

THERAPEUTIC STREETSCAPES: A New Bell Street Designed to Accommodate Those on the Autism Spectrum

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A Thesis submitted in partial fulfillment of the requirements for the degree of:

Master of Landscape Architecture  
and  
Master Urban Design and Planning

University of Washington  
2016

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Program Authorized to Offer Degree:

Landscape Architecture  
Urban Design and Planning

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University of Washington  
Abstract

## THERAPEUTIC STREETSCAPES: A New Bell Street Designed to Accommodate Those on the Autism Spectrum

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The rate of children and adults being diagnosed with Autism Spectrum Disorder (ASD) is rapidly rising throughout the United States. The CDC now estimates that 1 in 68 children are on the autism spectrum. At the same time cities across the United States are in a period of growth not seen since before World War Two. As more and more people move back to cities we need to consider designing for people with autism, a growing group of urban populations.

Current urban design standards and guidelines do not advocate for ASD focused elements. This thesis explores existing ASD guidelines, creating a framework for making public spaces more comfortable for those with Autism Spectrum Disorder. Using previous studies and best practices information, I combine research regarding ASD architectural guidelines, Therapeutic Garden design, and best practices for Streetscape Design.

This project creates a new streetscape typology designed to accommodate those on the autism spectrum. The proposal is located within Belltown a neighborhood in Downtown Seattle. Belltown is the densest neighborhood in Seattle, extremely walkable, great transit and a large number of affordable housing units. The final design of the project includes multiple elements that could be applied to urban design and streetscape designs around the country as a way to consider the ASD population in the creation of our public spaces.



# THERAPEUTIC STREETS CAPES:

A New Bell Street Designed to Accommodate Those on the Autism Spectrum

Joshua Saitelbach

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# ACKNOWLEDGMENTS

I would like to start by thanking my classmates in both Urban Planning and Landscape Architecture for constantly pushing me this year, all of our conversations and discussions have somehow shaped my role as a designer and planner of the built environment.

I would like to specifically thank my committee members, Daniel Abramson and Daniel Winterbottom. Your feedback has made this project more complete and valuable to the profession and ASD community as a whole.

I would also like to acknowledge Amy Wagenfield for taking time to send me information about projects and designers in the profession leading the way today, my coworkers at AHBL who taught me on the ground tactics that can be used to create therapeutic spaces, and finally Rich, for providing constant support, constant feedback.

Thank you all.



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# Therapeutic Streetscapes: **Introduction**

# DILEMMA

I have been working with children on the Autism Spectrum Disorder (ASD) for the past eight years. During our time together, I came to understand that inhabiting public spaces create challenges for people with ASD. One of the children I watched would often have behavioral outbursts but only on a specific side of the street. This outburst could have been a result of many different sensory influences. If we crossed the street, his behavior would be under control. One thing was certain, the way we design our built and non-built environments has an intense and profound impact on human behavior, for people with Autism, and those without.

Observing behavior changes based on environmental conditions is the reason for my own interest in Landscape Architecture and Urban Planning. How do we understand and create better spaces suited to those with Autism? How can our existing theories and frameworks guide us when making design decisions? This thesis is investigating at how Urban Design can make an impact on people with ASD. If cities were designed considering this often-overlooked group, maybe they would not only be better places for those with autism, but for everyone.

The writing style and graphic of my thesis was designed with the intention to be read not only by professionals designing and working in the built environment, but by parents, teachers, family members, and anyone who wants to gain an understanding of autism, and how we can make our cities safer and more inclusive. In the end, you will understand what makes a safe and comfortable streetscape for someone with Autism, and better comprehend how ASD individuals in the public realm cope with conditions designed without consideration for their needs.

Urban environments are designed for people without autism, or other disabling conditions. As this generation of children with autism ages, we must consider how we can use urban design to better accommodate those with Autism Spectrum Disorder into cities in which they were excluded from design consideration.

Although designers and planners are required to consider blind, deaf, and physically handicapped people due to ADA regulations, autistic people, though oftentimes more numerous, are typically forgotten.

ASD is a variable disorder and many believe that it is impossible to consider all individuals on the spectrum without generalizing. Autism activist and author Dr. Stephen M. Shore, has a famous saying; **“If you have met one person with autism, you have met one person with autism”**. His quote highlights the difficulty in accommodating the full range of ASD within one design. However, at this early point in Autism focused urban design, any attempt or effort to highlight Autism within the Built Environment will be pushing the field forward by encouraging planners and designers to consider this commonly forgotten demographic.

Public spaces can be scary places for people with ASD as well as their family members. Behavioral outbursts can be stigmatizing and lead to traumatic moments for ASD individuals. If our public spaces can be more inclusive in their physical design, then it could translate to a more inclusive social environment.

## UNITED STATES MINORITY POPULATIONS

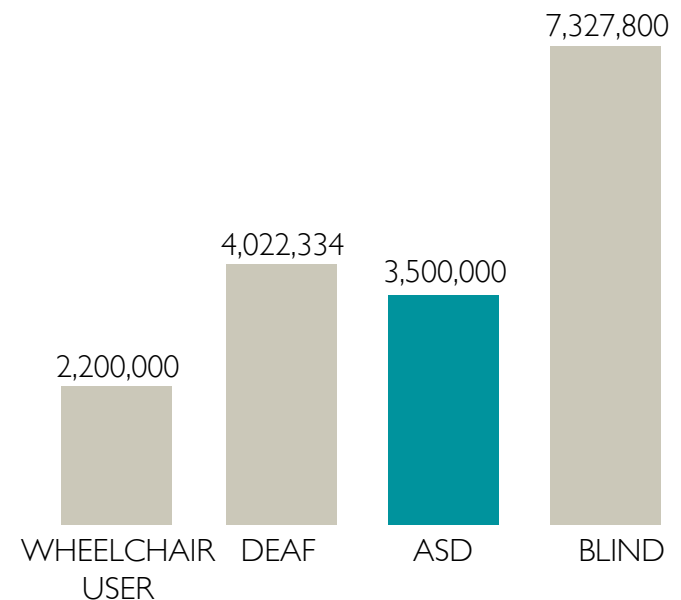


Figure 1: (CDC, 2015)

# INTRODUCTION TO AUTISM

Autism, or Autism Spectrum Disorder (ASD), is a rapidly growing disability estimated to affect 1 in 68 children in the United States. It was previously classified as a rare disorder, but recently, it has been found to be more common than Down syndrome and certain forms of cancer. (Kalyva, 2011) The recent growth of individuals diagnosed with ASD has encouraged new research on Autism, though there is still relatively little contextualizing ASD within the fields of Landscape Architecture and Urban Planning.

Individuals with ASD suffer from a neurological disorder, often causing impairments in social and communication skills. It was first categorized in 1943 by a psychiatrist, Leo Kanner. (Edwards, 2008) Today, we acknowledge that Autism is a spectrum disorder, comprised of a large range of severity and symptoms. Within the Individuals with Disabilities Education Act (IDEA) passed by congress in 1990, Autism is defined as follows:

**'Autism is a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age three that adversely affects a child's education performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences.'**

Since ASD is a spectrum disability individuals with ASD will have their own unique and diverse set of skills. People with autism are often extraordinary talented in the worlds of academics, music, and art. Approximately 40% of individuals diagnosed with ASD have an intellectual disability. (Autism Speaks, 2013)

Currently there is no known cure for ASD. This is a common misconception with those not familiar with the disability. Many types of therapeutic treatments can help build skills and control symptoms for ASD individuals. We will explore more specific therapeutic strategies later in the next section.

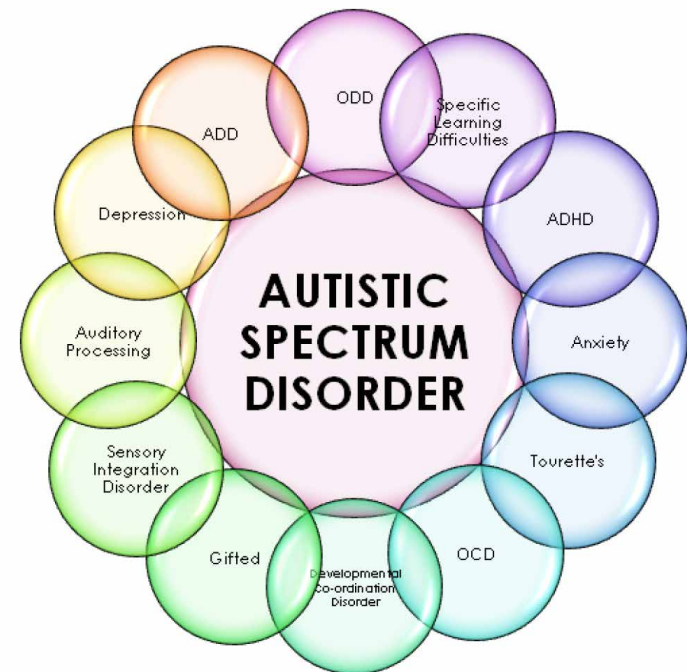


Figure 2: (Autism Speaks, 2013)

# Therapeutic Streetscapes: **Literature Review**

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# PART 2: LITERATURE REVIEW

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# AUTISM SPECTRUM DISORDER (ASD)

## GENERAL OVERVIEW

ASD is a complex neurological disorder that affects brain functioning, and often impacts the development of verbal and non-verbal communication skills as well.

ASD is referred to as a “spectrum disorder” with varying degrees of effects and severity for each individual. These symptoms can range from behavioral repetition patterns, limited interests, anxiety, limits to social interactions, poor motor skills, language and communication difficulties and sensory impairments. (Gunter, 2015)

The ASD population is growing quickly. In 2002 1 in 150 children was diagnosed with ASD. In 2006, the rate grew to 1 in 110, in 2008 it again grew to 1 in 88. Current estimates by the Center for Disease Control and Prevention (CDC) are closer to 1 in 68. (CDC, 2015) While the dispute over what is causing this growth has become increasingly controversial and political lately, ASD’s burgeoning presence cannot be ignored.

## ASD SIGNS AND SYMPTOMS

- Limited verbal speech
- Difficulty expressing wishes
- Limitations in understanding social norms
- Delayed body language
- Literate deficits
- Problems dealing with changes in routine and/or changing from one activity to the next
- Sensory modality difficulties, including over-responsiveness, under-responsiveness, or mixed responsiveness patterns to environmental sounds, light, visual clutter, and social stimuli (e.g., social touch, proximity of others, voices)

## Autism Prevalence by Gender:

**Boys: 1 in 42**  
**Girls: 1 in 189**

**Autism is 5 times more likely  
in males than females**

(Autism Speaks, 2015)

## SENSORY PROCESSING

Autism is thought of as a disorder of the senses and is sometimes called “Intense World Syndrome”. Those living with ASD have a harder time processing stimuli, resulting in atypical sensory perceptions. Stimuli can seem brighter, louder or scarier and when designing our urban landscapes, this must be taken into account.

In brains without neurological conditions, the nervous system functions by using two types of neurons, sensory and motor neurons. These two neurons work in conjunction, moving from the body’s receptors (places that receive stimuli, i.e. mouth or nose) to the brain to interpret the stimuli. For people with ASD, the communication between receptors and the brain is not as fluid. This is why they have a harder time processing stimuli. (Holbein, 2010) The difficulty and increased sensitivity to external stimuli is why Autism Speaks, a research organization, believes children with autism experience increased anxiety.

Sensory processing in ASD takes two forms, hypersensitive and hyposensitive. Hypersensitive people are thought of as overly sensitive. They react strongly to specific senses that can be painful and overwhelming for them. Hyposensitive people are under-sensitive. (Guner, 2015) They can often become agitated from lack of sensations. When that happens it is common to see out-of-control behaviors to help them stimulate sensations. It should be noted that someone with autism could be both hypo and hypersensitive simultaneously. These classifications are applied to each sense, so someone could be hyposensitive to auditory senses, and hypersensitive to vestibular sense (balance and coordination).

Oftentimes when the sensory processing abnormalities lead to frustrated or confusing situations for people with ASD, this can lead to a Sensory Overload situation.

*Autism: ‘Intense World Syndrome’*

# SENSORY OVERLOAD

Neurotypical brains work hard to communicate only as much information as they can handle. Though it is not even a conscious process, neurotypical brains are taking in tons and tons of information each second. In doing so, the brain organizes it, stores it, and evaluates it. Once evaluated, the important and relevant information it gets passed on to you. It only sends you what you need to know. (Hill, 2003) This process is something that people with ASD do not have. Their brains are not able to limit the amount of information passed on to them, this can result in sensory overload.

Let's imagine you are walking down the street. If you are Neurotypical, you're able to ignore the sound of the bird's overhead, or the car passing by. You can ignore the feeling on your skin when the breeze hits you, or tune out a raindrop splashing you. If you have ASD, chances are that those stimuli affect you very differently. When sufficient stimuli accumulate and begin to overwhelm, it often results in sensory overload. (Lauritsen, 2014) Sensory overload is not something just associated with ASD individuals; it happens to Neurotypical people as well. It is the feeling you get in a crowded place, that you have been in for too long and just need to get out. It is Times Square on New Years Eve, or front row at a concert - times where there is just too much going on.

Most people think we have five senses: hearing, smell, taste, sight, and touch. The exact number of senses is debated to be between 5 and 12. We will examine senses that affect ASD individuals while they are in urban landscapes. Auditory (hearing), visual (seeing), tactile (touch), olfactory (smell), proprioceptive (spatial), vestibular (balance)

***“The biggest problem for people with autism in the environment is sensory overload.”***

**– Temple Grandin**

## AUDITORY

Approximately 70% of individuals with ASD have some sort of sensitivity towards noise. This auditory sensitivity is what led to the discovery of autism in the 1950s. Parents began noticing abnormal reactions and behavioral outbursts from their children while vacuuming. (Humpal et al, 2012)

It is now understood that people with ASD have a difficult time localizing sounds and intensities. This means they have a hard time figuring out where a sound is coming from and how loud that sound actually is. In addition, someone with Autism cannot tune out excess sensory information, in this case sounds. They hear everything with a similar intensity, all as a singular sound. Any location or experience with multiple sounds can become overwhelming for someone with ASD. This includes most forms of public space.

People with autism are often sensitive to volume, pitch, or duration depending on the individual. Common noises that present issues are: high-pitched sounds, (alarms, sirens), buzzing (computers, electronics, fans) or echoes. (Carleton, 2011)

## VISUAL

People with ASD often suffer from Scotopic Sensitivity Syndrome, a visual perception problem caused by hypersensitivity to color, light, glare, patterns, and contrast. An example of this is fluorescent lighting. It is common throughout the spectrum to have people affected by them. They are brighter than typical lighting, emit a constant hum and have a flicker that.

Temple Grandin explained her experience with fluorescent lighting as such: **“Many individuals see the flicker and it makes the room flash on and off like a strobe.”**

This response to intense visual stimuli is important to incorporate into autism-friendly designs when thinking about pavement schemes, choosing color palette and creating lighting plans, etc. A study concluded that the visual problems that individuals with ASD face could result in poor facial processing skills, a common issue for many with autism. (Mour, 2008)

*My hearing is like having a hearing aid with the volume control stuck on ‘super loud’. It is like an open microphone that picks up everything. I have two choices: turn the mike on ... or shut it off.”*

**- Temple Grandin**

## TACTILE

The tactile sense refers to what is commonly called touch, the largest sensory system in the body. Many people with ASD have increased tactile sensitivities. Different touches can make someone with ASD respond very contrarily. Temple Grandin has stated that certain materials of clothing felt like she was wearing sandpaper. (Grandin, 1997) Nerves throughout the body sense the level of touch through the feeling of pressure and intensity. A common tactile sensitivity for ASD individuals is light touch, it can often be unbearable and painful, but a deep touch can encourage relaxation.

The tactile system is comprised of two parts: the first is responsible for pinpointing the sensation on the body, where is the individual being touched. The second determines if that touch is safe for your body; for example if you are touching a hot pan. This two pronged system explains why it takes a second for you to realize that pan is hot. For people with ASD, these parts are not as clearly delineated. (Hill, 2003) Often times the second part does not respond as quickly, explaining why some ASD people can hold hot items without feeling immediate pain.

## OLFACTORY

The olfactory sense, or sense of smell, is derived from our Limbic system, part of the brain related to pleasure, memory and emotion. This may help explain the strong, oftentimes sentimental emotions associated with a particular smell. Within the brain, smell and memory are stored together. In addition to memory, the olfactory sense is strongly intertwined with other senses, specifically taste. (Carleton, 2011) Flavors of food are detected by our olfactory sense as well. This can explain why children, with ASD and without, refuse to eat certain foods based solely on the smell. Smells resurface memories of disliking certain foods, all a function of the olfactory system.

For someone with autism the power of the olfactory sense can sometimes be overpowering and also lead to sensory overload. Smell can lead to a sensory overload experience for neurotypical people as well. A case study recants the experience of a girl with Autism who could not handle the smell of gasoline, and because of it, her parents would never fill up the car with her. (Holbein, 2010) This is an example of a change in behavior dictated by a sensory reaction, which happens in public spaces all the time.

***It is estimated that 50% of people with ASD have a different olfactory perception than typical people.***

## PROPRIOCEPTIVE

The Proprioceptive sense provides the ability to sense where your body is and how you are positioned. Proprioceptive sense, is not what comes to mind immediately when we think about our senses. This might seem like something that is just a part of you, but imagine for a minute that you did not know where your ear was. Can you feel your ear without touching it? For neurotypical people when they hear something loud they are very aware of where the ear is. This is an external stimulus that helps the brain understand where and how it is positioned. An individual with ASD has these sensory functions, however in times of stress they can be ignored.

When faced with a sensory overload, many individuals with ASD are exposed to too many senses to localize them on their body, and they lose contact with their proprioceptive abilities. An example of this is when you feel overwhelmed and someone gives you a hug, and for that moment, all is okay. This deep pressure applied to your body re-awakes your proprioceptive sense, and returns control to you. This phenomenon applies to people with autism as well. Deep pressure applied to someone with ASD is a common therapeutic technique to reduce stress and calm during a sensory overload. The squeeze chair has been designed to give you a "hug". It is a technology that has even been adapted into agricultural industries to reduce stress among animals at poultry and beef farms. (Grandin, 1997)

## VESTIBULAR

Our inner ear controls most of our vestibular sense, and is responsible for maintaining balance and coordination for our body. Sensory receptors within our inner ear inform the brain about gravity through vibrations on cilia, or the little hairs, within our ear. The hairs sway and change position when the head is tilted, bent or moved, and relay information back to the brain. Our inner ears also can understand movement, such as accelerating, stopping, or spinning around. (Hill, 2003)

ASD individuals with a hypersensitive vestibular sense can easily feel dizzy after seemingly simple movements like standing and sitting quickly, or by sitting in a car. On the other hand hyposensitive ASD individuals are known for swinging on the swings for a long time in order to provoke their vestibular sense. (Edwards, 2008)



*Figure 3: This squeeze toy was inspired by Temple Grandin's Hug Machine.*

Image sourced from: Got-Autism.com

## ASSOCIATED THERAPIES

People with autism often undergo a multitude of therapeutic programs and exercises as a way to help lessen behavioral outbursts and improve levels of functioning. Educators and researchers have found that the earlier an individual is diagnosed and therapies begin, the more successful the treatment usually is. (Perry, 2008) Through examining some therapies associated with ASD we will get a sense of struggles and challenges required to overcome the negative effects. These can then be applied within the urban fabric and landscape.

### Music Therapy

Music therapists use music to improve on targeted skill building on a case-by-case basis. The three most common areas individuals with ASD work on are, 1) Communication skills 2) Social Skills and 3) Emotional skills. Typically, music therapy is done through a behavioral approach focused on using instrument instruction, movement, dance, and improvisational exercises to reach set goals. (Humpal et al, 2012)

This therapy focuses on multiple senses based on each client. Through rhythmic exercise it can help a patient focus on their vestibular, proprioceptive, and auditory senses, which can be applied to everyday life.

### Aromatherapy

Aromatherapy is a sensory stimulation therapy. For ASD individuals it is a way to engage multiple senses at once. Real estate agents understand this link between smells and feelings. That's why sometimes they bake cookies in homes they are selling to invoke thoughts of welcoming and comfort. Aromatherapy tries to create those positive associations as well, and uses one of the most powerful senses, olfactory, to achieve this. Common fragrances used are, frankincense, cedar wood and lavender. These strong oils can stimulate ASD individuals and begin to link positive memories with specific smells.

There are many more therapeutic programs designed for people with ASD to consider when designing public spaces some include: Equestrian Therapy, Speech and Language Therapy, Applied Behavioral Analysis, Massage Therapy, TEACCH and many more.



Figure 4: Frankincense: One of the scents recommended for Aromatherapy focusing on individuals with ASD.

## EMPLOYMENT AND HOUSING OPPORTUNITIES

In addition, people with autism often struggle with access to affordable housing, employment opportunities, and continuing education. Most adults with ASD live at home. For many this is due to financial constraint; however, it should be noted that there is currently a lack of housing choices for people with ASD. There are few co-housing communities that specialize specifically in autism and often not enough affordable housing within urban areas. In addition to low cost housing, people with ASD often need to pay for caretakers, therapists and other social services. It is estimated that someone with autism will need \$3.2 million over their lifetime to cover costs associated with the disorder. (Autism Society, 2013)

The employment opportunities for people with ASD are likewise incredibly limited compared to the national economy. Only 10% of people with ASD find employment after high school. (Decker, 2014)

Providing appropriate housing close to employment opportunities could begin to reverse the current trend. In areas with mass transit and walkable streets, those with autism do not have to rely as much on external assistance for their transportation needs. They have more control over their own travel.

