THE WELL-ADJUSTED SCHOOL: ADDRESSING CHILDHOOD OBESITY THROUGH THE ARCHITECTURE OF CANADIAN SCHOOLS

by

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DEDICATION

This thesis is dedicated to Carson, my family and my girlfriends for their much needed support, patience, humor and wisdom.

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ABSTRACT

This thesis explores the relationship between the built environment and the effects that it can have on a child's ability to value a healthy lifestyle. As children spend the majority of their time in schools, and are heavily influenced by their surrounding built environment, it is appropriate to examine the architecture of an urban school and understand how it can have a lasting impact in molding a child's future well-being.

This thesis takes a critical position on the typical academically focused pedagogy of schools. The aim is a transformation that not only impacts a child's academic outlook but also the child's ability to develop a healthy lifestyle.

The design approach recognizes the three most influential aspects in a child's life that will lead them towards a healthy lifestyle as a young adult. These include community and family, physical activity and healthy food. These critical stimuli help to develop the design framework that can also be applied to a range of other design environments to promote a positive, healthy atmosphere.

Using downtown Calgary, Alberta as the research milieu I look to take best advantage of the surrounding urban conditions to facilitate the design of a school using a design strategy that accommodates enhanced physical activity and healthy dietary concerns.

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CHAPTER 1: INTRODUCTION

This thesis begins with design research on the current state of schools and their curriculums in order to formulate fundamental design criteria, then analyzes precedents for evidence of creative design translation. The design work develops with a careful examination of potential hybrid programming, as well as site selection criteria for best situating the school in a multi-layered urban context. The design sets out to resolve a number of design principles ranging from optimizing solar orientation to maximizing movement of the student population.

1.1: Thesis Question

> How can the architecture of a healthy school inform the well-being of both the child and the community?

Over the past three decades children's overall physical health has shown a marked decrease. Within school systems physical education is no longer valued as highly as it was in the past. These vital hours of physical movement each day have been substituted for other academic classes or have become obsolete altogether. What has happened as a result is truly alarming.

In 2005 the Canadian government spent 5.3 billion dollars on obesity related issues.[1] Not only is it costing the government an inordinate amount of money, but for the first time in our history our children's lifespan could be two to five years shorter than our own.[2] This epidemic is impacting the future of our children and this thesis aims to examine architectural strategies for the positive re-shaping of the curriculum. Architecture alone can not solve childhood obesity; rather, this thesis suggests that this large task can only become a realization when there is a collaboration of many fields working together to find solutions to this growing epidemic.

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1 Public Health Agency of Canada (PHAC) | Agence De La Sante Publique Du Canada (ASPC), "Childhood Obesity", Public Health Agency of Canada, 03 Aug. 2010, Web 05 Feb. 2011, http://www.phac-aspc.gc.ca/ch-se/obesity/obesitybck-eng.php.

2 Unknown "Physical Activity and Inactivity," Home, 2009, Web 05 Feb. 2011, http://www.activehealthykids.ca/ReportCard/PhysicalActivityandInactivity.aspx.

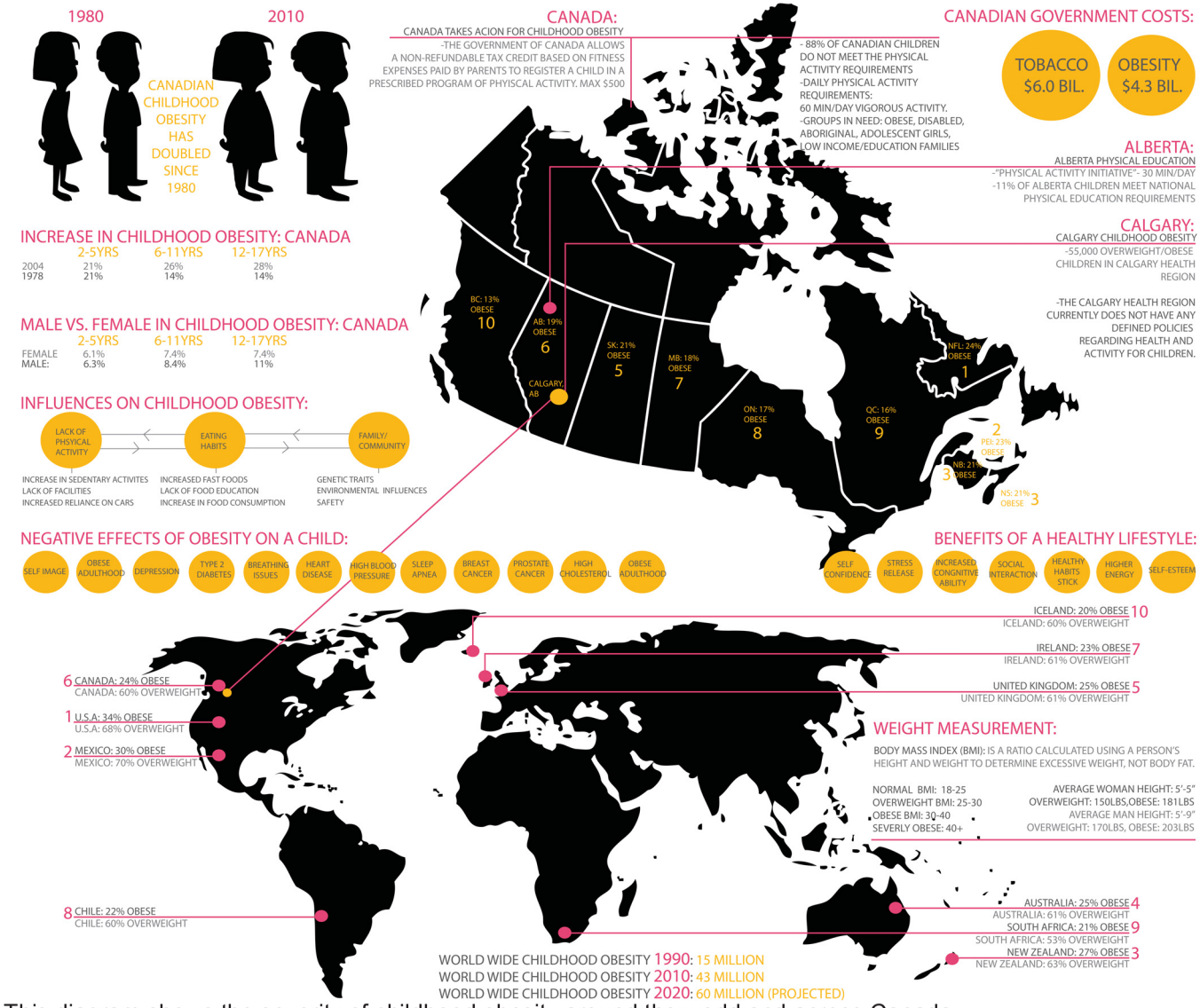
There are many reasons why physical activity is not valued as much as it once was. Some of the critical reasons include:

> [t]he lack of time, funding, access, and planning and increased competition with various academic demands have also reduced in-school opportunities for physical activity and healthful eating.[3]

Activity is fundamental for the healthy development and growth of children. Not only is it vital to the physical development of a child but it also fosters the mental aspect of their development. Children receive positive outcomes from their participation in physical activity. Spaces need to be designed for children to explore and be creative, unlike the rigid, boundary driven schools and playgrounds that are so typical in our communities today. With better options for play and physical activity a child could become more inspired to engage in an active lifestyle. However, without the proper facilities, we are unable to give a child the quality well-rounded education they deserve.

Children have also experienced an increased amount of time spent doing sedentary activities, such as watching television, socializing on the computer or playing video games. This lack of physical activity, combined with unhealthy eating choices from an increase in fast food consumption, has resulted in the children of our generation becoming heavier and less fit. The following information graphic illustrates the many negative factors of obesity and the effects it has on people and children around the world.

3 Nicholas Gorman, Jeffery A. Lackney, Kimberly Rollings, and Terry T.K Huang, “Designer Schools: The Role of School Space and Architecture in Obesity Prevention,” Obesity 15.11 (2007), 2521



This diagram shows the severity of childhood obesity around the world and across Canada.

There is an abundance of research that has shown that an unhealthy child will most likely become an unhealthy adult, developing even more serious health issues as they age. As most of a child's life is spent at school, this should be a primary area of focus for designers.

Our lack of initiative to create innovative and inspiring learning environments has played a negative role in children's health. A child's environment will be one of the primary influences in shaping their lifestyle and understanding their health. Whether it is a change in the way we look at the pathways to and from school or the classroom design itself, the potential to prompt a child's creative stimulation and health lies within the built environment.

> Schools are among the first examples of architecture that everyone experiences and have a profound impact on all children as the grow up.[4]

This thesis takes a critical position regarding the built environment and the healthy development of a child. Without a change to our design criteria we are making our children's path towards a healthy lifestyle very difficult to navigate.

1.2: Area of Study

> Therefore the first objective of education is to develop health and character, to form active habits of body and mind which shall crystallize around simple wholesome notions of honesty, justice, responsibility-thus shaping the good, all around, fearless, independent, and useful citizen. The second objective is to differentiate capacity, and develop it to the highest degree, by giving it nutrition, exercise, roundness and finish.[5]

The area of study for this thesis focuses on the direct and indirect connection between health and architecture and how it can be a positive influence on the inhabitants of a building and surrounding community. More specifically, this thesis seeks to design an active school environment that encourages movement and appropriates space for learning the key factors of a healthy lifestyle. The built environment plays such a large role in shaping the lives of its inhabitants that we should seek to develop buildings that enhance and promote the physical, mental and social well-being of people.

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4 Zaha Hadid Architects. "Evelyn Grace Academy", Press Releases, 15 Oct. 2010, Web 29 Jan. 2011, http://www.zaha-hadid.com/press-releases.

5 Louis H. Sullivan and Maurice English, *The Testament of Stone: Themes of Idealism and Indignation from the Writings of Louis Sullivan* (Evanston Ill: Northwestern UP, 1963) ,71.

> Efforts to identify factors contributing to rising obesity rates in the United States and beyond have implicated the burgeoning obesogenic[6] environment as a key determinant of obesity-related health behaviors.[7]

The area of study goes beyond the school environment. As we take a critical look at the associated factors that deter healthy design we can hopefully propose an improved framework that will guide the design of a healthy school. We must first understand the reasons why existing designs are not tailored to healthy lifestyles, get a better understanding of school typologies and ideologies and then pair them with the different developmental stages of a child in order to develop new ideas that will be suitable for the design of a healthy school.

1.3: The Deterioration of Healthy Design

> Just as design professionals are increasingly embracing green building as an objective, so too should they consider the potential effects of their designs on public health and well being.[8]

Over the past two decades there has been a global obesity epidemic for which there are many attributing factors. Some of these are out of our control, such as genetics. However, as designers we have an obligation to design buildings for the well-being of the inhabitants. Unfortunately, the focus of creating a healthy school building is relatively new. After the introduction of the automobile, architectural design steadily became more and more focused on designing around the impact of these vehicles. Suburban sprawl prevailed, moving cities further and further away from the idea of a dense urban fabric. With this new idea of designing around the vehicle, our cities began to see an increase in health related issues. People became reliant on cars for minor tasks such as grocery shopping and driving their children to activities. Destinations were no longer “walkable.”

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6 *Obesogenic*: Refers to conditions that lead people to become excessively fat. Michael Quinion. “Obesogenic”, World Wide Words, 25 May 2005. Web 05 Mar. 2011. http://www.worldwidewords.org/turnsofphrase/tp-obe1.htm.

7 Gorman, Lackney, Rollings, and Huang, “Designer Schools”, 2521

8 Michael R. Bloomberg, David Burney, Thomas Farley, Janette Sadik-Khan, and Amanda Burden, “Active Design Guideline,” Design - Department of Design and Construction, City of New York, 2010, Web 29 Jan. 2011, http://www.nyc.gov/html/ddc/html/design/active_design.shtml.

Billboard showing the severity of childhood obesity in the Southern USA. (Photo taken in Atlanta, GA June 2009)

> As the twentieth century progressed and America's suburbs began to grow, however, a variety of policies were set in place to optimize automobile travel. Different forms of land use were separated by zoning codes, so home and stores were no longer within walking distance.[9]

With the advent of the car everyday happenings became simpler and more convenient, taking away any sort of physical activity needed to move from place to place. Designing around the car paralleled the movement of designing buildings around comfort. With the primary focus on human satisfaction as a precedent for designing buildings, elevators and escalators were placed in the front entrances of buildings to enable an easier mode of transportation. It was as if stairwells were designed only for egress, placed in solid concrete containers and tucked away on the sides of the buildings. They were not comfortable places, nor easy to access, and so as a result they became secondary modes of circulation. Given the simple choice people preferred to use the easier and more appealing mode of transportation.

There have been numerous studies regarding the use of stairs in a building and the difference it can make to an individual just from the daily use of them. Once people began using the

9 James Sallis, "Future of Children", The Role of Built Environments in Physical Activity, Eating and Obesity in Childhood 16.1 (2006), 92-93.

stairs they experienced a noticeable weight loss and an increase in social interaction with peers, which in turn positively reflected on their health and daily activities.

Sprint mobile company designed their headquarters in Kansas City to promote the health and well-being of their employees. They slowed down elevators to deter their use, banned the use of parking on site, repositioned the food court to the end of the building forcing employees to move further and designed a main stairwell that encouraged regular use. After only a few months employees showed a marked improvement in their health and work productivity.[10]

The German based group, Volkswagen, also attempted to foster fitness within their designs. Their idea was to incorporate the aspect of fun into daily activities in the hope that it would encourage people to become proactive about healthy decisions. Volkswagen created the theory they coined “The Fun Theory” where they designed and installed a working piano keyboard on a subway staircase adjacent to an escalator in Stockholm. People regularly chose this ‘fun’ way of transportation over the escalator.

10 Kate Zernike, “Fight Against Fat Shifting to the Workplace - NYTimes.com,” The New York Times - Breaking News, World News & Multimedia, 12 Oct. 2003, Web 15 Feb. 2011. http://query.nytimes.com/gst/fullpage.html.

Piano Staircase, by Volkswagen (The Fun Theory, 2009), promotes stair use in Stockholm by making them more fun to use.

Designing around convenience also led to a decrease in time people were being social within their communities. Herman Hertzberger talks about the ... '[h]eavily diminished dependence on one another due to our increased affluence and individuality'[11] from the use of cars. This lack of social interaction has also contributed to the increase in children playing alone instead of with other children. Since children are less social, the amount of hours children spend playing outside is being negatively affected. Peter Benson explained that 90% of human time is spent inside nowadays. Just twenty years ago we spent, on average, four hours outside per week for physical activity. Now children are spending about forty minutes per week outside for fitness.[12] Children playing outside and being active is vital to their future well-being and social interaction, and also plays a large role in the development of a healthy child.

1.4: Stages of Childhood Development and Necessary Spatial Arrangements

To fully understand how to create an appropriate design approach for a healthy school one must understand the corresponding stages of development in children. This thesis explores the potential in the development of a kindergarten to grade nine school structure. It focuses on these years because a child's most crucial physical, mental and social developmental stages are in these younger years. The school structure around them plays a very important role in shaping a child's development.

The following chart categorizes the motor, personal and social development patterns of children between the ages of five and nine. Understanding this chart and the difference between the phases suggests needed programmatic requirements to satisfy the different age groups. For example, there is a need for age-appropriate design spaces to allow for the separate developmental stages. There is also a need for specific spaces for group, competitive and organized activities. 'There should simply be more space for skating, playing football and other sports and sport-related activities',[13] as Herman Hertzberger suggests.

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11 Hertzberger, *Space and Learning*, (Rotterdam: 010, 2008), 206.

12 Peter Benson, 2010, International Making Cities Livable Conference, Charleston, SC, 2010.

13 Hertzberger, *Space and Learning*, 211.

The stages of childhood development shown in the following table demonstrate the changes in a child from age five to nine. This chart does not address the development of children over the age of twelve. This is because the motor, personal and social development of a child between the ages of twelve and fourteen is not significantly different. The only differences are that their motor skills become a little more complex.

	Motor Development	Personal/ Social Development
Early Childhood Ages 5-7	• Develops fundamental motor skills: Locomotor, Nonlocomotor and Manipulative. • Locomotor: Basic motor skills used to move from place to place Eg: walking, running etc. • Nonlocomotor skills: movement that does not require transportation of the body through space. Eg. Swinging, twisting. • Manipulative skills: Controlling objects, usually with hands or feet.	• At this age children are very egocentric, enjoy playing by themselves or with one-two others. • Very curious and enthusiastic but tire easily. • Need room to explore and be challenged. • At age 6-7 usually display an interest in most activities, though only for short periods of time. • At age seven children generally seek adult approval.

Middle Childhood Ages 7-9	• Children become more coordinated with the fundamental motor skills. Increased perceptual and cognitive development and increased physical size attributes to this. • Greater interest in playing more organized and competitive activities.	• Interests shift towards more group activities. • Keen interest in improving their skills and trying more complex activities. • Important to provide opportunities for each child to be successful. • Self image and group approval is very sensitive in this age.
Late Childhood Ages 10-12	• Complex coordination becomes apparent. • Children's movements become more fluid and creative. • Difference in activity preferences as girls start to enter puberty: dealt with by using more individualized teaching strategies.	• Physical maturity sets apart interests for boys and girls. • Both sexes enjoy highly competitive activities. • Enjoy planning and organizing their own activities. • Boys are less concerned about appearance and more so into vigorous, competitive sports and peer approval. • Girls tend to be less involved in vigorous activity, though it has been steadily increasing.

Chart summarized from Physical Education Glenn Kirchner and Graham J. Fishburne, 1998.

Another very important part of a child's healthy development comes from an interaction with nature. Peter Benson discussed the importance of nature and human interaction at the 2010 International Making Cities Livable Conference.[14] He stated that there is a direct link between human motivation, myopia, obesity and attention deficit hyperactivity disorder (ADHD) with the natural environment. 'Three studies of preschool children using direct observation report that being outdoors is the strongest correlate of the children's physical activity.'[15]

The combination grades (kindergarten to grade nine) also allow for opportunities of learning and interaction with older students. Secluding in or around their grade years does not allow for as much natural social interaction. Children need to learn from one another. There have been many studies exploring the differences between grade separation and organization. Among the top, for academic scores, is a kindergarten to grade eight or grade nine school organization. It comes out on top for academics and it is suggested this is because of the ability to learn from one another.

> Our behavior is a product of the physical and social environments that we inhabit.[16]

This natural social interaction and learning from others starts to suggest a school location within the urban context, learning from a wide range of people within the surrounding community.

1.5: Necessities for the Healthy Urban School

> The behaviors that take place in any school system are likely to be moderated by the broader macro-environment.[17]

After much research I was able to understand the three most influential areas that helped shape the healthy development of a child. These three aspects in particular let us define a child's well-being. They include community and family influences, physical activity and understanding healthy eating. Each of the three categories can be broken down further

14 Peter Benson, 2010, International Making Cities Livable Conference, Charleston, SC, 2010.

15 James Sallis, "Future of Children," The Role of Built Environments in Physical Activity, Eating and Obesity in Childhood 16.1 (2006), 91.

16 Andrew Baum, *Architecture and Social Behaviors : Psychological Studies of Social Density*, (New York: John Wiley & Sons, 1977), 19.

17 Gorman, Lackney, Rollings, and Huang, "Designer Schools", 2522.

to better understand the driving forces of each of them and the interaction between them. The following illustration is a depiction of the three influential areas. The centre imitates the representation of the existing, rigid, school fundamentals.

Photo montage demonstrating the cyclical overlap of community, food and physical activity in comparison to the standard, separated school system.

Within the community and family grouping there are issues of safety concerns, genetic dispositions, and social influences. Safety issues can be a concern for an adult when their child is playing on equipment or on the streets as well as concerns about unfriendly neighbourhoods within the city. Sadly, this major concern for safety while kids play has negatively affected the design development of playground equipment.

> Unintended misuse of equipment, brought on by boredom and the need to test the limits is a leading cause of playground accidents and has therefore become a focus of many accident prevention programs.[18]

These safety concerns often change the look of the playgrounds into uninspiring, prescriptive play areas. It is little wonder why children are not being as active anymore. 'Instead of stimulating spontaneity and creativity, most playgrounds offer a configuration of perspective items that only hinders a child's imagination.'[19]

Genetic traits from the family also interfere with a child's ability to stay fit. A child's genetic makeup can play a positive or negative role in influencing a child's weight and general health and usually remains an uncontrollable factor.

The third issue within the realm of community and family grouping deals with social influences. Social influences can be positive or negative. Peter Benson explains that 'it takes a community to raise a child.'[20] A child needs social interactions with the community in order to become a well rounded person. Many people including teachers, peers and family all play a role in shaping a child. It is necessary to have a positive community involvement within the school in order to see this reflected within the child's developed behavior. To have positive community involvement requires certain factors,

> The important factor is to develop facilities which take into consideration the play and social characteristics of the urban student and the ethics backgrounds and interests of the surrounding community. [21]

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18 Amy Kludt, "Footprints in the Snow: Playground Design as a Facilitator of Winter Play" (thesis, University of Michigan, Ann Arbor, 2009), 27.

19 Liane Lefaivre and George Hall, *Ground-up City: Play as a Design Tool*, (Rotterdam: 010, 2007), 27.

20 Peter Benson, 2010, International Making Cities Livable Conference, Charleston, SC, 2010.

21 Sherwood Cohn and Carol Carlin. "Site Development Goals for City Schools: a Report." Ed. Richard Dee. New York: A.S.L.A.F., E.F.L., A.C.A., 1973: 6

It is very important to have an overlap between the community and the school environment. 'The building which sets itself off from the community will never become a part of it, and it will be treated as an intruder.'[22]

The next category, physical activity, breaks down into three sub categories as well. These include, a reliance on cars for transportation, an increase in sedentary activities and a lack of facilities which provide opportunities for physical activity. Despite the need to design a site to facilitate the vehicle, we must also understand the need for a well developed connection system to the site for alternative modes of transportation such as biking or walking. The built environment can obviously play an important role by positively developing the proper facilities for organized physical activity, which will in turn play a role in increasing the well-being of children and promoting a lasting healthy and active lifestyle.

The last category, food, plays an influential role in developing a healthy building along with the community, family and physical activity groups. The issues with the food category can be broken down into several areas: lack of an understanding of healthy food choices; an increase in the amount of fast food choices; and an increase in food consumption. Each of these subcategories can be controlled in some way by the built environment. Providing the setting to teach children about food might suggest a school garden, while a market or overhauled cafeteria menu could provide healthy food choices for children.

All three of the main categories and their sub-components relate to one another and overlap in many areas. In order to provide a well-rounded, interesting space for children's activities, the architecture should give careful consideration to each of these areas. 'In short, we should do everything to bring city, school and home into alignment and make of them one seamless world of experience.'[23]

1.6: Spatial and Programmatic Organization of Schools

Understanding the developmental stages of a child and the influences that steer the development of a child moves us closer to translating the social issue of unhealthy children into an architectural design. A good starting point to articulate the healthy building is the

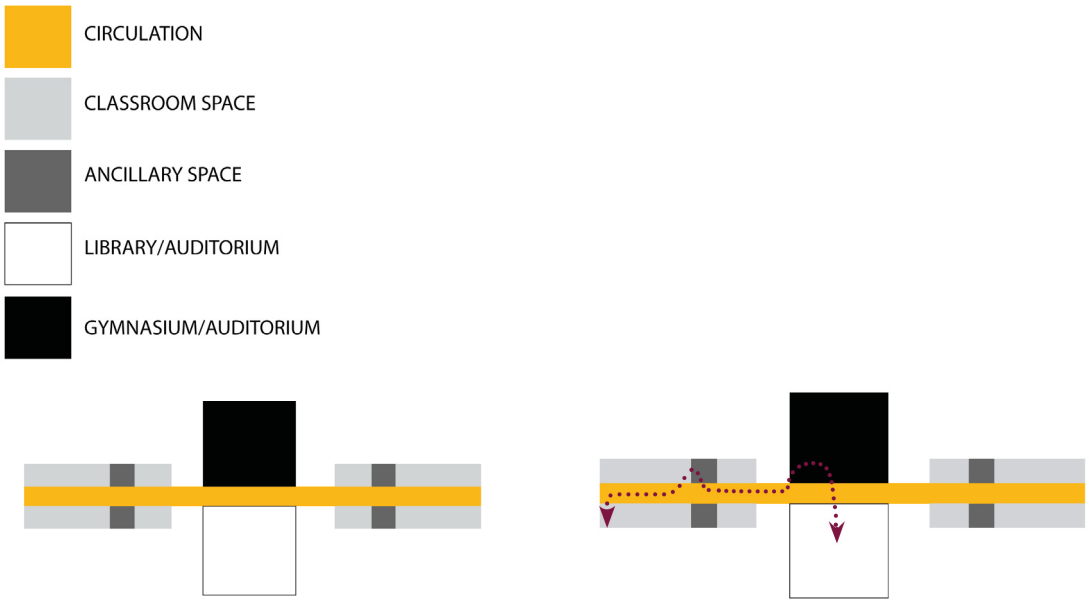
22 Cohn and Carlin. *Site Development Goals,* 6

23 Hertzberger, *Space and Learning*, 211.

provision of ample circulation space. To fully understand school layouts and circulation we must look at the history of school planning. This retrospective view provides us with an understanding of the ideas behind current programmatic planning as well as circulation paths between areas that can be modified to contribute to healthy design.

In a general sense, traditional schools are planned around a few standard principles. They include a double or single loaded corridor for classrooms, long, straight hallways, flat expansive plans and an organization which separates program uses into active space on one end and academic space on the other. The following diagrams demonstrate the typical school plan arrangements. Adjacent to them are diagrams explaining the path of circulation a child would use in that particular layout in order to use all the amenities within the building, or in other words their longest necessary path of travel. The blocks are arranged by circulation, classroom pods, ancillary space (washrooms, offices, faculty meeting rooms, etc.), gymnasium space that could potentially double as auditorium space and library/auditorium space.

The Dumbbell Model and The Classroom Cluster Model maximize the building use with the longest path of travel. These models create the greatest opportunities for movement within the building, as well as social interactions amongst the users. The Hybrid Model is a proposed model that builds on the idea of separated gymnasium and library spaces, similar to The Dumbbell Model and Classroom Cluster Model. The Hybrid model attempts to create circulation throughout the building by breaking off pieces of the programmatic elements and distributing them around the building.

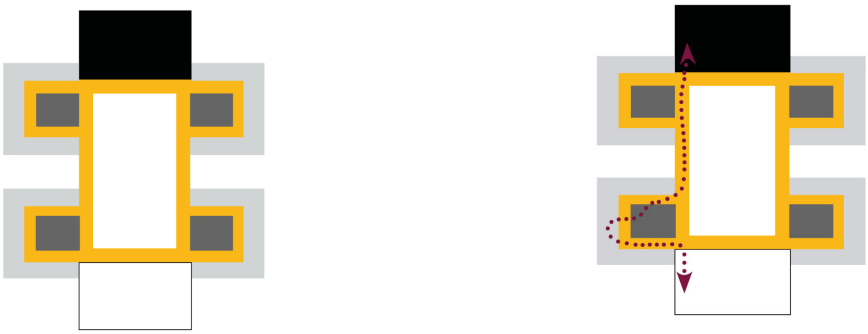


The Centralized Resource Model: Demonstration of minimum building movement.

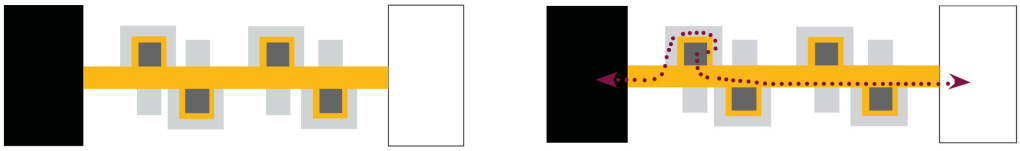
The Dumbbell Model: Demonstration of maximum building movement and social potential.

The Spine Model: Demonstration of minimal building movement.

The Courtyard Model: Demonstration of minimal building movement.
Circulation configurations adapted from Stephen Kliment, 2001.

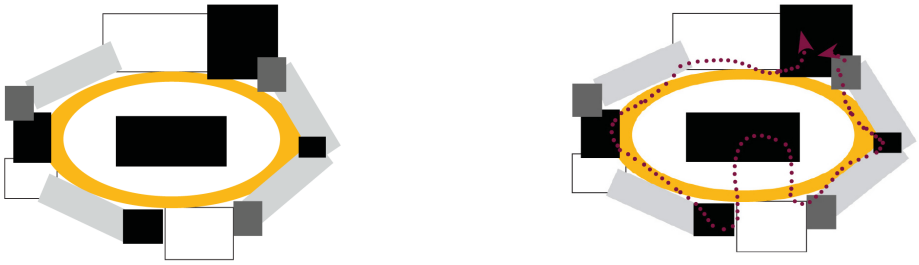


The Courtyard with Classroom Clustering Model: Demonstration of minimal building movement.



The Classroom Clustering Model: Demonstration of maximum building movement and social potential.

Spine with Single Loaded Classroom: Demonstration of minimal building movement.



The Proposed Hybrid Plan: Developed as a plan to promote the most movement and social interaction.

Circulation configurations adapted from Stephen Kliment, 2001.

Schools were typically designed in a generic fashion. A typical classroom consisted of straight rows of desks, bounded by four linear walls while the hallways leading to them were long, straight corridors, lined with lockers and lit by florescent lights. It was not until the introduction of the open classroom concept that a child was able to move freely around a classroom. Even with this plan the classrooms were typically situated at one end of the building and the activity programs at the other to lessen distractions. Herman Hertzberger explains how building functions should be planned as an overlapping idea rather than exist as two separate entities.

> The components traditionally described as dedicated - lunch and stay over room, library, assembly hall, gymnasium – are steadily opening up and being absorbed by the large area at the school's core. If articulated properly, these functions overlap rather than exist side by side.[24]

Distributing the school program encourages movement throughout the building and thus creates a more healthy and social environment. It also helps to stimulate a child's mind with a constant change of scenery instead of prescriptive movements through a building.

The other important discussion of spatial and programmatic planning is the threshold between the interior and exterior of the building. There is great potential to utilize this in-between space. If a plan integrates an overlap of programmatic elements, then there is a need to design the threshold zones so that they become smooth transitions from one space to the next.

1.7: Early Design Exploration

As part of my pilot project I chose to study the connection space between the indoor area and outdoor area of a building. The concept was to create a space that encouraged the movement between the indoor and outdoor environment. The space was designed to be utilized during all seasons. This is an important environmental factor to consider when designing in Canada. It is also important to design this threshold space to become a multi-functional space. A class could move outside or children could play beneath the sheltered walkway. It is also critical to note the design decisions were made to encourage play amongst the children, a vital part in their healthy development. It should be a place where a child can experience natural elements and freely, but safely, explore an environment.

24 Hertzberger, *Space and Learning*, 124.

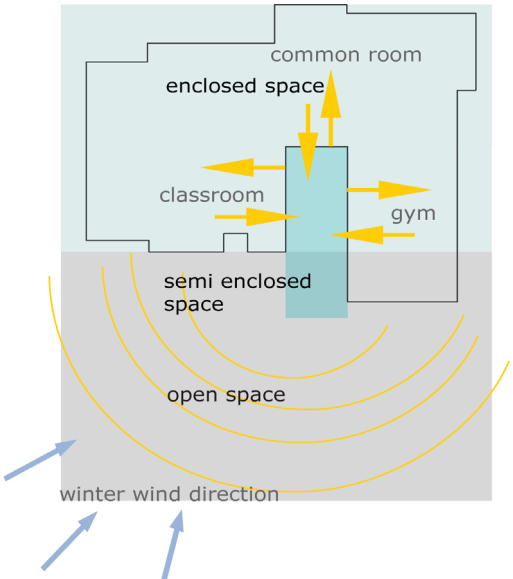
A child's sensory development comes from natural interaction and, as such, should be integrated into a child's play space. 'A play space should always have water, mud, sand, rocks and other elements where a kid can be a kid.'25 During the school year children should look forward to their time spent outside playing and being active. It is this key area creating a positive link between the inside and outside program that will help to encourage play and health.

For the most part, the current schools found in Canada lack any sort of transition zone between the indoor and outdoor environment. They are uninviting spaces, unsheltered from the elements with completely unstructured green space. Classroom and learning space should be extended outside. The following photo demonstrates a typical existing Canadian school's indoor/outdoor threshold space. This space is not inviting, nor protected from the harsh seasonal elements, and therefore does not suggest a smooth or encouraging transition from indoors to the outdoors.

