ARCHITECTURE WITHIN THE ECOTONE: REVEALING THE RELATIONSHIP BETWEEN CITY, PEOPLE, AND WATER THROUGH THE DESIGN OF AN AQUARIUM ON HALIFAX'S WATERFRONT

by

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CONTENTS

ABSTRACT

The primary area of study for this thesis is public aquarium design. Through the study of previous proposals for an aquarium in Halifax, significant aquarium facilities around the world, and the technical requirements for the re-creation of various aquatic habitats, an effective design for a Halifax aquarium can be developed.

The introspective nature of major aquarium facilities often creates a significant disconnect between programmatic activities within the aquarium, and the dynamics of the building's immediate urban context. The efficacity of exhibit design is relating content and context, allowing the visitor to become personally invested in what is being exhibited. Through an architectural design strategy that relates exhibit, building, and site, an aquarium project could serve as an effective vehicle for connecting the Halifax harbour to its dynamic waterfront and vibrant urban fabric.

ACKNOWLEDGEMENTS

Thanks to my parents and friends, for their love and support.

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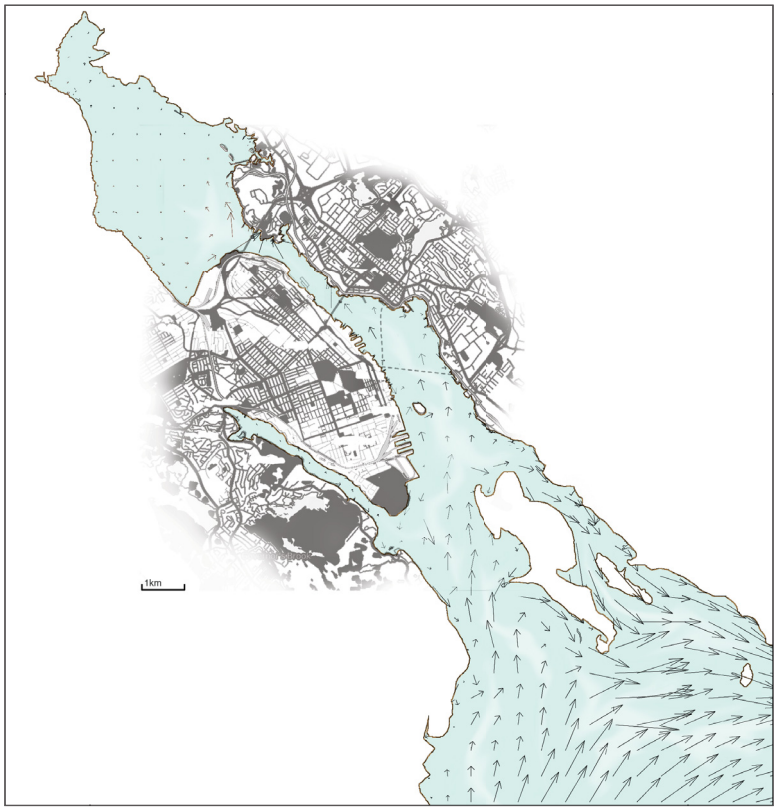
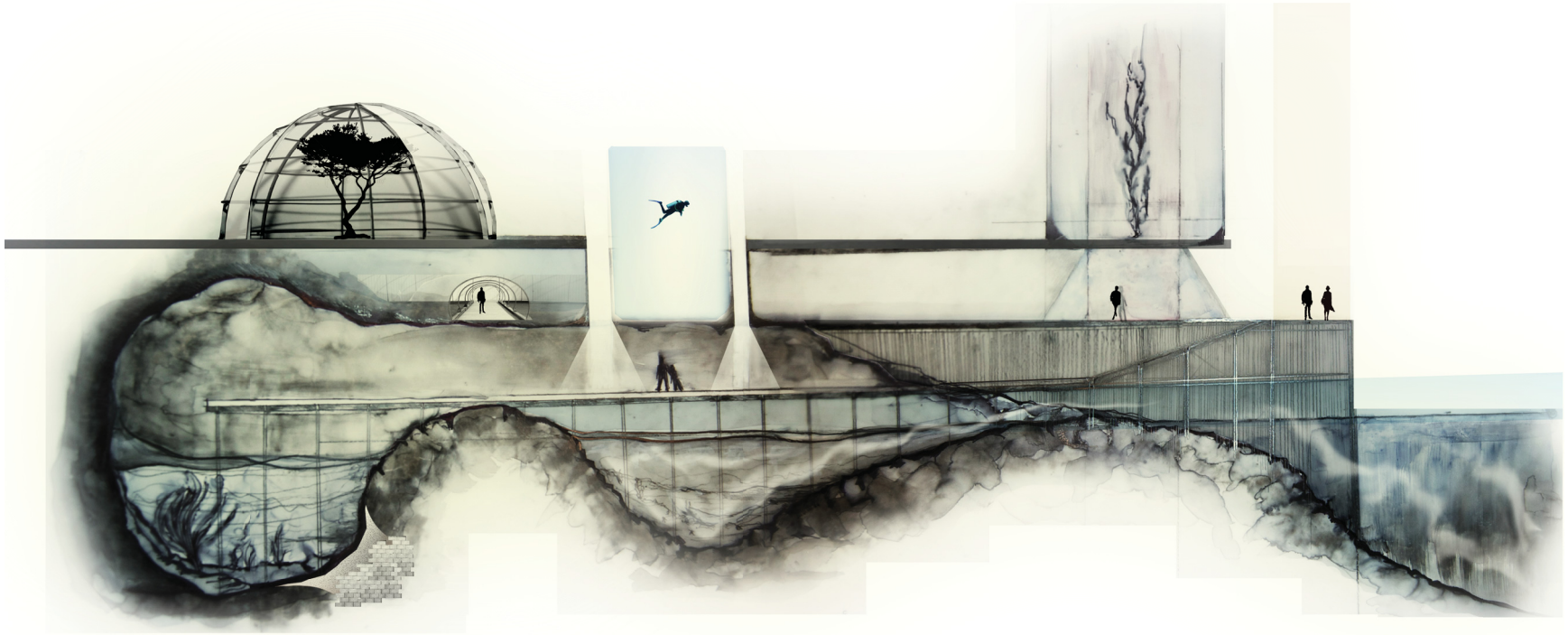
CHAPTER 1: INTRODUCTION

Thesis Question

How can architecture be used to explore spatial and experiential relationships between human and aquatic environments?



Rhythms of city and harbour



Conceptual section
Inversion of human and aquatic environments

Waterfront History and Development

Located on one of the largest natural seaport harbours, Halifax's downtown exists because of its unique waterfront. The city's strategic location has solidified its identity as a significant military hub, industrial area, and commercial gateway. For over 250 years, the Halifax harbour has remained an integral part of economic activity for the city, the province, and Atlantic Canada (Frost 2008, 3).

In the 19th century, the port of Halifax had a significant naval and commercial presence. During the peak of the 'Golden Age of Sail', Halifax's maritime commercial base was dependant on its relationship to the water. Maritime traffic brought immense commercial prosperity until the expansion of the railway system in the 20th century. Commercial competition from Quebec and Ontario, and a lack of entrepreneurial initiative, resulted in the end of the 'Age of Sail,' and ultimately led to the decline of the Halifax waterfront (Boileau 2007, preface).

By the 1970s, the neglect and decay of the port finally resulted in a concerted renewal effort by the government and the public through the establishment of the Halifax Waterfront Development Corporation in 1976 (Boileau 2007, preface). The corporation's goal was to revive the energy and commercial dynamism of Halifax's historic waterfront:

> Waterfront Development harnesses the waterfront's potential by creating ideas, infrastructure and experiences that stimulate business investment and community pride. The redevelopment and revitalization of waterfront lands is the primary mandate of the corporation, and following our development principles is crucial on the Halifax waterfront, and every waterfront. (Halifax Waterfront Development Corporation n.d)

Public Facilities for the Halifax Waterfront

In 2004, the Halifax Regional Municipality conducted an investigation into six waterfront cities similar in scale, character and function to Halifax: Victoria, British Columbia, London, Ontario, Portland, Oregon, Charleston, South Carolina, Helsinki, Finland, and Wellington, New Zealand. These case studies focused on urban development, and emphasized the significant role that waterfronts play in downtown revitalization initiatives. Performance spaces, plazas, museums, tourism facilities, and park spaces are all examples of attractions that bring tourist and community recreation back to the downtown (HRM Capital District 2004, 18).

As development along Halifax's waterfront progresses in the 21st century, it is important to consider the types of buildings occupying the periphery of city and harbour. With residential, commercial, and office buildings already present along this route, one could argue that a significant civic institution, like an aquarium, could provide public attraction and amenity that is not currently available. The facility could play a significant role in the revitalization of the waterfront and downtown because if its appeal to both tourists and citizens.

Proposed Site and Program

Why An Aquarium for Halifax?

With a downtown core that has been in decline over the last few decades, it is important to consider the economic, social, and ecological value that an aquarium could provide for the city of Halifax:

> Planners in other cities have considered many different solutions to revitalize waterfront districts of cities around the world. One possible solution to many of Halifax's problems is to develop a public aquarium for the Halifax downtown waterfront district. This aquarium could act as a draw to tourists, become an educational centre for Nova Scotia, and become a research facility for governments and other agencies. (Ferguson 1993, 4)

An aquarium is an economically viable facility to place along the waterfront. By acting as both a tourist destination and a educational center, the Halifax Aquarium could serve as a visitor's destination during peak tourism months, between May and October, and as a student destination for regional school boards and universities throughout the academic year. By providing significant social spaces, a lecture theatre, exhibition space, and laboratory facilities, the aquarium could not only provide spaces to conduct marine research, but also act as significant public platform where environmental concerns and conservation efforts in the Atlantic region can be discussed openly.

Site Selection

Presently, significant waterfront property is occupied by single-level parking lots, which do not provide amenity or an appealing urban experience for tourists and citizens. The HRM is currently supporting policies that discourage long-term parking in the downtown, and encourage the use of public transit (HRM Capital District 2004, 20). By implementing these policies, large single-level parking lots along the waterfront can be demolished and replaced with more engaging public spaces and facilities.

The proposed location for the Halifax aquarium is the parking lot directly adjacent to the Maritime Museum of the Atlantic on the waterfront. The juxtaposition of these two attractions could allow the aquarium to act as the ecological counterpoint to the Maritime Museum, which holds exhibits that are focussed primarily on the naval and nautical history of the Maritimes. The aquarium could also help to create an engaging suite of significant civic institutions in the area. By establishing partnerships between the Halifax Aquarium, the Maritime Museum of the Atlantic, the Art Gallery of Nova Scotia, the Discovery Center, and NSCAD University, public attention could be drawn to Halifax's downtown and waterfront area.

