Principles of Comprehensive Pedestrian Networks in a Multi-Layered City

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EXECUTIVE SUMMARY

Pedestrians in Hong Kong are faced with unique challenges put forth by the region's multi-layered system of walkways. Our project aimed to identify the positive and negative aspects of walking in Hong Kong, identify principles of a comprehensive pedestrian network, and make recommendations on how to make the region's current networks more comprehensive.

For the purpose of our study, we chose four districts in which we analyzed walkability: Tsuen Wan, Tai Kok Tsui, Tsim Sha Tsui, and Central. We began our research by developing color-coded maps of the pedestrian networks at each grade (ground level, above-ground, and below-ground) for each of these districts. These maps provide a visual representation of walkability, and were used to qualitatively analyze and rank each district based on overall connectivity. Additionally, routes between popular destinations in each district were used to analyze district-wide walkability. They were scored based on the following design parameters: way-finding, accessibility, amenities, and convenience.

Our general observations in combination with our qualitative and quantitative walkability analysis were used to compile a list of recommendations for future urban development. In conclusion, we determined that way-finding, accessibility, and connectivity should be improved. Way-finding is simply improved by increasing the number of directional and street signs and ensuring that they are consistent in both appearance and location. Accessibility should be considered an initial priority rather than an afterthought. Finally, connectivity on the ground level can be preserved by removing unnecessary pedestrian barriers and adding crosswalks when possible. These improvements to Hong Kong's walkability could greatly enhance the quality of life in the region.

ABSTRACT

Walkability can either significantly enhance or diminish the quality of life in urban areas. Throughout history, the needs of pedestrians in Hong Kong have been pushed aside and considered as an afterthought in urban development. Intricate multi-layered networks of pedestrian walkways have been developed to accommodate for high foot traffic and lack of ground space. However, due to their sporadic and uncoordinated construction, these networks are often confusing and frustrating to navigate. Four districts were chosen to represent the pedestrian experience of Hong Kong: Tsim Sha Tsui, Tai Kok Tsui, Central, and Tsuen Wan. After an extensive analysis of the walkability and connectivity of these four districts, a series of recommendations for improvement were compiled. We recommend an increased amount of consistent signage, prioritized handicapped accessibility, and preserved ground-level connectivity. If these recommendations were to be efficiently implemented, the pedestrian networks of Hong Kong would become considerably more comprehensive, leading to a higher quality of life for the region's citizens.

AUTHORSHIP

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CHAPTER 1: INTRODUCTION

Modern cities offer a wide array of travel options, but even with buses, trains, taxis, and more, walking is the preferred method of travel for many people. As one of the most densely populated places in the world, Hong Kong has had to adapt to a rapidly increasing number of pedestrians over the years. Owning a personal car is no longer practical in most urban areas of Hong Kong due to space limitations, so commuters largely rely on public transportation and their own two feet to get to their destinations. Even with the convenient and efficient public transportation offered throughout Hong Kong, some amount of walking is required for most trips. To compensate for un-crossable high-capacity roads and limited ground space, an intricate system of multi-layered pedestrian pathways has developed. As urbanization increased and land reclamation at the harbour front became popular, elevated walkways and underground tunnels were built by the government and private developers to allow for pedestrian transport. Unfortunately, as is the case with most urban planning, vehicular transportation was the primary focus, and these pedestrian networks were built as an afterthought. Vehicular-focused cities can be traced back to the architectural legacy of Robert Moses, who attempted to revolutionize the city of New York. (Dim, 2012) Due to the sporadic construction of pedestrian networks, traveling on foot through Hong Kong has become difficult and confusing.

Multi-layered pedestrian networks have been implemented in a variety of environments. Each of Hong Kong's districts provides an example of a unique pedestrian network. For example, an extensive skywalk system was created in Tsuen Wan, while a large network of underground tunnels were built in Tsim Sha Tsui to connect the two main MTR stations (Tsim Sha Tsui Station and Tsim Sha Tsui East Station). Our goal was to analyze the general positive and

negative aspects of these unique multi-layered walkways in order to compile recommendations on how to make Hong Kong's pedestrian networks more comprehensive. In order to conduct a broad study of Hong Kong's pedestrian networks, we chose four different districts throughout the area: Tsim Sha Tsui, Tai Kok Tsui, Central, and Tsuen Wan. Pedestrian transit was analyzed in each of these districts in order to identify their strengths and weaknesses, as detailed in the Methods Chapter. We present the results of our extensive walkability study in Chapter 4: Results and Conclusions. Our conclusions were compiled in this chapter in order to determine the principles of a comprehensive pedestrian network in the context of a multi-layered city. After analyzing the data and observations collected, we presented a list of recommendations that could improve walkability in Hong Kong and help the city move towards becoming more comprehensive. Our research highlights the need for change, and we encourage policy makers and private developers of Hong Kong to invest their time and effort into improving the area's walkability.

CHAPTER 2: BACKGROUND

2.1 Walkability

In order to understand the goals and significance of this research project, walkability must first be defined and emphasized as a vital aspect of urban planning. Many specific characteristics of pedestrian transport determine the walkability of an area, and ensuring that a city is walkable can provide a multitude of benefits for both its government and citizens.

2.1.1 Defining Walkability

An area can be classified as "walkable" if you are able to travel through it on foot, but whether or not the journey is safe, efficient, or enjoyable is an entirely separate issue. Walkability as a whole encompasses many various characteristics of the pedestrian experience. According to the *Walkable City, Living Streets* dissertation by Simon Ng, walkability "can be summarized as the three D's, i.e. diversity, design, and density." (Ng, Lau, Brown, Tam, Lao & Booth, 2012, p. 14) A fourth aspect of walkability, destination accessibility, was also considered significant by subsequent studies. By analyzing the characteristics detailed in each of these four categories, one can compile a logical backing for a relatively objective classification of "good" and "bad" walkability.

The large majority of urban pedestrians are traveling to transport themselves to a specific location, but their travels can easily be made more convenient and enjoyable when a large variety of amenities are offered along the way. In this sense, diversity is vital along walkways in order to

provide a truly walkable environment. Streets that offer a wide array of shops and restaurants spread throughout residential buildings will not only improve the walking experience for pedestrians, they will encourage others to walk more in that area.

In addition to providing a variety of amenities, streets with satisfactory walkability are designed for safe and efficient pedestrian transport. Neighborhoods with logically organized streets ensure efficient travel. A grid network is preferable, because it simplifies way-finding and yields sufficient connections between roads without high-density intersections, which can become dangerous and confusing. Various other design parameters contribute to the safety of an area for pedestrians. An adequate number of crosswalks can prevent unsafe attempts at crossing busy roads. Vehicle speed should also be controlled in areas where pedestrians are walking close to the roadway. A combination of crosswalk frequency and lower vehicle speed can greatly improve the safety of a pedestrian network since "larger blocks suffer as much as three times more vehicular fatalities than smaller blocks." (Ng, Lau, Brown, Tam, Lao & Booth, 2012, p. 17)

While an area can be considered quite "walkable" if it has a diversity of amenities as well as a safe and efficient street design, pedestrians will be even more satisfied if density is controlled properly. Placing residential buildings and areas of interest too far away from each other will deplete street life and discourage walking as a mode of transport. It can be argued that placing these points of interest too close to one another can lead to over-crowding, especially in highly populated cities, but people naturally gravitate to bustling areas for a sense of safety and sociability. Finding the appropriate balance of density is often the key to designing a city that is enjoyable and rewarding to live in.

Destination accessibility is the final crucial element of pedestrian networks that determines the walkability of a city. In order to maximize walkability, destinations must be relatively easy to access for all pedestrians. This includes continuous pathways, minimal barriers and obstacles, and adequate handicapped accessibility. Other modes of transport may be preferred if pedestrians can't reach their destination on a relatively continuous route. Barriers that prevent crossing the street and large obstacles on the sidewalks will also make walking less desirable. Unfortunately, handicapped accessibility is often overlooked because elevators and wheelchair ramps can be expensive and challenging to implement, which forces the injured, disabled, and elderly to use vehicular transportation rather than enjoy the streets of their city. While a diversity of attractions, safe and efficient street design, and appropriate density of destinations contribute to the walkability of a city, pedestrians will be unwilling and sometimes unable to walk around if their destinations aren't easily accessible. Each of these characteristics – diversity, design, density, and destination accessibility – equally contributes to the overall definition of walkability.

2.1.2 Importance of Walkable Environments

As one of the most densely populated regions in the world, with a population density of about 6,540 persons per square kilometer (Hong Kong Information Services Department, 2012), Hong Kong is not the most ideal place to own a personal car. Parking space is minimal – if it's even available at all – gas stations are scarce, and roads are busy with taxis and public transport vehicles. Even so, 85% of the population still has to travel on an average weekday, and without widespread personal car use, 95% of those trips require walking. (Zimmerman, 2012) Since such a large portion of Hong Kong residents are pedestrians on a daily basis, it is important for city planners to keep their needs in mind. Improving the pedestrian experience is also in the best

interest of the government, because a walkable environment with satisfied pedestrians can greatly benefit a city.

Governments that invest time and money into safe, efficient, and enjoyable pedestrian travel will experience a variety of benefits from their walkable environment. Walkable neighborhoods are attractive to tourists, so increasing walkability could help boost tourism and stimulate the economy. Less people choosing to drive or take taxis will also eventually lead to reduced air pollution. In places like Hong Kong where smog and general poor air quality are becoming increasingly dangerous, this is particularly important. The health of citizens should always be a concern for the government, so any potential reduction of air pollution should be considered. Improving walkability can also benefit public health by promoting healthier lifestyles. Demanding careers with long work days often prevent people from eating healthy and exercising on a regular basis. Just a slightly increasing daily exercise by walking to work would advantage those who have a hard time staying active.

A more walkable environment would not only do wonders for public health, but would also benefit the society as a whole. The social environment of a city flourishes when its people are out enjoying the street life and congregating in public areas. In such a friendly area full of activity, the sense of safety and community is strengthened, which naturally leads to a more fulfilling quality of life. Local businesses attract much more attention and make significantly more money when citizens choose to walk rather than use vehicular transportation. It is much easier to stop into stores for quick errands on the way to school or work when walking, so smaller businesses are less likely to get overlooked. An increase of consumer spending means more opportunity for success in the city and a stronger middle class. Considering the numerous benefits that walking

can provide for a city, pedestrian satisfaction should be a priority for city planners and government policy makers.

In March of 2006, the potential benefits that walkable environments provide came to the forefront of London's society, and an extensive study concerning way-finding throughout the city began. The study, called Legible London, proposed a unified system of way-finding points throughout London to ensure easier navigation for both locals and tourists. This was meant to remedy the problem of inconsistent signage that had previously plagued the city. Similar to current-day Hong Kong, previous signage in London varied in placement and overall appearance, so pedestrians weren't sure what to look for when trying to find their way. The new guidelines dictated the height, pavement location, and fixing of signs, making sure to find a balance in their number and frequency. (Brown, 2006) The system was based on the fact that pedestrians look for similar-looking signs in similar locations when trying to find their way, and they want to find way-finding information quickly and intuitively. (Brown, 2006) If similar concerns are raised in Hong Kong, steps like this can be made towards improving the pedestrian experience in the region.

2.2 Hong Kong Walkability

Hong Kong's mountainous geography, central harbor, and high population density make the creation of a comprehensive pedestrian network both a priority and a challenge. On Hong Kong Island, urban development has been pushed to the coastline due to the overwhelming presence of mountains on the rest of the island. In fact, only 35% of its total land space has undergone urban development. (Jim, 1989) The most developed areas of Hong Kong are located on the waterfront

of Hong Kong Island and Kowloon. (Hamer & Yeung, 1997) Therefore, despite the overall size of Hong Kong, most people tend to collect at the coast, making it one of the busiest places in the world. This fact alone emphasizes the need for walkability to be improved in Hong Kong's urban areas. Additionally, 95% of the population does not own a private car, and therefore relies on walking and public transit for their commutes. (Zimmerman, 2012) Ensuring efficient pedestrian transit is an absolute necessity in such a concentrated, walking-focused population.

2.2.1 Land Reclamation

Land reclamation has historically been a common solution to limited space for urban development. Cities such as Singapore, Macau, New York City, Boston, and Chicago have indulged in a significant amount of land reclamation. This practice has been used in Hong Kong since 1886. (Ng, 2006) By filling swamps, wetland, and seaside, land reclamation yields valuable land space for residential and urban development. Over sixty-seven square kilometers have been added to Hong Kong using this procedure, which comprises approximately 25.6% of Hong Kong's total urbanized area. (Ng, 2006) Even today, there are a considerable amount of land reclamation projects continuing in Hong Kong, including the Central Reclamation Phase III and Wan Chai Development Phase II on Hong Kong Island. When populations are dense and ground space is limited, land reclamation can appear to be the best option, as is the case in Hong Kong.

This is clearly a quick and efficient solution to minimal ground space in cities, but there are considerable drawbacks. Possibly the most significant is the destruction of wildlife habitats surrounding reclaimed areas. Diminishing the waterfront also negatively impacts the aesthetic aspects of the coastline, and encourages water transportation that pollutes the ocean. These

disadvantages of land reclamation have made many countries seriously reconsider their policies and restrict the practice. (Waskey, 2007) In Hong Kong, for example, the Hong Kong Court of Final Appeal halted this type of construction in 2004 because the project "would result in permanent destruction and irreversible loss of what should be protected and preserved." ("Hong Kong court rules," 2004) The limitations on expanding land have caused many cities to find alternative solutions to their decreasing land space and increasing populations.

2.2.2 The Vertical City

Since land reclamation is unsustainable and controversial, Hong Kong has been forced to make the best out of preexisting land, causing "linear clustering and mixed development patterns." (Hui, 2013) As ground space has become scarcer over the years, contractors have chosen to expand buildings upwards, creating an impressive landscape of skyscrapers and high-rises. To accommodate for pedestrians, a multi-layered system of walkways has been developed, consisting of standard ground-level crosswalks, underground pedestrian tunnels, and elevated skywalks. Air pollution from vehicular exhaust in Central, Causeway Bay, and Wan Chai is extremely unpleasant for pedestrians and ultimately leads to serious health issues (Legislative Council, 2002). Hong Kong's high population density also results in large amounts of congestion on the street level. Pedestrians are often forced to walk close to vehicular traffic, which poses many safety hazards. Problems like this have been remedied by separating pedestrians from vehicles with the development of these multi-layered walkways.

Hong Kong has more than five hundred skywalks, making it the highest concentration of elevated walkways in the world. (Legislative Council, 2002) These networks connect over

10,000 residencies, malls, car parks, railway stations, hotels, sport halls, and markets. (Woo, 2011) In combination with the extensive system of underground pedestrian tunnels, these skywalks decrease the safety risks faced by pedestrians walking on the ground, and alleviate a large amount of congestion on ground-level sidewalks. Additionally, these alternative networks provide ample route choices for pedestrians. During unfavorable weather, pedestrians can often complete their entire day of travel without leaving enclosed areas offered by skywalks and underground tunnels. In general, the multi-layered pedestrian networks of Hong Kong have greatly improved the walking experience throughout the region.

Despite the multiple benefits provided by multi-layered pedestrian networks, some design flaws still result in unfavorable walking conditions. One such flaw is the removal of ground-level crosswalks when skywalks or underground walkways have been developed. This forces pedestrians to endure the hassle of level changes and make unnecessary detours, while reducing their freedom of choice during their daily travels. (Zimmerman, 2012) For example, Park Road and Seymour Road of Western Mid-Level completely lack crosswalks, making ground-level travel on foot confusing and often impossible. (Legislative Council, 2002) Additionally, extensive skywalks can have a detrimental effect on the commercial value of ground-level businesses due to the reduction of pedestrian flow. A survey by Woo in 2011 shows that ground-level businesses can experience a reduction in sales of 10 to 50% following the construction of new skywalks in the area. This shows that a balance of street-level connections and alternative networks needs to be achieved. Although the multi-layered aspect of Hong Kong's walkways provides many benefits, some updates could be made to remedy design flaws and greatly improve the walking experience.

2.2.3 Government Policies

In order to understand how government policies are made, it is necessary to understand exactly what they entail. In his study of pedestrian planning in Hong Kong, Chan (2002) defines "policy" with five characteristics: government, course of action, public problem, implementation, and authoritativeness. In order to count as an official policy, it must be implemented by the government and involve a set of actions or decisions with a continuity of purpose. The purpose must involve finding a solution to a public problem through a plan that is implementable, rather than a generalized concept. Finally, it must involve some kind of legislative authority that ensures that it will be enforced. If all of these parts are in place, it is considered an official government policy.

Government policies are debated and put into effect based on government priorities. Walkability and pedestrian interest have slowly come to the forefront of Hong Kong's priorities as the need for walkable environments becomes more and more evident. In 2002, the Transport Department of the Hong Kong government concluded that "85% of the population travels on an average weekday, and 95% of the trips are either walk-only or require walking to and from public transport." (Zimmerman, 2012, p. 1) The Environment, Transport, and Works Bureau (2003) published another paper detailing their strategy for the future of transportation in the city. Recognizing that walking is an important form of transportation, pedestrianization is mentioned as a priority. Primarily, the government was concerned with reducing the conflict between pedestrians and road traffic. There are two different ways this can be accomplished: get vehicles out of the way of pedestrians, or get pedestrians out of the way of vehicles.

"Pedestrianization is the designation of pedestrian exclusive zones." (Chan, 2002, p. 23) By excluding vehicles from an area, safety hazards and general transit conflicts are reduced. These pedestrian-focused areas provide a multitude of benefits, as mentioned in section 2.1.2 Importance of Walkability. There are three different levels of pedestrianization implemented in Hong Kong. A full-time pedestrian street is limited to pedestrians only, with the exception of emergency vehicles. A part-time pedestrian street only allows vehicular access at certain times of the day. There is no street parking on these roads, but spaces are reserved for delivery vehicles to unload cargo, providing local businesses with necessary goods and materials. Finally, there are traffic-calming streets on which pedestrians and vehicles have full access, but road traffic is discouraged. Pedestrians have access to a wider sidewalk on these types of streets, while the vehicular lanes are narrowed, and little to no street parking is available. These types of pedestrianization are implemented in areas that have popular destinations which attract more people. There are often large crowds in these areas, so pedestrians must be segregated from vehicular traffic to reduce safety concerns. (Transport Department, 2013)

In Hong Kong, there are several agencies that aid in implementing pedestrianization schemes:

> The Transport Department was responsible for traffic management issues and the provision of pedestrian facilities at the local level based on the amount of pedestrian and vehicle traffic. The Planning Department, on the other hand, was involved in the provision of basic pedestrian facilities based on its various plans. As for the Highways Department, it too was involved by being responsible for the planning, construction and maintenance of roads and pedestrian walkways.

(Lee, 2004, p. 44)

The process of implementing these schemes starts decisions on what areas require pedestrianization. Complaints from the public and local governments, as well as studies conducted by outside consultants bring attention to these areas that require change. Pedestrianization is then undertaken if the lack of walkway space for pedestrians cannot be solved through other means. Once it is decided that the area must be pedestrianized, the engineers from the Transport Department begin drawing up plans. These plans must be approved by various government departments, followed by consultation from the public. This part of the process is often time-consuming, and the project can only move forward once all parties involved are satisfied. Finally, the Transport Department must obtain sufficient funding before the roadwork can begin. Once the construction is completed, the area is legally designated as full- or part-time pedestrian only. (Chan, 2002)

When vehicles cannot be separated from pedestrians, pedestrians must be separated from vehicles. This involves the creation of above and below-grade crossings, as described in the previous section (2.2.2 The Vertical City). Although 70.4% of pedestrians would prefer to use street-level, or at-grade, crossings (Audit Commission, 2010), level-changes are often required for safety and efficiency reasons. This is especially true on high-capacity roads with heavy vehicular traffic. Too many crosswalks on roads of this type interrupt the flow of traffic, making travel significantly less efficient. When designated crosswalks aren't provided, however, many people will choose to jaywalk: "Crossing facilities located too far away from pedestrian routes could lead to pedestrians creating their own crossing points to the detriment of their own and other road users' safety." (Audit Commission, 2010, p. 1) In order to prevent this, pedestrian

barriers are installed between road lanes and next to sidewalks. In situations like this, the grade-separated crossings (either below or above ground) become very useful and often necessary. (Audit Commission, 2010)

Although most pedestrians express distaste for elevation changes while walking, many measures can be taken to improve the alternative pedestrian networks that exist above and below ground throughout Hong Kong. For example, escalators leading to elevated footbridges and subway tunnels are extremely convenient and greatly preferred by the public. (Audit Commission, 2010) Also, these grade-separated crossings provide weather protection, and are therefore greatly preferred during unfavorable weather conditions. (Zimmerman, 2012) However, a major problem introduced by grade-separated crossings is insufficient handicapped accessibility. In 2012, the Hong Kong's government began implementing a policy of universal accessibility to alleviate this problem. This policy includes the installation of ramps and elevators in places where previously there were only stairs or escalators. (Hong Kong Information Services Department, 2012) If more pedestrian-focused government policies like this were to be implemented, the general pedestrian experience in Hong Kong could be significantly improved.

By completing the extensive background research detailed in this chapter, a sufficient knowledge base of walkability in general was established. Moving forward, we were able to take a fresh look at our research objectives, making a detailed and well-informed plan of action to complete our goals of recommending improvements for the future of pedestrian-focused urban planning in Hong Kong.

CHAPTER 3: METHODS

Once the scope and significance of our project was determined, we began an extensive research study on the walkability of Hong Kong. Multi-layered pedestrian networks were analyzed qualitatively using visual representations of connectivity, as well as quantitatively using a pre-determined scoring rubric and detailed observations.

3.1 Visualizing Walkability

Pedestrian-focused maps of Tsim Sha Tsui, Tai Kok Tsui, Central, and Tsuen Wan were created in order to visually represent the connectivity of each district. The locations of these districts throughout Hong Kong are indicated on the map below.

Figure 1: Map indicating locations of districts chosen for analysis

3.1.1 Mapping Pedestrian Networks

Mapping vehicular roads is a common and well-known process. Pedestrian-focused maps, however, need to take into account all walkable areas, rather than just streets designated for vehicular travel. This includes taking jaywalking into account – streets lacking pedestrian barriers can be crossed at any point, not just at designated crosswalks. Thus, pedestrian-focused maps can be a bit more complicated to generate, and aren't as widely available. In order to visualize the walking experience of Hong Kong, we mapped the pedestrian walkways and identified un-crossable or un-walkable areas in the districts we chose to study.

3.1.2 Mapping Multi-Layered Pedestrian Networks

Mapping pedestrian networks becomes even more complicated when multiple layers of walkways exist, as is the case with Hong Kong. We quickly discovered that visualizing all three layers of Hong Kong's pedestrian networks on one map would be both complicated and ineffective. To remedy this, each layer was represented with a different color and represented on its own individual map. Image-editing software such as Photoshop and Gimp were utilized to superimpose these pedestrian networks over conventional street maps.