Co-housing communities provide further resources for ASD individuals such as built in therapeutic opportunities like Equestrian or therapeutic pools. Staff understand daily challenges and needs and can provide support. However, these facilities remain out of reach for many, but we still need to provide housing that promotes independence and healthy lifestyles for all people on the autism spectrum. (Roche + Roche, 2015)



Figure 5: Sweetwater Spectrum ASD Housing - Sonoma California

# THERAPEUTIC GARDENS

## GENERAL OVERVIEW

Therapy gardens are based on the philosophy that interaction with plant-dominated environments can benefit people through the healing evidence of nature (Marcus, 1999). Therapeutic gardens are designed for a specific user group, examples range from therapy gardens for classrooms and schools, to therapeutic gardens for Alzheimer's patients in care facilities; they are unique and designed for their specific user group. (The American Horticultural Therapy Association)

The American Horticultural Therapy Association (AHTA) developed seven characteristics found in therapeutic gardens. These act as good building blocks to design from depending on whom the garden is being designed for:

1. Scheduled and programmed activities
2. Features modified to improve accessibility
3. Well defined perimeters
4. A profusion of plants and people/plant interactions
5. Benign and supportive conditions
6. Universal design
7. Recognizable place making

Therapeutic gardens are typically found outside of the public realm at private care facilities, schools, and hospitals. Often, this is for the safety of its users, for example with dementia patients, or it is because of maintenance costs. These spaces require upkeep, which can be expensive, prohibitively for many public entities. (AHTA, 1995)

This exploration of therapeutic spaces will highlight details of several specific aspects for therapeutic spaces: plantings, circulation and site considerations.



*Figure 6: Example of an accessible garden bed.  
Image from Accessiblegardens.org*

# THEORETICAL UNDERPINNINGS

## **Biophilia:**

E.O. Wilson's Biophilia hypothesis suggests that there is an innate connection between humans and other living systems, like the natural environment. This concept was published in his 1984 book titled Biophilia. Wilson suggests this connection can be found within every aspect of human life. Subconsciously or not, we incorporate aspects of nature into our lives, and are wired to do so. This hypothesis lends weight to the main objective of Therapy Gardens being plant based spaces. (E.O. Wilson, 1984)

## **Attention restoration theory(ART) Kaplan + Kaplan:**

Developed by Stephen and Rachel Kaplan, Attention Restoration Theory asserts that people can concentrate better and for longer periods of time after spending time, or looking at photos of nature. Also as proven by Ulrich in 1984, looking at Nature helps with stress reduction and led to a faster recovery in surgical patients. (Ulrich, 1984)

## **Nature Deficit Disorder:**

While not technically a disorder, this term was pulled from Richard Louv's book, Last Child in the Woods. To summarize, Louv suggests that as our society and culture prioritizes different values, we are leaving nature behind and not spending time outdoors ourselves. Nor are we allowing our children to spend enough time outdoors. Louv suggests that spending time outdoors can improve attention spans, reduce stress, improve cognitive development, and creativity. (Louv, 2005)

## PLANTING AND THERAPY GARDENS

Plants are the focal point of therapeutic spaces. They are dynamic and fluid, not only changing year to year, but also season to season. Consideration must be taken to create a space that is interactive year round. As far as Autism specific therapeutic gardens, Daniel Winterbottom and Amy Wagenfield best summarize it from *Therapeutic Gardens Design for Healing Spaces*; "Nature, for those with ASD, means sensory environments that nourish and enrich rather than under-over stimulate."

Planting design is a large part of that sensory environment. Plants can have different touches, smells, colors and even tastes, all of which are experienced differently for a person with ASD. The following section will dive into specifics on the relationship between plants and sensory interactions.

### TOUCH

The tactile sense, or experience of touch, for people with ASD is often extreme. As a result, plants that have thorns or sharp leaves should be avoided. Examples of plants commonly found in the Pacific Northwest include: Common Holly (*Ilex aquifolium*), Rose (*Rosa*) or Oregon Grape (*Mahonia aquifolium*). These plant examples are obviously sharp to most people. There are common experiences for people with ASD that might not occur to neurotypical individuals. Often grasses can have a prickly effect and may feel uncomfortable. Taller, softer grasses are preferred over turf. They can have a calming, swaying effect and can endure physical interactions, something all plants in streetscape design should be able to endure. Plants can feel smooth and rubbery, or alternatively, often sticky and tough. Identifying the appropriate plantings based on touch can be helpful when creating a relaxing, safe space for people with ASD. (Marcus et al, 1999)

It is important to not only consider the physical touch of the plant, but how that changes throughout the seasons. For instance, deciduous plants that



*Figure 7: Ilex aquifolium or Holly has prickly leaves that could be uncomfortable to touch.*

lose leaves throughout the fall and winter could become less noticeable and easier to bump into, which would not feel good to anyone. Plants may also have different fruits and seeds they can often drop throughout the year. In fact some plants may even drop full branches throughout the year. The Monkey Puzzle tree (*Araucaria araucana*) drops its sharp branches as it ages. More commonly found in public spaces, the Horse Chestnut (*Aesculus hippocastanum*) has fruits that drop and are heavy and sharp. Those fruits, whether directly falling onto someone, or touched on the ground could aggravate tactile sensors in people with ASD. Trees often drop husks, or seeds onto the ground and those factors should be considered when picking a species.

## COLOR

Response to specific color varies and is unique to each individual with ASD. While a specific color is unlikely to outright upset someone, colors have the ability to enhance sensory sensitivities. (Gilliot, 2007) Lots of exciting colors all at once can signal excitement which might not be a positive thing for someone experiencing many sensory emotions, it could trigger a sensory overload experience. For example, the color red has been linked to increased heart rates and respiration. Warm-toned colors, like red and orange should be used secondary within the planting plan. Plant colors change seasonally as well, and variability throughout the year should be considered. An obvious example is the Red Maple (*Acer rubrum*), which turns a sharp red in the fall and is a very common street tree.

For meditative gardens, which are intended to be spaces for relaxing and reflective thought, experts suggest sticking to a simple color pallet, with mostly a series of greens. (Wagenfield et al, 2015) By choosing a minimal amount of visual contrast, they are intending to limit excitement or sensory activity. This is a concept that could be applied to a space when limiting excitement, for those with ASD as the reduced visual contrast and stimulation would minimize the chance of a sensory overload.

## CIRCULATION

Circulation in this case refers to how people move around and through a site. Irregularity and changes in routine are a common difficulty for people with ASD and may cause stress or anxiety, leading to sensory overload. Creating paths that eliminate surprises can be a helpful tool for people with ASD, especially in public spaces. In order to limit stress, two main objectives should be considered when designing circulation: 1) signage and 2) pathway orientation.

In public spaces, signage must be quickly processed. Specifically for people with ASD with a wide scale of comprehension. One of the most important aspects of good signage is consistency. Signs should be placed at the same height and spacing throughout the space. (NYC, 2001) While these suggestions apply to therapy gardens, this advice is followed on a citywide scale with street signs. Pedestrians, bikers and drivers know they will see a street sign at every corner, at a certain height, and they will all look the same. It would be much more difficult for a neurotypical person to navigate if there was not a specific system in place, let alone someone with ASD. A designer should also consider the use of iconography within the sign design as well. Often a sign can give just as much information with a simple icon, and is legible to a larger audience.

Secondly, the type of pathway can change the experience of a space. For those on the ASD spectrum, a curved path is often recommended for therapeutic garden spaces. Children and adults with ASD experience difficulty transitioning from one activity to the next. (Wagenfield et al, 2015) Curving pathways can help these transitions by flowing from one space to the next by providing a gentle transition. Curving spaces also take advantage of open sightlines and encourage a more relaxed setting and pace. These curving pathways when widened can also easily become flex spaces and provide an area to relax before the next activity around the corner.

## NOISE

As stated in auditory sense, noise affects people with ASD much more acutely than neurotypical people. That, I would argue it is the most important sense to consider when designing a therapeutic garden. There are several scales, the first and largest is the overall site design.

Considerations must be made when choosing a location. Avoiding busy roads and highways is a great place to start. The consistent sounds can be disturbing to those with ASD. If the site is located near a road a good vegetative screen would be helpful. Echoing spaces are also extremely stimulating for ASD individuals. To limit the sensory interactions with external noises, Richer et al suggests using brushed versus polished concrete to cut down on the vibrations. (Richer et al, 1971)

It is also important to consider noise in the physical design. Just like the fluorescent lights indoors, there are common elements found outdoors that emit a consistent sound. Air conditioners are one example and should be placed out of range, or screened. Other smaller elements to consider, include plantings, water, and artwork. Plants can often create sounds: branches shake in the wind, leaves rustle next to each other, and sometimes branches can scrape against each other or nearby structures. This is common among Poplar family of trees (Populus). Their broad leaves catch wind and quake as they do so. This soft, but constant sound could contribute to over stimulation for people with ASD. (Marcus et al, 2014)

Plants often attract wildlife that make noise. Many people are familiar with the sound of seagulls and it can be overwhelming for those with ASD; a song bird in a tree could have the same effect. These characteristics need to be considered when locating trees, shrubs and groundcovers that attract noisy wildlife.

## CASE STUDY: Institute for Child and Adolescent Development

The Institute for Child and Adolescent Development is located in a residential neighborhood in the college town of Wellesley, Massachusetts. This non-profit organization uses its garden as a place for individual and group therapy sessions. Most visitors to the institute are children, coping with emotional, learning, or behavioral disorders. The site is approximately one acre in size and was designed by the Landscape Architecture firm Reed+ Hilderbrand who won the American Society of Landscape Architecture (ASLA) President's Award of Excellence for its design, the most prestigious award given by the ASLA.

Clare Cooper Marcus and Marni Barnes cover this garden extensively in their book, *Healing Gardens*, where the designer Douglas Reed, explains the design narrative:

**“The design expresses the narrative of the watercourse that weaves its way through the site linking a sequence of spaces that correspond to stages of a child’s recovery.** They include archetypal landforms carved by water, a cave-like ravine for safety and security, an upland wooded plateau for exploration, a mount for climbing, an island for seclusion, a pond for discovery, steep and shallow slopes that invite risk and a large sunny glade for running and playing. A play terrace provides the threshold from the clinics playroom into the garden. A low fieldstone seatwall retains the terrace and defines the entrance into the adjacent ravine. The paving breaks apart into a checkerboard of individual stones and grass squares to express freedom of movement into the garden.” (Marcus et al, 1999)

Reed designed the space to be more naturalistic than manicured. He looked

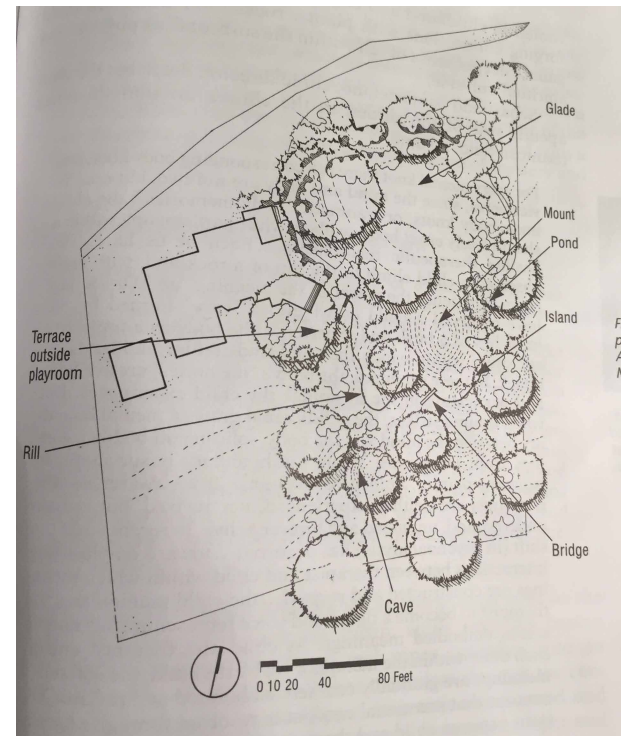


Figure 8: Plan drawing of the Institute for Child and Adolescent Development showing the sequence of space throughout the garden.

Source: (Marcus et al, 1999)

to include plants with “sensual and spiritual properties”. He chose plants with large leaves to create quiet internal spaces, like thickets of bamboo (*Phyllostachys*) and azaleas (*Rhododendron*). Since the garden has year round use, he chose plants with year round interest for example Paperbark Maple (*Acer griseum*), which has a papery textured bark, and leaves that change colors in the fall. (Hilderbrand, 2010)

Water is a strong element that runs consistently through the entire site. For the most part the water is contained within an eight inch wide steel channel that curves throughout the different areas, eventually emptying into the pond. Water here is intended to symbolize life and recovery, mimicking the journey patients have at the institute. The water here originates at the terrace, the entryway into the garden. As water bubbles over the basin, it is piped through the seating wall into the garden space and begins its journey through the space, exactly how a child would begin to explore the garden. (Marcus et al, 1999)

The project goal is to provide a place for children to interact with landscape. Depending on the child’s needs there are spaces for a multitude of different sensory experiences. The open spaces invite risk, like climbing up the rocks, or running down the steep hillside. There are also spaces for protection, like the ravine or the cave, which feel more enclosed. Finally there are spaces for isolation, the island, which provide the child with a private reflection space.



Figures 9+10: Top, channel running through garden. Bottom, Origin point for water and piping through the wall into the park. Source: Reed + Hilderbrand

## CASE STUDY: William E. Carter School

The Carter School, located in Boston, is a public school that serves children up to seven years old with severe developmental delays, often including Autism. The parents and staff at the Carter school worked closely with David Beraducci Landscape Architecture to create this sensory garden. This Sensory garden provides great examples of plant selection, pathway and circulation design and interactive features.

The circulation route at the Carter Sensory Garden mimics a large swooping figure eight. The pathway was designed with materials that provide color contrasting edging in order to help ease visually impaired movement. By choosing a different edging color and texture the designer creates a zone to signal visitors they could veer off the path. The surfaces of the garden were designed to be level and easily navigable for those in wheelchairs. The figure 8 route provides the main connections throughout the garden. There are several other side pathways that connect to various different quiet areas, a chance for many students to recharge and relax. These small spaces provide seating, shade and some sort of interactive feature. (Wagenfield et al, 2015)

Lining much of the pathway are tall ornamental grasses, which allow the user the opportunity to engage with the plant. By feeling the light blades of grass on their hands as they walk by, or even letting the grasses touch or tickle their faces. They experience the slight sensory stimulation often desired by individuals with hyposensitive sensory issues. In other sections of the park the planting plan creates areas with heavy shade, and more infrequently, areas with direct sun. The shade is found through some of the existing evergreens that remain on the site, and also through the newly planted Birch Groves (*Betula*), and several trellises. There is a space in the garden for smelling as well. Herbs, lilac and roses are nestled in a planting bed nearby a quiet place within the garden. This design tactic helps to limit the number of senses being stimulated at once. The quiet space provides a low stimulation environment



Figures 11 + 12: Pathways at William E. Carter School  
Source: Beraducci Landscape Architecture

for individuals to arouse their olfactory sense, one of our most powerful.

The garden uses water as an interactive feature in many of its different areas. Throughout the space visitors can hear or see the water. At many of these areas, students are able to touch and interact with water as well. This is done through the use of two different water features. The first, accessible by pushing a button at wheelchair level, releases a cooling mist both watering the plants on the nearby trellis, and cooling the students nearby in a safe way that is neither surprising or overwhelming. It gives the students a sense of control within nature. The second water feature is bubbling fountain that invites touch of the water; and features a button that can intensify the bubbling. A similar sense of control is provided to users there. (Beraducci, 2016)



Figures 13, 14, 15

Top Right: Bubbling water fountain

Bottom Right: Lawn and open play space

Bottom Left: Small seating area

Photos: Beraducci Landscape Architecture



Figure 16: Master Plan: William E. Carter School  
 David Beraducci Landscape Architecture

# EXISTING GUIDELINES FOR ASD DESIGN

## GENERAL OVERVIEW

Current research on autism-focused design is mainly limited to two specific topics: residential design and classroom design. Both of these categories are more relevant to architecture and interior design than urban design; however, many of the principles outlined within current research may also be applied to outdoor and public space design. Each study has proposed recommendations and guidelines for ASD focused design. By comparing multiple studies we can begin to see commonalities within research that may be applied to a specific location within Seattle.

The guidelines set forth through six different studies will be covered. This comparative exercise will show how often the same principles are repeated. It should be noted that on the whole, there is a need for more qualitative data on ASD focused design. This is a major limitation, as most of the data is based on observational studies or authors experience, which must be considered when applying these principles and findings.

## RESEARCH ORGANIZATION

The studies are organized into two different categories based on their original application. The following section will look at each of the following studies

### Classroom Design

Mostafa: Architecture ASPECTSS

McAllister + Maguire: A Design Model- The Autism Spectrum Disorder Classroom Design Kit

Vogel: Classroom Design for Living and Learning with Autism

### Residential Design

Brand: Living in the Community, Housing Designed for Adults with Autism.

Sanchez, Vazquez, Serrano: Autism and the Built Environment

# MOSTAFA

Mostafa's research focuses on design in the built environment and its affects on functionality for individuals with ASD. Mostafa demonstrates that architecture has the ability to influence behaviors for people with ASD. "[T]his study shows promising indications of the possible improvement of autistic behavior, as indicated by increased attention span, reduced response time and improved behavioral temperament, using an altered architectural environment." (Mostafa, 2008)

This study used both observational studies and interviews to formulate design recommendations. Her interviews are conducted with second party sources, people who do not have autism, but frequently interact with those who do. (parents and teachers of ASD children) The observational study was done on children with ASD in an educational setting. She sets up this study as a "first stage" attempt, with a wish for a larger study group or sample size for future testing.

Her final product was a sensory design matrix that matched sensory issues in ASD individuals with architectural attributes. Some examples of architectural attributes are: lighting, acoustics, rhythm, color, symmetry, scale etc. The sensory issues covered are similar to the ones covered in section one, Auditory, Visual, Tactile, olfactory (smell), proprioceptive (Spatial). Mostafa's research found acoustics as the most influential factor on ASD behavior. Other architectural attributes that significantly influenced over behavior included lighting, colors and patterns and texture.

She highlighted issues surrounding the lack of criteria for the built environment not only for people with ASD, but also for other "sensory sensitive" groups, like individuals with epilepsy and migraines. Mostafa argued that design interventions can help sensory sensitive groups , including those with ASD, these groups are not mutually exclusive.

		Sensory Issues																
		Auditory			Visual			Tactile			Olfactory			Proprioceptive				
		a	b	c	a	b	c	a	b	c	a	b	c	a	b	c		
ARCHITECTURAL ATTRIBUTE	Structure	A	1	2		1	2	1	2	1						2	1	1
		B	3	4	3	3	4									4	3	
		C	5	6	5	5	6	5	6	5						6	5	5
		D					7										7	7
		E	8			8											8	8
	Balance	F	9	10		9	10	9								9	10	9
		G					11										11	11
		H				12	13	13	12								13	13
		I				14	15	14								14		14
	Quality	J				17	16			18								
		K		19			19	20										
		L	21	21	21													
		M		22						22	23							
	Dynamic	N										24	25	24				
		O				26	26	26		26						26	26	
P					27		27								27	27		
Q		28			28		28								28	28		
R																		

Figure 17: Mostafa's Sensory Design Matrix.

This is one of the only studies that defined with ASD focused design standards that could be replicated. Similarly, it is one of the only studies that used both qualitative and quantitative methodology. The field of ASD design is new and expanding; more studies on the same topic must be completed to gain more information and context.

## VOGEL

Vogel presented “eight design standards and solutions” from her research (Vogel, 2008). Her study was based completely on interviews, which limits the scientific validity, but is able to provide insights from individuals with ASD. These perspectives are rare in ASD research. Qualitative surveys will play vital role in determining urban design standards focused on individuals with ASD. (Grancich, 2014)

Vogel's set of standards and solutions are based on “interviews with people most directly affected by autism, parents, teachers, therapists, as well as college students and adults with autism.” (Vogel 2008) The result is a list of eight design standards that are meant to be ASD standards for interior spaces. Standards that are geared towards ASD individuals can have multiple applications, whether they are in classroom design, residential design or urban design. Her standards and solutions are: flexible, adaptable, non-threatening, non-distracting, predictable, controllable, sensory motor attuned, safe and non-institutional. There are no concrete design attributes like Mostafa recommends. The standards lay out the framework for general themes that ASD environments, both indoor and outdoor need to address. While I applaud her methods, I think the result is pretty vague to be singularly applied to a project without including other research.

## VOGEL'S 8 DESIGN STANDARDS

FLEXIBLE  
ADAPTABLE  
NON-THREATENING  
NON-DISTRACTING  
PREDICTABLE  
CONTROLLABLE  
SENSORY MOTOR ATTUNED  
SAFE AND NON-INSTITUTIONAL

## MCALLISTER AND MAGUIRE

Like Vogel, Mcallister and Maguire set out to create a list of guidelines for ASD focused design. They focused specifically on children with ASD within classroom contexts. They used existing guidelines and their own observations in order to expand. The previous guidelines were created in 2009 by the government of the United Kingdom. The UK Government Building Bulletin 102 specifies standard design guidelines for children with ASD, stating:

“Simple layout: calm, ordered, low stimulus spaces, no confusing large spaces; indirect sunlight, no glare, subdued colors, good acoustics, avoid sudden/ background noise; robust materials, tamper-proof elements and concealed services: possibility H&S [health and safety] risk assessments; safe indoor and outdoor places for withdrawal and to calm down.” (Mcallister et al, 2012)

The UK government is the only government to acknowledge the need to include ASD design standards in legislation. They are the only country I have found to have specifications for ASD design. Hopefully more will follow.

The specifics within the guidelines detail elements to be considered in a classroom environment. These guidelines align with the previous research, pointing out components like colors, acoustics and noise, and places to be alone.