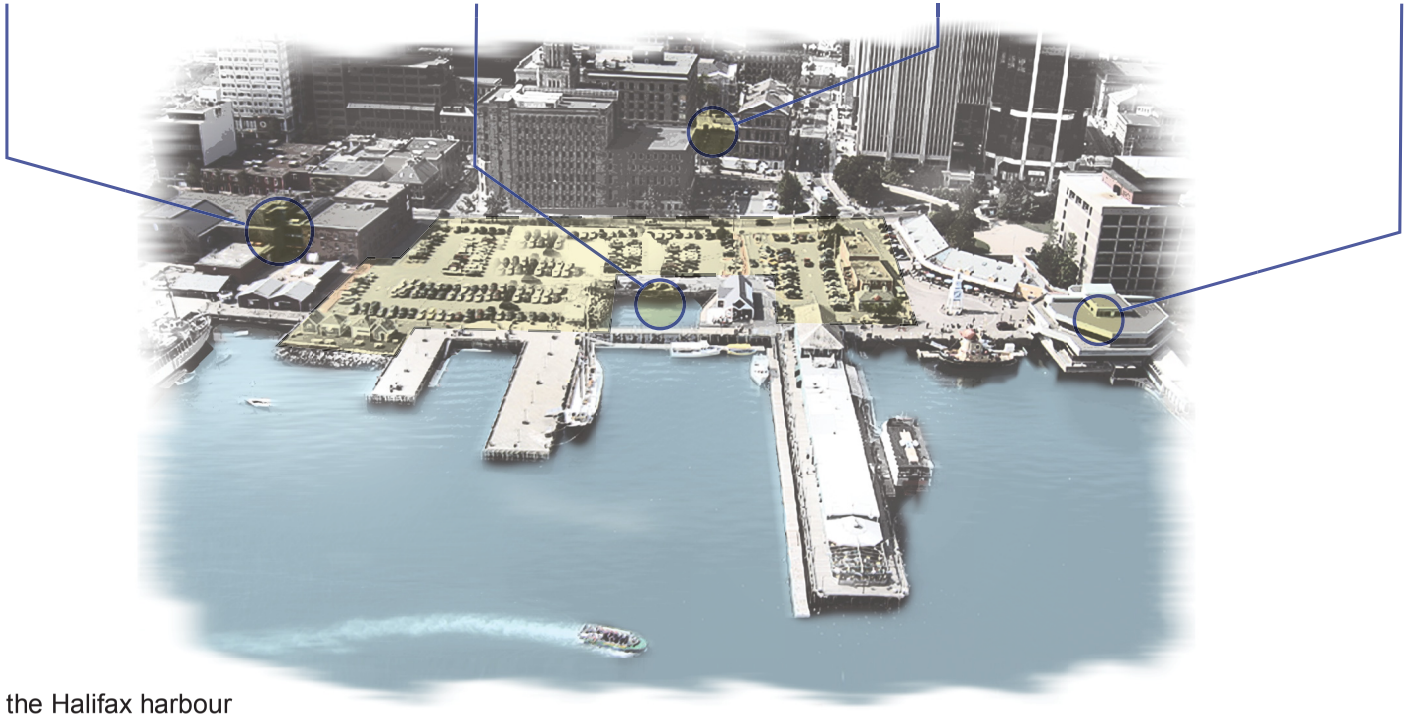
One of the unique features of the site is the presence of a small harbour inlet, which allows for pedestrians to catch glimpses of the marine phenomena present within the harbour. This site experiences the dynamics of pedestrian, vehicular, and marine traffic flows, as well as the tidal variance that is a significant to the Atlantic Canadian coastline. The implementation of an aquarium program on this site could allow for significant relationships between water and city to be explored through an architectural design.

MARITIME MUSEUM
OF THE ATLANTIC

HARBOUR
INLET

ART GALLERY OF
NOVA SCOTIA

FERRY TERMINAL



Aerial view of the Halifax harbour
Original image source:
(Halifax Alive, 2011)

Aquariums as Tools for Conservation Efforts

Since the Halifax aquarium is meant to act as the ecological counterpoint to the Maritime Museum of the Atlantic, it is important to understand the significant role that aquariums play in conservation efforts. The Association of Zoos and Aquariums (AZA) undertook a three-year study of the impacts of zoo and aquarium visits. The purpose of the study was to better understand and predict how institutions like aquariums contribute to public understanding of ecology, and how effective they are as tools for conservation education (Falk 2007, 4).

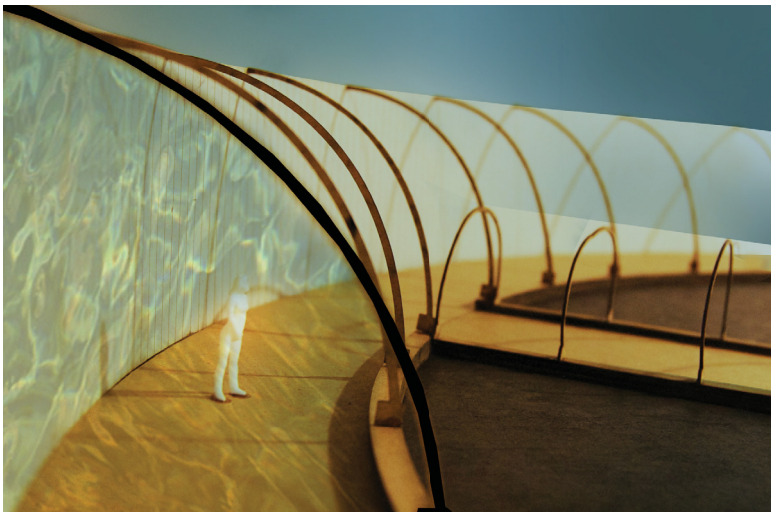
The results of the AZA study found:
54% of the individuals surveyed had elevated awareness of their role in conservation as a direct consequence of their visit.

42% commented on the important role that zoos and aquariums play in education.

Seven to eleven months after their visit :
61% of visitors were able to talk about what they learned from their previous visit

35% reported that the visit reinforced their existing beliefs about conservation. (Falk 2007, 4)

The results of the AZA study are significant, and demonstrate the value that an aquarium brings to the city of Halifax. The aquarium would provide a public venue for both visitors and citizens where issues related to ocean conservation efforts and current research can be showcased. The aquarium could act as an aquatic ecological center, and could work in conjunction with the significant research facilities already existing within the Halifax Regional Municipality such as Dalhousie's Department's of Oceanography and Marine Biology, the Bedford Institute of Oceanography, and the Ecology Action Center.



Conceptual perspective
Inversion of human and aquatic environments

CHAPTER 2: AQUARIUM STUDIES

The History of Aquariums Facilities for Halifax

The prospect of an aquarium for Halifax is not an entirely new idea. Within the last few decades, significant proposals have been made to build an aquarium in the Halifax area. Yet because of the changing economic landscape over the last forty years, proposals and feasibility studies have resulted in varied conclusions.

1. 1962

The Bedford Institute of Oceanography is officially opened. This institution was originally designed as a center for hydrology, oceanography, geophysics, chemistry, and geology focusing on aquatic environments within Atlantic Canada and the Canadian arctic (Gordon 2011, 7).

2. 1967

The first proposal for an aquarium in Halifax coincided with the Centennial of Canada's Confederation in 1967. Unfortunately, the aquarium project was poorly managed, and large cost increases accrued before construction even began, leading ultimately to the cancellation of the project by the City of Halifax. The Centennial Pool project was constructed instead (Ferguson 1993,12).

3. 1978

The concept of a Halifax aquarium resurfaced in 1978 when a feasibility investigation was conducted by the Waterfront Development Corporation. After considering the population base in the Halifax-Dartmouth area, the WDC concluded

that this area was too small to support an aquarium project (Ferguson 1993, 12).

4. 1985-1990

The Cable Wharf parking lot at the corner of George and Water street was identified as a promising site for an aquarium. A feasibility study was prepared which identified the need for additional income to subsidize the operations of the aquarium. Despite the amount of Corporate Sponsorship, as well as all the time and effort spent on proposals for this project, it never went ahead (HRM Capital District 2004, 34).

5. 1990-1992

In the early 1990s, the notion of a Halifax aquarium was investigated once more when the Canadian Department of Fisheries and Oceans operated a fish 'touch tank' on the Halifax waterfront throughout the busy summer tourist months. The small tank contained crabs, scallops, sea cucumbers and starfish that could be touched an inspected up close, and visitors could experience these creatures free of charge. Less than one square meter in size, this small exhibit attracted 77,000 visitors in the summer of 1990 (Ferguson 1993, 15). This touch tank was so popular with tourists that a local entrepreneur built a small aquarium in a tent at Sackville Landing which operated for several summers (HRM Capital District 2004, 34).

6. 2002

The Halifax Waterfront Development and Open Space Plan is established by the Waterfront Development Corporation

Ltd. and the Halifax Regional Municipality. This plan entailed the creation of two major open spaces along the waterfront. A large amount of development was proposed, and the potential for a Halifax Aquarium was discussed throughout preparation of this plan (HRM Capital District 2004, 4).

Despite consistent concerns pertaining to the feasibility of this type of facility, it is clear that the concept of an aquarium for Halifax has always been present. With a significant tourism industry, various marine research facilities, as well as development initiatives for waterfront redevelopment, a Halifax aquarium could provide significant value to the city.

Aquariums as Informal Learning Environments

Informal learning environments such as planetariums, aquariums, museums, and science centers are shown to be very effective for scientific learning, especially when compared to a formal classroom setting. This is primarily due to their ability to reach people of all ages, with varying levels of interest, knowledge, and experience with science. Exhibit design has also become increasingly interactive, which has been shown to elicit more thoughtful comments and conversations about what is being exhibited (Fenichel and Schweingruber 2010, xii).

The Discovery Centre located on Barrington Street is a successful example of an informal learning environment within the city of Halifax. Offering a unique, interactive and engaging learning experiences for visitors, these types of exhibits are integral for scientific education in the Halifax area.

> According to the Discovery Centre, children who are exposed to these types of hands on exhibits are less likely to be intimidated by math and science later on in life, and are more likely to pursue careers in these fields. (HRM Capital District 2004, 35)

The HRM has put forward a mandate emphasizing the importance of these kinds of facilities for municipal development in the 21st century, and is planning on moving this facility to a more prominent place on the Halifax waterfront. This mandate further supports the notion of a waterfront aquarium project, as this type of facility would provide interactive scientific learning exhibits for younger demographics.

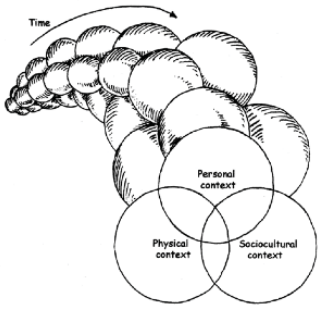
Touch tanks
Monterey Bay Aquarium
Image source:
(Davis 1991, 132)

Touch tanks have become great educational tools for aquariums because they allow visitors to engage with marine life in a tactile manner. This method of interactive learning is especially significant for younger demographics, allowing children to gain a better understanding of marine ecology, and the materiality and fragility of ocean ecosystems.

> ... learning is not something that happens, or is just inside the head, but instead is shaped by the context, culture and tools in the learning situation. (Hansman 2001, 45)

Interactive exhibit
Touch tanks

The Contextual Model of Learning



Contextual Model of Learning
Image source:
(Falk & Dierking 2000, 12)

The primary challenge for exhibit designers is to extend the impact of scientific learning beyond the initial visit, and to inspire thought about the exhibit content long after the initial experience. Recent museum and visitor studies have shown that the key to extending the experience beyond the visit is to give individuals a sense of how the content being exhibited relates to their physical and socio-cultural context.

Falk and Dierking's contextual model of learning illustrates the significance of the physical environment's role in the learning experience. Architecture and exhibits that place an individual into their immediate context have been shown to reinforce a visitor's learning experience outside the museum. (Falk & Dierking, 2000)

The contextual model of museum learning further supports the notion of a waterfront aquarium, as the relationship between content and context is significant for information retention. By illustrating the connection between aquarium content and the ecosystem of the harbour through an architectural design, it is hoped that visitors will be more personally invested in their aquarium experience.

Aquarium Precedents

Aquarium precedents are useful for gaining an understanding the nature of these complex building types. Throughout my investigation into aquarium facilities and informal learning environments, an articulation of physical context through architectural language was an important design objective to research.