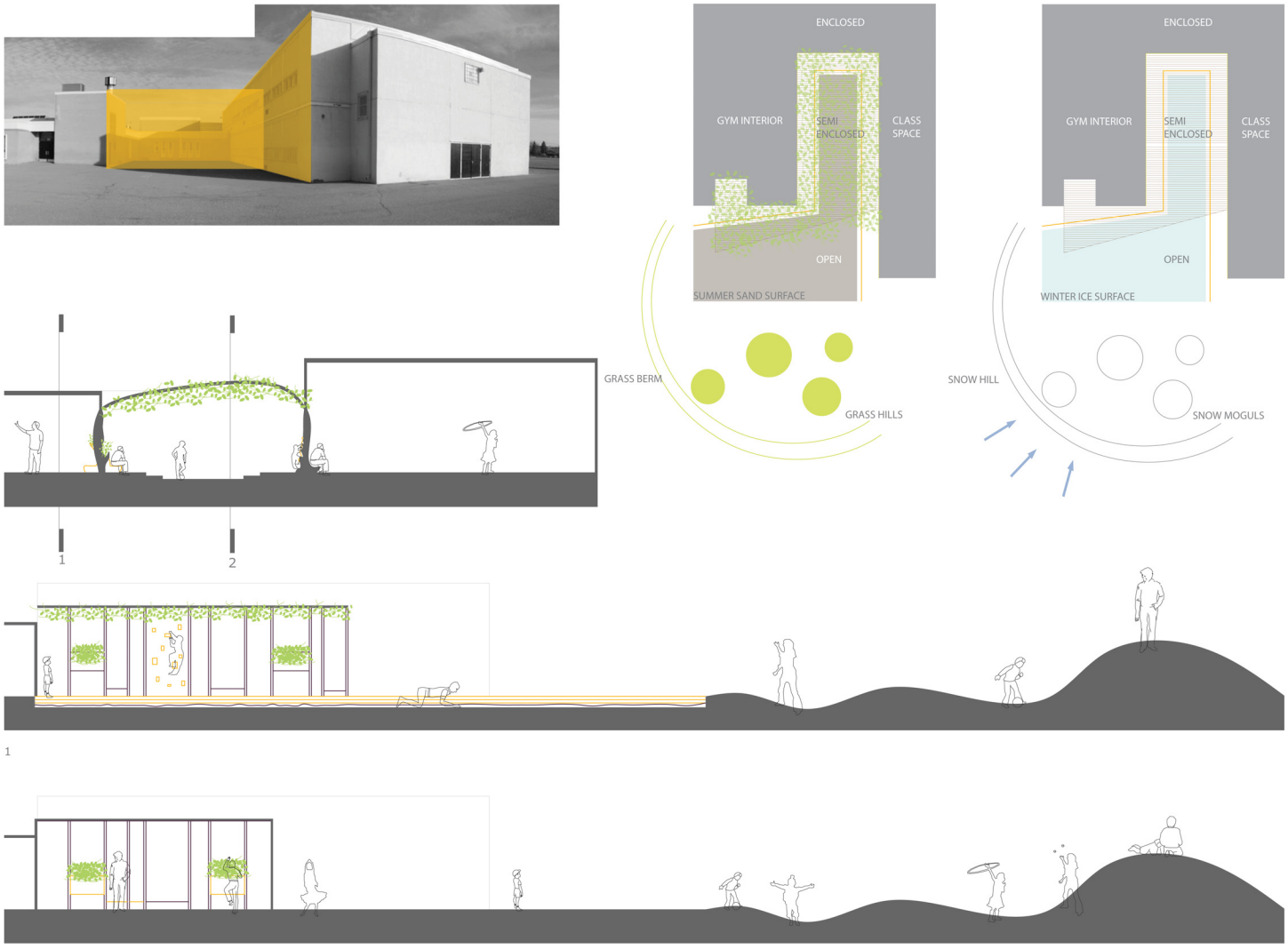
25 Susan Lennerd, 2010, International Making Cities Livable Conference, Charleston, SC, 2010

Inglis Elementary School, Halifax, Nova Scotia. Showing the play space of an existing school.

My pilot project was an investigation of an in-between space of an existing building. The design objective was to create a usable space. A space where children could play or a classroom was able to function by moving outdoors in any season. The design was a trellis-like structure that bridged the gap between the existing gymnasium, interior common space, a classroom and the exterior landscaping. The structure was designed to protect the space from the Canadian elements as well as give a smooth, transitional zone from enclosed space to semi-enclosed and to the open landscape. The follow diagram depicts the transitional zones.

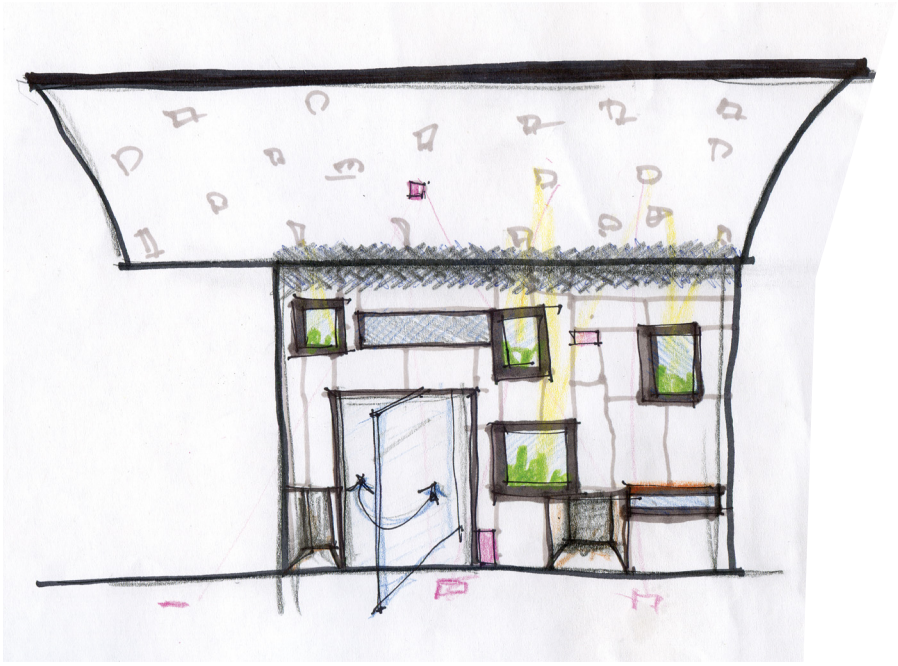


Transitional zone diagram for pilot project



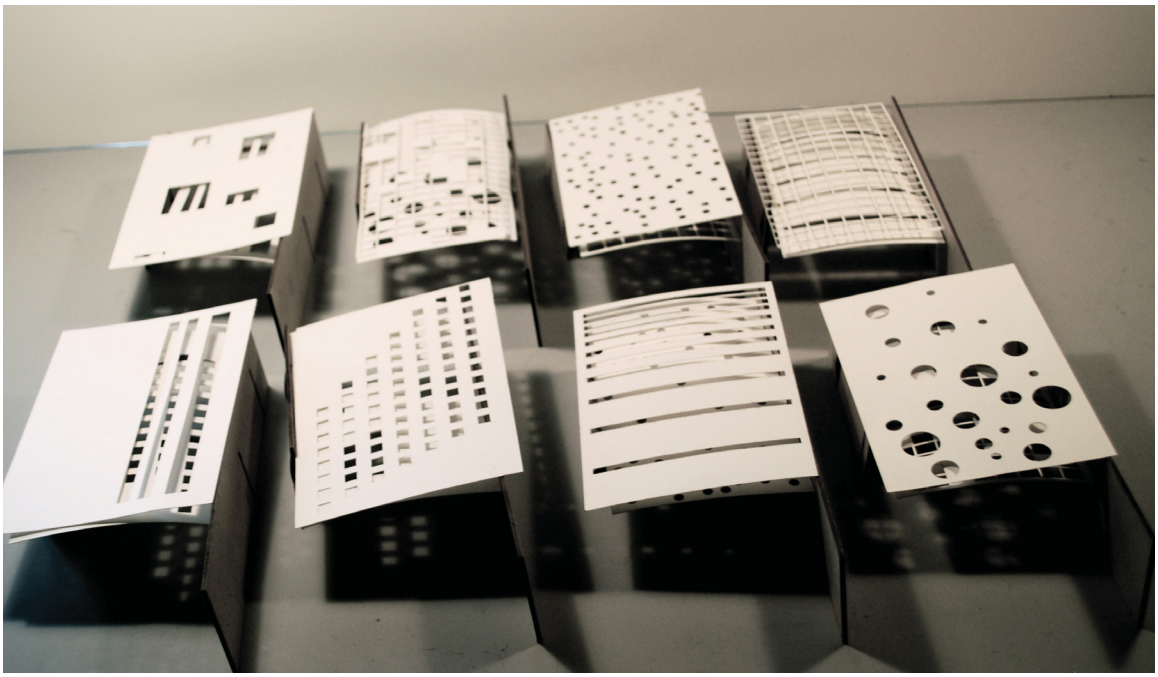
Pilot project study of connection spaces

The activity area beneath the structure was intended to create a circulation path and centre as a play space or classroom space. In order to fully activate the space I created a double roof structure that would protect against the elements while allowing for optimal use of space and natural light. In addition to the use of color and natural light I wanted to create a playful atmosphere to allow children to explore. The following diagrams are sketches of the space underneath the added structure.



Sketch of the area underneath the structure.

Sketches of the structure with light infiltration and double roof.



Double roof study models.

Herman Hertzberger would argue that a playground should stimulate a child's mind by allowing them to freely explore and be creative, unlike the play spaces we provide in many schoolyards. The colorful factory produced playgrounds, so often set into the landscapes of schools, impede a child's imagination by directing them into a set play format. They feel restricted to climbing the ladder, sliding down a slide and moving only within the set of restricted boundaries set out for them on the playsets.

> It is quite impossible to imagine children developing their play skills exclusively at specifically allocated places with equipment specifically devised for the purpose, this is, set apart from everything in our normal daily living environment.[26]

For my pilot project I wanted the "activity space" to become fully usable. This influenced the double roof structure where the top layer became the environmental protection layer and the under structure could be used by the child for climbing and adding natural elements, amongst other things. The top layer also incorporated the use of color and light to better enhance the space and to stimulate movement through the transition zones.

My design concept shows how this structure can be used both between spaces, as well as an attachment to one building portion. Providing a design for both situations shows the adaptability of this particular design form and idea.

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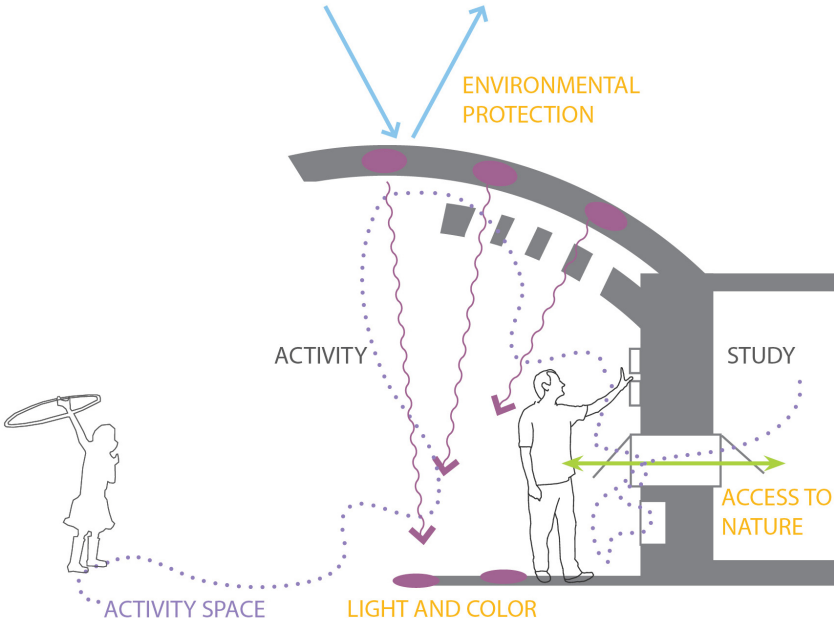
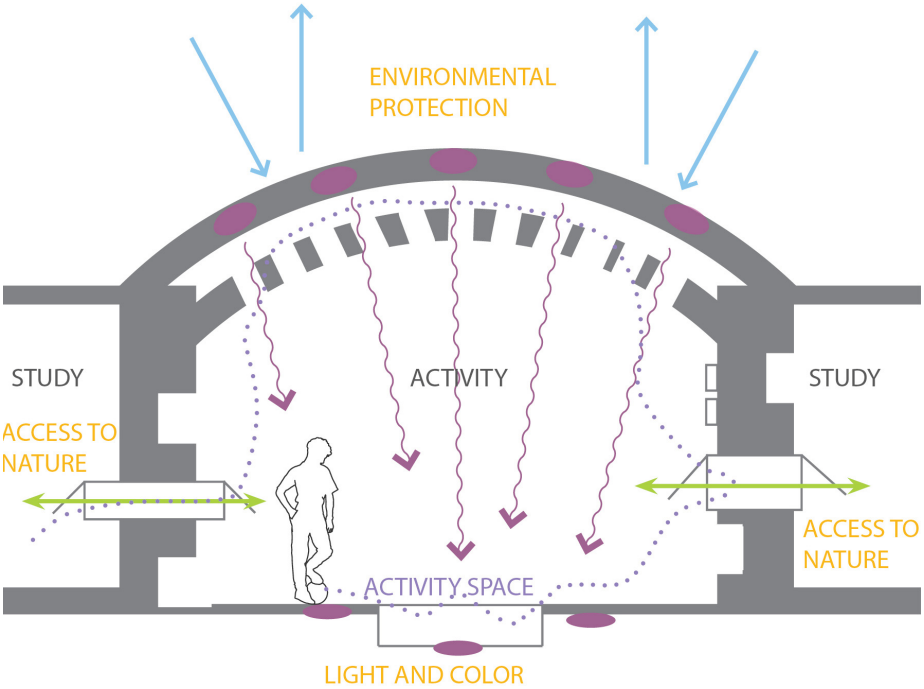
26 Hertzberger, *Space and Learning*, 227.



Active area study with single wall connection.



Active area study with double wall connection.

The exterior landscaping of the building is just as important as the building itself. While it is necessary for children to have access to green space, the plans of the school in relation to the “playing fields” or “playgrounds” are not always appropriate or encouraging. Children do not necessarily want to have wide open, completely unstructured green space. The idea behind these gigantic green spaces is understandable. They give children room to play sports, but if they are not designed to inspire and stimulate a child’s mind, then they lack the fundamental elements which encourage children to be creative and active.

1.8: Architectural Precedents Evidence-Based Design

There are many different types of school programs that attempt to integrate a healthy lifestyle. One example is the Montessori schools. The Montessori pedagogy allows children to “generally work individually on self-chosen activities.”[27] At first thought, one might conclude that this type of pedagogy would be contrary to the efforts to implement a healthy atmosphere since it is fairly self-directed. However, the reality is that this type of environment allows for ample movement and social interaction among the users. These two things alone significantly contribute to a child’s well-being both mentally and physically. ‘The school, designed in 1960 but extended several times, permits (through its programmatic arrangement) activities to take place simultaneously without disturbing each other.’[28] This is an important aspect in allowing children to move freely through the building, while also allowing for non-disruptive learning environments.

The Delft Montessori school in Delft, the Netherlands, was designed by Herman Hertzberger in 1970. A particular area of interest within the design was the children’s play space. He incorporated many informal areas throughout the building to encourage play. Some included a floor space with blocks that could be removed or rearranged to create new spaces. Another was an outdoor sandpit area that has since been removed due to parental safety concerns. These concrete block sand pit and garden areas provided the children with a place that ‘fired the imagination.’[29]

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27 Hertzberger, *Space and Learning*, 31.

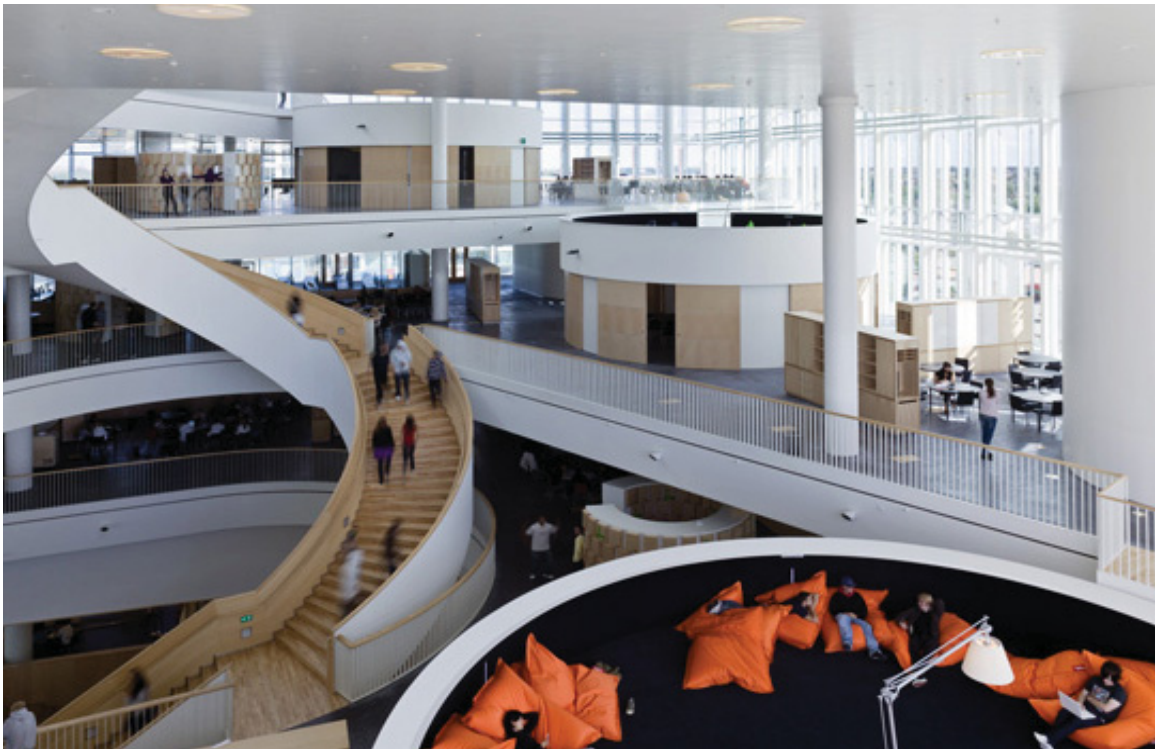
28 Herman Van Bergeijk, *Herman Hertzberger*, (Basel: Birkhäuser Verlag, 1997), 34.

29 Hertzberger, *Space and Learning*, 183.

Delft Montessori School, Delft. (Hertzberger,1960)

Another example of a school that has been successful in creating a healthy atmosphere is the Øerstad College in Copenhagen, Denmark. The Øerstad College was completed in 2007 by 3XN Architects. This urban school was designed around creating flexible space, with very fluid internal circulation. The school itself was designed for media arts but incorporates design elements centred around the idea of activity and movement. Almost every where within the school, the gymnasium at the bottom of the atrium to the fluid circulation space that wraps the interior, provides you with a strong visual connection to the active space.

Ørestad College, Copenhagen. (3XN Architects, 2007)



Ørestad College, Copenhagen. (3XN Architects, 2007)

> The storey decks are open towards the central core, where a broad main staircase is the heart of the college education and social life, the primary connection up and down, but also a place to stay, watch and be seen.[30]

The urban location connects the students with a broader social network than just the students within the building. The location has also made it simple to access the building by bicycle or walking instead of a motor vehicle. The gymnasium is used by the surrounding community allowing for a more direct social interaction between the students.

Another feature that lends nicely towards a healthy school mentality is the implementation of color within the building facade and interior. The exterior louvres allow a reasonable amount of natural light to enter the building and change the feel of the building by adding color.

The final feature worth mentioning is the classroom design. There are no traditional shaped classrooms within the building. Each floor contains breakout spaces or informal areas that are adapted to the teacher and student needs. The overall success of this built facility stems from the design principles used throughout the school and highlights an effective approach to creating a healthy atmosphere.

It is not common to see a school that is built beyond three stories. The Calhoun School in New York for example, has successfully designed an addition that now spans nine storeys. The school is separated into a section with kindergarten to grade one students, and the nine storey second building houses grade two to grade twelve for a total of 750 students. This progressive institute teaches students to learn experientially. They steer away from traditional school layouts and have encouraged a more hands-on learning approach. The supporting architectural solution to house their flexible learning process is a vertical structure. The design creates many open spaces to align with the schools ideologies to "see the learning."[31] There is a continuous ramp that connects the building and encourages interaction with communal areas on each floor. The school also encourages interaction within the surrounding community with the use of the main floor public library. Located in the New York urban environment, the schools mission is "intellectual pursuit, creativity,

30 "Ørestad College." 3XN - Arkitekter, Web 15 Oct. 2010. http://www.3xn.dk.

31 "Mission & Philosophy." Calhoun School, Web 15 Feb. 2011. http://www.calhoun.org/page.cfm?p=15.

The Calhoun School, New York. (FxFowle Architects, 2004)

diversity and community involvement."[32] The roof of the building also houses a green roof area that doubles as an interactive learning space for science and other classes. These roof gardens are capable of growing food.

32 "Mission & Philosophy," Calhoun School, Web 15 Feb. 2011, http://www.calhoun.org/page.cfm?p=15.

The “Edible Schoolyard” is another design proposed in New York by Work Architecture Company. The architect’s idea was to design a school based around a community garden. The gardens are part of the central learning area, used by the students and the surrounding community. The adjacent building and greenhouse facilities have a cooking area and kitchen space to further their understanding of the food cycle.

Community gardens and “edible schoolyards” have been implemented more and more within schools to help children learn about healthy eating as well as create an atmosphere for experiential learning.

Design concept for an Edible Schoolyard in NYC. (Work Architecture Company, 2009)

CHAPTER 2: DESIGN

2.1: Program

In order to fully comprehend how to shape a child's experience while at school we should first look at the existing curriculum and daily activities so as to assess the areas needing the most change. This will inform us of the necessary programmatic elements required for the building and guide us towards devising an active school plan.

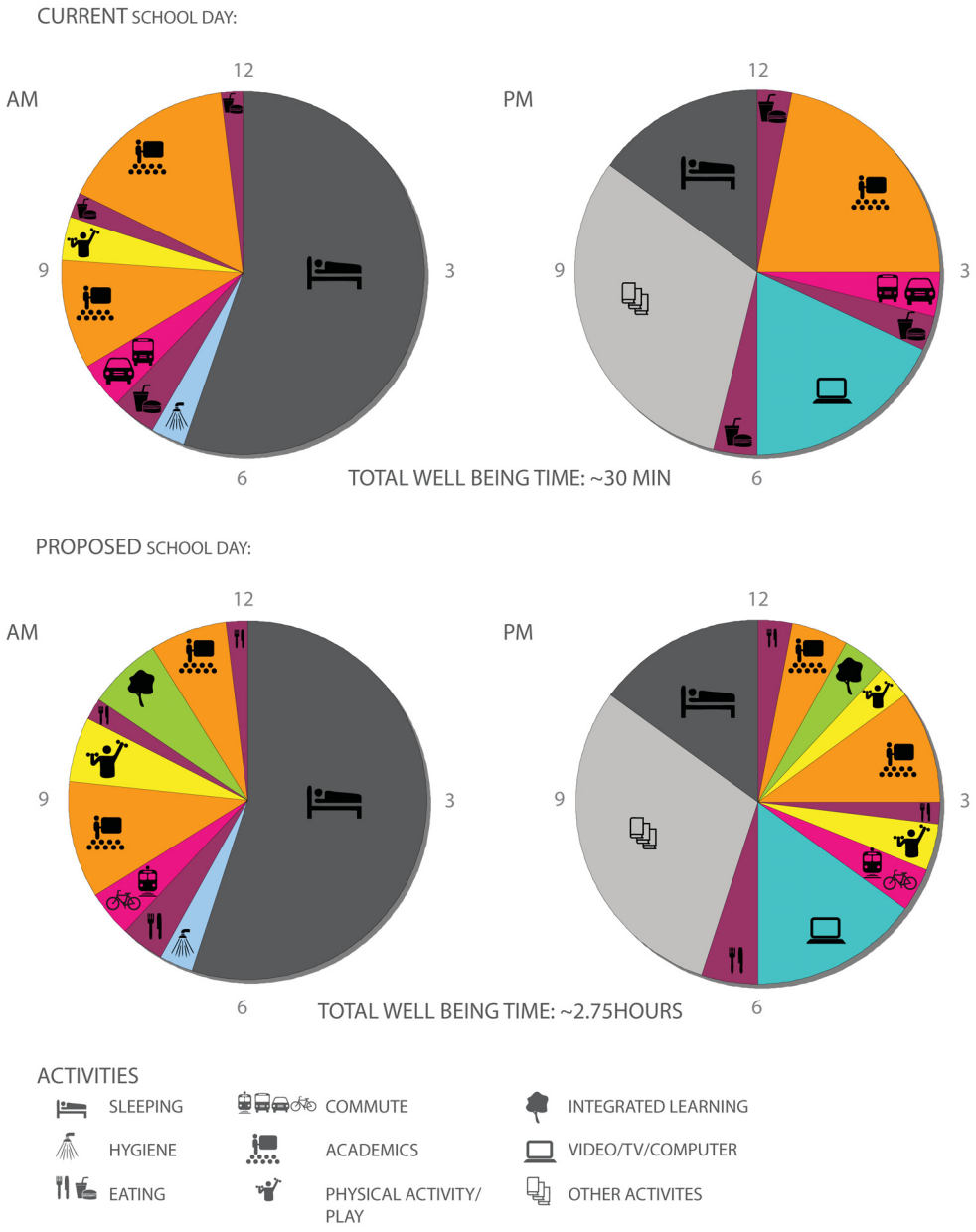
The daily life of a child can be thought of as cyclical; each activity affects the next. As an example, you can compare a child's day without breakfast versus one with breakfast. For the child without breakfast, they are drained of energy quickly. This in turn affects their focus in class and their ability to participate in physical activity. For lunch they could binge eat leaving them sluggish for the remainder of the day. At the end of the school day they will most likely take a bus home and sit in front of a television or computer. By comparison, a child who has breakfast will feel more energized during the morning and will be positively influenced by that decision throughout the day.

The following diagram was made to assess the typical daily routine of a child and highlight areas in need of change. It has been adjusted starting with the morning commute, eating a better choice of breakfast (anticipated from learning healthy habits at school), an extended recess in the morning, integrated learning time (where facilities such as classroom gardens become a second ground for teaching) and available facility use for after hour activities.

The overall academic portion has not been lessened in the new curriculum. The physical activity outcome has now become much greater and there is an introduction to heathy food knowledge through the integrated learning sessions. As suggested by the Canadian government, a child should have about sixty minutes of vigorous activity per day.[33] In the current daily activities graph we are able to see that the total activity outcome is approximately thirty minutes. This is based on the fifteen minute morning recess session and an added fifteen minutes elsewhere during the day. This chart assumes a child will meet the sixty minutes recommended physical activity by completing thirty minutes outside

33 Public Health Agency of Canada (PHAC) | Agence De La Sante Publique Du Canada (ASPC) ,"Childhood Obesity", Public Health Agency of Canada, 03 Aug. 2010, Web 05 Feb. 2011, http://www.phac-aspc.gc.ca/ch-se/obesity/obesitybck-eng.php.

of school hours. The new proposed chart reaches approximately three hours of physical activity. This is accomplished through changing the mode of transportation to get to and from school, implementing an integrated learning block (school gardens and hands on learning about the food cycle) and using the building after school hours. At the end of the school day the commute has been pushed back due to an allowance for after school activities within the building. The three most influential areas in a child's development, community/ family, physical activity and food, have now been implemented into the curriculum by way of the built environment.

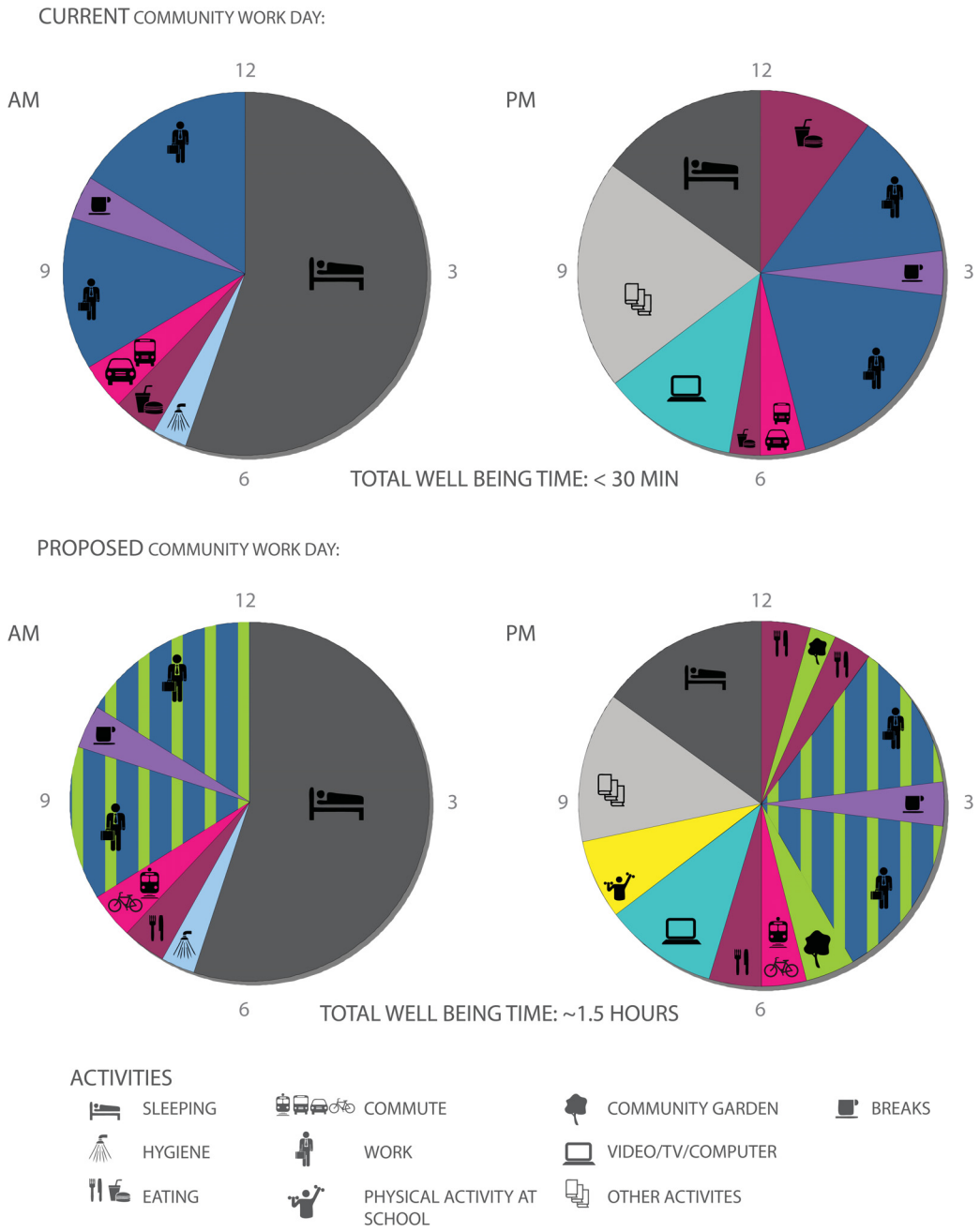


Comparison of the current daily activities of a child versus the proposed changed daily activities of a child that could be implemented into the design.

By understanding what a child would need throughout the day to increase their well-being we can start to pair them with the built program needed to satisfy the activity.

As we have seen earlier, there is a correlation between community involvement and a child's healthy development. We can also look at the daily activities of the community members to understand the potential benefits a parent or community member could have from the development of a healthy environment.

The chart compares a community member's day through their commute to work, their daily activities while at work and the potential physical activity engaged in after work. The striped areas show the ability for one to be employed within the healthy environment. From these charts we are able to decipher what types of programs would be necessary to fulfill the increase of healthy behaviour for the child and the community members. It is at this stage that the social issue of unhealthy children starts to translate into architecture through program and curriculum adaptations.