## MCALLISTER + MAGUIRES GUIDELINES

THRESHOLD AND ENTRANCE  
SIGHTLINES  
VISUAL TIMETABLES  
HIGH-LEVEL GLAZING  
VOLUMETRIC EXPRESSION  
CONTROL  
ACCESS TO EXTERNAL PLAY  
QUIET ROOM  
TOILET PROVISION  
LARGE FLOOR AREA

# BRAND

In addition to classroom specific design guidelines, the UK funded research that investigated housing design for adults with ASD. Brands 2010 study focused on using design to: “Reduce the triggers of agitation and anxiety, by providing comprehensible, coherent spaces that meet the sensory needs of the individual.” (Brand, 2010)

Brand argued that there are four trigger categories that cause anxiety for people with ASD. He noted that a “comprehensive study is needed because groupings of behavior started to emerge from the research, but further study is required to prove their universality.” This aligns with Dr. Stephen M Shore’s saying, when you have met one person with autism, you have met one person with autism. It is important to keep in mind each person will have a different reaction to a trigger, and each ASD individual will have a different set of triggers. That being said, Brand proposed four categories of guidelines organized by design triggers: they are Sensation, Perception, Refuge and Empowerment. (Brand, 2010)

*Sensation:* Low arousal environments that minimize sensory overload, and provide appropriate stimulation for ASD individuals with under developed sensory sensitivities.

*Perception:* Navigable, easily oriented environments; clear sensory cues that specify distinct spaces and uses; permeable interiors that are predictable and legible.

*Refuge:* Personalized private spaces for retreat and withdrawal if overwhelmed.

*Empowerment:* Environments in which stimulation can be calibrated by ASD residents according to their personal needs.

## BRAND’S 4 CATEGORIES

SENSATION  
PERCEPTION  
REFUGE  
EMPOWERMENT

## RICHER + NICOLL GOALS

The categorization of Brand's triggers, such as refuge are previously mentioned in Mcallister and Maguire's, and Mostafa's studies. All the previous authors discuss control of sensational aspects in the built environments, but none have so far mentioned empowerment for ASD individuals. Every person with ASD is unique. They deserve the opportunity to make changes within their environments, to make themselves more comfortable, and feel less anxiety. Brand's usage of this guideline will hopefully encourage further research and policy in line with this sentiment.

## SANCHEZ, VAZQUES, SERRANO

Sanchez, Vazques and Serrano's study reviewed previous work done by Richer and Nicoll in 1971, and by Beaver in 2003. Richer and Nicoll were the first to come up a set of principles to apply to ASD focused design. There principles were intended to reduce frustration and flight behaviors for people with ASD. They suggested: 1) Subdivision of spaces; 2) safety and robustness's of elements; 3) minimal intrusion/maximum autonomy; 4) durable elements and materials; 5) controlled sensory stimulation including a retreat box and highly stimulating areas and 6) lastly use of light dimmers. (Richer, 1971)

Beaver, an architect from the UK, provided a list of suggestions that are quite specifically focused on children who have ASD in interior spaces. His suggestions were: 1) Corridors designed as utilized spaces, 2) ample spaces to facilitate proximity needs, 3) use of curved surfaces (i.e. walls), acoustics, safety, radiant heating, cross and passive ventilation, safety windows, indirect, diffuse lighting; avoid fluorescent lighting; Quiet rooms to calm over stimulated ASD individuals, Sensory rooms and gardens, warm but not over stimulating color palate. (Sanchez et al, 2001)

### 1) Reduce Frustration

- Subdivide space into small areas
- Provide active spaces (climbing, sliding, rolling)
- Toys for repetitive movement

### 2) Reduction of Flight Behaviors

- Structures and fixtures firmly anchored
- Areas for two types of social interaction: Close contact and rough play

## BEAVER'S STRATEGIES

- Hallways should be designed as usable space, not just for circulation
- Curved walls help guide circulation and tactile sense through touch
- Acoustics are taken into account, avoiding too polished materials
- Lighting should be indirect and diffuse illumination, dimmers and ambiance
- Sensory rooms and gardens
- Warm color palette, but not over stimulating
- Provide quiet spaces, respite from sensory overload

What Sanchez, Vazques and Serrano appreciated most from Beaver's research was his warning on creating overly friendly ASD environments. He suggested that if ASD individuals are consistently in safe, friendly environments geared towards reducing sensory overload, when they get into the outside world, they will be more prone to sensory issues and not be prepared for the transitions between the two worlds.

Finally, Sanchez, Vazques and Serrano's own conclusions suggested five categories designers and planners should think about when creating spaces focused on ASD individuals. These included: 1) imagination, 2) communication, 3) social interaction, 4) sensory difficulties, and 5) behavior and safety. These themes are directly applicable to Universal Design because these categories could easily be applied to neurotypical focused design since they do not have to be specific to individuals on the autism spectrum.

## UNIVERSAL DESIGN

North Carolina State University's Center for Universal Design defines Universal Design today as, "The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." (Hohlbein, 2011) For a lot of designers, designing to Universal Design standards has meant thinking about people in wheelchairs or those who are deaf or blind. By designing an environment geared for ASD individuals, we can broaden which groups designers consider when discussing Universal Design.

## SANCHEZ, VAZQUES, + SERRANOS DESIGN CRITERIA

IMAGINATION  
COMMUNICATION  
SOCIAL INTERACTION  
SENSORY DIFFICULTIES  
BEHAVIOR AND SAFETY

## UNIVERSAL DESIGN PRINCIPLES

EQUITABLE USE  
FLEXIBILITY IN USE  
SIMPLE AND INTUITIVE  
PERCEPTIBLE INFORMATION  
TOLERANCE FOR ERROR  
LOW PHYSICAL EFFORT  
SIZE AND SPACE APPROACH AND USE

# COMPARISON

After reading through the different suggestions for Autism focused design, I was able to pick up on many similarities between researchers. By comparing the guidelines side by side, I think the similarities will be even more prevalent. My annotations are where I saw overlap, and on the following page I break down the comparisons further.

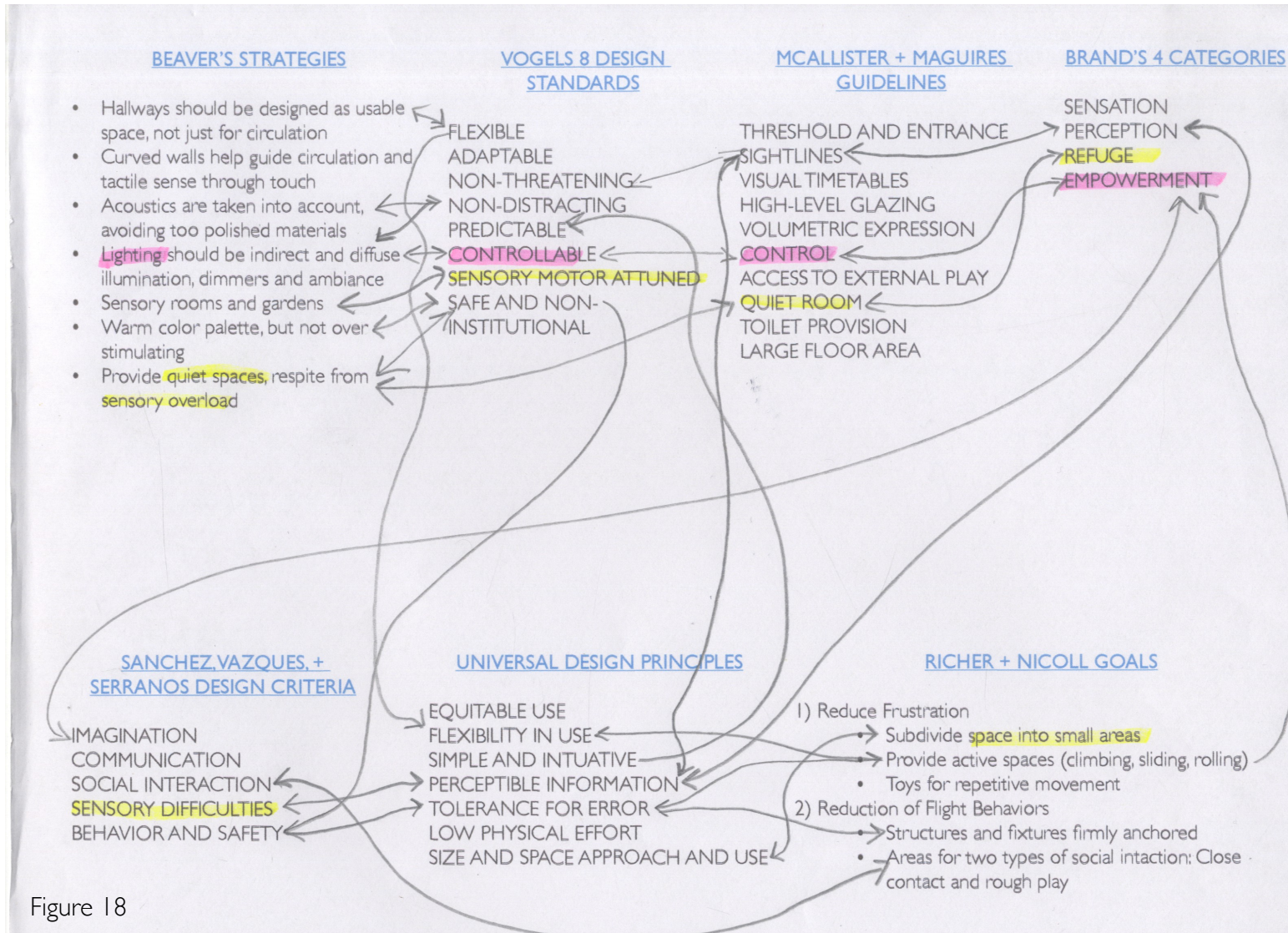


Figure 18

## COMMON THEMES

### **Quiet** (5/7)

Some words and concepts are frequently repeated throughout the different standards and guidelines. For example, “Quiet” is something brought up by separately by Beaver, quiet Spaces and with McAllister and Maguire, quiet room. Quiet places are suggested because of their ability to mitigate the risk of sensory overload by greatly reducing auditory senses. With that in mind, several other criteria are in line with “Quiet”. Brand’s Refuge category is essentially a suggested area where ASD individuals can enjoy an environment with fewer sensory experiences, affording them the option to take in less information. Richer and Nicoll suggested dividing a space into small areas. This organization of space attempts to achieve the same goal, using a similar mechanism. Five of the seven Autism Specific guidelines mention quiet spaces, or smaller spaces with minimized sensory activity, as important components that designers need to incorporate into their designs. Only Sanchez, Vazquez and Serranos not specifically include anything about quiet spaces. They do however suggest that Sensory difficulties are an important design criteria. In addition to quiet several overlapping themes emerged:

### **Control** (4/7)

Control of the environment provides ASD individuals with empowerment. It is one of the reasons why Beaver suggested outfitting lighting with dimmers. Dimmers could allow ASD individuals control over that visual sensory experience. Vogel and McAllister and Maguire listed “control” within their standards and guidelines. Brand has taken my favorite approach and his fourth category is labeled Empowerment. The ability to control an element can actually be a self-esteem building function as well.

### **Safety** (4/7)

Safety should be the paramount consideration when designing for anyone, including those with ASD. It is especially important to consider when completing streetscape design, as this thesis proposes. Several guidelines offer specific recommendations: Richer and Nicoll suggest that structures

and fixtures should be firmly anchored. Vogel suggests that safety should be pursued in a non-institutional manner, but give little clue how that could be interpreted. Sanchez, Vazques and Serrano suggest that safety and behavior need to be thought as a single criterion, and I would agree with that to an extent. While some ASD individuals can have flight or flight behavioral outbursts, or react to sensory experiences with behavioral outbursts, designing for safety and to minimize behavioral outbursts would result in different outcomes.

### **Spaces Flexible in use (3/7)**

This criteria was brought up by the research as it applies to indoor spaces and design. When designing in the urban environment, especially streetscapes, space is so valued that all design concepts need to be flexible in use, space and program. In addition, flexibility is a principle within Universal Design, and Beaver provides an example of an indoor flexible space, like a hallway being used for play in addition to circulation.

### **Social Interaction (3/7)**

The design of our built environment can help increase instances of social interaction. Simple things like the placement of benches can increase sociability. When considering the social interactions of individuals with ASD, different guidelines need to be followed to create successful spaces. Richer and Nicoll suggest providing areas for two types of social interaction: close contact and rough play. Their suggestions are geared towards children's educational spaces, so the rough play probably does not have a place in the urban streetscape environment, but the concept of group versus individual social interaction must be considered and a design needs to be scaled appropriately.

Some themes that were also repeated include: 1) Simplicity and ease of use 2) Perceptive information 3) predictability 4) imagination 5) providing active spaces. These themes will be incorporated as guidelines for the streetscape design concept.

# STREETSCAPE DESIGN

## GENERAL OVERVIEW

Public spaces are some of the most important places within cities. Nisha Fernando summarizes the importance of public space in her article Open-Ended Space: “[Public spaces] act as breathing spaces where people may relax, socialize, purchase food and other goods, engage in various public events or simply enjoy being in an urban setting and absorbing the everyday life that surrounds them.” What many don’t realize is that streetscapes are some of the most important public spaces we have, certainly the largest and most common (Fernando, 2007).

In Seattle an estimated 33% of the city is “Right of Way,” or street. Streets function primarily as transportation routes, a very active function. However, people on the streets display both active and passive actions. Urban Designer, Jan Gehl in his book, *Life Between Buildings*, suggests successful public spaces allow for walking, standing, sitting, seeing, hearing and talking.

This section will focus on Public Spaces and accompanying academic theories, and movements surrounding Streetscape design. Understanding how these Streetscape best practices may or may not be the best approach for an ASD friendly design will be crucial in creating a successful site specific design for those with ASD.

A great place to start in order to gain an understanding of the relationship between buildings and the city are figure ground diagrams. There are a few variations of figure ground diagrams but the general concept shows buildings in black, and open space in white. The contrast between the built and unbuilt tells a lot about a city.

To the right is the figure ground diagram of Barcelona, Spain. We immediately see that there are several main arterials that cut through the city grid. These maps begin to tell a story about Barcelona. The older Gothic Quarter with



Figure 19: Figure Ground Map of Barcelona.

denser buildings and thinner streets is shown on the bottom left corner of the map. The experiences of place here is vastly different than the newer gridded section of Barcelona that has wide avenues and an orderly circulation. The reason the experience of each part of Barcelona are so different has to do with the amount of 'right of way' in each part. The Gothic Quarter has a small percentage of area dedicated to streets. The result is a highly walkable section of the city with room for people rather than cars. The rest of the city grid has ample space for cars. We can see in the newer part of the city that there is a much greater percentage of unbuilt versus built area.

Seattle is a newer city, so much of its figure ground map would resemble the grid structure of the newer Barcelona. Figure ground diagrams provide great insight into a cities urban fabric.

## PUBLIC SPACE THEORIES

### Jan Gehl

Urban designer and owner of Gehl Architects, Jan Gehl has published several acclaimed books looking at how cities can be improved as better places for people. In his book, *Cities for People*, he points to "Limited space, obstacles, noise, pollution, risk of accident and generally disgraceful conditions" as typical for most residents of cities worldwide. Consistently, the human dimension of cities is overlooked. Gehl fails to consider minority populations when arguing that cities need to be designed at a scale for people. While not addressing groups often overlooked specifically, his research and proposals aim to improve on existing urban safety and inclusivity in a broader sense. He presents his interventions in a physical manifestation rather than a sociological one.



Figure 20: Social Distances, Gehl Architects

Some of the ideals he advocates for are increasing the amount of public space for pedestrians and cyclists, rather than for automotive use. He cites Copenhagen as an example: from 1960 to 2005, the city added nearly 1 million sqft in pedestrian space. The number of pedestrians counted rose 35% in the first year alone (1961). More pedestrians begin to contribute towards what Gehl refers to as a Lively City. Lively cities are safer, more sustainable and healthier, socially and physically for residents. (Gehl, 2011)

Gehl also strongly recommends designers of the public realm consider the human scale when designing. Many cities, especially in the United States, are designed at an automotive scale. Cars move a lot faster through spaces than people, in order to catch the driver's attention, everything needs to be bigger in order for the driver to spot it. Gehl refers to Venice as a 3 mph city, a walking speed. Details are small and there is a wealth of sensory experiences within a quick period. Dubai he describes as a 62 mph city. Vast buildings are noticeable from the car; public spaces are large, and there is a consistently high noise level. Using human senses to understand human scale is prominently featured in Gehl's research as well.

Human vision and sight is limited to the front of our bodies. When looking straight ahead we can see peripherally, downward to an extent, and only a little bit upward, without changing the direction of where we are looking. Gehl understands that humans typically can identify people at a distance of 330 yards. At 110 yards body language can be interpreted. At 55-70 yards we can identify if we know or recognize the person. (Gehl, 2010) These numbers should be considered when designing specifically for people with ASD. Often, as previously covered, people with ASD often have difficulty with facial processing/recognition skills. (Holbein, 2010) This could result in a different set of ranges for human recognition or identification.

Hearing and having conversations in public spaces has ranges as well. Shouting is understood from 55-70 yards, while loud talking can be heard at 35 yards away. As you get closer to someone the possibility of having an understood conversation occurs at about 7.5 yards to 20 inches apart. People with

Figure 21: The 62 mph hour city of Dubai:



Figure 22: The 3 mph hour city of Venice:



ASD might be comfortable in these ranges, but often auditory issues are intensified and they might prefer more space, which would provide a quieter conversation. In designing Autism focused spaces, it is important to provide the option for both ranges.

### **Hannah Arendt**

While not a designer or planner in practice, political theorist Hannah Arendt is noted for her book, *The Human Condition*. Within this theoretically driven book, Arendt discusses how the public realm is connected to every person's social, economic, and political life. This highlights the difference between our public and private lives, and the comparison of how we act in public versus private spaces.

Arendt often brings up Greek thinkers and their understanding of the public spheres. In Ancient Greece political discussions took place in the public realm, at the polis where citizens would discuss current events and debate policies. (Arendt, 1958) The public realm was a space of togetherness and sometimes judgment. The Greek philosophy of public space had a lot in common with the modern day saying "To see and be seen." This essentially means that people go to public spaces to be noticed and to notice other things. Socialization is an important concept of the public realm and should be a principle feature of public space design. Unfortunately, it is rarely a consideration in Streetscape

### **Spatial Justice**

At the heart of Spatial Justice comes Henri Lefebvre's theory that the way we organize cities, and specifically public spaces, is a direct reflection of social norms and priorities in society. Since the public realm is space, we can visualize injustices being done within the spaces created through social influences. The concept is similar in theory to Environmental Justice, a movement from the 1970s, that focused on areas suffering from intense industrial pollutions

*In the broadest sense, spatial (in)justice refers to an intentional and focused emphasis on the spatial or geographical aspects of justice and injustice. As a starting point, this involves the fair and equitable distribution in space of socially valued resources and the opportunities to use them.*

– Edward Soja on Spatial Justice

that were most commonly located in neighborhoods with greater racial and economic diversity.

The theory of Spatial Justice references the difficulties many groups inhabiting public spaces suffer. Spatial justice also refers to larger urban planning principles of space, like not being able to afford the city you work in. Another example of this would be comparing the amount of space we dedicate to automotive travel versus other transportation types.

Lefebvre, in his writings *The Production of Space* explains that the public realm is a reflection of societal values and social productions. He argues that every society designs and inhabits its own spaces differently (Dover, 2013). This ideal could be translated to public spaces for ASD individuals. ASD individuals are a type of society group, and the spaces they designed and created would be unique compared to a neurotypical societal space.

### **William Whyte**

William Whyte and his work have provided urban designers with valuable observational data on how people act in public spaces. Whyte's book, *City: Rediscovering The Center*, was a starting point for many urban theorists including Jan Gehl, to think about how our public spaces could be better designed for people.

Whyte created a film that documents his observations several spaces around New York City that show how people use public spaces contradicts many societal standards for public space, for instance that it is safer to separate pedestrian traffic and automobile traffic (Whyte, 1980). Whyte was a big advocate for Bottom-Up design. This meant his design approach started with an understanding of the way people use a space, and the way they would like to use a space. Often saying that people "vote with their feet", he spoke about how people would not use a public space if they were not comfortable in

***“So-called ‘undesirables’ are not the problem. It is the measures taken to combat them that is the problem.”***

**– William Whyte**

that space. Applying this to someone with Autism who is rarely comfortable in public spaces not designed for them, it is easy to see that they would rather avoid the public realm in general. By creating a specific spaces for people with ASD they could reclaim their position in the public realm.

## Universal Design

Universal Design, as previously touched on, are guidelines created to provide access to everyone. There are seven principles of Universal Design. 1) Equitable in use 2) Flexible in use 3) Simple and intuitive 4) Perceivable information 5) Tolerance for error 6) Low physical effort 7) Size and space, approach and use. These principles are not mandated in terms of City and Urban Design like American Disability Act (ADA) requirements are. Universal Design principles are intended to go above and beyond the ADA mandates.

The goals of Universal Design are to allow people with diverse abilities to use buildings and places comfortably and safely, as much as possible without special assistance. Universal Design can be applied to the design and creation of anything. It is commonly found in architectural guidelines indicating which type of signage are among best practices, or which type of door handle is easiest to open for a wider user group.

In streetscape design, Universal Design principles can be found in some newly constructed crosswalks in Seattle. New crosswalk buttons that speak to users help blind individuals know when it is time to cross the street. In addition to a starting guide to cross, the countdown timer has a beeping sound that speeds up as time counts down.

Oftentimes, Universal Design components help ease the lives of multiple groups of people. By removing a step into a hotel, the hotel creates an easier



*Figure 23: An example of ADA required design elements that do not actually provide a service to people with disabilities. Universal Design goes a step beyond ADA principles.*

entrance for people in wheelchairs, but it also makes it easier for people carrying suitcases with wheels.

Currently Universal design does not consider ASD design considerations. In order to truly achieve a universal design standard this quickly growing user group needs to be listened to and thought of when making design decisions.

*“Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody.”*

- Jane Jacobs

## STREETSCAPE DESIGN BEST PRACTICES

This section will look at some examples of Streetscape Design that are looked towards as examples within the field. These examples prioritize human scaled spaces, and pedestrian movement. It is important to note that these best practice examples are chosen because of the creation and design of the public space, not for the performance capabilities of moving users quickly through the space as a traffic engineer might select.

