Melfa Road Walk N’ Roll Tactical Urbanism Interventions for Improving Road Safety and Nature Connections

Prepared by: Kristi Ellerbroek, Henry Li, Doula Jiang, Elaine Hu, Wenyao Li, JP Deland

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UFOR 401:
Integrated Urban Forestry Capstone

Melfa Road Walk N’ Roll
Tactical Urbanism Interventions for
Improving Road Safety and
Nature Connections

Prepared By:
Kristi Ellerbroek    Henry Li    Doula Jiang    Elaine Hu    Wenyao Li    JP Deland

Prepared For:
Dr. Melissa McHale    Dr. Angela Rout    Prof. Andrew Almas    TA Kaitlyn Pike    TA Yaying Zhou

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Executive Summary

The objective of the Melfa Road Project (MRP) is to address inadequacies in street safety in East Acadia neighbourhood while incorporating community ideas for enhancing biodiversity, fostering environmental education, and promoting connections to nature for children.

The MRP inventories all classes of land-use, soft landscapes, canopy cover, and above ground-infrastructure features. Metric outputs show that 52% of land-use types is public land, 18% is residential, 2% is institutional, 66% of soft landscapes are lawns, 22% is wild greenery, and 11% are planting beds. There are 101 trees in the study site, 64% of which are deciduous, and the rest is coniferous, which encompasses a total canopy cover of 13.5%.

Through a site assessment and QGIS analysis, the MRP examines overarching problems associated with Melfa Road, such as lack of street safety signs, unsuitable placement of garbage dumps, and underutilised parking lots. Through an extensive literature review we suggest opportunities for tactical urbanism interventions (TUI) that adhere to UBC land-use plans and initiatives.

Melfa Road is heavily depended on by students, children, and families and is trafficked by vehicles, bicyclists, and pedestrians. There is abundant greenspace accessibility for passive or active recreation, for activities such as walking, playing, bicycling, and lounging. These outdoor areas provide a moment for relaxation but missed opportunities in past designs along with the placement of current roads and parking lots creates a barrier to these beneficial activities.
Introduction

The MRP seeks to ameliorate approximately 100 metres of Melfa Road in the Acadia East neighbourhood in University of British Columbia (UBC) endowment lands (Figure 1; Appendix A). The neighbourhood has a high density of youth facilities such as day-cares, a kids club, and an elementary school. As such, children and families depend on the site for travelling to school, but Melfa Road lacks several safety features. The MRP is an opportunity to incorporate ecological and traffic features onto a busy streetscape, promoting a connection between safety, nature, and youth.

Urban streets and pathways near schools are often congested (Petch & Henson, 2000). In many cases, this results in a clash between cars, cyclists, and pedestrians, compromising safety for children (Petch & Henson, 2000). In attempts to improve public safety, cities have introduced a variety of physical design interventions into busy zones, and some of them incorporate landscaping and ecological elements (Audrey & Ferrer, 2015). Additionally, research has shown that exposure to nature in regular daily routines is beneficial for children (Otto & Pensini, 2017).

TUIs can be a tool to achieve this. A TUI is defined as scalable, creative tactics to improve the city condition, which can be citizen-built or city-led (Yassin, 2019). TUIs tend to be seen as temporary or low-cost but serve a higher purpose in improving the urban environment more rigorously than other formal design processes (Yassin, 2019). The MRP aims to discover what small-scale interventions can be implemented on Melfa Road that will benefit both the safety of pedestrians and nature interactions. Our client is UBC Social Ecological Economic Development Studies (SEEDS) as well as Community Development, Campus & Community Planning. The end-users that will receive benefits of the MRP are the students, children, and residents surrounding the East Acadia neighbourhood.
Transportation, Routes, and Ecological Features in Streetscapes

To increase children-pedestrian safety, the factors affecting road safety must be defined and analysed (Petch & Henson, 2000). Several studies, including experimental reports, community interviews and surveys, and epidemiologic strategies, can identify potential factors that pose a risk to children travelling in the urban built environment (Keshia, 2014; Hassen et al., 2021). This includes analysing collision reports and their subsequent safety interventions (Pollack et al., 2014; Audrey & Ferrer, 2015). Multiple studies have specifically focused on children's road safety, such as crossing behaviour, young pedestrian distraction, and visual load thresholds of urban clutter (Tapiro et al., 2019), and the overarching relationship between children's traffic safety and the urban built environment (Petch & Henson, 2000). Furthermore, there are correlations in children's road safety based on age and geography and pedestrian/cyclist casualties and socio-economic status (Petch & Henson, 2000).