Comparison of the current daily activities of a working community member versus the proposed community member influenced by a healthy environment.

The next diagram charts the needed spaces in a the building to fulfill the above graphed daily activities. At the centre of the program flow chart is the healthy school space, branching off into two subcategories, community and curriculum. The next categories, food and physical activity become the bridges between the school and the community. As the program diverges out from the healthy school centre, we can see the overlap of program requirements for both the community and the school.

Within the curriculum there are the typical requirements for a school such as a library, computer lab and communal gathering space or auditorium. The added elements are the outdoor classroom, studio space and integrated learning areas.

At this point, it is important to note the division of physical activity on the diagram. Physical activity for a child is broken down into two categories, free activity and organized. Free activity can be associated with play and organized activity can be associated mainly with sports. Though there are many overlaps between them, we separate them to distinguish the needed programmatic elements.

There are other programmatic elements labelled as “off-site amenities”. These will be discussed further in section 2.2.2.

The program has now started to shape the architectural need. We can see that there is a need for organized and free activity space as well as integrated learning space that can be more than just learning about nutrition. This could be a hands on classroom or garden that teaches a child about math, science, geography or nutrition.

> Within schools, integrating gardening activities with education on produce and food preparation may encourage students to eat healthier and may remove barriers to preparing fruits and vegetables. [34]

The overlaps between the community and the school, through food and physical activity, suggests a need for shared space within the building(s). These commonalities could advocate areas such as a community garden (where integrated, hands-on learning could take place) or a shared gymnasium and common gathering space.

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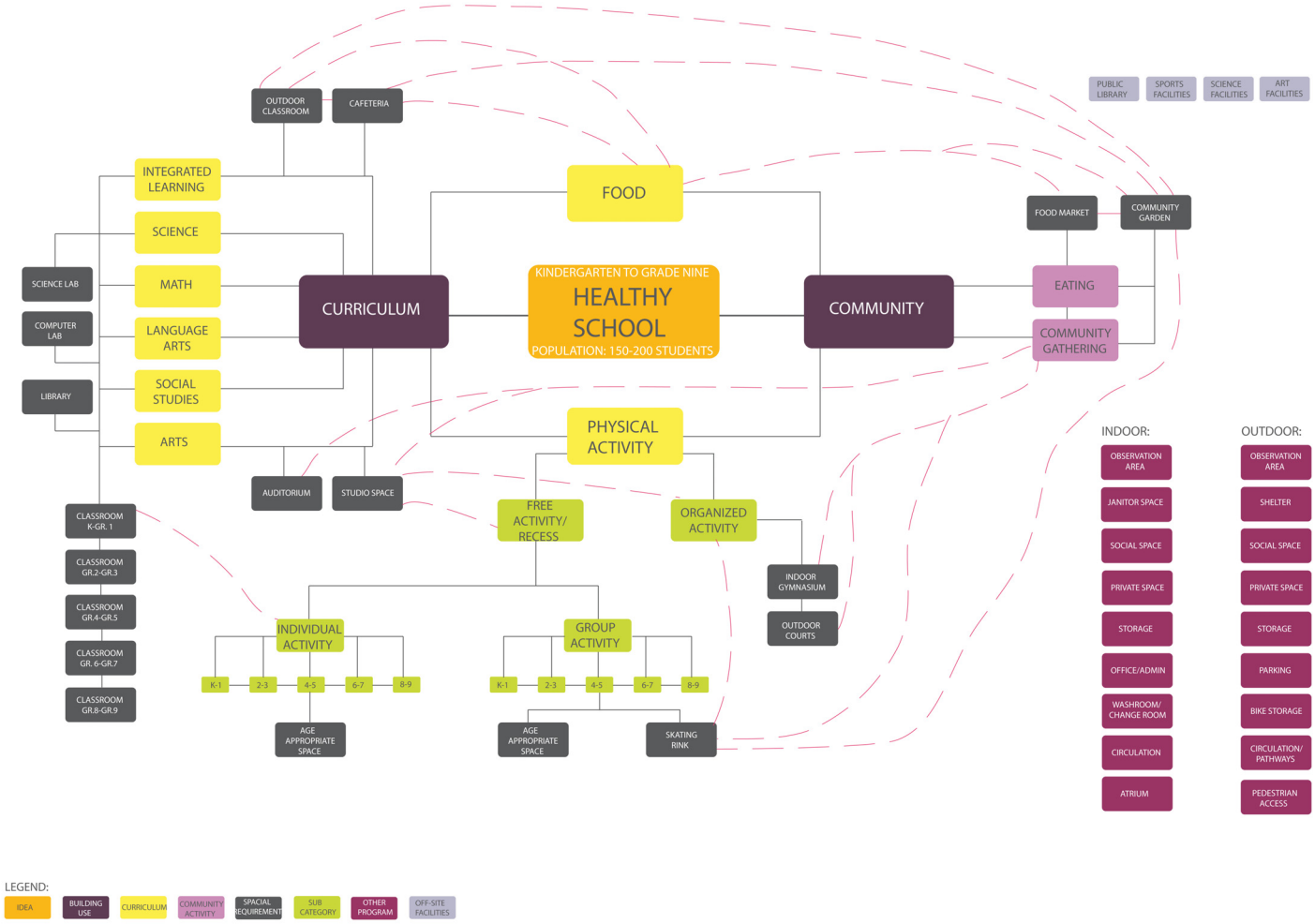
34 Gorman, Lackney, Rollings, and Huang, “Designer Schools”, 2525 .

PROGRAMMATIC ELEMENTS:



Healthy School program requirements.

2.2: Site

> Kids in the community should be called the free range children, like the trapped chicken.[35]

The community of Eau Claire lies on the edge of the Bow River just north of the core downtown in Calgary, Alberta. What was once a site of mechanics and car repair facilities has now become one of Calgary's up and coming areas. In the early nineties Eau Claire Market was redeveloped to serve the surrounding residential population. It soon became a hub of activity, being so close to the river and a central connecting site to the main bicycle path arteries. However, after a few years, residential settlement declined in Eau Claire and this resulted in the closure of the main market. Since then, major renovations and additions to the area have brought about a myriad of new residential developments to the Eau Claire area making it a feasible site to propose a school, market and a community centre.

The site selection aimed for a site with direct and easy access to the bicycle pathway system and Light Rail Transit (LTR) system within Calgary. Having a site within reachable distance from these secondary modes of transportation tackled the first step in eliminating the necessity for motor vehicle transportation. The next sought after feature was an area that was well connected visually and physically to the downtown core. These factors would lead to an increase in social interaction within the area, create opportunities for working parents to have easy access to their children and transform the Eau Claire area into a family friendly neighbourhood.

The Eau Claire area provides direct access to both the bike pathways as well as the adjacent park, Prince's Island Park. The park can become an overflow, support space for children's activities throughout the school day, as well as afterwards, and create a place of gathering for both the children and the community.

The following image shows the existing and projected population for the area, as well as the surrounding site information and weather conditions for the area. The orange piece represents the actual site of study.

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35 Perry Bigelow, 2010, International Making Cities Livable Conference, Charleston, SC, 2010.

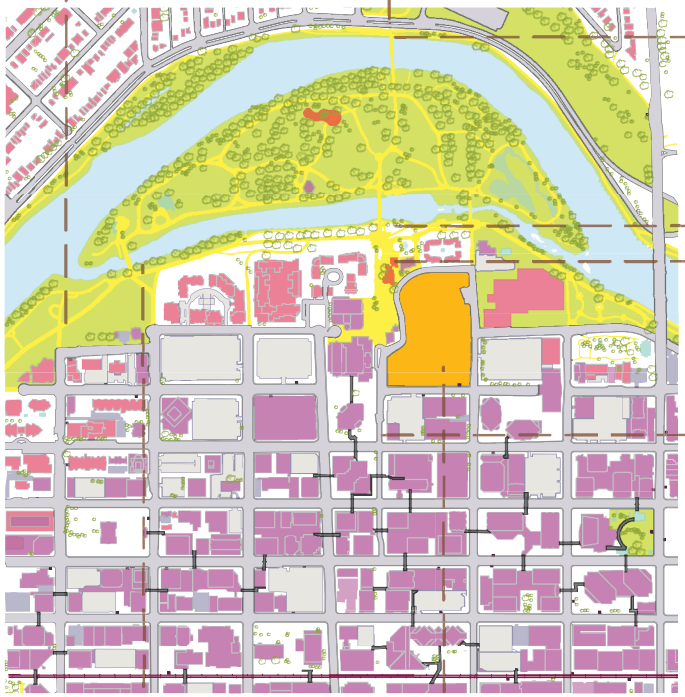
CALGARY, ALBERTA

WEATHER: °C + mm

	HIGH	LOW	AVE	SNOWFALL
JANUARY	-2.8	-15.1	-8.9	17.7
FEBRUARY	-0.1	-12.0	-6.1	13.4
MARCH	4.0	-7.8	-1.9	21.9
APRIL	11.3	-2.1	4.6	15.4
MAY	16.4	3.1	9.8	9.7
JUNE	20.2	7.3	13.8	0
JULY	22.9	9.4	16.2	0
AUGUST	22.5	8.6	15.6	0
SEPTEMBER	17.6	4.0	16.8	4.8
OCTOBER	12.1	-1.4	5.4	9.9
NOVEMBER	2.8	-8.9	-3.1	16.4
DECEMBER	-1.3	-13.3	-7.4	17.6

CHILD POPULATION: EAU CLAIRE AREA

	15-19YRS	5-14YRS	0-4YRS
2009:	59	39	22
2015: (PROJECTED)	170	125	65

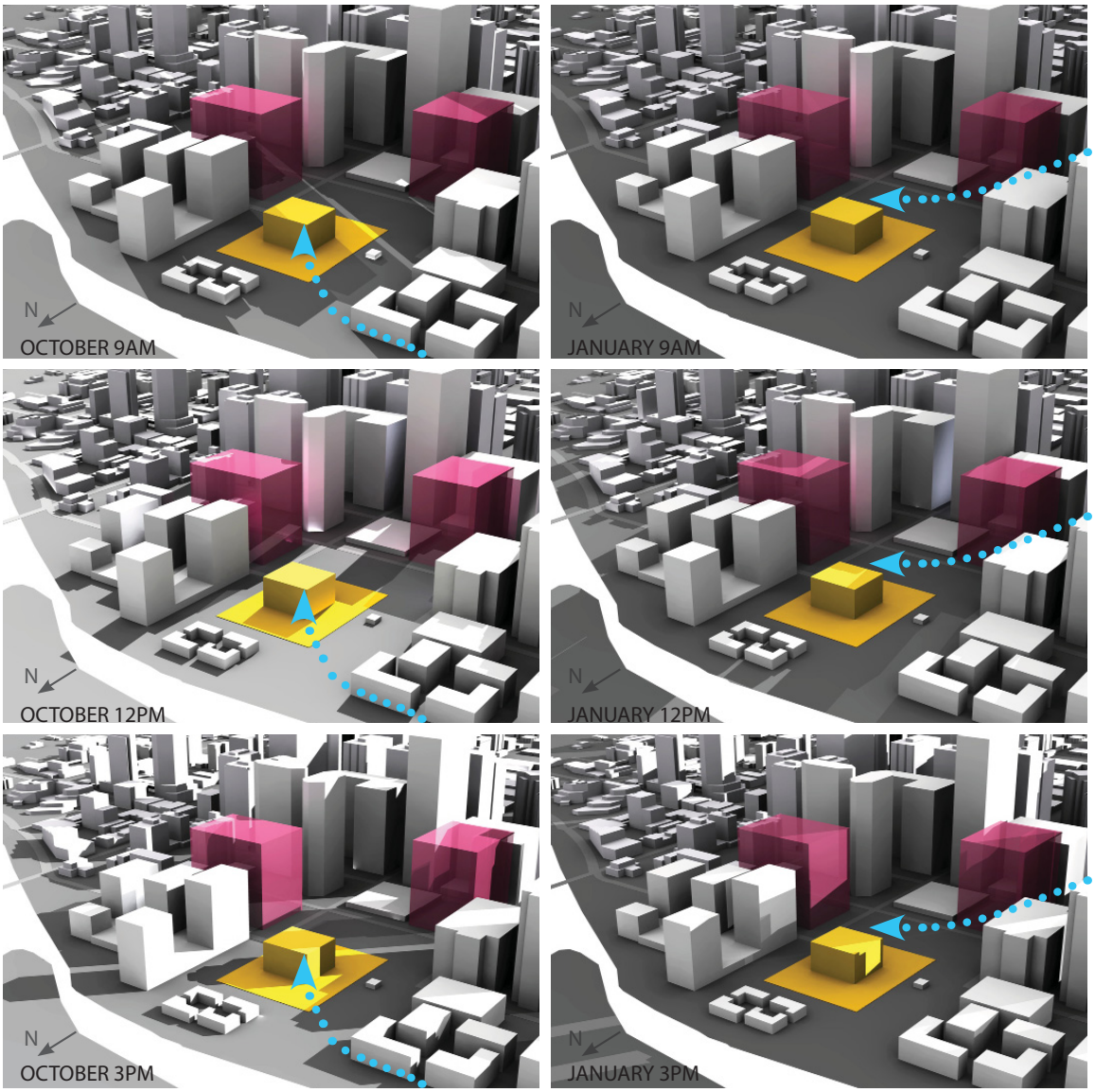


Eau Claire Area Data.

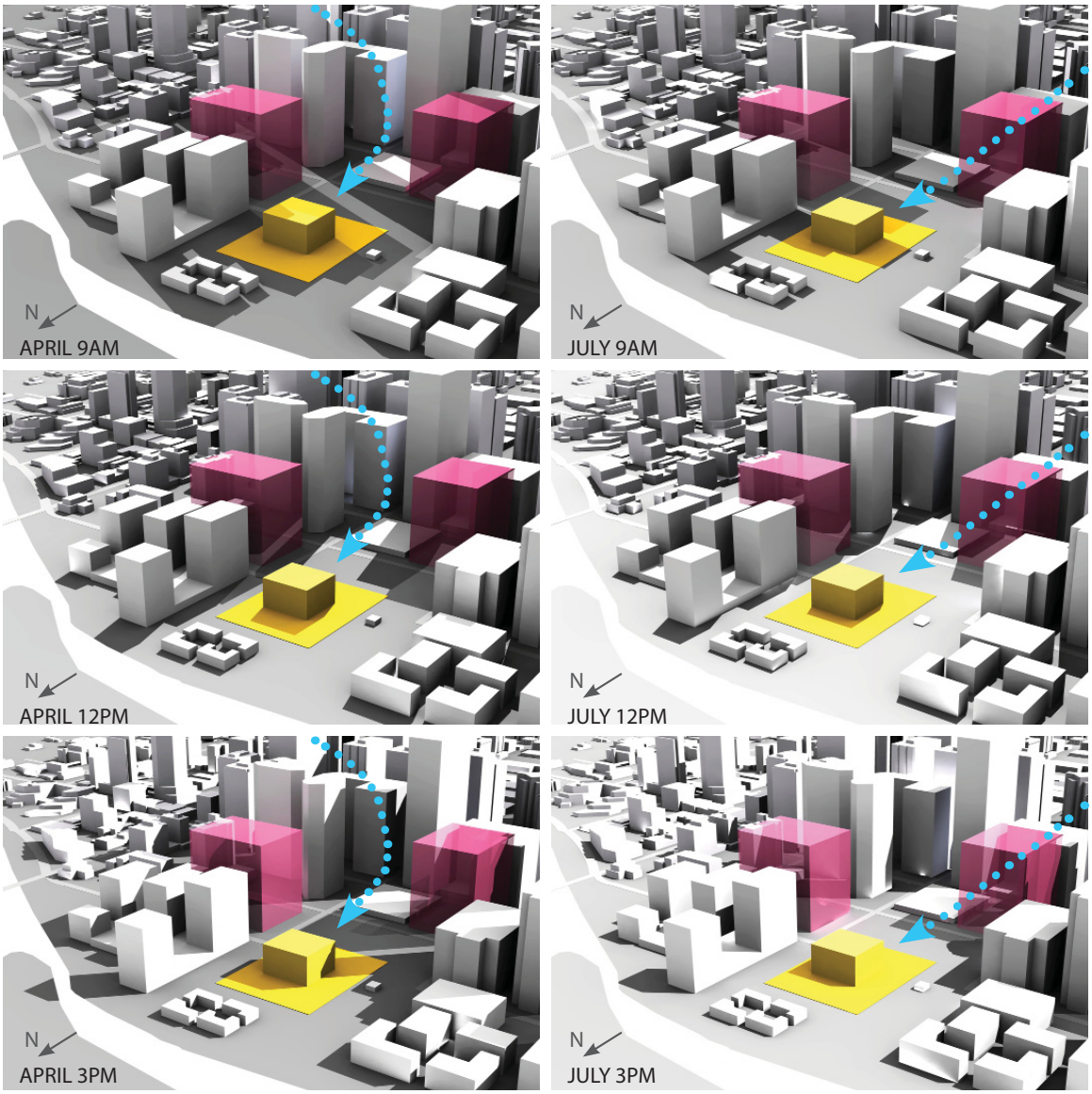
Looking South towards the site from Prince's Island Park towards. (Adapted from Matthews, 2009)

Looking west down the bike path.

Looking South from the bridge to downtown, Calgary.



Initial Sun Studies for October and January.



Initial Sun Studies for April and July.

Initial sun studies on the site start to show the best areas for building in relation to shaded areas and windy areas. In order to create optimal play spaces for activities one should strongly consider the solar studies.

The pink shaded buildings represent future residential buildings around the site. These should also be taken into consideration, as they could significantly impact the site with overcasting shadows.

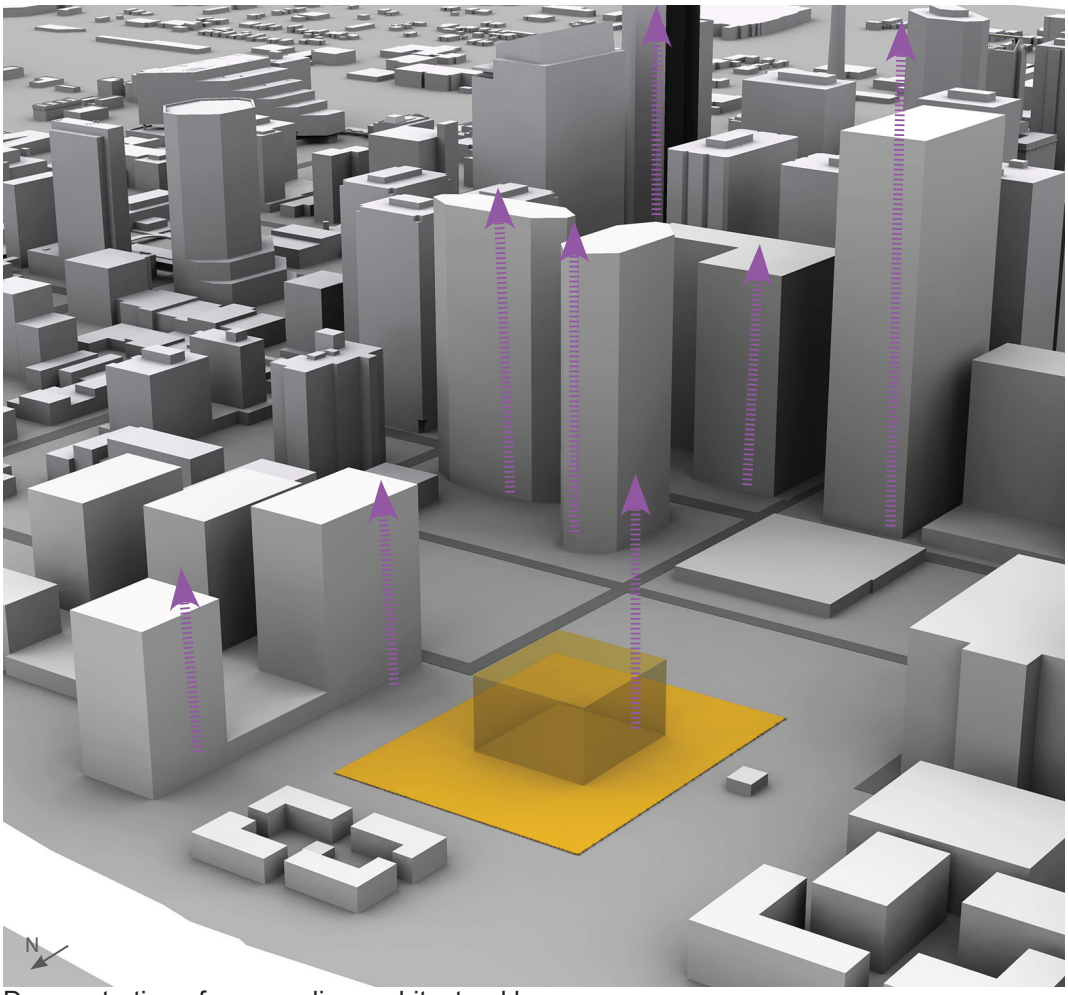
Other site studies included understanding the surrounding architectural context, including the formal language of the architecture, the significant views from within the site, the

building occupants around the site, as well as the major arteries for proposed building entry locations.

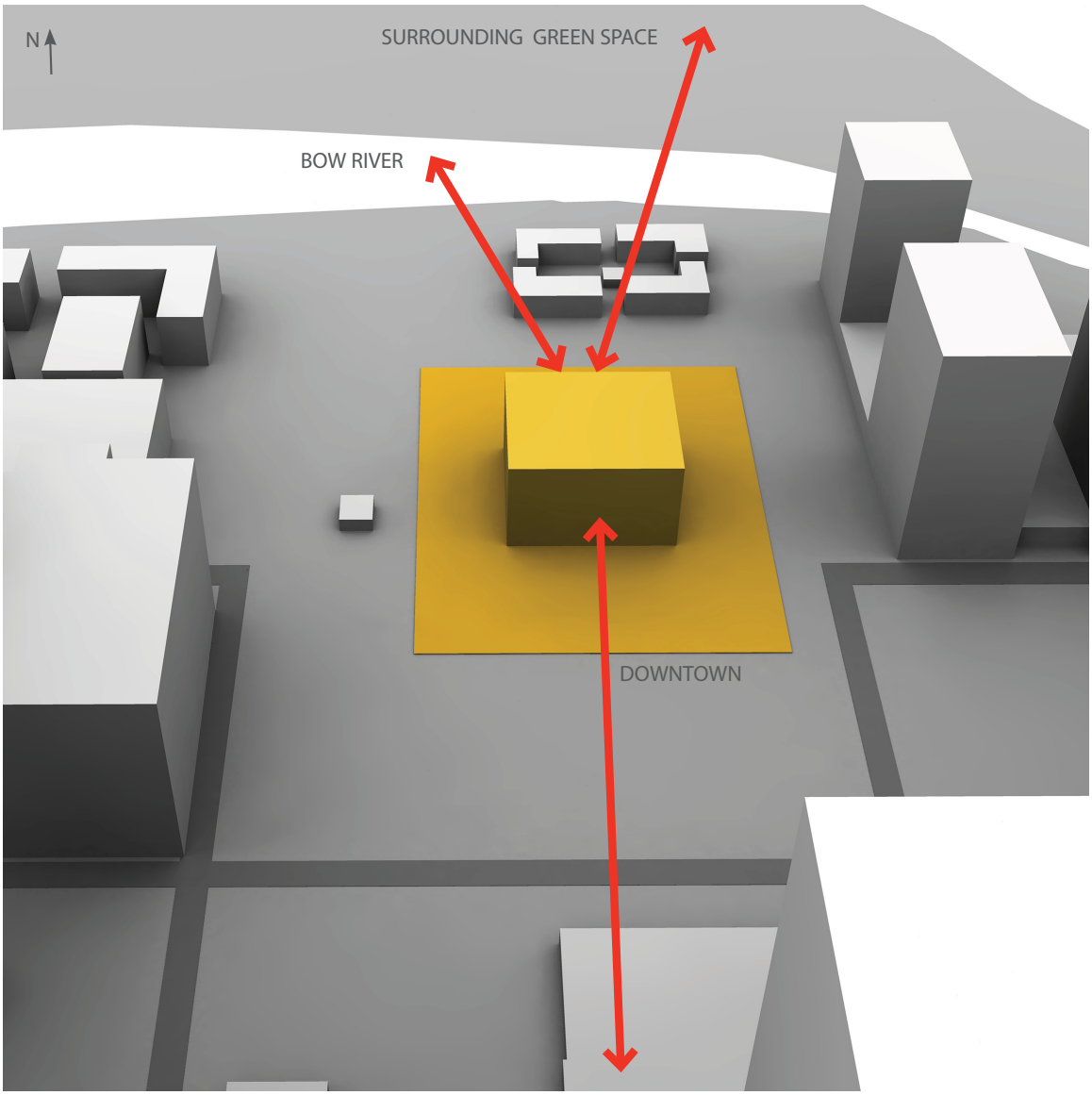
The first diagram is about the formal architectural language surrounding the site. It suggests that a vertical school would blend in well with the neighbouring buildings. A feature to note is the stepped effect of the buildings as they get closer to the river. This is due to zoning laws in the area. The residential blocks form a “secure” ring around the site, increasing the security of an urban school location. Jane Jacobs talked about having eyes on the street for security purposes. ‘...[t]here must be eyes upon the street, eyes belonging to those we might call the natural proprietors of the street.”[36]

The entry points become a focus to encourage the use of “alternative modes of transportation”, including biking and walking or taking the train.

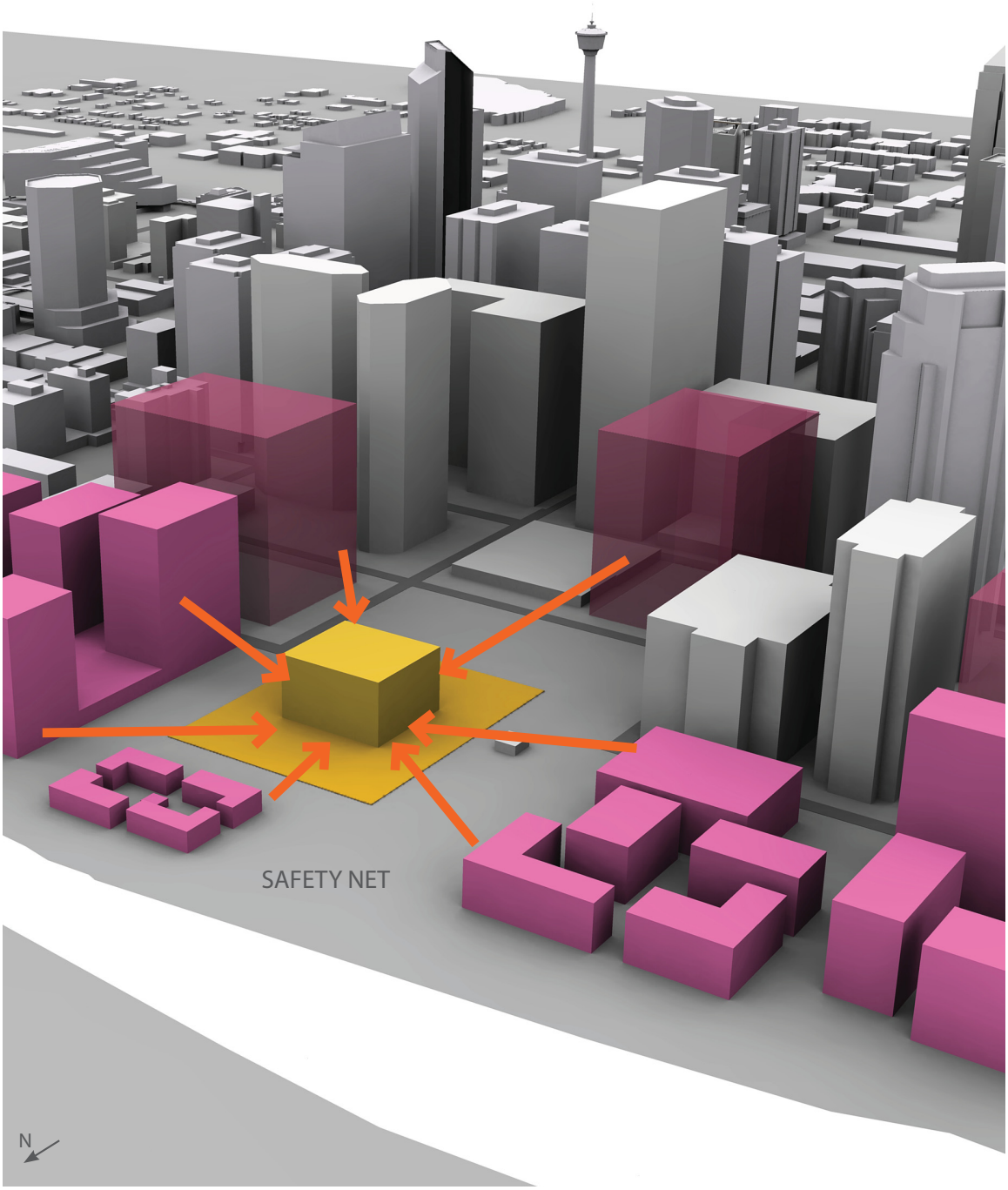
36 Jane Jacobs, *The Death and Life of Great American Cities*, (New York: Vintage, 1992), 35.



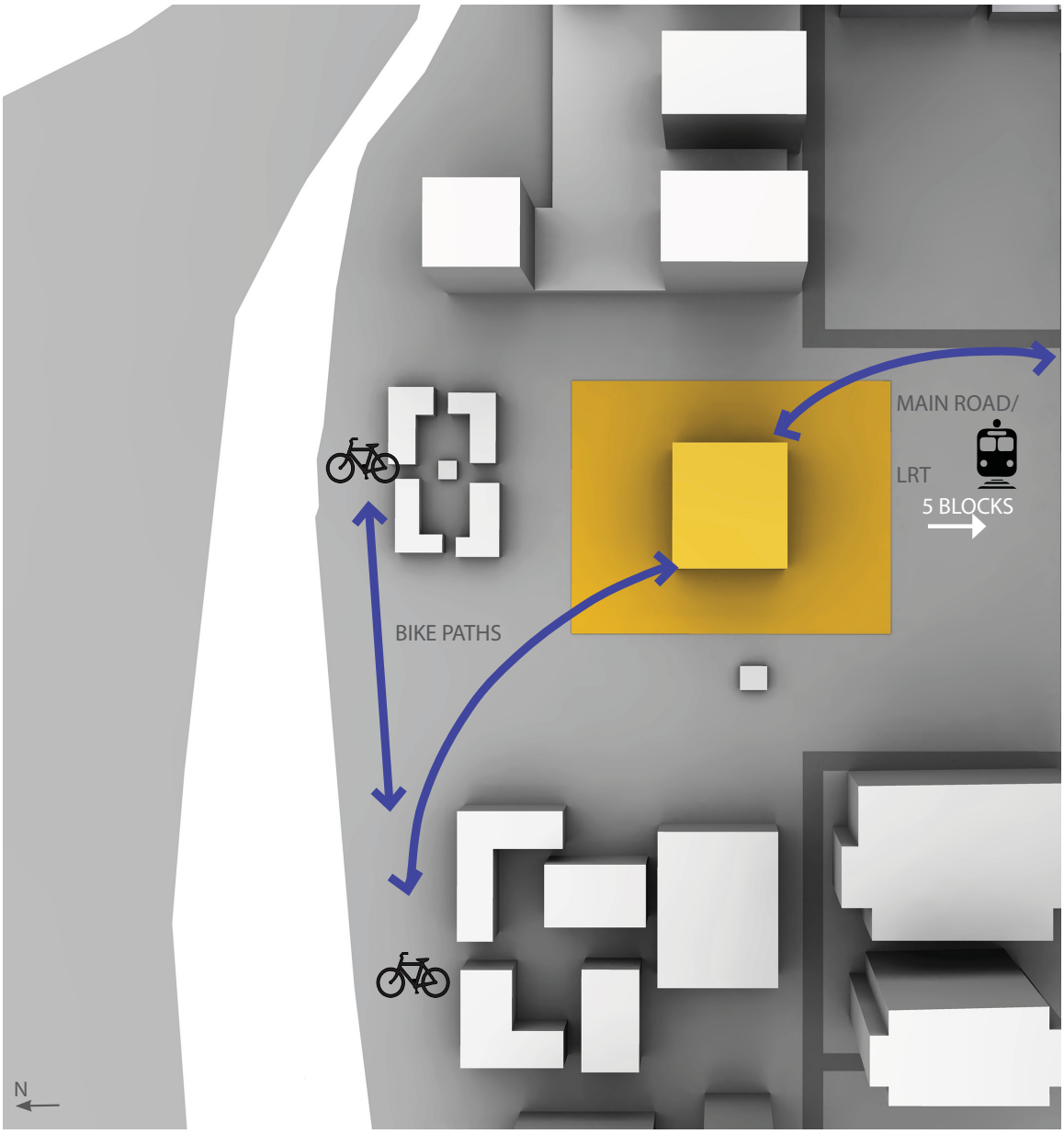
Demonstration of surrounding architectural language.