New Academy of Sciences Building California

Golden Gate Park, San Francisco, California

Renzo Piano, 2008

New Academy of Sciences Building green roof
Image source:
(Taylar, Ingrid 2008a)

The purpose for this building was to bridge various programmatic elements under one roof, connecting the Kimball Natural History Museum, Steinhart Aquarium, and Morrison Planetarium, while also linking the entire project to its ecological setting. The design intention for the building was to create an iconic modern landmark that brings attention to preservation efforts. The exhibition of local ecology, development of building transparency, and formal emulation of the Californian terrain reinforces Piano's concept of the museum being placed underneath a portion of the Golden Gate Park:

> With the new Academy, we have created a museum that is visually and functionally linked to its natural surroundings, metaphorically lifting up a piece of the park and putting a building underneath. (Zeiger 2008, 152)

Building transparency
Image source:
(Taylar, Ingrid 2008b)

The new academy was designed to have a low environmental impact in order to advocate environmental responsibility and the preservation of natural ecosystems. Piano's tectonic strategy for connecting building and park was implemented through a careful selection of materials and a thoughtful arrangement of spaces. Glass is used extensively for the exterior walls, and slender support columns enhance transparency, allowing visitors to look through the museum and engage with their surroundings.

This case study is and informative precedent for a Halifax aquarium because of its formal and ecological connection between building, exhibit and context. Additionally, the project's intentional openness and transparency demonstrates a questioning of the traditional aquarium and museum typology.

Monterey Bay Aquarium

Monterey,California

Esherick Homsey Dodge and Davis, 1984

View to Monterey Bay
Image source:
(Davis 1991, 131)

The site for the Monterey Bay aquarium is located near a great ocean fissure that sustains an abundance of varied marine life. This unique location is ideal for oceanographic and marine research, and the primary initiative for the aquarium is to devote attention to the vibrant sea life present within the Monterey Bay.

> The hidden soul of Monterey Bay is likely to remain a sweet mystery, but some of its stirrings are slowly becoming intelligible to scuba-diving marine biologists. Now there is an aquarium at the edge of this sea which displays the secrets of its deep to the rest of us. ("New Aquarium" 1985, 123)

Kelp forest tank
Image source:
(Davis 1991, 132)

The architectural design of the museum is derived from the old factory buildings that once housed a fish cannery on the waterfront site. Factory-like loft spaces accommodate large fish tanks, laboratories, classrooms, dining facilities, technical support spaces and vast mechanical equipment areas required for the aquarium. A terraced path to a tidal basin on the building's exterior allows visitors to experience local ecology. Views of seabirds diving into the water and seals perched on nearby rocks gives the visitor an enhanced experience of the aquatic ecosystems of the Monterey Bay

Viewports into large tanks
Image source:
(Davis 1991, 133)

(“New Aquarium” 1985, 123).

This aquarium design is successful because of its commitment to the preservation of its ecological context. The aquarium not only hosts the species present within the bay, but also pays homage to the industrial history of its waterfront location.

Pedestrian walkway
Halifax waterfront

Small wharf shed building

The Acadia docked in front of the Maritime Museum

Theodore Tugboat
Boat tours

CHAPTER 3: DESIGN

Best Practice For Aquarium Design

After investigating the history of project proposals for Halifax, considering contemporary theory on informal learning environments, and looking to successful precedents, it is clear that establishing a relationship between scientific content and context is critical for effective learning experiences. Design criteria establish guidelines for successful aquarium facility along Halifax's waterfront.

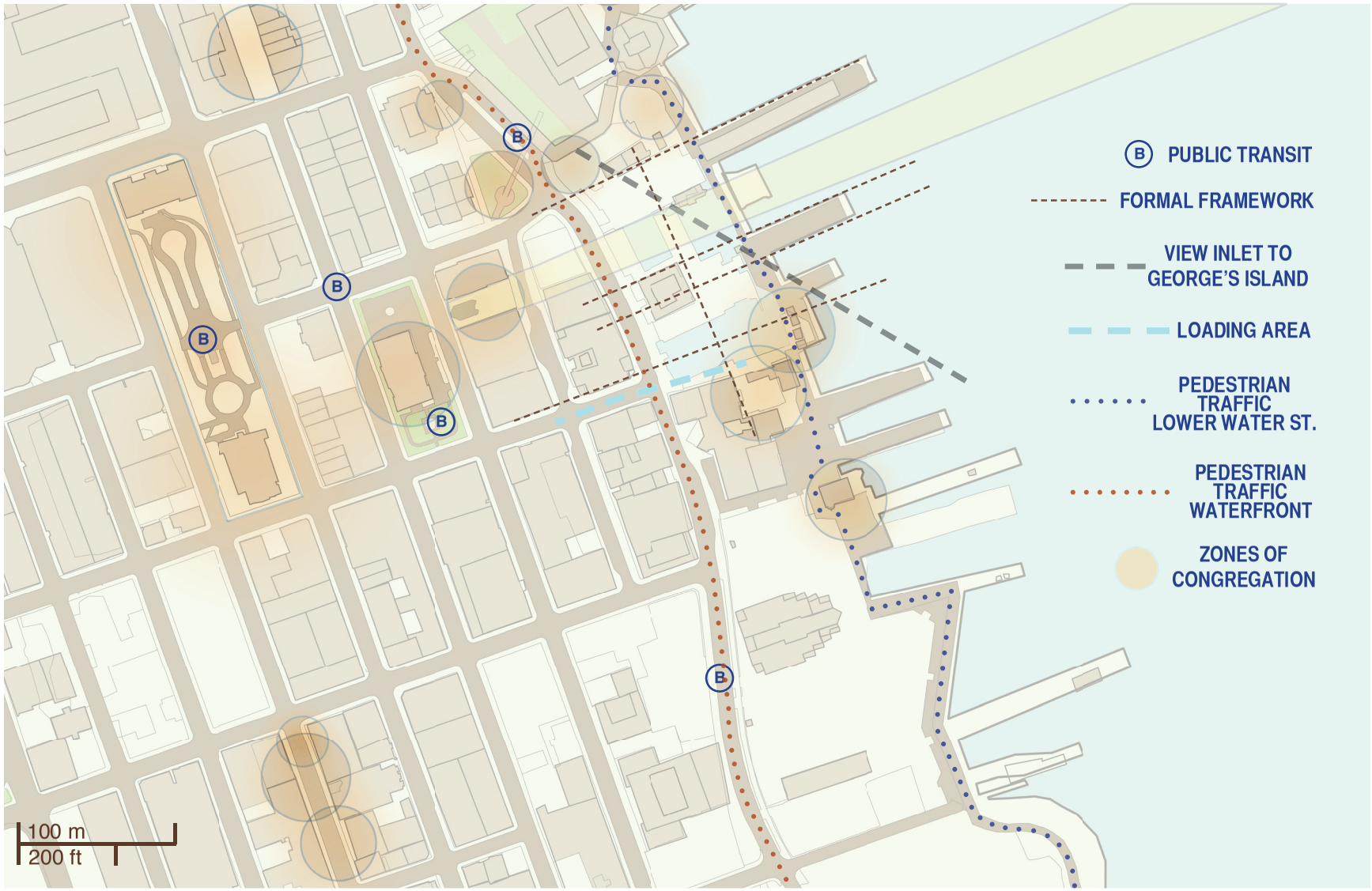
Architectural Design Criteria for the Halifax Aquarium

- Implement interactive exhibits and touch tanks
- Showcase local ecology
- Relate building and landscape
- Maximize continuous public access to the water's edge
- Create public spaces that provides quality, amenity, and flexibility
- Interpret historical uses, activities and forms of the waterfront
- Provide a dynamic, year-round destination
- Integrate well with the surrounding urban fabric
- Support activity at the water's edge

These principles serve as effective design criteria for any significant public building on the Halifax waterfront. In order to abide by these principles, it is crucial to outline significant site forces. By identifying existing traffic flows (pedestrian, vehicular, marine), significant public spaces, important views, as well as architectural forms (urban and marine), one can begin to develop an effective massing strategy for the proposed aquarium.

Site Forces

The site is the parking lot directly adjacent to the Maritime Museum of the Atlantic. This dynamic area experiences the flows of pedestrian, vehicular, and marine traffic. The tidal variance that is a significant element of the Atlantic Canadian coastline is also apparent within the harbour inlet. Therefore, the tides can become a part of the exhibition, connecting Lower Water Street to the Halifax harbour. The gradient between land and sea can be explored through an architectural design.



Significant forces acting on the site

Site Strategy

The massing strategy for the Halifax aquarium is meant to negotiate between the forces of the urban fabric and the wharf.

View corridors between city and harbour created by Prince and George streets remain unoccupied by building massing.

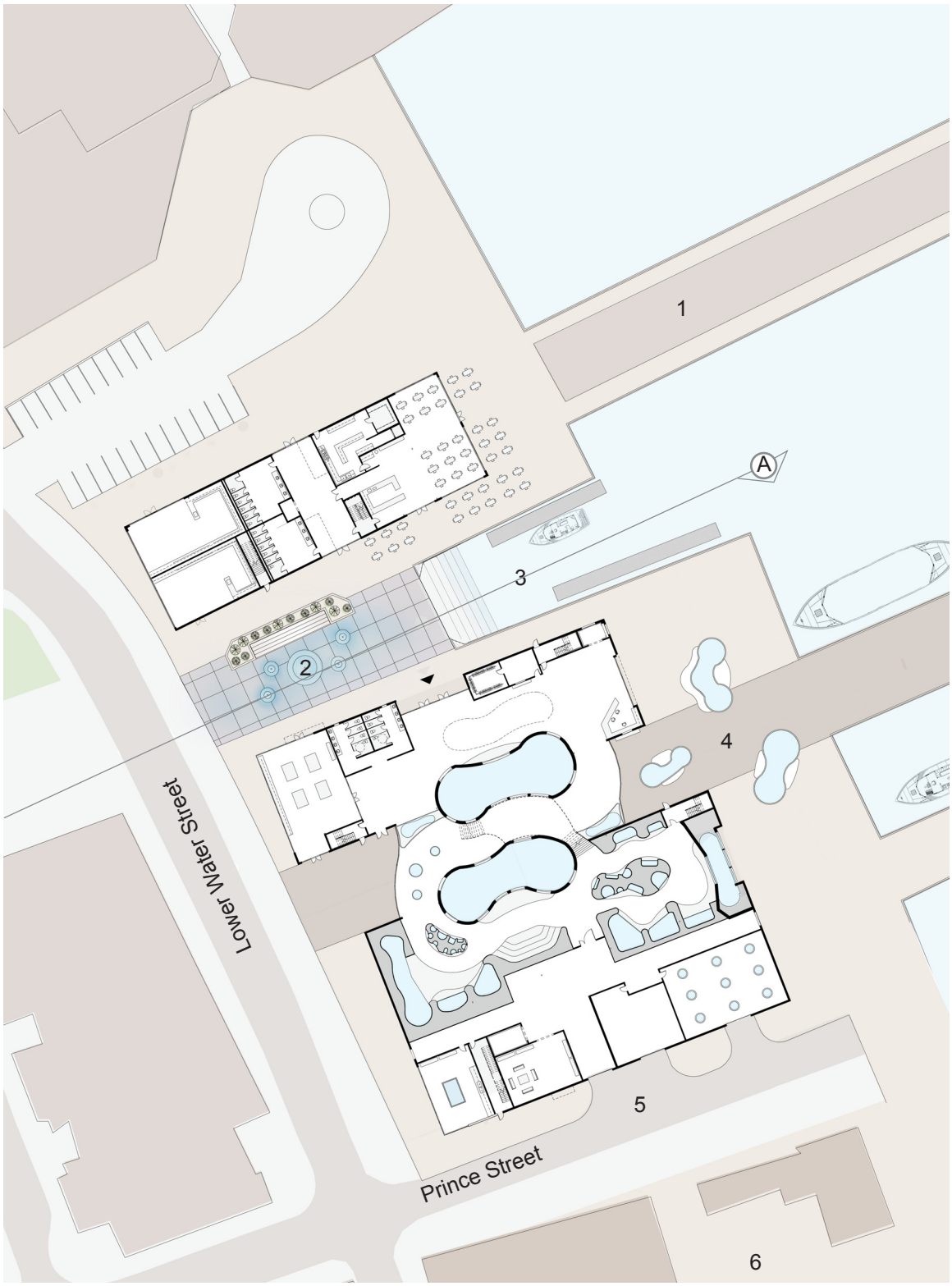
Borrowing from the rectilinear finger wharf and shed building language, building masses follow a similar rhythm in the form of shed buildings.