### SWALE ON YALE, SEATTLE

The Swale on Yale is a recently completed (2013) streetscape design in the quickly growing South Lake Union neighborhood in Seattle, about a mile away from Belltown. While the final design calls for four blocks of redesign, the current swales occupy two blocks.

A swale in this case refers to a type of landscape design intended to manage rainwater runoff. The Swale on Yale is more specifically bioswale, or a swale that removes pollution from surface runoff while at the same time managing excess rainwater flow.

Rainwater that falls in Capitol Hill gets drained through pipes in the street and sent to the Swale on Yale where it is collected, cleaned of its pollutants and deposited in Lake Union. This streetscape design is a great example of a performance based streetscape design for its rainwater collection qualities. When the four blocks are completed it should have the capability to annually treat 190 million gallons of storm water (Seattle Department of Parks, 2015).

Each swale is 10 - 11 feet wide and contains a series of different plants that absorb toxins from storm water runoff. The width of a parking lane is also about 10 feet; by removing a single lane of traffic, the design is able to filter water for a large part of the city. The different series of plants creates a color-



Figure 24 + 25: Swale on Yale, informational sign, seating, and bioswale. Photos by KGP

blocking pattern that is continually changing, bringing a visual interest to the swale. The Swale on Yale integrates seating within its design as well, allowing users to stop and enjoy the space as well. There are also informational signs instructing visitors about the functioning aspects of the street.

## MELBOURNE LANEWAYS

These leftover spaces in Melbourne have been transformed into some of the cities more vibrant and alive spaces. Laneways in Australia are alleyways here in the United States. They form an interconnected web of spaces connection central Melbourne. These spaces are alive with people walking, talking, shopping, eating, watching, and just being in public space.

These spaces use materials with small dimensions, representing the scale of the space. The mix of different materials can contribute to the chaos and the crazy feelings of the space. Store signs commonly hang from above, sometimes even neon.

Many of the Laneways are covered with a glass canopy. Since they are typically narrow spaces, little sunlight reaches them and a canopy helps to keep unwanted weather elements out like rain. The scale of the Laneways help to increase social interactions because of the human sized space. Street cafes have seating in intimate arrangements where passerby's can interact with customers. They have unique personality and charm, brought on by human values and wishes for a new type of public space in Melbourne.

While these spaces are incredibly active places to experience urban life, it would be an uncomfortable place for a person with ASD. The narrow laneways do not allow for places of refuge from the sensory experiences happening all around. Different pavements, signs and sounds that are often unexpected can be scary and extremely loud.



Figure 26 +27: Melbourne's alleyways are vibrant places scaled to the pedestrian experience.

# STREETSCAPE DESIGN BEST PRACTICES

## PASEO DE GRACIA, BARCELONA

One of the main thoroughfares running through Barcelona is the 200ft wide Paseo de Gracia. Paseo de Gracia is a grand street connecting many different neighborhoods together; the Barcelona Metro also runs underneath it emphasizing the linear importance of this street. One of the most interesting aspects of this boulevard is the section. Since the street is so wide, there is plenty of room for separating specific modes of travel, which is also helpful to people with ASD.

There is a specific place for cars to drive fast, there is a specific lane for busses to travel down. This is important because busses often are noisy, which can be startling for people with ASD. Locating them in a specific location helps reduce the surprise of a fast bus driving by. The six fast moving vehicle lanes are in the middle of the street. On either side of them are a pedestrian median that separates the lanes from a much slower parking area. These one to two lane sections move much slower and are intended to be used by people parking in the area, or servicing local businesses. They also act as impromptu bike lanes. The slower traffic makes this the safest part of the street for cyclists. Finally on the edges of the street, where the buildings meet the sidewalk, are very wide pedestrian spaces for people to walk through.

By creating these distinct separations of space on the Paseo De Gracia, pedestrians walking are far removed from the fast traffic happening in the middle of the street. This is a great example of a street that uses its size to provide a safe, comfortable pedestrian environment without limiting its capabilities to move as many vehicles as possible.

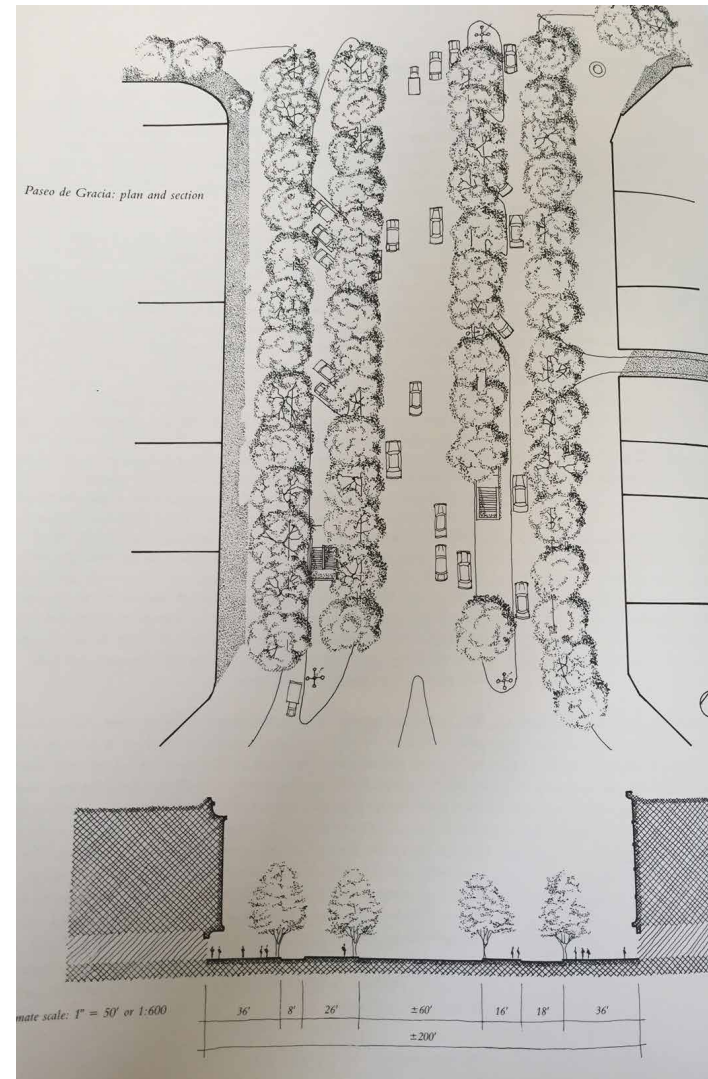


Figure 63: Section and Plan of Paseo De Gracia  
Photos from Great Streets, Allan Jacobs

# STREETSCAPE DESIGN BEST PRACTICES

## STROGET, COPENHAGEN

The Strøget is a great example of a pedestrian focused street. It is more of a destination and less of a piece of the network, a great exercise in place making. The Strøget is a shared space street, meaning unlike the Paseo De Gracia, there are no curbs, and because of it, no specific place for cars to drive or more likely in downtown Copenhagen, cyclists to bike. The single surface is made of concrete blocks with different textures. The small details on the street make it a great example of Jan Gehl's 3mph street. The street, created in medieval times, around 1400, winds its way through central Copenhagen changing widths constantly throughout.

These changes in width allow for spaces to rest and sit arbitrarily throughout. However these spaces are more of a surprise than an expected amenity, which could be difficult for someone with ASD who would like a break from walking. The curved street also protects its pedestrians from external strong winds by blocking many of the forces and not creating a wind tunnel effect.

Typically cars are only allowed on the street servicing the buildings in the early mornings. Bikers often find themselves unable to bike due to the large numbers of shoppers and pedestrians walking the Strøget. The volume of activity and people on the street could be intimidating for those with ASD. It is a great reminder that great places are not always great places at accommodating those with ASD.

There are also commonly street performers on the Strøget which contribute to the main street vibe. These performers contribute to the place making experience, but should be located in areas where people can walk by flexibly as for people with ASD, the range of reactions to the music could be great.



Figure 64: A wide area of the Strøget, places provided to sit and watch.

# STREETSCAPE DESIGN BEST PRACTICES

## SUNSET TRIANGLE, LOS ANGELES

Sunset Triangle is an example of a pavement to parks streetscape design. This is a low cost, quick way to turn a typical auto-centric street into a social place. By rerouting a redundant traffic pattern, the designers were able to open up some public space. They used low cost strategies, like paint and planter boxes to distinguish this plaza from the street that surrounds it. This type of space creation, giving back area to pedestrians helps to improve comfort levels for people with ASD. Now there is a space to get some relief from the busy loud street that used to have no where to hide from.

The spaces design includes café tables and chairs, which are all moveable, this provides the flexibility for the user to sit where ever is more desirable, or comfortable to them. In addition to the seating choices, there are also multiple standing umbrellas that provide shade and can help people with ASD limit the amount of sensory inputs.

The repetitive, bright yellow and green circle pattern painted through the space is great at informing fast moving vehicles that this is not a space for cars. It is not however a good space for people with ASD. There are no breaks or areas without this bright pattern. As a remediation I would suggest to use this at the edges, and perhaps in some spaces throughout the middle, but to paint multiple areas a more subtle color. In addition, an increased number in plants and planter boxes would begin to trigger some benefits in therapeutic garden spaces.



Figure 65: Sunset Triangle, Los Angeles

# Therapeutic Streetscapes: **SITE ANALYSIS**

**53-77**

# PART 3: SITE ANALYSIS

**1** Seattle Analysis

**2** Belltown Analysis

**3** Bell Street Analysis

## SITE ANALYSIS OVERVIEW

The location for our ASD Friendly Street Design is Bell Street, between 5th and 6th Ave. This is the first block of Bell Street that follows Bell Street Park. The city has plans to continue the park type design to this block in the future though no plans have been created yet.

I choose Bell Street because it is a great opportunity to create a ASD focused street that does not have to be auto focused as Bell Street is by plan and design, a technically a park in Seattle. These qualities allow me to provide a more intensive ASD focused design than what could be implemented on a typical auto centric streetscape, as a result the street will be more successful in providing a comfortable environment for people with ASD.

Bell Street is a great connection from the dense residential neighborhood of Belltown, and the ever-expanding job center in South Lake Union. This site choice expands the comfortable pedestrian network that will one day connect both of these downtown neighborhoods. Belltown can be the first street in a future network of streets that provide amenities to people with ASD allowing them to be more independent in transportation to and from work, home or anywhere they need to go.

The following section analyses Seattle, Belltown and then Bell Street. It includes information from multiple site visits and many diagrammatic site maps. It serves as a great place from background information that will inform future site design decisions.



# BELLTOWN

## GENERAL OVERVIEW

Located within the Downtown area of Seattle, Belltown is the densest and one of the most diverse neighborhoods in the city. Belltown is situated directly on Elliot Bay just north of the Central Business District of Seattle. The neighborhood is noted for its convenient location within the city; it boasts a Walk Score of 97 and a Transit Score of 98 (WalkScore, 2016). Transit maps follow and show the interconnectivity throughout the neighborhood.

Belltown is currently the most populous neighborhood in Downtown Seattle and the densest in the city. There is a mixture of many different building types and programs throughout the neighborhood. In Seattle's first building boom around 1970, many high-rise residential development projects were built in Belltown. Much of the subsequent development in Belltown occurred during the other building booms of the 1990s and now in 2016. The average one-bedroom apartment in Belltown rents for \$1,950, making it one of the most expensive neighborhoods in the entire city of Seattle (Zumper, 2015). While this price point puts the neighborhood out of reach for many residents, there are multiple options for affordable housing throughout the neighborhood and downtown.

The neighborhood has seen recent commercial growth as Seattle's economy expands. Many large companies now call Belltown home, and in 2010 there were an estimated 52,000 workers in Belltown (Sound Transit, 2015). The neighborhood's employment opportunities, and housing choices make it a great study area for creating a streetscape with Autism friendly features.

Belltown's open space is somewhat limited. To the north sit the recently completed Olympic Sculpture Park, and Myrtle Edwards Park along the bay. In the center of the neighborhood is Regrade Park, a popular dog park that is about .3 acres. Recently a joint effort between multiple city agencies like Parks and Recreation, and Transportation, added more open space into the neighborhood with Bell Street Park completed in 2014.

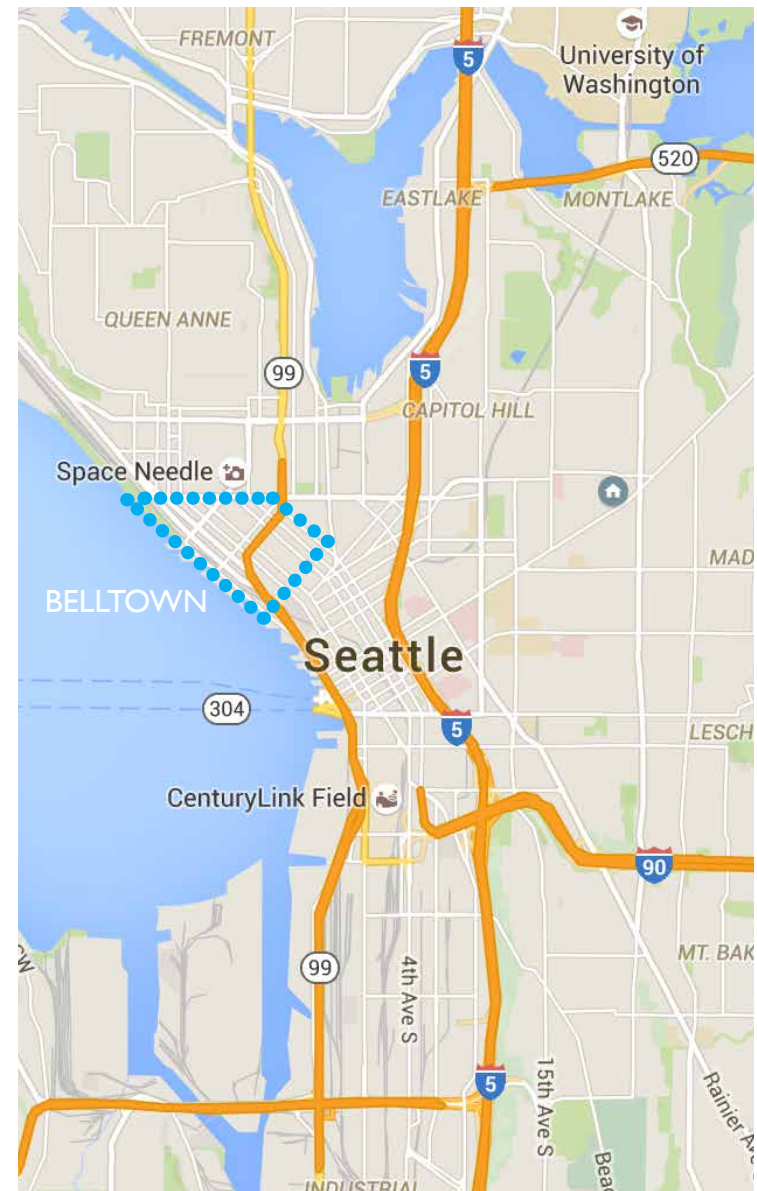
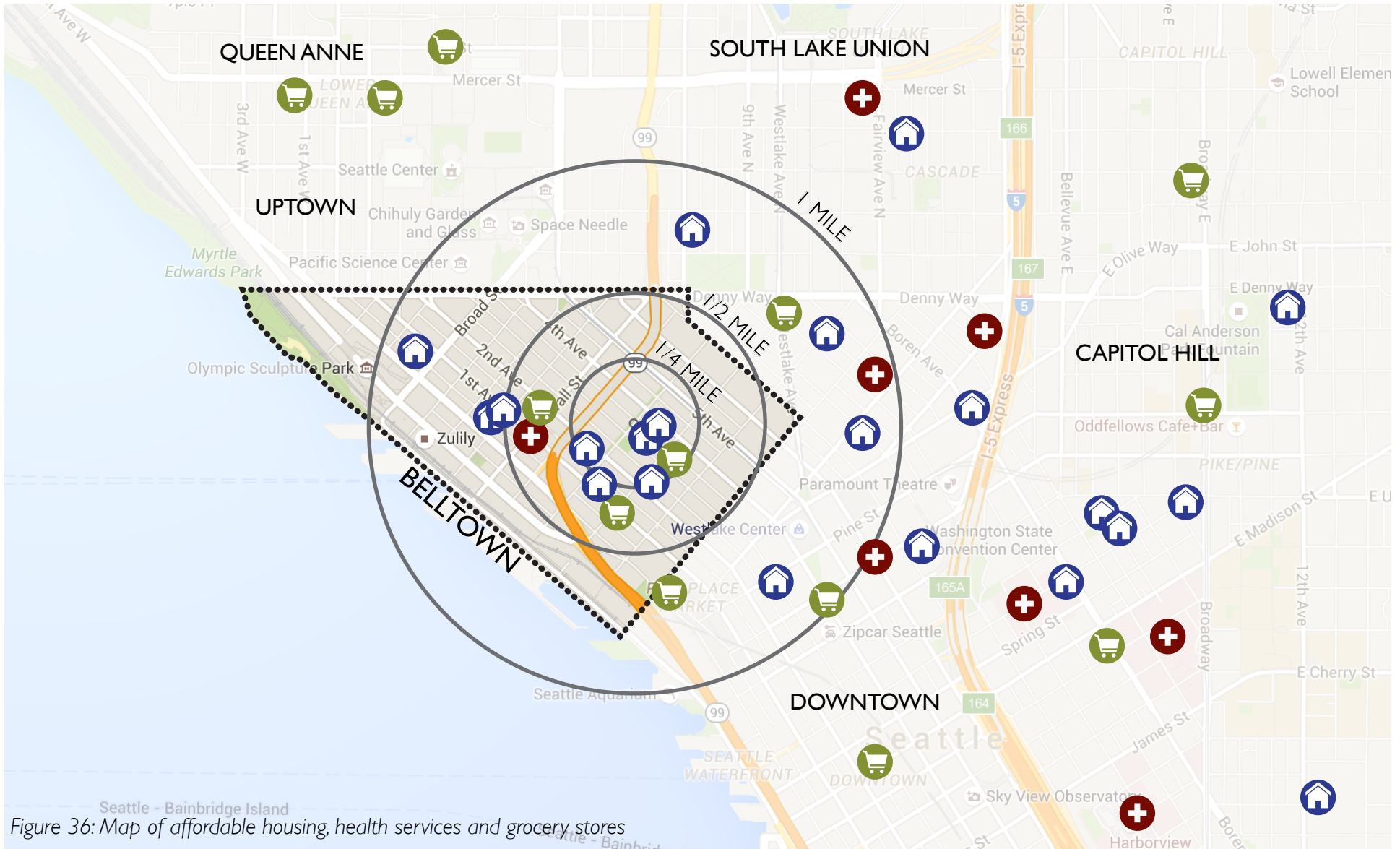


Figure 29

# SITE ANALYSIS: BELLTOWN



## AFFORDABLE HOUSING

The city of Seattle is experiencing rapid growth with has been driving apartment rental prices upwards steadily. Affordable housing options are necessary for many ASD individuals who wish to live a more independent lifestyle. While the city of Seattle is consistently working on creating more units of affordable housing, competition is fierce for units.

Many of the cities affordable units are within the Belltown Neighborhood, many along Bell Street. There is also a grouping of affordable housing in the First Hill neighborhood, south of Capitol Hill.

There are many units available in Belltown compared to other neighborhoods in Seattle because of the zoning regulations, which permit 400ft tall residential towers capable of providing more units.

More units of affordable housing allow more people with disabilities, who on average make lower wages to afford living in Belltown.

## HEALTH SERVICES

Located on the map are the local health services for the Downtown Seattle neighborhoods. There is a large density of hospitals in the First Hill neighborhood. These are large institutional services that have a regional clientele.

More commonly found throughout downtown are smaller clinics. The UW Hospital, Belltown Clinic is located in central Belltown. It is the only facility directly in the community though many other health services can be found within a mile radius.

South Lake Union, while noted for health care, is more research guided than provided care.

Access to Health Services are critical for everyone, especially those with ASD. More types of therapeutic treatments may mean more trips to the medical professionals office than neurotypical people.

## GROCERY STORES

Access to healthy food is often difficult for people with ASD. Being in close proximity to a grocery store with healthy options allows individuals choice in the food they buy. This choice helps build confidence by allowing decisions to be made. In Belltown there are multiple smaller scale grocery stores that could be easier to navigate than the large box chain stores.

The large chain stores are found in neighboring communities like Uptown and Downtown. The ones in Uptown might be a bit far to walk, but are within transit service areas. One of the greatest assets in Belltown area is Pike Place Market, a year round farmers market that even accepts food stamps for those who have them. This is a walking distance resource for those in Belltown and a great way to get high quality produce.

# SITE ANALYSIS: BELLTOWN



## TRANSIT

Residents would accurately argue they have been drawn the shorter stick as far as transit investment goes. While there are no plans for light rail to connect directly to Belltown, residents are within a mile of two major, grade separated transit lines. The Central Link Light Rail, and the Seattle Monorail. The Monorail is largely a tourist mode of transit, moving people from the center of Seattle, Westlake Center, to the Seattle Center and Space Needle. The Link Light Rail has plans for a regional system connection estimated for completion in 2040.

Several main bus lines run through Belltown namely the D + E rapid ride lines which run on 3rd Ave through the Heart of Belltown. There are many other bus lines that run on the perimeter of Belltown, such as Route 8 and 91.

Transit is crucial for people with ASD as it allows them to live independent lives in urban places. Reaching important things like job centers and healthcare should be easily available.

## OPEN SPACE

Belltown, and other downtown neighborhoods in general, are underserved when it comes to required open space as mandated by the Seattle Comprehensive Plan. Within Belltown only a few small parks exist, most notably Olympic Sculpture Park. Seattle Center in neighboring Uptown is a large community center with lots of open space, but it is somewhat cut off from Belltown by the street grid.

Downtown Seattle has minimal open space as well, but the upcoming renovation of the waterfront and dock area should provide additional opportunity for public space.