Surrounding focal points to the site.



Surrounding residential and potential residential developments.



Potential Main Entrance locations from Bike Paths and LRT.

Existing site features include Prince's Island Park directly north of the site, proximity to the Bow River (again, directly north of the site), the bicycle paths and the downtown core. During the summer months the area becomes very busy with people enjoying the park, attending festivals within the park and walking/bicycling on the pathways. During the winter months the area is not as heavily used but activities such as the Bow River skating rink and the bicycle paths are still available attractions.

The hockey rink on the river directly North of the site. (Herbison, 2011)

2.2.1: Connecting to The City

> Recent studies using objective measures of total physical activity found that residents of high-walkable neighborhoods get one hour more of physical activity each week and are 2.4 times more likely to meet physical activity recommendations than residents in low-walkable neighborhoods.[37]

Eau Claire is located on a main junction of the bike paths that join into the extensive pathway system throughout the City. It is also located five city blocks north of the LRT. While the winter months in Calgary tend to slow down bicycle activity, the pathways surrounding the site, as well as across the river, are maintained throughout these winter months and as a result are used frequently (refer to section 2.2.2 for a map). Having close access to the LRT system also increases the chances of people being physically active as they still walk from the LRT station to their final destination, as opposed to using a vehicle that would drop them off at the door. The following diagram highlights the connecting routes to the site.

37 James Sallis, “Future of Children,” The Role of Built Environments in Physical Activity, Eating and Obesity in Childhood 16.1 (2006), 92-93.

Map of Eau Claire site area showing connections. (Adapted from CtrlAltDel, 2009)

2.2.2: Surrounding Allies

A recent Atlanta based study showed that people were more willing to walk somewhere if their destination was within a one kilometre radius from them.[38]

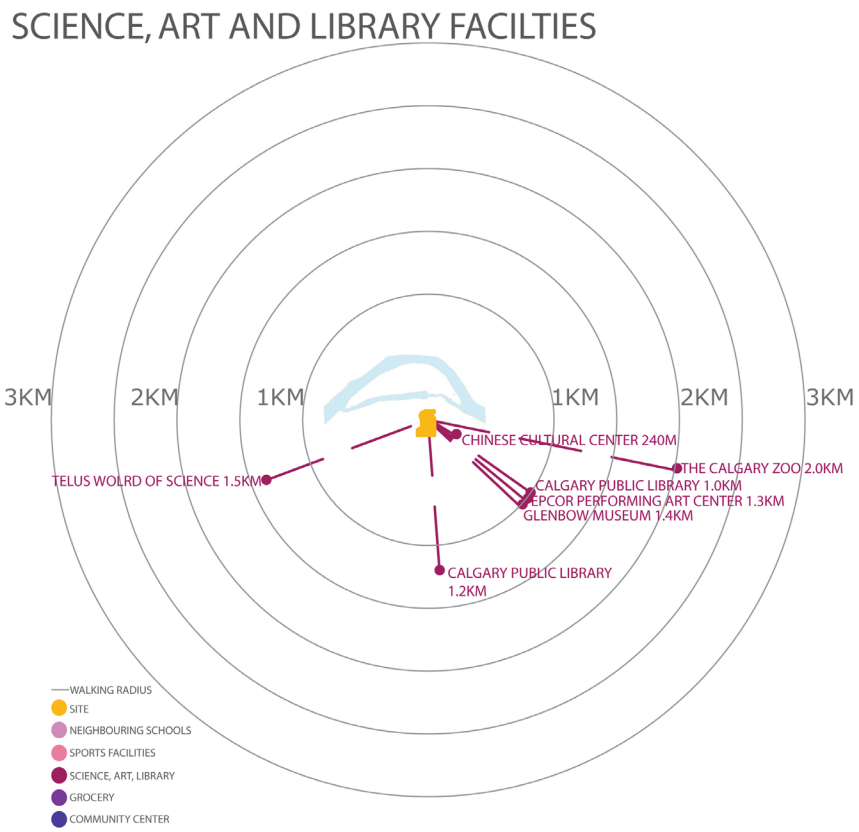
> The results indicate that when people have many destinations near their homes and can get there in a direct pathway, they are more likely to engage in moderate physical activity for ≥30 Minutes on a random day.[39]

The following images are a study of the surrounding allies to the site. The maps breakdown the destinations within a one, two and three kilometre radius from the site. They include useful "off-site amenities" for schools, as well as a study of the existing community facilities in the area to get a better understanding of the full range of programmatic needs within the Eau Claire area.

What was found was that the community of Eau Claire lacked any food or community facilities within the one kilometre reach. This suggests possible additional programmatic elements that could solidify the site and enhance the three influential groups mentioned before, community involvement, food and physical activity. It also backs up the argument set out in section 2.1 that a community centre would be a logical addition to the site.

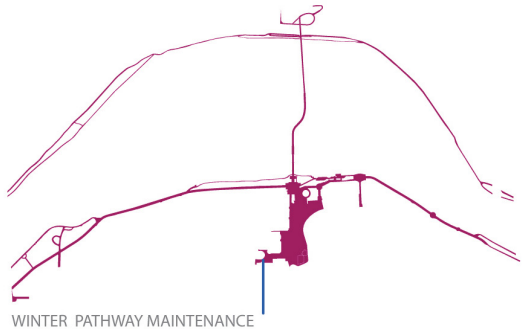
38 L. Frank, T. Schmid, J. Sallis, J. Chapman, and B. Saelens. "Linking Objectively Measured Physical Activity with Objectively Measured Urban Form Findings from SMARTRAQ," American Journal of Preventive Medicine 28.2 (2005): 117-25.

39 Frank, Schmid, Sallis, Chapman, Saelens. "Linking Objectively Measured Physical Activity" 117-25.



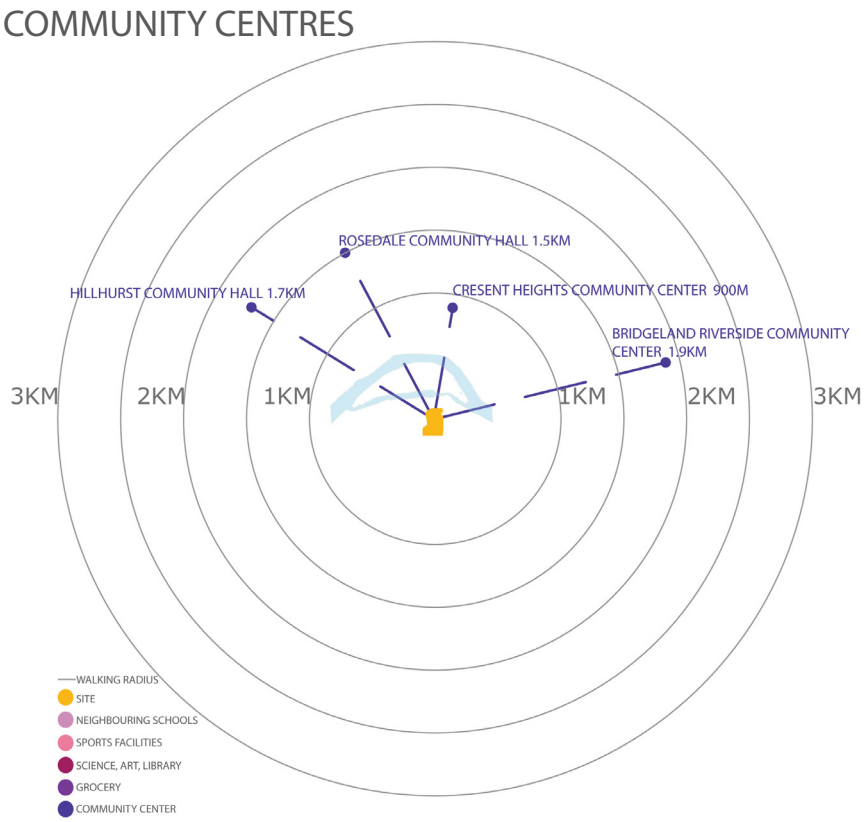
Map of surrounding science, art and library facilities within a 1, 2 and 3kilometre radius.

PATHWAYS



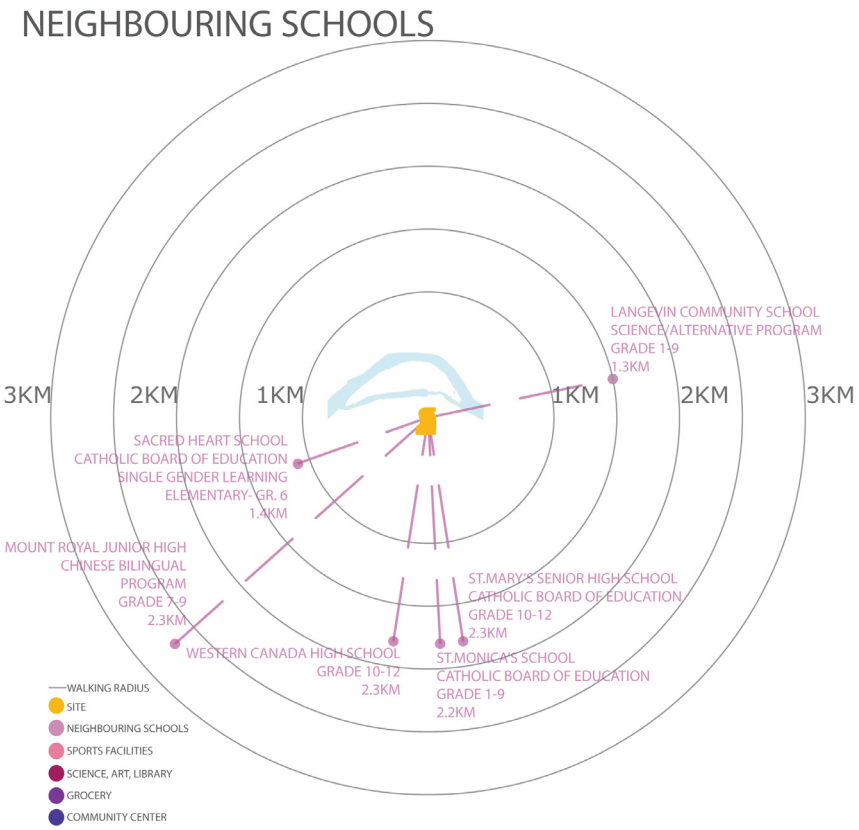
LRT
SITE
PLUS 15 WALKWAYS
PATHWAYS
COMMERCIAL BUILDINGS
STREETS AND SIDEWALKS

Map of surrounding pathways within a 1, 2 and 3kilometre radius.

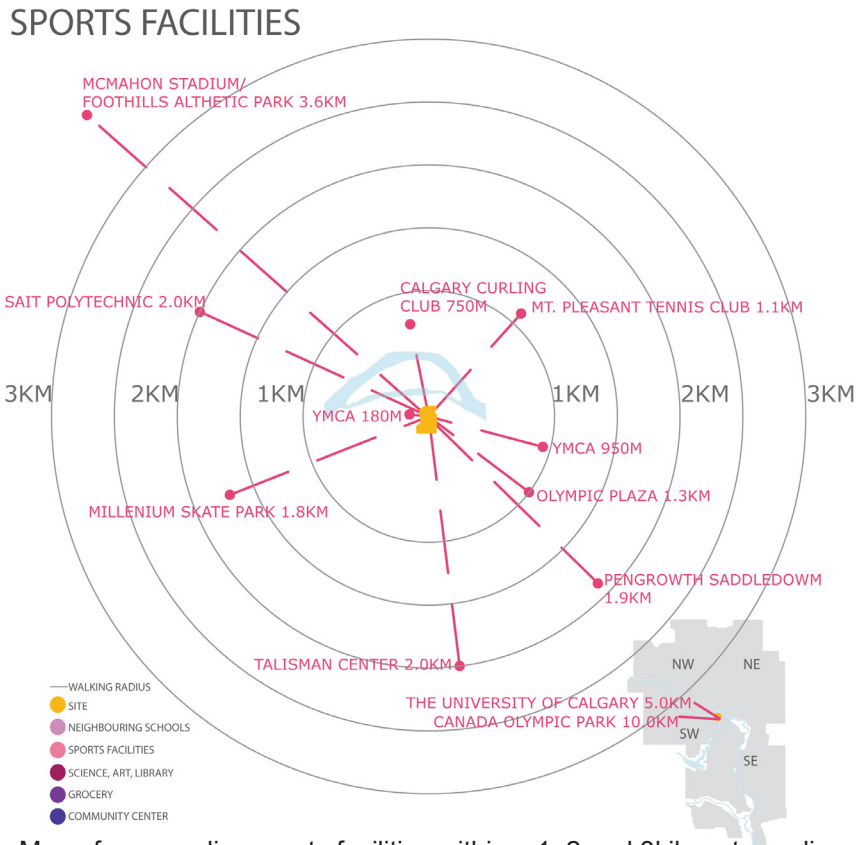


Map of surrounding community centres within a 1, 2 and 3kilometre radius.

Map of surrounding grocery stores within a 1, 2 and 3kilometre radius.



Map of neighbouring schools within a 1, 2 and 3kilometre radius.



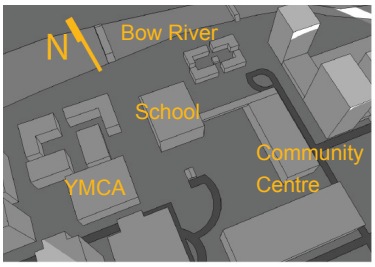
Map of surrounding sports facilities within a 1, 2 and 3kilometre radius.

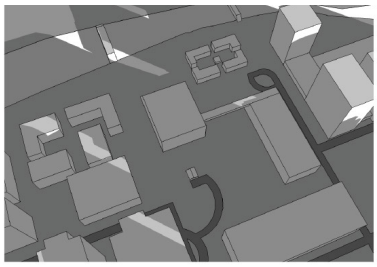
2.2.3: Site Massing Studies

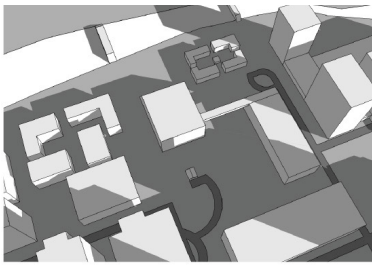
It is important to understand the shaded areas for potential play spaces both on the interior and exterior of the building, as well as the wind direction, especially during the winter months. From the initial site studies in section 2.2 we are able to understand placement of the building based on shadows and wind studies. To further the study, initial building forms were placed on the site to ensure that their relationship to the sun angles provided benefit to the surrounding environment. The building blocks for the potential community centre and school have been strategically placed on the site for investigation. At the south edge of the site I have enclosed the area by proposing a mix-use development block. This was done to tighten and confine the site limits, as well as to complete the circle of residential blocks around the site for security purposes. The following diagrams are sun studies with the initial architectural building forms.

The school block was pushed north, closer to the Bow River's edge and in line with the adjacent residential units. The building now acts as a landmark on the bicycle path where an entrance to the school can easily be seen.

The community centre borders the east edge of the site to allow for a larger inner courtyard between the two buildings. The space between then becomes a shared courtyard creating a connection between the community and school. A physical connection becomes apparent with the addition of a bridge joining the two buildings together at the third floor.







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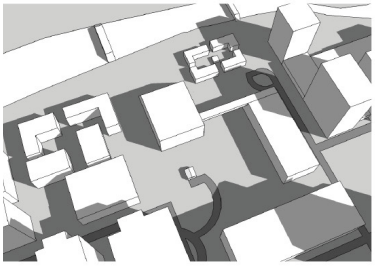
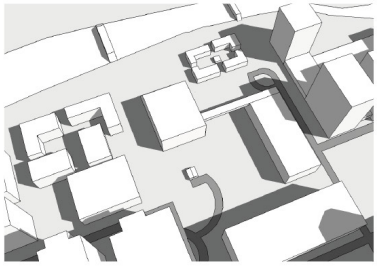
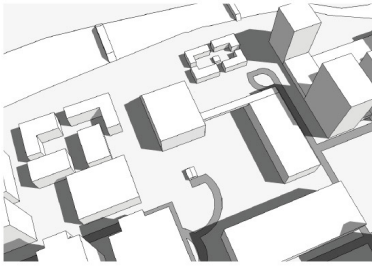
FEBRUARY: 10 AM

MARCH: 10 AM







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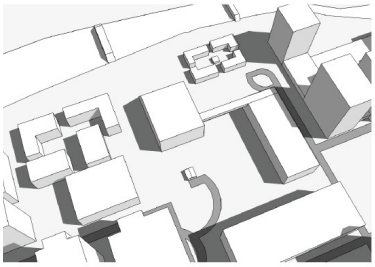

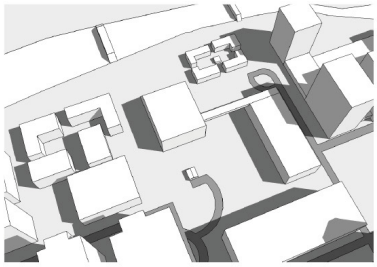

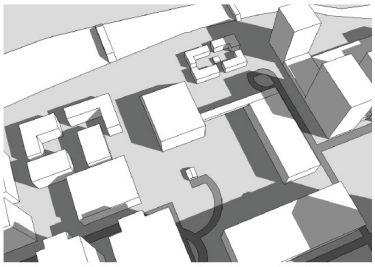

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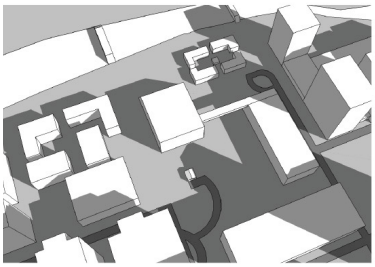
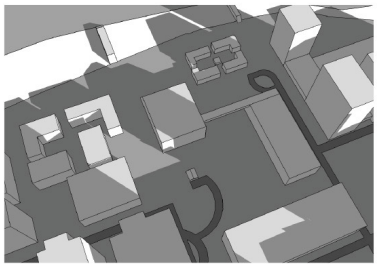
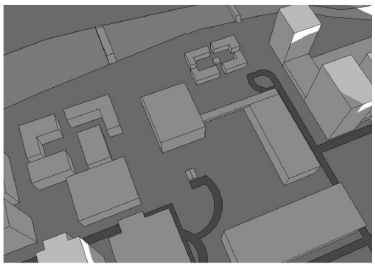
SEPTEMBER: 10 AM





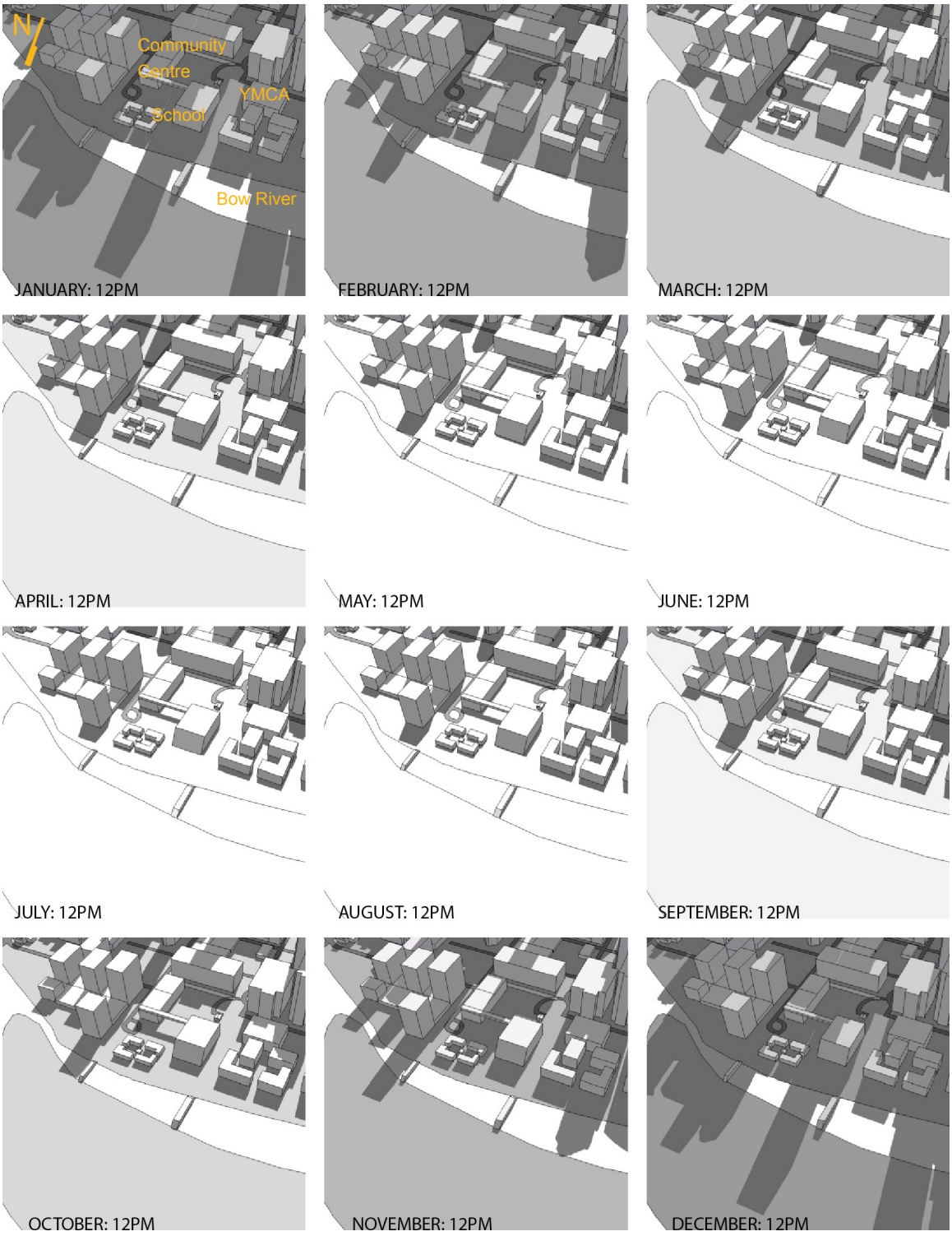


OCTOBER: 10 AM

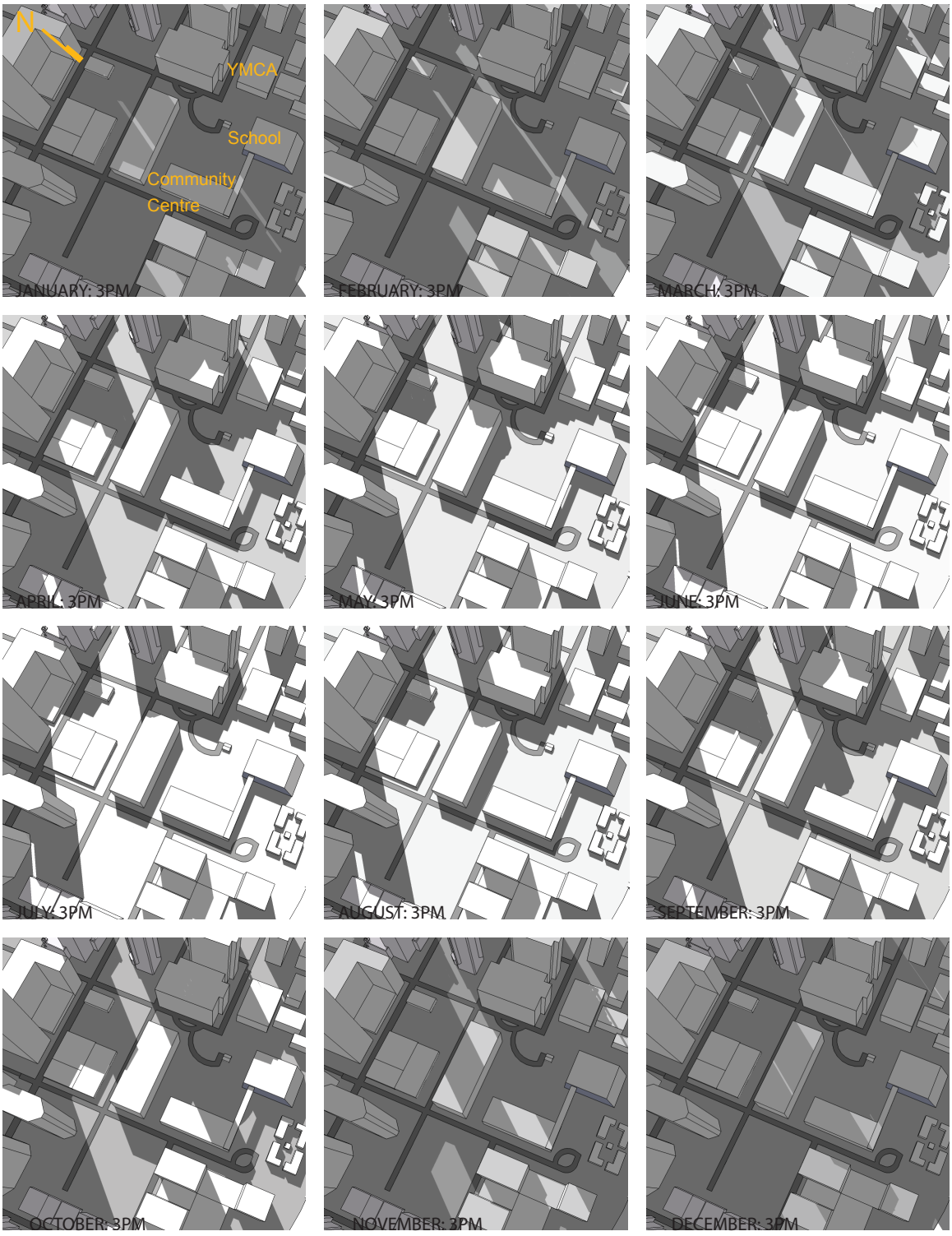
NOVEMBER: 10 AM

DECEMBER: 10 AM

Site sun studies at 10am during the year.



Site sun studies at 12pm during the year.

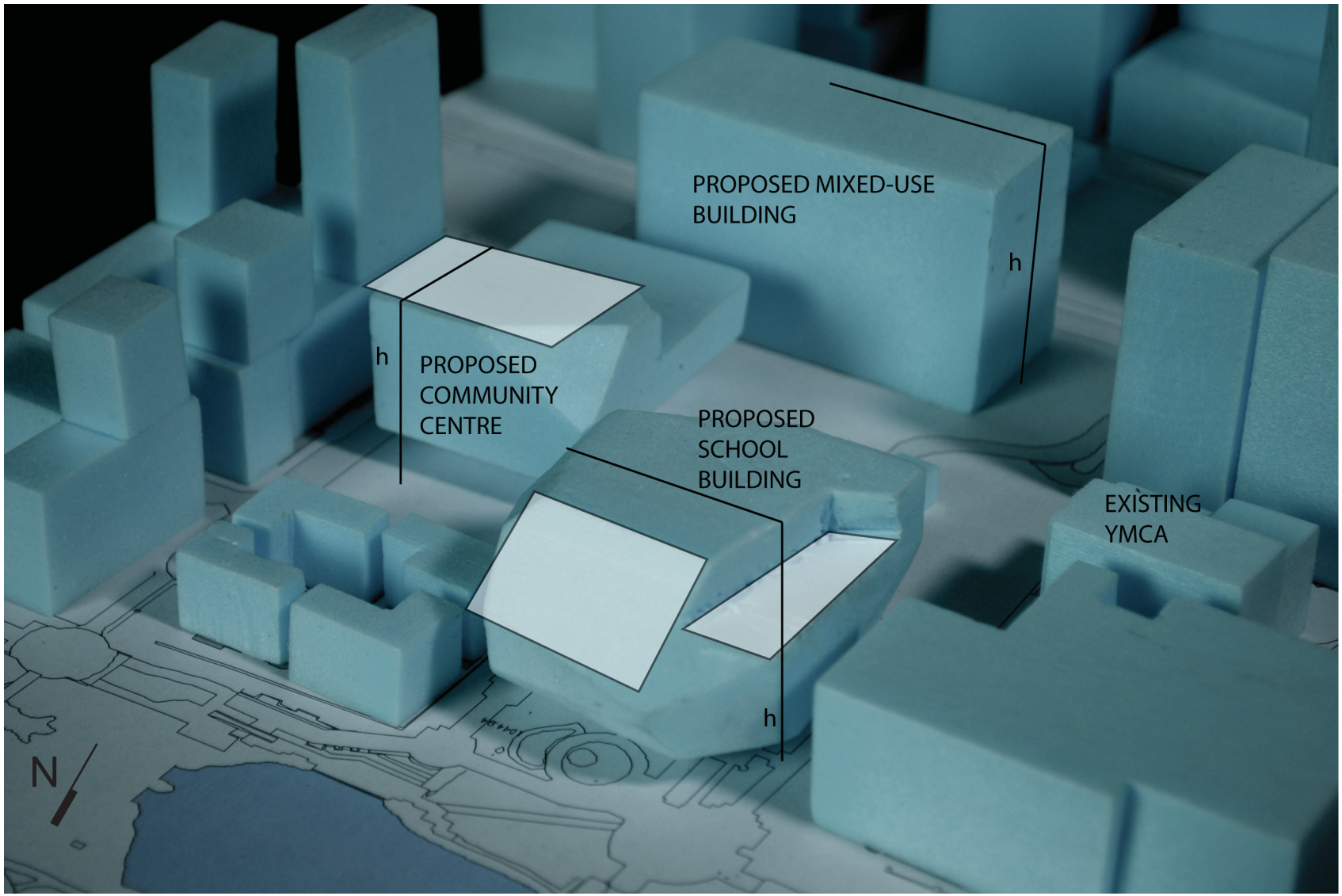


Site sun studies at 3pm during the year.