A public water plaza between two of the shed buildings enables an unobstructed view from the Ondaatje court at the Art Gallery of Nova Scotia and the Halifax harbour. The plaza acts as a significant threshold for the aquarium, as well as a threshold between harbour and city.

The block language and sidewalks of Prince and Lower Water Streets are maintained.

A loading zone along Prince Street is established.

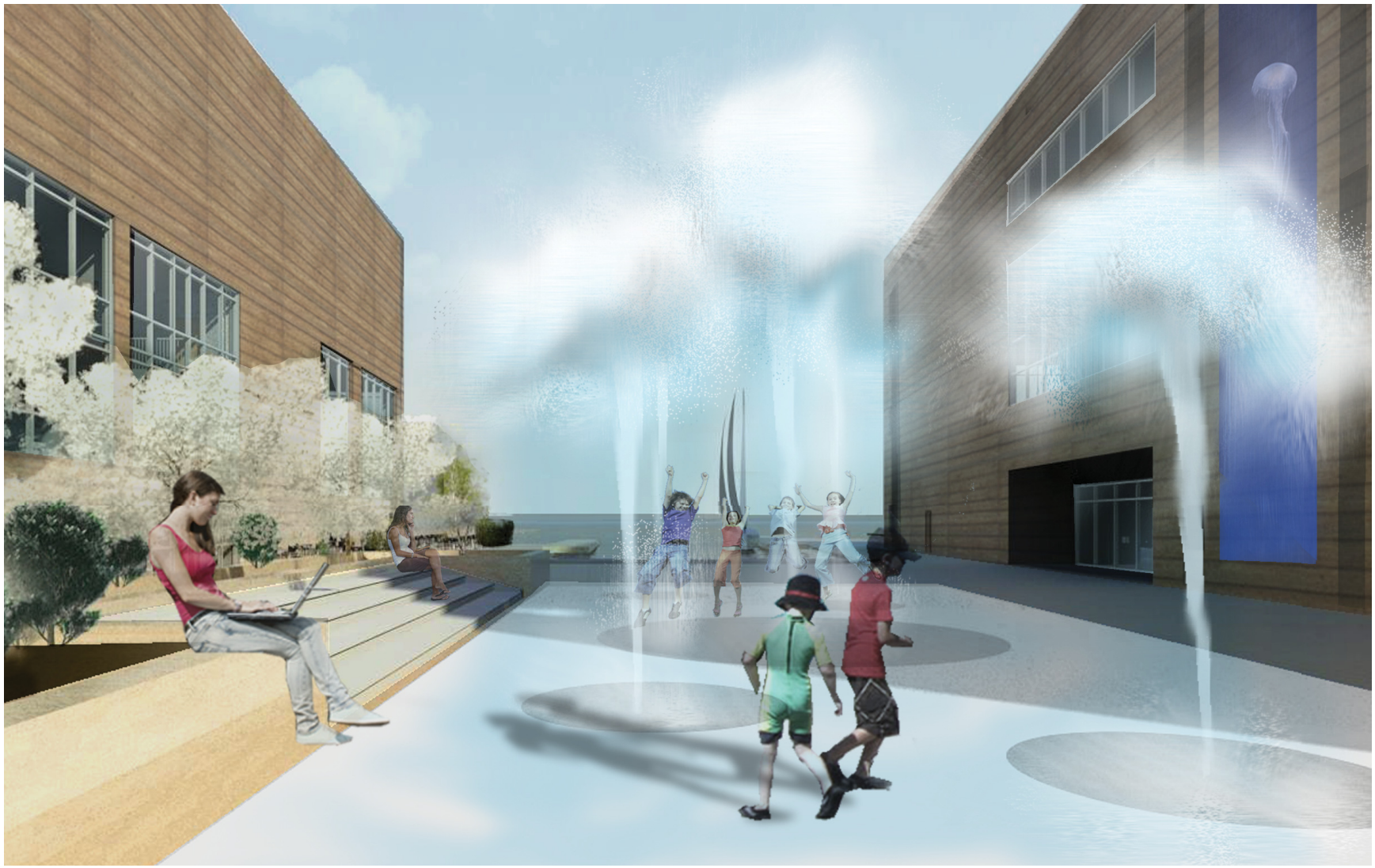
Touch tanks are placed along the pedestrian route of the waterfront. Passersby experience touch tank creatures while simultaneously engaging with the dynamic Halifax harbour.



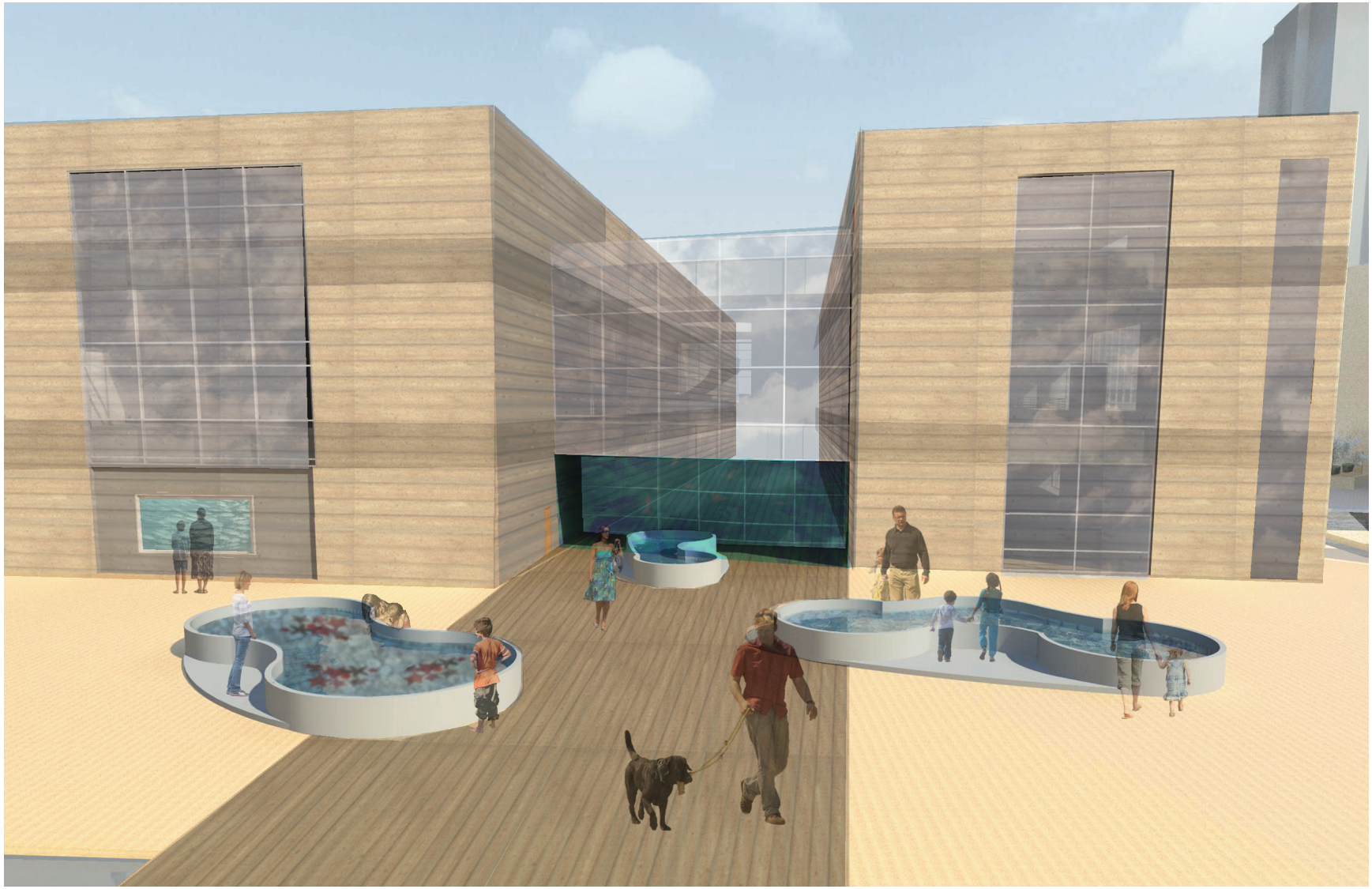
Site Elements

1. Murphy's Wharf
2. Water Plaza
3. Harbour Inlet
4. Touch Tanks
5. Loading Area
6. Maritime Museum of the Atlantic

Section A
Site section from harbour to Ondaatje court at the Art Gallery of Nova Scotia



Aquarium water plaza
View from Lower Water Street to the Halifax harbour



Waterfront pedestrians interacting with outdoor touch tanks

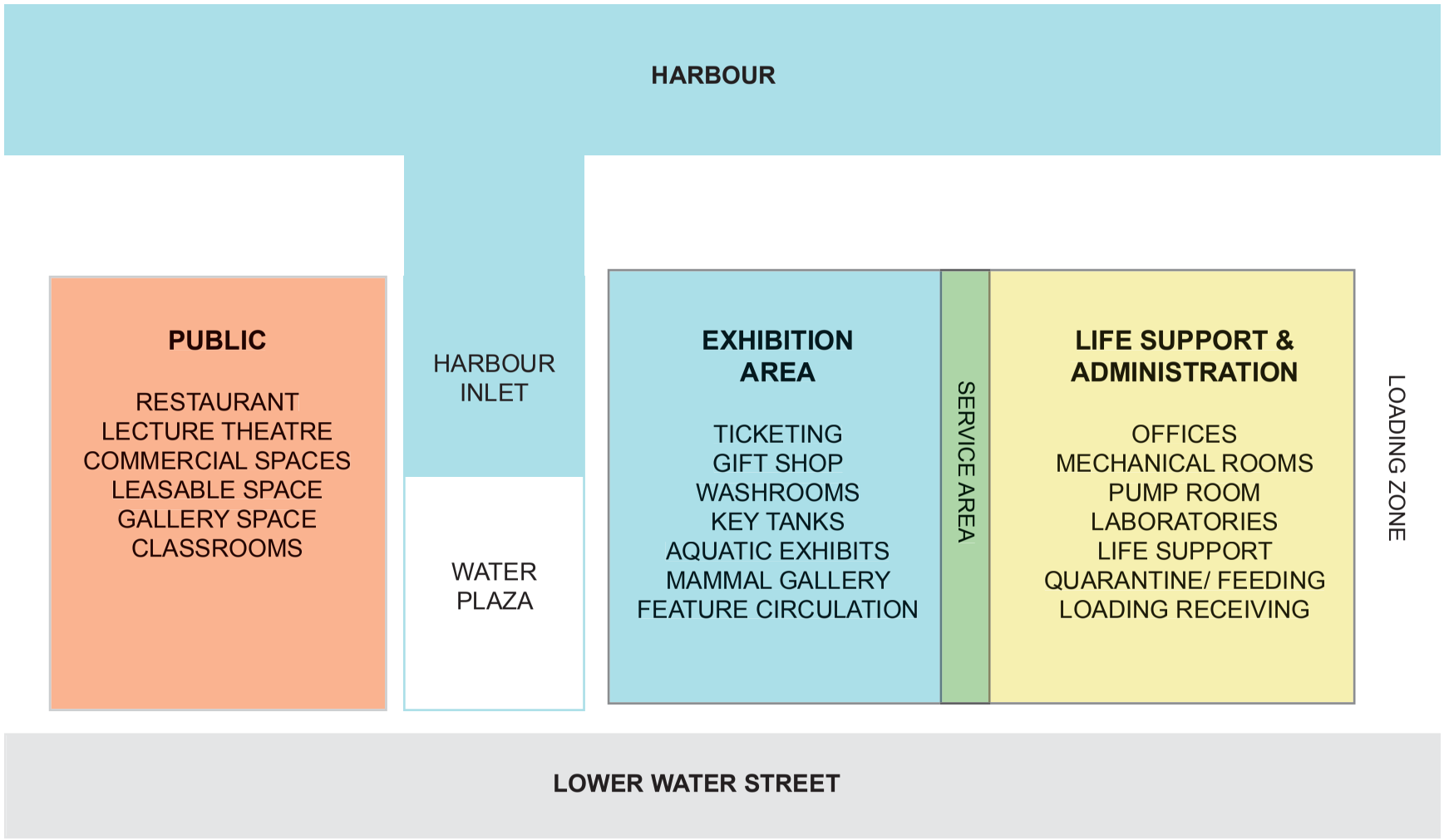
Building Design

Division of Program

Aquariums are complex buildings with numerous programmatic elements. Space planning is accomplished through the grouping of program according to the characteristics of the site.