Open space is important for all people, but especially those with ASD as they encourage active lifestyles, and provide room for socialization.

## JOB CENTERS

The majority of jobs within the Puget Sound are located in these neighborhoods of Downtown. While South Lake Union receives a lot of attention for its tremendous growth lately, Belltown is projected to have a substantial increase in employment opportunities in the next 25 years as well.

Belltown's proximity to the Downtown core is also ideal for its residents to access the large number of job opportunities located there as well. Belltown is located between future job hubs of the Puget Sound and opportunities for residents there to commute to work by walking or transit, are growing.

These job centers provide opportunities for all types of employment including jobs for people with ASD.

# BELLSTREET PARK

## GENERAL OVERVIEW

Bell Street is a thoroughfare running Northeast/Southwest through Belltown. The street is one of the few streets in Belltown classified as an Access Street (SDOT, 2015). Access Streets, as defined by the City of Seattle, refer to streets that are not a part of the arterial network; they provide access to local residential or commercial areas.

The urban fabric lining Bell Street varies in scale. Most of the current development along the street consists of low to mid-rise buildings, one to eight stories in height. These developments typically consist of a single story of commercial or retail with additional stories consisting of residential units. There are a few high-rise buildings lining Bell Street as well, including the recently built Insignia, which tops out at 41 stories. There is a mix of old and new construction along the street of varying scales and heights creating an interesting, consistently changing pedestrian environment, one of Gehl's criteria for a *Lively City*. (Gehl, 2010)

In 1998, neighborhood groups in Belltown realized a need for more open space in their community. The Bell Street Park project was approved within their Neighborhood Plan. Facing harsh realities about the cost of land in Downtown Seattle, the department of Parks and Recreation got creative about open space and decided that underutilized right of way was another option.

In a joint effort between Design firms SvR, Hewitt, multiple City of Seattle departments, and community members and groups, Bell Street Park was officially opened in the spring of 2014, occupying 1.33 acres in the heart of Belltown.

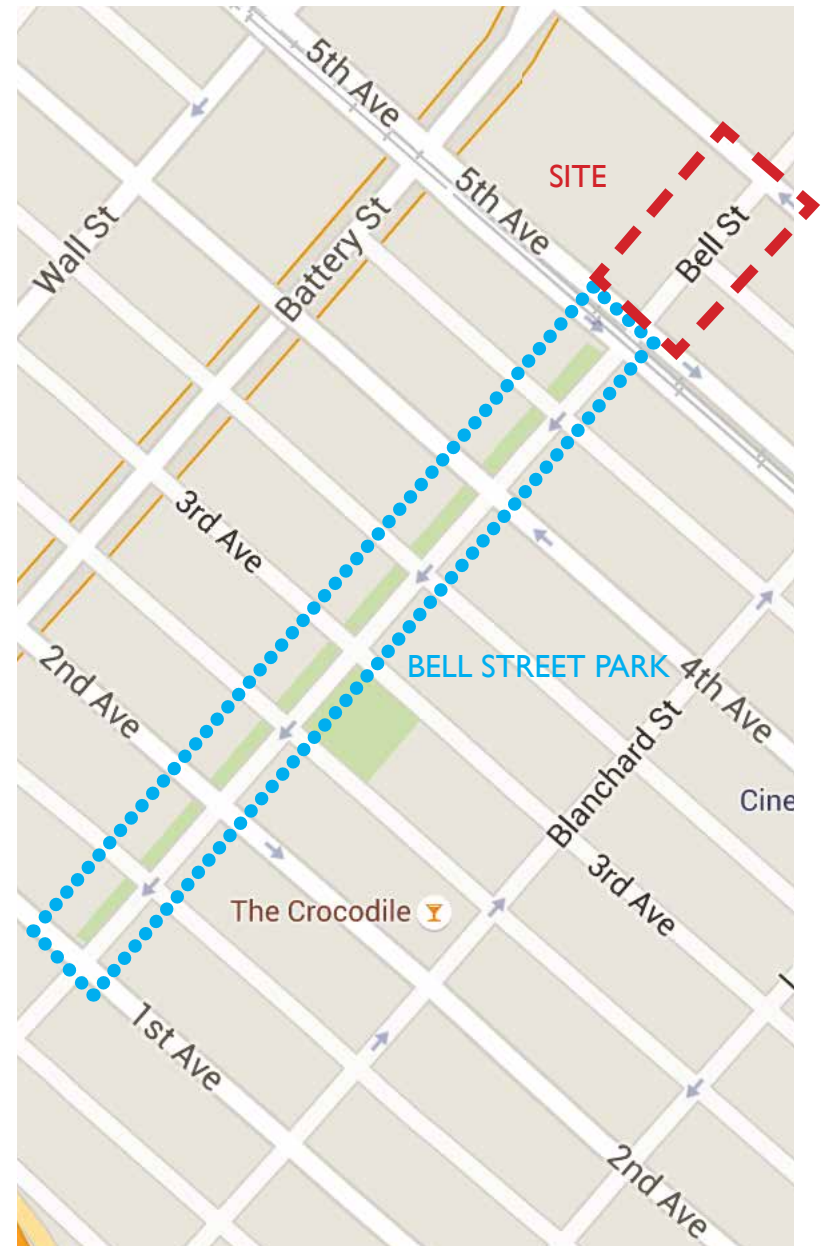


Figure 30

## BELL STREET PARK DESIGN CONCEPT

Bell Street Park stretches four blocks from 1st Ave up to 5th Ave along Bell Street. The new street functions like a woonerf, a type of streetscape design found originally in the Netherlands, but now all across the world. A woonerf type street has a few elements that make it different than a typical street. (Dover, 2014)

The most striking difference between a typical street design and a woonerf is the aspect of shared space. Shared Space in streetscape design intends to integrate multiple forms of transportation, automobiles, bikes and people. By mixing different modes in the same space a certain level of uncertainty arises. (Dover 2014) Advocates of woonerf suggest that when there is uncertainty, no one is sure who has priority in the street and drivers slow down dramatically. This theory has been backed up by William Whyte in his films and observations. (Whyte, 1980) This phenomenon can be experienced in Seattle at Pike Place Market where cars often drive down the street mixing with tourists, bikers and market workers with carts. Shared Space streets do all they can to remove features commonly found on auto-centric streets like curbs, traffic signs and traffic lights.

Woonerf's literally translate from Dutch to English as "Living Yard". (Dover, 2014) These spaces are intended to be continuations of your home in the public realm, somewhere that is familiar and comfortable, but with opportunities for socializing and "being seen".

With a woonerf typology in mind, SvR began designing Bell Street to have Shared Space principles. There are no curbs on Bell Street, rather there is a single continuous level of pavement that was intended to act as shared space between people, bikers, and cars. On the ground though this intervention proves to be less than successful in achieving its shared space goals. The single horizontal plane is broken up into thirds by a different color concrete pattern.



Shared Space Street in the U.K.

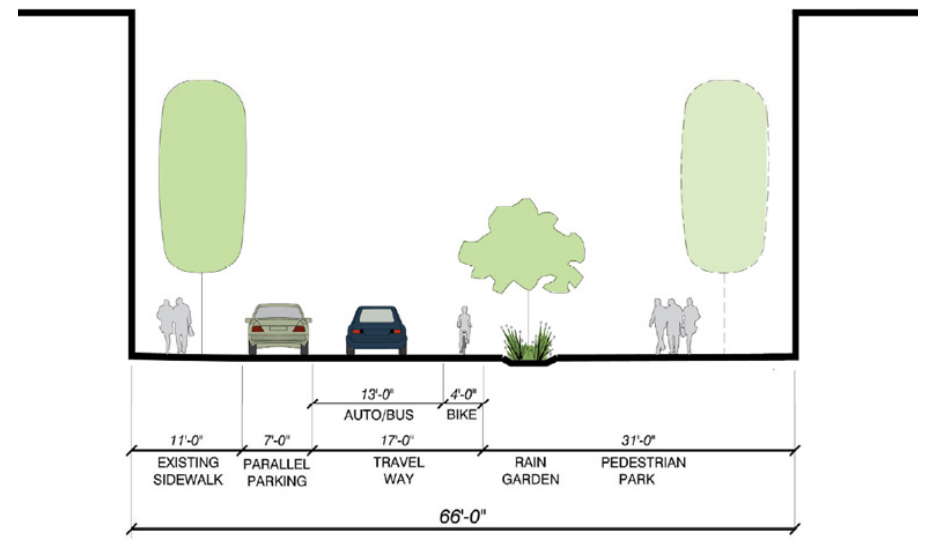


Figure 31 + 32

Bell Street Park Section, SvR

## BELL STREET PARK DESIGN CONCEPT

This creates two different spaces, separated by the line of darker pavement, one for cars and the other for people. The curb-less design was one of the main strategic design decisions for Bell Street Park. (Seattle Parks, 2013)

SvR Main Design Directives:

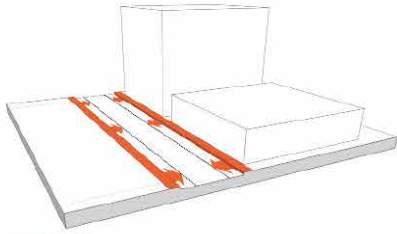
1. **RECLAIM** one traffic lane and one parking lane for park use.
2. **ELEVATE** the roadway to the sidewalk level to create a continuous curb less surface
3. **MIX** park and street elements into a wall-to-wall tapestry of shared space that blurs the boundaries between pedestrian and vehicular areas. The rest of their design intentions can be seen in the diagrams following.



Figure 33: Seating opportunities on Bell Street

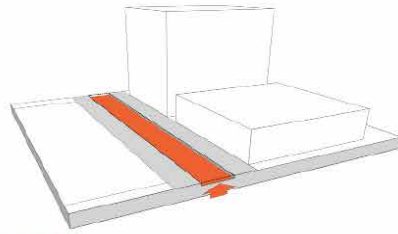


Figure 34: Aerial of Bell Street between 1st and 2nd Ave



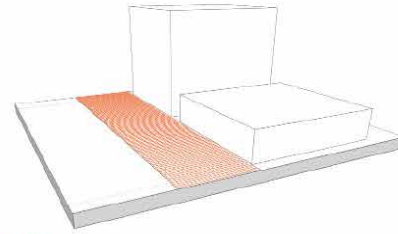
**1. RECLAIM**

Space for vehicular use was reduced from two lanes with some back-in parking to one lane and pockets of parallel parking, creating more space for plants and people.



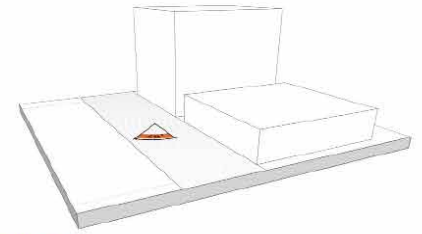
**2. ELEVATE**

The roadway was lifted to the elevation of the sidewalk to form a shared surface from one building face to the other.



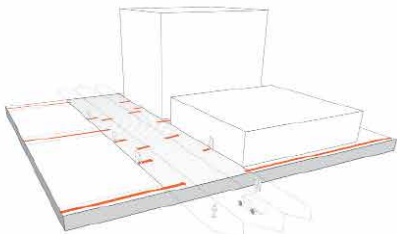
**3. GRID**

Sawcut scoring was carried across the entire space to unify the corridor and provide a finer grain of detailing that claims the roadway as part of the street park.



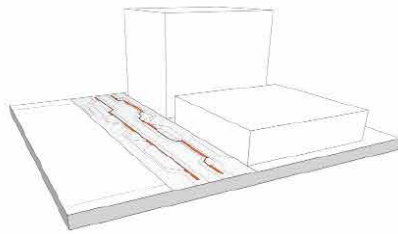
**4. TWIST**

The grid was twisted to break down streetscape conventions of 'along' and 'across' and encourage more diverse movements.



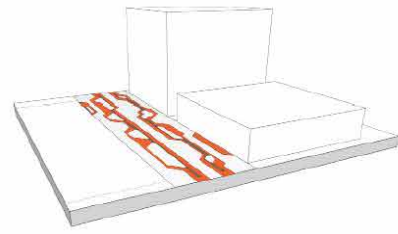
**5. MEANDER**

Flows of pedestrians, bicycles and vehicles are shifted to slow cars and create pockets for gathering in appropriate locations.



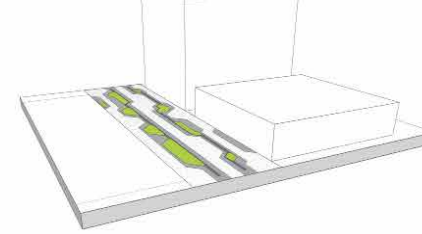
**6. GUIDE**

Shared spaces can be challenging for the visually impaired. Dark tactile pavers form ribbons of texture to signal that one is leaving a pedestrian-only zone and entering an area shared with vehicles.



**7. BLUR**

A zone of medium tone and texture radiates from the dark tactile ribbons to narrow the perceived width of the vehicular lane and form "eddies" for activation and gathering.



**8. GROW**

The design integrates a rich layer of vegetation and trees selected for both natural appearance and pragmatic durability resulting in over ten times as much vegetated area as other comparable downtown streets.



Figure 35: From SvR design, diagrams showing the design intentions of Bell Street Park

## SITE ANALYSIS: BELL STREET



### Bell Street Site Analysis

This trace paper exercise illustrates external factors that effect design like wind, direction, sun at different times of the year and view sheds from the proposed site.

Figure 38

## SUN

Seattle is the most northern major city in the continental United States. The latitude creates a big differential between summer and winter sun light. The direction that Bell Street runs, Southeast-Northwest provides it with a pretty consistent level of sun. It is sunnier on the northern side of the street, though that is due to the buildings and development. Currently, on Bell Street between 5th and 6th Ave, there is no development on the south end of the street. This creates a sunny block of Bell, not shaded by buildings. It is safe to assume that this parcel will be developed in the near future based on neighborhood trends. We will assume for this project that development will occur.

The winter sunlight is far less in Seattle and the north end of the street will receive less sunlight than it would in the summer.

Individuals with ASD are sensitive to strong sunlight and glare, considering this in the design of the urban environment is critical.

## WIND

Seattle's wind pattern are pretty stable thought the year. Nine months out of 12, winds prevail directly from the South. Since the angle of the street is not orthogonal we do not have to worry about creating wind tunnel situations.

When wind patterns change, wind comes from the South West potentially moving up the street easily and quickly, which typically happens in Winter months.

Seattle wind speeds, averaged annually are typically around 8mph. This is not a strong force wind, but should be considered with the design of outdoor spaces. Wind speeds are higher in the winter than the summer months with a range of 2mph.

Winds can create external noise and pressure that is uncomfortable to people with ASD. It is important not to create opportunities for increased wind activity.

## VIEWS

Belltown sits on the shore of Elliot Bay. It continually slopes down to meet the water. To explain, 1st street is closer to water level than 2nd, 2nd is closer than 3rd etc. The further you move inland, the further you increase in elevation. This topography affords beautiful views from Bell Street, South West to Elliot Bay, and the Puget Sound with the Olympic Mountain range in the background.

To the north of Bell Street sits Seattle Center and the Space Needle. Views to the Space Needle can be found at intersections but because of the high rise development in the area, it is difficult to see the Space Needle from street level on Bell Street. Another interesting view is the Seattle Monorail which runs above ground on a monorail platform down 5th Ave, at the southern end of the site.

Views allow people to place themselves within a location. If someone with ASD is lost, these indicators are great ways to head the correct direction.

# PROGRAMMATIC DIAGRAM: BELL STREET

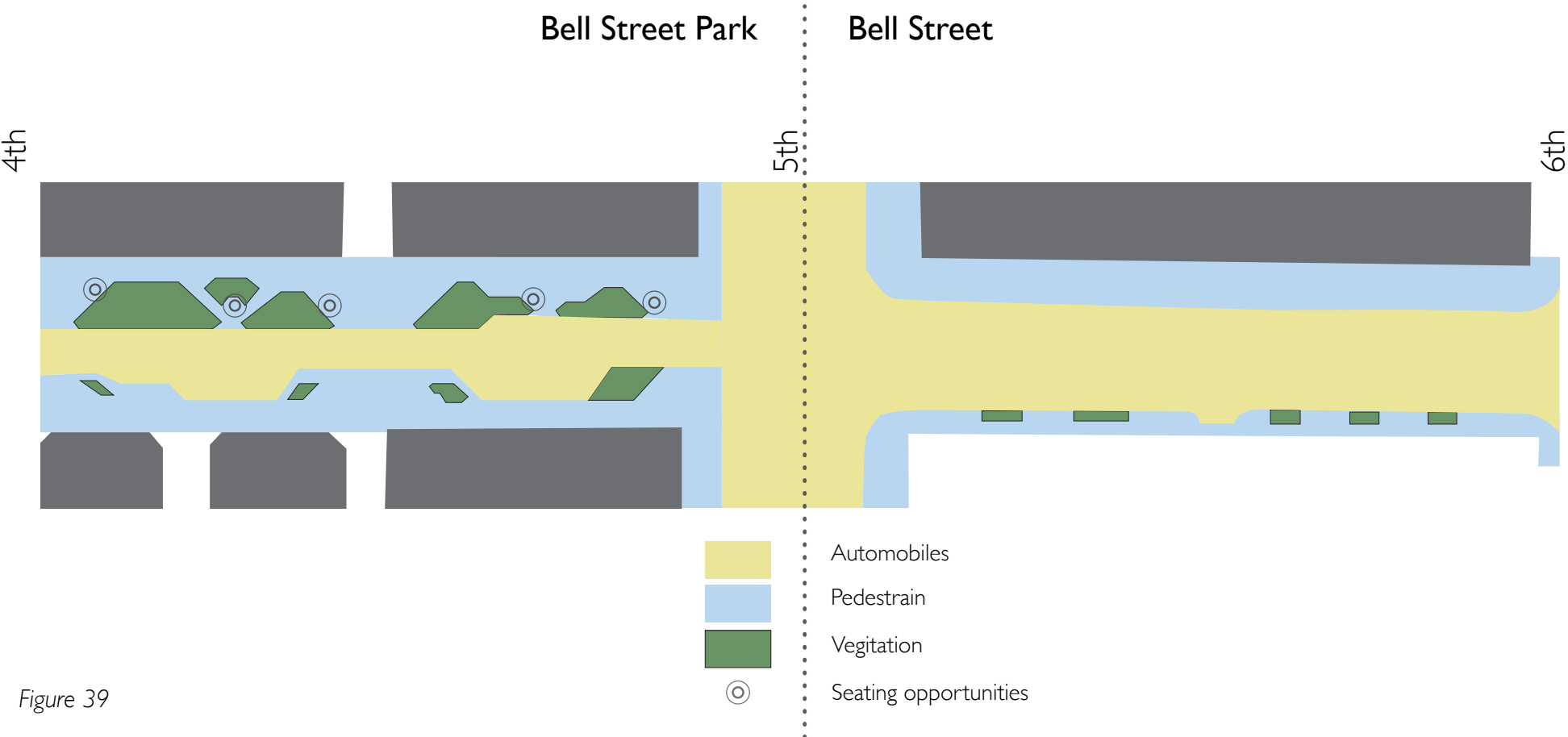


Figure 39

## AUTOMOBILES

Just by looking at the space for automobile transportation in yellow, it is clear to see that automobiles are the priority on Bell Street between 5th and 6th Ave. This changes at Bell Street Park where the spaces cars can occupy is about half the area. Bell Street is a one-way road and moves cars the same direction, but each section of street has been designed very differently. The new segment at the park is a single lane, with bump-out space for parallel parking. The older typical section of Bell Street is a two lane street with two continuous parallel parking lanes on the sides, effectively creating a four lane single direction street, similar composition to that of a freeway.

The priority placed on automobile transportation typically found on most American streets changes the experience of place. Cars contribute to noise and environmental pollution, making streets with a focus on automobiles oftentimes less pleasant than others. ASD individuals with sensitive sensory neurons may find the pollution and noise from vehicles unpleasant. Pedestrian focused areas are generally safer places to walk.

## PEDESTRIAN

Opportunities for walking are more comfortable on Bell Street Park, than on Bell Street. This is in part due to the amount of square feet dedicated to people rather than cars. The wide sidewalks allow groups to walk with out obstructing traffic, and for multiple activities to occur within the public realm.

Multiple seating areas dot the sunnier northern side of Bell Street Park providing opportunity for community engagement and spontaneity within public space. Seating areas also provide a resting spot and invite people to stay rather than walk through the site.

Comparing this to Bell Street, we can see that the pedestrian space is very limited and does not have room to provide any other use or function that allowing people to walk through the site.

## VEGETATION

Similar to the square footage differences in automotive and pedestrian space, the difference in the amount of space dedicated to vegetation between the two blocks is large. On Bell Street, there are standard cut outs in the sidewalk for plantings and trees. However in this case there is no ground cover; only tree canopy. These spaces seem to be more an obstacle in the right of way than a public amenity. Since the sidewalks are so thin they often get in the way of people walking, and people walk through them, harming the plants.

Bell Street Park is a different story. The larger dedicated spaces for plants create healthier habitats, for two reasons, they are allowed more space to grow, and there is no human traffic moving through the space. The majority of the vegetation is placed on the north side of the site to take advantage of sun. Finally, the plants act as a buffer creating a safe amount of distance from moving cars on the street.

Planting zones promote relaxation and reduce external urban stimuli for people with ASD.