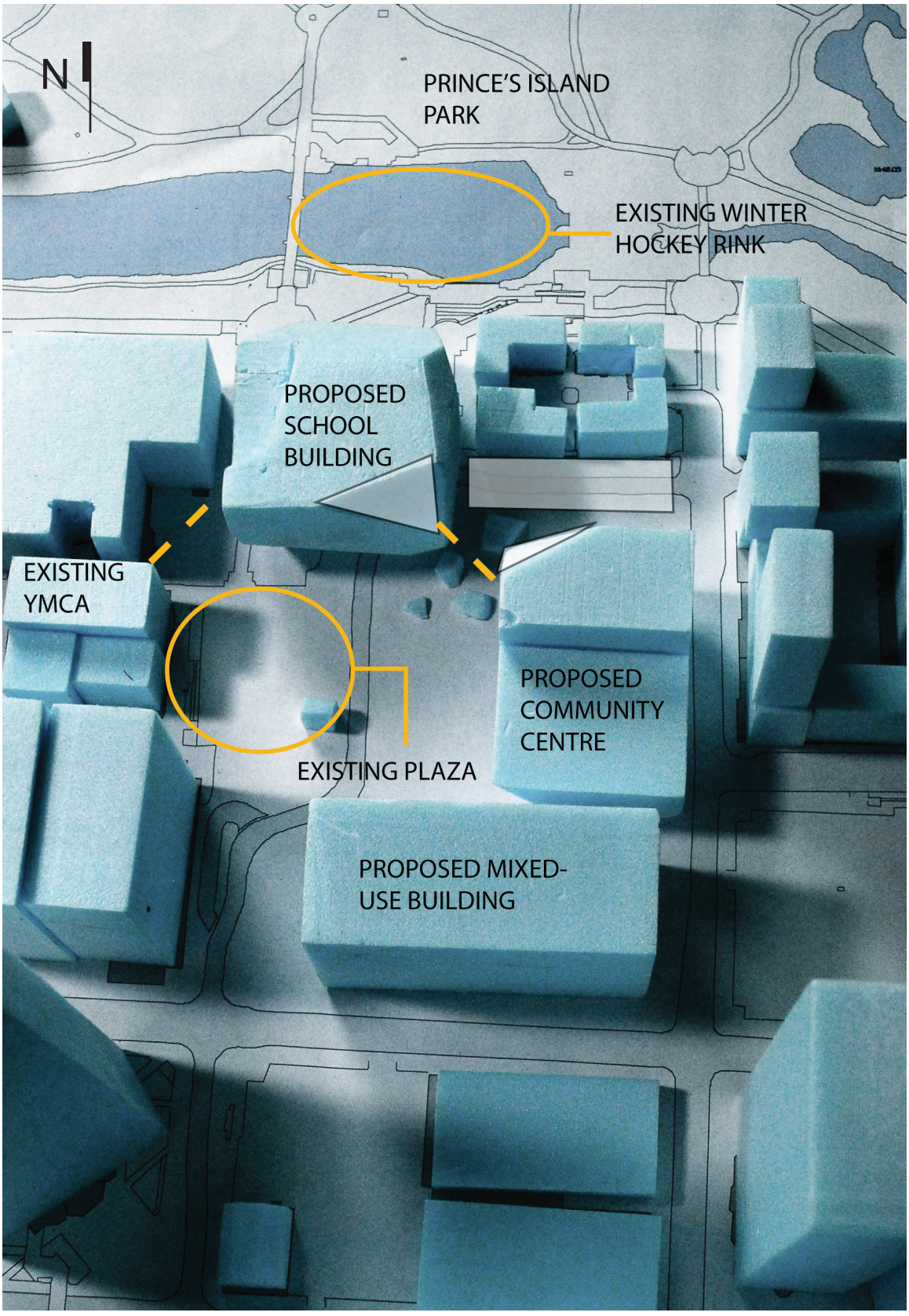
What was found in these studies was that the overpowering downtown shadows on the site. During the winter months it makes it hard to create optimal outdoor play space within the sunlight. Directly north of the site is the ice rink on the Bow River. In order to allow this site to have sun exposure during lunch hours the school building height must be no larger than seven-storeys. Anything higher than that and the building will overshadow the ice, more so than the existing skyscrapers to the south. Another building height implication is the proposed mix-use building on the south end of the site. At a height of ten-storeys the building does not pose much of a hindrance to the school and community centre site.

The other noticeable findings were the central plaza zone between the buildings and the roof tops of the buildings. The roof top of the community centre, at a height of seven storeys for the most part, has great sun exposure during the year, suggesting this to be a good location for green space. Similarly, the roof of the school could become a potential habitable space. The central zone between the school and the community centre also has great sun exposure during the day, allowing for the further development of a communal plaza area.

The community centre building has been set back from the north property line in order to lessen the overcasting shadows on the adjacent residential block. The next studies diagram these important focal areas.



Sun study findings.



Sun study findings.

2.3: Fundamental Principles

> Every educational building calls for a spatial order that works as a structure of streets and squares together forming a small city where everything is geared to the greatest possible number of social contacts, confrontations, meetings, adventures and discoveries. In other words, you are faced with a wider world that includes not just those of your own age.[40]

In order to design around our three influential areas, community/family involvement, food knowledge and increased physical activity we need to set up fundamental principles to guide the design, ensuring each of those influential groups are translated into the design vocabulary.

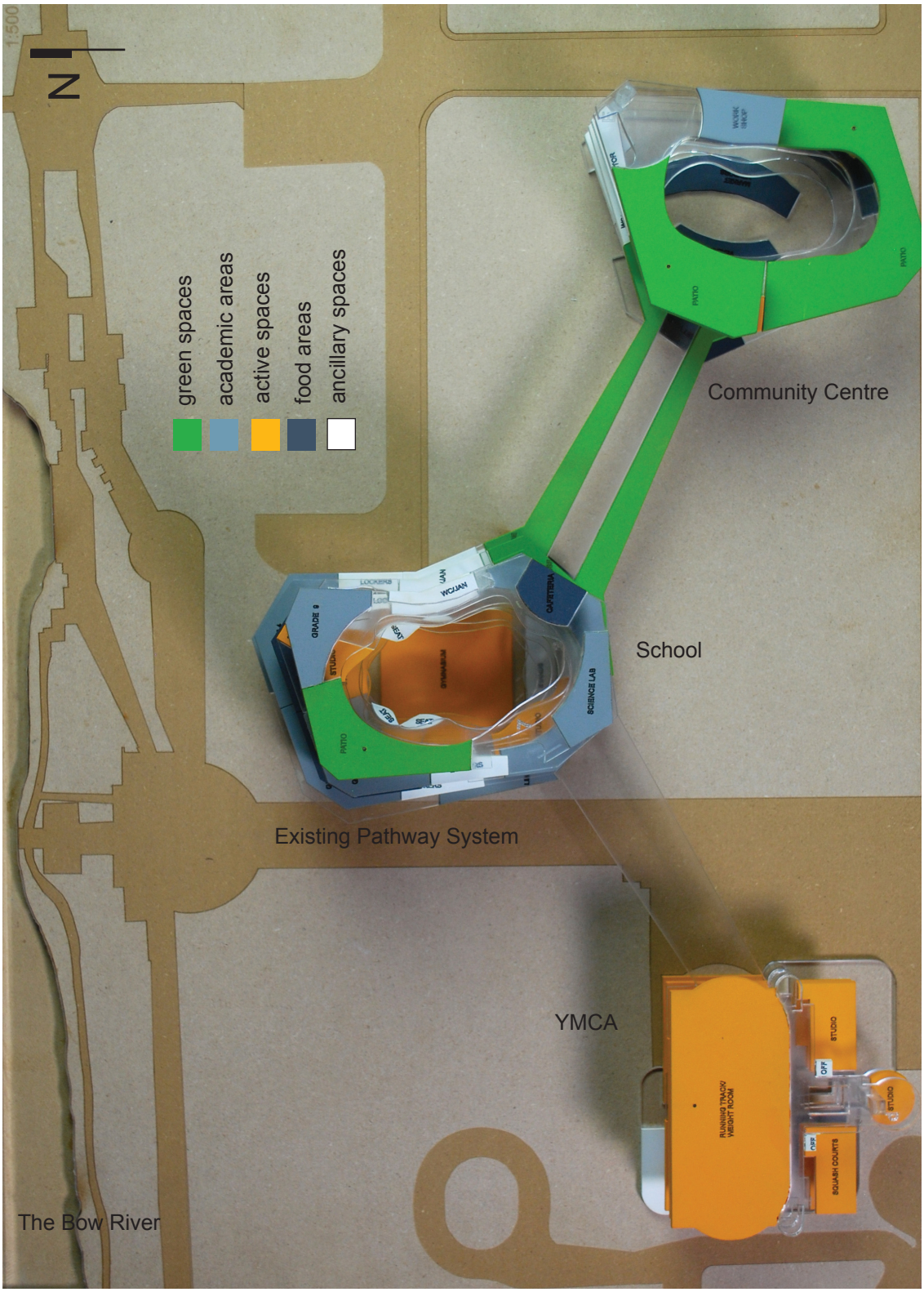
The fundamental principles necessary to address the three influential areas are :

- Designing Around the Sun
- Visual Connections
- Atrium Space
- Movement and Flow of Circulation
- Connecting to the City

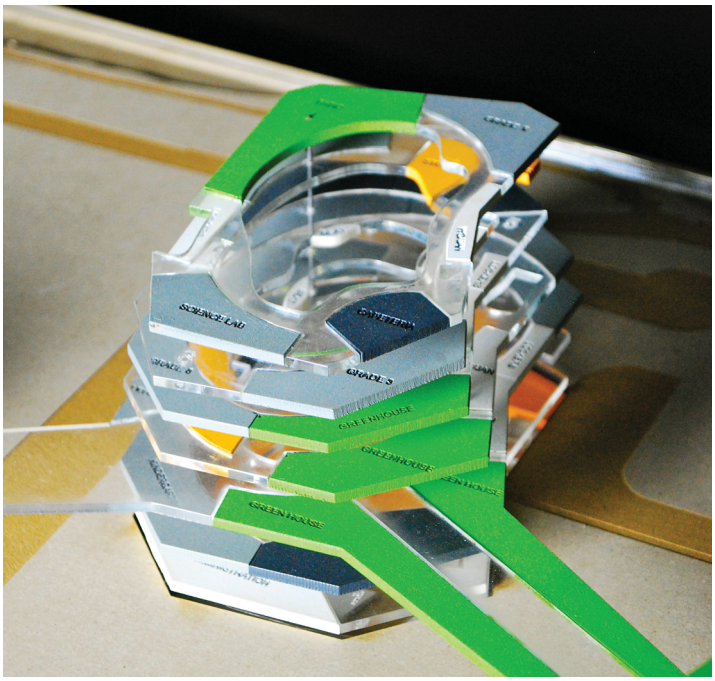
Designing to adapt to the sun angles aims to maximize natural lighting where programmatically needed. This principle links closely with the application of the atrium space, where the atrium becomes another entry point for natural light. The atrium space in turn connects both the internal visual connection of the occupants and the movement throughout the buildings inside. At the threshold of the buildings interior and exterior the fifth principle connects the school and community to the larger urban fabric.

The following model represents the five principles shown within the initial building design. The stacks represent the different floor plates, the clear pieces represent circulation space and the colored blocks show programs for each floor plate. The following sections will break down the five fundamental design principles and demonstrate their relationship to one another and the larger relationship to the initial design influences of community/family, food and physical activity.

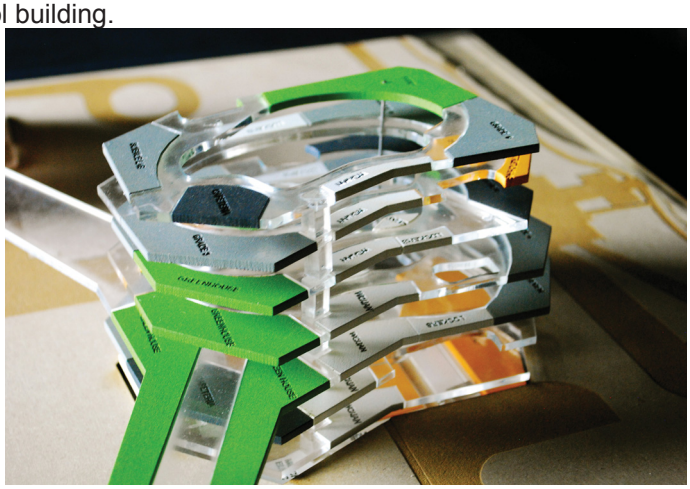
40 Hertzberger, *Space and Learning*, 123.



Aerial view of five principles model.



South view of program blocks for school building.

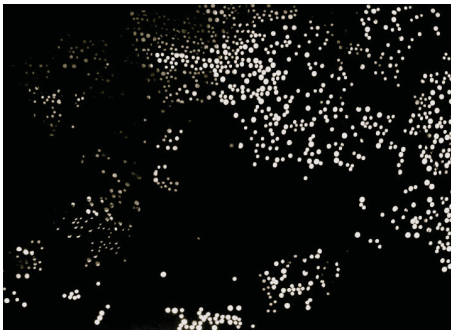

East view of program blocks for school building.


East view of program blocks for community building.

2.3.1: Designing Around the Sun

As we have seen in the previous sections, sun exposure plays an important role in the development of the healthy environment. At this point, however, we take the initial studies and start to develop them further. The facade is developed to understand the interior sun infiltration within the building. As most spaces in a school building would benefit from natural lighting, we must look for a method that can satisfy all of the program components.

A double skin facade can provide different amounts of light throughout the interior space but also create a fun atmosphere with an exterior pattern. Where necessary, it can avoid direct sun exposure, such as on the south and west facades. As seen in section 1.6, the pilot project explored the use of a double roof structure. The following photo is a exploration of patterns using stipples to transition between spaces that require more and less light.

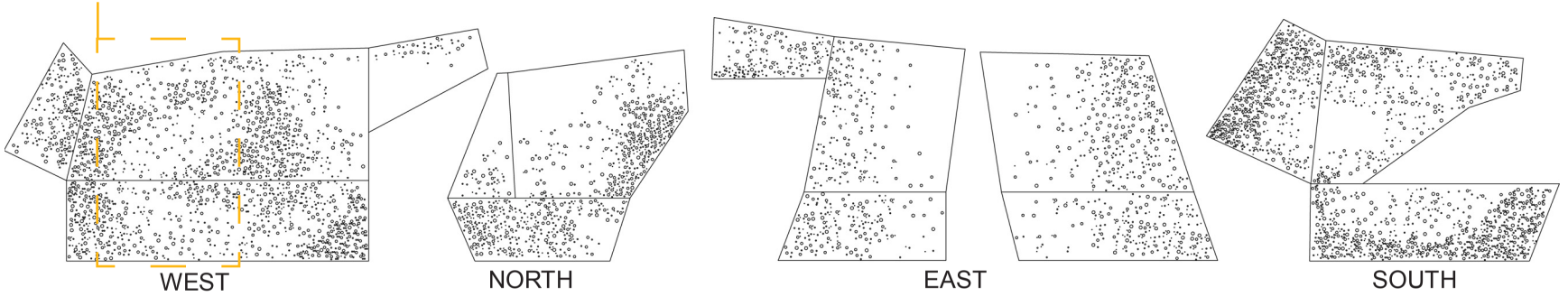


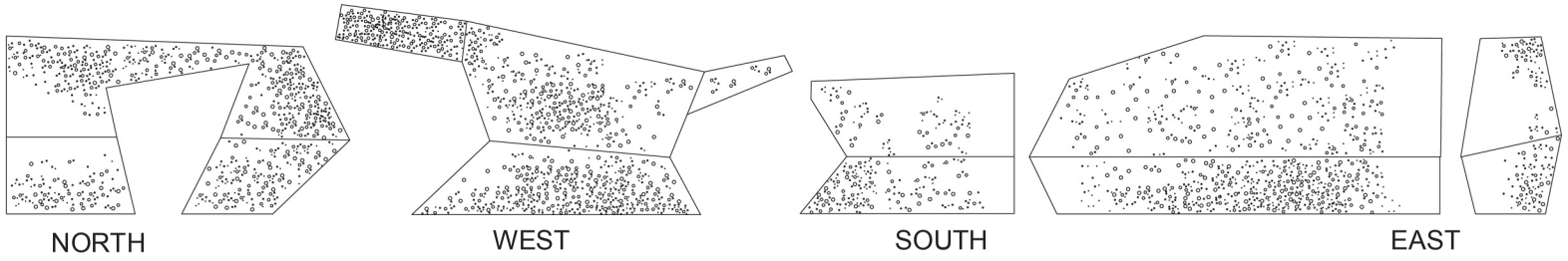
Facade pattern study.

The direct relationship of sun studies to community/family, physical activity and food becomes more apparent. There is a need for certain levels of sun exposure for food growth and to maintain a green space. For physical activity indoors, the addition of natural light creates more desirable space, similar to outdoor spaces and the community/family components require a safe, well lit environment.

The next diagram shows the proposed building facade for the school and the community centre. It has been unrolled to display the differentiations between the stipple pattern across the facade. Where the holes become more dense and apparent the facade has been matched with a specific programmatic space behind it in order to allow for more lighting, such as a classroom space.

STUDY AREA FOR SECTIONAL MODEL.
(SHOWN ON PAGES TO FOLLOW)

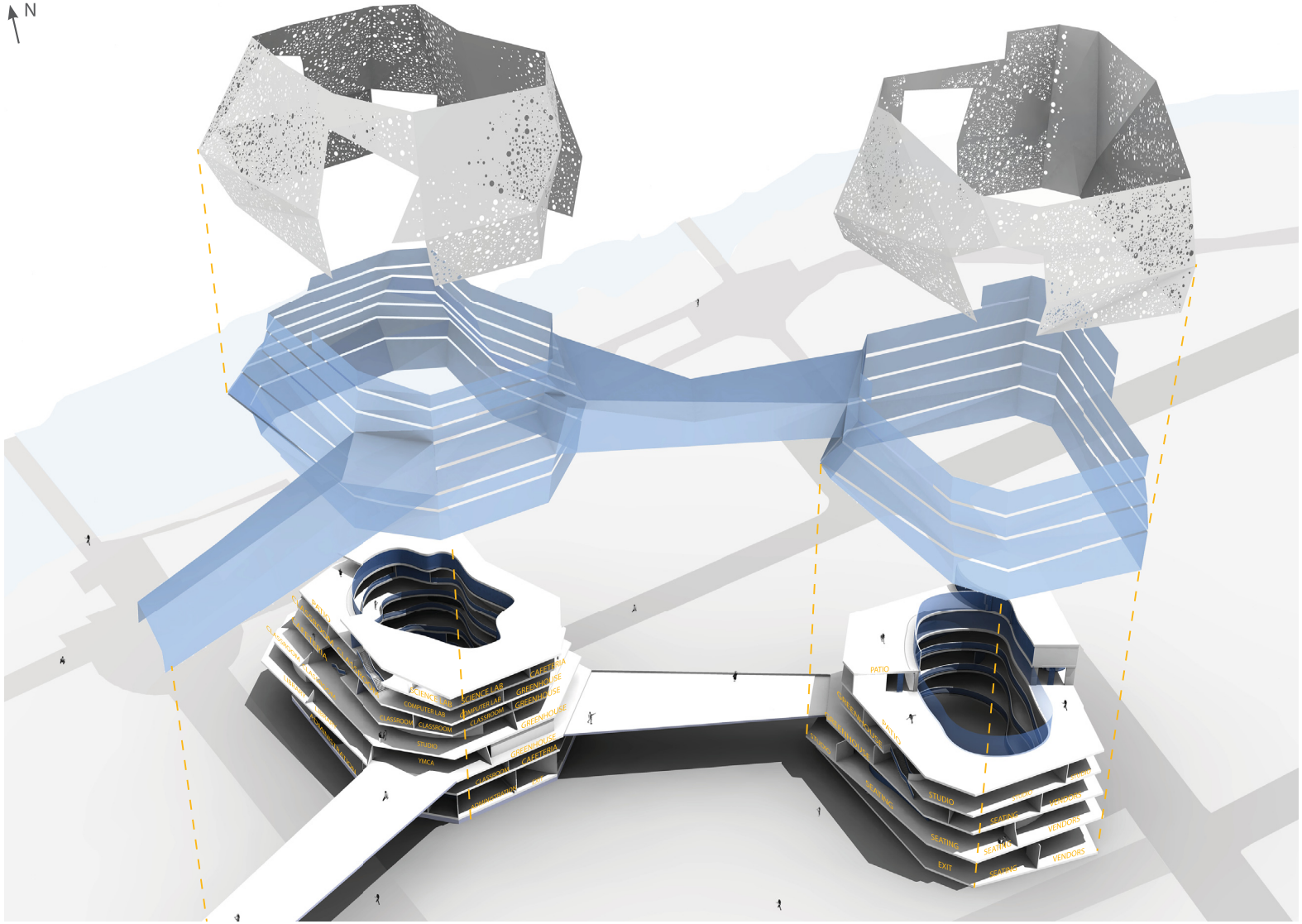




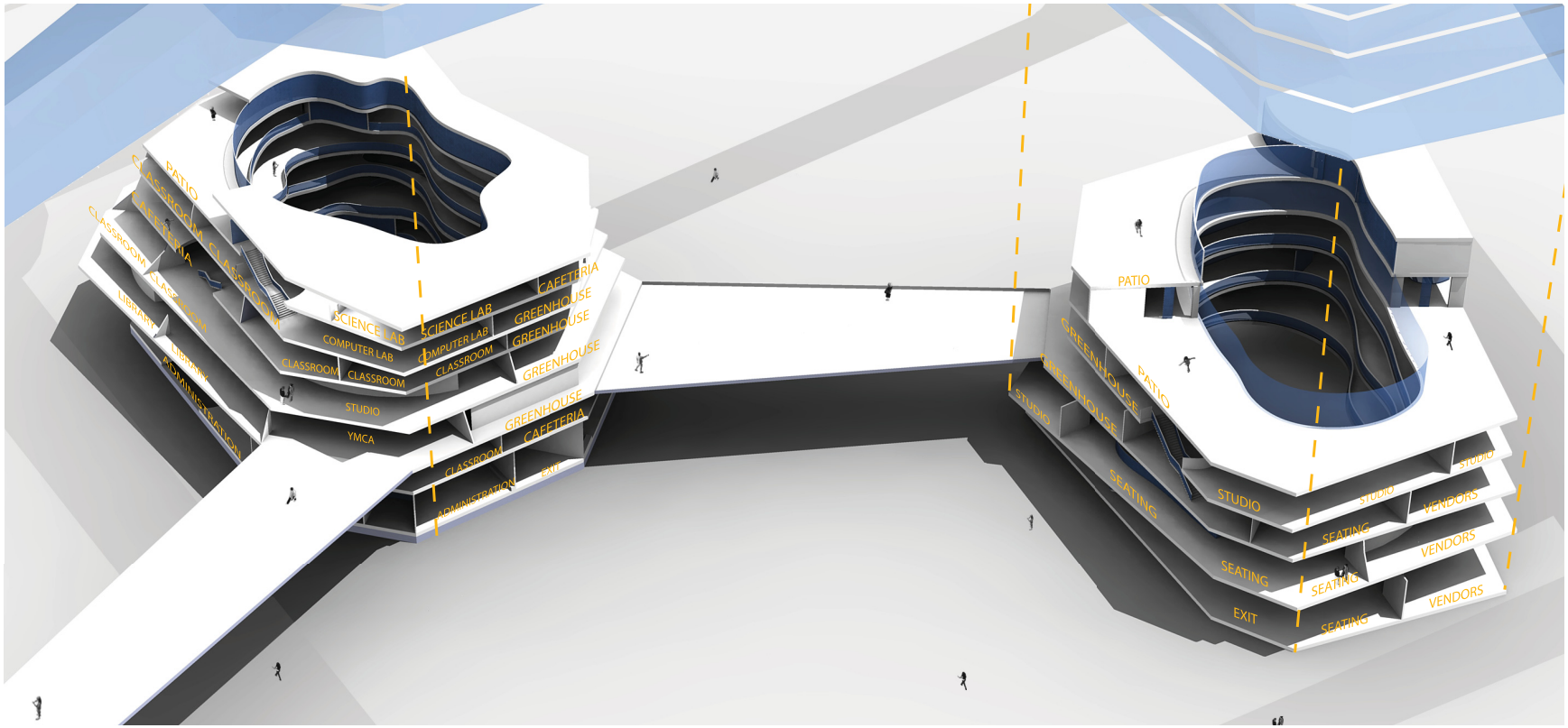
Unrolled facade plates showing stipple pattern.

A further investigation of the facade shows the programmatic spaces on the interior of the buildings matching the stipple pattern of the facade. The following diagram also shows the pieces of the facade used for the enclosure of the building. With a double skinned, aluminum facade, the interior spaces are enclosed with a glass skin to block the elements, while the perforated exterior skin acts as the light controlling piece and creates a whimsical atmosphere for the building users. The glass layer controls the inner temperatures with operable glazing pieces. Where there are exterior focal points, such as the Bow River to the north, the perforated skin has been peeled back altogether to allow for an unobstructed, framed view of the area.

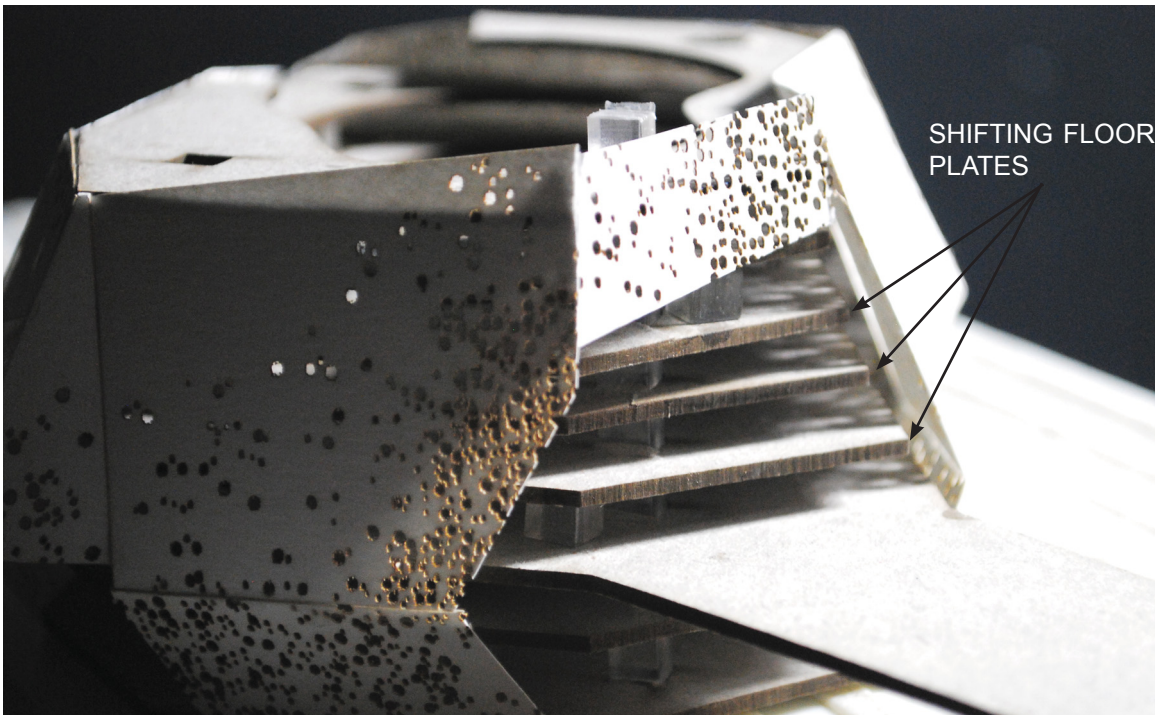
The aspect of this building that uses the sun as the design driver is the shifting floor plates. Similar to the design of the atrium (discussed in the following section 2.3.2), the floor plates shift at each level to allow for more or less sun to enter the spaces. Where sun is needed, in areas such as the greenhouse, the floors are stepped back to allow for maximum sun exposure. Furthermore, on the south facade where summer sun becomes overbearing, the top floor overhangs the lower ones to act as a sun shade. These ideas work with the facade structure to create atmospheres that do not overheat but are filtered with natural lighting.



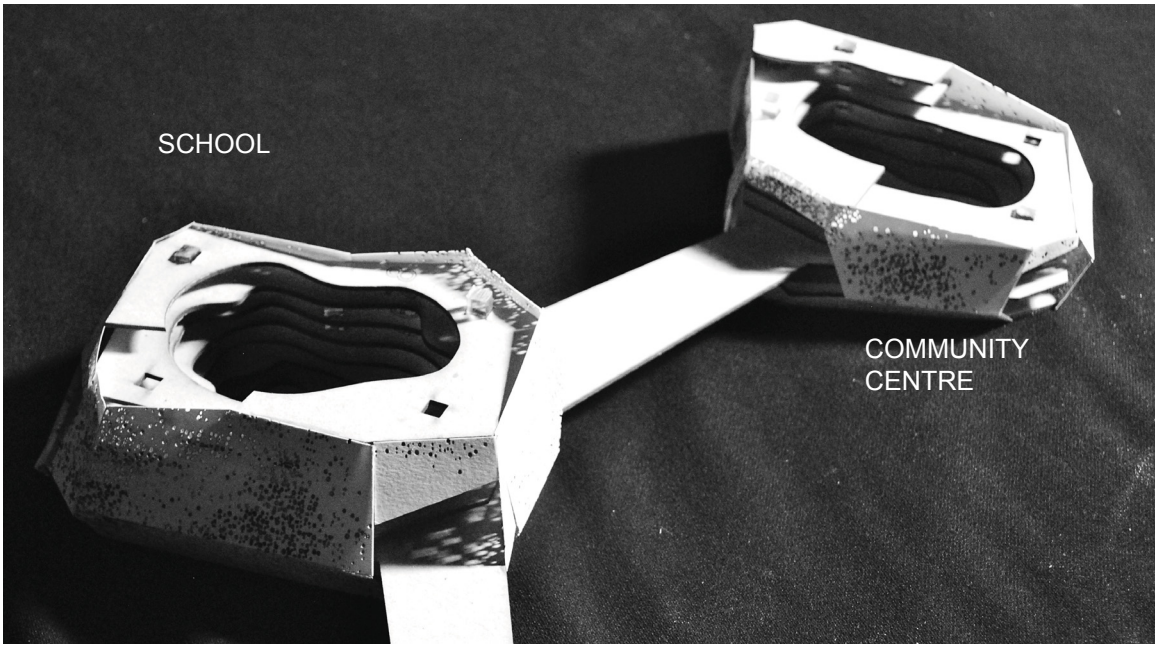
Facade explosion showing building components and program use behind facade. (Enlarged image on following page).



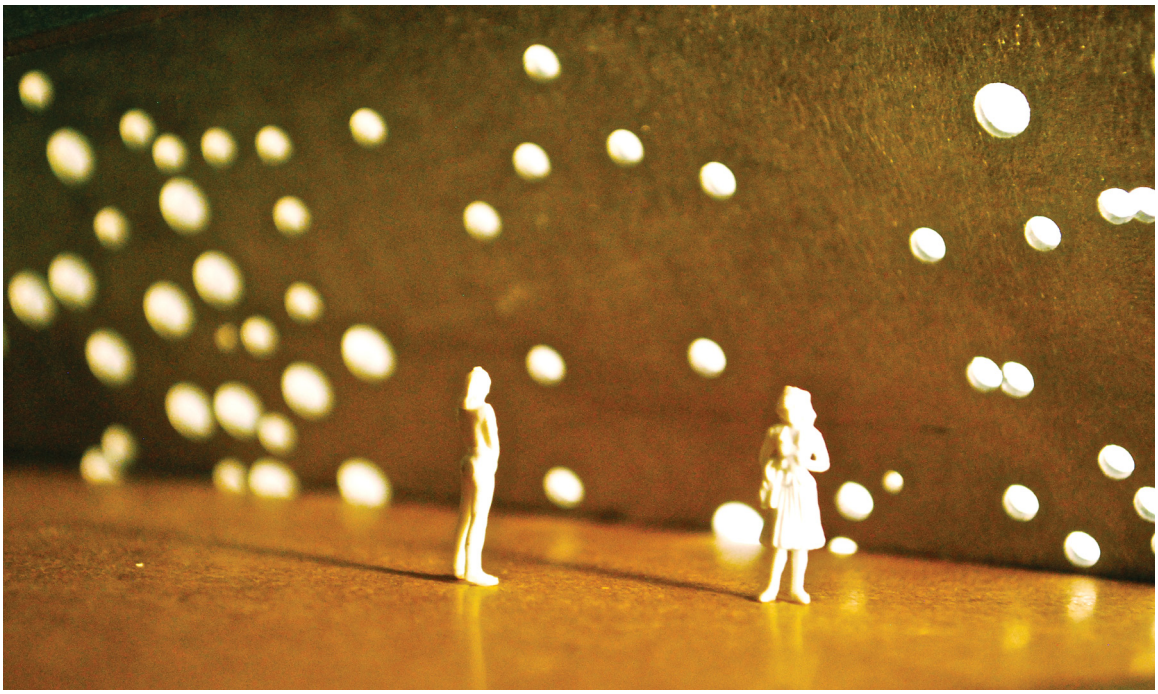
Enlarged image showing room use behind facade.



Exterior view of school building model at greenhouse bridge.

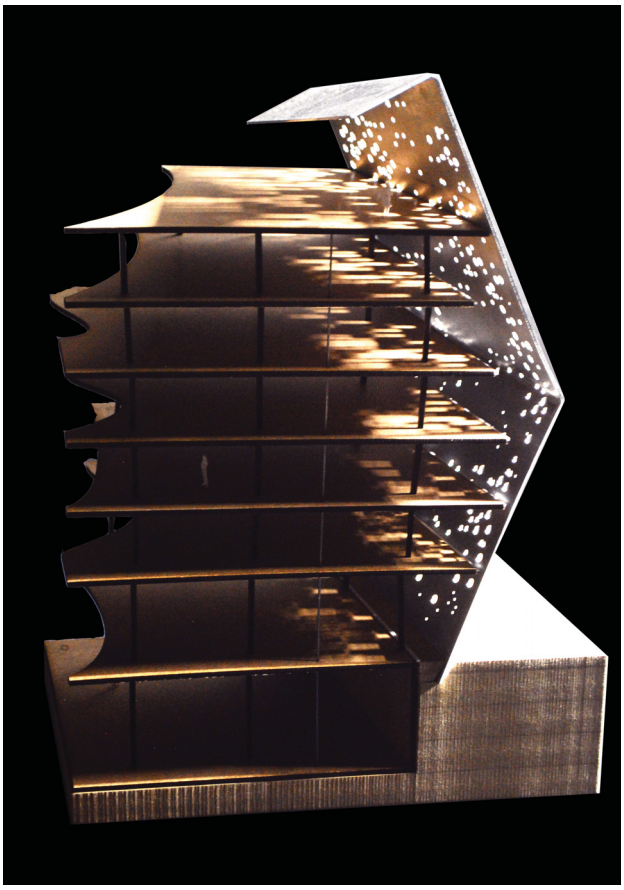


Exterior view of school and community centre.