In order to locate walkable areas on the street level and above ground, Google Street View was utilized. Ground-level and above-ground connections were easily identified using Google Street View, but additional surveying of our study areas was necessary to find underground connections. Additionally, a combination of Google Street View and field research was utilized to identify "level changes," such as the staircases and escalators that are used by pedestrians to

access skywalks and underground networks. In order to clearly visualize the pedestrian networks, the following color scheme was chosen: ground-level connections were shown in green, underground connections were shown in yellow, above-ground skywalks were shown in blue, un-crossable areas were shown in red, and level-changes were indicated using purple dots. Appendix E displays all of the generated maps, including grade-specific maps, overall pedestrian maps, and maps identifying popular attractions that were analyzed in each district.

3.1.3 Analyzing Connectivity

Connectivity is an extremely important aspect of walkability – a well-connected environment makes pedestrian navigation and transit much more simple and time-efficient. Connectivity is difficult to analyze quantitatively, so we developed a logical system to analyze the connectivity of each of our chosen districts. After developing pedestrian maps using the method described in the previous section, we were able to use them as an accurate visual representation of district-wide connectivity. We chose to analyze each grade of the pedestrian networks separately: above-ground, ground-level, and below ground. We then ranked the connectivity of all the districts – Tsim Sha Tsui, Tai Kok Tsui, Central, and Tsuen Wan – at each of these grades individually. In order to determine the ranking of districts at each grade, several factors were taken into consideration. It was easy to determine by looking at the map how extensive each network is. Additionally, the amount of the district that each network provided access too was determined. Finally, the amount that the network was integrated with other grades and the amount of extra route-choice it provided was taken into consideration. Based on these characteristics, the districts were ranked for connectivity on each grade as objectively as possible. Once these rankings were determined, overall connectivity rankings were generated based on grade-specific connectivity.

The average rank of a district at each grade determined its overall connectivity rank. The logical reasoning behind the ranks was documented in order to ensure objectivity in this qualitative assessment.

3.2 Walkability Analysis

In order to analyze district-wide walkability as accurately as possible, popular destinations were chosen within each district, and the "desire lines" between these attractions were explored. The desire lines contain all logical and straight-forward routes between the destinations. By including all of these routes in the analysis, an accurate representation of the walking experience was achieved.

3.2.1 Measuring Design Parameters

In order to further analyze the walkability of each district, we chose significant design parameters that contribute to an environment's walkability, and recorded whether or not they were present. First, popular destinations within each district were chosen. "Desire lines" that connected these attractions were then used for analysis. Desire lines between attractions consist of all common and logical routes. We then searched for the presence or absence of our chosen design parameters within each desire line. By using this method, the most commonly used pedestrian walkways were evaluated, allowing us observe an accurate representation of district-wide walkability.

When making observations along desire lines, routes were divided into numbered "blocks" – short sections of road that do not require a direction change, street crossing, or level change. The elevation of each block was labeled as either ground, elevated, or underground. Once this general classification of each block was complete, we took measurements based on four chosen design parameters: way-finding, accessibility, amenities, and convenience. Based on our preliminary research, as well as our interviews with professionals in walkability and urban design (Appendix B – Appendix D), we identified what characteristics of a route affect its walkability, and determined that they all fall into one of these four categories. Therefore, scoring the desire lines based on these categories would allow us to quantitatively measure the walkability of a district. The following section explains our scoring system for these design parameters, as well as the process used to rank the districts in each of the four categories.

3.2.2 Ranking District Walkability

After qualitatively measuring walkability by analyzing connectivity based on our pedestrian maps, we developed a scoring and ranking system in order to quantitatively measure walkability. Certain characteristics in each of the four design parameters (way-finding, accessibility, amenities, and convenience) were assigned a point value. If those characteristics were present, the desire line being analyzed would earn the appropriate number of points. If they were not present, no points would be awarded in that category. This point distribution is shown in the scoring rubric below:

Table 1: Point Distribution in Each Design Parameter Category			
Way-finding (3 points possible)	**Accessibility (3 points possible)**	**Amenities (3 points possible)**	**Convenience (3 points possible**
Maps = 1	Ramp = 1	Shopping area = 1	Presence of roof = 1
Directional signs = 1	Elevator = 2	Seating area = 1	Completely enclosed = 2
Street signs = 1		Public toilets = 1	Escalator = 1

As shown in the table above, the scoring system was weighted based on the importance of each aspect. For example, an outdoor area with a roof can protect pedestrians from rain, so it earns the block one point. However, a completely enclosed area, such as an enclosed skywalk or underground tunnel, can protect pedestrians from a multitude of unfavorable weather conditions, so it earns the block two points. The scoring charts for all desire lines are displayed in Appendix F.

A quick statistical analysis of the scores was conducted in order to compare the desire lines with one another. The total score for each category was determined, and this score was divided by the number of blocks to calculate the average score for each desire line. In order to determine the scores for an entire district rather than each individual desire line, the categorical totals for every desire line were added together, and then divided by the total number of blocks examined throughout the entire district. This allowed us to compare the scores between districts, and rank the districts in each category.

The research methods described in this chapter were carried out over the course of seven weeks. By the end of the term, we had a deep understanding of both the strengths and weaknesses of

Hong Kong's multi-layered pedestrian networks. In the following chapter, the obtained results will be presented, as well as the concluding recommendations compiled from our analysis.

CHAPTER 4: RESULTS AND CONCLUSIONS

The results of our research, carried out using the methods described in the previous chapter, are displayed and analyzed in the following sections. First, we will take a look at each of the four districts we studied – Tsim Sha Tsui, Tai Kok Tsui, Central, and Tsuen Wan. We will present our general observations, as well as specific criticisms based on the pedestrian-focused maps that were created and the quantitative scoring analysis that was performed. Once an in-depth look at each district is completed, a summary of positive and negative aspects of walkability in Hong Kong is presented. Finally, the principles of a truly comprehensive pedestrian network are listed, and, most importantly, recommendations for the improvement of Hong Kong's pedestrian experience are made.

4.1 In-Depth District Analysis

As previously described, the walkability of the four chosen districts was analyzed using both quantitative and qualitative measurements. A visual analysis of connectivity was conducted by generating pedestrian maps for their ground-level, above-ground, and below-ground pedestrian networks. Quantitative scoring charts were completed to analyze the desire lines between popular destinations. The following sections are a presentation of our general observations, pedestrian maps, connectivity examination s, and walkability rankings.

4.1.1 Tsim Sha Tsui

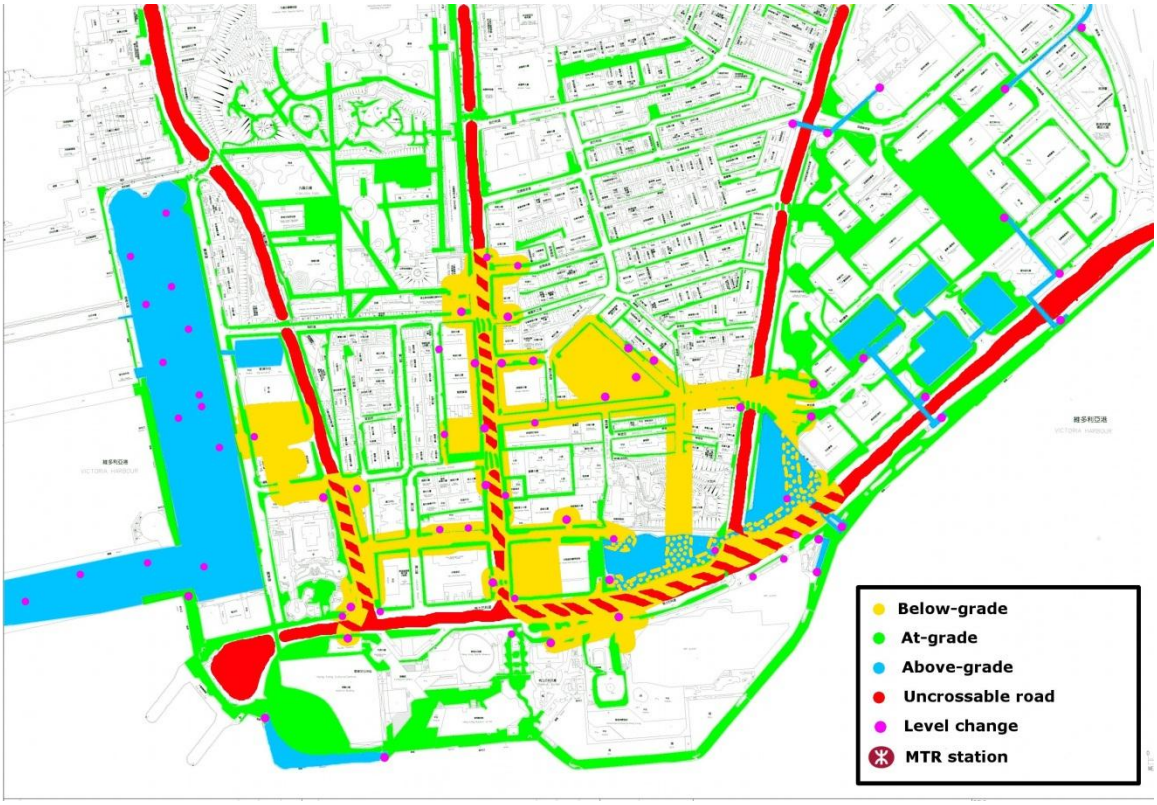

Figure 2: Overall pedestrian map of Tsim Sha Tsui

Tsim Sha Tsui is a district on the tip of the Kowloon Peninsula across Victoria Harbour from Hong Kong Island. It is a major shopping and commercial area that is popular with both locals and tourists, and has a number of residential buildings. Nathan Road is the main high-capacity road of Tsim Sha Tsui. It runs down the center of Kowloon Peninsula and is lined with malls, shops, and other various attractions. Tsim Sha Tsui MTR Station is directly underneath Nathan Road, and West TST Station lies to the southeast. The Hong Kong Science Museum is in the eastern half of the district. Kowloon Park, a large, public garden, is in the northwest of the district. The real draw for tourists, however, is the waterfront. The Avenue of Stars, Hong Kong's equivalent to the Walk of Fame in Hollywood, is perhaps the most popular attraction in Tsim

Sha Tsui. There are also the Harbour City Mall and ferry piers along the western waterfront.

Tsim Sha Tsui has extensive pedestrian networks on every level (See Appendix E.2). Unfortunately, at-grade connectivity is harmed by the presence of high-capacity roads that divide the district into segregated sections (See Appendix E.3). Canton Road and Kowloon Park Drive run north to south in the western part of the district. Nathan Road can be seen running down the center, while Chatham Road South is in the east. All of these roads are difficult for pedestrians to cross due to a limited number of dedicated crosswalks. Salisbury Road, however, is completely void of pedestrian crosswalks at the ground level. These high-capacity roads are the biggest negative aspect of Tsim Sha Tsui's ground-level pedestrian network.

The extensive underground pedestrian tunnels in Tsim Sha Tsui alleviate some of the problems faced by pedestrians when trying to cross high-capacity roads. As seen in Appendix E.5, the tunnels spread out from the below-ground MTR stations and are mainly used to bypass the major roads. This district has probably the most extensive use of underground passages in all of Hong Kong. These passages allow pedestrians to cross Salisbury Road, which is lined with popular destinations. The tunnels also connect to shopping malls, so their use is widespread for both locals and tourists.

As shown on the map in Appendix E.4, the elevated pedestrian networks in Tsim Sha Tsui are rather minimal. A fair number of skywalks have been built in the eastern part of the district, while a few others were constructed to allow pedestrians to cross Salisbury Road. There is also an elevated walkway constructed above Chatham Road South. In the west, most elevated pedestrian areas are found in and around the Harbour City Mall, but these are only meant to add

to the shopping area, rather than serve a substantial purpose in pedestrian transit. A small elevated area also exists near the Avenue of Stars, primarily serving as a tourist attraction and a popular viewing destination for the nightly Symphony of Lights. Since Tsim Sha Tsui has such an extensive underground pedestrian network, development of skywalks has mostly been overlooked, especially in the center of the district where underground tunnels provide the most connectivity.

The map in Appendix E.1 shows the desire lines that were scored as described in 3.2.1 Measuring Design Parameters. These desire lines run from the ferry piers to Kowloon Park, Kowloon Park to the Hong Kong Science Museum, Hong Kong Science Museum to the Avenue of Stars, and Avenue of Stars to Tsim Sha Tsui MTR Station. The scoring sheets for these desire lines are displayed in Appendix F.1 to F.4. General observations were made in each of the four categories as the scoring charts were completed.

Since Tsim Sha Tsui is mainly a commercial district, it proved to be satisfactory in terms of shopping-related amenities. In general, an ample number of various shopping locations are evenly spread throughout commonly traveled streets. As far as public seating areas and public toilets go, however, Tsim Sha Tsui was not as adequate. Public seating areas were mainly only found along the harbourfront and within parks, but most routes throughout the shopping areas were severely lacking in seating. There are also very few public bathrooms. Toilets are offered in most stores and shopping areas, but public bathrooms on the street were not prominent. It is not ideal to have to enter a shopping area to access a bathroom, because many shop owners require a purchase to be made before allowing pedestrians to use their facilities.

The convenience of weather protection is present in many areas throughout Tsim Sha Tsui. The extensive underground network provides full weather protection during unfavorable conditions since it is fully enclosed. The majority of skywalks are also covered with a roof, providing some relief on rainy days. There is even some weather protection offered on the ground level due to awnings and building overhangs. These types of weather protection are not ubiquitous, though. Escalators are also quite prominent, which makes level changes seem like much less of a hassle for pedestrians.

Handicapped accessibility is very inconsistent in Tsim Sha Tsui. In many places it doesn't exist at all. Ramps are sometimes offered, but they aren’t always useful for people in wheelchairs who do not have the strength to transport themselves on inclines. Ramps are also useless when they only provide partial accessibility. For example, Exit A1 of Tsim Sha Tsui MTR Station has a ramp that only goes halfway up to the entrance, with stairs going up the rest of the way, as shown in Figure 3. The only fully useful accessibility points are elevators, which are not offered at every level change, and only exist at select MTR station entrances. Additionally, when these elevators are present, there is often insufficient signage indicating their location. For handicapped pedestrians, traveling through Tsim Sha Tsui is challenging and often requires long, confusing detours.

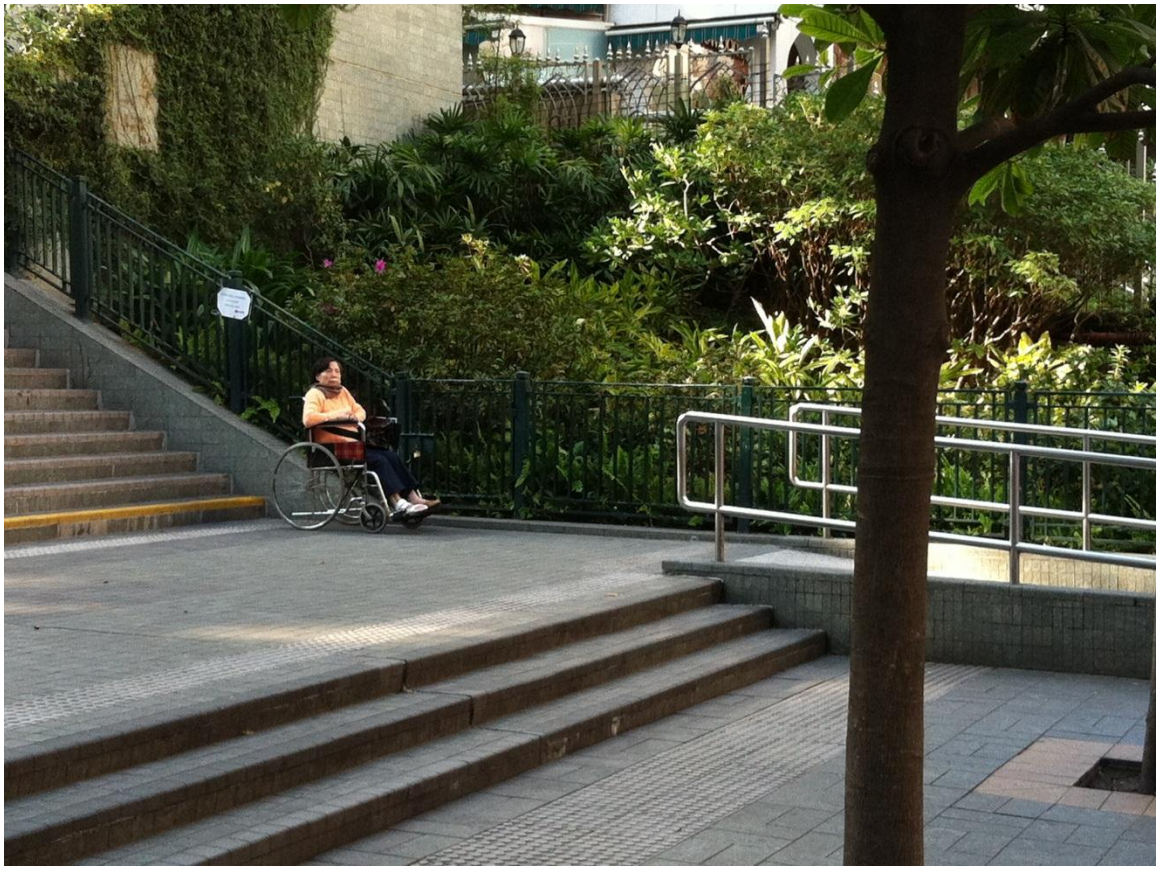

Figure 3: Incomplete handicapped accessibility at Exit A1 of Tsim Sha Tsui MTR Station

Way-finding is also occasionally problematic in Tsim Sha Tsui. As with the other districts, signs pointing towards MTR stations are usually very easy to find due to their consistent appearance and frequent placement. Maps located within the MTR stations also contribute to satisfactory way-finding. Problems with way-finding are encountered as pedestrians travel out into the district and begin exploring the alternative networks. When on the ground level, pedestrians may have a hard time figuring out which underground tunnel or skywalk they should enter because there is a lack of signage indicating where these networks will lead. For example, entrance into the underground tunnel is necessary to cross Salisbury Road, but the sign with this information does not indicate where the entrance for the underground tunnel is located. Street signs are not always placed in consistent locations, which makes traveling on the ground-level equally

frustrating and confusing without prior knowledge of the area. Additionally, the maps that are occasionally offered within tunnels only indicate the underground network, unlike the MTR maps which give a full representation of the ground-level as well as exit locaters for the underground level. These frustrating way-finding problems could easily be remedied with proper planning.

Overall, Tsim Sha Tsui is characterized by an extensive underground network, a heavily segregated ground network, and a minimal elevated network. There's lots of shopping, but little seating and few public bathrooms. There is plenty of weather protection and escalators. Handicapped accessibility is inconsistent and frustrating, and way finding can be difficult when trying to cross major roads. Although this district has some strengths in terms of walkability, there is much to be improved upon.

4.1.2 Tai Kok Tsui

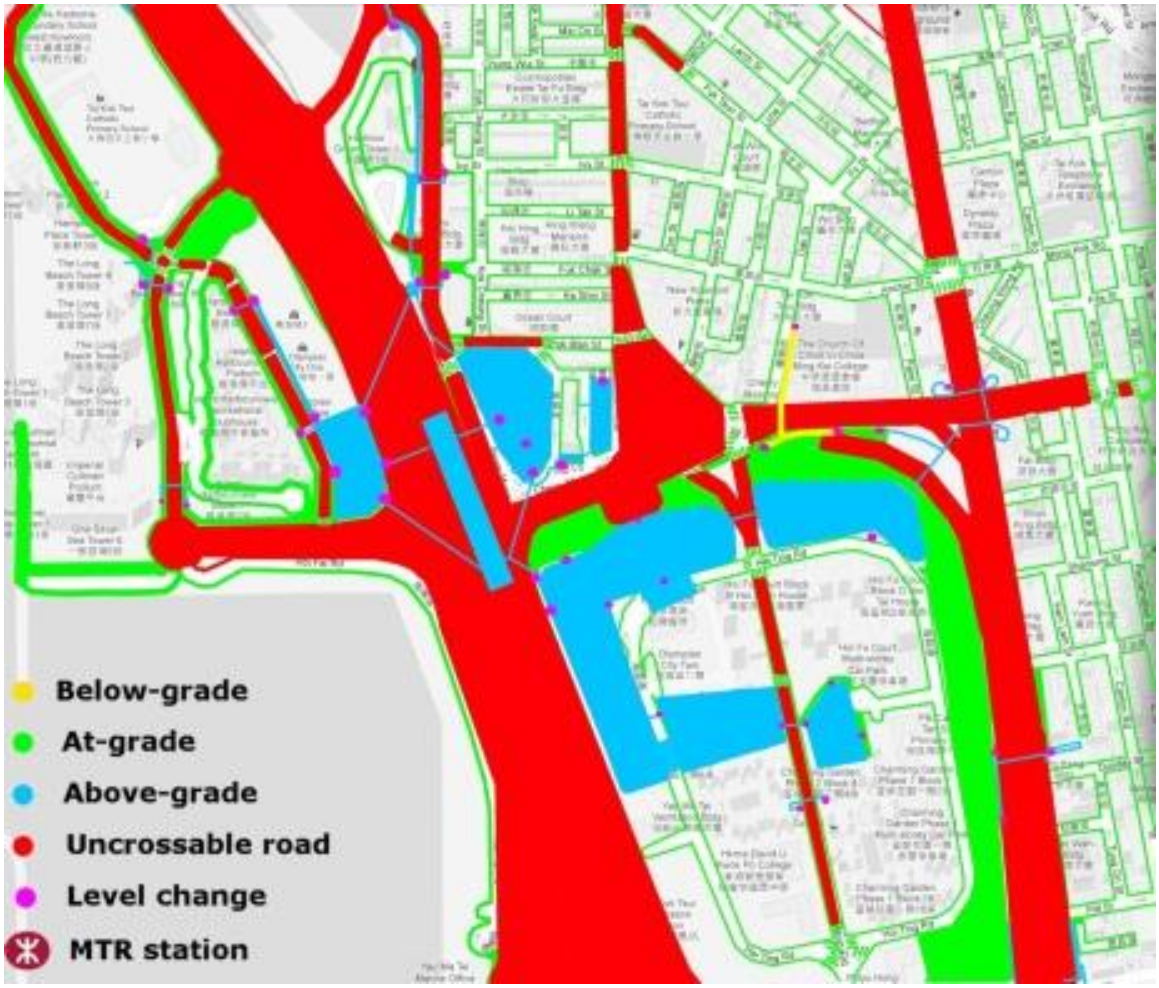

Figure 4: Overall pedestrian map of Tai Kok Tsui

Tai Kok Tsui is on the waterfront of west Kowloon peninsula. It is primarily a residential and industrial area, so there are much more local citizens than tourists on average, especially compared to Central and Tsim Sha Tsui. Since Tai Kok Tsui is not recognized for tourism, there is only a small number of attractions, such as Olympic Station, the Olympian City shopping centers, and the minimal waterfront. As shown on the map in Appendix E.6, desire lines between Rosedale Hotel, the waterfront, and Olympian City 2 were chosen for use in analyzing the

district's walkability. Appendix F.5 and Appendix F.6 display the scoring charts for these desire lines. Four high-capacity roads run in the north-south direction through this district: West Kowloon Highway, West Kowloon Corridor, and Nathan Road. In the east-west direction, Cherry Street separates the district into two halves.