TUIs and Child-Nature Interactions

The concept of nature-based education assumes that children learn better through hands-on activities. Nature-based education is defined by Otto & Pensini (2017) as promoting a connection to nature through acquiring environmental knowledge. Nature-based education can be a tool to incorporate families and children's ideas into TUIs, based on a preliminary ecological context (Derr, 2015). Some engagement strategies include photo stories, child tours, art displays (3D models with cardboard boxes, straws, toys, leaves, branches; NACTO, 2020), road design competitions where local children vote (Happy City, 2021), sensory walks, and voluntary trash pick-ups (Barrable et al., 2021; Barrera-Hernández et al., 2020). These nature and community-based activities uncover values, interests, and needs of the community, which can be used to make decisions on what TUIs to incorporate in the area.

Simple urban design interventions, even if they are low-cost, can improve residents' well-being and social competence (Negami et al., 2018). Some examples include community gardens, artistically painted intersections, and greenways (Negami et al., 2018). Colour specifically can be used to delineate the various functional components of the street while calming traffic, prioritising pedestrians, supporting safety initiatives, and enhancing the urban environment (O'Connor, 2021; Negami et al., 2018). Chalk, paint, cones, flex posts, curb stones, games, and playable structures have also been used as temporary TUIs to support a children-safe streetscape (NACTO, 2020). During the COVID-19 pandemic, the degree to which strategies can be achieved is uncertain. The willingness of developers and planners to contribute to child-nature interactions and how they can help will greatly affect the progression of strategies that promote children nature interactions.

UBC Goals for Pedestrian Safety and Nature Connections

UBC has many land-use plans and strategies to support pedestrian safety and enhance nature connections. UBC has stated commitments to increase safety and routes for non-vehicles while encouraging these routes to be well-connected (UBC Board of Governors, 2021). UBC’s Child Care Expansion Plan Point Grey Campus (2018) addresses child-care facilities, which are linked to child-transportation safety and children's exposure to greenspace. UBC has plans to build more day-cares on campus, especially for children 3 years and younger, which are required to have accessible outdoor space (UBC, 2018). Some of these future day-cares will be near Melfa Road (UBC, 2018). UBC aims to support and enhance ecological health on campus by goals addressing climate change, single-occupancy vehicle (SOV) emission reductions, and increasing greenways (UBC Vancouver Campus, 2021; UBC Board of Governors, 2021). UBC aims for landscapes that produce a
variety of ecosystem services, including food production, while encouraging Indigenous species planting “rewilding” and biodiversity (UBC Board of Governors, 2021). There is a knowledge gap on the practicality of incorporating these initiatives at the individual road scale. To address this, a comparative analysis on TUIs and UBC plans will be conducted. The MRP team’s goals in this study are to (1) perform a comprehensive site assessment of the Melfa Road area that focuses on routes, safety features, and ecological features; (2) highlight potential TUIs from literature reviews and perform a comparative analysis; and (3) associate opportunities in the site to incorporate TUIs for future designers to consider that are aligned with UBCs goals and initiatives.

## Methods

### Site Assessment

Our first approach was to conduct a comprehensive site assessment of Melfa Road, focusing primarily on pedestrian, bicycle, and automobile routes, as well as ecological features and potential areas for improvement. For safety features, we recorded routes and specific locations of facilities. Through this site assessment, we were able to identify potential factors that affect safety and nature connections. We recorded routes by observing traffic and footpaths on site and layering the data over satellite images on Google Maps (Figure 2). Facilities data was collected through observation, then tabulated (Appendix C) and marked on a map (Figure 2) to present exact locations on Melfa Road.

To provide a simpler and clearer visual understanding of the current site conditions on Melfa Road, detailed pictures were inserted on the map (Figure 2) to illustrate the safety-related issues that existed on Melfa Road. For ecological features, we collected tree species and diameter at breast height (DBH) information for all trees on Melfa Road and aggregated the data into tables to create QGIS maps (Appendix C). We also assessed tree health conditions by examining trunk wounds, canopy density, etc. (Appendix C).