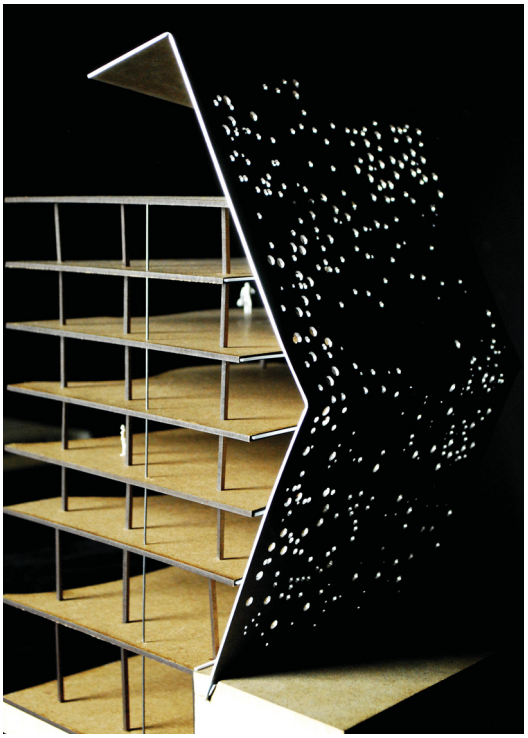


Experiential qualities of interior space of the facade.

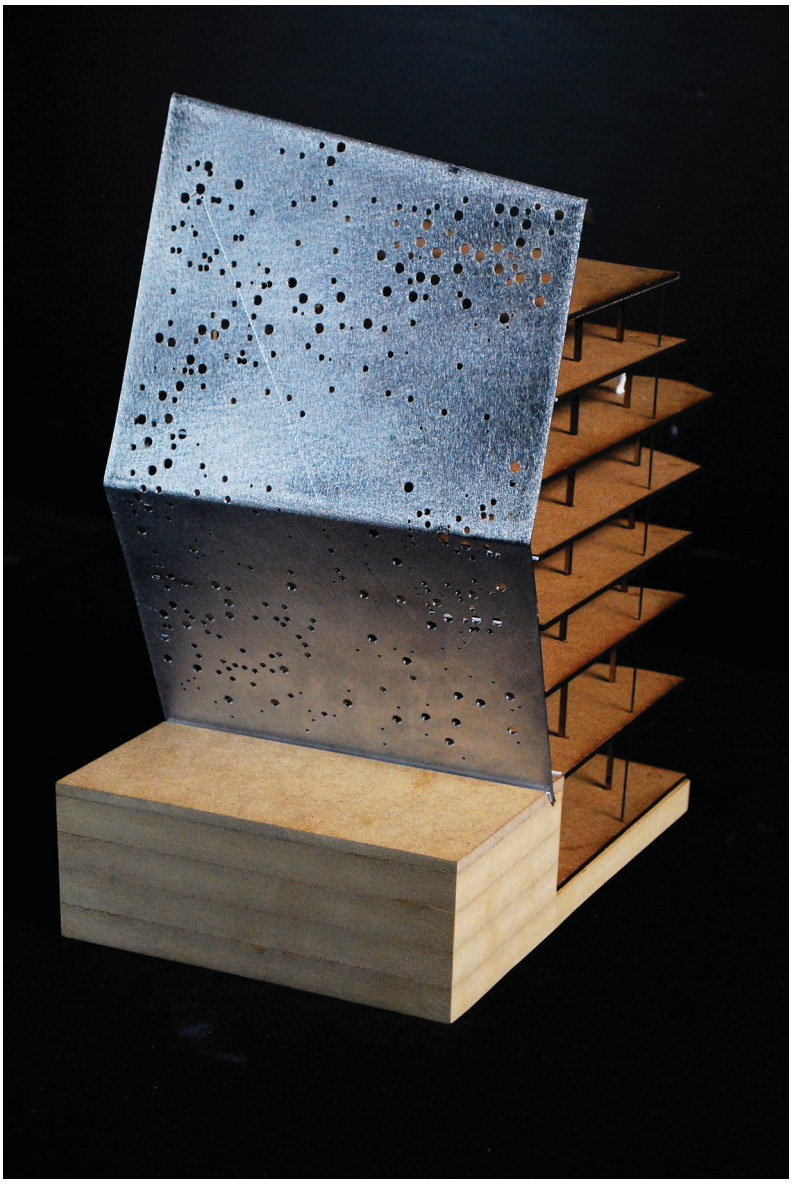
Experiential qualities of the patio space from the facade.



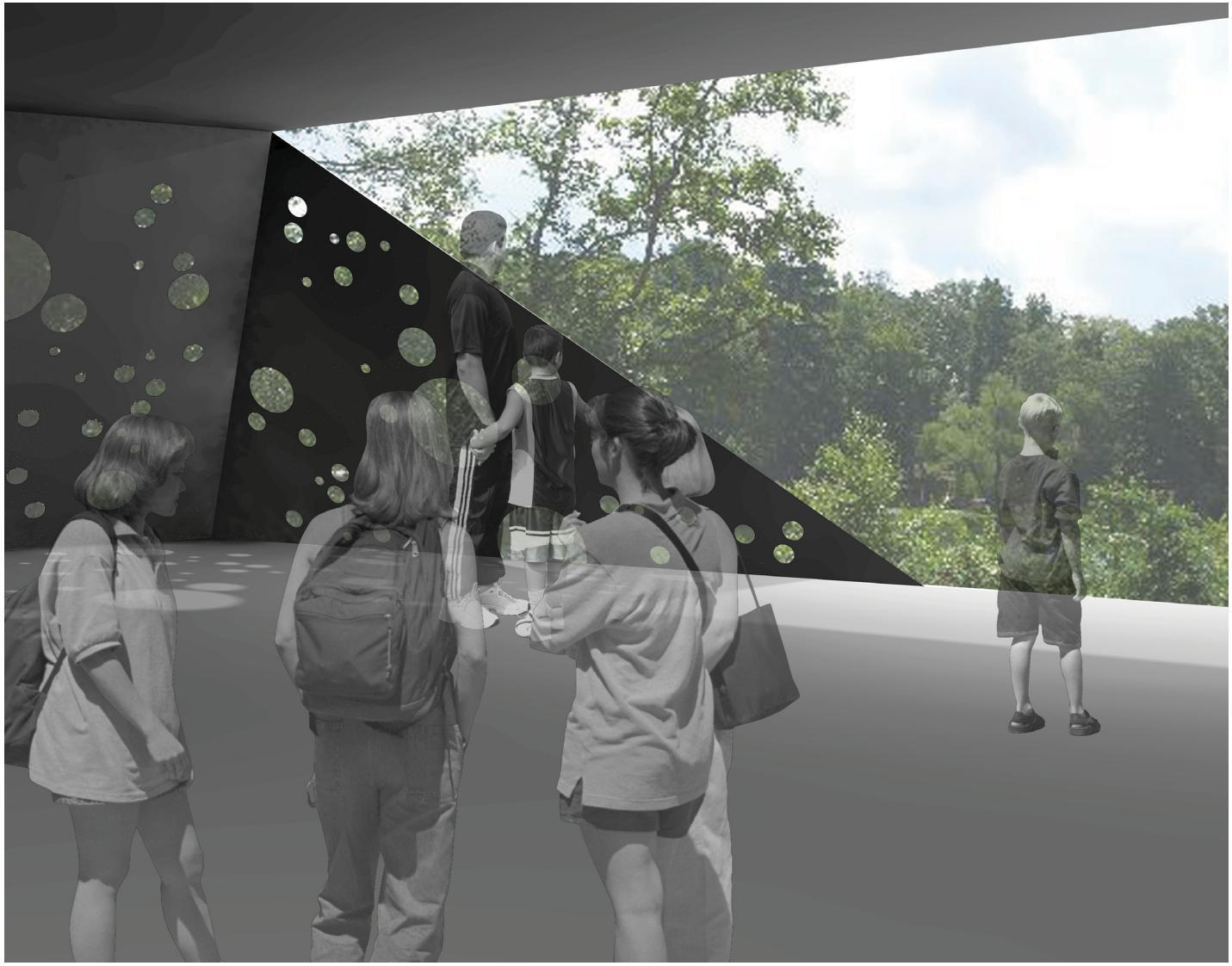
Day time light study of facade section. (Section cut shown on page 68)



Night time light study of facade section.



Section of facade showing materiality.



Interior view toward Prince's Island Park where facade has been pulled back to allow for framed views.

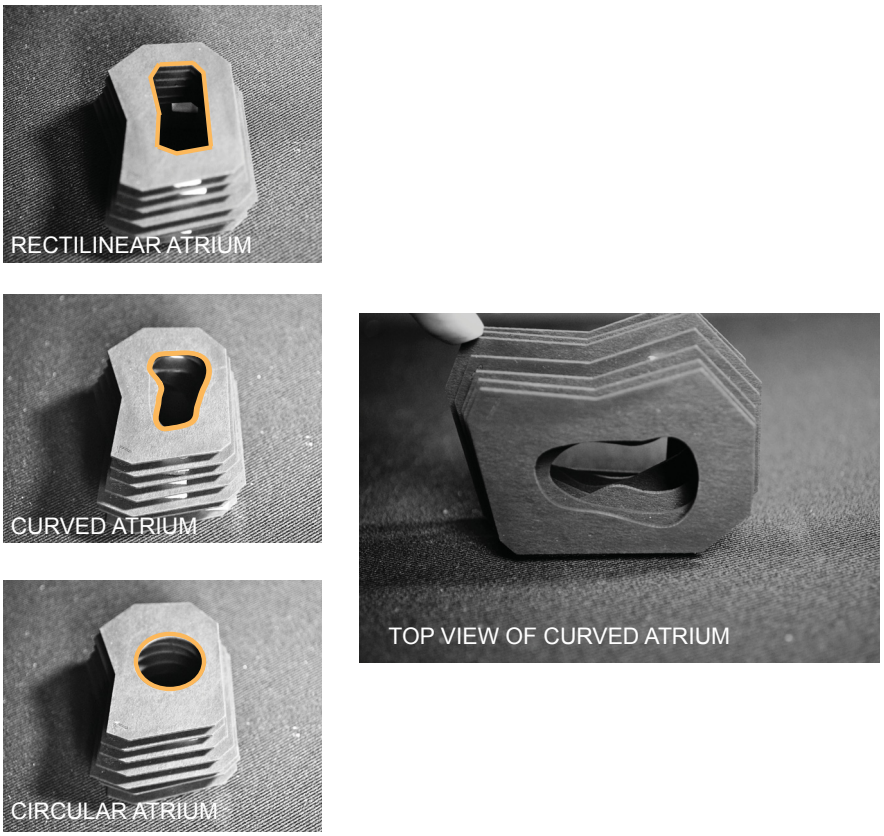
2.3.2: Atrium Space

> To children, it is of great importance that they have the feeling that they are not shut in, and that they always have an overview of the space around them.[41]

The next design principle is the atrium space. Designing an atrium space closely links to visual connection, movement and circulation as well as the design around the sun principles. Wanting to satisfy all of the design drivers, we look to explore shapes that fit in with the proposed floor plates and facade. The following studies demonstrate different patterns for the atrium. The curved atrium creates a free flowing movement around the atrium as well as allowing for different variations within the lower floor plates, which in turn allows for a better visual connection throughout the building.

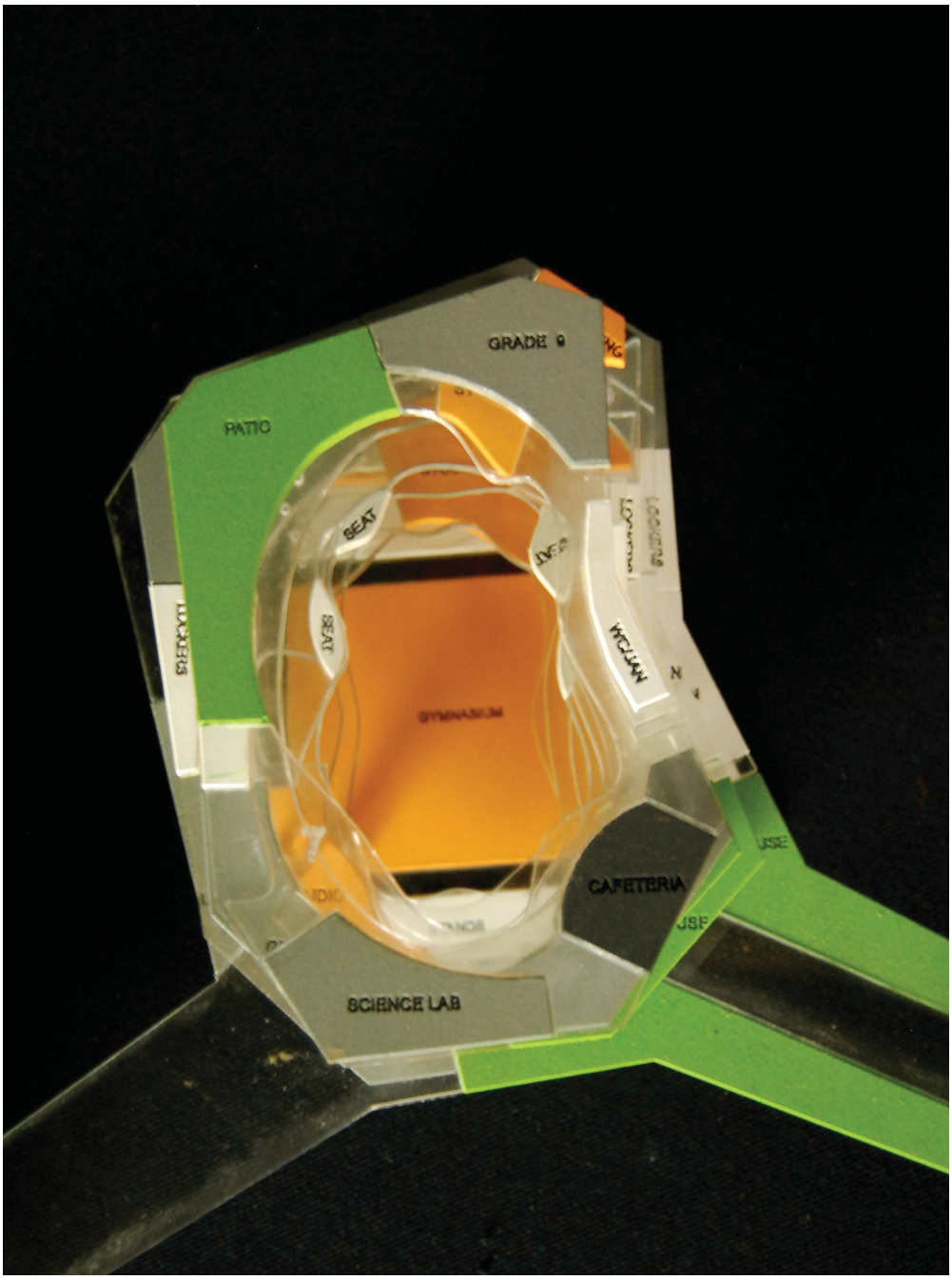
There can be an emphasis on the programs that need a visual connection by pulling and pushing program spaces between the interior atrium and the exterior, inside walls.

41 Lefaivre and Hall, *Ground-up City*,107.

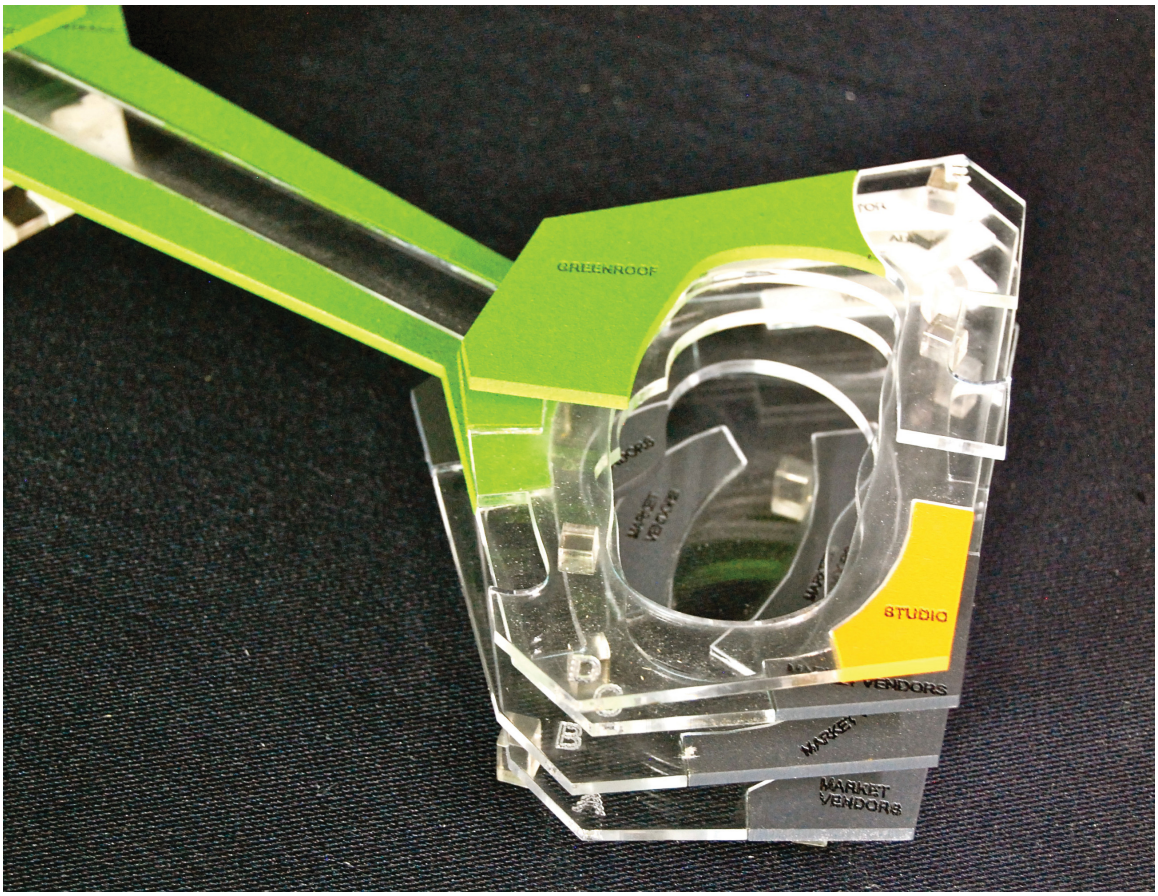


Exploration of atrium shapes.

The following photo shows the visual connection decisions made for both the community center and the school building based on the shape of the atrium as well as the dynamic feel the changing atrium spaces give.



Bird’s eye view of the atrium space for the school.



View of the atrium space for the community centre.

2.3.3: Visual Connections

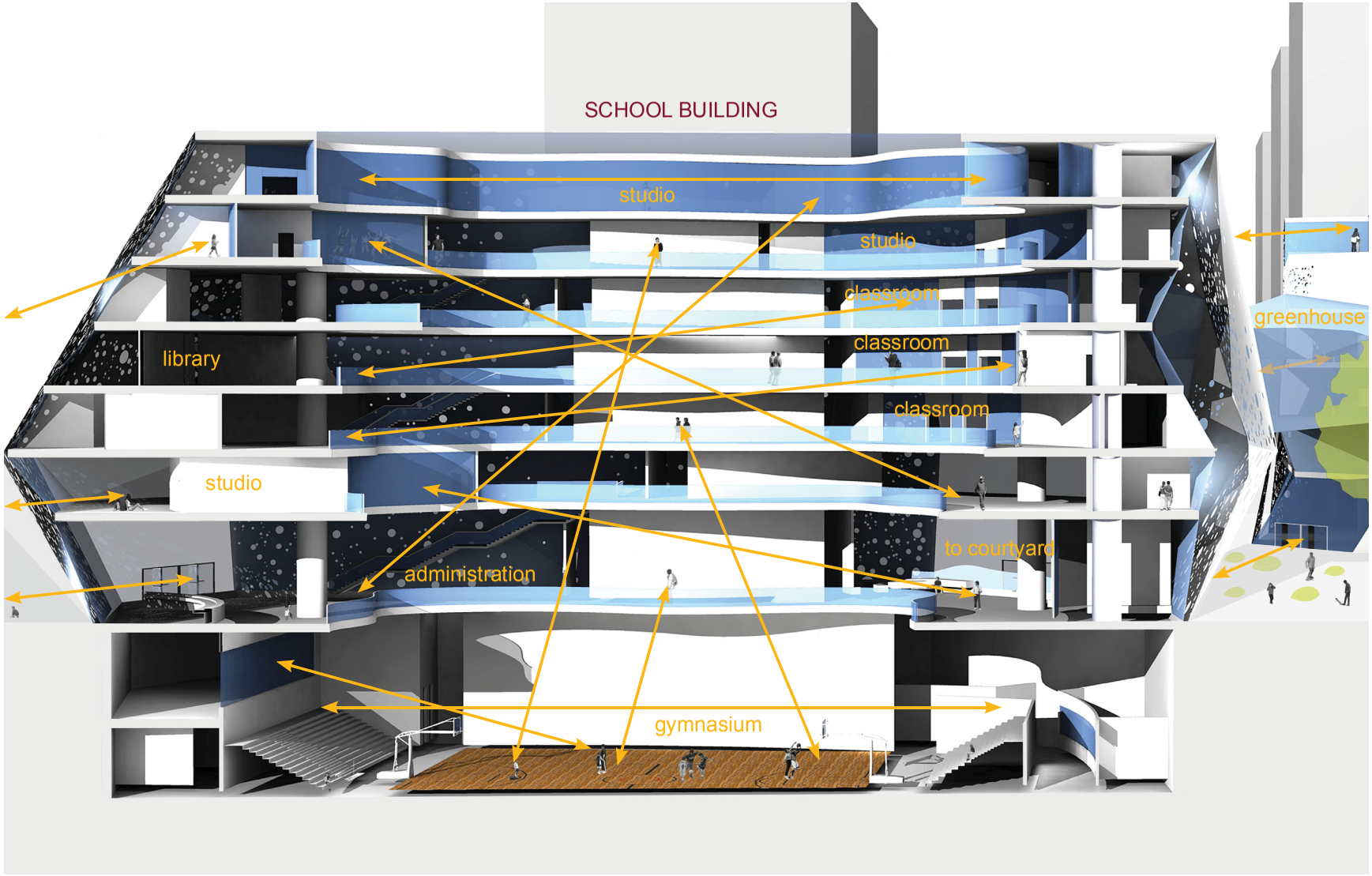
> The connecting layer establishes a function, physical and visual link between the separate places. It is the cement of the network.[42]

As suggested in previous sections, the visual connections are important and necessary elements throughout the building and surrounding environment. Not only is it imperative for children to have a visual connection to program spaces but also to other students and community members. As previously discussed, early learning from one another becomes a very important part of a child's development and future well-being. The atrium space then becomes the focal point where the visual connections start to mold a chid's view of their surrounding built environment. The following building section drawing shows a section through the atrium spaces where programmatic elements have been pushed and pulled in order to highlight spaces and encourage a clear visual connection.

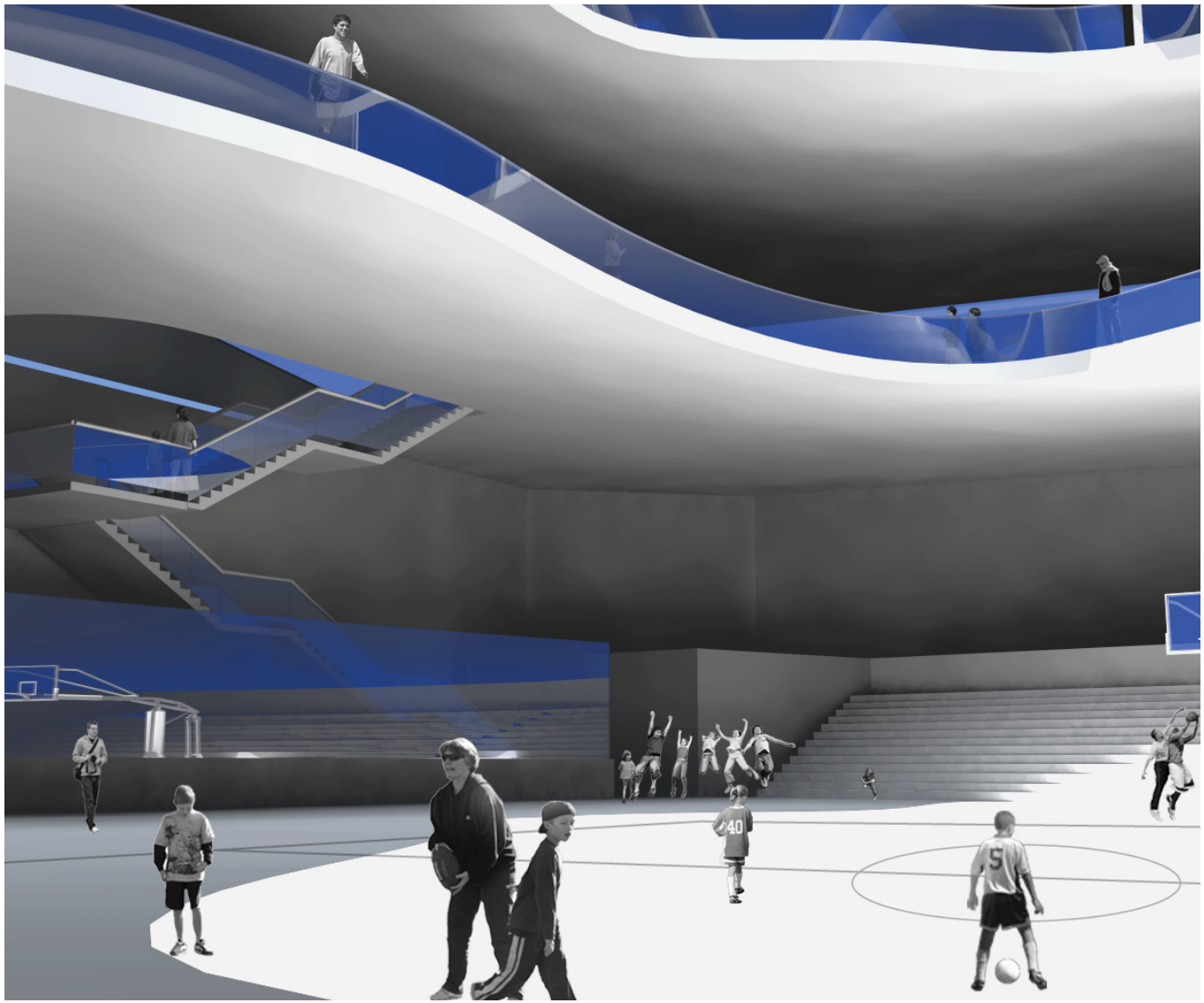
The exterior visual connections (described briefly in section 2.2) focus mainly on the view of the river, downtown core, bicycle pathways, adjacent park as well as the communal plaza between the community centre and the school.

42 Lefaivre and Hall, *Ground-up City*,114.

Section through school building showing the five principles applied to the building. (Enlarged image on following page).



Enlarged section through school building showing the five principles applied to the building.



Interior view of gymnasium below grade.

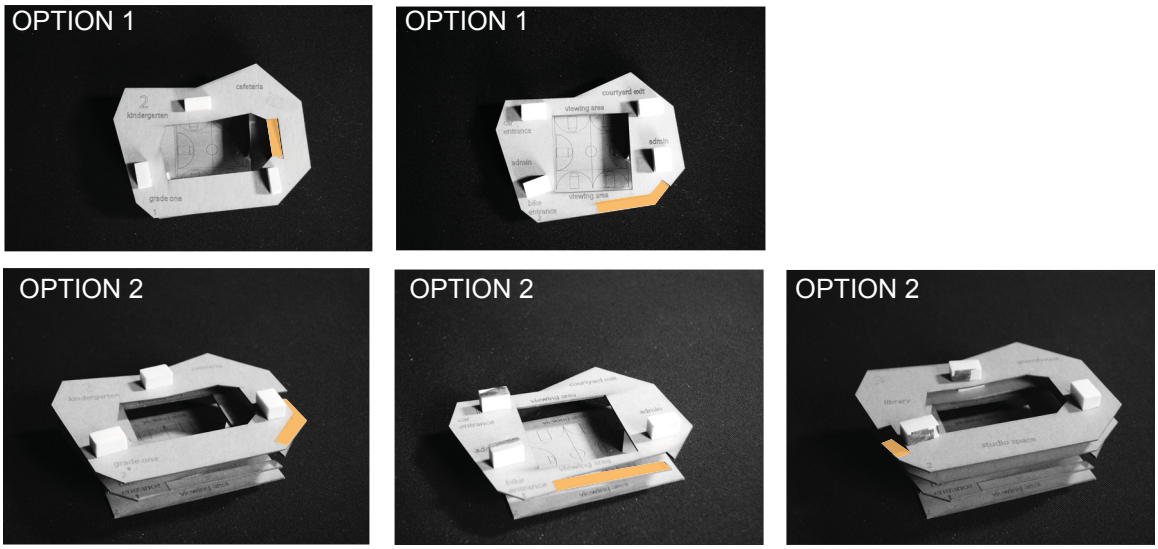
2.3.4: Movement and Flow

> [Restricting movement] …often it is merely limited opportunities for movement that create many so-called behavioral and learning difficulties.[43]

Movement and circulation are key to providing a building that encourages well-being. You want to encourage a child to move as much as possible for physical activity as well as increasing their social interaction, therefore the atmosphere must provide seamless transitions both throughout the interior space as well as from the interior to exterior.

Encouraging movement through a space is easily done through visual connection. A person will be more easily influenced to use the stairs if they are well lit and are easily accessible. The following study shows the differences in arranging the stairwells around the atrium space. Option one shows the circulation alternating between the interior and exterior of the atrium, while option two shows a continual use of the interior of the building. Both options continually circle the building, however, option one allows for necessary movement between the interior and exterior of the building.

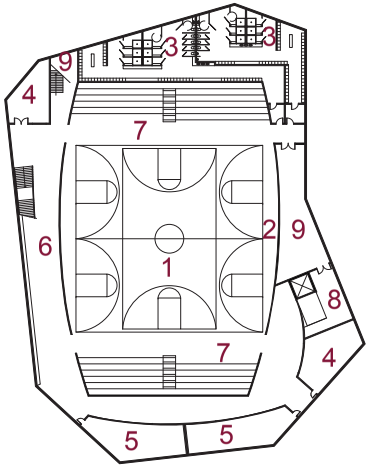
43 Anita Rui Olds. *Childcare Design Guide* (USA: McGraw Hill Companies, 2001), 9.

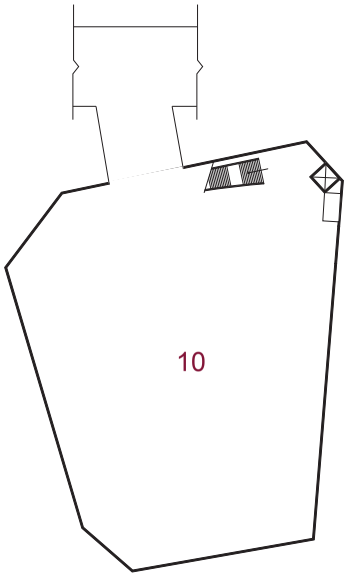


Options of circulation pathways around the atrium space.

The following floor plans show, in more detail, the programmatic layout and groupings of the spaces within the building. The third floor plan demonstrates (colored similarly to the five principles model on page 65) the relationships between the interior and exterior spaces and uses.