As shown on the map in Appendix E.7, pedestrian areas in Tai Kok Tsui are mostly present on the ground-level and above-ground. The only underground walkway in this district, shown in Appendix E.10, provides a spot for pedestrians to cross Cherry Road. Appendix E.9 shows the skywalk system in Tai Kok Tsui, which exists in a spider-like structure that radiates from the Olympic MTR Station. This network connects the MTR station to residential buildings and shopping areas, which is preferable for leisurely walking. However, pedestrians are forced to use these skywalks to cross some high capacity roads, requiring many detours and a reduction in route choice. A positive aspect of connectivity in this district is shown in Appendix E.8 – the narrow roads in residential and small-business areas make the ground-level easy to navigate on foot. Pedestrian barriers aren't used very often in these areas, which allows for easy street crossing. Additionally, these narrow streets are generally set up in a grid-like structure, making for easy navigation and efficient connectivity.

The amenities of Tai Kok Tsui are rather lacking, especially when compared to the other three districts in our study. Near residential areas, there are occasionally small shops, but a trip to Olympian City or Langham Place is necessary for an ample amount of shopping. This can be expected in such a small residential area, however. Seating areas and public bathrooms are also lacking in Tai Kok Tsui. Since most shopping areas are small businesses, pedestrians would most

likely not be able to use those bathrooms during their trips without making a purchase first. Simply adding public toilets and seating areas could greatly improve walkability in this district.

As far as convenience is confirmed, which we defined as the presence of weather protection and escalators, Tai Kok Tsui scored extremely well. Its elevated networks are fully enclosed, providing full weather protection, which is extremely favorable during cold winter months or rainy days. Awnings and building overhangs are also commonly found along ground-level walkways. Escalators are also very common, especially near the few designated shopping areas, which makes changing levels much more convenient for pedestrians.

Handicapped accessibility was also extremely satisfactory in Tai Kok Tsui. Pedestrians commonly only come to this district for the attractions near the elevated walkways, so these areas have the highest amount of foot traffic. For this reason, elevators are almost always offered, both for the convenience of pedestrians, and for accessibility for handicapped pedestrians.

The biggest difficulty encountered while traveling through Tai Kok Tsui is way-finding. Especially when compared to the other three districts of study, signs are extremely lacking. Since Tai Kok Tsui is not a very popular tourist destination, there are no directional signs pointing to attractions, and maps are extremely rare. In fact, maps are usually only found within shopping areas, and only depict the stores within the building. Street signs are also very inconsistent in placement throughout the district. It is not uncommon to see smaller side streets that are completely lacking any type of street sign. Also, small, barely visible street signs are

occasionally placed high up on buildings. Survey knowledge of the area is required to efficiently travel on foot.

4.1.3 Central

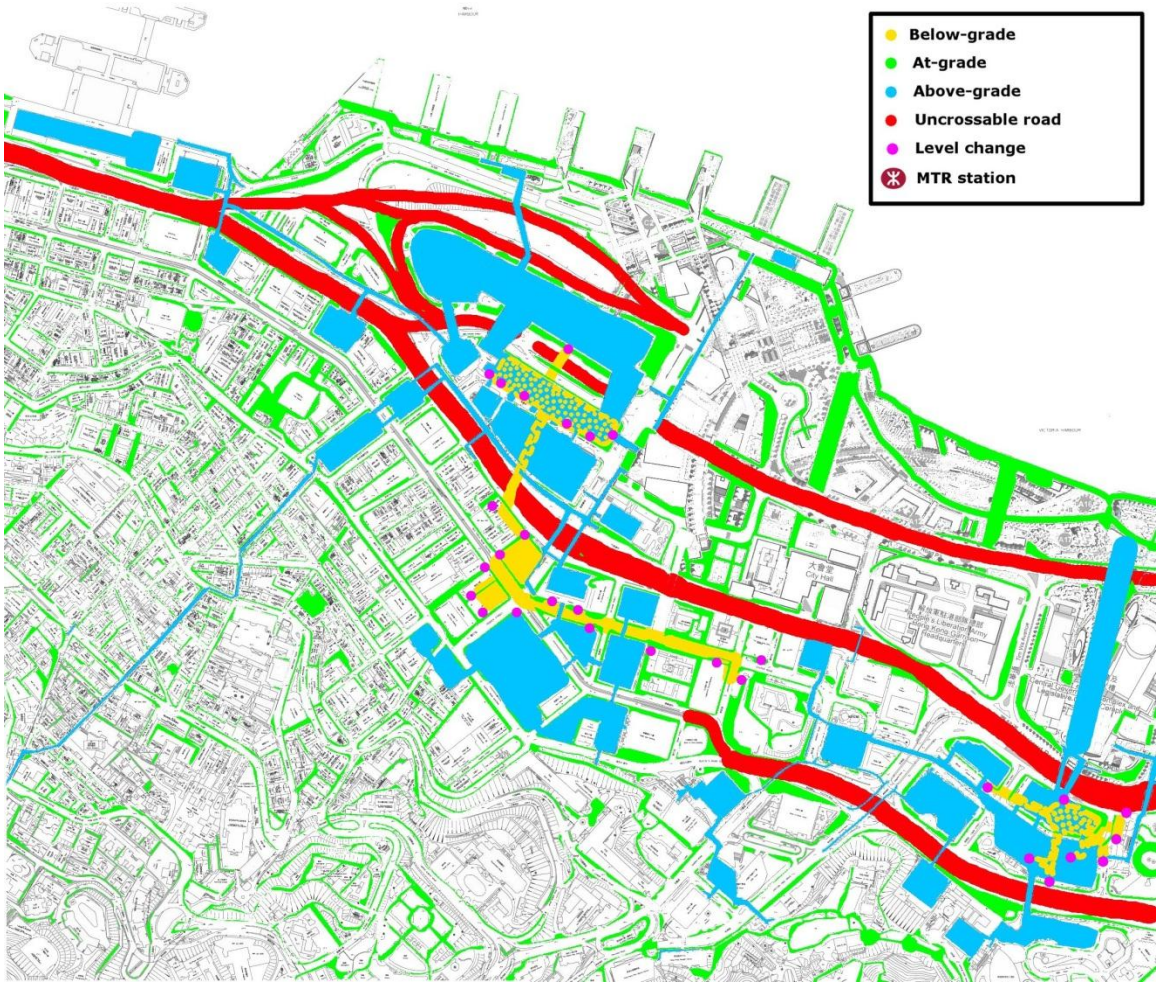

Figure 5: Overall pedestrian map of Central

Central – largely commercial and business district – was observed in the context of the four predetermined scoring categories: accessibility, way-finding, amenities, and convenience. Central MTR Station, Hong Kong Park, Lower Peak Tram Station, and the Star Ferry Pier are

commonly visited popular destinations that were included in the district analysis. In order to quantitatively score the district in the four categories, desire lines between these popular attractions were explored. These desire lines are displayed on the map in Appendix E.11. As previously stated, desire lines consist of the logical routes between two chosen destinations. The scoring charts for the desire lines in Central are displayed in Appendix F.7, F.8, and F.9.

While scoring the desire lines, many general observations were made about each of the four scoring categories. The significant commercial and business influence in Central was very evident during initial observations. In this sense, the amenities of the district were very desirable. Not only was a large amount of shopping offered, but there was a sufficient diversity of amenities. In the same neighborhood as large shopping malls and office buildings, it was easy to find a wide variety of restaurants, bakeries, tailors, and other businesses with many different services.

In terms of convenience, Central also proved to be satisfactory. Ground-level connectivity was maintained, with sufficient crosswalks and pedestrian lights. The skywalk system in Central was well-integrated and easy to navigate. Skywalks are at logical locations so pedestrians don’t have to search very far to cross high-capacity roads or access above-ground shopping areas. Since ground-level connectivity is also maintained, pedestrians have the convenient option of remaining on the street to complete most of their journeys.

Most importantly, way-finding proved to be a simple task in Central. Directional signs pointing to popular destinations, depicted in Figure 6, were common along busy streets. The entire route from Central MTR Station to the Lower Peak Tram Station was completed by relying solely on

these directional signs, rather than portable GPS devices as many of the other routes required.

Figure 6: Directional sign pointing to popular destinations in Central

Unfortunately, there was a lack of signage outside of level changes indicating where skywalks would lead. In some cases, they weren't necessary because there was only a short section of elevated walkway, so it was evident where it leads. In most cases, however, stairs and escalators led up to an intricate system of skywalks. Before entering these skywalks, it was unclear where they would lead. The more commonly traveled skywalks that led to popular destinations sometimes had directions and maps inside, but the lack of exit and entrance indicators on the ground level could lead to confusion. Another negative aspect of the skywalk system in Central is that without warning, many skywalks would lead directly into shopping areas. It can be argued that this increases business in those stores, but it clearly leads to a lot of confusion and frustration for pedestrians that are just trying to reach their final destination.

Another negative observation made in Central pertains to handicapped accessibility. Although the large majority of skywalks, shopping centers, and various businesses were accessible, there was a lack of signage pointing towards ramps and elevators, and long detours were often required to get to these points of accessibility. Walking through Central can be exciting and easy, but difficulties are encountered for those who are unfamiliar with the area and for the handicapped.

Creating and observing the pedestrian maps of Central (displayed in Appendix E.11, E.12, E.13, E.14, and E.15) revealed some positive aspects of connectivity in the district. Ground level connectivity, displayed clearly in the map in Appendix E.13, was maintained with easily crossable streets, and many crosswalks complete with pedestrian lights on high-capacity roads. The extensive skywalk system in Central, represented on the map in Appendix E.14, is also favorable. It allows for easier access to certain areas, weather protection during unfavorable conditions, separation of pedestrians from vehicles, and a divide of pedestrians that lowers hectic foot-traffic.

The pedestrian maps of Central also revealed some negative aspects of the district's connectivity. As shown in the map in Appendix E.15, the underground network of Central is minimal. Many Hong Kong citizens work in Central, and it is a popular destination for both locals and tourists. With such a large number of pedestrians every day, a more extensive underground network could be beneficial. Additionally, high capacity roads segregate the ground level of Central from its harbourfront. The harbourfront is a desirable aspect of every coastal district in Hong Kong, so easy access is preferred. The lack of ground-level connection to the harbourfront means that pedestrians have no choice but to access the skywalk system if they wish to reach the water. Navigating in Central can also get very complicated because the ground-level is not set up in a grid structure. Streets that intersect at strange angles can be confusing, and leads to less efficient connectivity at intersections. Problems that arise while walking in Central are clearly pinpointed when the pedestrian networks are represented visually, as they have been in these maps.

4.1.4 Tsuen Wan

Figure 7: Overall pedestrian map of Tsuen Wan

Tsuen Wan is located in the western New Territories, and is primarily a residential district with some shopping areas. Its major destinations include the two MTR stations (Tsuen Wan and Tsuen Wan West), the town hall, ferry piers, and playground on Sha Tsui Road. The map in Appendix E.16 depicts the desire lines between these attractions that were chosen for walkability analysis in the district. The scoring charts for these desire lines are shown in Appendixes F.10 through F.13. The extensive elevated network of Tsuen Wan, depicted in the map in Appendix E.19, extends from Tsuen Wan MTR Station in the north to the residential buildings and Town Hall in the south. This convenient connection between attractions allows for efficient travel with minimal detours, although it does reduce route choice for pedestrians that prefer traveling on the ground. Additionally, these skywalks often lead into residential buildings, which is confusing for pedestrians who are unfamiliar with the area and may not know how to get back down to street-

level. When pedestrians are able to travel on the ground network, however, they can easily navigate through the convenient grid-like structure of walkable areas with ample crosswalks across busy roads. Although the underground network in Tsuen Wan is rather lacking (see Appendix E.20), it does provide a connection to the ferry piers, and connectivity is preserved with the ample number of skywalks and sufficient ground-level crosswalks.

Tsuen Wan is generally lacking in amenities, especially in comparison to the other three districts of study. Although some shopping malls exist throughout the district, it is generally lacking in street-level shopping areas. As commonly seen, elevated pedestrian networks often do not have many shopping areas. Since the elevated network of Tsuen Wan is so widespread and commonly used, this becomes more apparent and reduces the possibility of attracting tourists. Public toilets and seating areas are extremely rare as well. For this reason, leisurely walks through Tsuen Wan are not particularly attractive, and it seems like most pedestrians in the area are only traveling to leave or get back to their homes.

One redeeming quality of the walking experience in Tsuen Wan is relatively effective way-finding. Directional signs pointing to attractions were scattered throughout the districts, and signs indicating the locations of exits from skywalks were present. Many maps were offered inside of the two MTR stations, and the grid-like structure of the ground-level pedestrian network made navigation much simpler. Tsuen Wan was also one of the only districts which had signs on the ground outside of level-changes indicating where skywalks or tunnels would lead, although it seems as if these were in place due to ongoing construction, as shown in Figure 8.

Figure 8: Exit indicators for a skywalk in Tsuen Wan due to ongoing construction

The convenience of weather protection was scarce on the ground level, but the extensive skywalk system provided fully enclosed areas for pedestrians to walk without experiencing unfavorable weather conditions. In terms of handicapped accessibility, Tsuen Wan was rather lacking. Ramps were extremely rare, and when elevators were offered, they were hard to find and required long detours away from the main entrances for level-changes. For this reason, most handicapped pedestrians are forced to remain on the ground level while traveling through Tsuen Wan, reducing their route choice and the enjoyment of their trip.

4.1.5 Walkability Rankings

The four districts were ranked in the following categories: way-finding, accessibility, amenities, convenience, and connectivity. The method described in 3.1.3 Analyzing Connectivity was used

for connectivity rankings. Since each district has unique characteristics of connectivity at each grade, they were first ranked by individual grades: ground-level, below-ground, and above-ground. These rankings were then used to determine the overall connectivity rankings.

For above-ground pedestrian networks, Central was determined to have the best connectivity. Not only are the skywalks in Central extensive and cover a large area of the district, but they provide multiple convenient crossings for pedestrians to travel across high-capacity roads. Tsuen Wan had the second best skywalk system due to its extensive nature around MTR stations and popular attractions. Unlike in Central, however, these skywalks do reduce some of the route choice on the ground level. Tai Kok Tsui has a fair number of elevated networks, but they are not nearly as extensive and are narrowly focused around MTR stations. Since skywalks are only found in small areas around the edges of Tsim Sha Tsui and are absent from the center, this district was determined to have the worst above-ground connectivity of the four chosen districts.

Tsim Sha Tsui's extensive and well-connected underground pedestrian networks earned it first place on this grade. They cover a large area and conveniently connect popular destinations. Central comes in second place for underground networks because of the connections its tunnels provide across high-capacity roads. Tsuen Wan has slightly more underground tunnels than Tai Kok Tsui, so it was ranked third on this grade, although neither of these districts fully utilizes underground networks to improve their connectivity.

Central was determined to have the best ground-level connectivity due to its large number of walkable areas and common street-level crosswalks. Although pedestrian barriers are fairly common in Central, they do not interfere with the placement of proper crosswalks. A smaller

number of walkable areas on the ground level caused Tsim Sha Tsui to come in second place, although its grid-like structure does improve connectivity on this grade. Tsuen Wan has many pedestrian barriers, making ground-level travel difficult, so it came in third place. There are, however, a small number of crosswalks on high-capacity roads that improve ground-level walkability. Tai Kok Tsui, however, was ranked last for ground-level connectivity due to a high number of pedestrian barriers and minimal crosswalks. In fact, West Kowloon Highway is completely un-crossable at street level and many of the narrow roads in industrial neighborhoods lack crosswalks all together.

The rankings of the districts at each grade were averaged to determine their overall connectivity rankings:

Table 2: Overall Connectivity Rankings
1. Central
2. Tsim Sha Tsui
3. Tsuen Wan
4. Tai Kok Tsui

Using the scoring method described in 3.2.1 Measuring Design Parameters, and the ranking method described in 3.2.2 Ranking District Walkability, the desire lines of each district were scored (see scoring charts in Appendix F) and used to rank the districts in terms of way-finding, accessibility, amenities, and convenience. The district-wide scores in each category are as follows:

Table 3: District-Wide Design Parameter Scores				
District	Tsim Sha Tsui	Tai Kok Tsui	Central	Tsuen Wan
Way-Finding Score	41.7%	34.7%	50.9%	36.9%
Accessibility Score	18.5%	66.7%	43.3%	23.1%
Amenities Score	32.3%	25%	29.8%	19%
Convenience Score	32.8%	61.3%	43.9%	39.6%

Based on these scores, the districts were ranked in order from best to worst in each of these categories. The results are as follows:

Table 4: Walkability Rankings			
Way-Finding	**Accessibility**	**Amenities**	**Convenience**
Central	Tai Kok Tsui	Tsim Sha Tsui	Tai Kok Tsui
Tsim Sha Tsui	Central	Central	Central
Tsuen Wan	Tsuen Wan	Tai Kok Tsui	Tsuen Wan
Tai Kok Tsui	Tsim Sha Tsui	Tsuen Wan	Tsim Sha Tsui

4.2 A Comprehensive Hong Kong

Our research in Tsim Sha Tsui, Tai Kok Tsui, Central, and Tsuen Wan gave us an overall look of the pedestrian experience in Hong Kong. After generating pedestrian maps and ranking the various aspects of walkability, we identified the characteristics of comprehensive pedestrian networks as well as the positive and negative aspects of Hong Kong's current networks. Based off of these conclusions, we have compiled a list of recommendations to mold Hong Kong into a more walkable environment.

4.2.1 Defining a Comprehensive Network

Defining what makes a network comprehensive involves many different factors. A previous study, Study on Planning for Pedestrians, defines a comprehensive network as a network made up of "safe, uninterrupted, convenient and pleasant passageways for pedestrian movement between activity generation and attraction points" (Zimmerman, 2012). These networks consist of the elevated walkways, subways, and elevators. The study brings up the benefits of relieving pedestrian overcrowding at the ground level as well as reducing the need for cars or public transport for short trips. Another study, the Road Safety Review (Zimmerman, 2012) instead calls for "comprehensive segregated pedestrian networks" in order to combine complete safety with maximum convenience. This safety would come from diverting the flow of pedestrians away from the ground level and therefore the flow of traffic. Both of these definitions rely on the multi-layered networks in Hong Kong in order to increase the pedestrian capacity of roads and deal with Hong Kong's high population density and existing road network. A network which has many high volume roads running through populated and economically active areas, creating conflicts between pedestrians and traffic flow (Zimmerman, 2012). This setup, however, has resulted in a loss of the street grid and instead resulted in isolated islands with walls that upset the existing public grid and connections (Zimmerman, 2012).

For this study, the definition of a comprehensive network will build upon the two definitions that introduced this section, as well as take into account the walkability factors discussed earlier. As Hong Kong consists of multiple layers, with each layer affecting the others, it is imperative to view the network as consisting of all three layers, elevated, ground, and underground, in addition to the connections between them. In terms of what qualities define a comprehensive network, it

will be considered a system which is safe, convenient, pleasant, and provides choices of route for the pedestrian.

Safety involves removing pedestrians from vehicle traffic that could potentially be dangerous, whether through multiple layers or other methods. Convenience encompasses the levels of handicap accessibility, way-finding, and amenities; all of which should be readily available in truly comprehensive network. Whether the network is considered pleasant is based on factors such as weather protection and aesthetic qualities of possible routes. The final piece of the comprehensive network is the amount of choice a pedestrian has for his route. This factor is based on the connectivity of the network and how many routes between destinations exist. The existence of the connections allow for people to have different routes to account for different types of weather or for different types of walks. While people normally prefer ground crossings, when an inclement climate is introduced, a preference for weather protected elevated walkways or subways become apparent (Zimmerman, 2012). Also a person who is going for a leisurely walk will care more about visuals during a walk than someone who is walking purely to get to his destination. The connections also make walking easier to find shorter routes. Currently the MTR invests in links between stations and nearby developments, but connection between and within districts are lacking (Zimmerman, 2012).

4.2.2 The Current Positives

Hong Kong's pedestrian networks, in their current state, cannot be considered "comprehensive." However, during the observation of the four chosen districts and the development of pedestrian maps, some positive aspects of walkability were identified.

The presence of shopping areas definitely contributes positively to a walkable environment. These areas create a positive feedback loop, in which people are encouraged to walk because they will pass by many businesses, and businesses benefit from the increase of customers as more people choose to walk. In all four chosen districts, shopping areas were always within walking district, and a variety of businesses were often present.

The option of weather protection is also important in a walkable environment. Enclosed skywalks and underground pedestrian tunnels provide weather protection in all areas of Hong Kong. When above-ground and below-ground networks are extensive, pedestrians have the option of remaining safe from unfavorable weather conditions and roadside air pollution. In some cases, a certain amount of weather protection is offered at the ground level because of large awnings, enclosures extending from buildings, and pathways that are underneath skywalks. It can be seen on a rainy day that this shielding is greatly appreciated by pedestrians.

Another feature that adds convenience for pedestrians is the presence of escalators. Escalators are quite common in districts with popular tourist attractions, making traveling easier and more enjoyable. Most exits and entrances for MTR stations offer escalators as well. In general, MTR stations are quite convenient for pedestrians. In addition to escalators, they always have maps of the surrounding area, as well as descriptive signs for the location of each exit. It is always easy to find an MTR station due to the universal symbol on signs pointing towards them in the surrounding areas.

These positive aspects of walkability are not present in every district. They all contribute to a more walkable environment, and many of them can be easily implemented throughout Hong

Kong. A higher presence of these characteristics, as well as a minimization of the negative characteristics, would make the pedestrian networks of Hong Kong much more comprehensive.

4.2.3 The Current Negatives

As difficulties were encountered while walking through our chosen districts, we took note of the specific aspects that were negatively affecting walkability in Hong Kong. The presence of high-capacity roads was one of the first obstacles encountered. These cannot be avoided due to the demand for efficient vehicular traffic and have therefore become a significant problem for pedestrians. Specifically, barricades on either side prevent pedestrians from crossing them. These roads therefore districts into a series of "walkable" areas divided by un-crossable lines. This segregation has been remedied with the addition of walkways at other levels. The problem with this solution is that long detours are often required to access level-changes, and there is often a lack of signage indicating their location. Forced level changes also reduce the amount of choice that a pedestrian has for their route and eliminate foot-traffic on the ground level. Pedestrian transit on the ground level should be preserved as much as possible because it makes navigation easier and can positively impact businesses along the street. Forced level changes are also undesirable because they cause more congestion on skywalks and in underground tunnels. Enabling ground-level walking can remedy all of these problems.

Inconvenient handicapped accessibility has also proven to be an issue in many areas of Hong Kong. Long detours are often required to access ramps and elevators, and there is a lack of sufficient signage to indicate where pedestrians can find these accessibility points. Even more problematic is that handicapped accessibility is incomplete in some areas. For example, at exit

A1 of the Tsim Sha Tsui MTR station, a ramp was constructed halfway to the entrance, followed by stairs, making it impossible for pedestrians with mobility issues to enter the station.

Another significant concern is that there is a lack of public utilities in most districts, such as restrooms and seating areas. In most cases, pedestrians have to enter shopping centers, restaurants, or other businesses to access toilets, which are often not open to the public. Additionally, when these amenities are offered, they are usually only seen at the ground-level. Districts with extensive skywalks (like Central) or extensive underground pedestrian networks, (like Tsim Sha Tsui) could greatly benefit from adding these facilities to their alternative networks. Without the ability to access a restroom or sit down to take a break, many people may choose other forms of transportation rather than inconveniencing themselves by walking.

