interval that at least one pedestrian was crossing the cycle track, which is influenced by the frequency of buses servicing a particular stop).
- The presence of a large number of parked shared bicycles at the bus stop influenced where passengers waited for the bus and led to more conflicts with cyclists.
- There is a significant need to alert pedestrians and cyclists to each others' presence, which can be improved by using transparent street furniture and removing large obstructions like trees or bushes.
- The route choice of passengers for accessing the platform has a significant influence on safety risk. This can be improved by clearly marking crossings and using channelization to guide pedestrians to these crossings.

Conclusions of Literature Review

Based on the review of the tribunal ruling, existing design guidance, and empirical studies, the following conclusions can be drawn:

- The key challenges that people with sight loss face at island platform transit stops include not being able to detect cyclists approaching, difficulty orienting themselves and navigating to and from the raised platform.
- There are notable inconsistencies across existing design guidance documents, particularly in relation to the design of crossings and design provisions for people with sight loss.
- When interactions at island platform bus stops occur, cyclists and sighted pedestrians most often use eye contact to negotiate which user will give way, rather than a strict adherence to pedestrian priority. When conflicts do occur, many are attributed by researchers to "pedestrian inattentiveness". While this may be an acceptable explanation for sighted users, those living with sight loss are more challenged to negotiate in this way and cyclists may not register this. In turn, people with sight loss are more likely to have a poor perception of cyclist behaviour at crossings and in some cases have led people to fear these crossings or avoid them altogether.
- Based on the evidence of human behaviours, it is likely that a rigid, compliance-based approach to establishing pedestrian priority at crossings will likely not be adhered to by most users and will likely not address the disproportionate impacts felt by people living with sight loss.
- There is clear evidence that marked crosswalks across the bicycle path improve user awareness, predictability, and wayfinding at island platform bus stops. Channelization of pedestrians using furniture or railings as well as reducing clutter and improving sightlines can help further improve safety and predictability.
- The likelihood and frequency of interactions between pedestrians and cyclists at island platform transit stops increases with higher bike volumes, passenger volumes and with greater frequency of buses servicing the stop. This suggests that there may be a benefit to establishing different design criteria for bus stops at high-volume locations.
- While design guidance offers suggestions for calming bicycle speeds in advance of island platform transit stops, the London study did not find cyclist speed to be correlated to a higher rate of interaction with pedestrians. Therefore, an exclusive focus on calming bicycle speeds may not be enough to improve safety.
- There was no mention in the literature of the use of audio-based solutions to improving navigation at these crossings; therefore, this topic remains a gap in the collective knowledge.

Key Challenges and Potential Solutions

The key challenges for people living with sight loss as described above are listed in *Table 7* below, along with potential design solutions mentioned in the literature. Later in this report, this table is expanded based on the findings of the field research.

Table *7*: Key challenges with island platform transit stops and potential design solutions based on the literature review

Challenge for people who are blind	Potential Design Solutions (based on literature review)
Orienting themselves to the stop layout / navigating to and from the island platform	Establish a consistent nomenclature for this stop layout to improve ease of communication. Painted crosswalk with warning tactile surface. Directional tactile surface extending from the crossing to the back of sidewalk and from the crossing to the bus stop pole. Channelize crossings using furniture, railings, etc. Audible announcements for alighting passengers at stops with island platforms. Establish a consistent design approach, including placement of key elements like stop pole, crossing(s), and shelter.
Detecting approaching cyclists and confirming that an approaching cyclist has stopped	Pavement markings oriented to pedestrians encouraging looking left and/or right (applicable to people with low vision). Auditory or tactile feedback that a cyclist has stopped using yet-undeveloped technology.
Negotiating right of way with approaching cyclists	Painted crosswalk with signage to establish priority. Remove sightline obstructions and clutter. Flashing beacons or poles to highlight crossing to cyclists. Raised crossings, sharp tapers, or narrowed bike path to slow cyclists and increase awareness. Restricting use of this design when highly complex conditions are present (e.g., steep grades, two-way cycle tracks, downtown environment, transit station, etc.)

The potential solutions discussed informed the development of WSP's research methodology, which focuses on testing key variables and design features.

4. Methodology

This section describes how test sites were identified and evaluated, the research methods used, the schedule of testing, and limitations of the research.

Assessment Criteria

Based on the literature review, the following assessment criteria were developed to evaluate the accessibility and usability of existing island platform transit stops. These criteria cover five main categories: road factors, bicycle facilities, crosswalk elements, island platform elements and contextual factors. Each category is discussed in further detail in the following subsections.

Road Factors

Road design factors include the road characteristics in the bicycle facility's shared environment. These include the road classification (arterial, collector, etc.), grade and horizontal curves which directly influence the geometry of the bicycle facility. Traffic control, road signs and traffic calming measures close to the stop can impact cyclists as they present an additional mental load that can cause distractions. Traffic volumes and speeds also indicate the level of the ambient noise in the environment for the crossing of people with sight loss.

Table 8: Assessment Criteria for the Road Factors category

Road Factors	Definition	Significance
Road classification	Local/collector/arterial road	Busier roads tend to have higher ambient noise
Road speed	Road posted speed in kph	Higher speeds can affect the noise and the overall perception of safety for all road users
Traffic control	Traffic light/ Stop controlled/etc. if stop is at an intersection	Higher traffic control near the stop decreases the speeds for all road users
Signs oriented to motorists	Nearby road signs in the cyclist's field of vision	Signs in the cyclist's field of vision can cause a visual overload and become a distraction
Road grade	Road grade percentage (i.e. uphill, downhill)	Downhill grades result in higher bicycle speeds
Horizontal curves	If any	Horizontal curves can affect sightlines
Traffic calming measures	If any and if stop is at an intersection	Some measures can have direct influence on cyclists by adjusting their trajectory

Bicycle Facilities

The design of the bicycle facility affects both cyclists and pedestrians. Bidirectional bicycle facilities pose a greater threat to pedestrians crossing as they have a longer crossing distance and require attention to

incoming cyclists from both directions. This is especially problematic in the case of individuals living with sight loss.

Elements like signage, pavement markings, sightline obstructions and calming measures affect the cyclist's behaviour and the negotiation of the right of way at the crossing.

Table 9: Assessment Criteria for the Bicycle Facilities category

Bicycle Facilities	Definition	Significance
Directionality	One-way or two-way cycling facility	Bidirectional facilities require attention to incoming cyclists from both directions
Lane width		Longer width means longer travelled distance by crossing passengers with sight loss, thus increased exposure
Elevation	Street, intermediate or sidewalk level	Varied elevation creates a psychological distinction between the various elements at the stop with a curb
Pavement markings	Green paint, Bicycle stencils, shark teeth, "slow", etc.	Influences the communication of the right of way at the crossing
Signage oriented to cyclists	Bicycle signal, Yield to pedestrians, Yield to bikes, Pedestrian crossing, RRFB, etc.	Influences the communication of the right of way at the crossing
Sightline obstructions	If any	Affects the level of attention of the cyclists to crossing pedestrians
Bicycle speed calming measures	If any	Influences the cyclist's behavior at the stop

Crosswalk Elements

The crosswalk elements that are considered include elevation, pavement markings, surface type, tactile surface warning and directional indicators. These elements are essential to warn people with sight loss, especially those who are alighting buses at the stops.

Table 10: Assessment Criteria for the Crosswalk Elements category

Crosswalk Elements	Definition	Significance
Number of crosswalks		Indicates the number of points of conflict
Position of crosswalk relative to the bus	Front and/or rear	Could be of influence on the perception of safety for crossing pedestrians
Elevation	Street, intermediate or sidewalk level	Varied elevation creates a distinct line between the various elements at the stop
Pavement markings	Zebra crossing, etc.	Influences the communication of the right of way at the crossing
Surface type	Asphalt, concrete, etc.	Could be of influence on the perception of safety for crossing pedestrians
Tactile surface warning	Yellow TWSIs, Grey TWSIs, none, etc.	Warns crossing pedestrians with sight loss
Tactile directional indicator	If any	Guides crossing pedestrians with sight loss

Island Platform Elements

The island platform's length and width as well as its furniture, shelter, and delineation are important elements. They dictate the level of comfort of the crossing pedestrians and their preference while waiting for the bus (on the island or the sidewalk).

Table 11: Assessment Criteria for the Island Platform Elements category

Island Platform Elements	Definition	Significance
Platform width	Dimension of the platform measured perpendicular to the road	Dictates the capacity for the boarding passengers to wait on the island
Platform length	Dimension of the platform measured parallel to the road	Dictates the capacity for the boarding passengers to wait on the island
Street furniture	Benches, garbage bin, bikeshare hub, etc.	Dictates the waiting location for the boarding passengers
Placement of shelter	If any	Dictates the waiting location for the boarding passengers
Delineation	Delineation between platforms/sidewalk and bicycle facility using delineators or fencing	Could be of influence on the perception of safety for crossing pedestrians
Landscaping	Taper on either side, if any	Influences the behaviour of the cyclists while travelling through the stop

Contextual Factors

Other factors such as land use, pedestrian and bike volumes are indicative of the behavior at the island platform transit stops.

Table 12: Assessment criteria for the Category of contextual Factors

Contextual Factors	Definition	Significance
Land use		Land use influences the environment and the ambient noise in the area
Pedestrian volumes	Low/medium/high	Affects the capacity for the island and the negotiating right of way
Bicycle volumes	Low/medium/high	Affects the negotiating right of way
Bicycle speeds		Affects the safety of the crossing passenger and the ability of the cyclists to come to a stop
Bus frequency		Affects the need for additional elements in the facility to accommodate for the passenger demand
Placement of the stop	Near side/Far side/midblock	Could influence the behaviour of the cyclists while approaching the stop

Site Selection

This section details the process used to identify test site candidates, evaluate each site's suitability for testing, and develop the final recommended list.

Initial Long-List

WSP developed an initial long list of test site options using input from the project Advisory Committee as well as WSP's knowledge of island platform bus stops implemented across Canada. This list includes 25 sites spanning 8 municipalities in 5 provinces. At this stage, the only screening applied was whether each stop constituted an "island platform bus stop", where there is a clear passenger waiting area located between a cycling facility and the roadway curb. The initial long list is shown in *Table 13*.

Table *13*: Initial long list of test sites

Province	City	Street / Intersection
Alberta	Calgary	Bowness Rd NW / Home Rd NW
BC	Burnaby	Lougheed Hwy at Gaglardi Wy
BC	Burnaby	Gilmore Ave / Halifax St
BC	Vancouver	Pacific St / Richards St
BC	Vancouver	Beach Ave / Cardero St
Manitoba	Winnipeg	Empress St / St Matthews Ave
Manitoba	Winnipeg	McDermot Ave / Frances St
Manitoba	Winnipeg	1062 Rte 42
Manitoba	Winnipeg	1774 Rte 42
Ontario	London	Dundas St / Colborne St
Ontario	Ottawa	Prince of Wales Dr / Dynes Rd
Ontario	Ottawa	Bayview A (O-Train station)
Ontario	Ottawa	Heron Rd / Kaladar Ave
Ontario	Ottawa	Heron Rd / Gilles St
Ontario	Ottawa	Pimisi A (O-Train)
Ontario	Ottawa	Fisher Ave / Dynes Rd
Ontario	Toronto	Kipling Ave / Kidron Valley Dr
Ontario	Toronto	Murray Ross Pkwy / Evelyn Wiggins Dr
Ontario	Toronto	Queens Quay / Yonge St
Ontario	Toronto	Queens Quay / Lower Simcoe St
Quebec	Montreal	Berri / Sauvé
Quebec	Montreal	Rue Lajeunesse / Rue Villeray
Quebec	Montreal	De la Roche / Christophe-Colomb
Quebec	Montreal	St-Denis / Mont-Royal
Quebec	Montreal	St-Denis / Belanger

Screened Out Locations

Next, each site was visually reviewed using Google Maps and basic data was collected including bus service frequency (frequencies of 30 mins or greater were screened out), likely volume of pedestrians and cyclists, integration with an adjacent intersection, and presence of tactile features. Based on this screening, 13 sites were screened out, with reasons stated in *Table 14*.