1: gymnasium
2: climbing wall
3: change room
4: office
5: meeting room
6: viewing area
7: seating area
8: mechanical/electrical
9: storage
10: underground parking

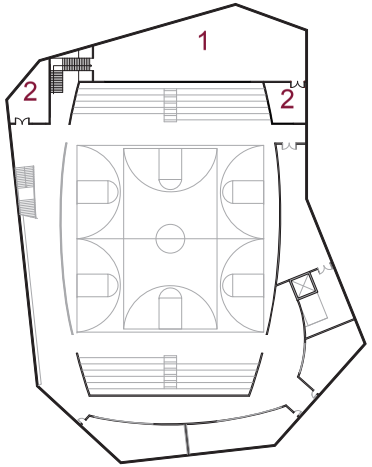


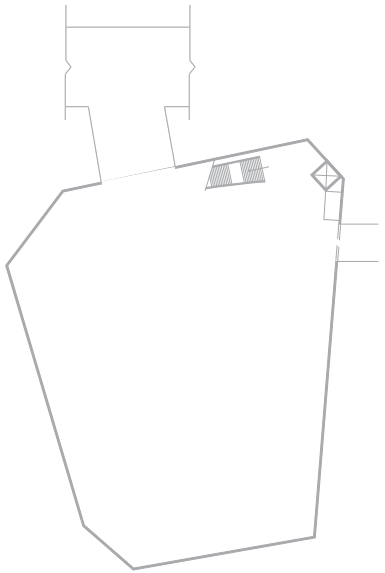


N

Level 0

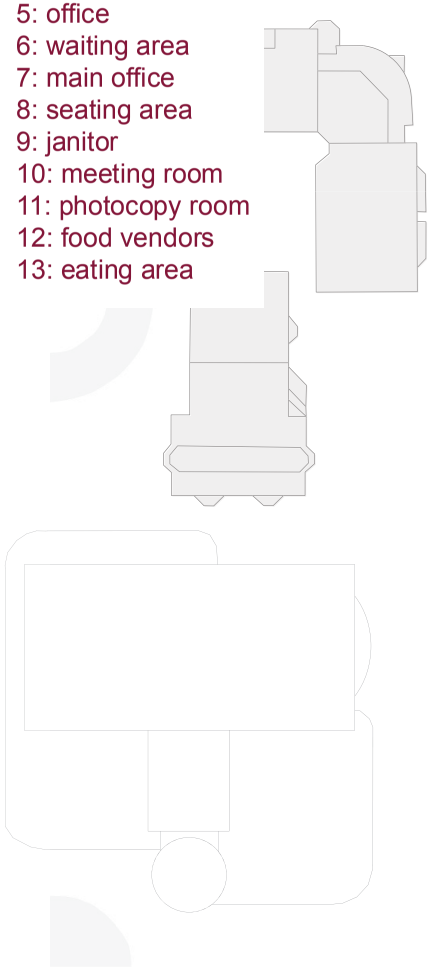
1: studio space
2: office

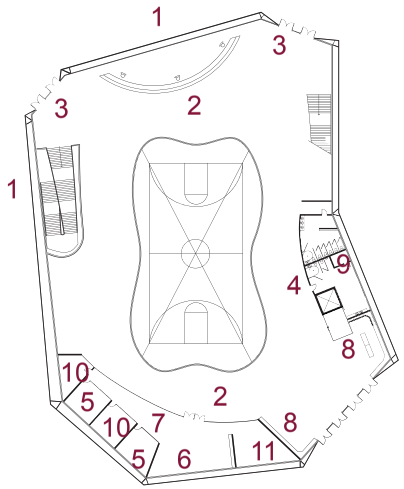


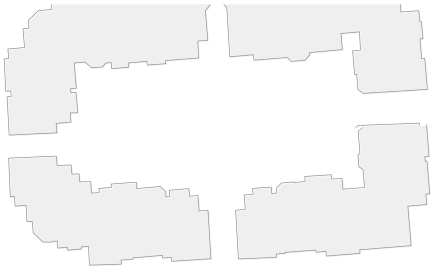


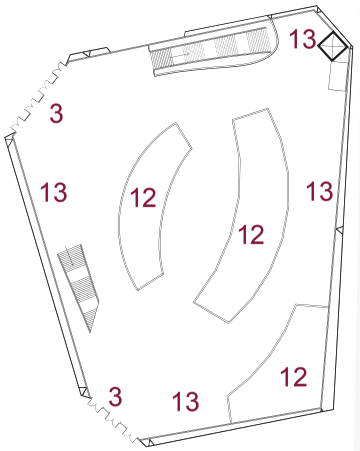
Level 0.5

1: bike parking
2: administration
3: entrance
4: washroom
5: office
6: waiting area
7: main office
8: seating area
9: janitor
10: meeting room
11: photocopy room
12: food vendors
13: eating area





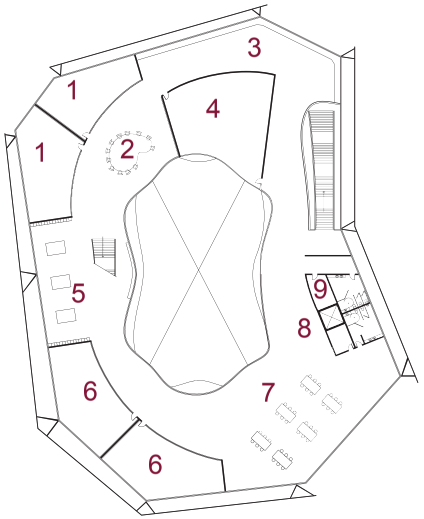


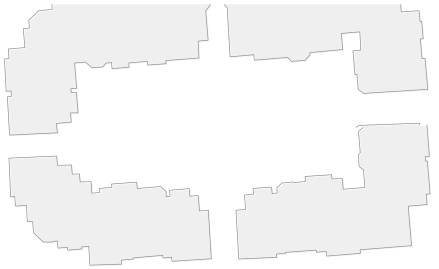


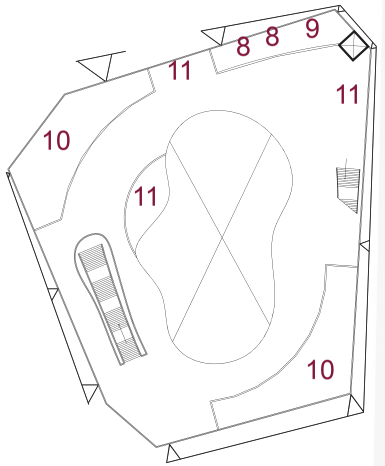
N

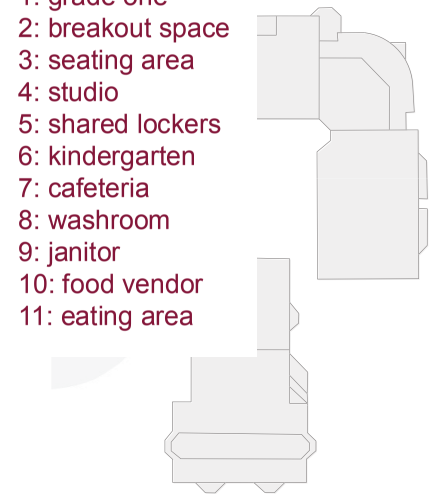
Level 1

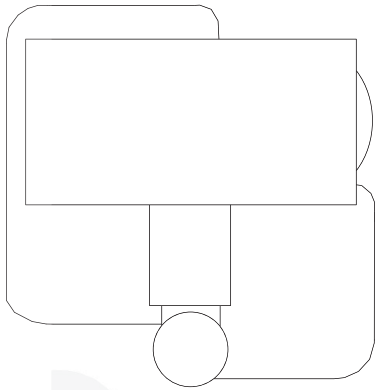
1: grade one
2: breakout space
3: seating area
4: studio
5: shared lockers
6: kindergarten
7: cafeteria
8: washroom
9: janitor
10: food vendor
11: eating area











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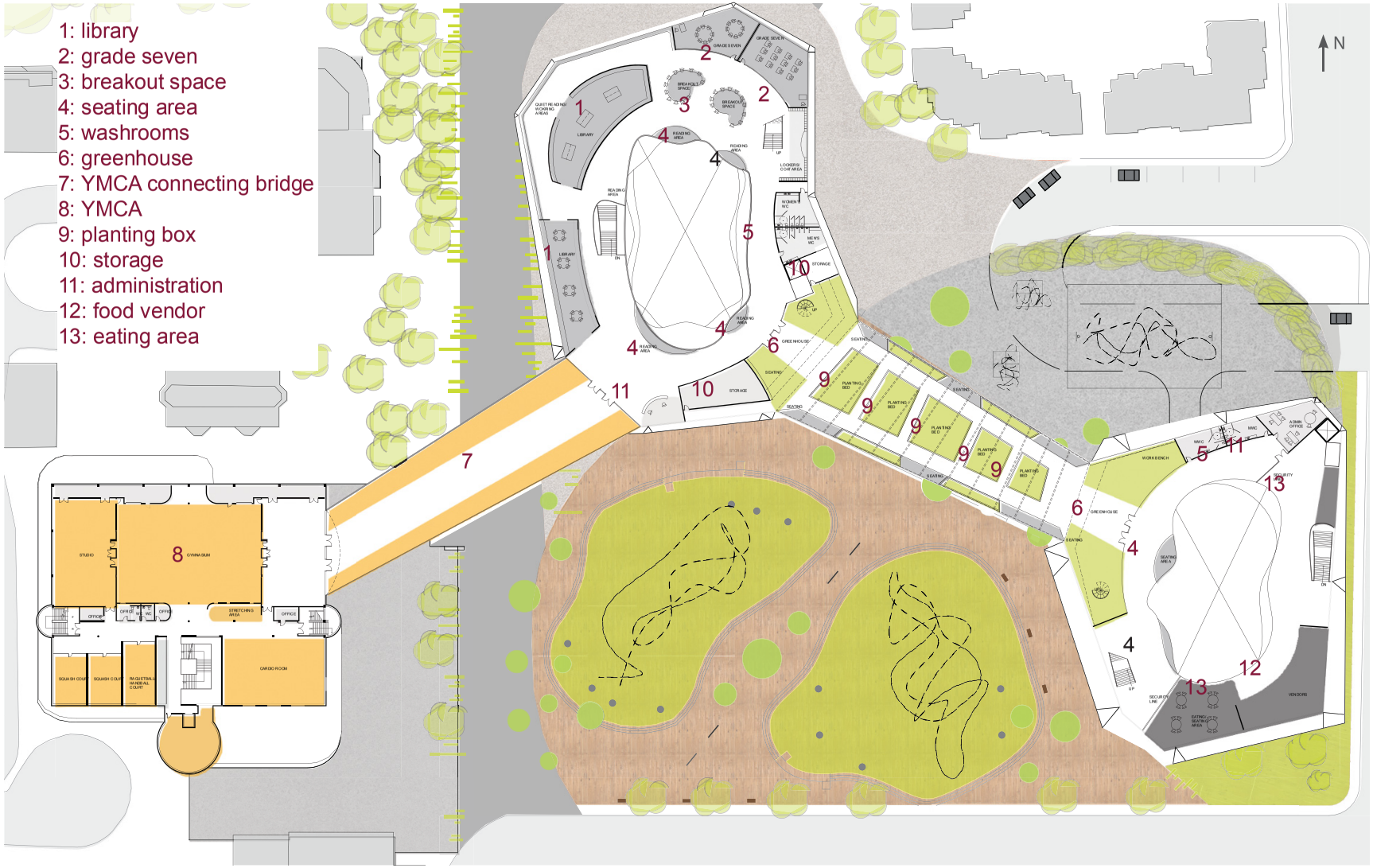
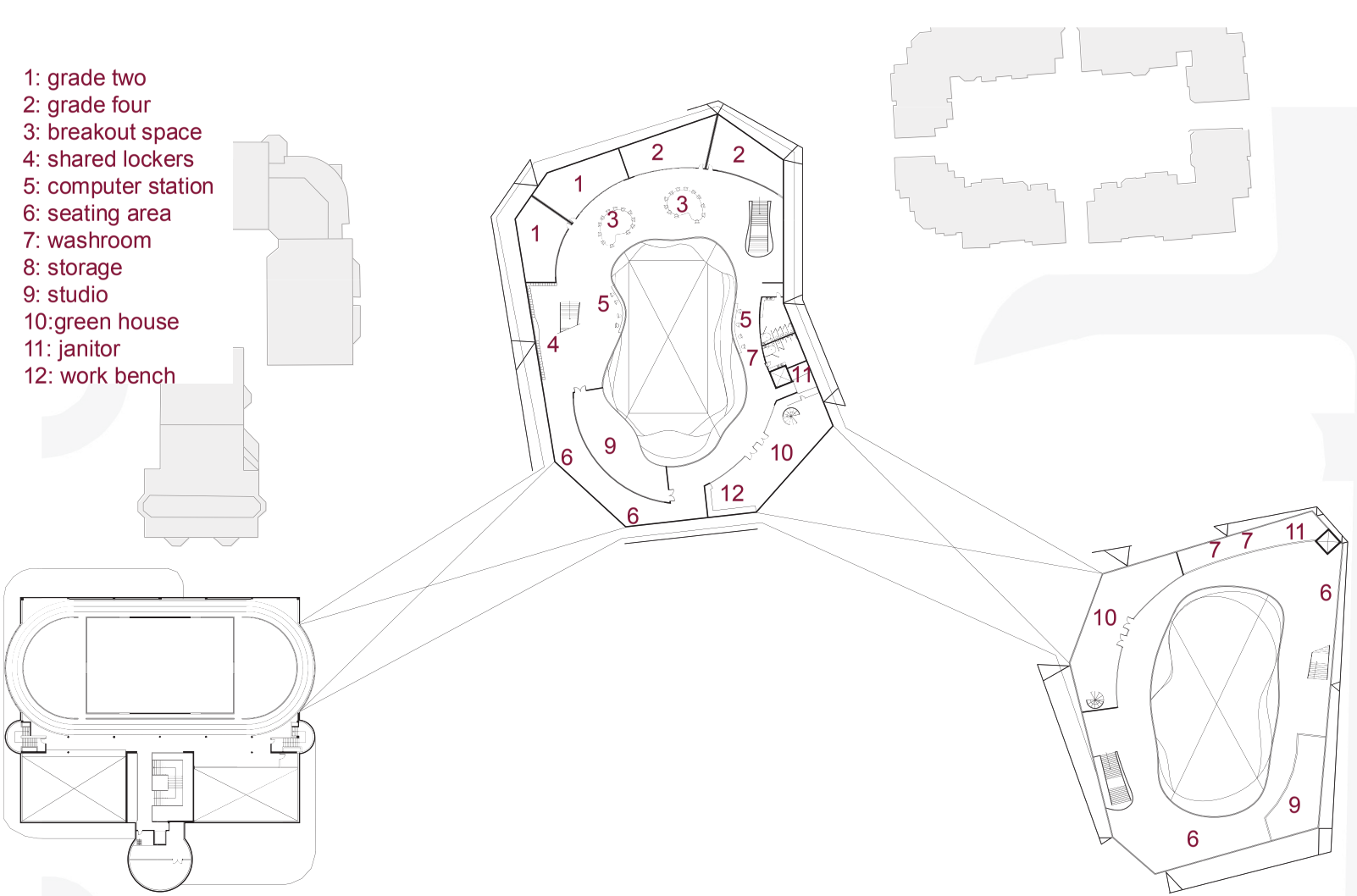
Level 2



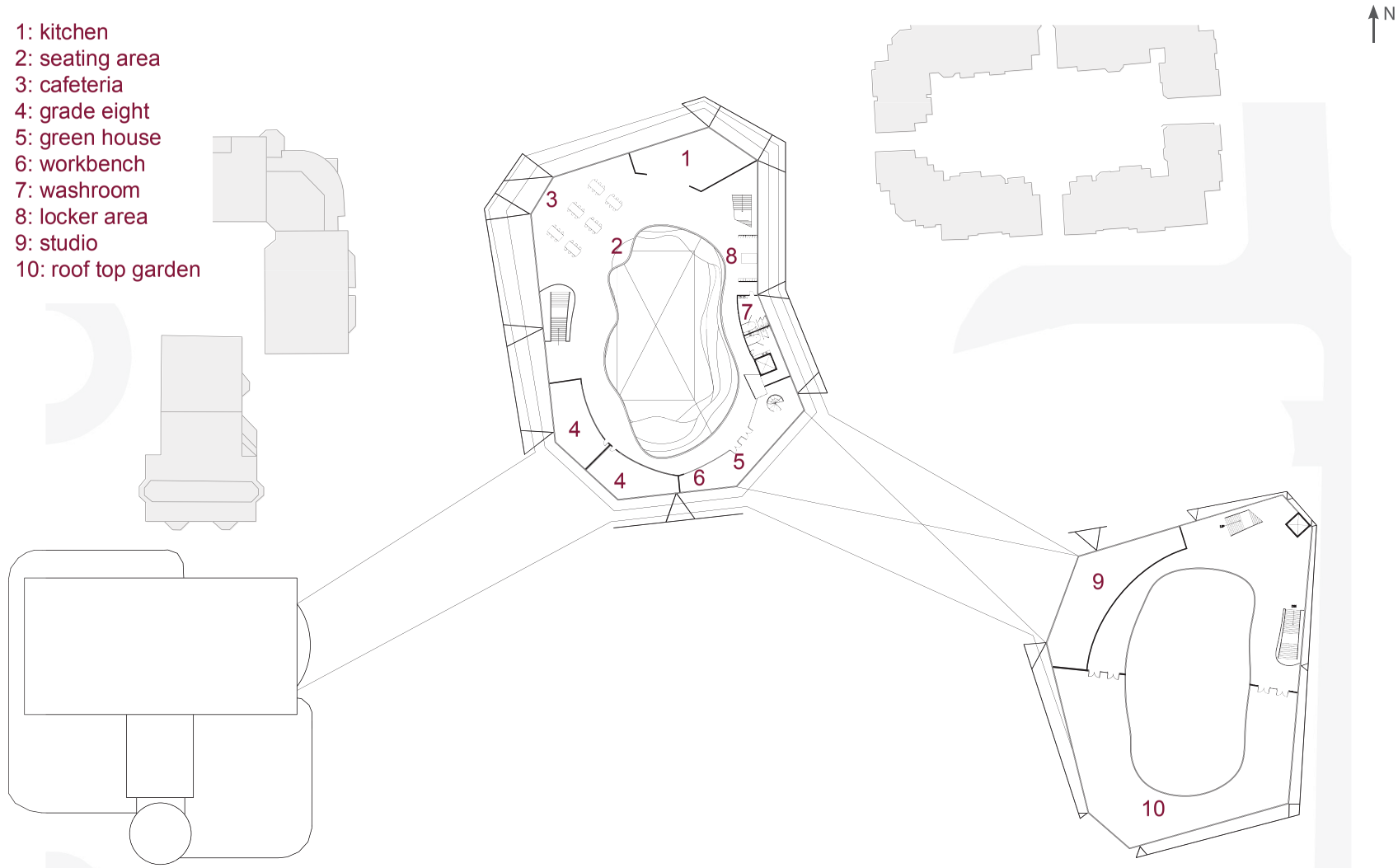
3rd Floor Plan

1: grade two
2: grade four
3: breakout space
4: shared lockers
5: computer station
6: seating area
7: washroom
8: storage
9: studio
10:green house
11: janitor
12: work bench



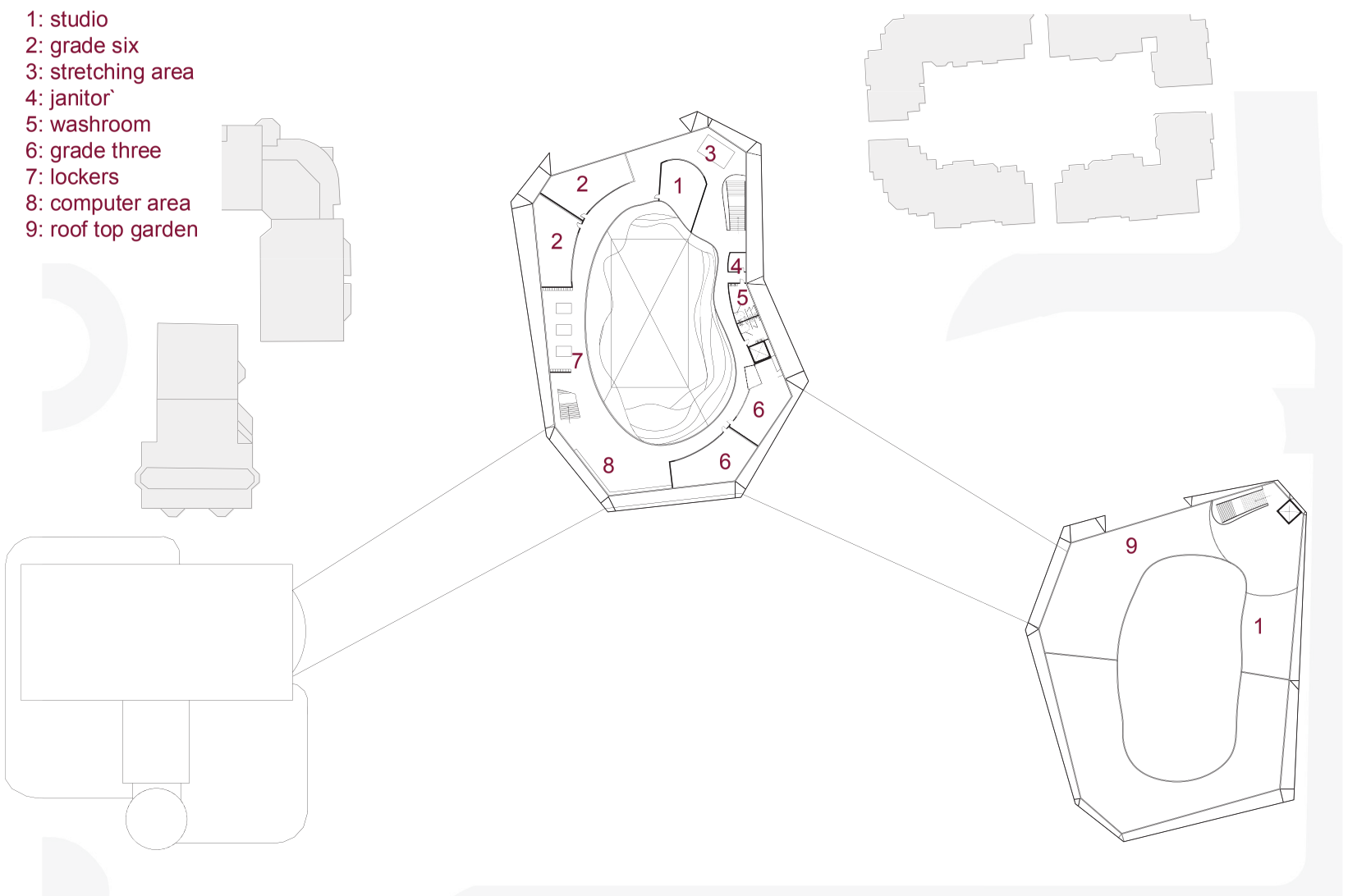
Level 4

1: kitchen
2: seating area
3: cafeteria
4: grade eight
5: green house
6: workbench
7: washroom
8: locker area
9: studio
10: roof top garden

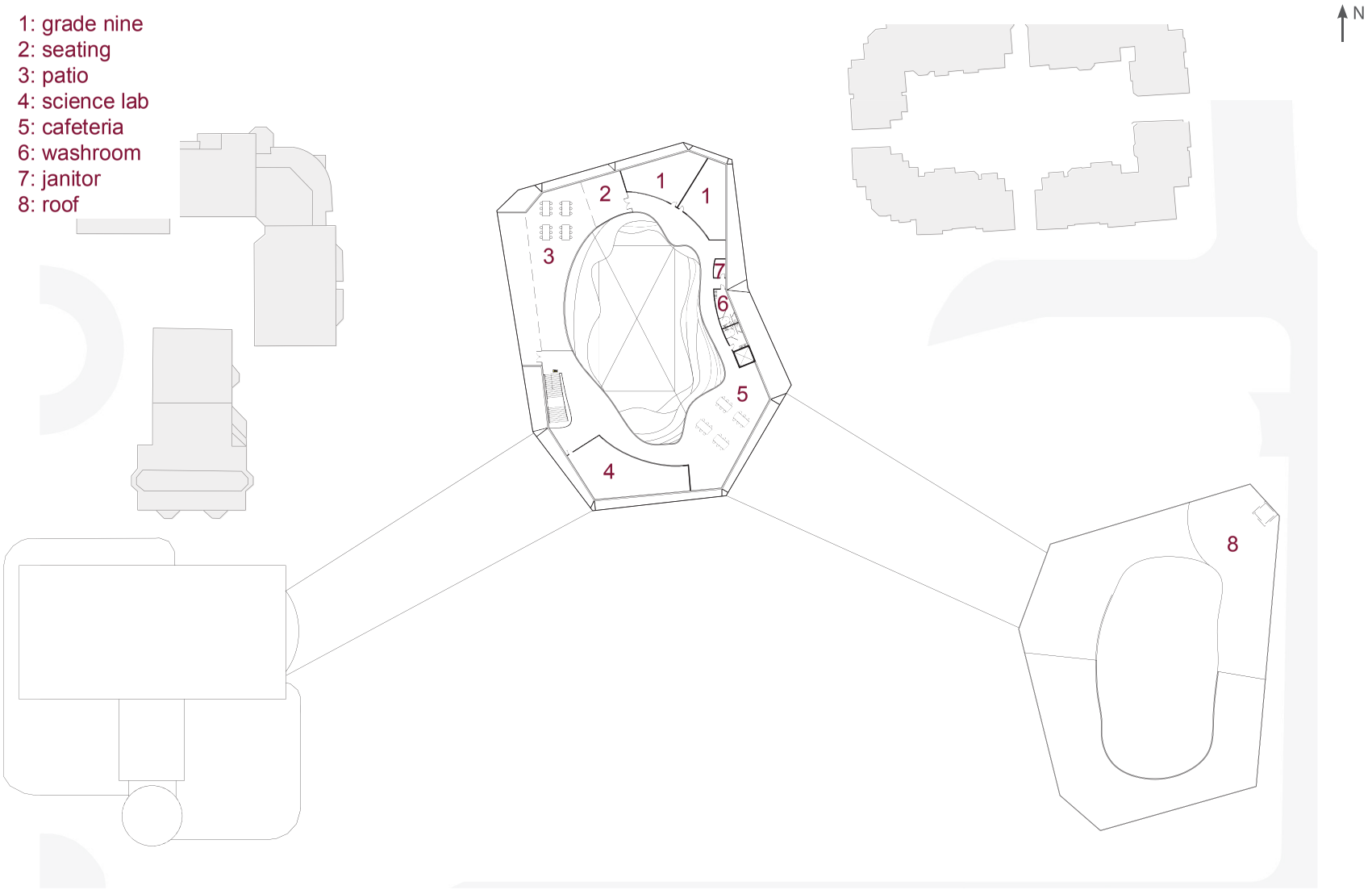


Level 5

1: studio
2: grade six
3: stretching area
4: janitor`
5: washroom
6: grade three
7: lockers
8: computer area
9: roof top garden



Level 6



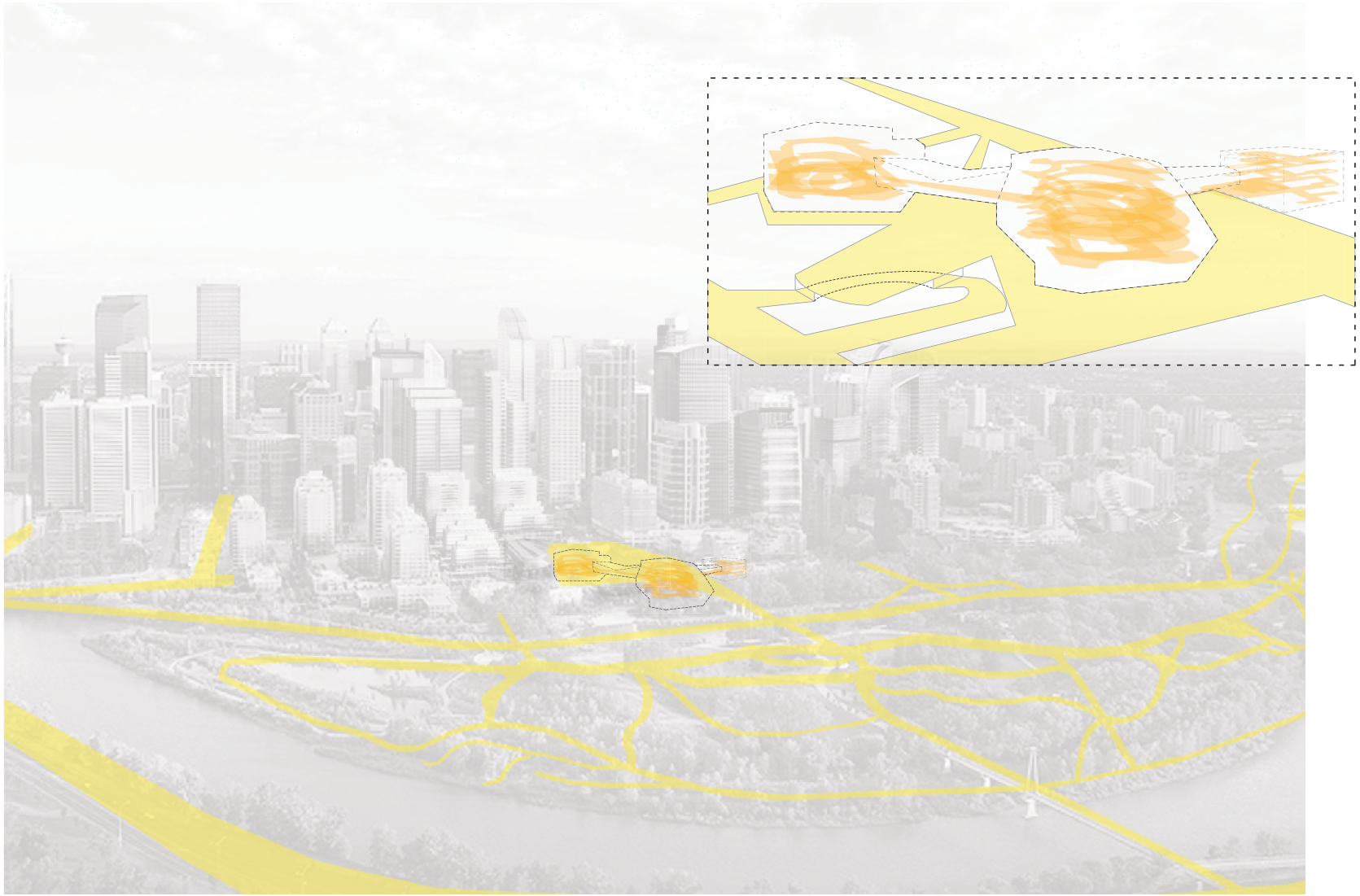
Level 7. (Roof plan shown in following section)

2.3.5: Urban Edge and Connection

On a larger scale the movement and flow between the building and the City are also very important components. As shown in earlier sections, the site was chosen for its connection to the extensive bicycle pathway network and accessibility to the downtown core. Where the bicycle pathway system meets the school building the pathway becomes integrated within the interior circulation of the building complex. The following image highlights the connections of the design as a whole.

Just west of the school building is an existing YMCA. To further connect to the City and create an environment both friendly to the child and community we create a second link to the YMCA. This link utilizes the added YMCA program space, and encourages the use of all three buildings throughout the year. Having a physical connection between the three buildings creates a well rounded atmosphere where programmatic elements are, like the hybrid model building layout (page 19), able to be used simultaneously, encouraging movement and social interaction.