Way-finding in Hong Kong also varies drastically, depending on the area and district that is observed. Directional signs are rare, and maps are usually only located inside of MTR stations, so pedestrians that are unfamiliar with the area in which they're walking can easily get lost. When maps and directional signs are present, they vary greatly in appearance, so they can easily go unnoticed. Even standard street signs vary in their placement – some are located on posts at intersections while some are placed high on buildings. In neighborhoods without many tourist attractions, sometimes street names aren't indicated at all. Directional signs are also omitted in areas that aren't extremely popular with tourists. Central has a considerable amount of this kind of signage, while areas like Tai Kok Tsui (which is mostly industrial) are neglected in terms of way-finding. This makes navigation confusing for those who are unfamiliar with the area, and prevents them from coming across popular destinations such as Langham Place and Olympian City.

In addition to maps and directional signs, indicators of exits and entrances for level-changes are also very rare. More often than not, pedestrians cannot be sure of where a skywalk or underground tunnel will take them until they have switched levels. Even then, many of these alternative networks lack exit indicators all together. Pedestrians must often have prior knowledge of the area in which they are walking if they wish to efficiently navigate the alternative networks of Hong Kong's multi-layered pedestrian walkways. These negative aspects of walkability, along with the positive aspects identified earlier, should be taken into consideration when planning for the future of Hong Kong's pedestrian transit.

4.2.4 Recommendations for Improvement

The analysis of the four chosen districts, as well as the general positive and negative aspects of walkability, were compiled to come to conclusions about what improvements should be made in Hong Kong. If these recommendations are implemented by urban planners and developers in the future, great strides can be taken towards making the multi-layered pedestrian networks of Hong Kong much more comprehensive.

First and foremost, improvements should be made in handicapped accessibility. Ramps and elevators should be planned as forethought for all pedestrian networks that are built in the future, rather than including them as a retrofit after construction is complete. These points of handicapped accessibility should be built close to main entrances and stairs so they are easy to find, and those with mobility problems do not have to take unnecessarily long detours. Signs indicating these points of access should also be added. In existing networks, signs of this nature should be installed at a much higher frequency, and *complete* accessibility should be ensured.

Ubiquitous way-finding should be considered equally important. Central is a good example of consistent signage leading to major destinations – this should be used as a model and applied in other districts. Simply adding the types of directional signs seen throughout Central in every district would be an inexpensive and efficient way to make the rest of Hong Kong considerably more walkable. Additionally, signs should be consistent in appearance and noticeable. Street signs should be placed at similar locations on every street, and way-finding signs in general (both directional signs and maps) should look similar in size and color so they can be easily identified. Signs or maps should be added to all level changes indicating which destinations are reachable from that network. Legible London, the study concerning way-finding in London that was mentioned in 2.1.2 Importance of Walkability, could be used as a model for improving signage throughout Hong Kong. This study ensured that signs were easy to find due to their frequency, consistent placement, and identifiable appearance. Way-finding points like these are simple and cost-effective, and they would greatly improve the walking experience throughout Hong Kong.

When possible, ample route choices should exist. A simple way to ensure this would be to maintain ground-level connectivity by removing pedestrian barriers and adding more crosswalks across high capacity roads. While alternative networks above and below the ground level have their benefits, pedestrians should have the option of remaining on the ground to complete their journeys whenever possible. Forcing level changes to cross busy roads can be confusing and lead to a lot of congestion in skywalks and underground tunnels. For example, pedestrians are required to enter an underground network in Tsim Sha Tsui to cross Salisbury Road, when it would be much more effective to remove some barriers from the roadside and install periodic crosswalks. When level changes do occur, they should not lead directly into shopping malls. Simply adding an additional walkway around shopping centers would allow pedestrians to utilize

many skywalks without the frustration of getting lost inside of a mall.

Amenities such as seating areas and public toilets are also very important for walkable environments. Pedestrians will be unwilling to continue their travels on foot if they don't have somewhere to sit and rest or go to the bathroom. While constructing more public toilets may prove to be costly, increasing the number of seating areas along popular routes shouldn't be very expensive and would greatly improve the walkability of an area.

From all of these recommendations, there are three that we consider most important, and should certainly be implemented if at all possible. First, handicapped accessibility needs to be an initial priority during future development, not an afterthought or retrofit. Second, signage needs to be consistent in appearance, location, and frequency. Consistent signage like this should be just as ubiquitous throughout every district. Finally, ground level connectivity should be preserved as much as possible, which can be accomplished by removing pedestrian barriers in select locations and replacing them with controlled crossings.

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APPENDIX A: SPONSOR DESCRIPTION

Our sponsors, Designing Hong Kong and the Harbour Business Forum, are two organizations dedicated to improving the living quality and value of Hong Kong's urban landscape. Designing Hong Kong is concerned with all aspects of livability within the region, while the Harbour Business Forum's primary focus is on the waterfront of Victoria Harbour.

Designing Hong Kong

Designing Hong Kong is a single, private non-profit organization. Its mission revolves around six major objectives. Their goals can be summarized as promoting the health, safety, convenience, and welfare of Hong Kong and its community, as well as enhancing the quality of Hong Kong's living environment. They conduct research studies and raise awareness about their cause through education. Designing Hong Kong also aims to form alliances between members of the community that share these goals and to carry out any lawful deeds which help achieve them. (About Designing Hong Kong, 2010)

Paul Zimmerman, Markus Shaw, Peter Wong, and Christine Loh founded DHK in 2006. Most of the organization's work is done by volunteers, and their projects are funded by donations. DHK partners with many environmental and urban planning organizations, such as the Centre of Urban Planning and Environmental Management and the Harbour Business Forum. (Audi, Byorkman, Couture & Najem, 2011, p. A-1) An example of a past project that DHK participated in is a competition for the design of the Central Waterfront, in which entries were used in an urban design study. They also helped in a project involving studying, measuring, and analyzing the

walkability of different districts in Hong Kong in order to recommend improvements. (Audi, Byorkman, Couture & Najem, 2011, p. A-2)

Harbour Business Forum

Harbour Business Forum (HBF) is an alliance consisting of 122 business members. These members include 10 Patron Members, 30 Corporate Members, 53 Professional members and 29 Supporting Members. HBF was originally launched in June 2005 under the concern that urbanization around the harbor could negatively impact the future development of Hong Kong. Their primary focus is on the development of the harbor front, hence their name. They wish to see Hong Kong's harbor "become a genuinely vibrant accessible and sustainable world-class asset." In order to accomplish this, HBF's three main objectives are creating an overarching agency for the harbor, promoting projects related to the interests of Hong Kong's harbor, and supporting the Harbour Planning Principles. (About Us, 2010)

Within HBF, there are three major divisions of responsibility. The first is the Patrons Committee, which serves as the Harbour Business Forum Board and is in charge of overall policy control. This branch consists of Patron Member representatives, who guide HBF in terms of funding and appointing senior representatives. Funding for the HBF comes primarily from Patron Members. The Executive Committee is responsible for overseeing development and approving project funding. The committee contains senior representatives from HBF and the chair of the Best Practice Committee. This third and final division (the Best Practice Committee) is in charge of overseeing the research agenda and engaging members of HBF in the preparation of research and position papers. This committee is made up of professional services firms with a variety of

members: engineers, architects, planners, and business consultants. (Structure of HBF, 2010) With their passion for improving the quality of life in Hong Kong, both DHK and HBF will aid us in our research on Hong Kong's walkability so that we can provide them with conclusions regarding worthwhile investments in urban planning of pedestrian networks.

APPENDIX B: INTERVIEW TRANSCRIPT – PROFESSOR SUZANNE LEPAGE

A vital preliminary step of any research project is consulting experts in the field. At its core, our project is about urban planning, so we turned to WPI's civil engineering department for guidance. Professor Suzanne LePage was interviewed for the IQP conducted in 2011 on walkability in Hong Kong, so she was chosen as a starting point for our research. Although she hasn't worked with walkability or pedestrian research specifically, her experience in urban planning provided us with relevant background information. We were given permission to record and publish our interview with Professor LePage, which is transcribed below.

Professor Suzanne LePage

Professor of Civil Engineering, Worcester Polytechnic Institute

Kaven Hall

Nathan Ferreira, Jordan Vishniac – Chairs

Stephanie Lesage, Zibo Wang – Secretaries

December 7, 2012

Have you had any experience [in urban planning] with walkability?

I have a lot of working experience in transportation planning. Did we do a lot of programs in walkability? Not necessarily, but I can direct you to some resources.

I suppose the first thing to ask is, what aspects of walkability would you focus on if you were to conduct a study like ours?

Probably safety and then capacity. You don't want a situation where there's not enough space, and people have to step into the road. The other thing that's really important is: why would people walk in that particular area? Are there actually places to park and then get out and walk? Are there services that they are walking to and from? What's the trip purpose? That would be the other thing to really think about, because you could build something that's walkable but nobody wants to use it. There's no reason to walk in that location because there's either too much space between buildings, or there's no parking near enough to where the attractions might be. People like to park right where they're actually going, and they're not necessarily going to want to park in one location and then walk along an area.

Okay, so this is more open-ended, in that it's not necessarily related to walkability, but how would you go about conducting a field study for any kind of urban planning? What would be the first step?

Well first, you have to identify the problem you're actually trying to solve. So if you're looking at grade-separated versus ground-level, you would want to identify how many of each of those you would have. Then I would compile as much data as I could, probably in a mapping format, using G.I.S. or other methods. That would probably be driven by what your sponsor has

available for you to use when you get there. Your second step is basically to gather data. I would probably look at any past incidents of pedestrian and vehicle conflicts – any kind of car crashes. I would also look at biking. With bicyclists, if you don't have the capacity on the road, they're going to use the sidewalk potentially. So, is there a conflict there? I would gather all the land-use data to get information about density. Then you're looking at an evaluation of a problem, so you would also want to identify possible alternatives. What I would do if I was studying something like this, I would figure out some way of scoring or rating walkability in different areas. The steps that would follow would really be driven by how you identify your problem – what you're looking for out of your study.

They're looking mainly at where they should invest their money. Our main problem will be figuring out what aspects of walkability are important to the people who will actually be using these walkways – pedestrians, commuters, and tourists.

Okay, so there's an aesthetic quality… if you're looking at what matters to the people, you're probably going to want to have some kind of survey.

Right. The three methods we're looking at are observational study, surveys, and short personal interviews. Apparently the problem right now is that pedestrian plans are just to get people out of the way of road traffic, and they want to know if they should invest in a real pedestrian-focused plan instead of just getting them out of the way.

So it's more about where the pedestrian is going and whether they have connectivity. It sounds like you might have to get some real discrete information from your pedestrians. Interviews are

good sometimes to get a general sense, but if you're really looking to quantify it, you're going to want a set, short questionnaire that you can collect a lot of, with the exact same questions that are always asked the same way. What strikes me too is the investment in grade-separated versus on-ground [walkways]. If you put in a pedestrian bridge in an area where it's easy to cross the street, it's kind of worthless. Looking at the issue of safety, you have to find areas that are the least safe for pedestrians to make that crossing. Those are the areas that would be worth the investment, if they're actually connecting places that people are walking to and from. So your trip purpose and your safety would be your big deciding factors of determining whether it's worth investing in a pedestrian bridge. Otherwise, who would walk up stairs and then go across, or walk a bit out of the way to get to the bridge, if it's easier to just cross the road.

Can you think of any other qualities that would make some walkways more appealing than others, besides safety?

I think it depends on who your pedestrian is. If they're making a work trip, things like aesthetics probably don't matter – it's going to be about what's the quickest distance and the safest distance. If they have children with them, safety's going to be more important. If I'm walking with a stroller, I'm going to be looking for a ramp. There's also accessibility issues with people who have mobility problems, whether they're in a wheelchair or walking with a cane or a walker, they're going to make their choices a bit differently. So it really depends on the user and their trip purpose. If the purpose is "I'm just going to go, hang out in this neighborhood and do some window shopping," it's going to be leisurely. I'm probably going to stay on the side of the road until there's an obvious crossing location and there's an interesting "something" on the other side of the road. The reason for crossing the street at a certain location would really be driven in a

much more leisurely way if I was just there for recreational use, like casual shopping. If I'm on my way home and I have to go and get squash at *this* vendor and then go over *here* to a butcher, then over *here* for a bakery, I'm more in a "work" mode. I'm going to choose the shortest distance between two points. If I'm walking with someone who's older, has mobility issues, or is very young – basically someone who is going to be in some way vulnerable – I'm going to make my decisions differently.

Our sponsor is focused a bit on both of these populations. On the one hand, they were very specific about commuters, while on the other hand they talked a lot about turning these areas into social spaces.

If they're social spaces, you want more street furniture – you want more little benches and plaza areas so people can sort of sit and commune with each other. If they're commuting paths, then they want to be efficient and safe. You don't want a lot of street furniture [in those areas] – that's going to attract a lot of people who will be loitering, and that can become an obstruction. If you want both, you need to think about having space outside of the walking area for gathering places. You should also look at some demographic data for how many people live there and work there. If you're looking in a residential neighborhood, most people work a significant distance away, so they're probably driving. The other thing you should think about is the transit interconnection. If someone is taking a bus or a train, they're going to have to walk from wherever it leaves them to their ultimate destination, or they'll be walking to another bus stop or subway station. Those are going to be significant attractions for pedestrians because you don't get to those locations by any other mode… you might bike, but the primary mode to a transit stop is walking. You have to have good walkability around those or your transit use could possibly decline.

According to the data I found, the average commute [in Hong Kong] is about half an hour which makes me think they're not working where they're living.

Is that a driving commute?

I believe it's using public transit for the most part – the bus, the MTR…

So what you really want to get is *distance* traveled, because it might take them half an hour to go half a mile if there's a really poor [transportation] service in that area. For example, I used to commute to Boston, and I would come in on the commuter rail. It can bring you all the way to South Station, or you can get off at Back Bay. I worked in the north end of town so the typical commute was to transfer in Back Bay to get to a different line and get across to North Station, but it was actually quicker for me to walk. Either way it would take me 15 to 20 minutes to get from Back Bay to North Station. It's not a very far distance, so if the weather was nice – if it wasn't raining or if it wasn't *too* cold – I would typically just walk that distance. [In that way], traveling times can be a bit misleading. It depends on the system – sometimes it might just be that the T system doesn't connect very well in between, and I have no idea what that's like in Hong Kong.

From what I've heard, [public transit in Hong Kong] is very good, but that can be very subjective. Once we're there, we can get a better sense of that. There is another team this year that is studying transit so we can also talk to them. Now, are there any general processes or issues that normally come up when you're trying to create new infrastructure in urban areas?

For example, if we wanted to suggest adding more seating or adding another pedestrian walkway, what types of problems would our sponsors face?

I think that depends a lot on the location. If you were asking me what the barriers would be to do something like that in Boston, I could probably rattle off a few zoning codes and things you'd be concerned with – as far as Hong Kong, I'm not sure. Typically, at the local level, you're going to have to have some sort of local approval, so you'll have to look in to how they do that. In some cases, it might be the city's department of public works who is actually responsible for building new things like that, so you're going to have to get buy-in from them. If that's not your sponsor, then that would be a barrier – whoever owns that space would have to be the first person to buy-in. Now even if it's the city, the DPW for example, it doesn't necessarily mean that they always have the freedom to make their own decisions. Sometimes they have to get approval from their Board of Selectmen or City Council, whatever is their boss in that government structure. You're going to want to start with the owner and then look at the regulatory process they have to go through and the rules associated with that. Either it will just be asking approval to spend money, or seeking grant money (which will come with strings too). You might be able to get a grant to improve something, but then the requirements might be a little more stringent on how it's designed. For example, in the U.S., if you get certain federal funds for any kind of transportation improvement, it absolutely has to be A.D.A. accessible. So I would say that ownership, funding, and local rules would be your main things you need to focus on.

Okay, final question: are there any other sources that you know of that we should be looking at in terms of walkability?

Well, there were some IQPs in the past that looked at walkability in Hong Kong, so I would start with those due to the extent that they dealt with this specific area. There was a group that came to see me last year before they went to Hong Kong, and I sent them something I'll send you – the Mass Highway Design Guide. It has some sections in there about designing facilities for pedestrians. It's kind of general though, since they're typically designing roads. It's called the Project Development Guidebook, and it's basically their design guidebook for building roadways. They're doing a better job these days of incorporating all modes [of transportation] in their road designs instead of just designing roads for vehicles, so that's why they have a section in there on pedestrians. Sidewalk widths, things like that. There's a little bit of background there that might be helpful.

That should definitely help a lot. I think that covers most of what we wanted covered. Do you have any last bits of advice for us?

Have fun in Hong Kong!

APPENDIX C: INTERVIEW TRANSCRIPT – SIMON NG

When first arriving in Hong Kong, the scope of our project and what districts were to be studied needed to be determined. It was desired to have districts that represented a wide range of district types, showing both good and bad walkability. Simon Ng is the Head of Transport and Sustainable Research of the Civic Exchange Company, and his research has included topics from sustainable transportation to livable cities, among other topics. We went to him to ask for his input on the subject and were joined by one of our sponsors, Paul Zimmerman, who is the CEO of Designing Hong Kong.

Mr. Simon Ng

Head of Transport and Sustainable Research, Civic Exchange

Paul Zimmerman

CEO of Designing Hong Kong

Nathan Ferreira, Jordan Vishniac – Chairs

Stephanie Lesage, Zibo Wang – Secretaries

January 8, 2013

Paul Zimmerman (P): So first, how do we get to a research project that we can conduct in just a few weeks?

Simon Ng (S): Well how much time do you have?

P: About two months, one week has already been lost and there is a week of presentations at the end with Chinese New Year in the middle. So we basically have to do everything between now and Chinese New Year. Then Chinese New Year will be cleaning up and presentations afterwards. Roughly we have to do everything pretty quickly. We have to define what a sensible way of approaching the project is. I hope that what they come up with at the end is a project and presentation that gets people to redefine the word comprehensive when talking about a network, address the issue of priority for certain levels, and the need for them to be overlapping so people can have choice. Also addressing the issue of transport orientated networks versus district networks. If those are the conclusions they come to and can support with some very good visuals and imagery, then we would have made some progress as people in Hong Kong are not very sensitive to those issues at the moment. If on top of that they could have some conclusions about how the government could get to that point, how to prepare a district and their plans, and figure out financial incentives for people to build connections to subways and to elevated networks then those could be some implementation suggestions. Then we would also have some comments on the institutional arrangements behind it. But going back to our question, how do we come up with a sense of our research? They've identified one previous study in which a woman identified in Hong Kong why we have some districts with some really good multi-layered pedestrian networks. I think Central is one, Tsim Sha Tsui is one with its sublevels, Tsuen Wan with an extensive elevated network, and maybe pick one or two more to explore the qualities and list qualities where we have an extensive multiple layered network. See what works and what doesn't work and why in order to reach their conclusions. Maybe that's one way to go forward

and that's where we are. After all of this we can use their presentation materials for the May pedestrian conference.

S: Yes we are trying to put together an event during the week of the United Nation's Road Safety Week to reconnect the three concepts, network, pedestrian safety and public space. Also how we can discuss the three things together, which is something that has been lacking in Hong Kong. With the public report recently, I'm sure Paul has shown it to you-

P: They've actually read it and they've considered following up on it and what you called the 4D Model. I don't know if the 4D model is a good basis for the research project per say, but that it would provide a good way of understanding the city.

S: Yes it is definitely a good way of looking at the issue, but you should, or you may have already, have your own way of thinking about what can be done here and in terms of the research. How you will define the scope for your six or seven weeks' time here to put together a report that could at least explain and reflect on what you have surveyed and seen here in Hong Kong in order to try and come up with your own interpretation and recommendation for the next step. That could be something you could bring back home as well. I'm sure in terms of density and urban development it is different, but still how we try to get people involved in what could be done here could help you in your city as to what can be done similarly. Not to solve a problem of the same scale, but at least the process and what you learn during the process. Second thing is that you will need to take some time to go out and walk and survey. I mean Central is very convenient, you have different layers and its better connected than most parts of the city. But let's say when it comes to Tsuen Wan, I'll just mention is further away from the city center.

Central and the urban core of Hong Kong were so small that we didn't have enough space. Then over the last twenty to thirty years we have expanded outward. Tsuen Wan was on the outskirts of the urban core but now it is considered part of the urban center. The other New Towns as you may want to go and see them. Actually Kowloon Bay could be another place.

P: Yes, except for in Kowloon Bay there is not much in place yet. It may be hard for them to understand what the plans are, it may be better to go to where there are physical multiple layers.

S: Ok, well the reason I mention Kowloon Bay is that the Development Bureau and such have a lot of plans and have been working with the Transport Department to help solve some of the issues. I think it is a kind of an example and an example of some of the good things they have done so far if you have time.

P: By all means, we need to create a map and I think we should identify areas. A comparison of areas would be very helpful to distill some conclusions. We will have to sit down with a map and just circle some of those areas.

S: Yes, I think that could be a start. They should go out to as many districts and locations to get a sense.

Well we live in Tai Kok Tsui and we've been to Mong Kok so far.

S: So you've seen the elevated system?

A little bit, we've also gone down to Kowloon Bay and Central yesterday. Central seemed to us an example of good walkability, do you agree?

S: I think that is the best example.

P: Well the better one yes, but there are issues.

S: Well yes but relatively the best.

We figured we would look at extremes of really bad and the best we could find and compare and contrast.

S: Well you can find really bad examples around. We have different islands with residential blocks. Then access for you to cross the roads is difficult, it's painful. You have to go up and cross and then go down again. It's not very attractive to people, even for abled people it's not convenient. So that's an example. Now in Tsim Sha Tsui East or Hong Kong there are similar examples. That's because there are highways dissecting the community, it becomes very difficult to cross the road so there needs to be a footbridge or a tunnel to cross the road. If you start to have a few of these islands it can become very segregated and inconvenient. It also makes it so there is no sense of community. That is another dimension of good walkability. We feel like improving walking and making the public space better will foster a good community and togetherness because it is so much easier for us to cross the street and get connected with people. And now everyone is living in small islands, it's not healthy. So that's another angle we are

trying to talk up, walkability as a social equalizer. There are so many disparities and problems and it is one of the many ways, low cost ways actually.

P: That goes back to the New York City study, where they recognize the importance of the street and the social space of the street where the community as a whole looks after the community. Where everybody knows each other, looks after each other, can see each other, can encounter each other, and that becomes a very important social environment. So the question is in a city like Hong Kong where it is multilayered, are we losing that ability because we don't have continuous social environments like that anymore that become the heart of the community. Because we've disconnected it, we've pulled it apart; we've consolidated it into podiums with shopping malls which are weak in terms of social spaces: no place to sit, highly commercial. And so it doesn't help the community to form.

S: Alright so let's go over what they should get done by the end of this week.

P: Well they need to get their head around the area, redraft their proposal. Is your schedule to get that finalized by next week?
Yes it is. We want to have a clear plan by then on what we are going to do.

P: Yes aim for knowing what you want to achieve.

We want to come up with a focus for our research and the goals that our research is trying to accomplish. One possible goal is to convince the government to make policy changes, to perhaps

treat the networks, especially the above grade and below grade ones, the same and give them a higher priority.