The water plaza is a significant public area for the aquarium. The main entrance and public amenity spaces like the lecture theatre, commercial spaces, restaurant, and classrooms are accessible to the public off of the water plaza.

The loading zone, life support, mechanical areas, and administrative spaces are placed on the Prince Street edge of the site.



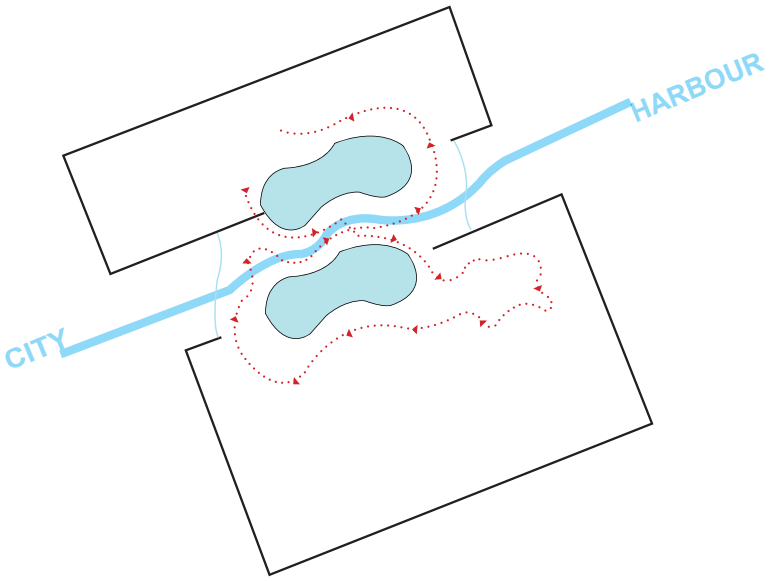
Division of program diagram

Circulation Strategy

The circulation strategy for the building is established by the two main tanks and the two shed buildings of the aquarium. Direct visual connections between city and harbour are maintained between the kelp forest and coral reef tanks. These aquaria are offset, allowing a path between them. The primary circulation area is glazed, allowing visitors to experience both city and harbour as the progress through the exhibits.

The hourglass forms of the tanks create flow and rest points for viewers. A feature stair connecting the three levels of the aquarium creates a circulation area between these two tanks.

Visitors move between the exhibits through the curvilinear forms within the circulation zone. This area marks the point where human circulation, animal ecosystem, cityscape and harbour converge.



Circulation diagram

Exhibit Sequence

Visitors entering the aquarium are immediately met with a double height lobby space. Large mammal sculptures lead visitors through the lobby to the admission desk. Admitted guests ascend to the third floor via a glazed feature elevator. Spectators take in views of the Halifax harbour as they begin their journey through the aquarium exhibits.

Once on the third level, visitors enter the temporary exhibit area which showcases the conservation efforts taking place in the Atlantic region. On the third level roof deck, visitors may catch a glimpse of researchers at work through the large windows of their research spaces. This level demonstrates the aquarium's role in the realm of marine conservation and research.

Visitors continue their experience by descending a stair wrapping the kelp forest tank. Stretches of kelp are visible through large acrylic windows. Resting on the stair landings, visitors glimpse both city and harbour. Daylight pours into this area through large skylights.

The second level contains rocky shore, sand dune, tidal flat, and estuary exhibits. Circulating through these exhibits, visitors are able to look down into one of the large tanks at a stunning coral reef ecosystem from above.

Visitors continue their descent along the edges of these large tanks via the feature stair. Resting on a large landing, visitors are able to experience both the kelp forest and the coral reef ecosystems as they approach the deep sea exhibits.

Deep sea exhibits are located on the main floor. The low lighting within this exhibition area gives spectators a sense of underwater submersion. As visitors begin to approach the aquarium exit, they are met with exhibits featuring the ecology of the Halifax wharves. After engaging with these presentations, it is hoped that visitors have gained a better understanding of Atlantic ocean ecosystems, and that they will have a heightened appreciation of the Halifax harbour.

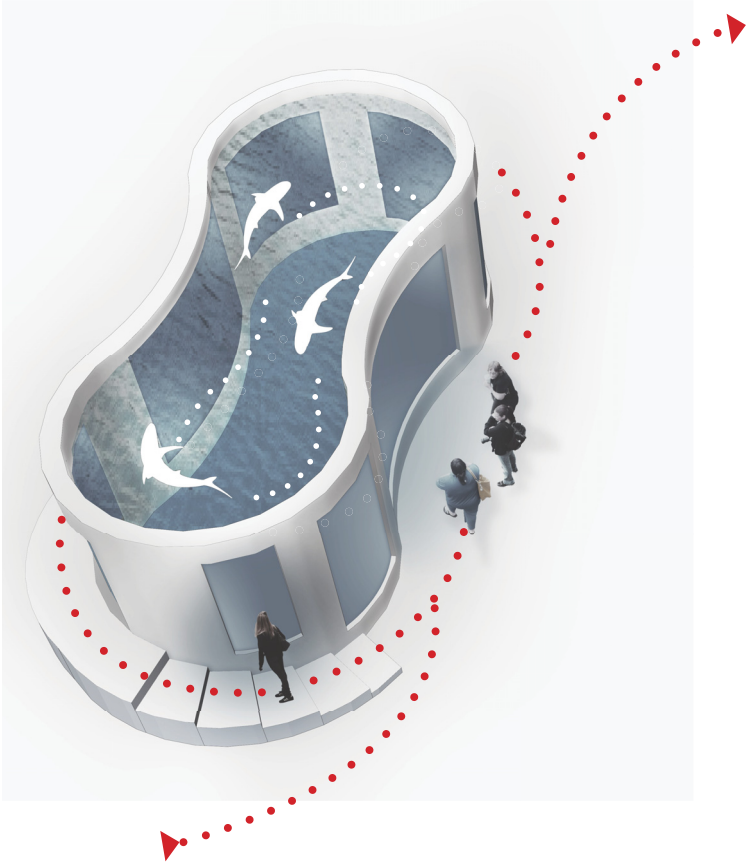


Diagram showing the circulation path and turn radius of larger fish, the hourglass form of the key tank, and the circulation path of visitors around the tank. Viewers experience the exhibits through the large acrylic viewports.

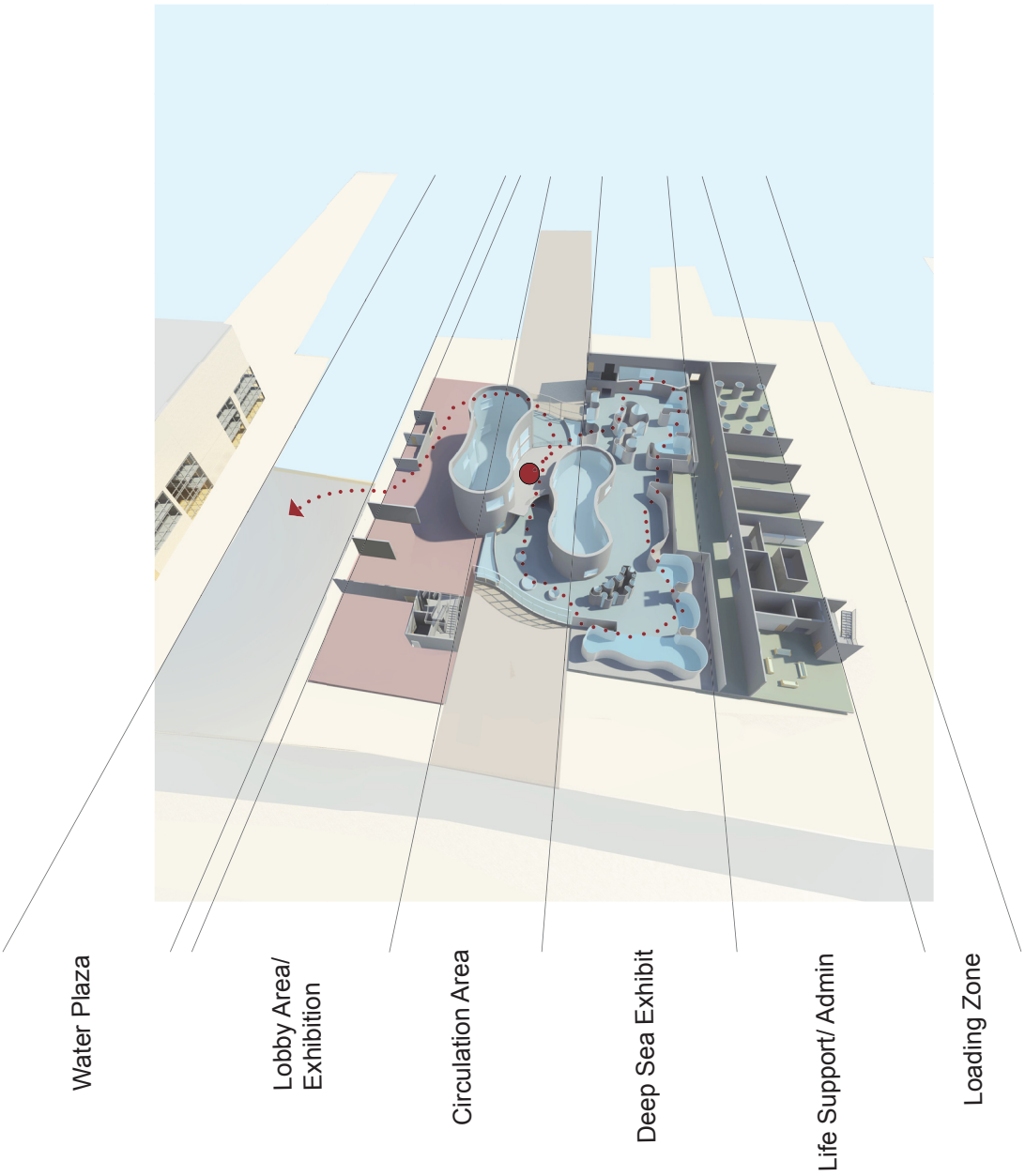
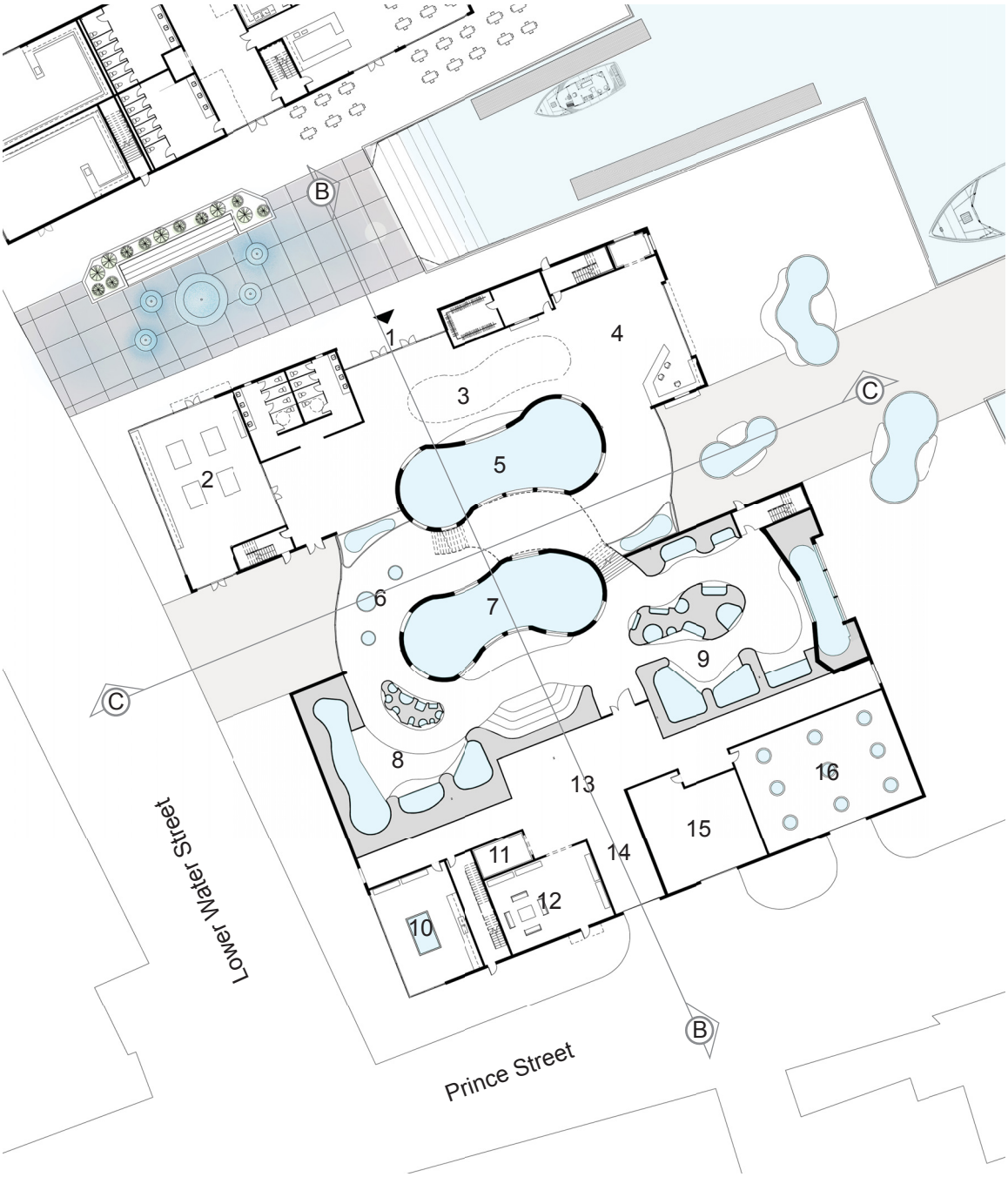