Table *14*: Screened out test site candidates

Province	City	Street / Intersection	Reasons for Screening Out
BC	Burnaby	Lougheed Hwy at Gaglardi Wy	Low pedestrian/bicycle volumes likely
Manitoba	Winnipeg	Empress St / St Matthews Ave	Low bus frequency
Ontario	Ottawa	Prince of Wales Dr / Dynes Rd	Low pedestrian/bicycle volumes likely
Ontario	Ottawa	Bayview A (O-Train station)	Atypical stop layout
Ontario	Ottawa	Heron Rd / Kaladar Ave	Low pedestrian/bicycle volumes likely
Ontario	Ottawa	Heron Rd / Gilles St	Low pedestrian/bicycle volumes likely
Ontario	Ottawa	Fisher Ave / Dynes Rd	Low pedestrian/bicycle volumes likely
Ontario	Toronto	Kipling Ave / Kidron Valley Dr	Atypical stop layout (mixing zone)
Ontario	Toronto	Queens Quay / Yonge St	Atypical stop layout (mixing zone)
Quebec	Montreal	Berri / Sauvé	Low bus frequency
Quebec	Montreal	Rue Lajeunesse / Rue Villeray	Low bus frequency
Quebec	Montreal	St-Denis / Mont-Royal	Low bus frequency, stop layout does not match latest City standards
Quebec	Montreal	St-Denis / Belanger	Low bus frequency, stop layout does not match latest City standards

Final Test Sites

The remaining 12 sites were further assessed with consideration for:

- Whether the stop is adjacent to a similar island platform stop along the same bus route, allowing a more efficient testing methodology (board bus at island platform, travel to next stop, alight bus at island platform)
- Whether the CNIB has a strong presence in the municipality to aid in recruiting participants
- Whether the stop includes “potential solutions” listed in the background review including:
    - attention TWSI
    - directional TWSI
    - channelization/fencing
    - painted crosswalks
    - sightline obstructions (or lack thereof)
    - bicycle speed calming measures
    - crossing control measures (flashing beacons, signal)

The final test sites selected for field testing are listed in *Table 15*. Photos of each site from Google Street View along with alt text are provided below. A comparison of the features of each of the sites is presented in *Table 3-16*.

Table *15*: Final sites for testing

#	Municipality	Site	Rationale
1	London, ON	Dundas St / Colborne St	Dense urban environment with high volume of pedestrians, high bus frequency, includes channelization and attention TWSI, stop is integrated with a protected intersection (but pedestrian crossing is still yield-controlled)
2	Winnipeg, MB	McDermot Ave / Frances St	Includes colour-contrasting elements, attention and directional TWSI, detectable separation of bike lane and sidewalk, good sightlines, design repeats along the corridor
3	Montreal	De la Roche / Christophe-Colomb*	Dense urban environment, Reflects Montreal's latest standard, attention TWSI along full platform length, detectable separation of bike lane and sidewalk, narrowed cycle track for speed calming
4	Calgary, AB	Bowness Rd NW / Home Rd NW	Attention TWSI but no crosswalk markings, sightline issues from shelter, no detectable separation of cycle track and sidewalk, design repeats along the corridor
5	Vancouver, BC	Beach Ave / Cardero St	Integrated with signalized pedestrian crossing at intersection, good delineation between cycle track and sidewalk and platform, high-volume bike route, design repeats along the corridor

*As of the writing of this report, the latest Google Street View imagery is not recent enough to show the latest Montreal installation. A photo is included below.

Photos of each site from Google Street View along with alt text are provided below.

Figure *7*: Dundas St / Colborne St in London, Ontario

Figure *8*: McDermot Ave / Frances St, Winnipeg, Manitoba

Figure *9*: De la Roche / Christophe-Colomb, Montreal, Quebec (photo provided by City of Montreal)

Figure *10*: Bowness Rd NW / Home Rd NW, Calgary, AB

Figure *11*: Beach Ave / Cardero St, Vancouver, BC

Table 3-16: Site design elements compared

	London	Winnipeg	Montreal	Vancouver	Calgary
Method of Control for pedestrian-bicycle conflict	Yield controlled	Yield controlled	Yield controlled	Signalized (pedestrian button at the sidewalk)	Yield controlled
Directionality of bicycle facility	1 way	1 way	1 way	2 ways	1 way
Elevation of bicycle facility	Sidewalk level	Street level on approach, ramping up at bus stop	Street level on approach, ramping up at bus stop	Street level, with sidewalk ramping down to street at crossings	Sidewalk level
Sidewalk/bicycle separation treatment	Unit pavers	Grass boulevard	Attention TWSI	Full-height curb	Ribbing
Signage directed at cyclists	Pedestrian crossing, stop for pedestrians	None	None	None	None
Pavement markings directed at cyclists	White zebra markings	Bicycle “sharrow” markings	Yellow zebra markings	Stop bar and intersection crosswalk marking	None
Bicycle speed calming techniques	None	Lane narrows and ramps up	Lane narrows and ramps up	None	None
Crosswalk elevation	Sidewalk level	Street level	Sidewalk level	Street level	Sidewalk level
Number of crosswalks	2	1	2 (continuous TWSI crossing along full length)	1	3 (TWSI only, no painted crosswalks)

Crosswalk surface and pavement markings	Asphalt, Zebra markings, Attention TWSI	Concrete, Attention and direction TWSI	Asphalt, zebra markings (yellow), Attention TWSI	Asphalt, Attention TWSI	Asphalt, Attention TWSI
Street/ bus stop furniture	Bus flag, bus shelter, bike rack, bins, and bench on platform	Bus flag on platform	Bus flag on sidewalk	Bus flag on platform	Bus flag, bus shelter, bin on platform, bench on the sidewalk

Research Design

The methodology used draws from the experience of other similar studies like the London Study and the experience of similar projects by WSP in New Zealand and Australia (described in previous memos submitted as part of this project). The selected experimental method was accompanied walk-throughs using a combination of a "think-aloud" technique and informal interview questions for the 5 sites, covering the various design elements for island platform bus stops. The "think-aloud" technique involves a asking a series of questions to participants to narrate their thought process as they carry out an activity. Participants respond to them by sharing what cues they are looking for, how they respond to them, and how it eventually helps them to complete the task at hand. This type of question helps capture the participant's reaction to the various design elements and environmental stimulus as they go through the bus stops.

Participants were recruited by CNIB and compensated for their time. They were scheduled for timeslots of one hour within each day, with a target of up to 8 participants at each site. A route was designed for each site that involved a meeting point at a nearby café to brief the participants of what to expect and to equip them with a camera and harness to capture video footage.

The walk-through for each site was designed to include boarding at an island platform bus stop, travelling on the bus for 1-2 stops, and then alighting at another island platform bus stop, after which participants researchers and participants travelled together back to the meeting point. For sites where a similarly designed bus stop was not available downstream for testing alighting, a loop was designed to ensure that the participants could alight at the same bus stop. Participants were asked about their experience getting on and getting off the bus at the island platform stop, and how that experience varied compared to a typical bus stop. In the case of sites that are along a corridor of similarly designed stops, participants alighted at a nearby stop of an almost identical design.

The full list of questions asked during the field testing is provided as **Appendix A**.

Prior to the site testing, WSP field staff were trained to follow a standard procedure and methodology, including sensitivity training for working with people with sight loss. Following the training, a meeting was set with each staff member in the various locations to discuss any concerns or questions with regards to the visit overall or the questionnaire. Due to the broad geography of the five test sites, a different WSP field staff was assigned to lead the testing for each location, and each location involved different participants.

As part of the staff training, staff were instructed only to guide participants when away from the study sites, if specifically requested by the participant, or if it was considered that the participants' safety was compromised. An example of an intervention was an instance where the safety of both the staff and participant were at risk was when alighting the bus at the front where there was a passenger exhibiting dangerous behavior with a hard object. To minimize risk, the staff rerouted the participant by alighting using the second bus door. Interventions were also taken when participants walked on the bicycle path unknowingly and were brought back to the sidewalk by the staff member. Lastly, staff intervened when the participants walked past the bus stops and brought them back to the vicinity of the bus stops. Any companions accompanying the participant were required to refrain from providing answers on behalf of the participant, however, the participants were encouraged to use their regular navigation techniques including using phone application (speaking GPS) or asking for directions.

Schedule

Field testing commenced early May 2023. Due to adverse weather and scheduling challenges, a second half-day of testing was arranged with three additional participants.

Table 3-17 - Field testing dates and number of participants

Location	Bus Stop	Date	Weather Conditions	Number of Participants
London, ON	**Dundas St / Colborne St**	May 2nd, 2023	Cloudy with drizzle	5
Winnipeg, MB	**McDermot Ave / Frances St**	May 18th, 2023	Cloudy with drizzle	4
Montreal, QC	**Rue Gilford / Christophe-Colomb**	May 18th, 2023	Partly Cloudy	5
Vancouver, BC	**Beach Ave / Cardero St**	May 25th, 2023	Sunny	6
Calgary, AB	**Bowness Rd NW / Home Rd NW, Calgary, AB**	June 1st, 2023 & June 16th, 2023	Cloudy with drizzle & Sunny	3 & 3

Limitations

The methodology had some limitations due to scope, schedule and budget constraints. The use of different testing staff and participants for each site introduced the potential for researcher and participant biases, though this was mitigated somewhat by standardizing the staff training and questionnaire. In addition, to standardize the results relative to each participant's experience, participants were asked to compare their experience of an island platform bus stop to that of navigating a typical bus stop.

Furthermore, the methodology included notable variances between the designs tested. Further studies should account for that using a larger dataset. Lastly, to isolate the effect of each design element, before and after studies of the same site would be the best approach to see the direct effect on the participants and the effectiveness of each recommended change.

5. Field Testing Results

The following section details the results of the field testing at the five test sites. Results are provided for each individual stage of the passenger journey:

1. Finding the Bus Stop
2. Orienting and Navigating to and from the Bus Stop
3. Interactions with Cyclists
4. Boarding and Alighting

London

The first site assessed was in the City of London, at the intersection of Dundas St / Colborne St, shown in **Figure 9**. London Transit bus routes 02 and 20 served this intersection bus stop.

The accessibility elements incorporated into the design include:

- ✓ Attention TWSI
- ✓ Channelization
- ✓ Crosswalk marking
- ✓ Accessible pedestrian signals (on platform)

Figure 12: London Site at Dundas St/ Colborne St

Overall, the key findings for this site include:

- Only one participant successfully located the bus stop, primarily relying on peripheral vision to identify changes in the green bike lane colour and the shelter.
- During boarding and alighting, the bus stopped ahead of the bus flag 10% of the time while staff were observing, at the bus flag 40% of the time and behind the flag 50% of the time.
- All participants expressed a preference for waiting on the platform for the bus.

Finding the Bus Stop

To determine the perceptions of safety and the ease of locating the bus stop, participants were asked to rate their level of safety and the difficulty of completing tasks at this bus stop compared to a typical stop. Using a scale ranging from "1" (Very Unsafe) to "5" (Very Safe) for safety, and "1" (Very Hard) to "5" (Very Easy) for task completion, the main findings revealed that 20% of participants found the

process of locating the stop challenging, 40% felt neutral, and 40% found it relatively easy. Participants who initially missed the bus stop were guided back to the location by staff, allowing them to provide helpful information about what could have improved their experience in locating the stop.

Table 4-1 provides the techniques employed, the challenges faced by participants, and their recommendations to enhance the bus stop finding experience at the London site from their answers to the think aloud and guided questions.

Table 4-1: Technique, challenges, and recommendations for finding the bus stop - London site

Technique	Used guide dog and instructed them to find stop Listened for the bus shelter (using echolocation) Used cane to sweep and tap new unfamiliar areas Used technology to assist Used visual cues to see the green bike lane using peripheral vision Detected both crosswalks visually using peripheral vision Usually ask strangers for direction and assistance Found sign on the sidewalk “yield for pedestrians” Looking for grass buffer along the back of the sidewalk
Challenges	Wide sidewalks provided too much lateral distance from the TWSI/bicycle path crossing for someone sweeping with their cane Unable to listen for the shelter using echolocation Had a hard time hearing the bikes Loud constant traffic Unfamiliar with the area and the city Didn’t know to look for the TWSI
Recommendations	Education and awareness on the design and elements to expect Bike lane marking along the platform such as green surface treatment TWSI extending along both sides of the bike lane (like a subway platform edge) Accessible pedestrian signal (APS) with audio message indicating how to navigate and that there is a platform that can be accessed by crossing the bike lane

Based on the above, the following conclusions can be made about finding the floating island platform bus stops:

- The wide sidewalks had a detrimental effect of finding the bus stop as it was too far from the bus shelter. Shelters are usually found using echolocation as it blocks the sound from traffic.
- The placement of the stop at the intersection with the pedestrian signal at the platform was confusing to many users because initially they walked past the bus stop to the other crossing of the intersection.