P: Yes we are trying to define a network, the government tends to define network as the elevated network or the infrastructure of linkages. We say that the network is the entire area where people can walk in a district. This means that your public space, your park, your footpath through, and alleyways are all part of that.

A more ideal situation would seem to be giving the ground level more priority.

P: In some areas they like it where pedestrians are in the street, they started around 2000 in some areas, pedestrianization like the smaller streets in Tsim Sha Tsui. So that's the plan for this week. We need to have it nailed by then because then we will have about four weeks left to do the actual hard work. My suggestion would be to focus on some areas, so part of this week should be to go explore and nail down the areas that you are going to focus on.

Well I think as of right now Central is nailed down as a good example. Before we talked about having two examples, two bad, two good, just so we have the extremes. So we have one down and we are aiming for three more.

P: Well whichever you take there are good quality differences and bad quality differences in all areas. I would suggest you take areas where there are extensive overlapping networks so you can get to what makes Hong Kong unique. An example is Tai Kok Tsui where you guys are, you have the elevated networks, and you have all that road work where you can't connect. There are

some areas that are ground, some that are elevated, and some that are ground again, but if you look at the district as a whole, you see these elevation changes that you are forced to make. In Central you have more of these overlapping networks, Tsim Sha Tsui you have overlapping networks but they are below ground and at-grade. That gives you three, and then Tsuen Wan you have at-grade and the elevated network which is quite extensive, but the ground level is quite disjointed, more where they've removed the crossings at street level.

S: Yes, depending on what part of Tsuen Wan you're talking about. Tsuen Wan is quite a large area and the area around the MTR station you're right about they removed all the crossings and they kind of push everyone up to the footbridges. But in the older parts I feel like it's not too bad.

P: Well we need a map then; they need to mark off why certain areas are being picked. I mean we can help with that, but can you help with determining and making some suggestions about some areas, some areas of distinct networks. I can see Tai Kok Tsui, Tsuen Wan, Tsim Sha Tsui and Central quite easily. We know Tsim Sha Tsui and Central quite a lot, Tsuen Wan and Tai Kok Tsui would be kind of new. All four have a harbour front which the Habour Business Forum would be very happy with and all four have significant overlapping networks at different grades.

S: I am also familiar with Tseung Kwan O.

P: Sure, you could do Tseung Kwan O. But Tseung Kwan O is one of the areas under construction, so it's not obvious what-

S: Well, correct me if I'm wrong but we can divide it up into three small areas.

P: Yes well I suppose you could pick one of them, such as Hang Hau, a town where you have an overlapping network. It's an area that's easy to explore, it's easy to understand, better than Po Lam.

S: Yes and if you talk to the people they can tell you if they like it or not. Because some of them find it very useful to have all of these walkways and you don't have to go to street level.

P: it's great for a commuter, you don't need a jacket or umbrella, even when it rains and typhoons I can still get to the MTR station.

S: Yes obviously there are people who really like that kind of arrangement. But take away the street life and it may become very boring.

P: I don't really think it is one group against the other; it's just that commuters will like that aspect of the walkways. Whereas people will also like the street life aspect of the neighborhood, and one person may like both. But they may not understand there is a conflict in the way of planning the city that if you have one you lose some of the other. Or currently that's the case, so how can we keep both benefits. How can you have your network, your high connections from home to the MTR so you can stay out of the rain and the hot weather and getting between your bed and the MTR quickly? While at the same time have a neighborhood where on Saturday afternoon you can hang around outside, go peddling with your kid on a bicycle, go shop, walk by people, and can we have both? Ideally we have both. And that means you have choice, for my commute I have the network and for Saturday afternoon I can go outside. So then you have the benefits of both. It then becomes very close to Hendrik Tieben's discussion for Tin Shui Wai.

S: So I think what we are saying is that there are different areas that you should go look at before you pick your four cases. Obviously you have four on the table right now.

P: My suggestion would be also is to map it. Because I think one thing people just don't understand is that if you are at underground there is the limited number of destinations, the limited route choice, and the limited visibility. Then you have street level, you got a lot, and then elevated. If you did the three maps for Central, for example, you can actually show visually for people to go like "that's why you like to be at ground level because you have lots of this". And then subterranean level you only have A, B, and C, and maybe elevated you have a bit more. But obviously you have more in Central than in other areas. Where you have an elevated network the number of activities is fewer. Well for the length of the network versus the number of activities that are there. So to have some topology that allows you to justify and visualize your story. I can imagine it; I've just never done it or seen it. I've never seen somebody mapping so the elevated network in Central is compared over the elevated network of Tsuen Wan and if that correlates with people's comments of good and bad, but we can actually visualize and measure it in a way.

I think the creation of three maps would help a lot. We've seen a lot of maps where everything is sort of jumbled up into one thing and you can't really see what's going on. So if we just had three separate maps showing something similar to "you have these elevated networks showing you have these spots where it's not well connected" and we just show that, maybe people will realize that we need a little more connectivity.

P: One of the things I thought of was that if you had an elevated network, and if I did a street network I would map public spaces, seating, parks, shops, residential entrances, office entrances,

I would start mapping all of those. I would mostly get an area filled with dots, squares, and circles, all connected with the routes and the lines that I could walk as a pedestrian. All my crossings, they're all marked as lines and all my destinations marked as dots and squares and round circles, whatever, and they are all connected through that network. If I do the same for an elevated network and in an area where for example at the elevated network no place to sit, then suddenly my circles for seating have disappeared and if there is a park area, ok, then there is one little green square instead of ten. Then I start visualizing the limitations of that network versus the other network. The other one would be your connects and disconnects. So in one of the presentations we try to highlight a road in which you cannot cross, we did by having a blue line around the pavement to anywhere you could not cross and the way you can cross it is a different color. You can quickly see, top down, that there is this segregation where things become islands. So you can really see where things become segregated and route choice becomes limited. If you live in Hong Kong you know it, but you have never visualized it. And that is what impacts people's perception of quality of the pedestrian network of that district.

So I think that settles one major part of the project, mapping those major areas that we pick.

P: And figuring out a way to map it. Oren Tatcher definitely would be a good person to have a chat with. He is a transport engineer and he engineers railway stations and airports. We can set you up with that and help you get his contact information. So he studies intricately how people walk, the obstacles, where's the counter-flow, where's the cross-flow. Where do people go up, where do they have to get down. He calculates that and he has a way of mapping that very specifically because they use that in planning stations and airports. Including airports connected with neighboring parking lots, bus parking, train stations and how they connect. How are people

going to walk with a suitcase, can you walk with a suitcase, they have a mapping system for that and a visualization system. Ultimately there is an investment to be made by people in infrastructure and that's a lot of money. He's very good at that so I would talk to him. You may not want to use everything he does though as some of it is very intense. He has these timeline charts and you can see -people go up, with cross-flow, without cross-flow. We have some visuals on my computer. So make sure to see him soon.

Ok, so next I think we need some sort of verbal argument to convince them that things need to be changed. We were wondering are there specific reasons why they don't want to focus on pedestrians. Is it they just don't want to deal with it, is it they just haven't thought about this, or is there particular arguments they have that we will need to counter.

S: Well I don't think they have a policy to degrade the need of pedestrians. Neither do they have the policy to take care of people's needs as we walk. The thing is we rely a lot on public transport and we claim that our car ownership rate is low relatively speaking compared to other major cities in the world. But then in terms of planning we take care of vehicles first.

P: The thing is that walking is like water. I mean you can walk around this table and if I changed the shape you could still walk around it. There are certain shapes of this table that I either can or can't get a car around it though. Vehicles are technically much more difficult, need more infrastructures, need more planning, cost me more money. I can also measure, very clearly, congestion time, and the value of time with congestion. There's an essential need for moving goods and emergency people in and out of hospitals, if you don't get them quickly there they die. So it's all measureable. Walking though, you could squeeze past twenty centimeters. So the

demand for infrastructure, money, and decision making is much lower from a pedestrian point of view. Unless I start explaining to you that the social spaces are a great value for the community as a whole, it benefits the society, it benefits public health and therefore you should spend more money on it. Nobody has put that figure on it that the Transport Department has the motivation to invest lots of money and make very complicated decisions and spend lots of man hours on sorting it out. Cars and vehicles are much more obvious for them.

So we will want to focus on the economic and health benefits of social spaces.

S: From Hong Kong as a society, we also have that kind of need because we are getting more elderly people and they have different mobility needs in terms of accessibility. So that's an area that can be improved. And as I said earlier, in terms of the way we look at society and problems that have been developing such as poverty. For the low income they have limited choice in terms of transport, in terms of where they go to enjoy their afternoon for example. So if we can improve that aspect of city planning then we would be bringing a lot of good to those groups of people. By 2030 we are expected to have one elderly person out of every four.

P: It's a good point, visualizing the benefits. Also we talked about it this morning, make sure you visualize the obstacles such as where people can't make their own foot path; it helps people to understand it. Aging population is an obvious one, but as I said this morning, if people are willing to walk further and longer, you can increase the distance between bus stops. You increase the distance between bus stops, you can then reduce the number of bus stops, and traffic will flow and you have less congestion. Those arguments people may have not thought about so to put them out there up front is a good idea. I'm not sure you want to go and build an economic

model, calculating the internal and external benefits of making these improvements and putting a dollar figure on it because you don't have the time for that. Somebody did that in Hong Kong relating air pollution to public health and you had a very hard strong case where you could see the hospital admissions of a certain district dropped dramatically after they stopped using highly polluting fuels. You could see the drop, so you could then use it the other way around saying if it goes up, lots of people will go back to the hospital. Now that model has become a basis for justifying policy changes where there are actually people who now see it as a public health issue. There's no way you can do that in two weeks, so I won't even try. Instead aim for hard hitting visuals that are good examples that they can understand.

S: Another argument could be that air quality and walking is related. If more people are willing to walk then we don't need to rely so much on mechanized transportation. This will help cut down on air pollution.

P: Also now we are looking very much at the costs of transfers. If we want to reduce the number of buses on the road then people have to make transfers. Transfers are a penalty, but if we can reduce the cost of that penalty, the apparent cost of that penalty, by making it pleasant to walk from one bus to the other then it is a benefit. Over the next couple of weeks you could get examples of benefits of getting people to walk further and longer. I'm not sure if I've mentioned it already but one of the ways you can get people to walk further is giving them a place to sit. People will walk further if they have a place to sit or public toilets, which is counter-intuitive as sitting is not walking. So having a strong visual about the amount present would be extremely helpful.

S: Yes, and if at the end of this you could get something that you find useful for yourself and enhance your understanding of the city and could take back to your own city, that would be extremely useful and I think would create long lasting experience for you.

Thank you for your time!

APPENDIX D: INTERVIEW TRANSCRIPT – OREN TATCHER

Oren Tatcher is Principal at OTC Planning and Design, a consultancy in Hong Kong that specializes in planning transportation-related facilities. His knowledge of urban development in the area is extensive and he has tried his hand at multi-layered pedestrian maps in the past. We were given permission to record and publish our interview with Mr. Tatcher, which is transcribed below.

Mr. Oren Tatcher

Principal at OTC Planning and Design

Nathan Ferreira, Jordan Vishniac – Chairs

Stephanie Lesage, Zibo Wang – Secretaries

January 21, 2013

[A short description of our project is given to Mr. Tatcher.]

Well, I know Paul [Zimmerman] is very interested in the visual representation, and so am I. I'm sure he's shown you what the Civic Exchange is doing. We explored moving from a visual map to an app that was more interactive. I think this is the right direction. I tried to get Google interested in this, but it didn't work out. I find that the problem of representation is that it is a

three dimensional representation in Hong Kong. The existence of multilayered circulation, as well as the restrictions placed on single layer circulation, creates this problem. Paul and I are trying to come up with a solution to this. Your goal is to identify walkability, which I define as the user-friendliness of a pedestrian system. Generally, walkability is the question of whether or not you can walk. But this is a bit limiting. Technically something can be walkable, but I might say it's still not user friendly. We actually developed an analytical system for this. Are you familiar with the term level-of-service?

No, I'm afraid we aren't.

Level-of-service is a term coined by the Department of Transportation in the 1950's and 60's to define highway systems. When the interstate system was designed and built in the U.S., level-of-service was a way of defining the ability of vehicles to flow within a given road system. It was typically a function of the roadway width, or the number of lanes, the traffic flow, and how these two play against each other. You don't need to be a physics major to understand the inverse relationship between flow and roadway width to average speed and what you could define as level-of-service. In the late 60's, it was adapted to a definition of pedestrian level-of-service by an MIT professor, John Fruin, who wrote a formative text in the discussion of pedestrians, in which he applied the thinking process of the DOT level-of-service for highways to pedestrian movement. He specifically looked at things like corridors, to a lesser degree stairs, escalators, etc. and tried to apply some formulas to this. If it were about how many people are occupying a space, it would be in the number of people per unit area. If it's about flow, then the unit is persons per minute per foot width of walkway. What we have done in the last few years, is try to formalize and expand that concept to not just include space provision and ability to flow freely,

but to quantify issues such as level changes, whether or not level changes are assisted by escalators or elevators, weather-protection, and other elements that contribute to the overall experience, to therefore give it a rank. Typically level-of-service is ranked A to F, A being excellent, and F being basically a failure. So we tried to have a formula for weighting and assessing the overall experience. We use it primarily for transportation terminals, which are our expertise, but the principle applies to any kind of pedestrian system. It would be very interesting to me to see our concepts applied to a more general urban environment. I'll be honest that we haven't tried it. We've applied it only to transportation areas. How it applies to an urban network is something we haven't attempted, but in principle it should be applicable. I'm very curious whether what you are doing could use our conceptual framework.

Another term I think would be useful for you guys to look at is a system invented in the 1970's in University College London called Space Syntax. The guru of that program is a guy named Bill Hillier. It was actually done in the School of Architecture and Urban Planning at University College London. I briefly studied under Biller Hiller, and his concept really tries to look at issues like the idea of urban connectivity. It's a very interesting concept because it tries to break down urban space into something more rigorously analyzed and understood, because architects and urban designers have been talking about urban space in a very touchy feely way. I would say that what Bill Hillier tried to do to the analysis of urban space is what Nate Silver just did to punditry, basically just rendering the entire discussion irrelevant and wishy-washy. Because what he did is show that if you break down urban space into discrete elements and analyze them as a network of connectivity, it's a very powerful predictive tool for where people are going to be found, which route people are going to choose, and what spaces are considered successful or not. It's based on a very fundamental assumption that where people are is a good space, and where

people aren't is a not-so-good space. It also indicated what spaces are less connected than others and therefore less desirable than others. People feel less comfortable there and feel more detached from the rest of the city, and so on.

How it relates to walkability for me is that it's more useful as a comparative system, but if you apply that system of thinking to analyze Hong Kong's space you can compare it to a very well connected pattern, like Manhattan. Manhattan is very well connected and very user friendly. You don't need a lot of knowledge to find your way, whereas in Hong Kong because there is a much higher dependency on knowledge or signage, that has to translate into being less walkable or less user friendly. I you don't know the area, then you need all these gadgets to help, whether it's a map, or an app, or something else because there is nothing naturally intelligible in the network. Level-of-service is a very fundamental tool for assessing the experience of walking from point A to point B, but if you look at connectivity the Space Syntax is more helpful. It's useful to understand Hong Kong as a limited system of connectivity. That's a really fundamental thing in Hong Kong compared to most urban systems of connectivity that you know of. Even in a place like Central, you don't expect to find that level of redundancy at the bridge level because it naturally exists on the ground level. If you just take the elevated network and lay it on top of the ground network you can see that it's two systems, with far less connectivity above ground. I think what Paul would expect me to help you with is the visualization. Beyond those two concepts, it's hard to think of more. Did you bring any of what Paul showed you?

Yes. We also had some ideas of our own. We decided to split the different levels into separate maps.

We sort of did the same thing by differentiating between sidewalks and roadways, but you also need to represent barriers. The ability to jaywalk is actually an important part of walkability. It shouldn't be treated as some sort of violation of the rules. It's debatable if you want to apply that to very busy roads, but if you look at smaller streets, if you have a railing that limits your ability to cross. We haven't found a way to really illustrate that.

We sort of had an idea to use bolder colors for what's clearly walkable, like a sidewalk, use a slightly lighter shade for jay-walkable streets, and a dotted line for crosswalks. That way you can look and see that whatever's green, that's walkable. If you wanted to know exactly what level of walkability it was, then you could still differentiate. We haven't actually implemented this yet.

The problem there is that it can get quite complicated. Paul said he liked our early stuff because it was very simple, but once we tried to map three layer systems it gets quite complicated. There've been a lot of attempts. Paul's probably shown you what Jonathan Solomon did, which I dismiss as interesting but useless. It's not a user-friendly tool that people can use. It's more about academic research. The MTR maps are also useless. They try to be a little three-dimensional, but it's really difficult, and the ones at the entrances of stations I find are very problematic. Do you have the PowerPoint on the app we tried to make?

I don't think so.

Okay, let's pack up and head to my office.

[Everyone heads to Mr. Tatcher's office.]

Let's see, the level-of-service definition had to do with how much space there is. The more crowded it gets the lower the level-of-service. What we tried to do is take that concept and expand it, where we look at not just the space and the space available for a given flow, but also distance, whether there is a cross-flow or counter-flow, whether it’s covered or air-conditioned, as well as fundamental things like level changes. If an initial analysis shows a level-of-service E, then by introducing escalators here instead of just stairs we can improve the level-of-service to a D, and we can improve it further by introducing air-conditioning and so on. This is just an example of how things can be incrementally improved to improve the overall level-of-service. Ultimately what we do is analyze each route according to its individual components to give it an overall level-of-service assessment. We analyzed various transportation facilities using this method.

What we proposed was to do some sort of an app. It would start as something like a Google Maps add-on. It would use standard GPS to give you your location, and then it would also locate you on the right level. There are technologies based on Bluetooth and others that can locate people in indoor spaces. The app would have an indicator of what level you're on. On ground level it would indicate G, and then a level up would be +1, and below would be -1, and so on. Then you can change map elevation and it would show what's above or what's below you. When you want to find the route to a destination, it would plot the route but also indicate the places where you need to change levels. There's a different color of line for each level. What we are

trying to say is that the network is too complicated to have a simple projection on a piece of paper. Especially with today's technology, why restrict yourself to what the piece of paper can tell you, when you can navigate in a more sophisticated way between the different levels. The three-layered map is our best attempt to achieve this.

What's really important and doesn't exist today is to show the basement and bridge level including when they go through buildings. The IFC mall is mostly like a street, it's in the public, but we need to indicate this. For instance the MTR maps show the pedestrian bridges, but they don't show when they go through buildings. Once the bridge goes into the building they disappear on the map, and then the pick up again on the other side, so there's no way to see the connectivity. If you can do what our app does, you can segregate the different layers in a way that makes sense. But it's always a question if you want to give people something they can just look at and make sense of, then you need to find a graphic way of separating different layers, and that's always tricky. If you come up with a better graphic system, then we would definitely like to see it. That's mostly what I wanted to show you.

The problem is the level-of-service analysis is an analysis of routes, not a neighborhood. The question is what is the goal. Is the goal to evaluate a district, or is the goal to give tools to use in a district? These are two different things. If it's to evaluate, if it's an analytical tool, then you may want to get into things like individual routes, and then you can do an analysis. If it's about what are the options without the evaluation, then it's a different system. It's more like a map. You need to figure out what kind of product your sponsors want. Because if your product is an assessment and evaluation that helps identify areas for improvement, that's more of a level-of-service problem.

We think that's more or less what our sponsors are looking for.

Then I would say that our level-of-service tool could be very good, especially if you're looking at the harbourfront. Here is a comparison of New York to Hong Kong. In Manhattan there is a continuous and consistent system of pedestrian movement, whereas in Hong Kong it tends to be limited, constrained, with barriers, and so on. What's interesting is that in Manhattan there is a freedom of movement, whereas in Hong Kong the city is very broken up. Older areas do have traditional grids, but newer areas are divided into superblocks that are separated by high-capacity roads.

You wind up with completely separated networks that don't have a good way of moving between them.

Exactly. Here's a map of how you get from the Grand Hyatt to the Empire State Building. It's about a three hundred meter distance, but you have many different ways of getting from point A to point B. If you do the same thing in Hong Kong, to get from Grand Hyatt to Pacific Place, exactly the same distance of three hundred meters, you can see all the pedestrian barriers, bridges, crosswalks, etc. That ends up limiting your options to exactly two, and all of them are quite tortured. There's a lot of up and down, up and down. As opposed to the infinite ways in New York, there are exactly two in Hong Kong. We kind of have to accept that that's the way it is in Hong Kong, but you can at least analyze this as a level-of-service problem. In Manhattan it would be meaningless, because everything is pretty much an equal level-of-service. Call it good or bad, but it's all the same, and honestly it's pretty good. It's all on the same level, there are no level changes, you can jaywalk, you can move freely, and so on. But in Hong Kong if you talk

about the harbour, it should be fairly easy to analyze level-of-service from one landmark to another. This route lends itself very easily to a level-of-service analysis. So that's something you could propose to do. It's informing where improvements are needed and where problems are. So that's one suggestion I have for you. But again it depends on the goal. If the goal is to highlight problems that could be fixed, this isn't a bad approach. If the goal is to just map out what's there, that's a different issue.

There's been an IQP group before that's looked at specific routes like you just suggested. They created a tool to measure walkability. We remember Paul saying that while it was useful for specific routes, he wanted something that could be applied to an entire district.

Space Syntax might be more useful to you in that regard. What it finds is that, for example, this space is the most connected, because it has the fewest steps to every other space in the system. If you take a regular grid like Manhattan, they would all be the same until you reach the edge. Then take Hong Kong. The problem is that you have these very tenuous systems that are laid on top of each other, with some kind of grid in some areas, and then superblocks in others. If you just took a district and tried to identify the space connectivity as discrete spaces, you might discover something on the district level. I don't know if you guys can do it in four weeks, but I'd be very curious to see. There's no way to assess a district level-of-service, that's kind of meaningless. The Harbour Business Forum is more interested in destinations and routes, while Designing Hong Kong is always interested in maps. I'm just kind of throwing ideas at you guys. I suggest you find a way to represent and analyze the multilayered aspect of Hong Kong. You need to somehow give it an evaluation. It's quite complicated to do, because you need to take into account various parameters of accessibility. You need to find a way to represent it and analyze it

in a way that is meaningful. You can't just say that an area is terrible. It needs to be more fine-grained than that. You need to say what's terrible, where are the problems. Exactly how to do that is a bit tricky.

We definitely need to come up with a more objective way of analyzing the problem than just making maps.

The idea of mapping Hong Kong has become a very hot topic. Now everyone wants to map Hong Kong, and they're all making things that look cool, but are kind of useless. We were trying to be more user-oriented, than just find a cool abstraction, but there is value in trying to analyze things that is not just for end-users but for decision and policy makers instead. I have a feeling that something can be done, but I don't know what it is. If you guys advance this thinking by a couple of inches I think we'll be very grateful.

How about if instead of mapping entire districts, we instead identify major connections and analyze them by level-of-service. Would that be helpful?

It might be if you find there are critical routes that have a level-of-service problem. If you look out the window, you can see there's a bridge that goes over the high capacity road. It's difficult to get over the road without using it. If you considered this bridge to be a vital link between this neighborhood the harbourfront, then you could analyze it as a level-of-service problem. So maybe you're correct about identifying those critical links and analyzing their level-of-service. In terms of districts, it would still be a little narrow. Perhaps it's a two-step thing. The first is to identify the critical links and then analyze them.