# ACTIVE / PASSIVE DIAGRAM: BELL STREET

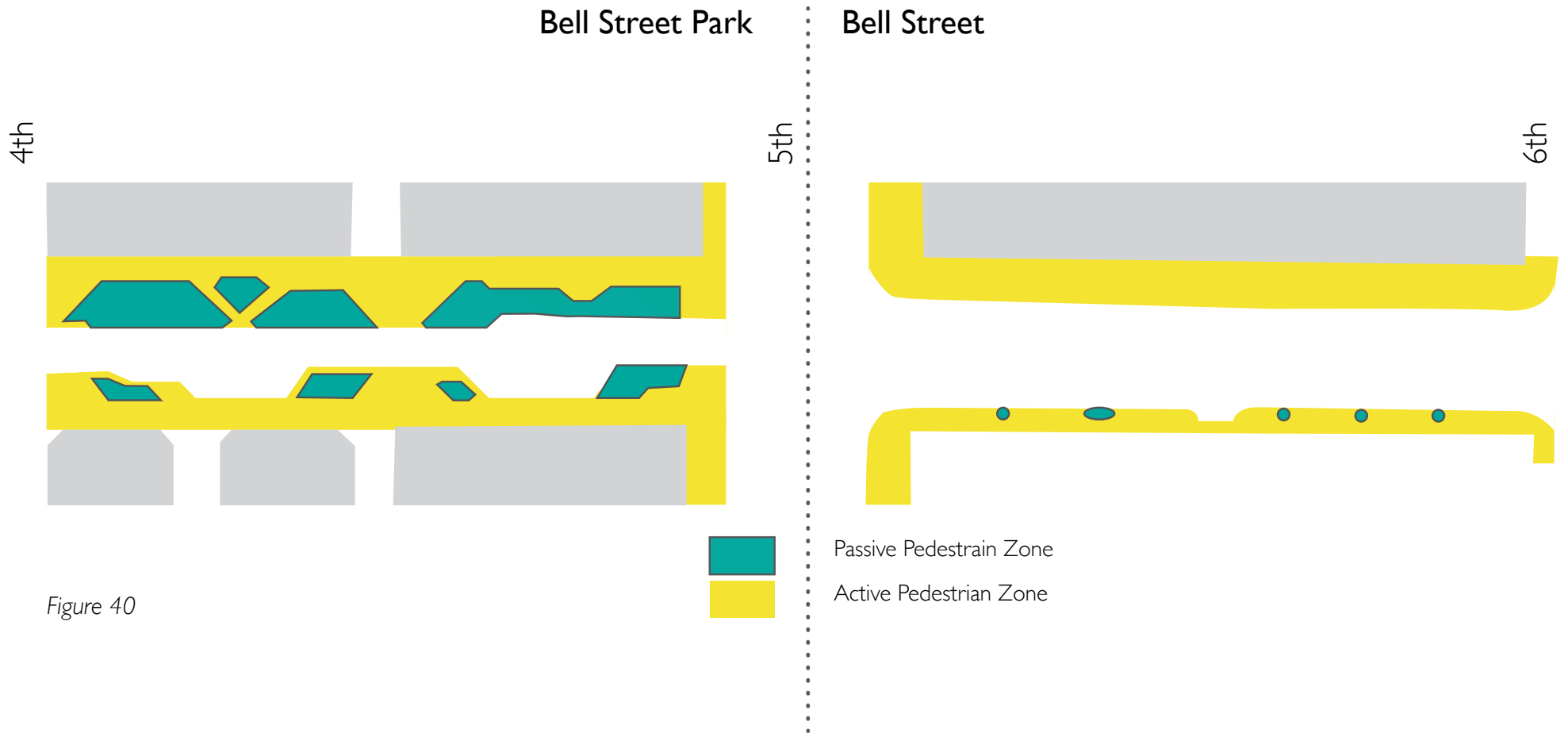


Figure 40













ACTIVITIES	PASSIVE	ACTIVE
WALKING		
RUNNING		
TALKING		
SITTING		
LISTENING		
STANDING		
WATCHING		
TOUCHING		
PLAYING		
RELAXING		

Figure 41

## ACTIVE / PASSIVE

Just like the difference in program between the two blocks, the activities taking place between the two blocks are vastly different. The Bell Street Park provides opportunity for both active and passive uses of its space within the dedicated pedestrian space. They create this balance in active versus passive spaces by providing areas to stay rather than move through the site. Large areas of plantings also help to invite people to hang out.

The designers did a good job of creating separation of passive versus active uses. The main pedestrian circulation routes in Bell Street park are along the buildings perimeters. While the passive spaces are sandwiched between the planting beds and the parallel parking spaces.

Bell Street on the other hand does not consider the passive user at all. Not even the tree pits provide opportunity for passive use as they are so small they are continuations of the sidewalk space, and just more room to walk. There is no where for a pedestrian to 'pull over' here.

## EXISTING CONDITIONS: BELL STREET PARK

Over the course of three quarters, I visited Bell Street and Bell Street Park on a monthly basis. One of the most obvious differences between the two areas was the volume of pedestrians and cyclists using Bell Street Park versus riding or walking down Bell Street. This seems to be a direct result of the design choices made at Bell Street Park. The wide sidewalks allow for groups of people to hang out, walk, or sit. Bikers feel comfortable sharing a space with cars that must drive slower due to street engineering decisions.

On the other hand, Bell Street is currently three lanes, and a one-way street. At times, it feels like an urban highway of sorts. There is little automobile traffic that moves down Bell Street, and as a result, drivers feel as though they can dominate the space and speed through it. This was a condition I noticed every time I visited the site. For people with ASD, the sudden loud noise created by cars rapidly moving and turning down Bell Street could create a sensory overload situation.

The pedestrian experiences are remarkably different on Bell Street as well. The north side of Bell Street in between 5th and 6th Avenues, where the new Insignia Residential Towers have been developed, have recently redesigned streetscape elements. These elements are a vast improvement over the previous and typical streetscape design of Bell Street. The typical streetscape, found on the south side of Bell Street, is a thin narrow space that makes walking down the street a scary experience. While walking up the street pedestrians are constantly surrounded by cars. The current development bordering the south side of the street is a pavement parking lot. The lot itself is in high demand, and as a result, the owners fit in parking spaces tightly, and wherever possible. Oftentimes, this results in car drivers parking their cars accidentally in the right of way impeding pedestrian movements. In addition there are several curb cuts, or driveways, that lead into the parking lot creating the possibility

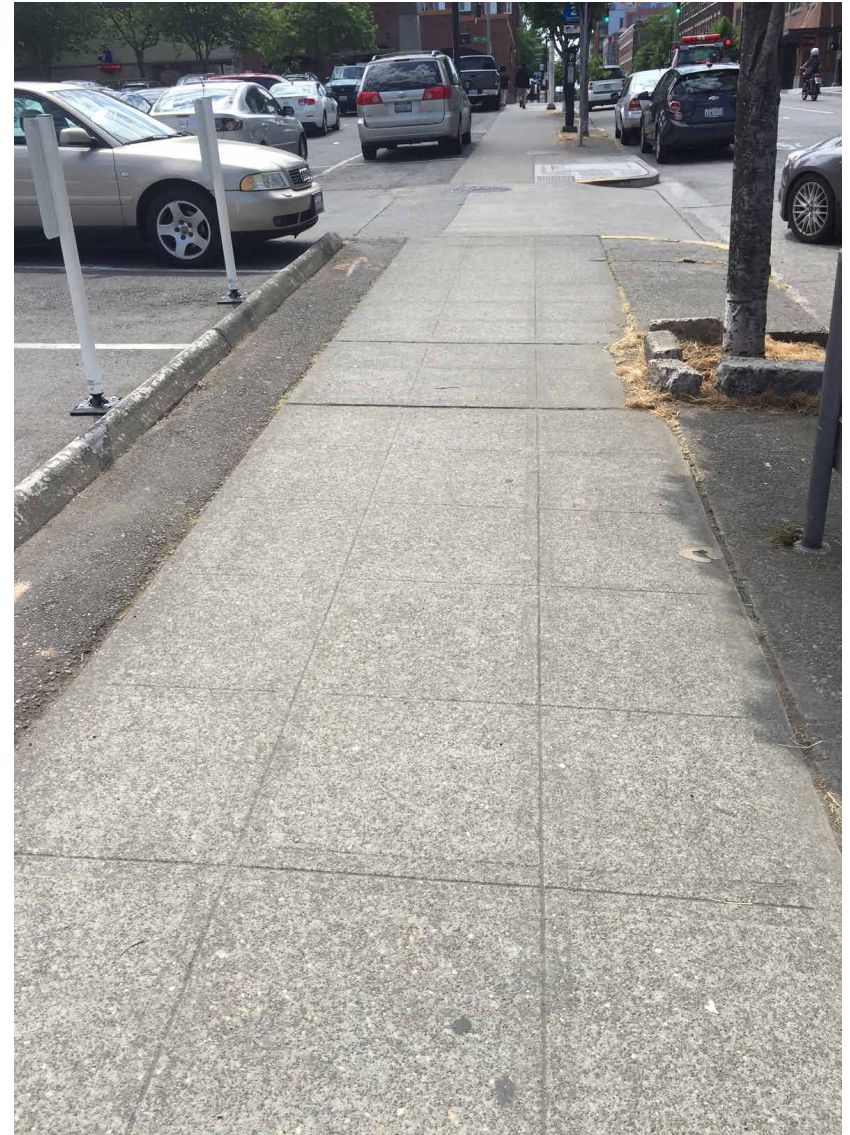
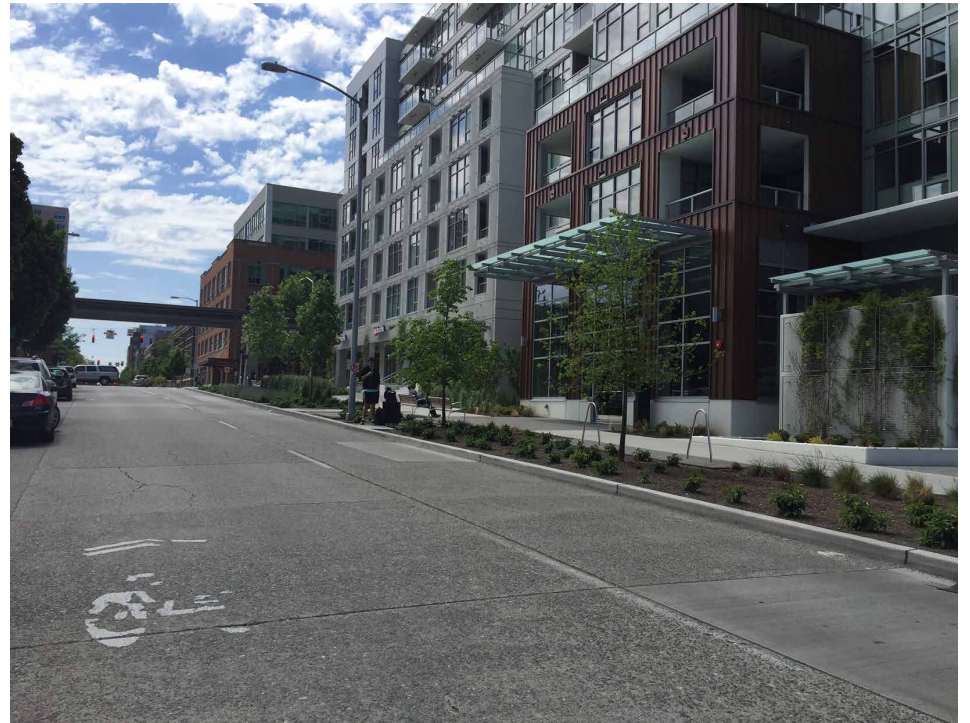


Figure 42: Bell Street Sidewalk Condition



*Figure 43: Confusion occurring all possibly at the expense of the pedestrian in the narrow sidewalk.*



*Figure 44: A wide Bell Street.*

## EXISTING CONDITIONS: BELL STREET PARK

for a pedestrian collision with someone leaving or coming into the lot. This lack of separation could create visual sense difficulties for someone with ASD unable to understand the contrast between driving and parked cars.

These vulnerabilities in the street design create what feels like a chaotic streetscape design, something that would be even more intense for someone with ASD to manage. Already we have noted several sensory challenges someone with autism might encounter walking down Bell Street.

The sidewalk itself is not in great condition, cracking and uneven in most places. People with ASD often have difficulties with their proprioceptive sense, or balance. We understand that when people with ASD are facing a sensory overload, and need to stop taking in information from the brain, the first thing to go is the proprioceptive sense. Sidewalks that are uneven are trip hazards and if someone is experiencing a sensory overload walking down Bell Street, they could be unaware of their balance while walking and would be more susceptible to falling and injuring themselves.

Vegetation on the south side of the street consists of four tree pits, each containing a Maple tree species (*Acer*) and some intensely uncared for grasses. These plants do not provide a tactile experience for those passing by. In fact I noticed myself trying to stay away from the dead grass, rather than interacting with it.

There are stark differences on the north side of Bell Street with a recently completed streetscape design. The developer pushed back the building envelope to create a wider sidewalk space. This wider sidewalk has different colored pavement, just like Bell Street Park to emphasize active zones, like walking or biking, versus passive zones like sitting or bike parking. These subtle



Figure 45: Bell Street Tree Pit



Figure 46: Covered walkway on north side of Bell Street.

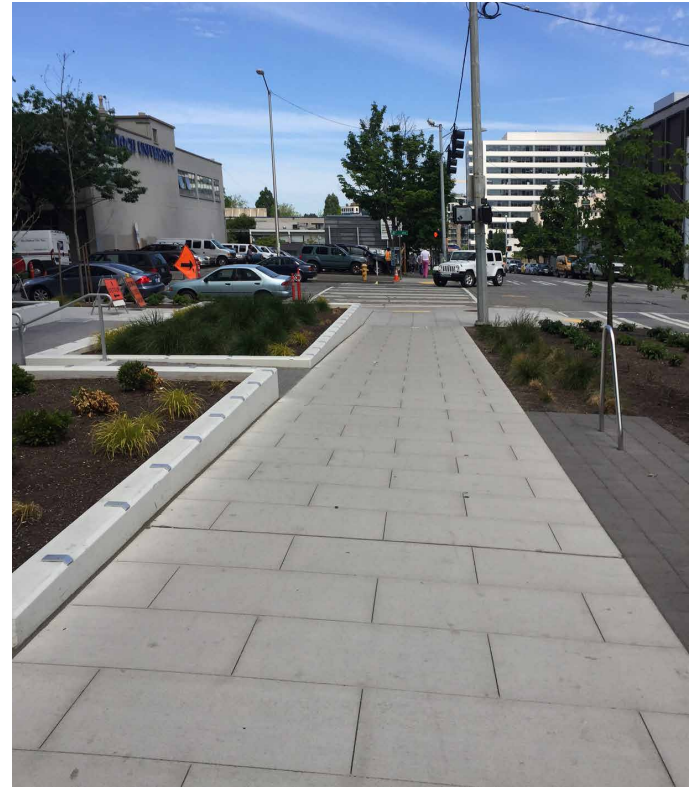


Figure 47: Pathway on north side of Bell Street, note the different pavers and colors.

signals are great ways to direct movement down the street and would provide ASD individuals with a consistent graphic dialogue from Bell Street Park to Bell Street.

The newly designed streetscape provides several bike racks for cyclists. While the recently completed streetscape was opened only a few months ago, I have yet to have seen these racks in used at all. This could be because there is no reason to come to this area other than if you live here. There are few public commercial stores, or things to activate the street in the way Bell Street Park is activated. In addition to the bike racks, there are several benches placed facing the building, with their backs to the street and the vegetation. They also are rarely used. Contrast this seating arrangement to that on Bell Street Park; both are surrounded by large spaces of plants and vegetation, but Bell Street unlike that of the Bell Street Park are bolted into the ground and do not make for a good conversational space. Bell Street Park, alternatively, provides movable tables and chairs, which are more flexible in use. People can move them to be in the shade or sun, to be alone or talk with people. Providing choices for people in our design schemes is important to create vibrant streets.

There are a number of different plant choices spread throughout the street. Grasses outline the walkway providing an interesting tactile experience for users. There are several different types of trees as well like the Tulip Tree (*Liriodendron tulipifera*) and the Paperback Maple (*Acer grisium*), which year round, has an interesting bark. Both trees would be great choices in designing an ASD friendly space. The tulip tree provides an interesting change in color moving from yellow to green as the season progresses. This change in color would not startle people adverse to changes due to its gradual nature.



*Figure 48: Distinct entryway on Bell Street with covered awning and its own pavement treatment.*

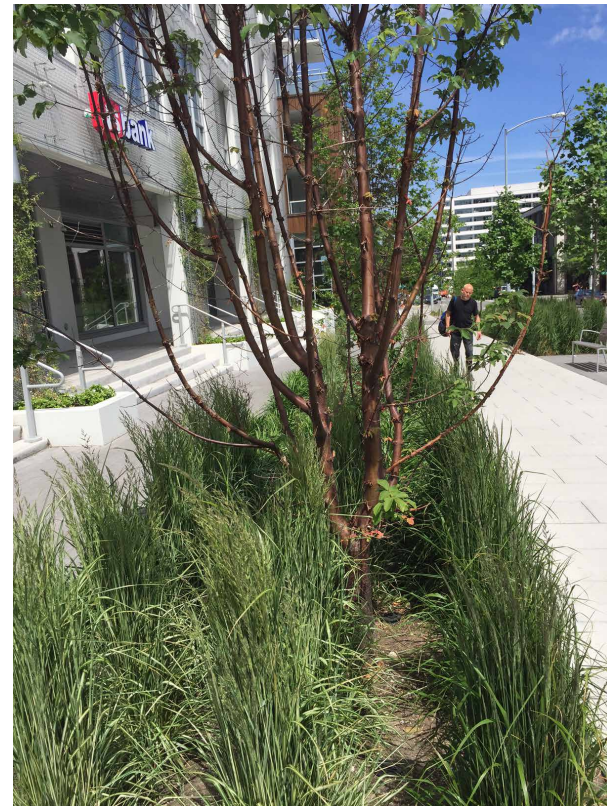
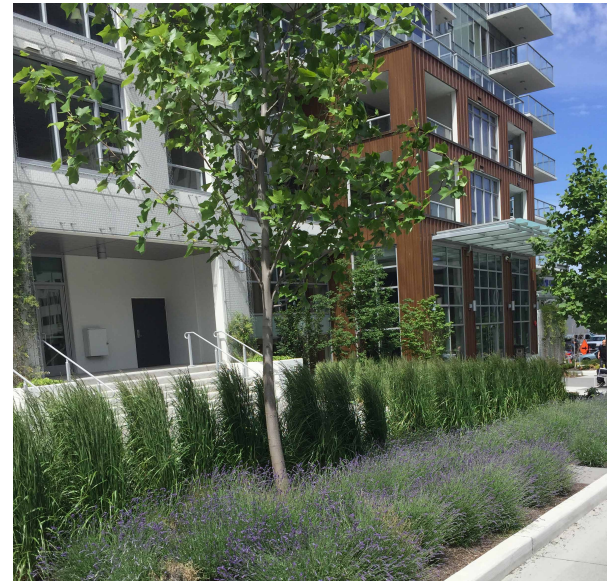


Figure 49: Site amenities not used along Bell Street.

Figures 50 + 51:

Top Right: Tulip tree and tall grasses

Bottom Right: Paperbark Maple tree



## THE FUTURE: BELL STREET PARK

The current Bell Street Park runs four blocks, from 1st to 5th Avenues. This build out was supposed to be the first phase of a Bell Street park, with a future expansion envisioned from 5th Ave to Denny Way, an additional another four blocks. While no timetable or funding source has been proposed for this expansion, this thesis project identifies the first block of that future project to be an ASD friendly Streetscape. Bell Street Park at its full eight blocks would then connect Belltown to South Lake Union with a green corridor. Connecting these newly developing centers of employment and residential housing with a safe, comfortable route for people with ASD could turn urban living into a reality for many with autism along this corridor.

Several other future projects are going to change the Bell Street Park corridor in the upcoming years:

Seattle's new Waterfront Park, designed by James Corner and Associates, which will stretch all along the water from Pioneer Square to Belltown, is planned to become Seattle's new front door, the main gathering space and *the* public space in the city. Bell Street is planned on being a connection route to that new space. While the park currently ends at 1st Ave, future plans proposed by the waterfront organizers include extending Bell Street public spaces until it hits the new public waterfront with the addition of a new Bell Street Pedestrian bridge crossing over the industrial rail tracks.

In addition local development along Bell Street will bring more residents and jobs to the immediate area. The recently completed Insignia building contains more than 500 new units and is located directly on the proposed streetscape site in between 5th and 6th Ave. Directly across the street from that, on a quarter of the block, a new data center is proposed and has plans to bring a few hundred jobs to the block. That leaves another section of Bell Street in between 5th and 6th Ave ripe for development. With the new Housing Levy



Figures 52 + 53 Top: 6th Avenue Data Center  
Bottom: Insignia Seattle, Residential Towers

proposed by the city of Seattle, affordable housing could be on the table.

On Bell Street Park, new development is growing higher, providing more units, and turning from the main auto centric routes of 2nd 3rd and 4th Avenues, to face Bell Street and promote pedestrian friendly spaces with the addition of multiple new retail spaces.