Orienting and Navigating to and from the Island Platform

Participants were asked about their experience navigating to and from the platform. During the study, cyclist presence was limited during the crossing to and from the platform.

The key findings are as follows:

- 20% of participants found it very easy to understand where to cross to the platform, 20% found it easy, and 60% remained neutral.
- In terms of safety perception, 60% of participants considered it safe or very safe to cross to the platform, while 40% maintained a neutral stance.
- Over time, participants became more familiar with the design, finding it easier to cross back to the sidewalk as they knew what to expect.
- Participants utilizing guide dogs found the fencing very helpful when crossing from the platform to the sidewalk, helping direct their dogs to cross at one of the designated bicycle path crossings. Crossing from the sidewalk to the platform, on the other hand, presented a challenge as the dogs often traversed to the middle of the bike lane and became stuck there, necessitating staff intervention.
- When crossing from the island platform to the sidewalk, the channelization proved effective in preventing participants from crossing in the middle of the bike lane as they made their way to the second crossing, located further from the shelter.

Table 4-5 presents the techniques employed by participants, the challenges they faced, and their recommendations, shedding light on navigating to and from the island platform at the London site from their answers to the think aloud and guided questions.

Table 4-2: Technique, challenges, and recommendations for navigating to and from the island platform – London Site

	Navigating to the island platform	**Navigating from the island platform**
Technique	Followed the TWSI to cross Listened for approaching cyclists Located the bike lane visually and crossed Instructed guide dog to cross Crossed from the crosswalk closest to the shelter (preferred by guide dog)	Easier now that there is context and familiarity with design Followed the TWSIs Listened for approaching cyclists Located the bike lane visually and crossed Instructed guide dog to cross
Challenges	Could not hear approaching cyclists No directional indicator of what direction should I cross the bike lane in Unable to identify the directionality of the bike lane Clutter at the platform, especially after crossing and moving to the bus shelter	Could not hear approaching cyclists Attention TWSI's size is too big that it made it seem like crossing an intersection
Recommendations	Wider attention TWSI to increase detectability at the sidewalk Some sort of audible indicators Directional indicator APS or Rectangular Rapid Flashing Beacon (RRFB) crossing control	Make cyclists more audible Use more colours Directional TWSI or arrow to help find the way back

Based on the findings above, the following conclusions can be made about improving the navigation on floating island platform bus stops:

- A directional indicator connecting to the attention TWSIs at each crossing supports navigation.
- Removing clutter to ensure a reasonable width for participants to walk around the platform is beneficial.
- Enhancing cyclists' audibility through basic mechanical sound-producing techniques or infrared technology would improve perceptions of safety among visually impaired users.

Interactions with Cyclists

The participants were asked about their experience navigating to and from the platform. For this site, specifically on this day, not many cyclists were observed during the time of crossing to the platform or back to the sidewalk.

The key findings are as follows:

- 80% of participants considered it safe or very safe to cross from the platform, while 20% found it unsafe. The participant that found it unsafe was completely blind and found the traffic noise hindering their ability to detect approaching cyclists.
- Participants using canes or guide dogs expressed feeling safe while crossing bike lanes, as they were more conspicuous to cyclists and often granted priority to cross.
- One participant highlighted that even with partial sight abilities to follow visual cues, using a cane in new locations facilitated easier crossings, as it increased their conspicuity to cyclists. Nevertheless, participants who relied primarily on audible cues encountered challenges in detecting cyclists, particularly in this location due to the prevailing traffic noise.

Boarding and Alighting

Through the use of the think-aloud technique and subsequent guiding questions, researchers explored participants' experiences during boarding and alighting at the bus stop. Techniques used during boarding included waiting at the bus shelter, listening for the bus approach and lowering, verifying the audio announcement, stepping onto the bus from the platform, and following the familiar process observed at typical bus stops. Notably, no challenges were reported during boarding. However, some challenges emerged during alighting, including passengers standing close to the door, potentially obstructing the front entrance.

Table 4-3 highlights the techniques utilized by participants, the challenges faced, and their recommendations regarding boarding and alighting at the London site.

Table 4-3: Technique, challenges, and recommendations for boarding and alighting the bus stop – London Site

	Boarding at the island platform	**Alighting at the island platform**
Technique	Waited at the bus shelter Listen for the bus approaching Listen for the bus lowering Hear the audio announcement to make sure this is the right bus to board Stepping onto the bus from the platform Similar to boarding at a typical bus stop Given priority by other passengers	Felt the gap between bus door and curb Similar to getting off at a typical bus stop
Challenges	N/A	Passengers standing on the platform close to the door to get on Passengers on the bus blocking the front door
Recommendations	N/A	Indication of the edge of the platform by using yellow coloured curb

In conclusion, based on our findings, boarding and alighting at this platform closely mirrored the experience at typical bus stops, with no significant issues reported by participants.

Winnipeg

The site assessed in Winnipeg was McDermot Ave / Frances St, shown in **Figure 10**. For this site, participants boarded at McDermot Ave / Frances St and alighted at McDermot Ave / Hargrave St. Both sites share a similar design.

The accessibility elements incorporated into the design include:

- ✓ Attention TWSI
- ✓ Directional TWSI
- ✓ Crosswalk (concrete surface)

- ✓ Tactile delineation (grass buffer)

Figure 13: Winnipeg site at McDermot Ave / Frances St to the left and Winnipeg site at McDermot Ave / Hargrave St to the right

The site at McDermot Ave / Frances St is a midblock bus stop served by Winnipeg Transit bus route 17. Notably, this site stands out as the only one which leverages both warning and directional TWSIs.

Overall, the key findings for this site include:

- 100% of participants were able to find the bus stop. Only one participant was unable to recognize the platform and attempted to cross to the street after reaching the platform (the participant subsequently detected they were on the road and stepped back onto the platform).
- During the boarding and alighting of the participants, the bus stopped at the bus flag 38% of the time.
- All participants noted that the behavior of other passengers did not affect their experience at this type of bus stop. This was primarily due to the low volume of passengers boarding and alighting during the site visit.
- All participants preferred to wait for the bus on the platform.

Finding the Bus Stop

Participants were asked about their safety perception finding and navigating the bus stop, the findings revealed that:

- When asked about the ease of finding and navigating this bus stop, 50% of the participants have indicated that it was “2-Hard” while the other 50% of participants found “4-Easy”.

- Participants with only the ability to detect shapes and shadows showed a decrease in ease of finding the bus stop compared to finding a typical bus stop.
- Participants with the ability to see colour had a better experience due to the use of colours and TWSI, making it easier for them to locate and utilize the stop. Participants with the highest level of vision abilities reported no noticeable difference.

Based on the think aloud technique and participant responses, **Table 4-4** highlights the techniques used, the challenges faced by the participants, and their recommendations to make finding the bus stop easier.

Table 4-4: Technique, challenges, and recommendations for finding the bus stop - Winnipeg site

Technique	Shoreline along the grass patch between the sidewalk and the roadway curb Used guide dog Followed the TWSI Used technology to assist Used visual cues to see the bike lane and TWSI colours
Challenges	Some initial confusion as they reached the roadway edge of the platform No indication that this is the bus stop Hard time locating the bus flag Had a hard time hearing the bikes No gaps in traffic to listen for the bikes
Recommendations	Education and awareness on the design Bus stop furniture Bus shelter Vertical delineation between the bike lane and platform Audible indicators for bus stops Zebra markings to indicate crossing

Based on the above, the following conclusions can be made about finding the island platform bus stops:

- Constricting the sidewalk and providing a grass buffer between the sidewalk and the bike lane was proved highly effective in guiding the participants.
- The directional TWSI was very useful in leading the users to the platform, not just because of the texture, but also its colours have alerted users with partial sight to cross to the platform.
- A common challenge and recommendation by all users were an indicator of a bus station on the platform. The bus flag was deemed too small, and the addition of a shelter or other furniture

was suggested. Based on other sites discussed in this document, the bus shelter aids in echolocating the bus stop.

Orienting and Navigating to and from the Island Platform

Participants were asked about their experience navigating to and from the platform. For this site, specifically on this day, not many cyclists were observed during the time of crossing to the platform or back to the sidewalk.

The key findings are as follows:

- 50% of the participants found it “4-Easy” to understand where to cross to the platform, 25% found it “5-Very Easy”, and 25% found “2-Hard”. The person that found it hard uses a guide dog.
- In terms of the safety perception, 75% of the participants found it “4-Safe” to cross to the platform and 25% found it “2-Unsafe”.
- Participants found it easier to cross back to the sidewalk but found it less safe. Most attributed this feeling to the lack of space on the platform and how when getting off the bus with more passengers, they would be pushed onto the bike lane.

Based on the think aloud technique and the questions asked to the participants, **Table 4-5** highlights the techniques used by the participants, the challenges they faced, and recommendations.

Table 4-5: Technique, challenges, and recommendations for navigating to and from the island platform – Winnipeg Site

	Navigating to the island platform	**Navigating from the island platform**
Technique	Followed directional TWSI's yellow colour Followed the directional TWSI Listened for approaching cyclists Located the bike lane visually and crossed Instructed guide dog to cross	Easier now that there is context and familiarity with design Followed the TWSIs Listened for approaching cyclists Located the bike lane visually and crossed Guided by the blue box to the TWSI and crossed Instructed guide dog to cross
Challenges	Could not identify the platform as a bus stop because of the lack of bus furniture Could not identify the platform as a bus stop by confusing the bus pole as a normal sign Could not hear approaching cyclists	Could not hear approaching cyclists Use more colours in designing to indicate different elements (green for bike lane, yellow curb to define the platform) but make sure to standardize it throughout city
Recommendations	Indicators to cyclists that priority is for pedestrians Zebra marking at crosswalk Bigger bus flag that includes the additional maps Wider attention TWSI to increase detectability at the sidewalk	Make cyclists more audible Signal to warn cyclists Zebra marking

Based on the findings above, the following conclusions can be made about improving the navigation on floating island platform bus stops:

- Adding zebra markings at the crosswalk,
- Change the location of the directional TWSI to be detectable close to the grass buffer,

- Provide audible queues using basic mechanical sound producing techniques or infrared technology (note that no such example is known in practice), and
- Include a “priority to pedestrian” sign.

Interactions with Cyclists

In this location, as well as in other assessed locations, there were no to minimal sightings of cyclists during each site visit. The main findings are as follows:

- When participants were asked about their ability to detect cyclists at this location, one participant found it "1-Very Hard," two participants found it "2-Hard," and one participant remained neutral.
- 75% of the participants relied on audible cues to detect approaching cyclists. However, two participants faced challenges due to the quietness of bicycles, while another participant had difficulty hearing them due to surrounding traffic noise.
- As mentioned earlier, the most significant challenge in interacting with cyclists at this location is the ability to hear them as they approach the crossings.

Boarding and Alighting

Regarding the boarding and alighting experience, participants were asked to compare their experience at this stop to that of a typical bus stop. The findings showed that participants had similar experiences overall. However, two participants found the boarding experience better at the floating platform bus stop design. When it came to alighting, participants had mostly similar experiences, except for one participant who found it more challenging.

The main findings are as follows:

- Participants felt more comfortable when alighting from the bus at the floating platform bus stop as they became familiar with its layout. This emphasizes the importance of raising awareness about this type of stop and striving for a more unified design approach.
- 50% of the participants expressed concerns with the narrow platform, which could pose a danger if a large number of people were getting off the bus and pushed them towards the cycling lane.
- The participant with the highest visual abilities found the blue square helpful in locating the guidance TWSI when alighting.

Based on the think aloud technique and the participants' responses, **Table 4-6** outlines the techniques they employed, the challenges they encountered, and their recommendations for improvement.