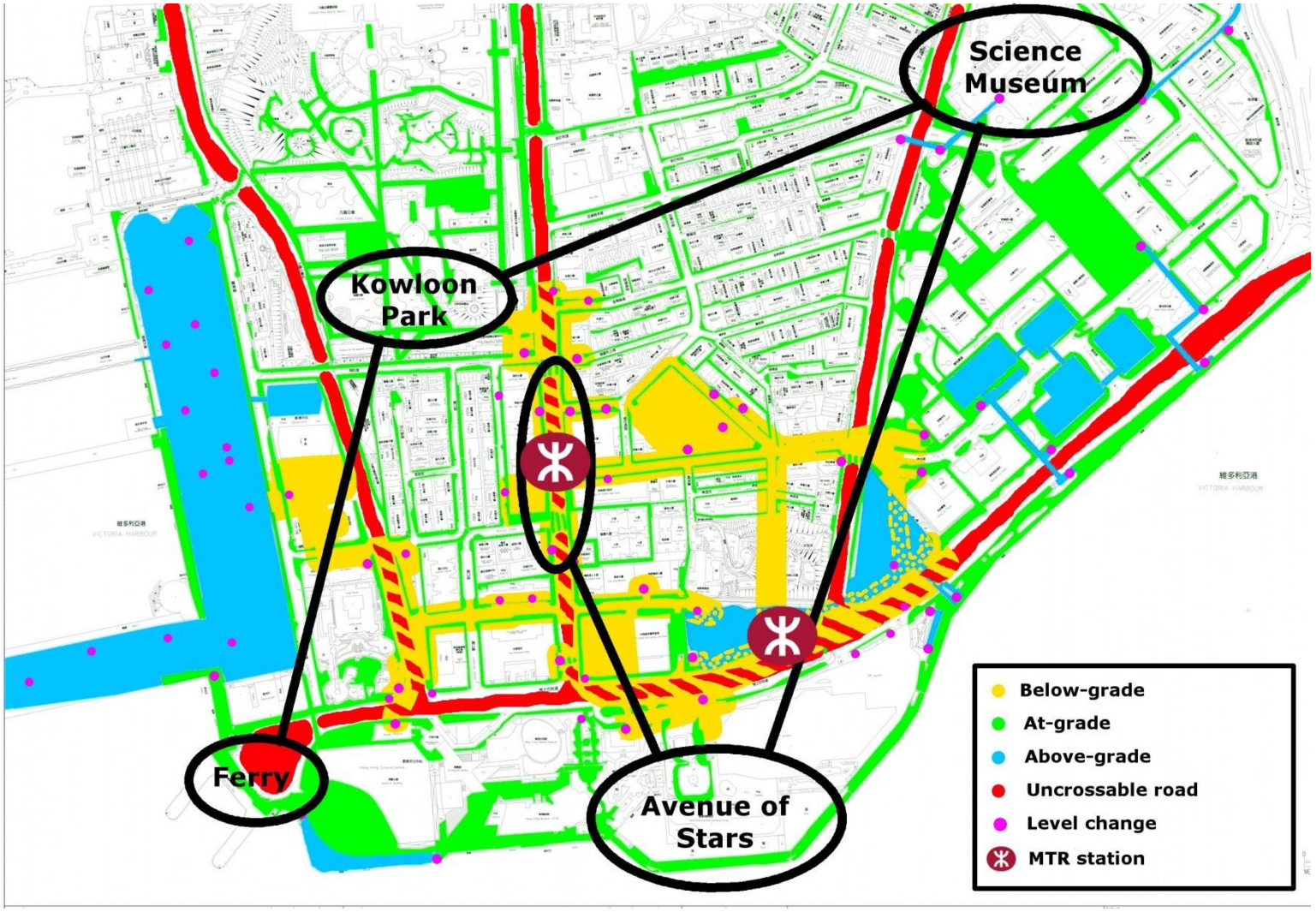
The Harbour Business Forum is especially concerned about access to the harbour.

Well yes, that's their thing. If you need any more material, just let me know.

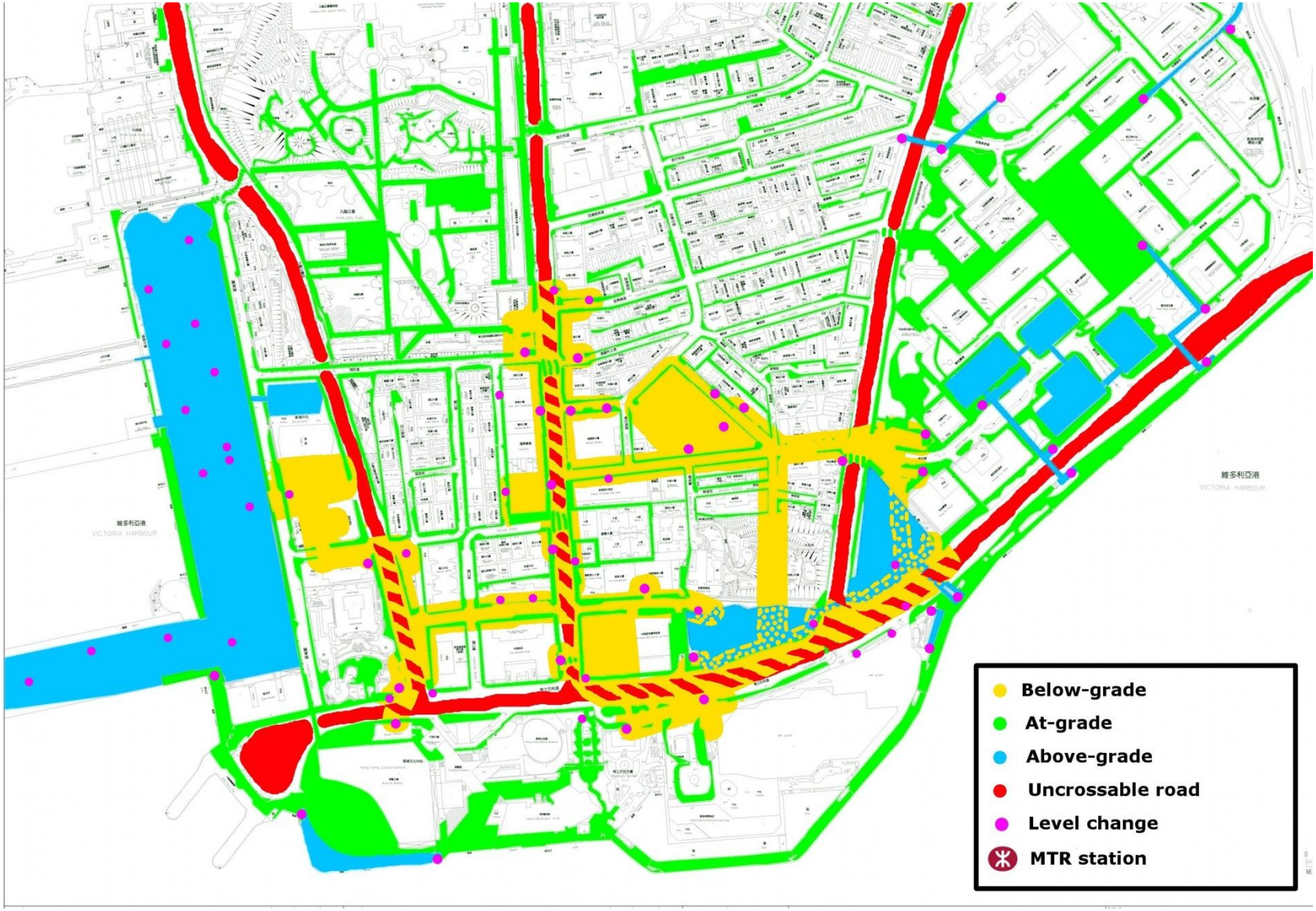
Thank you very much!

APPENDIX E: DISTRICT MAPS

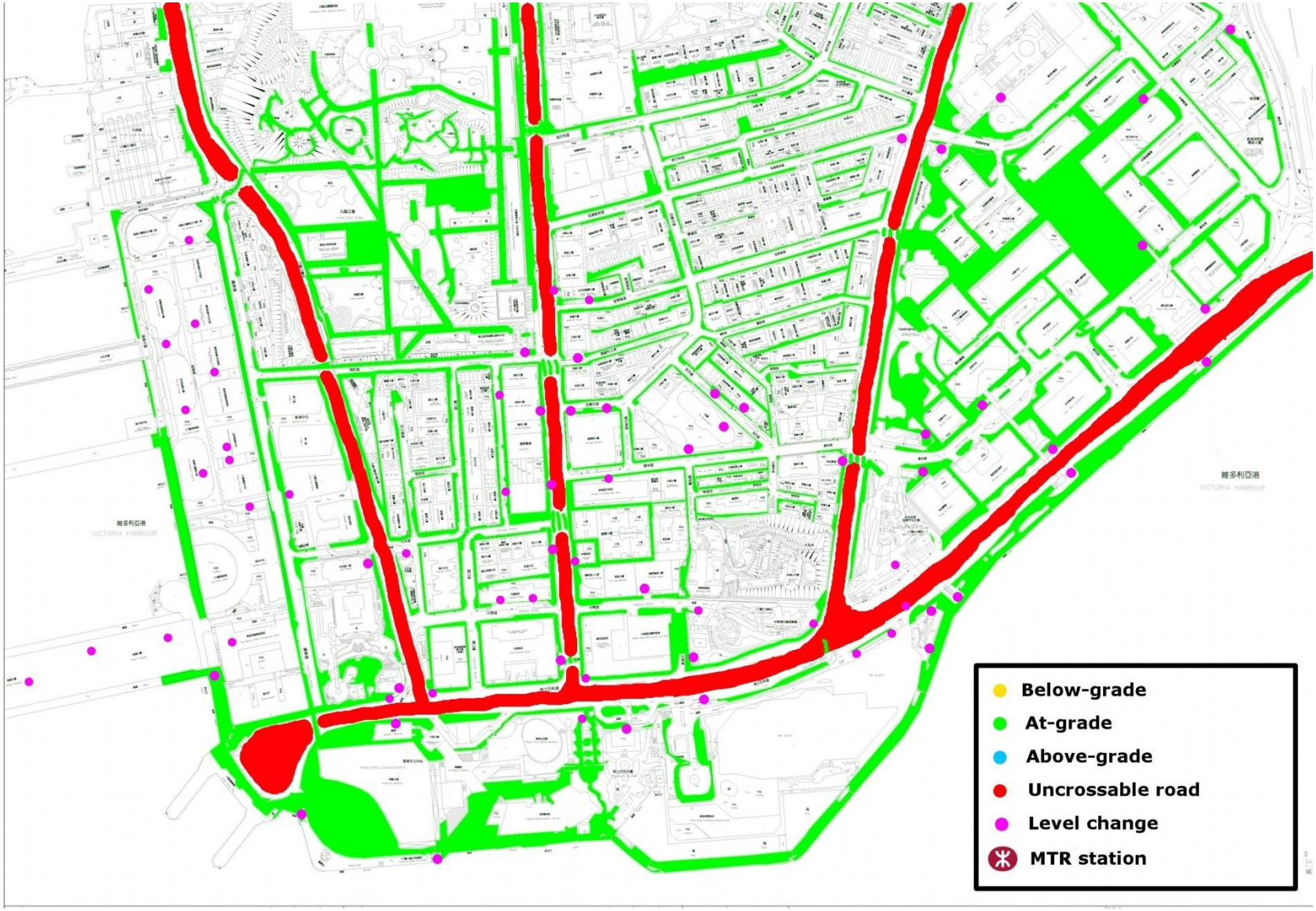
E.1 Tsim Sha Tsui Overall Pedestrian Map (with Desire Lines)



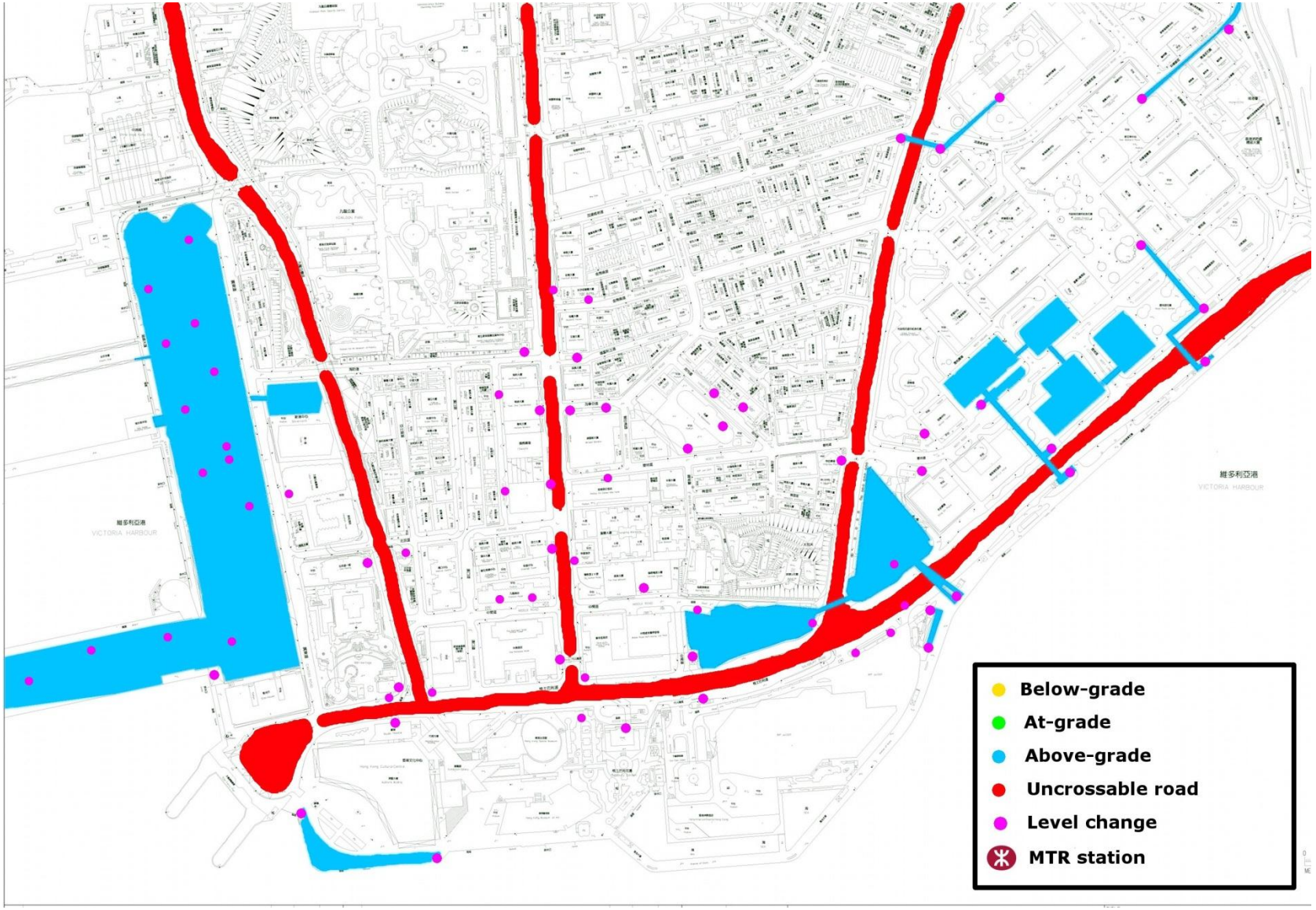
E.2 Tsim Sha Tsui Overall Pedestrian Map



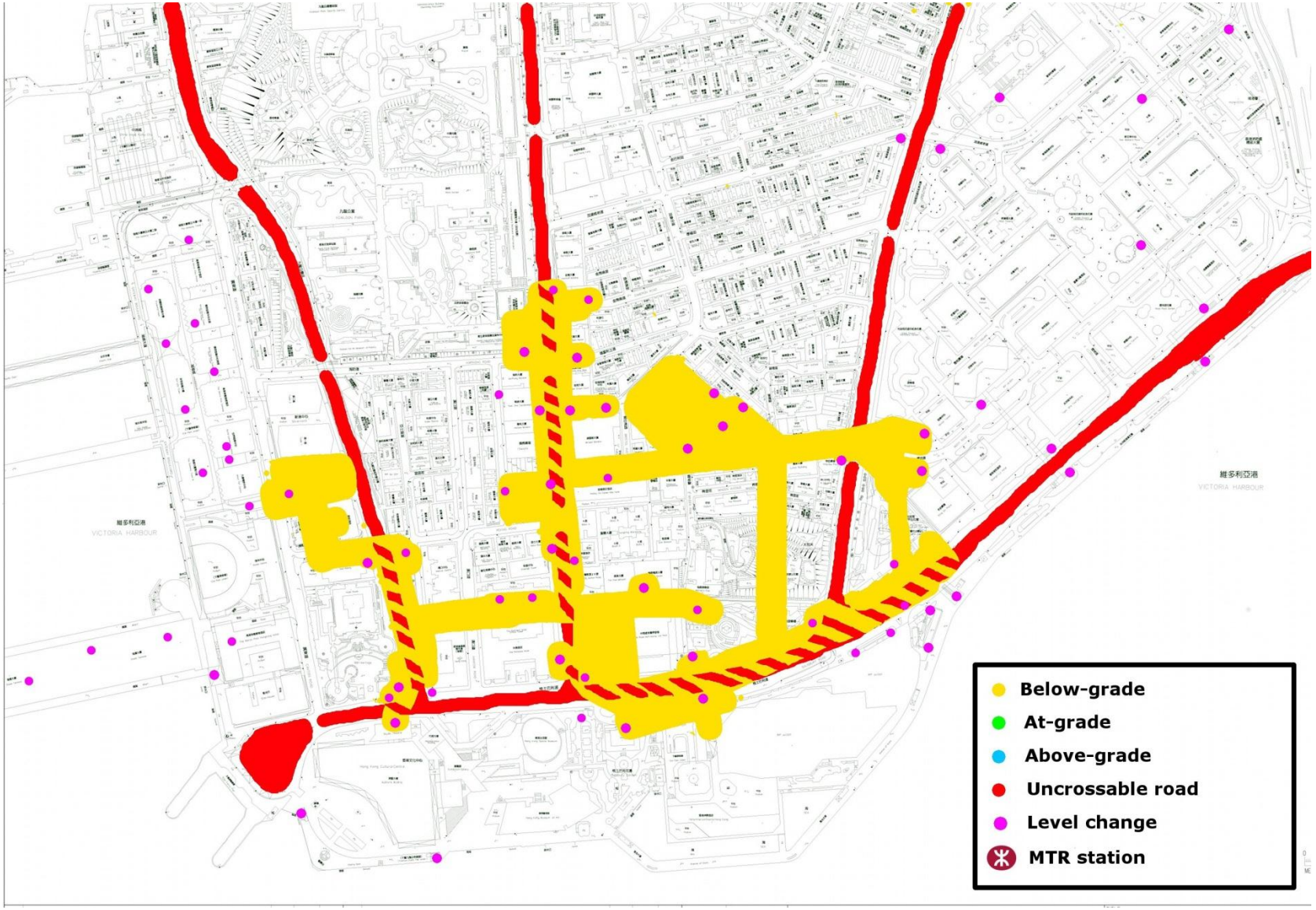
E.3 Tsim Sha Tsui Ground-Level Pedestrian Map



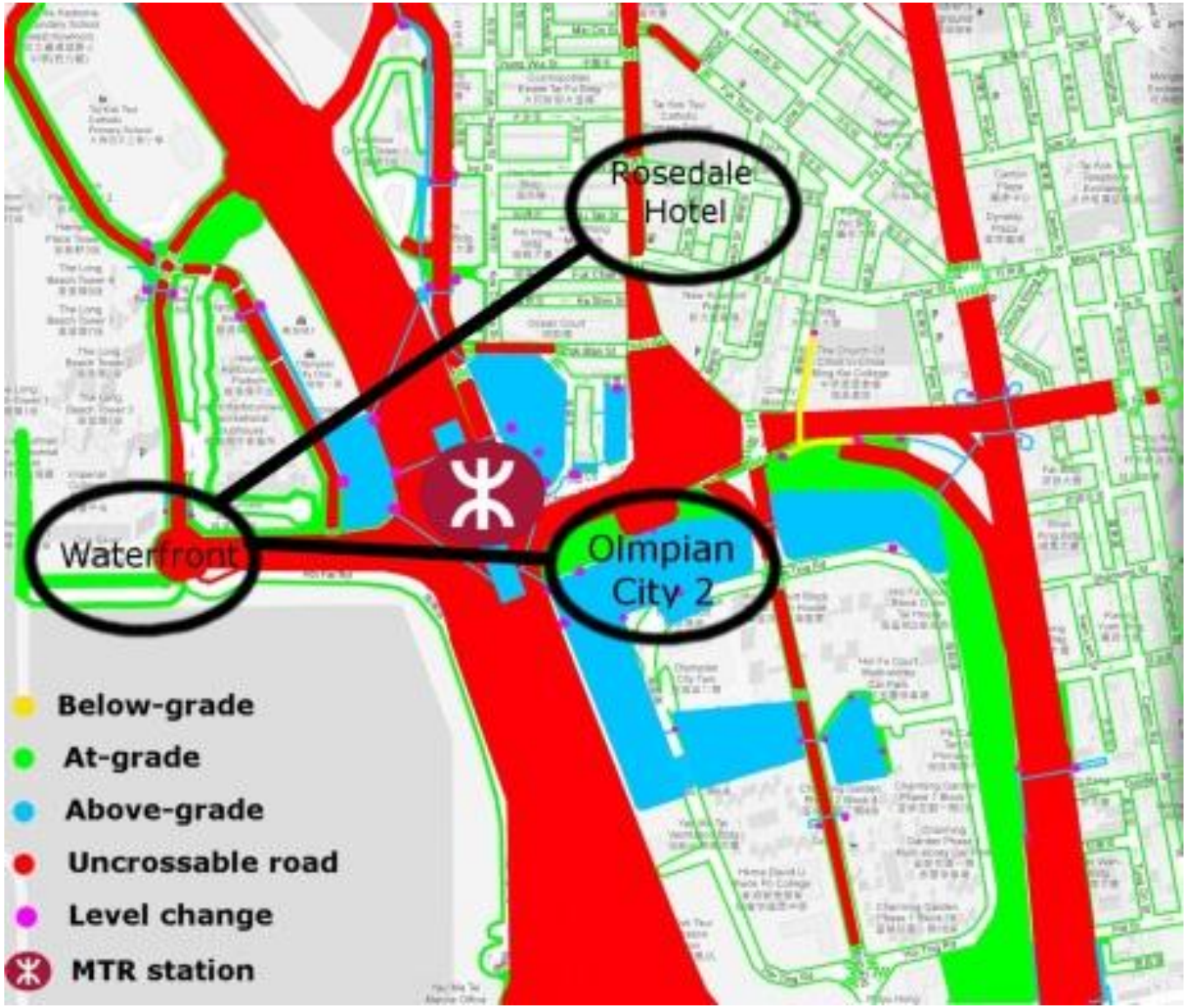
E.4 Tsim Sha Tsui Above-Ground Pedestrian Map