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**Figure 2:** Map showing the various conditions of trees, pathways, parking, and garbage dumps on site.  
*Source: Google Maps, 2022.*
QGIS Analysis and Maps

To start the mapping process, SEEDS provided us with the preliminary GIS data to perform basic analysis of our study site (GitHub, 2022). However, most of the files were incomplete and required supplementary online research to complete the data and begin mapping (Abacus, 2016). To better inform our recommendations for TUIs, we produced two primary maps that each highlight two aspects (infrastructure and ecology) of our study site (Figure 3 & 4). Our infrastructure map details the location of various safety and miscellaneous features, such as lamp posts, fire hydrants, bike racks, delineation posts, garbage cans/dumpsters, and any street signs (speed, children at play, stop, do not enter, crosswalk etc.; Figure 3). This map also features land-use types (residential, institutional, parking lot) and routes (crosswalks, local access ways, sidewalks). The ecology map shows soft landscape types (lawn, planting beds, wild) and urban forest canopy cover in terms of deciduous vs coniferous tree types (Figure 4). There is also a variant of the ecology map highlighting tree condition ratings (Figure 5) and an additional elevation map for planning drainage-based intervention locations (Appendix D).

These maps highlight areas that have higher densities of infrastructure features, canopy cover, and areas with poor tree condition. The suggested TUIs are based on this analysis (Figures 7-12).
Tactical Urbanism Interventions

To better understand the TUIs and allow for subsequent graphic detailing of site development, we conducted an extensive literature review on the topics of road safety, children-nature connections, and TUI. The TUI literature was ranked according to its relevance to the MRP. After reviewing articles and project precedents, key information was extracted and summarised into a spreadsheet (Appendix E). The main themes included are safety, ecology, and features for children. Challenges and opportunities for each design solution are included as well. We organised the information obtained from the literature into a TUI mind map for the study area (Appendix F) and then searched for other tactical urbanism intervention precedents based on the mind map and other information found in the spreadsheet (Appendix E).

Results and Discussion

Literature Review

From our literature review, precedent searches, and site assessment analysis, we found that there is an issue with the physical and conceptual scale of the MRP, the TUIs, and UBC Plans. We had some challenges with relating high-level plans to actionable recommendations. For example, UBC plans, and plans in general, are broad in nature, so it is difficult to realise UBC plans goals and initiatives into design inventions on the MRP site. As for TUI research and review, it is difficult to decipher what type of interventions could be replicated on the MRP site due to differing safety concerns, project site sizes, intervention budgets, project timeframes, and the balance between pedestrians and other modes of transportation.
Road Safety and Infrastructure Features

Through field observations and data analysis, the overall safety for children on Melfa Road has much room for improvement. Although not within the project boundaries, there are 9 day-cares and 1 elementary school just outside the study site, leading to high youth traffic (Appendix B). Leading problems center around overly dense street signs, street parking that compromise road space, and unmanaged garbage dumps. Firstly, there are 51 road signs in Melfa Road and only 19 of them serve as safety warnings, while the remaining 32 are for private parking rules. There aren't speed limit signs on Melfa Road. The high density of road signs inevitably causes an excessive visual load, especially for drivers who are hesitant in choosing a parking space or are distracted by the content of the signs (Petch & Henson, 2000). Children have a limited attention span compared to adults which limits their ability to make good crossing decisions, especially in the presence of distractions (Tapiro, 2019).

There’s a possibility children may spend too much time selecting or identifying safe crossing locations, leading to reckless crossing (Tapiro, 2019). Secondly, there are 62 perpendicular parking spaces on Melfa Road, 51 of which are perpendicular spaces and 11 are parallel parking spots. The 51 spots compress the already narrow roads surrounding Melfa Road and the 11 spots near Norma Rose Point School interfere with a child’s ability to see oncoming traffic and obstruct the view of motorists (Edquist et al., 2012). This makes it especially dangerous for children crossing into Melfa Road from the narrow Acadia Road.

Lastly, there are 5 dumpsters and 13 trash cans on site, with some dumpster lids being left open, allowing wind to blow garbage out. Garbage cans with open lids also attract wildlife, especially raccoons, which can cause harm to curious children. Abandoned furniture was also left next to the dumpsters, blocking the sidewalk (Figure 6).