Table 4-6: Technique, challenges, and recommendations for boarding and alighting the bus stop – Winnipeg Site

	Boarding at the island platform	**Alighting at the island platform**
Technique	Located the blue standing square and waited there Hear bus approaching Stepping onto the bus from the platform Like boarding at a typical bus stop Given priority by other passengers	Knew what to expect going back Found the blue square to be helpful to guide to the TWSI Searched for the gap between bus door and curb Typical getting off at a bus stop
Challenges	Finding the bus flag using technology	No colour contrast between the bus edge and the curb edge Narrow platform Harder if more people are getting off
Recommendations	Indication of a bus stop using furniture Indication of a bus stop using a bus shelter	Indication of the end of the platform by using yellow coloured edge

Based on the findings above, the following conclusions can be made about improving the boarding and alighting experience at the floating island platform bus stops:

- The blue square or any equivalent that indicates a landmark is useful in directing participants to and from the TWSIs
- Wide platforms are needed to allow for:
    1. Space to get off the bus without being pushed onto the cycle tracks, and
    2. Space to accommodate bus furniture as an indicator of a bus stop.

Montreal

The site assessed in Montreal is Christophe-Colomb Ave / Gilford St as shown in **Figure 11**. The site at Christophe-Colomb Ave / Gilford St is a floating island platform bus stop at the intersection being served by STM bus route 14. For this site, the participants boarded the bus at Christophe-Colomb Ave/Gilford St and alighted at Christophe-Colomb Ave/Mont-Royal St. The design between the two locations varies

slightly; the alighting stop was built as a temporary design using low-cost measures and is shown in Figure 12.

The accessibility elements incorporated into the design include:

- ✓ Attention TWSI
- ✓ Crosswalk marking
- ✓ Bus flag on sidewalk

Figure 14: Montreal Site at Christophe-Colomb Ave / Gilford St

Figure 15 - Montreal Site at Christophe-Colomb Ave/Mont-Royal St

Overall, the key findings for this site include:

- 40% of participants were able to find the bus stop.
- During the boarding and alighting of the participants, 100% of the time the bus stopped behind the bus flag.
- Participants mentioned that the behaviour of the other passengers affected their experience at this kind of bus stop. One comment was related to the fact that other passengers gave them priority which is a positive interaction. Another comment referred to the noise of having other passengers around can be distracting but not problematic.
- 40% of participants preferred to wait for the bus on the sidewalk because the bus flag was on the sidewalk and the platform lacked furniture.

Finding the Bus Stop

To understand the safety perception of the participants navigating the bus stop, they were asked to rate how safe do they feel carrying out any of the activities at this bus stop compared to a typical bus stop.

The key findings are as follows:

- When asked about the ease of finding and navigating this bus stop, 80% of the participants have found it “1- Very Hard” or “2- Hard”. Only one participant found it “4-Easy”.
- All participants showed a decrease in ease of finding the bus stop compared to finding a typical bus stop.
- The participants that were not able to detect the bus stop (walked past it on the first try), were brought back by the staff to the location of the stop and then they were able to narrate their experience (captured in table below).

Based on the think aloud technique and participant responses, **Table 4-7** highlights the techniques used, the challenges faced by the participants, and their recommendations to improve the bus stop finding.

Table 4-7: Technique, challenges, and recommendations for finding the bus stop – Montreal Site

Technique	Listened for traffic noise Used cane to sweep the area Followed the TWSI on the ground to the platform Followed to the next TWSI Followed the TWSI's colour Followed visual cues of bus sign on pole Searched for the bus pole Used audible GPS
Challenges	No indicators of a bus stop No physical or auditory indicators Bus sign is so high and not detectable Placement of bus sign on the sidewalk is confusing Too close to the street corner Marking on ground is worn out Audible GPS didn't instruct participant to cross to the platform "Detour" sign on the middle of the platform Space to stand on the platform
Recommendations	Include bus furniture Proper placement of bus flag Removal of construction in the area Clearer indicators of the presence of bus stop on the sidewalk

Based on the above, the following conclusions can be made about finding the floating island platform bus stops:

- Unplanned construction near the site added another level of confusion for the participants because of the added construction signage and noise.
- The attention TWSI was very useful in leading the users to the platform, not just because of the texture, but also its colours have alerted users with partial sight to cross to the platform. However, the site was not properly maintained, and more vibrant colours were needed.

- The placement of the bus flag is essential for locating the bus stop and the current placement on the sidewalk adds more confusion as participants choose to wait on the sidewalk.
- There is a need to update audio GPS platforms to include special instructions for finding this kind of bus stop.
- Participants did not shoreline along the grass buffer because it was inconsistent along the road and had various openings to driveways.

Orienting and Navigating to and from the Island Platform

When crossing the bike lane, not many cyclists were observed during the time of crossing to the platform or back to the sidewalk. Some participants experienced one to two cyclists while crossing.

The main findings are as follows:

- 20% of the participants found it “4-Easy” to understand where to cross to the platform, 40% found it “3-Neutral”, and 40% found “2-Hard”.
- In terms of the safety perception, 40% of the participants found it “4-Safe” to cross to the platform, 40% found it “1-Very Unsafe”, and one participant was neutral about it.
- Participant’s initial reaction was to wait on the sidewalk because of the bus flag which is usually where they stand as they wait for the bus.
- Two participants crossed at the nearby signalized intersection crosswalk where the bus pole is instead of the TWSI and were brought back by staff where they were guided to the attention TWSI.

Based on the think aloud technique and the questions asked to the participants, **Table 4-8** highlights the techniques used by the participants, the challenges they faced, and recommendations.

Table 4-8: Technique, challenges, and recommendations for navigating to and from the island platform – Montreal Site

	Navigating to the island platform	**Navigating from the island platform**
Technique	Followed TWSI's colour Listened for approaching cyclists Located the bike lane visually and crossed Used cane to cross	Followed the colour of the yellow TWSI band Listened for approaching cyclists Crossed immediately after alighting without checking
Challenges	Tactile was rusty Tactile is impossible to identify in the winter Could not identify the platform as a bus stop by confusing the bus pole as a normal sign Not enough signage or markings to indicate that this is different from a typical bus stop	Could not hear approaching cyclists Noise from traffic was loud
Recommendations	Signage indicating bikes are crossing Include a more prominent change in elevation for the bike lane Have audio warning Pictogram marking at the stop to show the set up Have the crossing at the intersection instead of the few meters offset since the platform extends to the front of the intersection Include delineation to show the parameter of the bike lane and avoid crossing at random locations	Make cyclists more audible Include bike calming measure

Based on the findings above, the following conclusions can be made about improving the navigation on floating island platform bus stops:

- When crossing to the platform, participants found it confusing and crossed at the edge of the intersection because this is the placement of the bus flag. Thus, the placement of the bus flag should either be on the platform or be close to the attention TWSI.
- The yellow TWSI along the sidewalk of the Christoph-Colomb Ave at Mont-Royal St (the alighting bus stop) was very helpful for participants with the ability to detect colour.

Interactions with Cyclists

This corridor observed some cyclists going through during the time of the field visit. This site observed the most interactions between cyclists and participants. Below are the main findings:

- When participants were asked about how safe they felt around the cyclists when crossing to the platform, one participant was neutral about it, 2 participants felt safe, and 2 participants felt very unsafe because they couldn't hear cyclists until they were very close – participants noted that the noise from traffic was overpowering.
- For most of the other locations, when the cyclists noticed the participant with a cane or guide dog, the cyclists stopped or yielded even if the participants weren't crossing at the time. However, for one of the participants in the Montreal site, one cyclist continued through without yielding and the participant retracted and waited for them to pass.
- On another occasion, there was a near-miss where the participant was crossing back to the sidewalk when a cyclist approached and yelled "attention" and sped up ahead of the participant, but the participant did not hear and continued crossing. The participant did not realize the presence of the cyclist even after they passed.
- The presence of a signal near the crossing caused more confusion for the negotiation of the right of way because there was no pedestrian push button and normal signalized intersection functionality.

Boarding and Alighting

Based on the think aloud technique and the questions asked to the participants, **Table 4-9** highlights the techniques used by the participants, the challenges they faced, and their recommendations.

Table 4-9: Technique, challenges, and recommendations for boarding and alighting the bus stop – Montreal Site

	Boarding at the island platform	**Alighting at the island platform**
Technique	Like boarding at a typical bus stop Given priority by other passengers	Knew what to expect going back Typical getting off at a bus stop Bus passengers indicate to the participants that there is a bike lane when they get off
Challenges	Finding the bus stop	No knowing what to expect
Recommendations	Indication of a bus stop using furniture Indication of a bus stop using a bus shelter	Wider island

Vancouver

The site assessed in Vancouver is Beach Ave / Cordero St as shown in **Figure 13**. Participants boarded at Beach Ave / Bidwell St and alighted at Beach Ave / Cordero St. Both sites are identical.

The accessibility elements incorporated into the design include:

- ✓ Attention TWSI
- ✓ Crosswalk marking
- ✓ Accessible pedestrian signal
- ✓ Tactile delineation (full-height curb)

Figure 16: Vancouver site at Beach Ave / Bidwell St

Figure 17: Vancouver site at Beach Ave / Cardero St

The sites along Beach Avenue are at intersection bus stops served by Translink bus route 023. The sites are signalized. Also, this corridor had the highest volume of cyclists observed during the field testing.

Overall, the key findings for this site include:

- 50% of participants were able to find the bus stop.
- During the boarding and alighting of the participants, the bus stopped behind the bus flag 100% of the time.
- 2 participants mentioned that the behaviour of the other passengers affected their experience at this kind of bus stop. They mentioned that they should be given priority.
- Only 50% of participants felt safer waiting for the bus on the platform.

Finding the Bus Stop

To understand the safety perception of the participants navigating the bus stop, they were asked to rate how safe do they feel carrying out any of the activities at this bus stop versus at a typical bus stop.

Here are the main key findings:

- When asked about the ease of finding and navigating this bus stop, 66% of the participants have found it “1- Very Hard” or “2- Hard”. The other participants have said that it was “3-Neutral” or “4-Easy”.
- Participants with only ability to detect shapes and shadows showed a decrease in ease of finding the bus stop compared to finding a typical bus stop.
- 50% of the participants were not able to detect the bus stop (walked past it on the first try). These participants were brought back by the staff to the location of the stop and then they were able to narrate their experience.

Based on the think aloud technique and the questions asked to the participants, **Table 4-10** highlights the techniques used, the challenges faced by the participants, and their recommendations to improve the bus stop finding.

Table 4-10: Technique, challenges, and recommendations for finding the bus stop – Vancouver Site

Technique	Tried to listen for signal Listened for traffic noise Followed the pedestrian signal beeps Used cane to sweep the area Followed the TWSI on the ground to the platform The two TWSIs assured them that they crossed the bike lane Followed the TWSI's yellow colour Followed visual cues
Challenges	No indicators of a bus stop No physical or auditory indicators Lack of furniture at the end of the curb Faint signal sound which was hard to follow Preconceived notion that bus stops are usually 15-20 ft after the intersection If not indicated prior to the experiment that there is an island, it would not have been detectable
Recommendations	Include bus furniture Include bus shelter Include benches Indicator or TWSI on the sidewalk to indicate a bus stop is present Standardize the design across the City Set back the sidewalk TWSI by 3 ft Paint crosswalk brighter colours More audible sounds and announcements

Based on the above, the following conclusions can be made about finding the floating island platform bus stops:

- Pedestrian signal at the stop was useful once heard and the participants made the connection that this is where the bus stop is.

- The attention TWSI was very useful in leading the users to the platform, not just because of the texture, but also its colours have alerted users with partial sight to cross to the platform.
- Including a directional TWSI on the sidewalk would help participants locate the bus stop.
- A common challenge and recommendation by all users were an indicator of a bus station on the platform. The bus flag was too small, and a shelter or other furniture would be useful. Based on other sites discussed in this document, the bus shelter aids in echolocating the bus stop.

Orienting and Navigating to and from the Island Platform

Participants were asked about their experience navigating to and from the platform. This corridor observed the most cyclists during the time of crossing to the platform or back to the sidewalk compared to the other sites.

Here are some high-level findings:

- In terms of the safety perception, 33% of the participants found it “5-Very Safe” to cross to the platform and 50% found it “2-Unsafe”. One participant found it “1-Very Unsafe”.
- More participants found it safer and easier to cross back to the sidewalk. This is due to their increased familiarity with the set up.
- One of the participants crossed past the platform to the middle of the intersection because they were not able to detect the bus stop at the platform. The staff had to intervene and bring them back to the platform.

Based on the think aloud technique and the questions asked to the participants, **Table 4-11** highlights the techniques used by the participants, the challenges they faced, and recommendations.