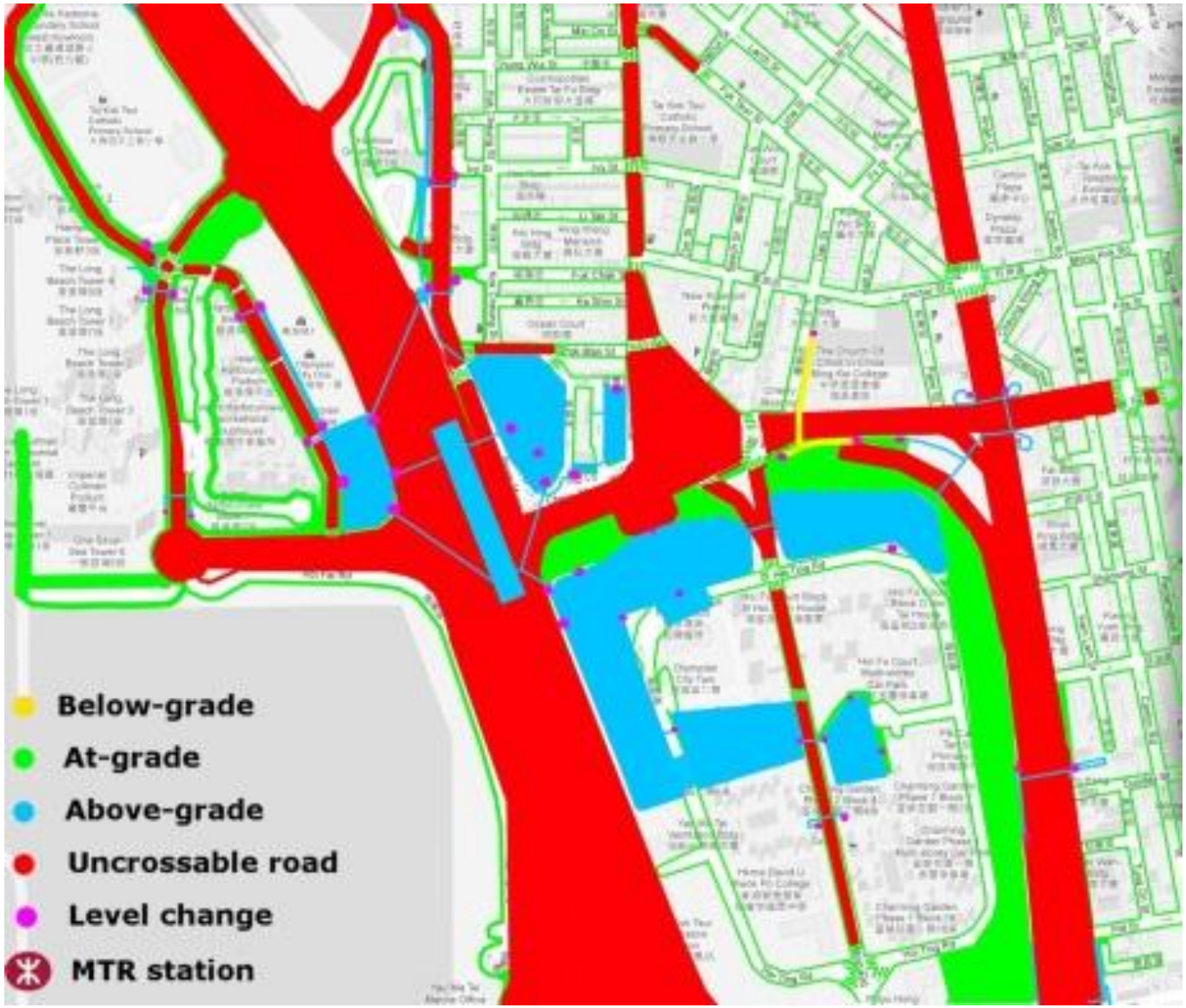
E.5 Tsim Sha Tsui Below-Ground Pedestrian Map



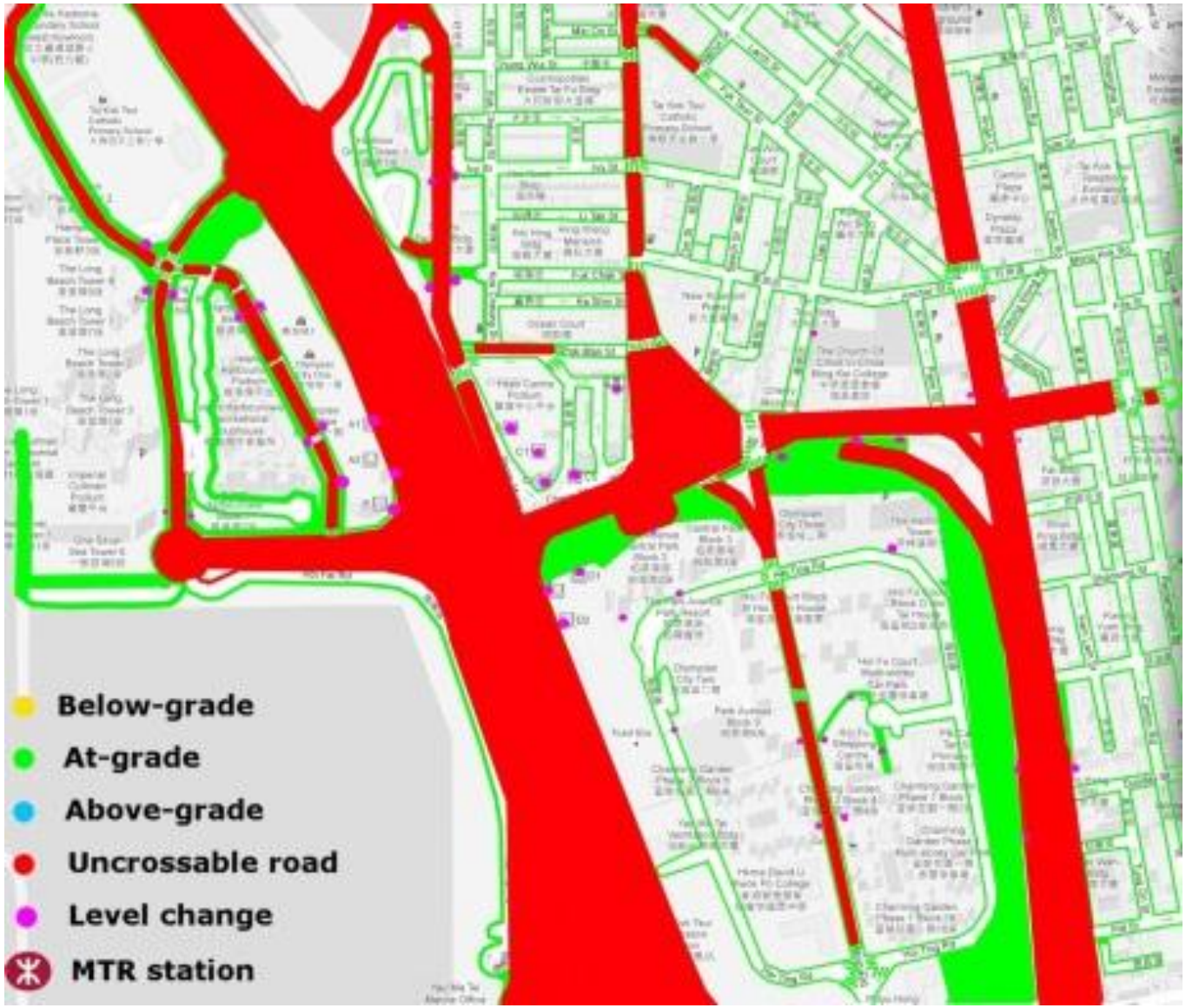
E.6 Tai Kok Tsui Overall Pedestrian Map (with Desire Lines)



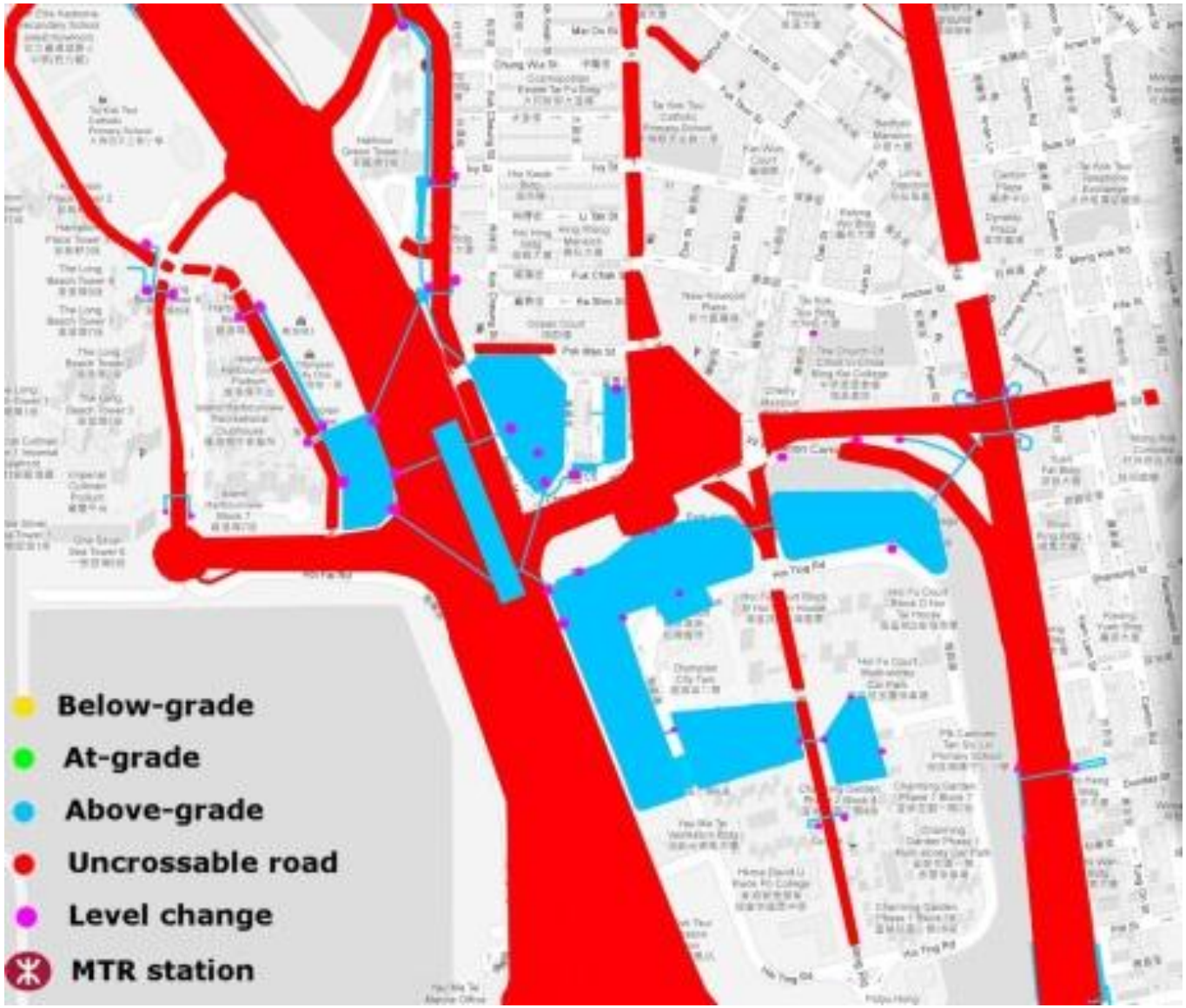
E.7 Tai Kok Tsui Overall Pedestrian Map



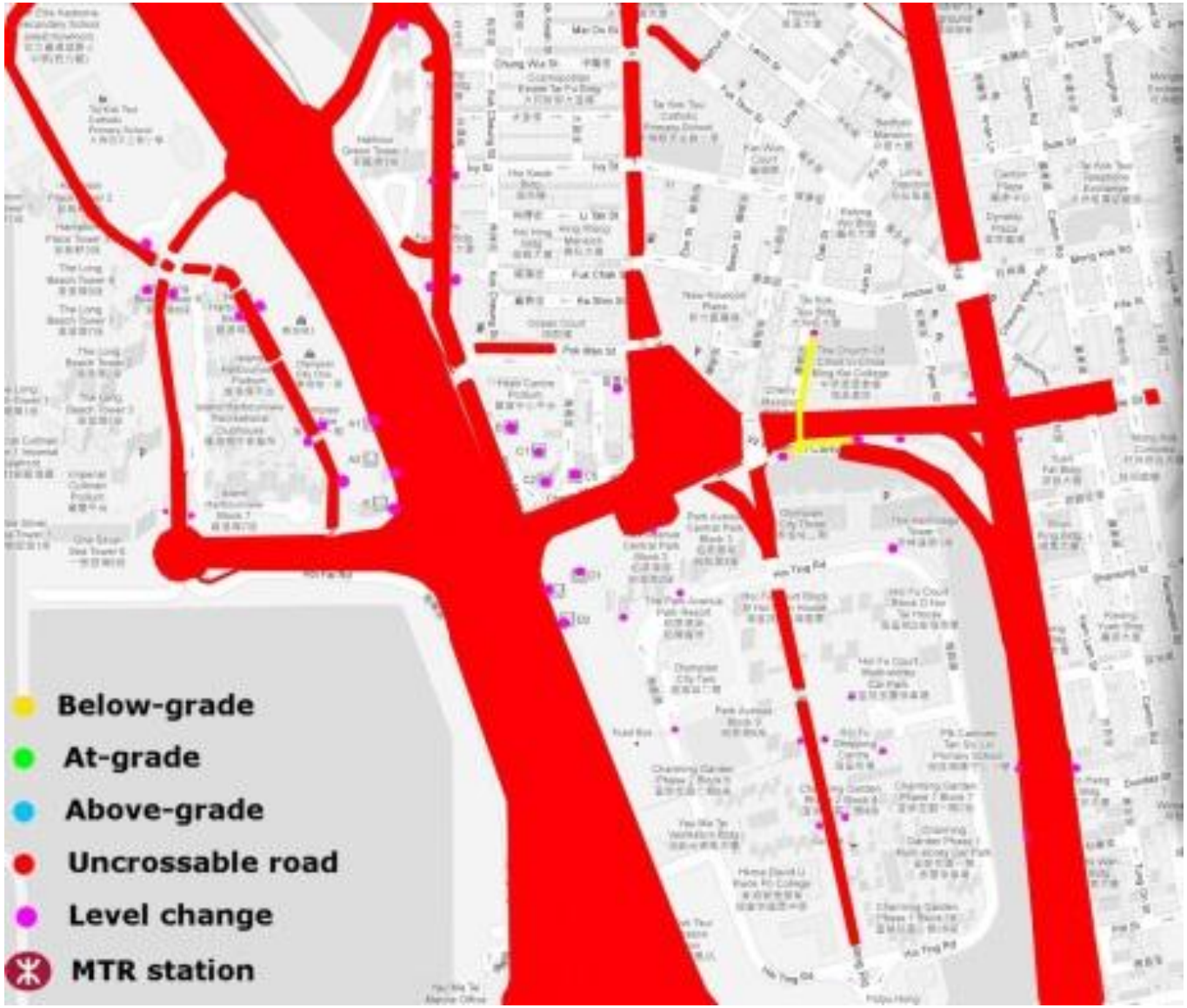
E.8 Tai Kok Tsui Ground-Level Pedestrian Map



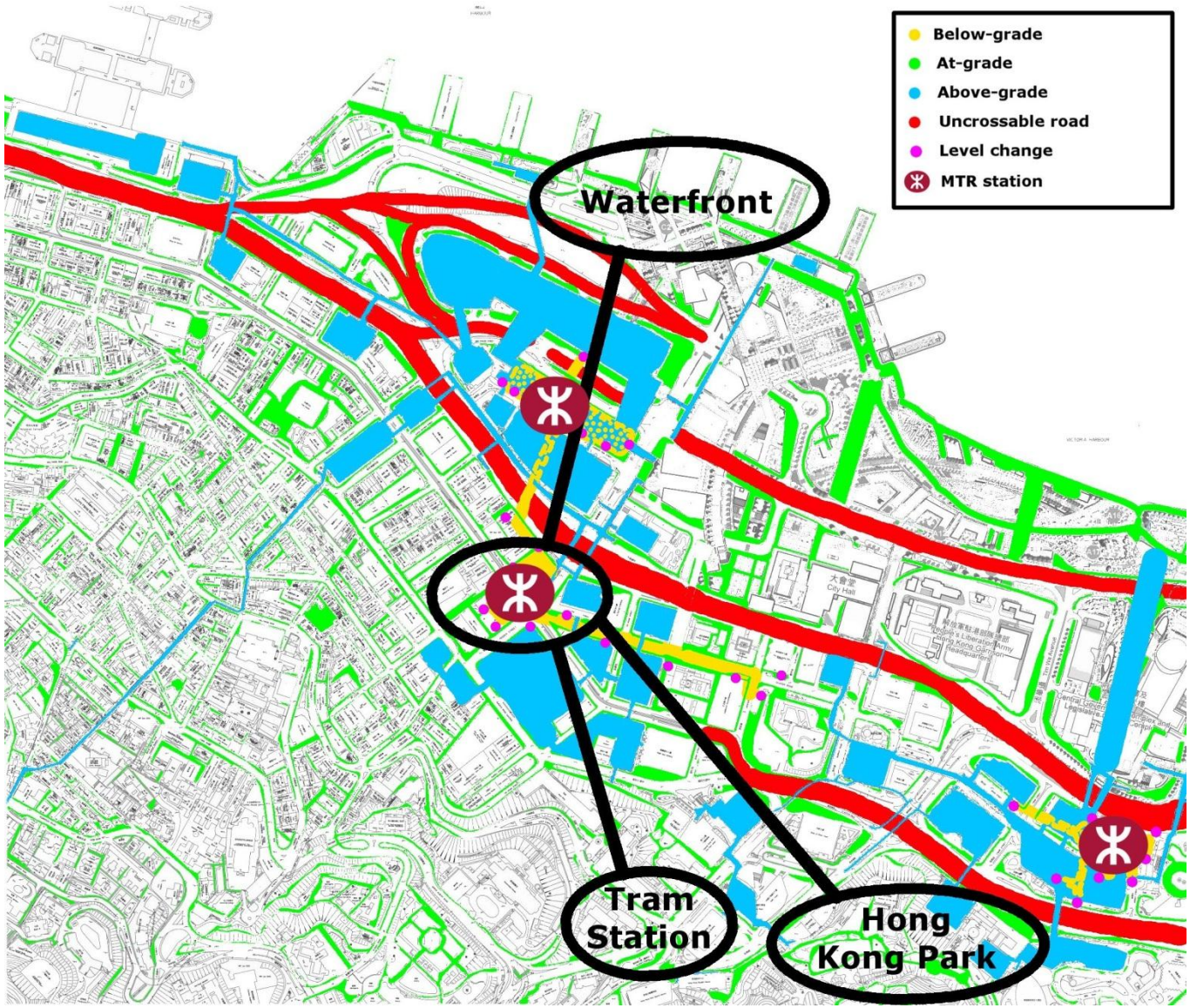
E.9 Tai Kok Tsui Above-Ground Pedestrian Map



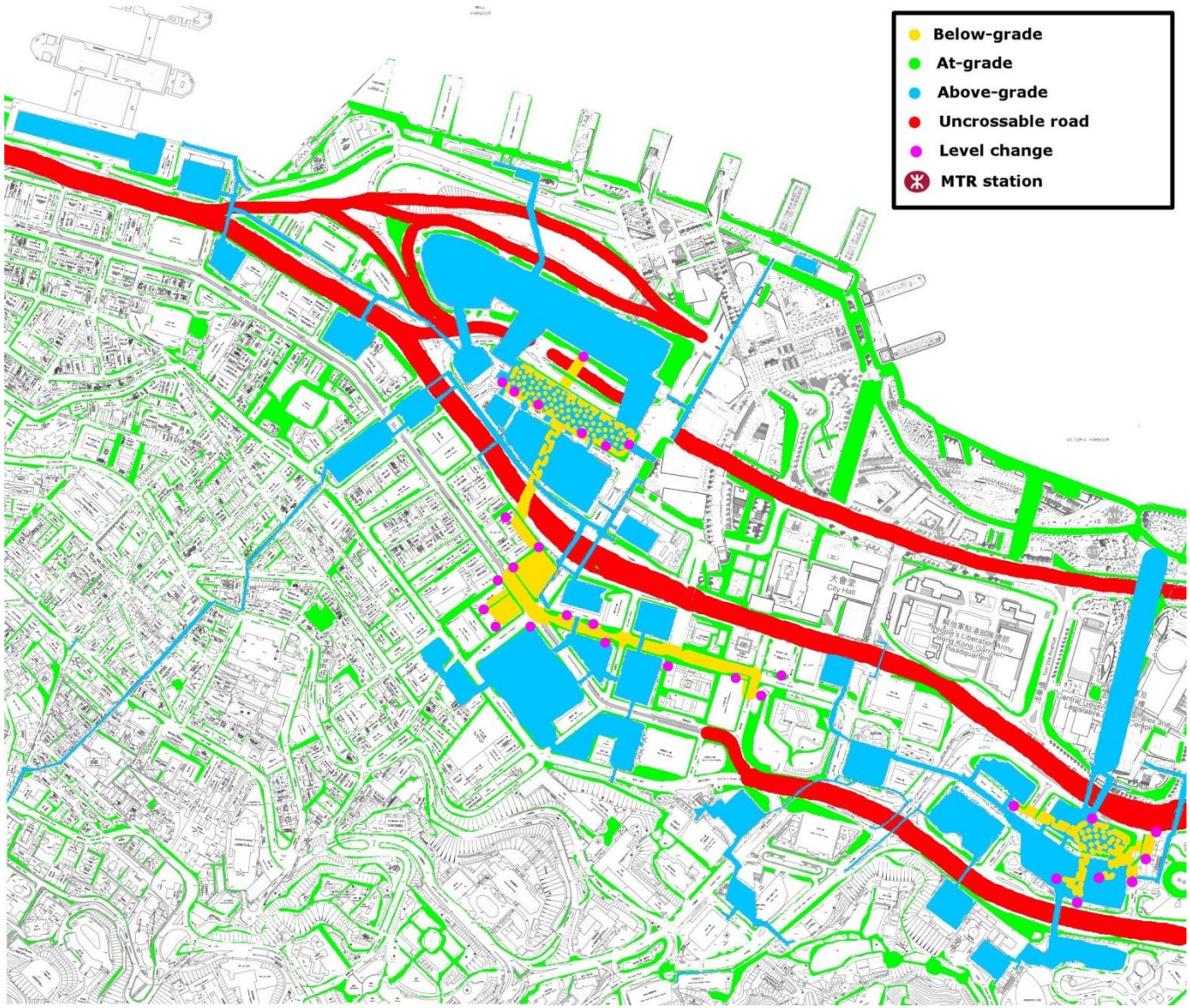
E.10 Tai Kok Tsui Below-Ground Pedestrian Map