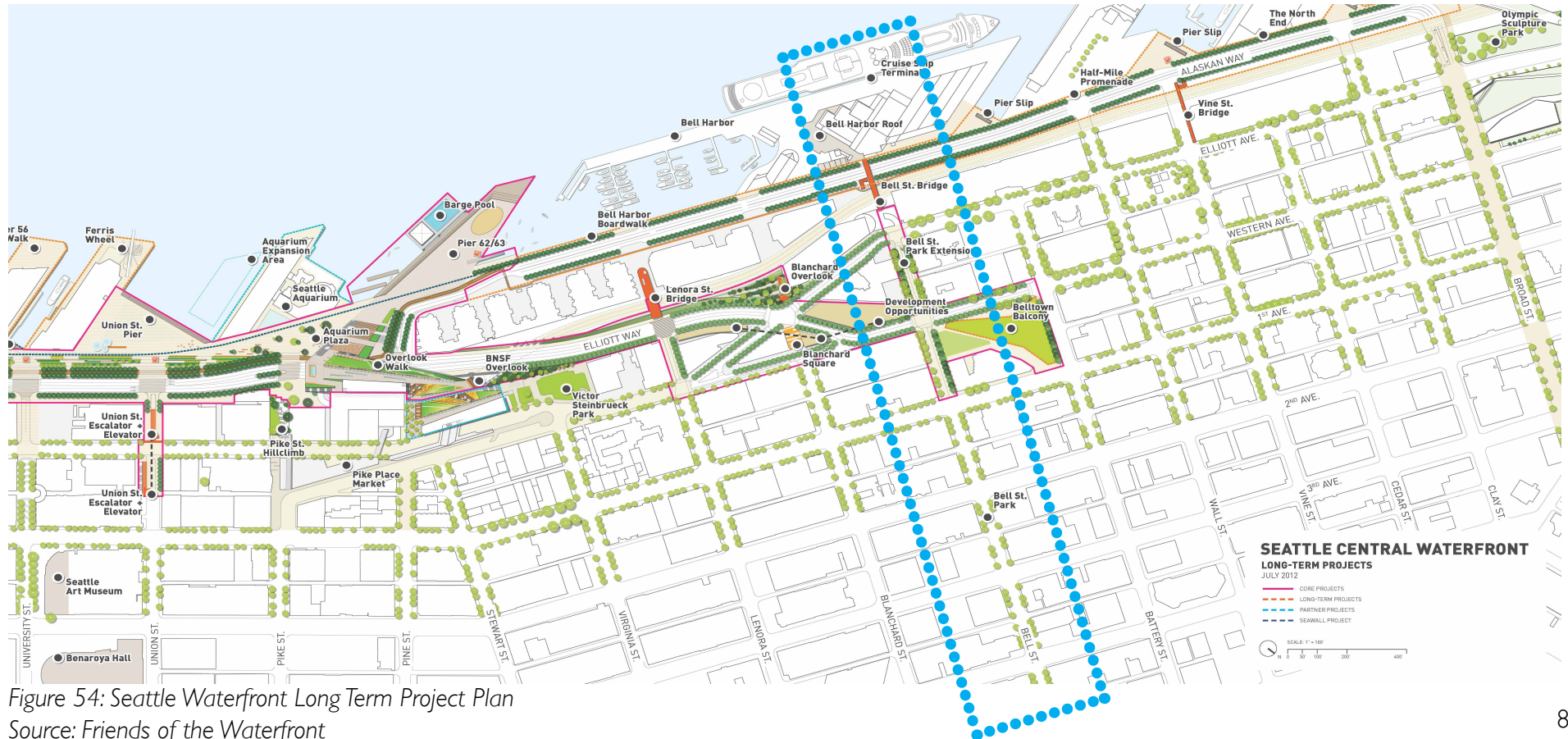


Figure 54: Seattle Waterfront Long Term Project Plan  
Source: Friends of the Waterfront

# Therapeutic Streetscapes: **DESIGN CONCEPTS**

**77 - 97**

## DESIGN APPROACH

My intention for this streetscape design is to create an anxiety-reducing, calm space that provides opportunity for increased functionality in people with ASD. This streetscape design is not intended to ignore the needs for an active operational corridor running through Bell Street. It also should not isolate neurotypical people. This is a street that would be integrative and should work for them, as well as people with ASD, it should though improve quality of life for people with autism in far greater extents than for other people.

This new streetscape design will accommodate pedestrians, cyclists, and automobile drivers keeping the traditional users of the street the same. In order to achieve this, let's look back at how we have approached this question throughout this project. We started by gaining an understanding of what Autism Spectrum Disorder is, and how it affects an individual. This led to a deeper exploration of the specific sensory differences between ASD and neurotypical brains.

We layered our information on Autism with a study on therapeutic spaces and the principles that guide them. By looking at two case studies, gardens that were designed for children with Autism demonstrates specific materials and plant choices that would be good or bad for people with ASD. The final section of our literature review covered existing guidelines for ASD design. After comparing and evaluating each set of guidelines, we were able to form a list of key takeaways from the existing ASD design research, of which the main ones are:

1. Flexibility
2. Continuity
3. Room for Refuge
4. Control
5. Predictability

The final section of the literature review studied the principles for quality public spaces. We looked at the best practices from around the world, but it will be important to consider how those spaces would function for someone with ASD as well.

In order for this project to be successful, the Bell Street, ASD friendly streetscape design needs to understand how all of these topics: Therapeutic Gardens, Autism Spectrum Disorder, and Existing Guidelines can intertwine and overlap. Since no specific examples of an ASD friendly streetscape design exist, the research needs to build and adapt to push the design forward. I plan on consistently move back and forth between each topic in my final design, allowing me to understand where every design decision stands in relevance to ASD people, Therapeutic design practices and the existing guidelines.

The site analysis is the next step of information to layer on top of the literature review. By understanding the external elements of the space, for example: wind, rain, and sun etc. a site-specific design emerges. This design is not intended to be copied and pasted across the world when creating an ASD friendly space. Every time someone designs autism friendly spaces, the specific external conditions of a place need to be carefully examined and considered.

The site for this project is Bell Street from 5th to 6th Avenues. The limits of the site will include the public space between the privately owned parcels on either side of Bell Street. I chose not to include the intersections within this scope because of the constraints in project scale. I intend to focus on creating several programmatic design concepts, which will be developed into a schematic design. These concepts will use the research and provide a physical manifestation of lessons learned so far from the project.

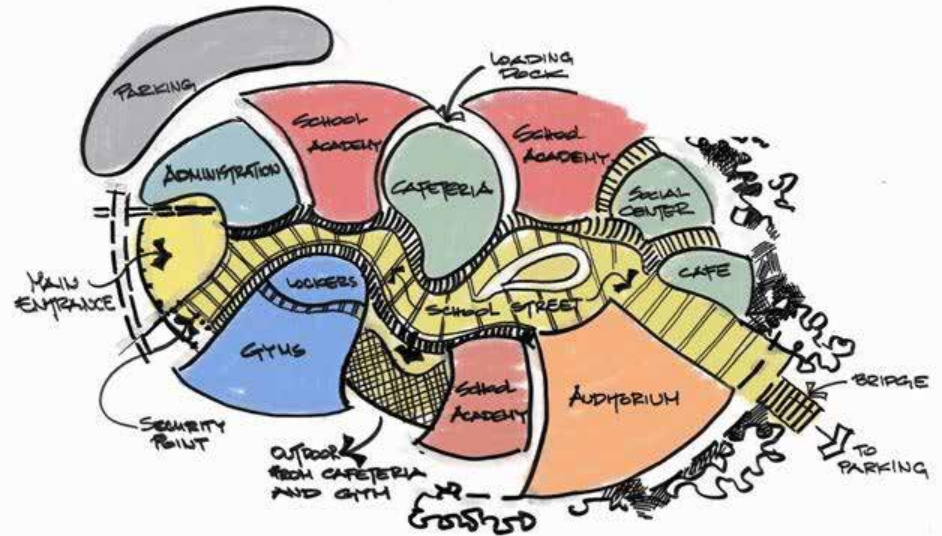


Figure 55: A bubble diagram, one form of programmatic

I will also make a few assumptions regarding the immediate site surroundings. Firstly, I assume that the current proposed development along Bell Street would proceed as planned. This includes the Data Center directly on Bell Street and 6th Ave, but it also includes a new residential tower development on 7th and Bell with over 1,000 residences proposed. This massive new influx of people should continue to make Bell Street a very urban, vibrant environment. I will also assume that car traffic on Bell Street and the surrounding area follows trends in Seattle as car use decreases. Similarly, I make the assumption that Sound Transit's Light Rail package follows its currently proposed alignment, which skips Belltown and serves South Lake Union instead.

## DESIGN INSPIRATION

After diving into the neurological effects of Autism, I grew even more interested by the amount of information people with ASD take in. I think that is what makes the disorder so powerful and mysterious to many. I began to think about the brain input in relation to the concept of frequency, or simply how often something is repeated. For some people with autism, life is all about patterns and frequencies. Repetition is a necessary and constant part of daily life.

Those with ASD live with a higher level of frequency than neurotypical people. They take in more information all the time. Elements of my streetscape design will be repeated throughout the block-long site at intervals of high and low frequencies, depending on the need and user groups. These differences in spacing will create pockets of alternative spaces often throughout the ASD friendly block.

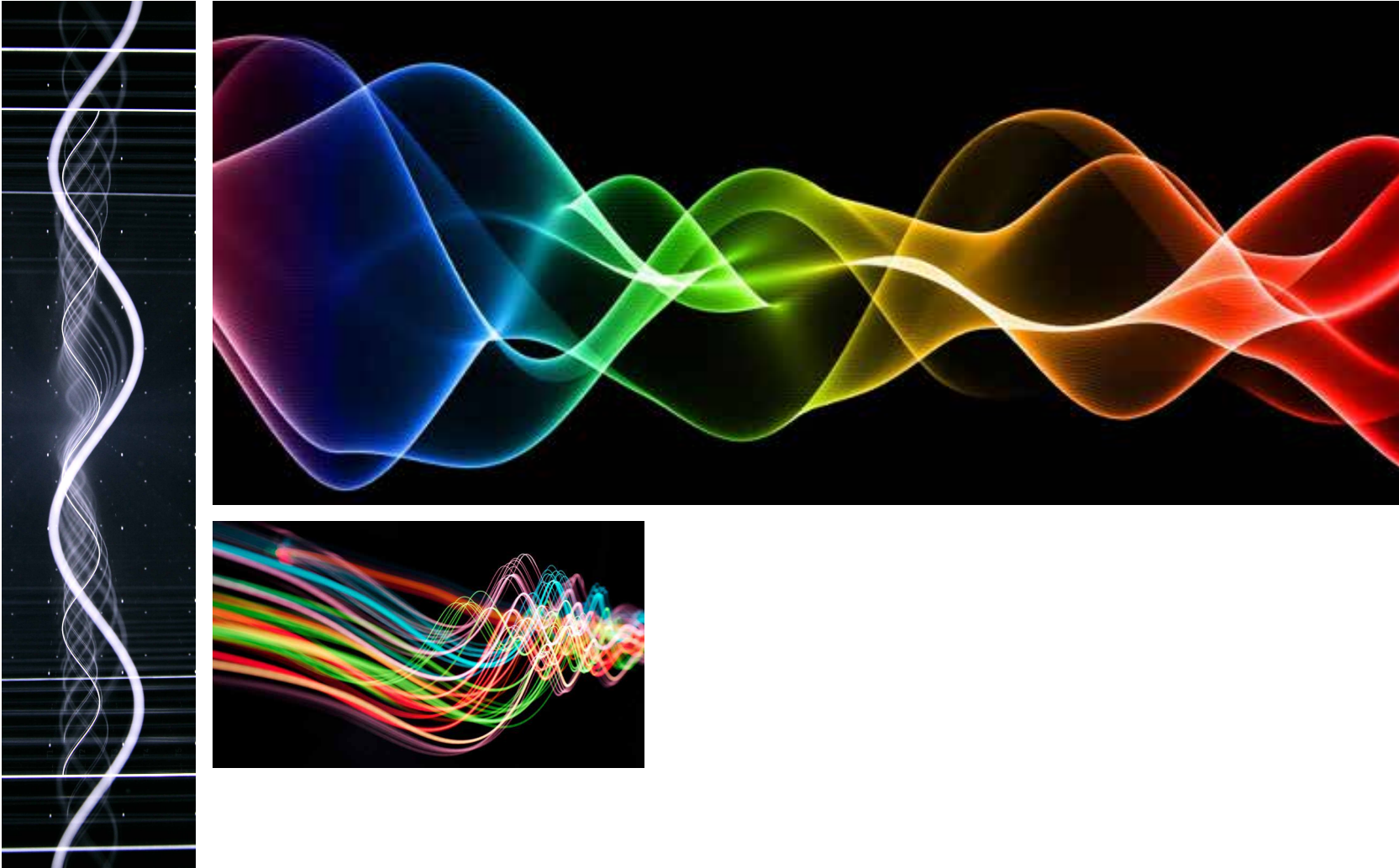
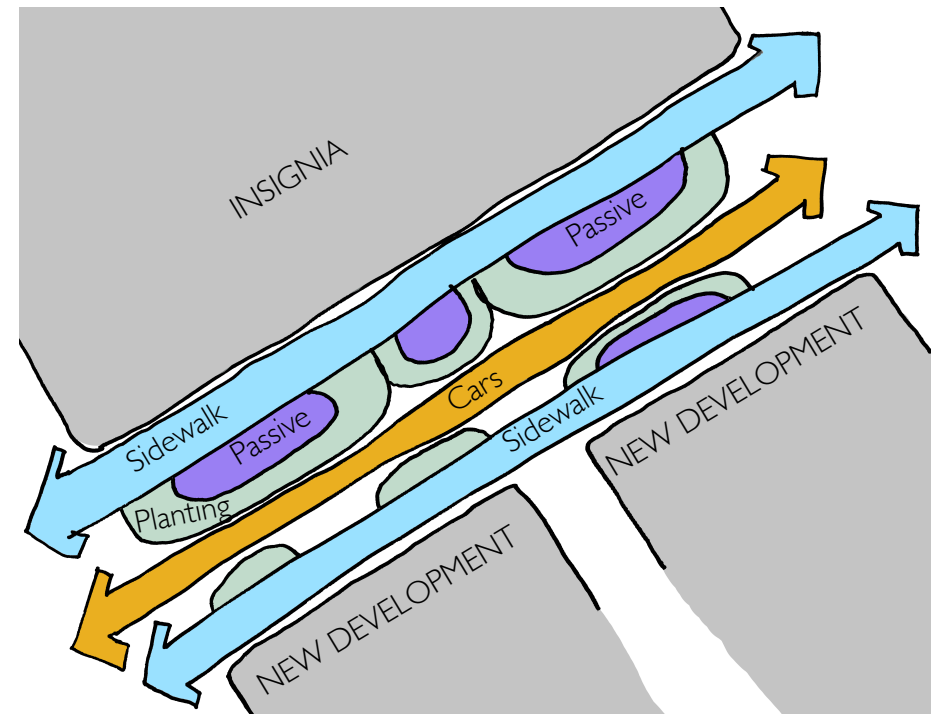


Figure 56: Examples of Frequencies and waves

## DESIGN CONCEPTS

The following are three different programmatic diagrams for the streetscape site. Each concept has positive and negative aspects, which will be addressed and evaluated. Afterwards, I will select the concept with the best potential to create an ASD friendly street. Aspects from all three concepts could be reincorporated into the final design.

### Concept I

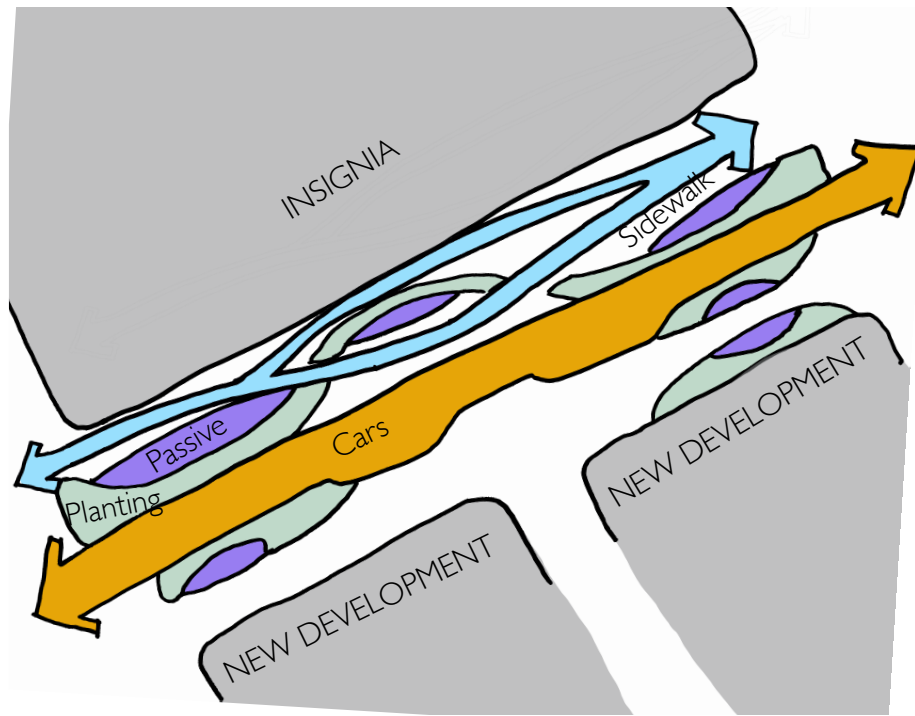


This programmatic concept remains true to following typical streetscape organization continuity is one of the key principles guiding ASD design. The cars remain in the center of the street, with a much smaller operating area. The pedestrian focused sidewalks are along the buildings with the intention of creating a vibrant corridor. Separating the car from the pedestrian space are a series of pockets. These pockets are intended to be spaces of refuge protected from the noise and chaos of the street by plant life.

Some of the negatives about this concept are; 1) Lack of possible interaction with plant life. 2) Spaces for refuge could seem too open to the sidewalk passing by. 3) Interaction between drivers and pedestrians are limited due to vegetative screen. This could make the street more dangerous as drivers might not realize the pedestrian environment.

Figure 57

## Concept 2

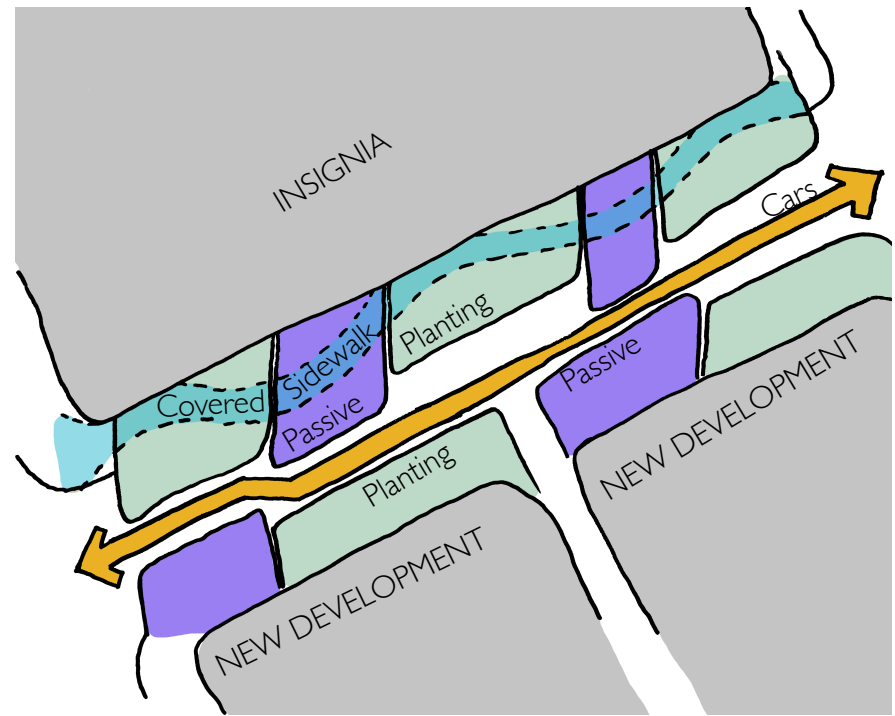


This streetscape design integrates the sidewalk into the planting areas. The intention is to provide flexibility to the user through walking options. If you're comfortable walking closer to the cars, you can, or you can stick closer to the building. Nestled within the planting areas are smaller spaces for refuge, or for hanging out.

The planting areas have designed following the pathway of a wavelength, gently curving and changing as someone walks down the street. The negatives of this design are that it is not as predictable which could be challenging for someone with ASD. Similarly the planting areas are not large enough to create an intensely therapeutic space

Figure 58

## Concept 3



This third concept alternates between planting areas and passive spaces for refuge or relaxing. Linking the different areas together on the north side of the street is a covered walkway, which gently curves from space to space. This walkway functions as the main sidewalk space. The curving can move people from space to space and is a tactic used to make transitioning activities easier in ASD gardens. The covered walkway prevents elements from affecting individuals, like the rain. The streetscape here has pockets for parking along the planting areas and bends traffic flow in an effort to slow it down.

The negatives about this design are the circulation routes are very limiting; there is little flexibility in movement or control in pathway. Also the connection to local developments and the rest of the street grid would be difficult.

Figure 59

## PREFERRED DESIGN SCHEMATIC PROPOSAL

The preferred design is a combination of several elements from all concepts, but largely from programmatic designs two and three. Elements from the preferred design are called out on the next page. This concept allows for bike and car traffic running down the middle lane, while providing ample pedestrian space to move through actively, or sit and enjoy passively. Car loading and unloading spaces are located in the middle of the block in order to keep the automotive spaces at the intersections smaller, forcing cars entering the street to slow down.

The north side of the street, which receives more sun, is larger, and provides more room for people walking than the southern side of Bell Street. More sun on the north also allows for larger planting areas creating opportunities for therapeutic garden qualities, within an urban streetscape design.

Spaces for passive activities like sitting, watching, or listening are nestled into the larger planting areas; this was a part of the first programmatic concept. The second concepts' circulation routes were also used as well as the final concepts' weather barrier.