Table 4-11: Technique, challenges, and recommendations for navigating to and from the island platform – Vancouver Site

	Navigating to the island platform	**Navigating from the island platform**
Technique	Followed TWSI's yellow colour Followed the TWSI to cross Followed the pedestrian signal beeping Listened for approaching cyclists Listened for traffic Located the platform visually while on the sidewalk Instructed guide dog to cross Felt the second TWSI (first on the platform) indicating the completion of crossing the bike lane Confirmed bus stop by reading braille on the bus sign	Easier now that there is context and familiarity with design Followed the accessible pedestrian signal Followed the TWSIs Followed visual cues Struggled knowing which direction to go to cross back to the sidewalk Listened for approaching cyclists Located the crossing visually and crossed Looked for curb cut / elevation change Instructed guide dog to cross
Challenges	Dog did not recognize the platform as a bus stop Could not identify the platform as a bus stop because of the lack of bus furniture Pedestrian signal was too quiet Not enough audible indicators of the direction of travel	Pedestrian signal button was too far from the bus flag to locate when crossing back Pedestrian signal's sound was too faint to locate Crosswalk opens on both sides so was unable to detect where to go
Recommendations	Louder pedestrian signal More audible announcements Wider attention TWSI to increase detectability at the sidewalk	Louder pedestrian signal Closer pedestrian signal Painting the entire island to enable visual detection Announcement saying that the light is red or green Some sort of direction indicator to direct crossing back to the sidewalk after getting off the bus

Based on the findings above, the following conclusions can be made about improving the navigation on floating island platform bus stops:

- Ensure that pedestrian signals are properly implemented with the right audible detectability.
- Add bus stop furniture as a cue.
- Change the location and the size of the attention TWSI to increase detectability on the sidewalk.
- Change elevation of the crossing to be the same between the sidewalk and the platform to avoid confusion about directionality of crossing after getting off the bus.

Interactions with Cyclists

This corridor, as previously mentioned, had the highest number of cyclists while conducting the site visits. Below are the main findings:

- 100% of the participants detected the cyclists on the lane, when there were any, as they were crossing or heard them pass by as they waited for the signal to change and cross.
- When participants were asked about how safe they felt around the cyclists at this location, 3 participants were neutral about it, 2 participants felt safe, and 1 participant felt unsafe because they can't hear them until they are close.
- When participants were asked about their ease of detecting the cyclists at this location, 4 participants found it "4-Easy", 1 participant was neutral and one participant found it "2-Hard".
- Cyclists at this location respected the light and stopped when it was the turn for the participants to cross. In one case, the cyclist stopped when they noticed the participant with the cane, made their presence clear, and asked them to cross.
- In this location, the participants relied heavily on listening to the pedestrian signal to decide when to cross unlike the other sites where the participants were listening for the cyclists. This is mostly because cyclists are quiet and can only be heard when close.
- It can be concluded that the presence of the pedestrian signal has increased the safety perception of the participants. However, they needed more reassurance that the cyclists have stopped at the light in order to start crossing.
- The signal has removed the need for negotiating the right of way.

Boarding and Alighting

Participants were asked about the experience boarding and alighting at this stop versus a typical bus stop and most participants indicated that they had the same experience boarding. However, for alighting, participants felt that the island sloped more, referring to travelling to the front of the platform where the elevation changes to street level through a slope instead of a step.

Participants felt more comfortable alighting as they were familiar with the layout of the stop. This further confirms the need for increased awareness on this kind of design and a more unified design.

Based on the think aloud technique and the questions asked to the participants, **Table 4-12** highlights the techniques used by the participants, the challenges they faced, and their recommendations.

Table 4-12 - Technique, challenges, and recommendations for boarding and alighting the bus stop – Vancouver Site

	Boarding at the island platform	**Alighting at the island platform**
Technique	Heard bus door open Stepping onto the bus from the platform Steep step onto the bus Looked for the handle but had trouble Like boarding at a typical bus stop Given priority by other passengers Bus stopped far from the bus flag	Knew what to expect going back Typical getting off at a bus stop Listened for the bus announcement Searched for the gap between bus door and curb
Challenges	Bus stopped far from the edge of the platform	A wide gap between the platform and the bus
Recommendations	Announcement at the bus stop Indicate on the platform where the bus will be	A barrier to stop stepping on the bike lane after getting off

Calgary

The site assessed in Calgary is Home Road / Bowness Road, shown in **Figure 15** and **Figure 16**. For this site, participants boarded at the north corner and alighted at the south corner. The two sites are identical in their design and are across the street from each other.

- ✓ The accessibility elements incorporated into the design include:
- ✓ Attention TWSI

Figure 18: Calgary site at Home Road / Bowness Road (north corner)

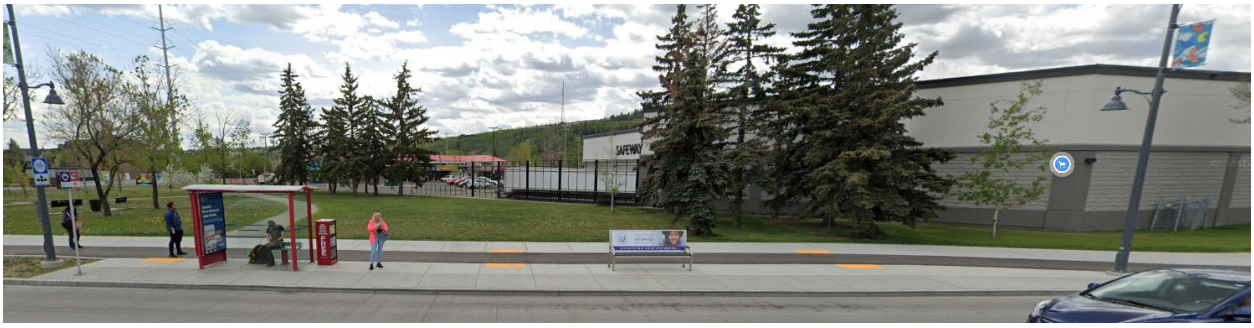

Figure 19: Calgary site at Home Road / Bowness Road (north corner)

The bus stop is served by several lines: Calgary Transit bus routes 1, 40, 53 and 306. This platform design for this site is similar to the design of that in London, Ontario. The design uses a shelter and multiple crossing locations over a distance.

Overall, the key findings for this site include:

- 67% of participants were able to find the bus stop. One participant was unable to identify that he has made it to the platform and attempted to cross to the street.
- During the boarding and alighting of the participants, the bus stopped at the bus flag 83% of the time and behind the flag in 17% of instances.
- Participants mentioned that the behaviour of the other passengers doesn't affect their experience at this kind of bus stop. At only two instances, the participants mentioned that they were affected by other passengers in a positive manner where they were given priority during boarding the bus.
- All participants preferred to wait for the bus on the platform except for one.

Finding the Bus Stop

Participants were asked about their experience finding the bus stop at the Home Road/Bowness Road versus a typical bus stop and here are the main key findings:

- When asked about the ease of finding and navigating this bus stop, **83%** of the participants rated their experience as “3” (neutral) and above. Only one participant indicated that it was “Very Hard”.
- Participants who were completely blind found it harder to find the bus stop compared to finding a typical bus stop.

Based on the think aloud technique and the questions asked to the participants, **Table 4-13** highlights the techniques used, the challenges faced by the participants, and their recommendations to improve the bus stop finding.

Table 4-13: Technique, challenges, and recommendations for finding the bus stop - Calgary site

Technique	Felt tactile markers at his feet Felt ribbing separating the bike lane and the sidewalk Shoreline the grass Followed the TWSI The plasticity of the TWSI produced a sound that was useful to follow Wide sweeps with cane Used visual cues like the bike lane and TWSI colours
Challenges	Some initial confusion as they saw multiple TWSIs Placement of the bench on the sidewalk Placement of the bench on the sidewalk and not aligned with the shelter Sidewalk too wide that made shorelining hard Platform too wide and long to find the shelter Walked on the bike lane without realizing Shorelining on the left side of the sidewalk while TWSIs are on the right side making it undetectable even with wide sweeps
Recommendations	Directional TWSI on sidewalk Audible indicators for bus stops Decrease sidewalk width Decrease platform size

Based on the above, the following conclusions can be made about finding the floating island platform bus stops:

- Large sidewalks and multiple crosswalks cause confusion to the participants and make it hard to echolocate the bus shelter.
- The placement of the bench on the sidewalk without any indication to cross to a platform makes the design even more confusing.
- The use of the attention TWSI was useful in alerting the participants that there was a crossing ahead, specially that the TWSI's plastic-like audio feedback alerted the users further.

Orienting and Navigating to and from the Island Platform

When navigating to and from this platform, the participants found certain placements of design elements confusing or worrisome.

The main findings are as follows:

- 80% of the participants found it "4-Easy" or "5-Very Easy" to understand where to cross to the platform, 20% found it "1-Very Hard". The person that found it "Very Hard" is completely blind.
- In terms of the safety perception, 66% of the participants found it "4-Safe" or "5-Very Safe" to cross to the platform and 33% found it "1-Very Unsafe" or "2-Unsafe".

Based on the think aloud technique and the questions asked to the participants, **Table 4-14** highlights the techniques used by the participants, the challenges they faced, and recommendations.

Table 4-14: Technique, challenges, and recommendations for navigating to and from the island platform – Calgary Site

	Navigating to the island platform	**Navigating from the island platform**
Technique	Followed TWSI's yellow colour Crossed at the TWSI when detected Followed the ribbing of the sidewalk to the TWSI to cross Listened for approaching cyclists Located the shelter visually and crossed Chose to cross from the crosswalk closest to the shelter Listened for traffic to detect directionality Crossed at the first crossing TWSI detected	Easier now that there is context and familiarity with design Felt the TWSI and followed it across Listened for approaching cyclists Located the bike lane visually and crossed Felt TWSI with cane Followed the ribbing of the bike lane to cross back
Challenges	Curvature of the bike lane caused confusion and heightened anxiety Could not identify the platform as a bus stop by confusing the bus pole as a normal sign Could not hear approaching cyclists Noise from traffic was too loud	Could not hear approaching cyclists Concern that the shelter is blocking the sightline for cyclists
Recommendations	Indicators to cyclists that priority is for pedestrians A crosswalk sign for pedestrians Directional TWSI connecting the two attention TWSIs Crosswalk markings Audible features Wider attention TWSI to increase detectability at the sidewalk	Make cyclists more audible Sign to warn cyclists that visually impaired individuals are crossing at the location Directional TWSI Separation of bike lane using vertical delineators

Based on the findings above, the following conclusions can be made about improving the navigation on floating island platform bus stops:

- The use of directional TWSIs would greatly assist in navigating the crossing as the bike lane curves and causes confusion,
- Change the location of the bench or include an audible message at the bench about how to navigate this kind of bus stop,
- Improve sightline at shelter by removing ads on one side or using canopy shelter, and
- Decrease the platform size and the number of crossings.

Interactions with Cyclists

At this location and similar to the other locations assessed, there were not many cyclists observed at the time of conducting the site visit. Below are the main findings:

- When participants were asked about their ease of detecting the cyclists at this location, 5 participants found it "1-Very Hard", and 1 participant found it "2-Hard" because of the traffic noise.
- On one occasion when a cyclist passed by one of the participants, they slowed down for them as they saw the cane but continued on their route as they observed that they were interacting with the staff and were not going to cross.

Boarding and Alighting

Participants were asked about the experience boarding and alighting at this stop. The main findings are as follows:

- Participants felt more comfortable alighting as they were familiar with the layout of the stop. This further confirms the need for increased awareness on this kind of design and a more unified design.
- Participants spent time travelling and exploring the before boarding as they tried to find indicative elements on a large platform.

Based on the think aloud technique and the questions asked to the participants, **Table 4-15** highlights the techniques used by the participants, the challenges they faced, and their recommendations.

Table 4-15: Technique, challenges, and recommendations for boarding and alighting the bus stop – Calgary Site

	Boarding at the island platform	**Alighting at the island platform**
Technique	Hear bus approaching Stepping onto the bus from the platform Like boarding at a typical bus stop	Typical getting off at a bus stop
Challenges	Finding the bus flag using technology	No colour contrast between the bus edge and the curb edge
Recommendations	Bus stopping at the bus flag and aligning with crosswalk	Indication of the end of the platform by using yellow coloured edge

Synthesis of Findings

A synthesis of the findings across all test sites is provided in **Table 16** below.