Referring to the infrastructure map (Figure 3), a couple of details were noted. Firstly, there are only two building types found on the MRP site - student residences at 17.6% and an institutional building (kids club) at ~2%. There is an abundance of youth services buildings just outside the MRP area, including 8 child day-cares, 1 youth services administration building, and 1 elementary school. Despite what the metric suggests, there is a high presence of youth on Melfa Road, and the excessive underutilization of parking and overflowing garbage dumps sends a bad environmental message to the youth of the Acadia Neighbourhood.
Ecological Features

Analysis of the canopy cover map revealed that the soft landscape is primarily lawn and wild at 66% and 23%, respectively (Figure 4). There are a total of 101 trees, comprising 18 species from 17 different genera. The most abundant trees are *Acer* at 26%, while *Thuja* comes in a close second at 22%. The trees are 64% deciduous with the remaining 36% being coniferous, providing a canopy cover of 13.5%. This isn't the best cover but in relative terms, it is a small site, and the lack of trees and availability of soft landscape highlights an opportunity to increase vegetation cover to meet UBC canopy cover goals.

Looking at tree health on the site, the majority are in good condition at 76%, while the remainder fall within a fair or poor condition (Figure 5). It’s important to note that most fair and poor conditioned trees are primarily located on the NW portion of the MRP site (Figure 5), which are newly planted trees placed in stressful conditions (heavily paved, poor water availability, etc.). These observations were confirmed during the site visit, where a general lack of tree maintenance was also noted. Branch failures were a common occurrence, increasing overhead risks to pedestrians from falling branches, and covered traffic signs, making it unsafe for passing cars.

Stormwater puddles were frequent during heavy rain events, indicating poor drainage and ground infiltration systems. Periodic excess or lack of water can affect plant health as roots cannot supply water to the leaves and cause shoot death of some trees from poor systems (Madzhi & Nor Akhsan, 2021). Those that survive can be stunted, becoming a safety risk to pedestrians. The lack of trees, poor management of trees, and limited availability of soft landscape highlights the opportunity to increase vegetation cover by planting diverse and/or native species that meet UBC canopy cover and diversity goals.

Physical and Mental Wellbeing

In our review of previous projects that address children-nature connections, we found that guiding children’s attention to explore nature and its surroundings has mental and physical health benefits (Otto, & Pensini, 2017). Otto and Pensini (2017) suggest that combining the acquisition of environmental knowledge with the promotion of an intrinsic driver serves as a holistic approach for increasing ecological behaviour. Studies on TUI’s suggest children care about the aesthetic value of the site and the places they visit (Van Kann, 2015). Therefore, the streets themselves can be developed as destinations for children where they can experience fascination, joy, and education while playing safely without traffic concerns (Duncan et al., 2020).

We found that interventions can cater to different age groups (Tapiro, Oron-Gilad, & Parmet, 2019; White & Stoecklin, 2008). For Melfa Road specifically, outdoor exercise can encourage children to explore their environment, which is important for promoting nature interactions and their personal development (Audrey & Batista, 2017; White & Stoecklin, 2008). Based on the article of designing streets for kids, we highlighted potential areas for change on the Melfa Road (Figure 7). We added outdoor furniture (in green), a playground (in purple), and paths on the grass (in blue) to encourage outdoor activities. Increasing the connection between children and nature will raise the awareness of nature health and develop ecologically friendly behaviour within residents, especially the youth, which is an important step on environment conservation (White & Stoecklin, 2008).
Based on the site assessment, we identified potential areas to enhance on Melfa Road, including excessive perpendicular street parking, littered dumpster areas, and insufficient speed bumps and safety-related traffic signage. During the literature review and precedent review process, we gathered several design solutions that could be applied to the site and mitigate these issues to varying levels. Studies illustrate that TUIs are in most cases not very costly and come in a variety of design forms and presence (Rehan, 2013). The MRP’s main objective is to transform significantly underutilised areas of Melfa Road, especially with hard pavement, into places that provide benefits to the natural environment and lead to increased use of the area.