Diagram showing division of program and circulation.

Circulation path from second floor to exit. Pedestrians walk between key tanks, through deep sea exhibits, the Halifax wharf exhibits, and then exit out onto the water plaza.



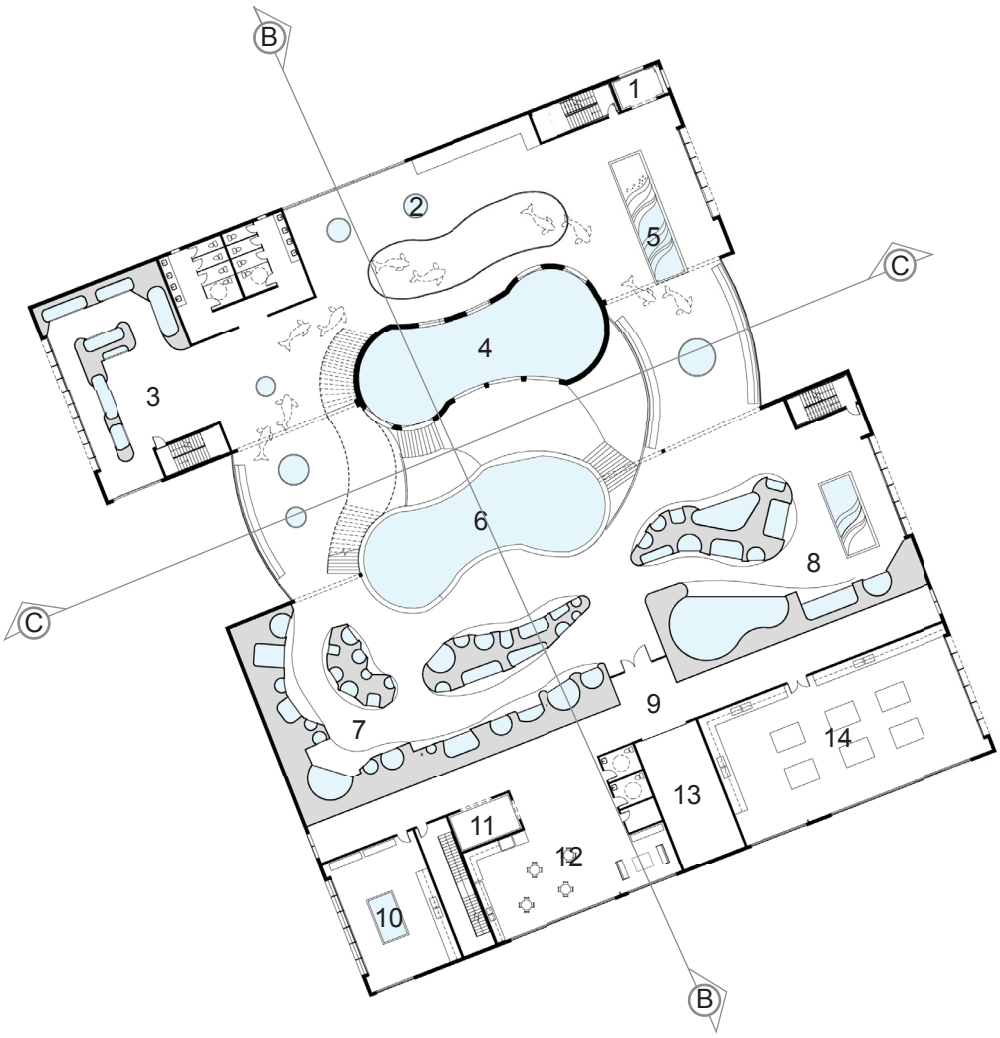
Exhibition

1. Entrance
2. Gift Shop
3. Lobby
4. Admission
5. Kelp Forest Tank
6. Wharf Exhibit
7. Coral Reef Tank
8. Deep Sea Exhibit
9. Sea Floor Exhibit

Life Support/Admin

10. Animal Quarantine
11. Loading Elevator
12. Staff Area
13. Service Area
14. Loading/ Receiving
15. Mechanical Room
16. Pump Room

Ground floor plan



Exhibition

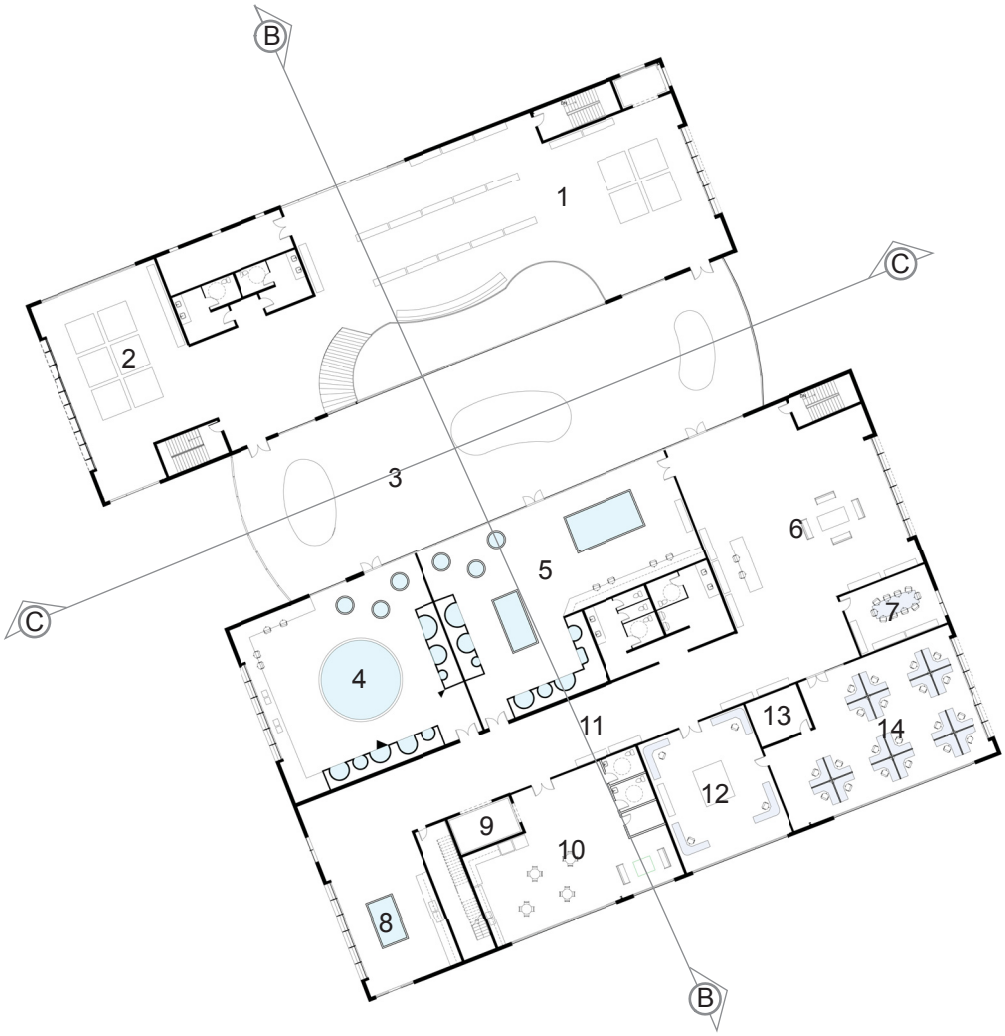
1. Feature Elevator
2. Mammal Gallery
3. Jellyfish Exhibit
4. Kelp Forest Tank
5. Sand Dune Exhibit
6. Coral Reef Tank
7. Rivers and Estuaries
8. Shore Exhibit