Table 16: Summary of findings of field testing

Challenge	**Synthesis of findings from field testing**
Finding the bus stop	12 of the 26 participants required assistance in identifying the general location of the stop adjacent to the sidewalk. Only the Winnipeg location had a 100% success rate in participants finding the stop the first time. People who are completely blind used echolocation to identify the presence of the shelter and therefore the stop. People who are partially sighted located shelters visually. Shelter and furniture were key landmarks for finding the stop. When these were absent or placed off of the platform, users were sometimes misled. When a shelter on a platform was far from an approaching user on the sidewalk, it was more difficult to detect using echolocation. Many users detected the bus stop by the presence of a diverging path from the sidewalk. These were detected by changes in the surface between the sidewalk and bike path (i.e., termination of grass buffer), and the presence of attention TWSI and directional TWSI across the sidewalk. When the approaching sidewalk is wide or significantly setback from the platform, participants had more difficulty in locating the shelter using echolocation. 67% of the participants who couldn't locate the bus stop found the sidewalk to be too wide.

Orienting and navigating to and from the island platform	The shelter was a key landmark for orienting to the stop and provided a signal for where passengers should wait for the bus. When the shelter was at the back of the sidewalk (i.e., not on platform), participants were confused about the layout. Sidewalk edges were used for shorelining. When a grass buffer was interrupted by a diverging sidewalk, users recognized it as a diverging path to the platform. Once people were aware of a diverging path to reach the platform, the directional TWSI helped people orient themselves to the correct path. This was also helpful when alighting to reach the sidewalk from the platform. Participants looked for bus stop pole to know where to wait for the bus and confirm they were at the bus stop. When the poles were not located on the platform, participants were confused. Sometimes poles were mistaken for signposts due to their odd size. The presence of clutter (poles, furniture, waste bins, benches) caused some to struggle when navigating platforms. Multiple crosswalks and very long platforms caused confusion. Attention TWSI's generally worked as intended and provided key information about crossings, when detected. 40% of participants found it easier to cross back to the sidewalk than to cross to the platform due to increased familiarity with the layout the second time. Participants shared than they felt more comfortable once with have experience with design. It was suggested by some that consistent design and training are key to the success of this design. When alighting, participants worried that narrower platforms would force them into conflict with cyclists when higher volumes of passengers were present. Channelization was particularly useful for directing alighting passengers to cross the bicycle path at the designated crossings.
Interactions with Cyclists: Detecting approaching cyclists	Across all sites and participants, everyone mentioned the need to make approaching cyclists more audible/detectable. Cyclists make little noise when travelling and bus stops often have significant background noise from traffic. The signalized crossing improved perceived safety but users still lacked reassurance that an approaching cyclist had stopped. At the London and Calgary sites, the shelter design obstructed cyclists' sightlines of passengers waiting to cross.
Interactions with Cyclists: Negotiating right of way with approaching cyclists	People using guide dogs were very conspicuous to cyclists, and cyclists were observed to give right of way. Signalized crossing removed need to negotiate right of way as users became reliant on the signal to manage right of way. There was a concern that with stops on the near side of a signalized intersection, cyclists were less likely to yield when they are approaching a green light.

Boarding and alighting	Some of the participants who rely on some visual cues had a hard time identifying the edge of the bus from the edge of the platform when alighting.

6. Additional Engagement

Based on the findings of the literature review and field study, WSP assembled a series of draft recommendations to improve the design of island platform bus stops for people with sight loss, which were shared with the CNIB for review and presented to the Advisory Committee and a focus group comprising participants of the study. The draft findings were also shared with members of the Translink Inclusive Bus Stops project to validate the findings and identify any gaps or inconsistencies between the two projects.

Advisory Committee Feedback

When presented with the recommendations and findings of this study, Municipal staff from the various communities represented on the advisory committee provided useful feedback that helped to refine the recommendations based on operational and context-specific considerations. The key points raised by the committee include:

- The available space remains a key constraint in municipalities' abilities to construct island platform bus stops. For example, Montreal's standard allows the platform to be as narrow as 1.5 m, which is insufficient to accommodate a shelter, and results in many users queueing on the sidewalk rather than the platform. Municipalities are divided on their approach to situations where there is insufficient space to provide a shelter on the platform. For example, while City of Montreal and City of Ottawa prefer to provide a narrow island with a shelter provided behind the sidewalk, others including City of Toronto prefer to forego the island platform and instead design the bus stop as a "raised cycle track bus stop" also referred to as an "integrated platform" (see example in Figure 18)
- Integrating island platform stops with signalized intersections is an area of focus and interest for some municipalities including Translink as it allows the potential to signalize the crossing of the bicycle path, which eliminates the need for pedestrians to negotiate with cyclists (assuming that cyclist signal compliance is adequate)
- Consistency in design standards continues to be a key priority for the CNIB in its Clearing Our Path guidance. This research found that users learn the layouts quite quickly, so experiencing the same layout in all stops within a municipality can improve users' confidence and experience with this design.
- Many transit agencies including Calgary Transit use advertisements in shelters as a form of revenue, but they are not mandatory at every stop and agencies have flexibility in where to provide ads. Removing or avoiding the use of ads where sightline issues are present should not be a challenge.
- While narrower shelters without walls (i.e., canopy shelters) are more space-efficient, feedback was received that especially in the Prairies, high winds necessitate the use of walled shelters. City of Calgary staff shared an example of a new bus line built with canopy shelters that had to be retrofitted post-opening to add walls due to significant user complaints. The applicability of canopy shelters will be highly sensitive to the climate conditions for a given municipality.
- Another concern of municipalities relating to the width of the platform is providing sufficient width to deploy a wheelchair ramp. Municipalities have mixed preferences on whether it is acceptable to deploy a ramp across or into a bicycle path, compared to a 3 m platform which would allow a wheelchair user to board and alight without blocking the bicycle path. The City of

Calgary's design approach avoids this where possible, while the City of Montreal's approach typically includes using the bicycle path for ramp deployment.

- There is a desire among municipalities to converge on a consistent approach for the use of TWSIs. While yellow TWSI offer the best visual contrast, when these are constructed with plastic they are highly likely to be damaged or destroyed by snow plows. For this reason, some municipalities including City of Montreal use cast-iron TWSIs cast in concrete for durability.
- There may be differences across provinces and municipalities as to the legal requirements of cyclists to yield to pedestrians at the island platform crossing points.
- When there is insufficient boulevard space to provide a grass buffer between the sidewalk and bicycle path, a beveled curb is an additional option has been found to be cane detectable. These have been used by the City of Toronto with success.
- City of Toronto staff provided feedback that along high-volume transit routes, providing multiple pedestrian crossings across the cycle track can be necessary to reduce the likelihood of crowding on platforms and minimize dwell times for buses.
- Some transit agencies including the Toronto Transit Commission (TTC) prefer to offset bus stops by one or two car lengths downstream or upstream of intersections to reduce the impacts of buses on vehicle operations and reduce delays for buses. This practice may make it challenging to integrate stops with signalized crossings and results in longer island platforms.

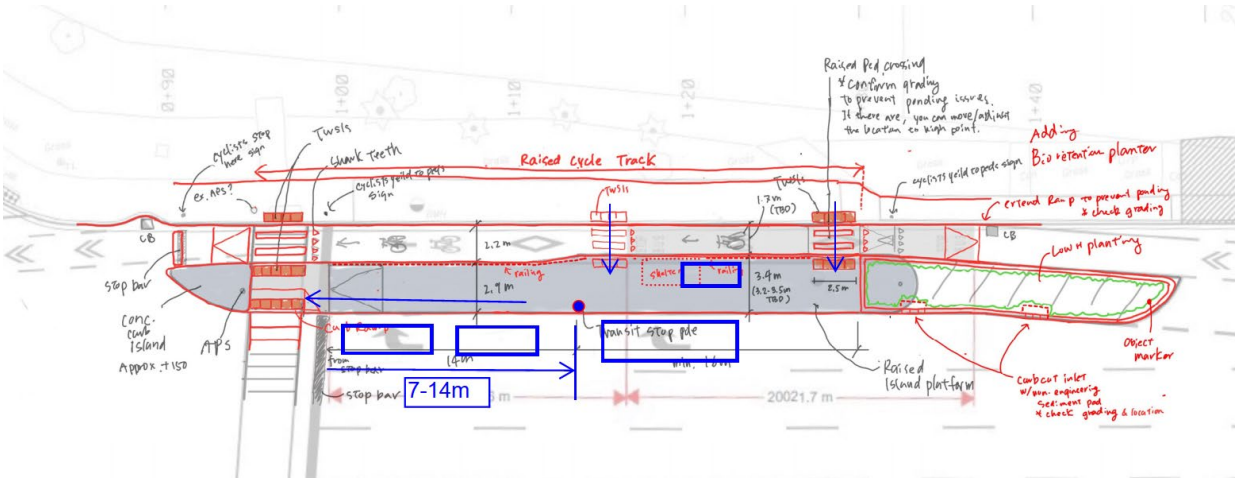

Figure 20: Example of near-side island platform bus stop set back from stop bar by two car lengths (sketch provided by City of Toronto staff)

Figure 21: Example of an "integrated bus stop" in Toronto

Focus Group Feedback

Following the completion of field visits, participants were invited to share additional insights with the project team after being given the opportunity to review the findings and recommendations. The feedback from the focus group provides an important validation of findings presented in this report as it was a final opportunity for people living with sight loss to ensure that this document reflects their lived experiences and presents solutions that align with their expectations.

Key themes from the focus group include:

- Participants agreed that the four main challenges captured in the study were consistent with the ones they experienced on site and when navigating this design in general. One participant added that interacting with cyclists and detecting them is very hard and during her visit she wasn't sure if there were any.
- Detecting incoming cyclists is very hard for participants with total sight loss. They were very supportive of the suggestion of audible indicators of cyclists. They inquired on the kind of noise that would be and whether it would be detectable in noisy environments like that of Vancouver. They also added that while this can solve the issue of hearing incoming cyclists, it doesn't solve the problem of knowing if the cyclists stopped for the participant to cross.
- Participants shared several experiences of previous encounters involving cyclists failing to yield to them at crossings. A lack of clarity and consistency about who has the right of way at these crossings creates tension and risk, with some participants even reporting cyclists shouting at them for crossing.
- Participants felt the need for a unified naming convention. They found it essential in getting the message across and to set their expectation of the environment they are about to interact with.

- Participants with total sight loss found some bus stops undetectable because of the wide sidewalk. Usually, wider sidewalks mean a multiuse path or indicated the presence of a bicycle path parallel to the sidewalk but not a bus stop.
- Participants found the TWSI useful in indicating the crossing, but they require more consistency in design of the truncated domes. Participants added that a connecting directional TWSI would be useful in identifying what direction they are going and would direct them to the other warning TWSI which would confirm to them that they have successfully crossed.
- Participants added that having multiple design elements to help guide them in these environments is crucial. Redundancy in indicators (audible, tactile, etc) help situate them better as people with different sight loss needs respond to different stimuli. Audio messages are the most universal, but need to strike a balance between being loud enough to be heard in traffic but not so loud that they overpower other indicators of the built environment.
- Participants said that the presence of a bus shelter is very useful when navigating these environments and they would like to see a consistent design within both their municipality and at the national level. The consistency in design would help solve many of challenges when it comes to navigating this type of bus stop because there would be no surprises to account for (except for approaching cyclists).
- Participants voiced their concern with long platforms because it is hard to understand where to stand and where to cross. They also added that bus stops being served with more than one bus line are generally hard to navigate because you can't always hear the bus announcement and you have to ask the bus driver and risk the possibility of missing the desired bus route by running around the platform and "playing tag" with the bus lines.
- Participants added that a bus pole on the sidewalk is helpful to identify a bus stop but should have some sort of sign/audible message to identify the stop as floating platform bus stop to let them know that there's a bike lane to cross in order to wait for the bus.
- Participants added that the fence was useful for the guide dog and would have been even more helpful if it was on the side of the sidewalk as well as the platform to avoid walking on the bike lane unknowingly.

7. Final Recommendations

This section presents the key challenges for people with sight loss when navigating island platform bus stops along with a list of recommendations based on the findings of this study. Interactions with cyclists are separated into two tasks: detecting approaching cyclists and negotiating the right of way with approaching cyclists, because of the important distinctions between the recommendations related to each type of interaction.