**Recommendations Overview and UBC Plan Alignment**

Nevertheless, we found that many of our chosen TUI’s align with many of UBC plan’s values, goals, and initiatives. In Figure 8 & 12, the recommendation to add permeable pavement and widening pedestrian lanes to include a bike lane addresses goals in Climate Action Plan 2030 and Campus Vision 2050 – Preliminary Terms of Reference (UBC Board of Governors, 2021; UBC Vancouver Campus, 2021). In Figure 9, the decision to repurpose a parking lot into a playground addresses recreation and accessibility goals in the Wellbeing Strategic Framework (UBC, n.d). This playground design also promotes a calming aesthetic that encourages discovery and feelings of sense of place addresses goals in Campus Vision 2050 – Preliminary Terms of Reference (UBC Board of Governors, 2021).
In Figure 10 & 12, adding green berms with park furniture addresses accessibility goals in the Wellbeing Strategic Framework (UBC, n.d). This recommendation also provides better accessibility to the community garden, which received note in Campus Vision 2050 – Preliminary Terms of Reference (UBC Board of Governors, 2021). Figure 11 aligns with many of the same plans as Figure 9, but Figure 11 also promotes planting biodiverse shrubs and bushes, which aligns with rewilding goals (UBC Board of Governors, 2021).

**Road Safety Improvements**

For MRP safety improvements, we recommend increasing and decreasing the number of signs accordingly. This means reducing signs related to parking regulations; increasing traffic signage, especially stop signs, slow-down signs, and no exit signs to prompt drivers to slow down and look for children crossing. We also recommend adding more speed bumps to control vehicular speeds (Audrey & Ferrer, 2015; Figure 8 & 12). As for the shared road portion, we suggest changing the perpendicular street parking into 45° parking, widening the walkway, and adding a separate bike lane (Figure 8 & 12). Acadia Road north-east of Melfa Road is also a safety hazard. Acadia Road is out of our jurisdiction; therefore, further research is needed for developing possible interventions and recommendations, especially at the bend on the south-east side where the two roads intersect near Norma Rose Point Elementary.

**Ecological Improvements**

For ecological improvements, we recommend adding art drawings on the fences surrounding garbage dumps and install signs reminding residents to keep garbage within the designated area (Figure 8). Referring to the project in New Westminster, kids’ drawings are a good reminder for not only children but also the adults (Happy City, 2021). The introduction of small-scale rain gardens beside the dumpster areas can mitigate pungent runoff and improve overall stormwater management (Rehan, 2013; Figure 8 & 12). We also suggest pruning and thinning the larger trees to remove any dead or decaying branches that could become an overhead to risk to users. We recommend adding berms on the turf lawn to separate the road and greenspaces to provide a safer natural environment, while reducing noise and light pollution (Barnes et al., 2020; Figure 10 & 12). Lastly, we recommend adding steppingstones to create distinct paths and plant flowers throughout to improve the biodiversity (Van Kann et al., 2015; Figure 11).

**Children-Nature Connections Improvements**

To better connect children with nature and encourage them to explore their environment, our recommendations focus on repurposing the parking lot and adding colourful and joyful elements to make the street a safe destination (Duncan et al., 2020). To emphasize a child-friendly theme on Melfa Road, we recommend adding continuous youth elements (Duncan et al., 2020) throughout Melfa Road, also aesthetically enhancing levels of physical activity (Van Kann et al., 2015). Aside from drawings on the garbage fences (Figure 8), colourful installations can also be placed at the enclosing area formed by raised berms as mentioned in ecological recommendations (Figure 10 & 12). Installing colourful chairs captures children’s attention and encourages them to stay and enjoy the time spent in nature (Bertolini, 2020; Figure 11). Drawings can be an effective tool for promoting a fun experience children have with nature (Van Kann et al., 2015). For example, we can repurpose the parking lot in front of the kid’s club into a playground by guiding children to make ground drawings (Figure 9 & 10). We can also make the entrance to nature on the playground clear by adding steppingstones and planting diverse plants in different colours to inspire children's interest in nature (White & Stoecklin, 2008).
Figure 8: Perspective View 1 illustrates recommendations along the Melfa Rd: (1) Repurpose original perpendicular parking into 45°, expanded area can be used to widen sidewalk and introduce a separate bike lane; (2) use permeable pavement instead of hard pavement; (3) add rain gardens beside dumpsters to improve biodiversity; (4) add paintings on dumpster fences, which could be done by kids; (5) add a speed bump to better moderate vehicular speeds; and (6) add SLOW signages to warn drivers there are kids ahead.