Life Support/Admin

9. Service Area
10. Life Support
11. Loading Elevator
12. Kitchen/ Staff Area
13. Mechanical Room
14. Laboratory

Second floor plan

ft
0 20 40



Exhibition

1. Temporary Exhibits
2. Conservation Exhibit
3. Roof Deck

Life Support/Admin

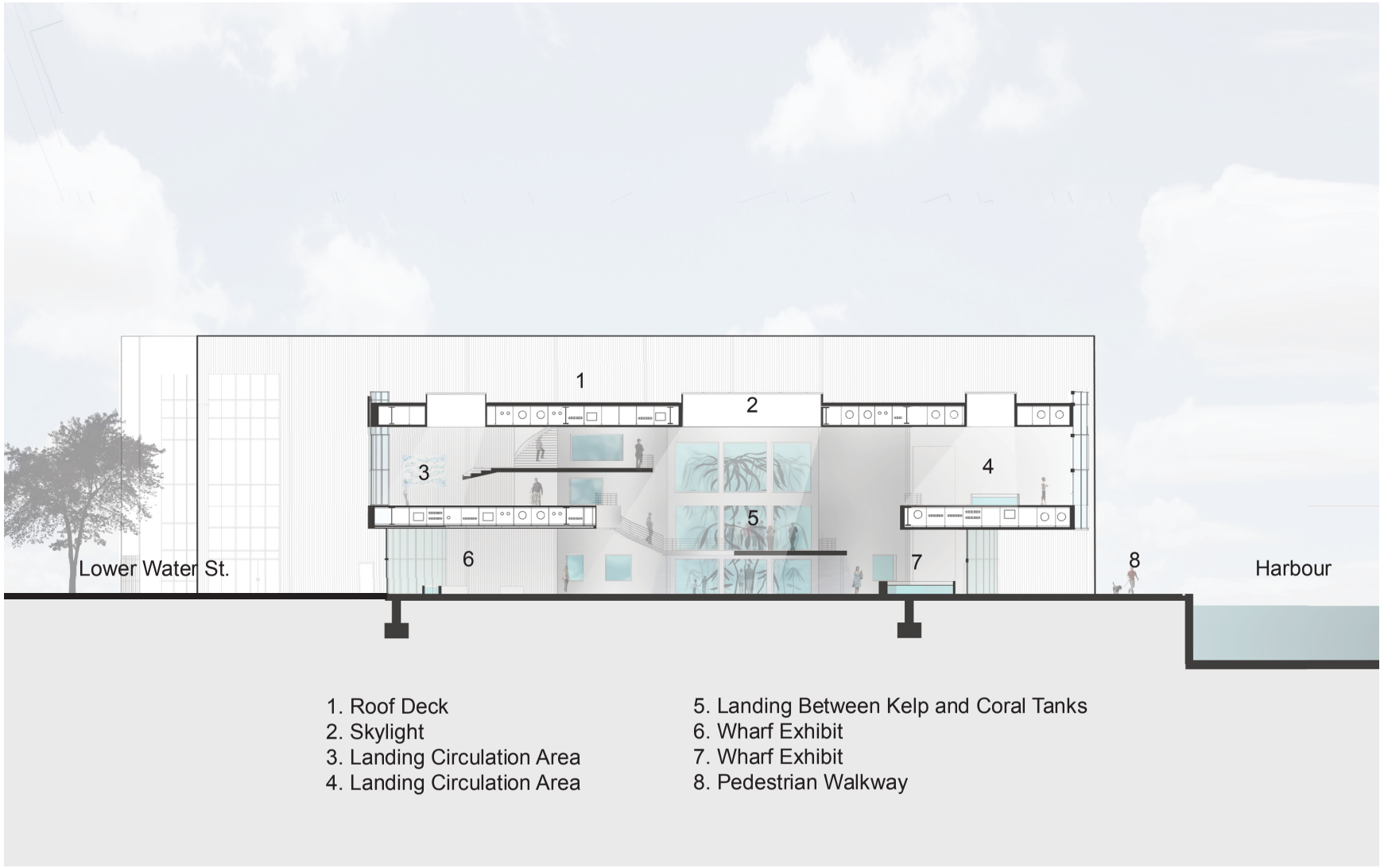
4. Research Laboratory
5. Research Laboratory
6. Common Area
7. Boardroom
8. Life Support Lab
9. Loading Elevator
10. Kitchen/ Staff Area
11. Service Area
12. Offices
13. Storage
14. Open Offices

Third floor plan

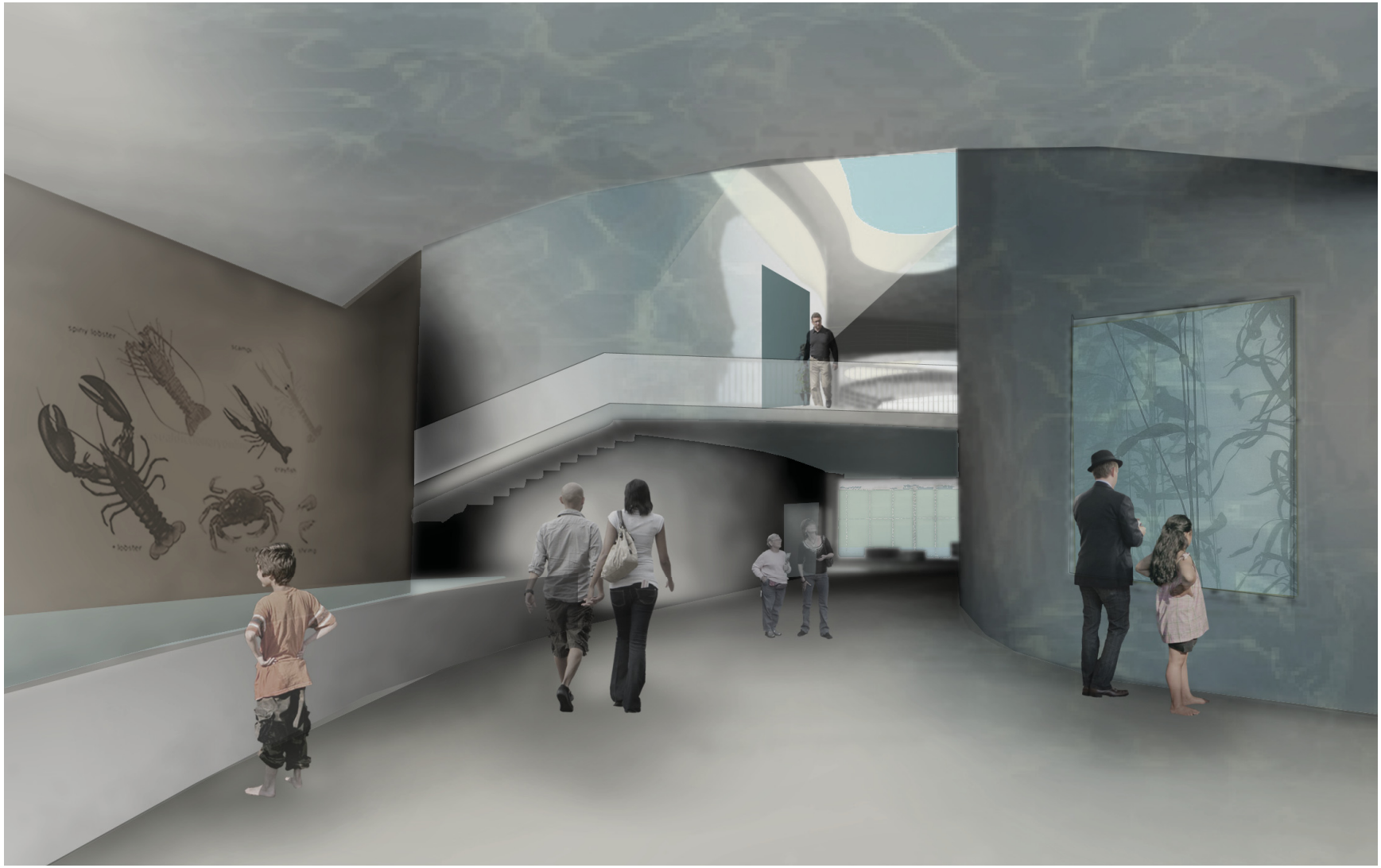
ft
0 20 40

1. Harbour Inlet
2. Temporary Exhibits
3. Mammal Gallery
4. Lobby
5. Kelp Forest Tank
6. Landing Between Key Tanks
7. Coral Reef Tank
8. Deep Sea Exhibits
9. Shoreline Exhibits
10. Life Support/Admin.
11. Kitchen/Staff Area
12. Service Area
13. Kitchen/Staff Area
14. Service Area
15. Loading/Receiving

Section B
Section from water plaza to loading zone



Section C
Circulation area between key tanks



Perspective of interior circulation space between key tanks
View to city

Perspective of interior circulation space between key tanks
View to harbour

Material Strategy

Tank Design

Apart from ease and economy of construction, there's no logical reason for aquarium tanks to be rectilinear in form. Curvilinear tank forms are most successful when it comes to recreating most natural aquatic environments, as they allow for a more comfortable circulation path for the animals on display.

> For the hobbyist, aquarist, or scientist who wishes to construct a model ecosystem, the materials are now available to do so in any shape. In most cases it is important to set aside the box convention and think first of the ecosystem that one wishes to model. Only after determining the ideal shape for simulation of the desired system should one become concerned about esthetics of viewing, and construction problems. Those concerns may then result in a modification of the ideal shape to a variant of the traditional form. (Adey 2007, 14)

Consequently, the large key tanks are in an hourglass form in plan, accounting for the swim path and turn radius of larger fish (tiger shark, dogfish, etc). The walls of the kelp forest tank extend up to the third level of the building, accommodating the vertical nature of this particular ecosystem.

For tanks larger than several hundred gallons, significant structure is needed to deal with the load of the water being contained. Therefore, the two key tanks are composed of a reinforced concrete walls, and views into the exhibits are created through the placement of large viewports. Window walls composed of 8" acrylic provide visitors with the ability to experience these larger scale ecosystems.

Structural Strategy

Steel frame construction is an appropriate structural system for this project because this method of construction evocative of the industrial shed building typology.

Because steel frame construction can accommodate significant spans, the large tanks containing the kelp forest and coral reef exhibits are properly housed, the exhibition circulation is left relatively open, and visitor views to both the city and harbour remain unobstructed by structural columns. Additionally, mechanical, air handling, water filtration, and electrical systems are fed throughout the network of open web steel joists, servicing the various aquarium exhibits.

Interior Finishes

Interior finishes were selected for durability, ease of maintenance, and their ability to enhance a visitor's experience of being surrounded by water.

Polished concrete floor provide a durable, easy to clean material that allows watery lighting effects to be extended throughout the floors of the exhibit. Since humidity levels are a significant concern within any aquarium design, rot-resistant fiberglass wall panels provide a practical interior wall covering. The reflective quality of these panels enhances the watery lighting effects that are significant to the aquarium experience. Reflective suspended ceiling panels also create these effects while also allowing easy access to significant mechanical systems. Additionally, wood finishes on the feature walls mark the edges of shed building forms. This wood gives visitors a sense of their orientation and position within the building.

Interior view
Sea floor exhibit

Image showing the juxtaposition of human and animal circulation, as well as the effects of light and water on interior walls.

Façade Strategy

Waterfront Vernacular

One of the merits of the Monterey Bay Aquarium is the design's retention of its former industrial purpose as a fish cannery. In order for the Halifax aquarium to appropriate architecture emblematic of the waterfront, exterior wood cladding that is typical of marine shed buildings is used. Since visual connection between city and harbour is significant, this wood cladding is contrasted with portions of glazing.

Environmental Control Strategy

Aquariums are sensitive buildings that require careful monitoring and significant environmental controls (water filtration, lighting control, temperature control, air handling). Therefore, an environmental control strategy for the façades could help to alleviate energy loads that go into moderating these aquatic environments. Through strategic mullion placement, the insetting of particular windows, and the use of shading devices, unnecessary heat loading and glare can be alleviated.