Table 17: Final recommendations

Challenge	Recommendations
Finding the bus stop	Prioritize placement of shelters on the platform as this is key for identifying the presence of a bus stop and finding the correct point to wait for a bus. Shelter does not need to be fully enclosed; canopy shelters or benches would accomplish this as well. Provide detectable separation between sidewalk and cycle track (i.e., raised curb or grass buffer) to allow for diverging route to platform to be detectable underfoot. Use pictograms or audio messages on bus furniture provided on sidewalk to direct users to the bus platform.
Orienting and navigating to and from the island platform	Establish a consistent nomenclature for this stop layout to improve ease of communication. Establish a consistent design approach, including the placement of key elements like stop pole, crossing(s), and shelter. Provide a painted crosswalk across bicycle path with attention TWSI at each end. Provide directional TWSI's extending from the crossing to the back of sidewalk and from the crossing to the bus stop pole. Channelize crossings using furniture, railings, etc. Place the bus flag/pole on the platform. Remove / relocate unnecessary clutter from the platform; don't place traffic or signage poles in the path of travel. Provide onboard audible announcements for alighting passengers at stops with island platforms. Provide more education on the use and purpose of directional TWSI's. Encourage the use of GPS-based wayfinding technology to add special instructions for navigating island platform bus stops. When integrated with a signal, raise the bicycle path crossing so that users can detect the curb ramp as the start of the roadway crossing.

Interactions with Cyclists: Detecting approaching cyclists	Promote good sightlines between cyclists and passengers. Avoid placing ads in shelters that block sightlines at crossings. Provide pavement markings oriented to pedestrians encouraging looking left and/or right (applicable to people with low vision). Develop a system of technology that provides auditory or tactile feedback to pedestrians when a cyclist is approaching.
Interactions with Cyclists: Negotiating right of way with approaching cyclists	Provide painted crosswalk with "yield to pedestrians" signage to establish pedestrian priority. Remove sightline obstructions and clutter to maximize visibility. Provide signage and consider flashing beacons to highlight the crossing to cyclists. Provide raised crossings, sharp tapers, or narrowed bike path to slow cyclists and increase awareness. When integrated with signalized intersections, include the bicycle path crossing in the signalized portion of the crosswalk. Restrict use of this design when highly complex conditions are present (e.g., steep grades, two-way cycle tracks, downtown environment, transit station, etc.)
Boarding and alighting	Paint platform curbs yellow to help identify the edge of the platform.

Finally, the literature review revealed that conflicts and near-misses increase when any of the following are present:

- High volumes of pedestrians (e.g., downtown environment)
- High volumes of cyclists (e.g., major cycling route)
- High frequency of bus service (e.g., 10 or more buses per hour)

Further, two-way cycling facilities and the presence of downhill grades can be expected to add further complexity to the navigation of these stops and the potential for conflict. It is recommended that where any of these conditions are present, consideration should be given to adding a controlled crossing (e.g., flashing beacon or signal) or removing the conflict altogether, such as by moving the bus stop or route, or relocating the cycling facility. Providing controlled crossings should arbitrarily or as a blanket solution may result in poor compliance and a false sense of security for bus passengers.

8. Conclusions and Next Steps

This study confirmed that people with sight loss are significantly impacted by island platform bus stops and provides detailed discussion on where impacts are felt. While the focus to-date has been on mitigating conflicts at island bus stop crossings, this study found that many designs lack the basic treatments that allow people with sight loss to identify, understand, and navigate them. This study found that attention TWSI's are well-understood by people with sight loss and are an effective communication tool. Directional TWSI's are also beneficial, but broader efforts are needed to ensure their intent is understood by users. The use of accessibility elements including TWSI's and tactile delineation are currently used inconsistently in the Canadian context and there is a significant opportunity for a more consistent design approach founded on universal design best practices.

While this study validates the need for more tools allowing people with sight loss to detect oncoming cyclists, it is unable to identify any successful techniques in practice. Further work should be undertaken by researchers and/or practitioners to identify technology or auditory based solutions. Another key knowledge gap commonly experienced by municipalities is how to address constrained situations where there is insufficient space for a full-size island platform. Further study should be conducted on the performance of constrained designs to understand the impacts of various trade-offs (for example, providing a narrow platform compared to providing no platform at all).

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Appendix A: Accompanied Site Visits Questionnaire

This appendix shows the general format of the questionnaire that is to be used on the accompanied site visits. Variations of it are used for the sites to make sure that the questions are relevant and directly related to the design elements for the site being investigated.

INSTRUCTIONS FOR STAFF

- Introduce yourself to the participant at the café.
- While at the café, ask your participants how they would like to be guided out of the café.
- Ask the participants if it is ok if you guided them by standing to the right side (away from the bike lane).
- Explain to the participants what is an island platform bus stop, the location of the bus stops(s) that you will be walking through, and the route that you will be taking WITHOUT telling them the elements at the stop.
- Clarify to the participants that you will be guiding them to the bus stop and at the bus stop you would like them to interact with the environment as if you were not there. You will, however, stop them from getting into harmful situations.
- Ask participants for consent to wear the harness with the GoPro. Help them out if needed.
- Read out the questions to the participant and write down the answers they give in the space provided. Extra space is available at the end of the document if you run out of space on the main answer sheet but do not forget to indicate the question number.
- You may share what you write with the participant if they ask for it however this is very unlikely.
- Mark the required information and the route taken by the participant to the bus stop from the intersection to the bus stop on the attached map.
- Don't ask the questions marked in * if the participants indicate that they are fully blind in question 4.

VISIT DETAILS

Bus Stop name	
Weather Conditions	
Time of arrival at bus stop	
Time of end of visit	

PARTICIPANT'S DETAILS

1. What is your age? _____

2. What is your gender?
   - ☐ Male
   - ☐ Female
   - ☐ Non-binary
   - ☐ Other: _____
   - ☐ Prefer not to say

3. What kind of support do you use?
   - ☐ Cane
   - ☐ Guide dog
   - ☐ Support person
   - ☐ Both
   - ☐ Other: _____

4. What How would you describe your ability to see? (Example: Color contrasts, shapes, outlines, etc.) or you are completely blind?

   _____
   _____
   _____

PARTICIPANT'S TRAVEL HABITS

5. What is your main mode of transportation? (walking, bus, taxis, car pooling, community service cars?)

   _____

6. How many trips do you usually make by bus in an average week? (For example, a trip from home to a destination and back home would count as one trip.)

   _____

7. How often do you use a bus stop that has an island platform?

   _____

8. Have you used the bus stop that we are to use as part of this study before?

   _____

9. Do you avoid bus stops that have such a set-up?
   - ☐ Yes
   - ☐ No

10. How easy is it for you to find a typical bus stop?

Very Difficult	Difficult	Neutral	Easy	Very Easy
1	2	3	4	5

11. How safe do you feel boarding a bus from a typical bus stop?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

12. How safe do you feel getting off a bus at a typical bus stop?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

13. How safe do you feel crossing a cycling/bike lane?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

THINK ALOUD #1

14. THINK ALOUD – Finding the bus stop **AND** Crossing the cycle tracks (For Staff: Ask your participants to think out loud as they try to find the bus stop from the intersection and cross the cycling lane) (What were your thoughts from the start position to getting to this point waiting to cross?)

_____
_____
_____
_____
_____
_____
_____
_____
_____

PARTICIPANT'S FEEDBACK ON FINDING THE STOP AND SAFETY PERCEPTION UPON CROSSING

15. Were you able to find the bus stop?

- ☐ Yes
- ☐ No

15i. What technique did you use to try to find this bus stop?

_____
_____

_____

15ii. What made finding the bus stop challenging?

_____
_____
_____

15iii. How was it different from finding a typical bus stop? Do you use the same technique?

_____
_____
_____

16. How easy was it to understand how to find and navigate this kind of bus stop?

Very Difficult	Difficult	Neutral	Easy	Very Easy
1	2	3	4	5

16i. Were there any design features that helped you navigate? (For researcher: you can hint about colors, markings, elevation, sounds, environmental cues, etc.)

_____
_____
_____

17. Was the sidewalk too wide for you to detect the bus stop?

☐ Yes
☐ No

_____
_____
_____

PARTICIPANT'S SAFETY PERCEPTION UPON CROSSING

18. How easy was it to understand where to cross?

Very Difficult	Difficult	Neutral	Easy	Very Easy
1	2	3	4	5

18i. What could be done to make it <u>easier to find</u> where to cross the point? (For staff: you can hint about *colors, *markings, elevation, sounds, etc.)

_____
_____
_____

19. How safe did you feel while crossing the cycle track to reach the platform to wait for the bus?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

19i. Anything about the design of the crossing point/crosswalk that you would have made you feel safer?

_____
_____
_____

20. What helped you decide to cross? Anything about the design or surrounding cues?

_____
_____
_____

21. Did you notice any other crossing points?

- ☐ Yes
- ☐ No

21i. If yes, how many were there? And what made you decide to choose this one?

_____
_____
_____

21ii. (For staff: go through all the other crossing points if there are multiple and ask them:) Which crossing would they choose and why?

_____
_____
_____

22. When you crossed to the bus stop, did you notice or feel the presence of any cyclists using the cycle track?

- ☐ Yes
- ☐ No

22i. How safe did/would you feel if there was a cyclist when you were crossing?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

22ii. How easy is it to detect a cyclist in this set up? What cues do you use? (audio / visual - mixture)

_____
_____

_____

22iii. How did the presence of a cyclists make you/ would make you feel if there were any? (for staff: even if there were none)

_____
_____
_____

22iv. Did you notice how the cyclist react to your presence?

_____
_____
_____

23. Did the background noise from passing cars make it hard to detect incoming cyclists?

☐ Yes
☐ No

PARTICIPANT'S FEEDBACK ON THE CROSSWALK DESIGN ELEMENTS

24. Did you notice if there were any tactile surface warning?

☐ Yes
☐ No

24i. How safe did its presence make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

24ii. Would you feel safer crossing if there was a tactile surface warning? How so?

☐ Yes (24i)
☐ No

_____
_____
_____

25. Did you notice if there were any tactile directional indicator?

☐ Yes
☐ No

25i. How safe did its presence make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

25ii. Would you feel safer crossing if there was a tactile directional indicator? How so?

☐ Yes (25i)

☐ No

_____

_____

_____

26. *Did you notice if the crossing had any markings or color contrast?

☐ Yes

☐ No

26i. How safe did its presence make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

26ii. Would you feel safer crossing had any markings or color contrast? Which?

☐ Yes (26i)

☐ No

_____

_____

_____

27. Did you notice if the crossing elevation was the same as the sidewalk or street level?

☐ Yes

☐ No

27i. How safe did its presence make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

27ii. Would you feel safer crossing if there was a variation in the elevation? How so?

☐ Yes (27i)

☐ No

_____

_____

_____

PARTICIPANT'S FEEDBACK ON THE BIKE LANE DESIGN ELEMENTS

28. Did you notice if the cycle track was 1-way or 2-way?

☐ 1-way
☐ 2-way
☐ Did not notice

28i. How safe did the 1/2-way cycle track make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

28ii. If 1-way, would cyclists in the other direction have affected how safe you felt crossing?
☐ Yes
☐ No

_____
_____
_____

28iii. If 2-way, would having the cyclists travel in only one direction have made you feel safer?
☐ Yes
☐ No

_____
_____
_____

29. Did you notice how wide the lane was?
☐ Yes
☐ No
☐ Did not notice

29i. Was it too wide?
☐ Yes
☐ No

29ii. Would you feel safer crossing that intersection given that the lane was less wide and you had to cross a smaller distance?
☐ Yes
☐ No

_____
_____
_____

30. *Were you able to recognize any of the markings on the bike lane? Green paint/bike stencil/ shark teeth?
☐ Yes
☐ No

Items:

_____

_____

30i. What other visual markings would have made you feel safer?

_____

_____

_____

30ii. *How safe would green paint make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

30iii. *How safe would bike stencil marking make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

30iv. *How safe would shark teeth marking make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

31. Did you notice if there is a bike signal at the crossing?

- ☐ Yes
- ☐ No

31i. How safe did its presence make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

31ii. Would you feel safer crossing if there was a bike signal?