Figure 9: Perspective View 2 illustrate recommendations over the parking lot: (1) Make the zebra crossing more visible, we recommend adding colourful paintings; (2) repurposing this parking lot into a playground to encourage children to explore the environment and to better use this area; (3) add wooden playground furniture on the lawn; and (4) introduce more vegetation to increase the biodiversity.
Figure 10: Perspective View 3 shows the green area in front of the community garden and our recommended changes include: (1) Adding a berm between the road and the green space; (2) adding some chairs in diverse colours; and (3) encouraging people to visit the community garden.

Figure 11: Perspective View 4 is a different view of the parking lot in front of the kids club. Recommended changes include: (1) Repurpose the parking lot into a playground; (2) add colourful and joyful drawings to the ground and develop the street as a travel destination; (3) clearly identify the entrance to help guide kids to explore more fun in nature; (4) add bushes to increase biodiversity; and (5) add large stones as seating.
Conclusion

Recent surveys and research into the situation of Melfa Road have shown that the community has a high density of youth facilities but lacks safety features. Despite the extensive greening of the community, the connection between community residents and nature could be strengthened. The purpose of the MRP is to improve community safety and foster connections between children and nature through TUIs. Through site visits and assessments of relevant forms and GIS maps; literature reviews, collection, and summarization of TUIs; we were able to highlight potential locations for safety features that support children’s interaction with nature and link MRP opportunities to our search. The various TUIs found are linked to provide future design ideas.

As UBC grows both in population and density, the need for parks and other recreational opportunities also grows. Growth should not come at the expense of the natural environment, but rather development should be used as a tool to protect natural and cultural resources and enhance the overall quality of life for local users. The MRP’s vision is to support and encourage outdoor habits and imprint a sustainable mindset in the youth.
Acknowledgements

As the MRP draws to a close, we would like to express our deep gratitude to the clients who gave us this opportunity to participate in the MRP, as well as the mentors and classmates who helped us throughout the process.

First, we are immensely grateful to Gabriella Scali, Benjamin Scheuffer, as well as the whole SEEDS team for giving us the opportunity to do this wonderful MRP on the topic and giving invaluable feedback every time, we had a meeting. Secondly, we would also like to show our gratitude to Dr. Rout, Dr. McHale, and Professor Andrew for their guidance and help throughout the MRP. Despite their busy schedules, they still took the time to coach us and answer the questions we raised during the MRP, providing ideas and methods to make the direction of our MRP clear. Here we would like to express our sincerest gratitude to them. We would also like to express our special thanks to our TAs, Kaitlyn Pike and Yaying Zhou for their feedback and patient guidance for each stage of our MRP, which is very helpful for us to improve and perfect the MRP. Finally, we thank Group 2 in this capstone class for working with us to complete the MRP. Their efforts and work have made the whole MRP more complete and diverse and allowed us to analyse and draw conclusions from more aspects.
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Ниязова, С. (2021). Экологическое образование детей в начальной школе. ЦЕНТР НАУЧНЫХ ПУБЛИКАЦИЙ (buxdu. uz), 5(5).


Appendices

Appendix A - Study Site Images

Appendix A1: Location of Melfa Road Project at local scale.
Source: Google Maps, 2022.

Appendix A2: Oblique view of Melfa Road.
Source: Google Maps, 2022.

Appendix A3: Oblique view of Melfa Road.
Source: Google Maps, 2022.
Appendix B - Nearby Youth Services Map

Appendix B1: Smaller scaled image of MRP site showing additional youth services building outside of site boundaries.

Source: QGIS, 2022.
Appendix C - Site Assessment

<table>
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<th>Safety Feature</th>
<th>In the community</th>
<th>Near Norma Rose School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road signs (Safety warning)</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Road signs (unrelated)</td>
<td>26</td>
<td>6</td>
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<tr>
<td>Street parking spots</td>
<td>51</td>
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<tr>
<td>Exposed trash cans placement</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Garbage dumpers</td>
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**Appendix C1:** Table of various safety features noted during site visits.