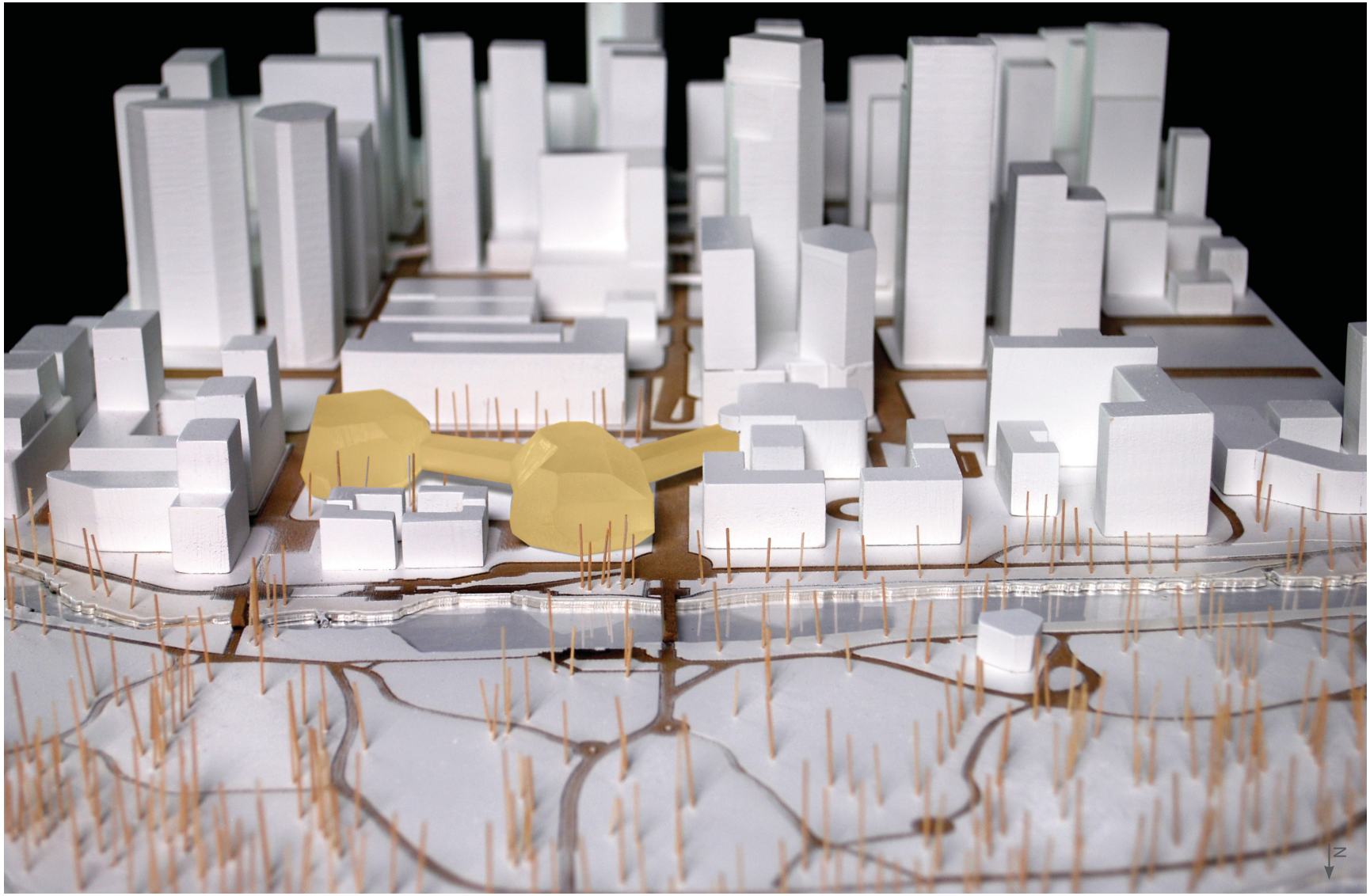
The following photos and diagrams depict the links between the community centre, the school building and the site, as well as the building complexes to the City itself. At a more haptic level there is an image that shows how the building would be accessed off the bike pathway at the edge of the City. The other drawings depict the atmosphere within the building itself. The bridge section shows the potential for an increased interaction amongst the children and the community, and an ability to learn about food from the gardens. The section also demonstrates the structural ideas for the bridge, using a concrete waffle floor slab, spider clip and trusses for glazing support. To control heat gain within the greenhouse, louvres for air flow have been added as well as tinted glass for sun shading.



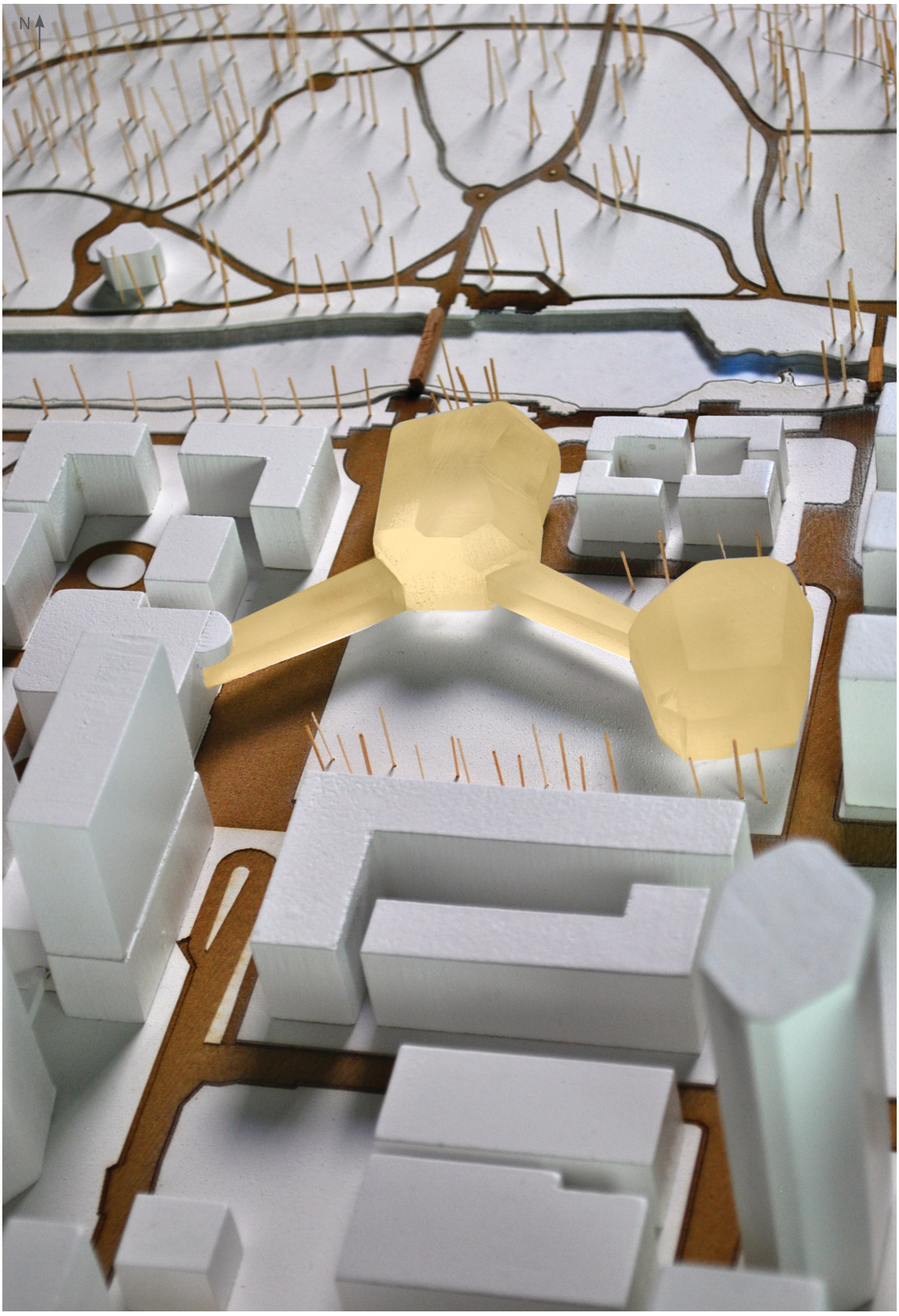
Circulation between indoor and outdoor.

Aerial view of school and community centre and surrounding buildings and landscape.

View of building from the west.

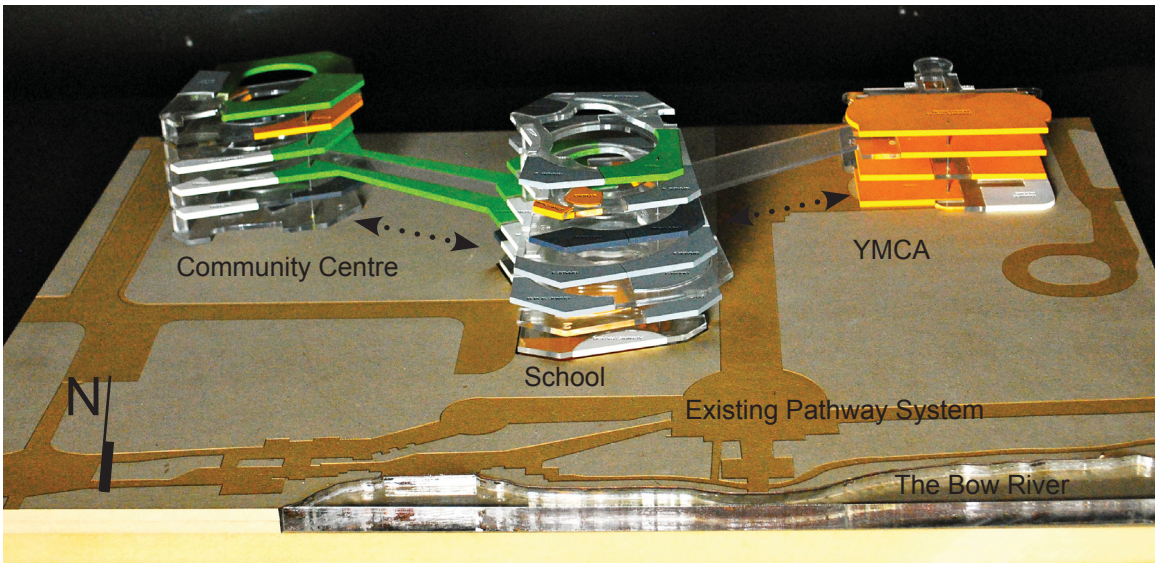


View of building from Prince's Island Park.



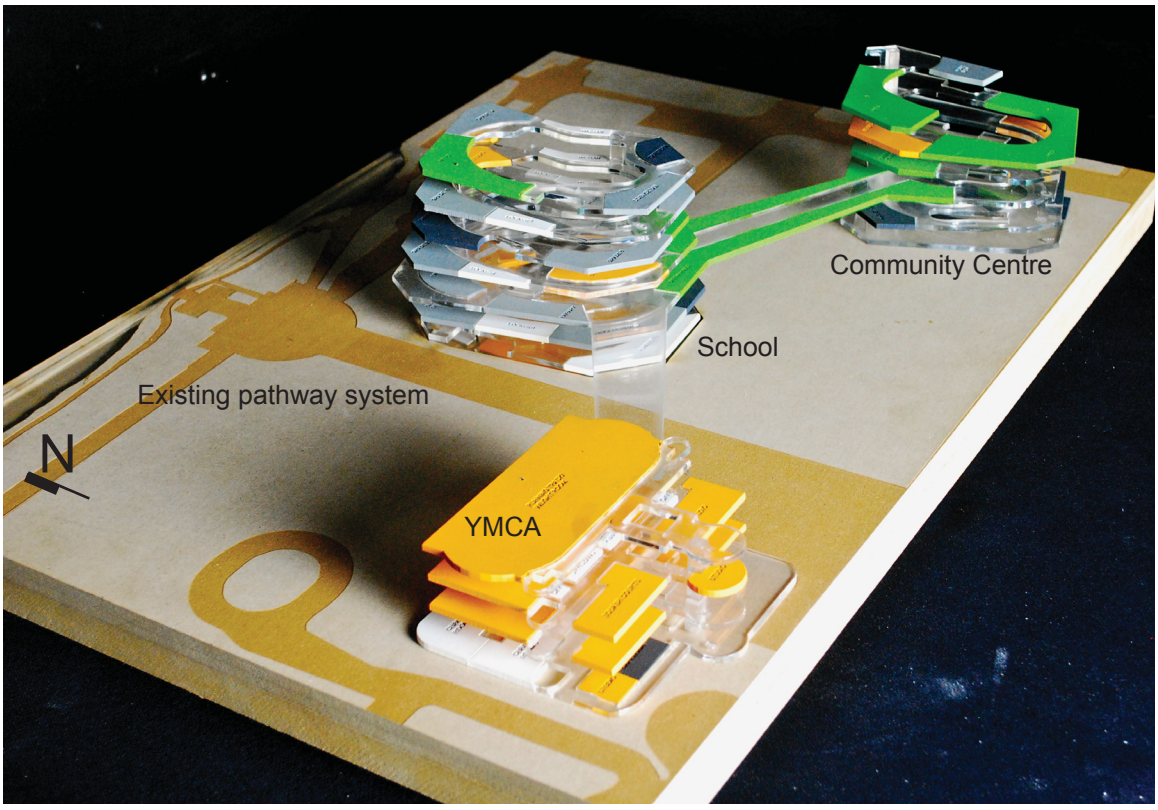
View of building from the south.

Site map and roof plan of the school, the community centre and the YMCA.

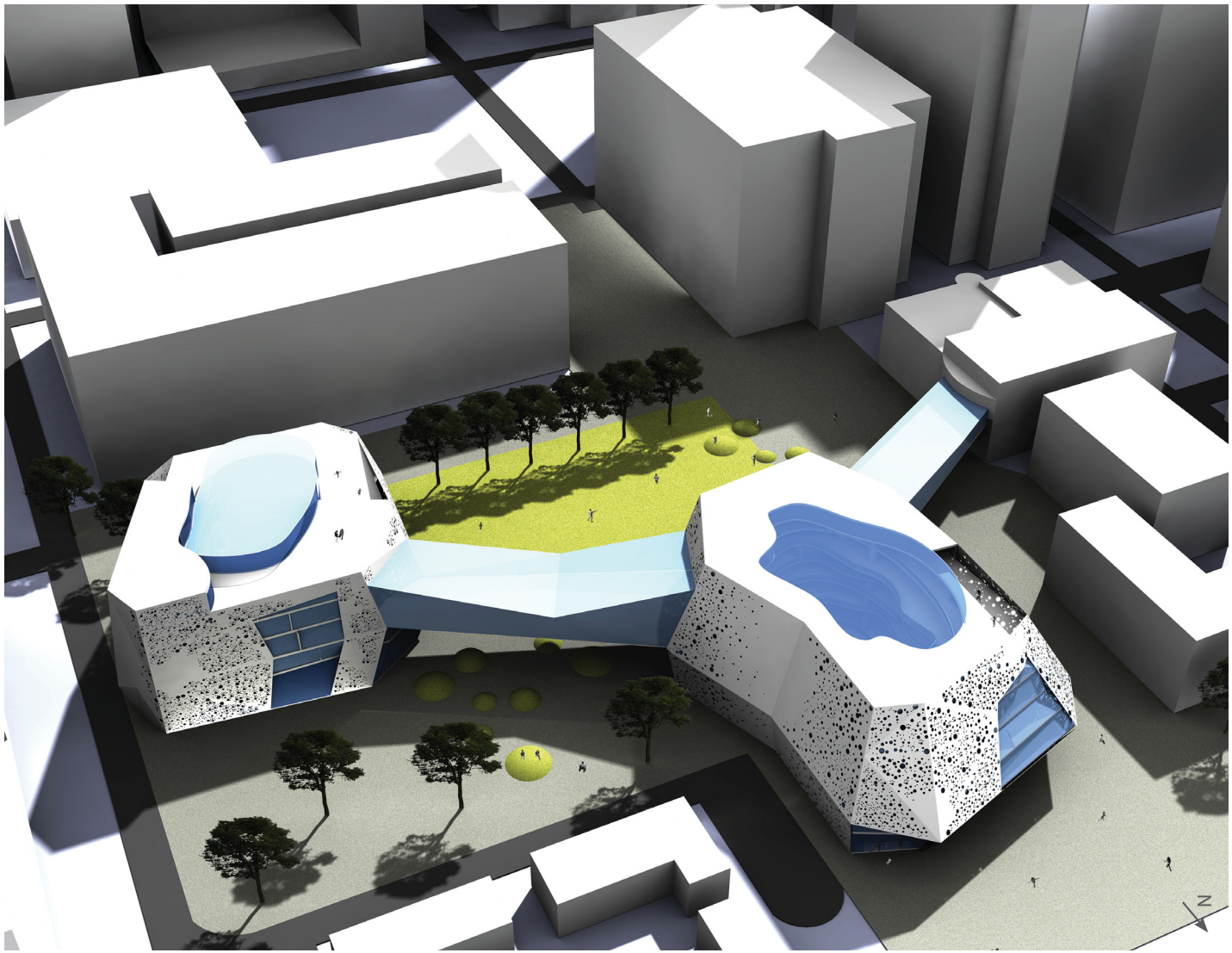


North view of program blocks for all buildings.

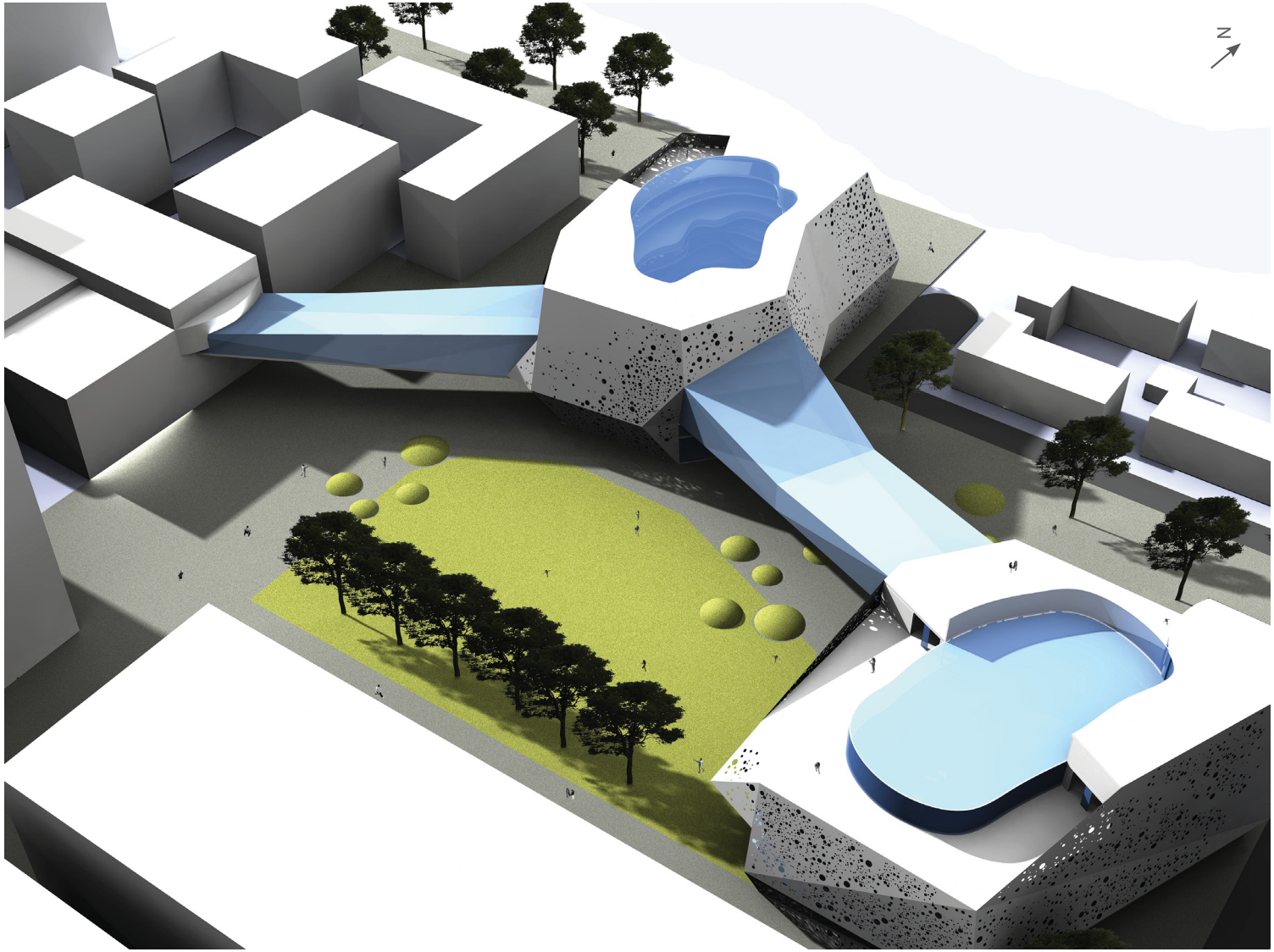
green spaces
academic areas
active spaces
food areas
ancillary spaces



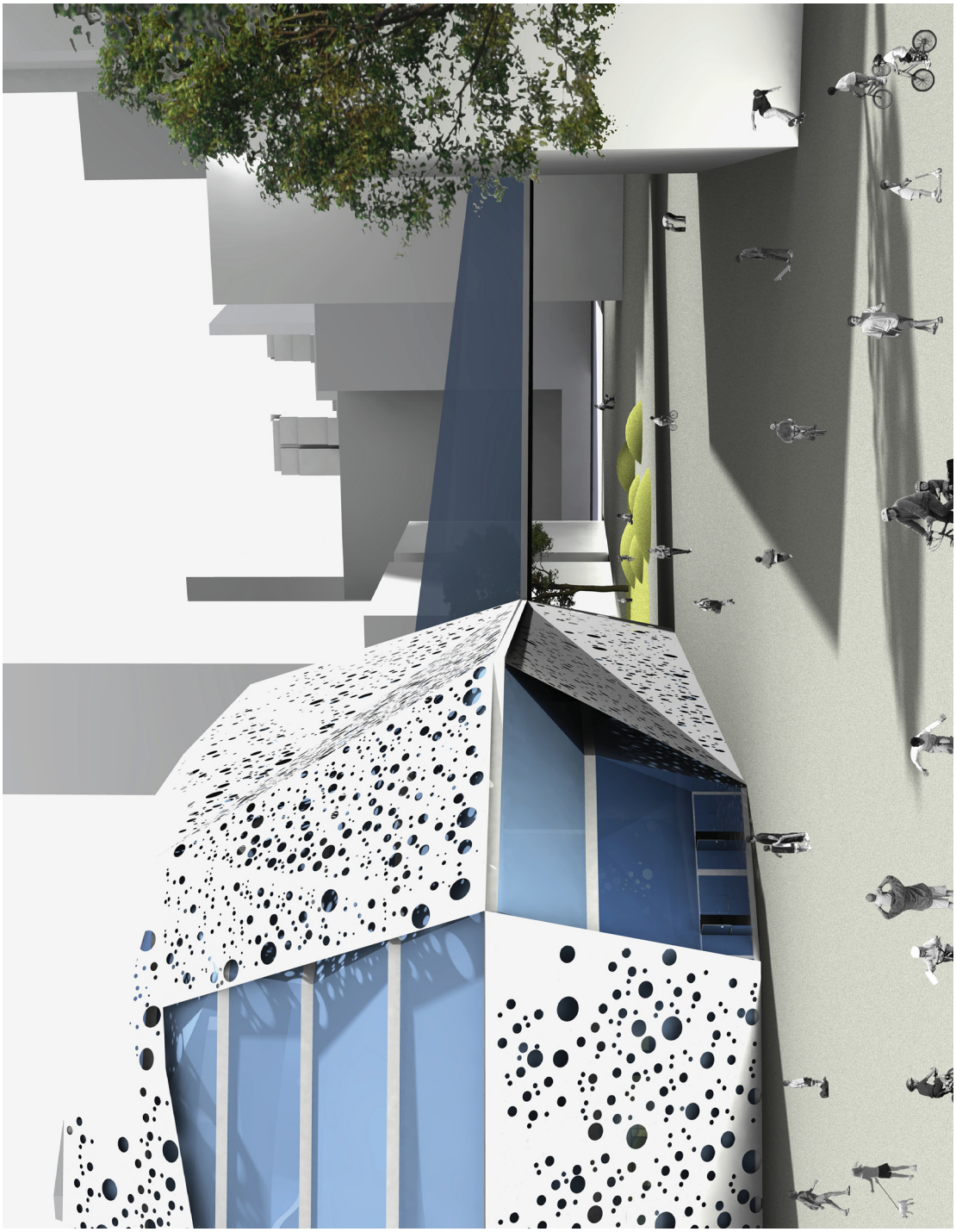
West view of program blocks for all buildings.



Aerial view of site towards city centre.

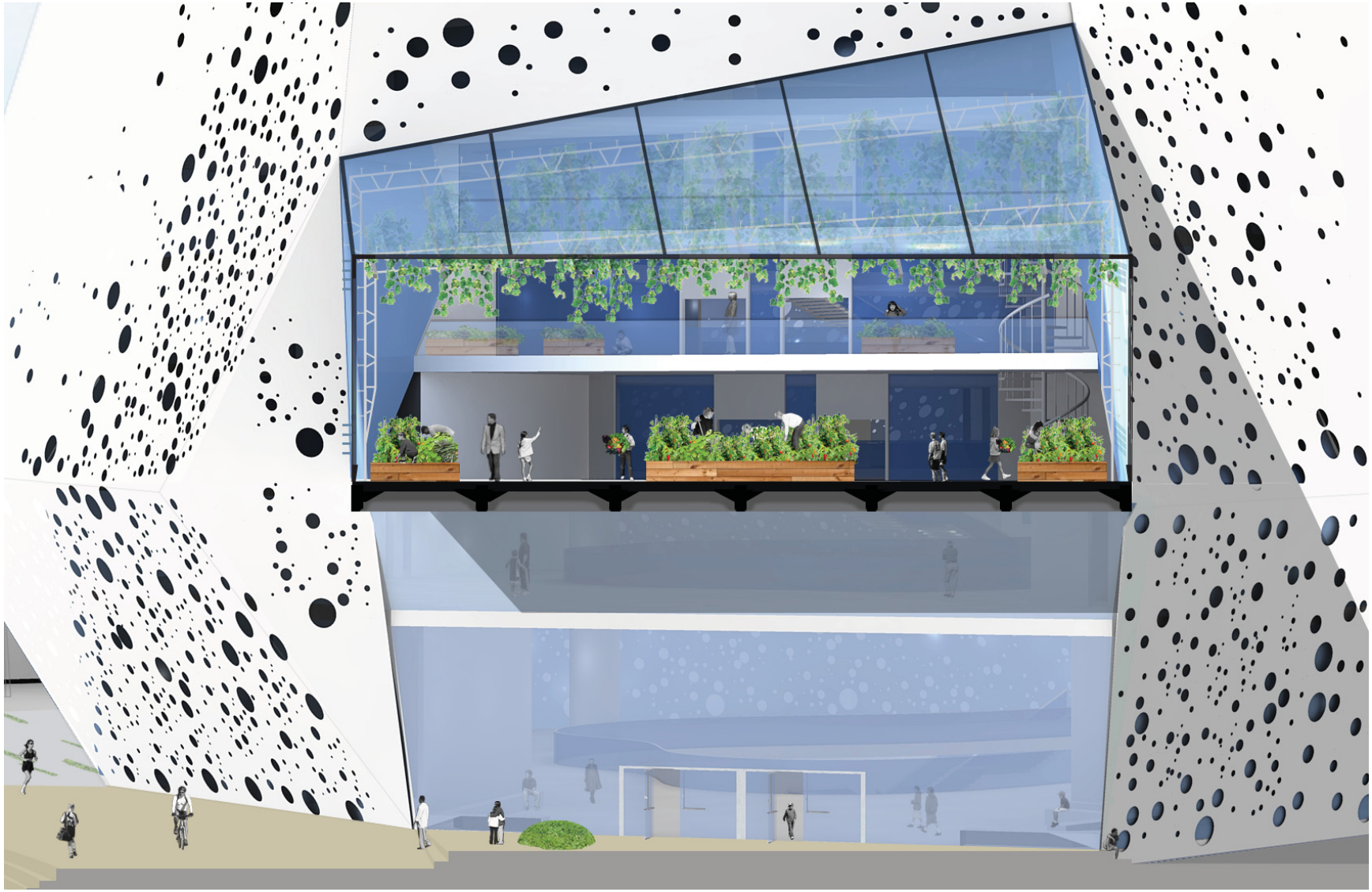


Aerial view of site towards Prince's Island Park.



View at bicycle path entrance towards city centre.

Section through connecting bridge/greenhouse in the school. (Enlargement on following page).



Enlarged section through bridge/greenhouse in the school.

CHAPTER 3: CONCLUSION

3.1: Summary and Findings

This thesis explores the meaning of architecture within the realm of the social issues of healthful living. Using a school and community centre as the area of study, the research path was directed at finding an overlap between a child's most central influences and creating an atmosphere that, given the urban context of downtown Calgary, Alberta, not only allows for a child to freely engage in physical activity, but is a suitable academic environment. These influences helped to create a set of principles to drive design decisions.

The five influential factors including atrium space, movement and flow, designing around the sun, urban connection and visual connections are all apparent and when woven together can create a space where a child is able to explore and develop strong foundations for a healthy lifestyle which will in turn strengthen the child's academic outlook. By exploring a child's direct need for an active lifestyle, architecture can react by providing the appropriate space necessary for the individual, recognizing that a school setting must be more than just a place solely for academics; it must also be a place that encourages a child or community member to engage in healthful activities.

Using the five principles to guide the design of the school building and community centre I looked to identify with a child's playful, exploratory nature within an environment. This was explored through the use of many architectural elements within and around the building. These include the landscaping, interior atrium space, activity space, the organization and implementation of programmatic elements, the building location and the playful, aesthetic nature of the building facade and form.

The surrounding exterior landscape features, including the grass mounds, different surface materials and shifting ground planes, allow for a minimally defined atmosphere, enabling a child to freely explore without being confined by an overly designed site. The interior of the building focuses on creating a very social atmosphere where children can learn about a healthy lifestyle through the physical and visual connection with one another and their surroundings. As well, the school aims to create a transformable atmosphere where a child is able to learn within a variety of environments. Hallways, studio spaces,

roof top gardens, the greenhouse, cafeteria spaces and the library can all become break-out learning spaces.

The gymnasium is strategically situated as the central focus within the building, visually accessible from each floor level, to promote its active use. Similarly, the exterior activity spaces in the park and beyond become apparent through the study of porosity on the exterior facade. The peeling back of the outer skin to provide clear views in specific areas reveal the park space to the north, the green house bridging the buildings, the shared courtyard space and the bicycle pathway, also encouraging their use.

The programmatic elements add much to the overall feel of the environment. It is not often that a child has the opportunity to learn about food and health through hands on learning, simply because the facilities are not provided. The addition of the greenhouse program also serves to link the community with the school users and provide for a unique academic environment for the children.

The building design identifies with a child's playful nature by creating an atmosphere unlike most schools. The facade itself creates an ever changing environment through the infiltration of light through the punched holes on the exterior facade. These small portholes are intended to maximize natural light where needed and vice versa.

While the massing of the buildings reacts contextually to the potential of this specific Calgary site on the edge of the downtown core, the exterior look does not blend into the surrounding architectural context, but rather stands out as a landmark, seen from downtown, across the river and down the pathways as an expression of health and wellness for children.

3.2: Obstacles

Challenges throughout the project included creating a place that satisfied many different age groups. The different developmental stages of a child can be compared to the necessity of design age-appropriate spaces. When pairing the community centre with the school and then again with the YMCA, there were challenges as to which spaces become defined and which become more open-ended. My solution was to create fairly open

spaces able to adapt to different users and program types. On a larger scale, I was able to understand the connections between the buildings and programmatic uses. However, a further investigation would be to direct the focus to a more detailed understanding of the specific spatial uses at a haptic level and from the perspective of the user. Aldo Van Eyck's playgrounds and Herman Hertzbergers' school designs were fundamental in the decisions made throughout this project. To satisfy the larger whole, a design must allow for many opportunities and encourage, rather than direct, the individual's focus on physical activity.

The five principles were created as a basic guide to ensure that a school could inspire a healthy lifestyle. However, the negative response to these guides would be to standardize them as the typical school design does. Location, age group and focus of the building in question require different architectural solutions and needs.

3.3: Further Investigations

What can be taken away from this thesis is an understanding of how to develop design guidelines that best suit the project's needs and goals such as the five principles that were established at the beginning of this project, as well as a new imagery of what school environments can become.

Further investigation within the realm of heathy design is endless. While school buildings are only one small target, my choice of the school environment was relevant in that it is, in most cases, the second home of a child. However, as a general design concept, all building types should be investigated to understand how architecture and design can positively influence a building's occupants.

On an urban scale, cities should challenge their future planning to understand the long-term effects they have on the people with the implementation of another highway leading to another sprawling suburbia. Are these places designed with all ages in mind? How accessible are they? And what opportunities are created for a person to engage in a healthy lifestyle?

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