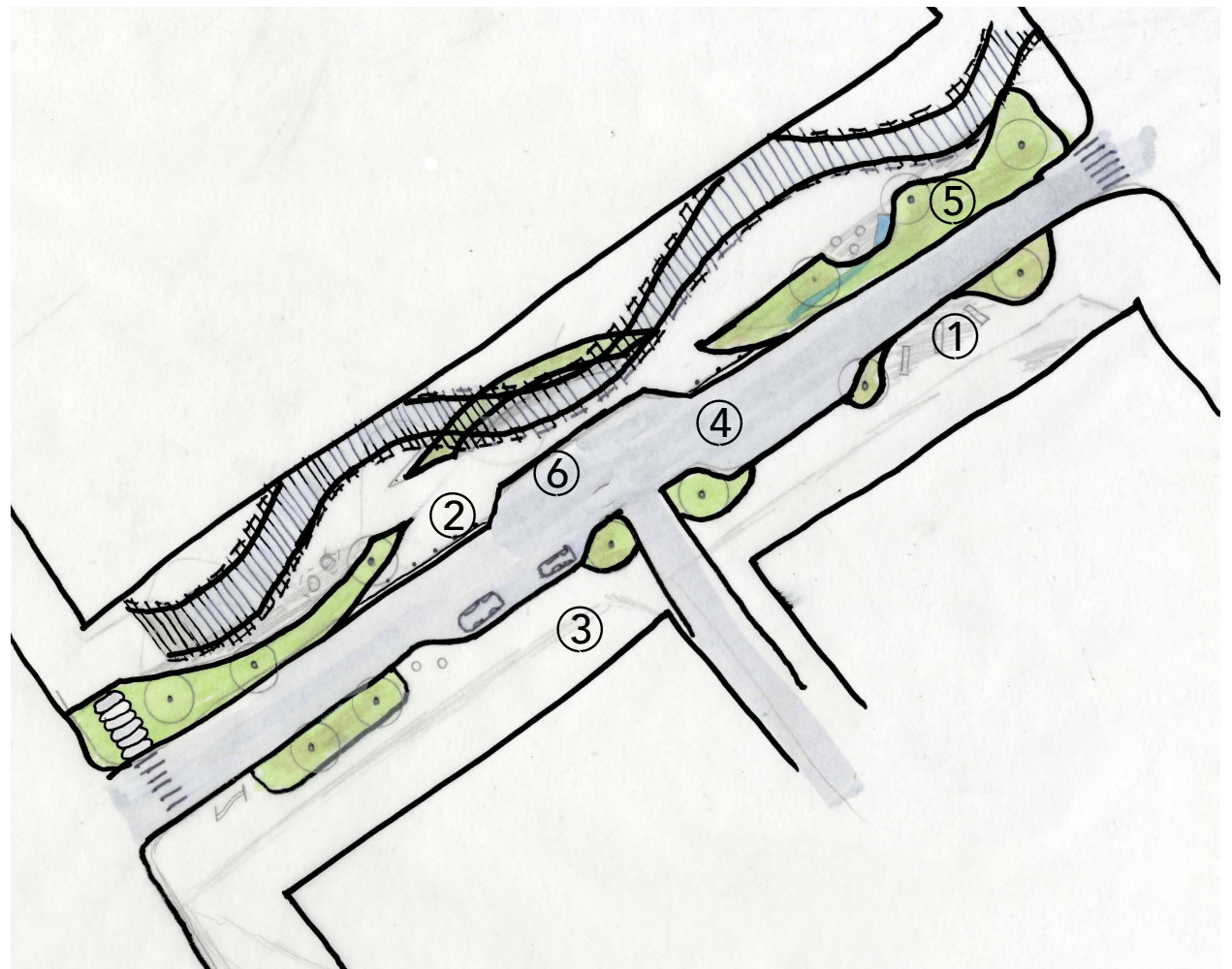


Figure 60

## PREFERRED DESIGN ELEMENTS

### 1 Places for Refuge

Carved out of several planting areas, are spaces intended for passive activities. These spaces are positioned in a way to be just off of the active pedestrian arterials. There are some on both sides of the street, but more on the north where there is more sun. ASD individuals can use these spaces to help calm down when too many sensory inputs occur at once.

### 2 Flex Spaces

The Flex spaces are open areas of concrete in-between the street and the active spaces on the sidewalk. They are intended to be non-programmed zones where individuals with ASD can feel comfortable doing active activities without being in the center of it all.

### 3 Wide Sidewalks

The final design includes wide sidewalks on both the north and south sides of the street. Wide sidewalks allow ASD individuals to have plenty of personal space when desired. They also allow for groups of people to travel together. Wide sidewalks contribute to a vibrant pedestrian experience, more eyes on the street.

### 4 Narrow Vehicular Travel-way

The automotive section of the street is limited compared to typical streetscape design. By making it narrower, more space for pedestrians is available. The narrow street slows vehicles down as they approach the street because of the tighter turns necessary to enter the street. The same principle is applied to the alley entrance as well. Parallel parking spaces are adjacent to the street on both sides. They are located near the center to accommodate more pedestrians at the busier intersections.

### 5 Large Planting Areas

The large planting areas, found on the north side to capture the sunlight, take pedestrians away from the urban environment and allow them to enjoy the therapeutic benefits of nature. Large beds contains numerous trees shrubs and tall grasses that bring tactile experiences to users

### 6 Streetscape with Curbs

While we have gone over the positive effects of shared street space, for people with ASD clear and defined pathways provide the safest urban experience. That is why there are curbs in this streetscape design. While it is possible here to cross at mid block easily due to the narrow street width, keeping consistent with other city streets is beneficial to those with ASD.

# BELL STREET: AN ASD FRIENDLY SPACE

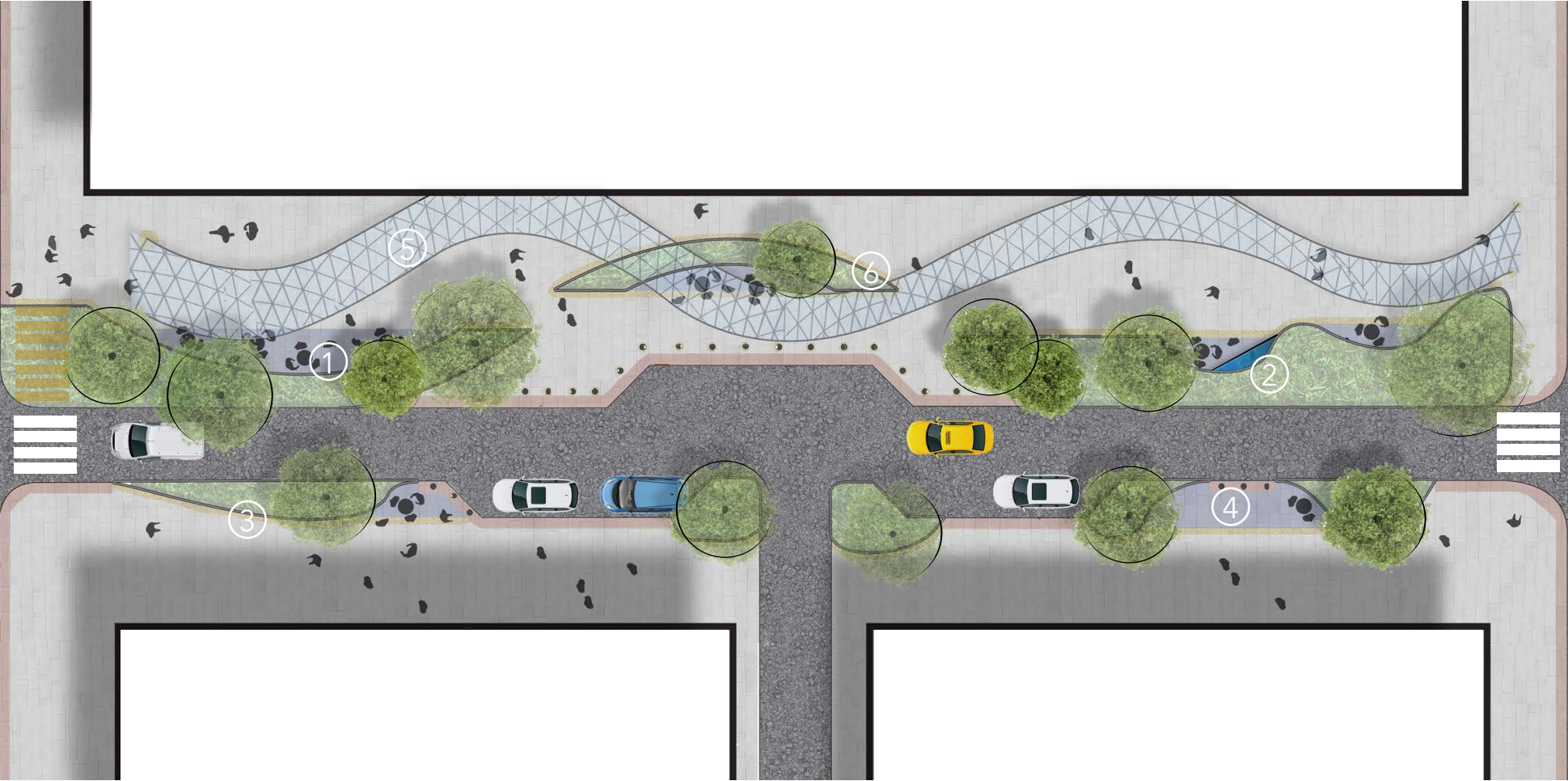


Figure 61 Rendered Physical Design

# ASD FRIENDLY ELEMENTS

## 1 Rearrangeable Furniture

Placed within areas of refuge and various places along the streetscape, rearrangeable furniture allows users opportunities for sitting and staying on the street rather than just passing through. By providing seating that can be moved and adjusted the users of the space have more control and flexibility in their options. For someone with ASD, this means they can move their chair into the shade if the sun is too strong. Providing a sense of control over a space is a guideline for ASD friendly design. Strong colors provide additional visual cues within the refuge areas. The photo below shows movable chairs and table in Times Square NYC.



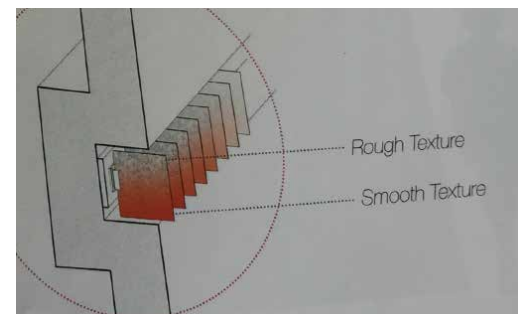
## 2 Water Features

Water features can be tricky elements of ASD design. When placing it into an ASD friendly space, thought needs to go into the type of water feature. I have chosen a bubbling feature, example below. This feature allows interaction with a very controlled jet of water. There is no basin for water to collect in. This is because some children with ASD have been noted to become obsessive over watching running water collect, some will even want to climb into it. Having a controlled sensory experience is a great way to bring the calming effects of water into a space.



## 3 Tactile Railing

Railing throughout the streetscape design, provides ambulatory assistance as various points. The railing is placed next to vegetation, and also offers a tactile and auditory experience. As proposed in an Architectural Thesis at WSU, this design element pictured below, would be integrated into railings on my site. The railing provides auditory and tactile sensory experiences by running your hands along the tactile railing. (Holbein, 2010)



## ASD FRIENDLY ELEMENTS

### 4 Safety Bollards

Bollards in this design line the open spaces between the automotive street and the pedestrian sidewalk. They are a visual indication that to pedestrians that they are leaving their intended zones, and other cue to drivers that many people are about. They have also been placed in far enough away from the street to make them a part of the street furniture. Bollards act as stationary places to lean on. They can also make someone with ASD feel more secure in a space because they can be used as a barrier or protective device to “hide” behind. Bollards are great place making tools and provide flexible programming to a space.



### 5 Shade Structure

A shade structure was included into the site design as a protective device weather elements, more specifically rain and sun, both of which can be irritants and contribute to a sensory overload situation. People with ASD are extremely sensitive to sun so providing areas where the glare can be reduced is crucial in creating a comfortable space for them. This shade structure is built from tempered glass effectively reducing the glare, but still allowing light through. It curves through the street providing cover in several of the passive activity areas. The shaded structure also connects to the entrances of the Insignia Tower. This shade provides a chance to adjust between indoor and outdoor lighting schemes. (Wagenfield, 2015)

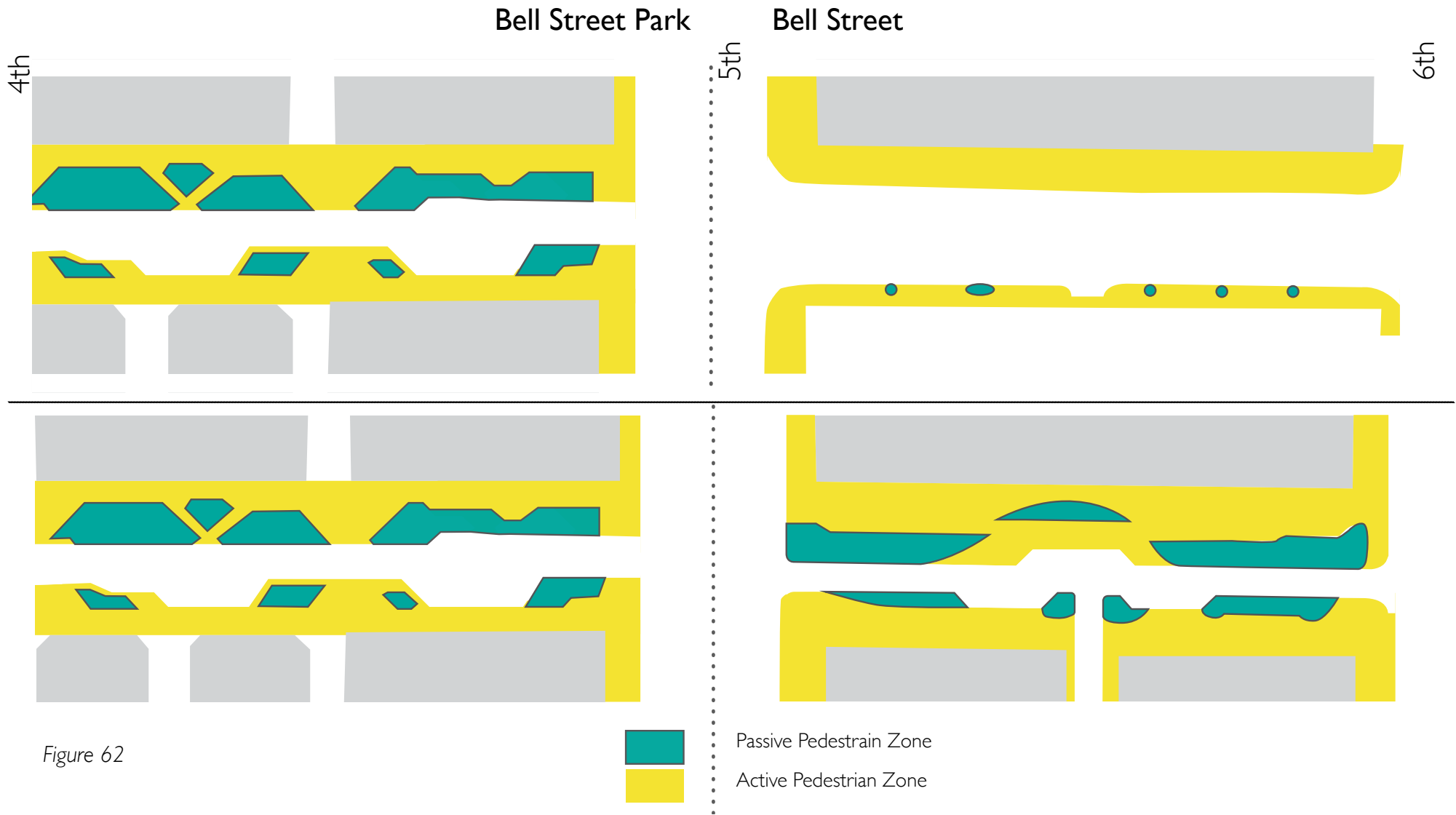


### 6 Curved Transition Spaces

The streetscape design is based on a wavelength, a design inspiration that has curving spaces as a central component. The curvilinear spaces help move users through different spaces helping ease the transition between active and passive activities. The curved spaces can also help control external sounds creating less ambient noise that could be disturbing to those with ASD. The curve of pathways and the curve of the overhead shade structure should help move users through the space.



# ACTIVE / PASSIVE DIAGRAM: ASD FRIENDLY BELL STREET



This diagram compares the space dedicated to active movement like walking, versus passive activities like sitting. For people with ASD clear delineations and spaces for each are important.

# ASD FRIENDLY PLANT PALETTE

Figures 66-74

## Trees



Tulip Tree (*Liliodendron tulipifera*)  
- Green to Yellow leaf color  
- Clean Street Tree, not much falls off



Parrotia persica (*Persian Ironwood*)  
- Smaller tree with soft tactile bark



Japanese Elm (*Zelkova serrata*)  
- Clean Street tree  
- Soft bloom color



Littleleaf Linden (*Tilia cordata*)  
- Dense canopy for shade  
- Tall overhead branches

## Grasses



Blue Oat (*Helictotrichon sempervirens*)  
- Sturdy grass with blue hue  
- Stands up to lots of interaction



Fountain (*Pennisetum alopecuroides*)  
- Soft texture grass



Japanese Forest (*Hakonechloa macra*)  
- Bright color great for helping visually impaired people



Mexican Feather (*Nassella tenuissima*)  
- Soft to the touch  
- Tall creates feeling of natural environment

# ASD FRIENDLY PLANT PALETTE

Figures: 75-80

## Shrubs



Sweetgale (*Myrica gale*)  
- Subtle smell  
- Waxy leaves, nice to touch



Oregon Box (*Paxistima myrsinites*)  
Slow growing evergreen shrub  
Not attractive to wildlife



Spanish Lavender (*Lavandula stoechas*)  
- Shrub that can provide a calming scent  
- Blue green hue is a relaxing color

## Groundcovers



Beach Strawberry (*Frageria chiloensis*)  
- Leathery leaves, new tactile experience



Deer Fern (*Belchnum spicant*)  
- Soft evergreen plant that's interesting leaves provide a unique visual and tactile experience



(*Sedum spathulafolium*)  
- Soft ground cover that can ease people into a planting space



Oak Fern (*Gymnocarpium dryopteris*)  
- Short ground cover that can make a soft base in a planting area.

# CONCLUSION

## Project Summary:

This thesis research was a process of learning about an entirely new set of research and applying to a specific design site. After reviewing the existing literature surrounding Autism Spectrum Disorder, it became clear to me that this design was all about sensory experiences. Using the base information about ASD we applied guidelines of Therapeutic gardens and Interior Architectural ASD guidelines to come up with a series of 5 important considerations for ASD streetscape design.

With the frameworks weaved together; it was applied to a site in Belltown, Bell Street, that has led the way in innovative Streetscape design. By continuing the Bell Street Park in an ASD friendly way we can push the boundaries of how a streetscape can look and feel while not excluding the other necessary functions a street performs.

Our street was designed to be a more comfortable place for all people who experience it, but a remarkably more comfortable place specifically for people with ASD.

## Compromises and Conflicts in Designing an ASD Friendly Street

Streetscape design can be a contentious issue. Often we hear or read articles declaring the most recent affront in the War on Cars. The take away from this is clear, people have a tough time understanding the benefits of reducing the space given to cars on a typical American street. This is also something we must realize and accept if we want to make positive change for the ASD community in our public space. Interventions like this project on Bell Street luckily do not have to worry about maintaining traffic flow and keeping a high amount of cars moving. Bell Street is not designed to do that in the first place. Most American streets are though and balancing the creating of comfortable space for people with ASD with performance of the street are difficult tasks.

During a thesis presentation I was asked a question; on a 1-10 scale if I would assign a typical street a number relating to how comfortable it is for someone with ASD. I gave it a 1, and gave a therapeutic garden designed for people with ASD a 10. Streetscape design will never reach a 10 in comfort for the ASD community and that is okay. One of the benefits of enjoying and being in public space is learning to deal with unexpected situations. These are growing experiences for everyone, ASD or neurotypical.

I would assign the redesign of Bell Street in Seattle a seven on the scale of comfort. The large scale of pedestrian space comparatively to the automotive space contributes greatly to that high number. Not all streets will be able to include wide vegetative spaces or water features, or overhead weather protection. They will probably have more than a single lane of traffic as well, and their speeds can be higher resulting in more noise and pollution emanating from vehicles.

Streets and urban streets specifically are some of the most uncomfortable places for people with ASD. They are chaotic, unpredictable and can attack all the senses at once. If we can make all streets marginally better for people with ASD by including just a few elements than we can take our cities from being a one in accommodation for people with ASD to, with a lot of work, a four. This might not seem like a big win for the ASD community, but it is. This semi-comfort street begins to create a citywide network of spaces and routes that can contribute to a better quality of life, and the possibility for more independence as well.

A strategy is slowly building up a streets comfort level would be implement the low hanging, easy to implement ASD friendly design suggestions. I would suggest using flexible seating, shade elements and bollards as a great place to start in future street conversion designs.

### **Lessons Learned and Limitations:**

Some limitations of this thesis project were time constraints. This was a nine-credit thesis assignment and a large amount of time went into fully understanding ASD, and the sensory differences experienced by so many people who have the disorder. Similarly, the push for autism specific research has been increasing in the past decade with a call to action for researchers by the National Institute of Health. Facts about autism are constantly changing and shifting so keeping track of current research was a time consuming task.

Other limitations of this study was the lack of involvement directly from the ASD community. They would absolutely need to be involved within future design and work for this streetscape, while it is possible to read and gain an understanding of daily life for someone with Autism, until they are involved with the project its remains a top down approach to the issue.

Finally some other limitations include the limited research covering ASD designed places. There are no studies studying how design choices have impacted comfort levels for people with ASD. All we can use are architectural designs and intentions to speak about ASD design case studies.

### **Going Forward:**

The thesis component of my degree at the University of Washington lasts only three short quarters. In that amount of time, it is difficult to get a grasp fully of Autism, Urban Design and Streetscape Design, Therapeutic Gardens and existing ASD guidelines, let alone complete a site-specific design for thesis. There were some time limitations as a result, this project is ready for future students to take the research composed here and apply it to a specific street in much more detail than the schematic plan here. It would be a great challenge to perform a streetscape revision on a much more heavily used thoroughfare also in an urban environment.

Further research also needs to be completed which studies, through observation, how the current urban design of streets considers people with ASD. Quantitative research is sorely lacking from Built Environment focused studies on Autism.

Finally a compendium of best practices relating to past Autism Specific design of all scales would benefit all built environment professions as a whole and could be used similarly to Universal Design Guidelines.

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