**Appendix C2:** Table of species and their quantity and average DBH.

**Appendix C3:** Bar graph of Appendix C2.

**Appendix C4:** Graph of tree assessment (type, health, and hazards).

**Appendix C5:** Map of infrastructure features found during site visits.
Appendix D: Elevation Map

Appendix D1: Map of elevation change (~4m) in the MRF.
Source: QGIS, 2022.
### Appendix E: Literature Review Spreadsheet

#### High Relevance Literature

<table>
<thead>
<tr>
<th>Citation Number</th>
<th>First Author</th>
<th>Year</th>
<th>Title</th>
<th>Summary</th>
<th>Utility (Intro, Definitions, Data, Examples)</th>
<th>Relevance (High, Med, Low)</th>
<th>Citation</th>
<th>Other Notes 1</th>
<th>Other Notes 2</th>
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<td>2014</td>
<td>UBC Transportation Plan</td>
<td>INVOLVING THE INTERSECTION BETWEEN CHILDREN AND TRAFFIC: A CONNEXION BETWEEN PEOPLE AND PLAY</td>
<td>This article introduces a service-learning program as a powerful tool to test the relationship between children and nature, with sections on how involving students in pedestrian planning and design</td>
<td>High</td>
<td>The University of British Columbia (2014). UBC Transportation Plan. Retrieved from [link]</td>
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<td>Cramer, J.</td>
<td>2008</td>
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<td>Cramer, J. (2008). Service-learning for connecting children with nature. Retrieved from [link]</td>
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<td>DLJ1_1</td>
<td>Happy City</td>
<td>2021</td>
<td>RECAP - Let children rule the street without cars</td>
<td>The project is being carried out by Happy City in partnership with the City of New Westminster and Glenbrook Secondary</td>
<td>Primary Users: Youth-led placemaking for safer streets</td>
<td>High</td>
<td>Happy City (2021). Retrieved from [link]</td>
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<td>XLL2_3</td>
<td>Tapiri, H.</td>
<td>2020</td>
<td>on pedestrian's visual walkability</td>
<td>The site chosen for the study, the authors used crash data to compare child fatalities around schools in</td>
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<td>Tapiri, H. (2020). on pedestrian's visual walkability. Retrieved from [link]</td>
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<td>XLL2_5</td>
<td>Fencherak, N.N.</td>
<td>2020</td>
<td>on pedestrian's visual walkability</td>
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<td>Fencherak, N.N. (2020). on pedestrian's visual walkability. Retrieved from [link]</td>
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#### Medium Relevance Literature

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<tr>
<th>Citation Number</th>
<th>First Author</th>
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<th>Summary</th>
<th>Utility (Intro, Definitions, Data, Examples)</th>
<th>Relevance (High, Med, Low)</th>
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<td>Streets for people in streets for people in</td>
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<td>KNE2_1</td>
<td>The University of British Columbia</td>
<td>2014</td>
<td>UBC Child Care Expansion Plan Grey</td>
<td>&quot;Children's service needs are met on the academic campus.&quot;</td>
<td>Medium</td>
<td>The University of British Columbia (2014). UBC Child Care Expansion Plan Grey. Retrieved from [link]</td>
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Appendix F - Literature Mind Map

Appendix F1: Literature mind map of ecology, safety, and children themes with respective UBC policy and guideline documents.
### Appendix G – Table of Potential Interventions

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<tr>
<th>Children</th>
<th>Opportunities</th>
<th>Features</th>
<th>Challenges</th>
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</thead>
<tbody>
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<td></td>
<td>Emphasize the play area for children</td>
<td>Playground, turf grass open areas</td>
<td>High expenses, budget limitations, barriers for plants growth</td>
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<td>Connect children with nature</td>
<td>Park furniture</td>
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<table>
<thead>
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<th>Safety</th>
<th>Opportunities</th>
<th>Features</th>
<th>Challenges</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Provide activity area designed for children</td>
<td>Green spaces, parking lot</td>
<td>Lack of maintenance, lack of space, traffic uncertainty</td>
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<tr>
<td></td>
<td>Protect people who use green areas from debris on the road</td>
<td>Bicycle shelter, walkway</td>
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</table>

<table>
<thead>
<tr>
<th>Ecology</th>
<th>Opportunities</th>
<th>Features</th>
<th>Challenges</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Increase biodiversity, increase green area</td>
<td>Rain gardens, permeable pavement, green lanes</td>
<td>High expenses, hard to maintain, less flooding</td>
</tr>
<tr>
<td></td>
<td>Mitigate microclimate</td>
<td>Structural soil &amp; infiltration planters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide activities area</td>
<td>Community gardens</td>
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*Appendix G1: Potential interventions and their features, opportunities, and challenges for themes of ecology, safety, and children.*