- ☐ Yes (31i)
- ☐ No

_____

_____

_____

32. Did you notice if there is a Rectangular Rapid Flashing Beacon (RRFB) at the crossing?

- ☐ Yes
- ☐ No

☐ I don't know what an RRFB is

32i. How safe did its presence make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

32ii. Would you feel safer crossing if there was an RRFB?

☐ Yes (32i)

☐ No

_____

_____

_____

PARTICIPANT'S FEEDBACK ON THE ISLAND PLATFORM DESIGN ELEMENTS

33. What was your experiences finding the main items on the island, such as the crossing point, the bus stop shelter, and the bus stop flag/pole? Easy/hard/cluttered?

_____

_____

_____

34. Is this width of the platform enough for you to stand and anticipate the bus arrival?

☐ Yes

☐ No

35. How much space did you feel was available on the island while waiting for the bus?

Very little space	Little space	Enough space	Spacious	A lot of space
1	2	3	4	5

36. How do you feel about the furniture (Shelter/benches/garbage bin/etc.) on the platform? Did it help you or get in the way? Elaborate.

_____

_____

_____

37. Do you feel more comfortable waiting here on the platform or the sidewalk and crossing the cycling lane when the bus arrives?

☐ Platform

☐ Sidewalk

_____

_____

_____

38. Did you notice any delineation (barriers/delineators or fence) between the platform and the bicycle lane?

- ☐ Yes
- ☐ No

38i. How safe did its presence make you feel?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

38ii. Would you feel safer crossing if there was an RRFB?

- ☐ Yes (38i)
- ☐ No

_____
_____
_____

STAFF OBSERVATIONS AND FEEDBACK #1

39. In the case of multiple crosswalks available, which crosswalk did the participant take to cross? (Mark with a "**C"** on the map attached)

- ☐ Check here when done, Map #:_____

40. What were cyclist flow levels at the time of crossing? (Consider both directions if it is a two-way)

- ☐ no cyclists within 100m
- ☐ 1-2 cyclists within 100m
- ☐ 2-4 cyclists within 100m
- ☐ more than 4 cyclists within 100m

41. What did you observe from the participant as they waited to cross? (ie. waited for gap in motorised traffic so they could hear cyclist approach)

_____
_____
_____

42. How did cyclists react to the presence of the participant? What was the interaction between the cyclists and the accompanied participant?

_____
_____
_____

43. Did the cyclists notice the cane or guide dog (if any) and gave priority to the participant or sped up instead?

_____
_____
_____

44. Where did the participant wait for the bus? (Mark with a "**P"** on map attached in package)

☐ Check here when done, Map #:_____

45. Approximately, how many people were waiting for the bus on the platform, if any?

_____

46. Approximately, how many people were waiting for the bus on the sidewalk, if any?

_____

47. Sightline Rating:

Very Clear	Partial clutter	visual clutter / blockage
1	2	3

48. When crossing, did the participants show of the following?

☐ False start
☐ Hesitation
☐ Long delay
☐ Retracting
☐ Yielding to cyclists
☐ Crossed without checking at all
☐ Other: _____

49. Did you notice any near-misses when crossing the cycling lane?

☐ Yes
☐ No

Situation:_____
_____

THINK ALOUD #2

50. THINK ALOUD – Boarding the bus (For Staff: Ask your participants to think out loud as they board the bus)

_____
_____

_____
_____
_____
_____
_____
_____

PARTICIPANT'S FEEDBACK AFTER BOARDING THE BUS WHILE ON THE BUS OR SHORTLY AFTERWARDS

51. Overall, how easy did you find it getting on the bus?

Very Difficult	Difficult	Neutral	Easy	Very Easy
1	2	3	4	5

52. Did the bus stop where you expected it to?

☐ Yes
☐ No

52i. how did this affect your experience of getting on the bus with the set up of the platform?

_____
_____
_____

52ii. Is it any different from boarding from a typical bus stop? How so?

☐ Yes
☐ No

_____
_____
_____

53. Was there anything about the layout of the bus stop that made getting on the bus easier or harder?

☐ Yes
☐ No

53i. how can this be resolved from your opinion?

_____
_____
_____

54. Did the behaviour of other passengers affect the ease of boarding the bus?

☐ Yes

☐ No

54i. If yes, elaborate on how so?

_____
_____
_____

STAFF OBSERVATIONS AND FEEDBACK #2

55. Approximately, how many people were on the platform when the bus arrived?

_____

56. Approximately, how many people got off the bus when it arrived?

_____

57. Approximately, how many people got on the bus when it arrived?

_____

58. Did the participant struggle finding the bus and getting on it?

☐ Yes
☐ No

59. Did other passengers notice the participant and gave them priority?

☐ Yes
☐ No

60. Did the bus stop at the flag or ahead or behind? (Mark **"B"** on map attached in package)

☐ Ahead
☐ Behind

☐ Check here when done, Map #:_____

THINK ALOUD #3

61. THINK ALOUD – Getting off the bus (and crossing?) (For Staff: Ask your participants to think out loud as they get off the bus)

_____
_____
_____
_____
_____
_____
_____

_____
_____

62. THINK ALOUD – Crossing the cycle tracks (For Staff: Ask your participants to think out loud as they cross the cycling track)

_____
_____
_____
_____
_____
_____
_____
_____

PARTICIPANT'S FEEDBACK AFTER GETTING OFF THE BUS OR SHORTLY AFTERWARDS

63. Overall, how easy did you find it to get off the bus?

Very Difficult	Difficult	Neutral	Easy	Very Easy
1	2	3	4	5

64. Did the bus stop where you expected it to?

☐ Yes
☐ No

64i. How did this affect your experience of getting off the bus with the situation on the platform?

_____
_____
_____

64ii. Is it any different from getting off at a typical bus stop?

☐ Yes
☐ No

_____
_____
_____

65. Was there anything about the layout of the bus stop that made getting off the bus harder?

☐ Yes
☐ No

65i. If yes, how can this be resolved from your opinion?

_____
_____
_____

66. Did the behaviour of other passengers affect the ease of getting off the bus?

☐ Yes
☐ No

66i. Elaborate on how so?

_____
_____
_____

PARTICIPANT'S SAFETY PERCEPTION UPON CROSSING BACK TO THE SIDEWALK

67. How easy was it to understand where to cross back?

Very Difficult	Difficult	Neutral	Easy	Very Easy
1	2	3	4	5

67i. What could be done to make it easier to find where to cross the point? (For staff: you can hint about colors, markings, elevation, sounds, etc.)

_____
_____
_____

68. How safe did you feel while crossing the cycle track to reach the sidewalk?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

68i. Anything about the design that you would have helped you feel safer or decide to cross?

_____
_____
_____

69. Did you notice any other crossing points?

☐ Yes
☐ No

69i. How many were there? And what made you decide to choose this one

_____

_____
_____

69ii. (For staff: go through all the other crossing points if there are multiple and ask them:) Which crossing would you choose to cross from and why?

_____
_____
_____

70. When you crossed to the bus stop, did you notice or feel the presence of any cyclists using the cycle track?

☐ Yes
☐ No

70i. How safe did/would you feel if there was a cyclist when you were crossing?

Very Unsafe	Unsafe	Neutral	Safe	Very Safe
1	2	3	4	5

70ii. How easy is it to detect a cyclist? What cues do you use? (audio / visual - mixture)

_____
_____
_____

70iii. How did the presence of a cyclists make you feel?

_____
_____
_____

70iv. Did you notice how the cyclist react to your presence?

_____
_____
_____

PARTICIPANT'S FEEDBACK ON THE ISLAND PLATFORM DESIGN ELEMENTS

71. Is this width of the platform enough for you to stand and cross back to the sidewalk?

☐ Yes
☐ No

72. Did you notice anything different or additional elements on the platform compared to when boarding the bus (shelter/benches/garbage bin/etc.)? Did it get in your way or help you find your way?

_____
_____
_____

_____
_____

73. What elements would have helped you or improved your experience crossing back? (marking/color/elevation/etc.)

_____
_____
_____
_____
_____

PARTICIPANT'S FEEDBACK ON THE CROSSWALK DESIGN ELEMENTS

74. Did you notice anything different or additional elements on the crosswalk compared to when boarding the bus (tactile indicators/marking/color/elevation/etc.)? Did it get in your way or help you find your way?

_____
_____
_____
_____
_____

75. What elements would have helped you or improved your experience crossing back? (tactile indicators/marking/color/elevation/etc.)

_____
_____
_____
_____
_____

PARTICIPANT'S FEEDBACK ON THE BIKE LANE DESIGN ELEMENTS

76. Did you notice anything different or additional elements on the bike lane compared to when boarding the bus (marking/green color/shark teeth/contrast/elevation/etc.)? Did it get in your way or help you find your way?

_____
_____
_____
_____
_____

77. What elements would have helped you or improved your experience crossing back? (marking/green color/shark teeth/contrast/elevation/etc.)

_____
_____
_____
_____
_____

STAFF OBSERVATIONS AND FEEDBACK #3

78. Detailed site photos - Showing sight line from crossing point in direction of cycle travel (i.e. direction you would look for cyclists - looking for differences / ease of detection)

☐ Check here when done, Folder Name: _____

79. Approximately, how may people got off the bus when it arrived?

_____

80. Approximately, how may people got on the bus when it arrived?

_____

81. Approximately, how many people were waiting for the bus on the platform, if any?

_____

82. Approximately, how many people were waiting for the bus on the sidewalk, if any?

_____

83. Did the front of the door of the bus and the crosswalk of the platform align?

☐ Yes
☐ No

84. Did other passengers notice the participant and gave them priority?

☐ Yes
☐ No

85. Did the bus stop at the flag or ahead or behind? (Mark **"B"** on map attached in package)

☐ Ahead
☐ Behind

☐ Check here when done, Map #:_____

86. Did the participant cross to the sidewalk right away or did they stay and explore the platform first before crossing back?

- ☐ Cross right away
- ☐ Explored

87. Where did the participant cross with regards to the crossing available? (Mark **"C"** on map attached in package)

- ☐ Check here when done, Map #:_____

88. What were cyclist flow levels at the time of starting to cross? (Consider both directions if it is a two-way)

- ☐ no cyclists within 100m
- ☐ 1-2 cyclists within 100m
- ☐ 2-4 cyclists within 100m
- ☐ more than 4 cyclists within 100m

89. Sightline Rating:

Very Clear	see pedestrian late / partial clutter	visual clutter / blockage
1	2	3

90. When crossing, did the participants show of the following?

- ☐ False start
- ☐ Hesitation
- ☐ Long delay
- ☐ Retracting
- ☐ Yielding to cyclists
- ☐ Crossed without checking at all
- ☐ Other: _____

91. When getting off the bus, did the participant just follow the crowd getting off the bus at the stop?

- ☐ Yes
- ☐ No

_____
_____
_____

92. What did you observe from the participant as they waited to cross? (ie. waited for gap in motorised traffic so they could hear cyclist approach)

_____
_____
_____

93. How did cyclists react to the presence of the participant?

_____
_____
_____

94. Did the cyclists notice the cane or guidance dog (if any) and gave priority to the participant or sped up instead?

_____
_____
_____

95. What was the interaction between the cyclists and the accompanied participant?

_____
_____
_____

96. When crossing, did the participants show of the following?

- ☐ False start
- ☐ Hesitation
- ☐ Long delay
- ☐ Retracting
- ☐ Yielding to cyclists
- ☐ Crossed without checking at all
- ☐ Other: _____

97. Did you notice any near-misses when crossing the cycling lane?

- ☐ Yes
- ☐ No

Situation:_____
_____
_____

THIS IS THE END OF THE WALK-THROUGH. THANK YOUR PARTICPANTS FOR THEIR TIME AND EFFORTS IN MAKING OUR CITIES A SAFER PLACE FOR EVERYONE.

ASK THEM OVERALL HOW WAS THEIR EXPERIENCE USING SUCH A BUS STOP DESIGN? HOW CAN WE DESIGN THIS BETTER FOR THEIR USE? WHAT QUESTIONS WOULD THEY LIKE TO REVISIT? WHAT QUESTIONS WOULD THEY WANT TO ANSWER?

_____
_____

TAKE A MINUTE TO REFLECT ON YOUR FINDINGS FROM TALKING TO THE USER. HOW WAS THEIR ATTITUDE ABOUT THE VISIT IN GENERAL? WERE THEY NEW TO THE CITY? HOW FAMILIAR ARE THEY WITH THIS SURROUNDING?