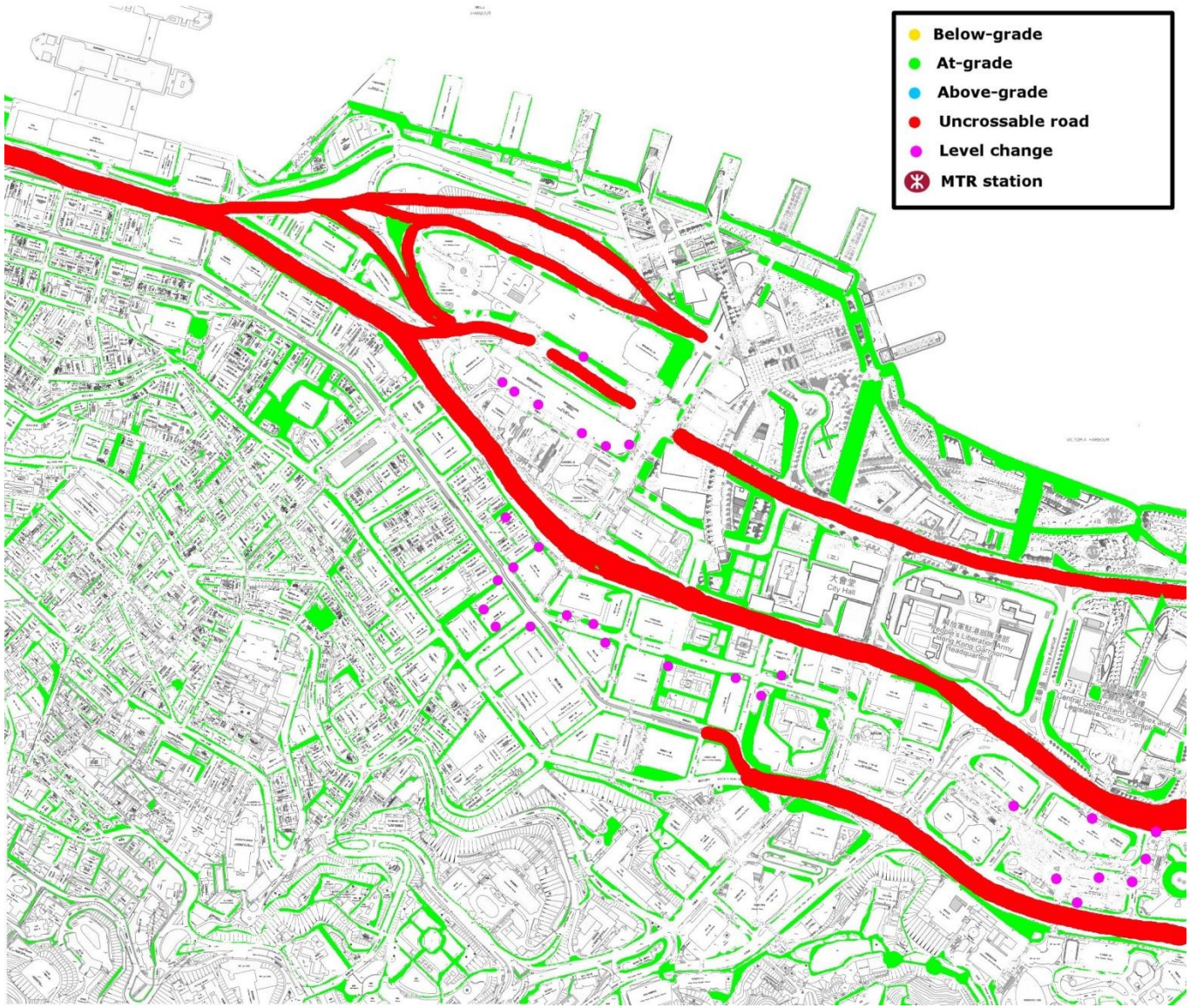
E.11 Central Overall Pedestrian Map (with Desire Lines)



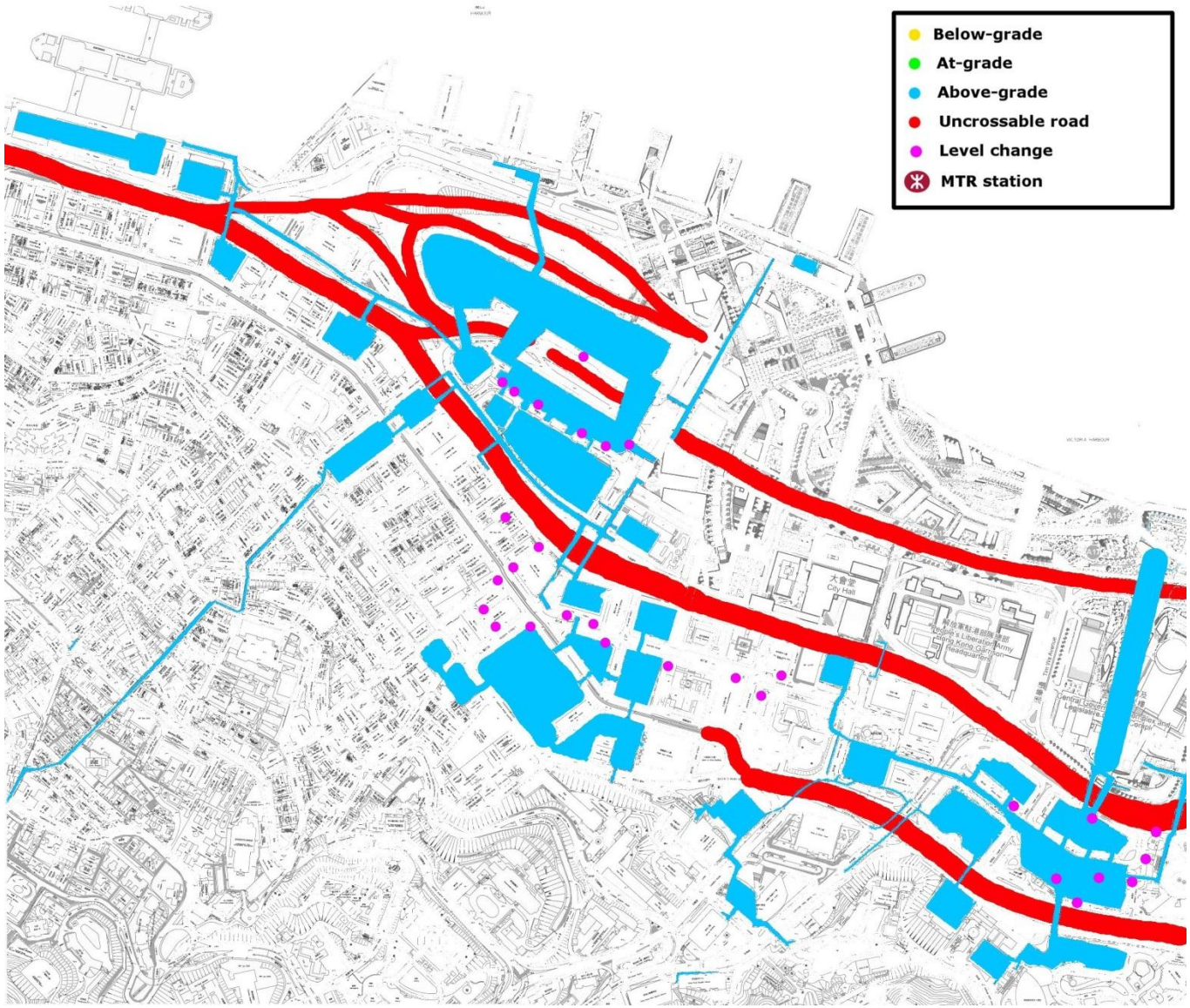
E.12 Central Overall Pedestrian Map



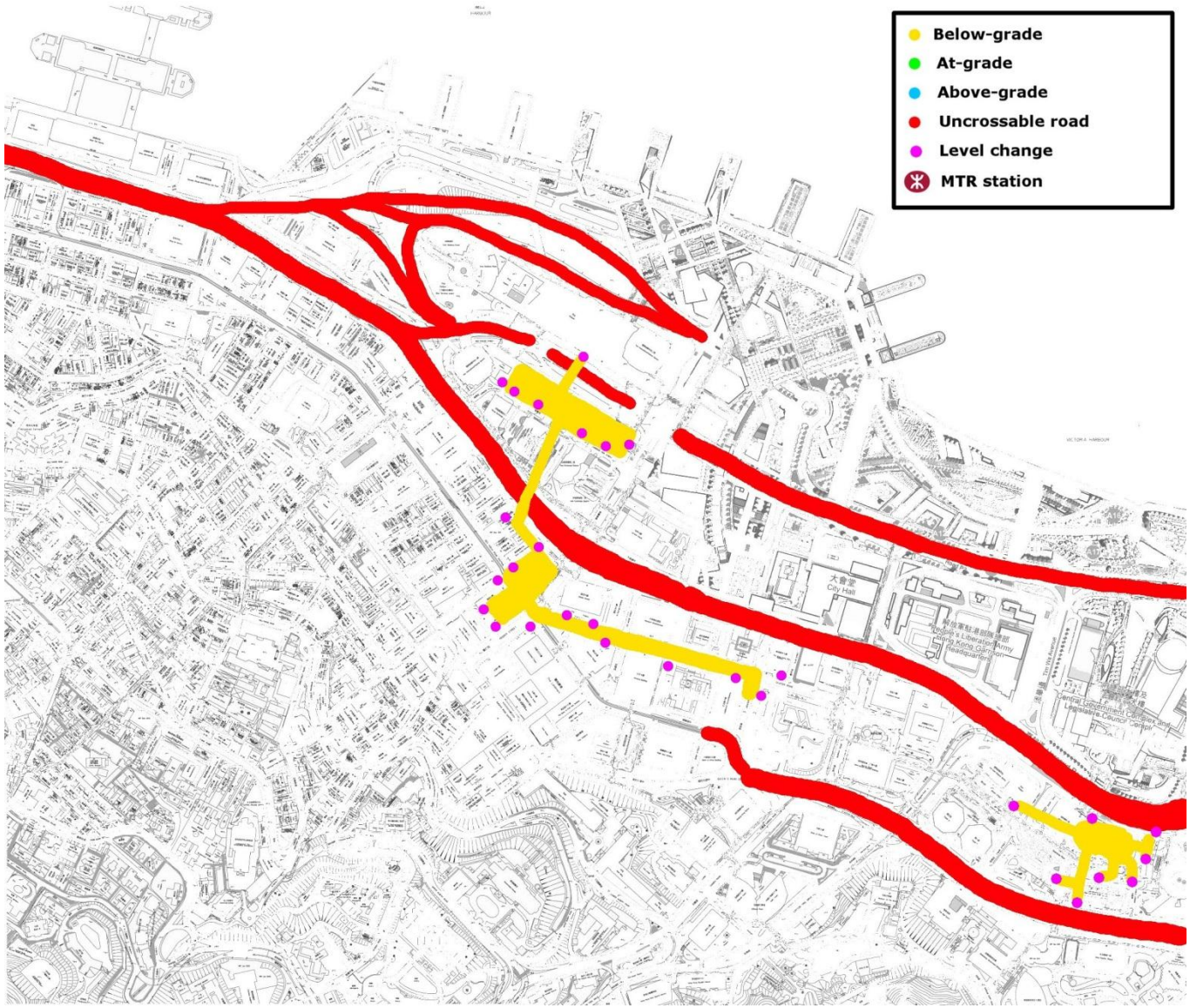
E.13 Central Ground-Level Pedestrian Map



E.14 Central Above-Ground Pedestrian Map



E.15 Central Below-Ground Pedestrian Map



E.16 Tsuen Wan Overall Pedestrian Map (with Desire Lines)

E.17 Tsuen Wan Overall Pedestrian Map

E.18 Tsuen Wan Ground-Level Pedestrian Map

E.19 Tsuen Wan Above-Ground Pedestrian Map

E.20 Tsuen Wan Below-Ground Pedestrian Map

APPENDIX F: DISTRICT SCORING CHARTS

F.1 Tsim Sha Tsui Scoring Chart: Ferries to Kowloon Park

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**0**	0	0	0
2	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**0**	0	0	0
3	E	**2**	1	0	1	**3**	2	1	**0**	0	0	**2**	1	1	0
4	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	E	**1**	0	1	0	**0**	0	0	**0**	0	0	**2**	1	1	0
Total		**5**	3	1	1	**4**	3	1	**0**	0	0	**7**	2	3	2
Avg.		**.833**	.500	.167	.167	**1**	.500	.5	**0**	0	0	**1.17**	.333	.500	.333
Score		**27.8%**				**33.3%**			**0.00%**			**39.0%**			

F.2 Tsim Sha Tsui Scoring Chart: Kowloon Park to HK Science Museum

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	E	**2**	0	1	1	**0**	0	0	**0**	0	0	**2**	1	1	0
2	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
3	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**3**	1	1	1
4	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**2**	0	1	1
5	G	**3**	1	1	1	**0**	0	NA	**NA**	NA	NA	**1**	1	0	0
6	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
Total		**9**	5	2	2	**1**	1	0	**0**	0	0	**12**	3	5	4
Avg.		**1.50**	.833	.333	.333	**.167**	.167	0	**0**	0	0	**2**	.500	.833	.667
Score		**50.0%**				**5.57%**			**0.00%**			**66.7%**			

F.3 Tsim Sha Tsui Scoring Chart: HK Science Museum to Avenue of Stars

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
2	E	**0**	0	0	0	**2**	1	1	**1**	1	0	**0**	0	0	0
3	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
4	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
5	G	**1**	1	0	0	**1**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
7	G	**0**	0	0	0	**1**	1	NA	**NA**	NA	NA	**2**	0	1	1
8	U	**0**	0	0	0	**2**	2	0	**3**	1	2	**1**	0	1	0
9	G	**0**	0	0	0	**1**	1	NA	**NA**	NA	NA	**2**	1	1	0
10	G	**2**	0	1	1	**0**	0	NA	**NA**	NA	NA	**0**	0	0	0
11	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**0**	0	0	0
Total		**8**	4	3	1	**8**	7	1	**4**	2	2	**11**	1	4	6
Avg.		**.727**	.364	.273	.091	**1.136**	.636	.5	**2**	1	1	**1**	.091	.364	.545
Score		**24.2%**				**37.9%**			**66.7%**			**33.3%**			

F.4 Tsim Sha Tsui Scoring Chart: TST MTR Station to Avenue of Stars

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	U	**1**	1	0	0	**2**	2	0	**1**	1	0	**2**	1	1	0
2	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	1	1	0
3	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	1	0
4	U	**1**	1	0	0	**3**	2	1	**0**	0	0	**2**	1	1	0
5	U	**2**	1	0	1	**3**	2	1	**0**	0	0	**1**	0	1	0
6	U	**0**	0	0	0	**3**	2	1	**0**	0	0	**1**	0	1	0
7	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	1	0
8	G	**2**	0	1	1	**0**	0	NA	**NA**	NA	NA	**0**	0	0	0
9	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**0**	0	0	0
Total		**9**	5	2	2	**11**	8	3	**1**	1	0	**10**	3	7	0
Avg.		**1.00**	.556	.222	.222	**1.639**	.889	.75	**.250**	.25	0	**1.11**	.333	.778	0
Score		**33.3%**				**54.6%**			**8.33%**			**37.0%**			

F.5 Tai Kok Tsui Scoring Chart: Olympian City 2 to Cherry St. Waterfront

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**3**	1	1	1	**2**	2	NA	**NA**	NA	NA	**1**	1	0	0
2	E	**0**	0	0	0	**3**	2	1	**2**	0	2	**1**	0	1	0
3	E	**1**	1	0	0	**3**	2	1	**2**	0	2	**1**	0	1	0
4	E	**1**	1	0	0	**3**	2	1	**2**	0	2	**1**	0	1	0
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
7	E	**0**	0	0	0	**1**	1	0	**2**	0	2	**0**	0	0	0
8	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
Total		**7**	3	3	1	**12**	9	3	**8**	0	8	**7**	1	3	3
Avg		**0.875**	0.375	0.375	0.125	**1.875**	1.125	0.75	**2**	0	2	**0.875**	0.125	0.375	0.375
Score		**29.2%**				**62.5%**			**66.7%**			**29.2%**			

F.6 Tai Kok Tsui Scoring Chart: Rosedale Hotel to Cherry St. Waterfront

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**1**	0	0	1	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
2	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
3	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
4	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**2**	0	1	1
5	G	**2**	1	1	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
7	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
8	G	**0**	0	0	0	**2**	2	NA	**NA**	NA	NA	**1**	0	1	0
9	E	**0**	0	0	0	**3**	2	1	**2**	0	2	**0**	0	0	0
10	E	**1**	1	0	0	**3**	2	1	**2**	0	2	**2**	1	1	0
11	E	**0**	0	0	0	**3**	2	1	**2**	0	2	**0**	0	0	0
12	E	**1**	1	0	0	**3**	2	1	**2**	0	2	**1**	0	1	0
13	G	**0**	0	0	0	**2**	2	NA	**NA**	NA	NA	**1**	0	1	0
14	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
15	E	**0**	0	0	0	**1**	1	0	**2**	0	2	**1**	0	0	1
16	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**1**	0	1	0
Total		**11**	7	3	1	**20**	16	4	**10**	0	10	**18**	1	8	9
Avg		**0.6875**	0.4375	0.1875	0.0625	**1.8**	1	0.8	**2**	0	2	**1.125**	0.0625	0.5	0.5625
Score		**22.9%**				**60%**			**66.7%**			**37.5%**			

F.7 Central Scoring Chart: Central MTR Station to Hong Kong Park

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
2	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
3	E	**0**	0	0	0	**1**	1	0	**0**	0	0	**1**	0	0	1
4	E	**0**	0	0	0	**1**	1	0	**0**	0	0	**1**	0	0	1
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	E	**1**	0	1	0	**1**	1	0	**0**	0	0	**0**	0	0	0
Total		**2**	0	2	0	**3**	3	0	**0**	0	0	**7**	0	2	5
Avg		**0.33**	0	0.333	0	**0.5**	0.5	0	**0**	0	0	**1.167**	0	0.333	0.833
Score		**11.1%**				**16.7%**			**0%**			**38.9%**			

F.8 Central Scoring Chart: Central MTR Station to Lower Peak Tram Station

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	1	0
2	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**2**	0	1	1
3	G	**3**	1	1	1	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
4	E	**1**	0	1	0	**1**	0	1	**2**	0	2	**2**	1	1	0
5	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**1**	0	1	0
6	E	**0**	0	0	0	**0**	0	0	**1**	1	0	**1**	0	1	0
7	G	**2**	0	1	1	**1**	1	NA	**NA**	NA	NA	**2**	0	1	1
Total		**9**	3	4	2	**3**	2	1	**3**	1	2	**11**	1	7	3
Avg		**1.286**	0.429	0.571	0.286	**0.786**	0.286	0.5	**1.5**	0.5	1	**1.571**	0.149	1	0.429
Score		**42.9%**				**26.2%**			**50%**			**52.4%**			

F.9 Central Scoring Chart: Central MTR Station to Star Ferry

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
2	E	**0**	0	0	0	**3**	2	1	**2**	0	2	**1**	0	1	0
3	E	**0**	0	0	0	**3**	2	1	**2**	0	2	**1**	0	1	0
4	E	**0**	0	0	0	**3**	2	1	**2**	0	2	**2**	1	1	0
5	E	**0**	0	0	0	**3**	2	1	**2**	0	2	**1**	0	1	0
6	E	**2**	1	1	0	**2**	1	1	**2**	0	2	**1**	0	1	0
7	G	**2**	1	0	1	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	G	**1**	0	0	1	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
Total		**6**	3	1	2	**15**	10	5	**10**	0	10	**11**	1	6	4
Avg		**1**	0.5	0.167	0.333	**2.667**	1.667	1	**2**	0	2	**1.83**	1.667	1	0.667
Score		**33.3%**				**88.9%**			**66.7%**			**61%**			

F.10 Tsuen Wan Scoring Chart: Town Hall to Ferry Pier

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	E	**0**	0	0	0	**1**	1	0	**1**	0	1	**0**	0	0	0
2	E	**3**	1	1	1	**3**	2	1	**1**	0	1	**1**	0	1	0
3	E	**0**	0	0	0	**1**	1	0	**0**	0	0	**0**	0	0	0
4	E	**1**	0	1	0	**1**	1	0	**1**	1	0	**1**	0	1	0
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	G	**0**	0	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
7	B	**1**	0	0	1	**3**	2	1	**1**	0	1	**2**	1	1	0
8	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
Total		**6**	1	3	2	**10**	8	2	**4**	1	3	**7**	1	3	3
Avg		**0.75**	0. 125	0.375	0.25	**1.4**	1	0.4	**0.8**	0.2	0.6	**0.875**	0.125	0. 375	0.375
Score		**25%**				**46.7%**			**26.7%**			**29.2%**			

F.11 Tsuen Wan Scoring Chart: Tsuen Wan MTR Station to Town Hall

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	E	**2**	1	0	1	**2**	2	0	**0**	0	0	**2**	1	1	0
2	E	**0**	0	0	0	**1**	1	0	**0**	0	0	**1**	0	1	0
3	E	**1**	1	0	0	**1**	1	0	**1**	1	0	**0**	0	0	0
4	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**1**	0	0	1
6	E	**0**	0	0	0	**2**	1	1	**1**	0	1	**1**	0	1	0
7	E	**0**	0	0	0	**2**	1	1	**1**	0	1	**1**	0	1	0
Total		**4**	3	0	1	**8**	6	2	**3**	1	2	**8**	1	5	2
Avg		**0.571**	0.429	0	0.143	**1.257**	0.857	0.4	**0.6**	0.2	0.4	**1.143**	0.143	0.714	0.286
Score		**19%**				**41.9%**			**20%**			**38.1%**			

F.12 Tsuen Wan Scoring Chart: Playground to Tsuen Wan West MTR Station

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
2	G	**0**	0	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
3	G	**1**	0	1	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
4	G	**1**	1	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**0**	0	0	0
6	G	**0**	0	0	0	**1**	1	NA	**NA**	NA	NA	**1**	0	0	1
7	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**0**	0	0	0
Total		**2**	1	1	0	**3**	3	NA	**NA**	NA	NA	**7**	0	2	5
Avg		**0.286**	0.143	0.143		**1.429**	0.429	1	**NA**	NA	NA	**1**	0	0.286	0.714
Score		**9.53%**				**47.6%**			**NA**			**33.3%**			

F.13 Tsuen Wan Scoring Chart: Tsuen Wan MTR Station to Playground

Block Number	Level	**Amenities**				**Convenience**			**Accessibility**			**Way-finding**			
			Shopping	Seating	Bathrooms		Weather	Escalator		Ramp	Elevator		Maps	Directions	Street sign
1	E	**2**	1	0	1	**2**	2	0	**0**	0	0	**1**	1	0	0
2	E	**0**	0	0	0	**1**	1	0	**1**	1	0	**1**	0	1	0
3	E	**1**	1	0	0	**1**	1	0	**1**	1	0	**1**	0	1	0
4	G	**1**	1	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
5	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
6	G	**0**	0	0	0	**0**	0	NA	**NA**	NA	NA	**2**	0	1	1
Total		**4**	3	0	1	**4**	4	0	**2**	2	0	**9**	1	5	3
Avg		**0.667**	0.5	0	0.167	**0.667**	0.667	0	**0.667**	0.667	0	**1.5**	0. 167	0.833	0.5
Score		**22.2%**				**22. 2%**			**22.2%**			**50%**			

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