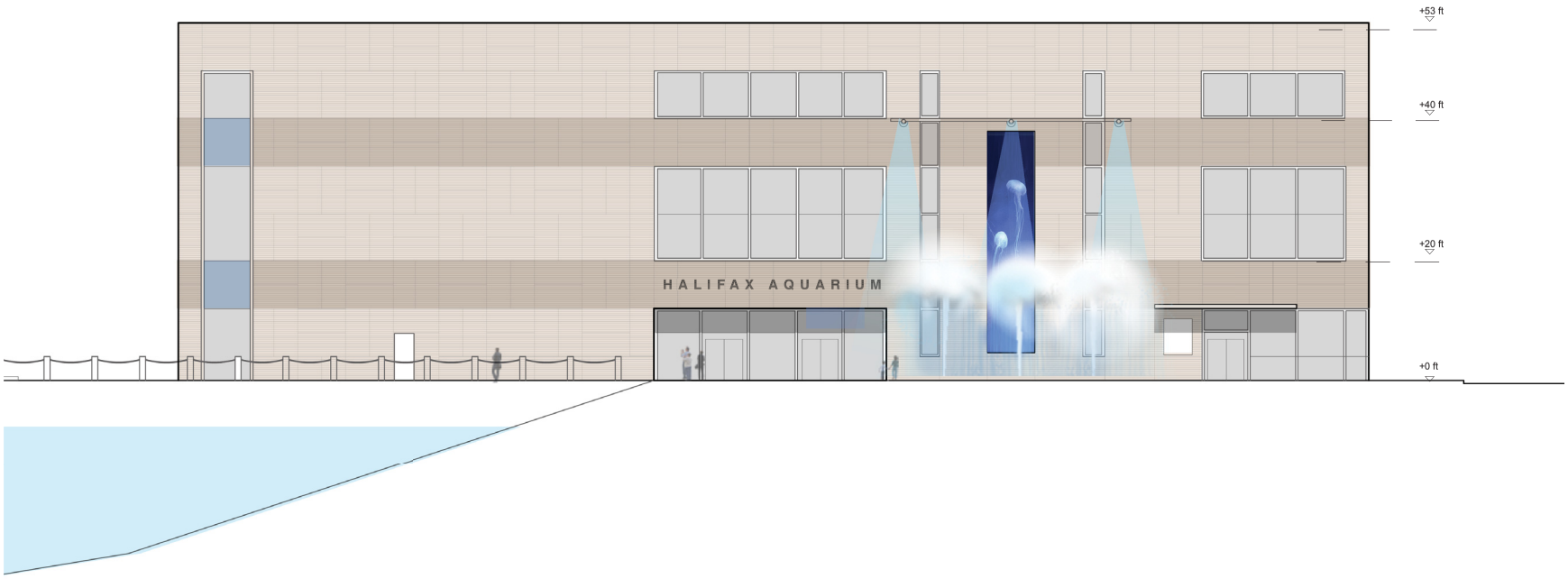






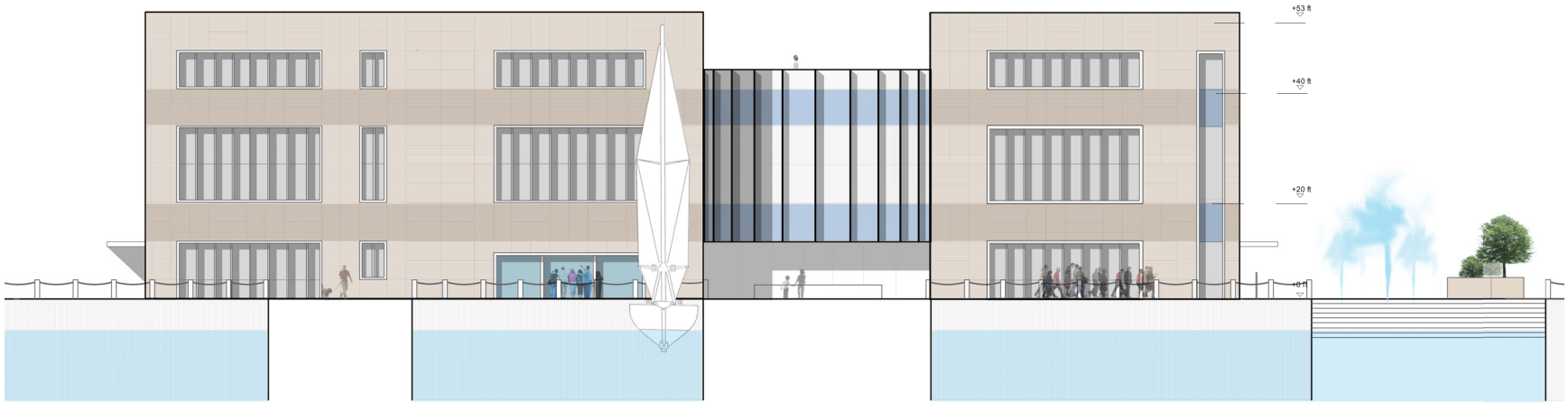
Waterfront vernacular

Waterfront vernacular

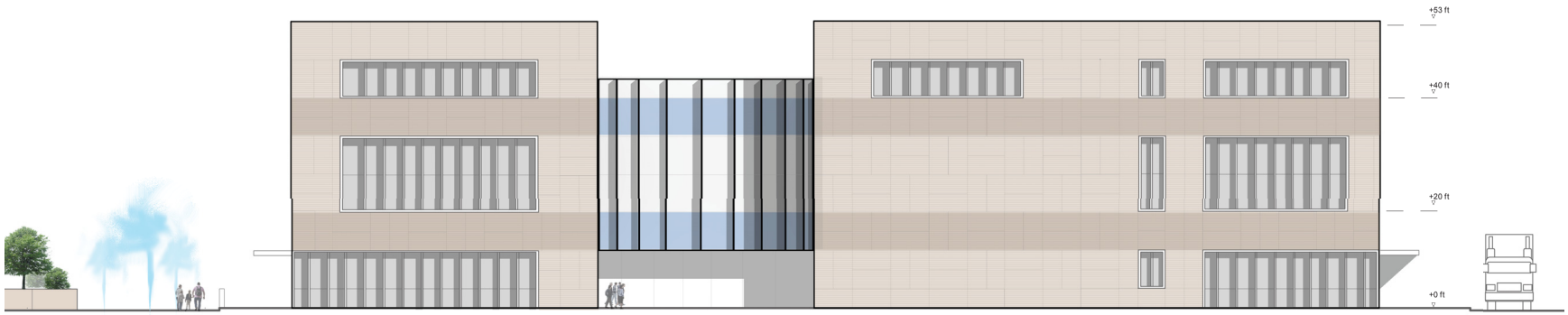


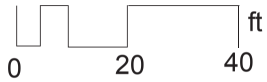
0 20 40 ft

North/ Entrance Elevation

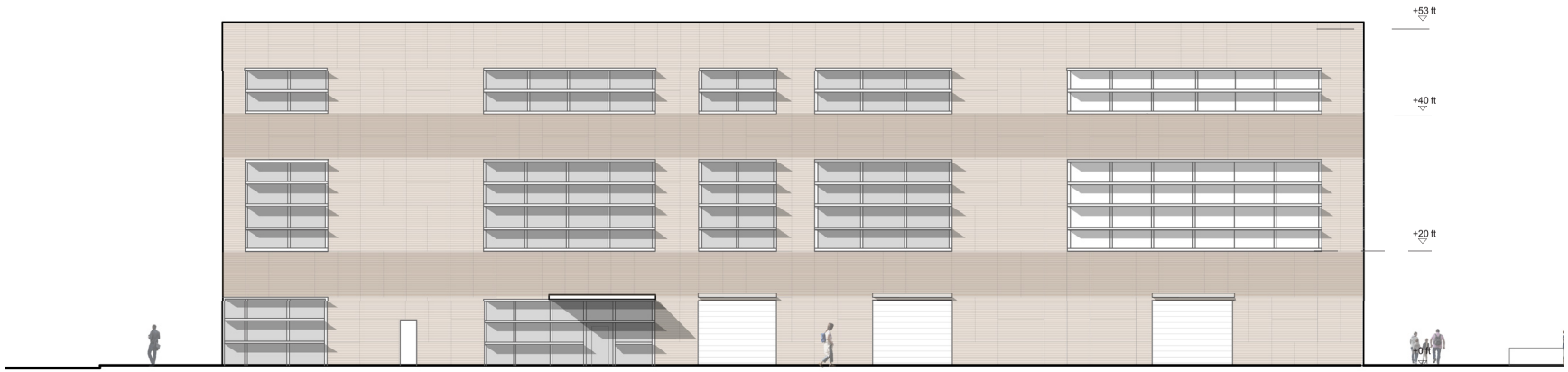


East/ Harbour Elevation





West/ Lower Water Street Elevation



South/ Service Elevation

CHAPTER 4: SUMMARY

The purpose of this thesis was to explore spatial and experiential relationships between human and aquatic environments. By selecting a site on the periphery of the man-made and the natural, and a program that juxtaposes human and animal habitation, relationships between these very different worlds can explored through an architectural means.

Halifax's nautical history and identity as a commercial trading port for the last 250 years has shown humanity's dominance over the harbour. However, the end of the 'age of sail' and decline of the waterfront throughout the later half of the 20th century has forced citizens of Halifax to redefine their historic harbour for the economic and environmental landscape of the 21st century. Halifax's ever-growing marine research presence and great need for public amenity along the waterfront creates a convincing case for the placement of an aquarium facility.

The proposed design for a Halifax Aquarium has demonstrated the potential for a an architectural negotiation between the man-made and the natural at the scale of the site, the building, and the exhibit. The site strategy demonstrates a sensitivity to the dynamics of both the city and waterfront through the maintenance of view corridors, and the extension of the harbour inlet further into the city through the creation of a public water plaza .The placement of animal touch tanks on the pedestrian walk further connects the human and marine life through tactile engagement.

The form of the building demonstrates an acknowledgement of both animal and human habitat. The shed-like forms pay homage to Halifax's industrial and commercial past, while the organic forms that connect these masses articulate the natural flows of aquatic ecosystems. The circulation strategy through the exhibits is derived from the negotiation of these two formal languages. Visitors are able to navigate between shed buildings through the meandering path and feature stair located between the two largest aquaria.

The studies into aquarium precedents and informal learning environments have shown that the acknowledgement of physical context is key for the creation effective and memorable learning experiences. This justifies the aquarium's location along the waterfront, as the harbour plays a significant role in connecting the ecology housed within the aquarium to its physical context. It is hoped that these moments of connectivity throughout the aquarium procession will enable visitors to walk away from their learning experience with a heightened appreciation of the natural environment that surrounds them.

Further investigation into this design proposal could yield further questioning of the traditional aquarium typology, both architecturally and conceptually. By further challenging the introverted, 'fish-bowl' mentality of the 20th century aquarium typology, one can begin to see how an aquarium/research facility can provide not only economic incentive, but also social and ecological value. In addition to rejuvenating Halifax's historic waterfront, aquarium visits have the potential to enhance children's passion for scientific learning and research while also showcasing the wonder and preciousness of marine life in Atlantic Canada.

GASTROPODS


BARNACLE


DOGWINKLE


MOON SNAIL


OCTOPUS


SHORT FINNED SQUID

ECHINODERMS


COMMON SAND DOLLAR


GREEN SEA URCHIN


ORANGE-FOOTED CUCUMBER

KELP/ SEAGRASS


ROCKWEED


HORSETAIL


SEA COLANDER


DULSE


EDIBLE SEAWEED

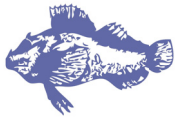
FISH


LUMPFISH


BASKING SHARK


HADDOCK


ATLANTIC COD


SHORTHORN SCULPIN


ATLANTIC MACKERAL

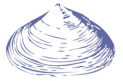

ATLANTIC HERRING


BLUEFIN TUNA


SPINY DOGFISH

MOLLUSCS/ CRUSTACEANS


BLUE MUSSEL


CLAM


SCALLOP


HORSE MUSSEL


OYSTER


ROCK CRAB


LOBSTER

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