SITE SPECIFIC REGIONALISM

by

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CONTENTS

ABSTRACT

As architecture continues towards a globalized practice, the increasingly standardized approach to building has resulted in an inflation of architecture with minimal sense of place. These designs often impose upon their context through means of material application, formal intervention, or physical connection, among other considerations.

This thesis develops a methodology for approaching the design of architecture that is regionally appropriate and authentic to place. To accomplish this the method focuses on designing in response to context, where context is argued as being composed of four principles: climate, landscape, technology and culture.

The synthesis of regional and site specific context analysis supports architecture that compliments its surroundings, yet is unique in its own identity; architecture that is both regionally appropriate and authentic to a place.

Though this method for regional design aims to be applicable to any facet of context, it is investigated through the context of Deep Bay, British Columbia.

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To my best friend that I miss everyday.
Here's two fingers to you.

CHAPTER 1: INTRODUCTION

Regionalism and Architecture

During the 20th century, globalization developed a dominant influence over architecture. It established faster building production, increasingly efficient, durable and available materials, and universal building technologies that minimize labour requirements. The effects of globalization extend to multiple disciplines, industries and cultures, describing a framework for assessing how the world is being shaped today. It's influence, while significantly advancing human life, at the same time constitutes a subtle destruction of great cultures by threatening them with the continued development toward a single, mediocre civilization (Frampton 1983, 16). Urban cities such as Oslo, London and Beijing, or the rural towns of Greece, Japan and Canada are initially thought of for their heterogeneous qualities. Such locations have buildings and communities characterized by local context, innovation and cultural history that are becoming overwhelmed by international architecture. This increasingly standardized approach to building has lead to an inflation of generic architecture with minimal sense of place. It is this issue that promoted architects to critically analyze the discourse of global and regional architecture toward the end of the 20th century (Moore 2001, 130).

During the 1980's and early 1990's the topic of regionalism received considerable attention through the essays of prominent theorists such as Kenneth

Frampton, Alexander Tzonis, William Curtis and Liane Lefaivre. This was a direct result of the growing effects of globalization. A core concept that remains a central figure in the resistance of globalized architecture is 'Critical Regionalism.' Critical Regionalism, as defined by Kenneth Frampton, is the idea of adopting modern architecture, critically, for its universal progressive qualities, but at the same time placing value on the geographic context of which the architecture is situated (Frampton 1983). The approach aims to find a balance, utilizing beneficial aspects of present globalization, yet applying them with regional comprehension. Today, globalization continues to grow incrementally as the world moves faster. Contemporary architects and theorists such as Glenn Murcutt, Rick Joy and the Patkau's continue to push varying approaches within the realm of regionalist architecture. However, their efforts remain drastically outweighed by the pressures of globalized architecture.

Illustrating architecture of imposition with Daniel Libeskind's ROM. (Wikipedia 2014)

As previously discussed, Kenneth Frampton's Critical Regionalism remains a central figure to the theory of regional architecture. His '*Six Points on an Architecture of Resistance*,' outlines conceptual guidelines for establishing architecture with a sense of place. In current practice, the discourse of regionalism is interpreted through varying opinions of what individuals understand as place. For example, the work of Vincent James and Jennifer Yoos strives to engage the traditions of local building practices by adapting them for new uses that reflect the local culture and social practices of all inhabitants

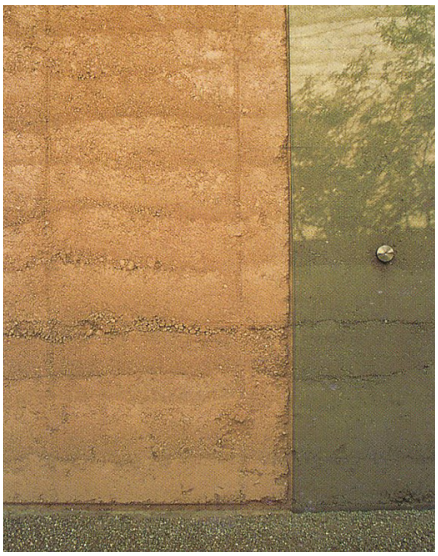
Illustrating adaptive technologies in VJAA's Minneapolis Rowing Club (VJAA 2015)

(MacKay-Lyons 2015, 171). Hence they apply an innovative technological approach that is focused on the social and cultural aspects of place. Whereas Tom Kundig concentrates on the continuation of local craft in technology and formally articulating anomalies occurring on the site (MacKay-Lyons 2015, 103). Kundig's outlook reflects regional thought by means of developing local technologies, yet his site specific intention is displayed through the level of care applied to the organization of his formal interventions on site. Tom Kundig's attention to the site specific leads to a discussion of what constitutes regional, as well as what constitutes place within the larger discourse. In particular, there are two practices that illustrate understandings of place at numerous scales, meanwhile finding unique ideals within the larger realm of regionalism: Rick Joy and Patkau Architecture.

Illustrating engagement of anomalies with Tom Kundig's The Pierre House (Olson-Kundig 2015)

Developing A Methodology

Similar to Kundig, Rick Joy designs his work to reflect an attention to both the regional and site specific scales. The architecture develops through his fundamental principles of responding to the surrounding climate and landscape, while also employing a precise use of materials to express the sensorial experiences of a place (MacKay-Lyons 2015, 85). The majority of his work is situated in the state of Arizona, which is commonly characterized by vast desert environments. The weight, texture and color of materials are clearly articulated to describe both the spaces he creates



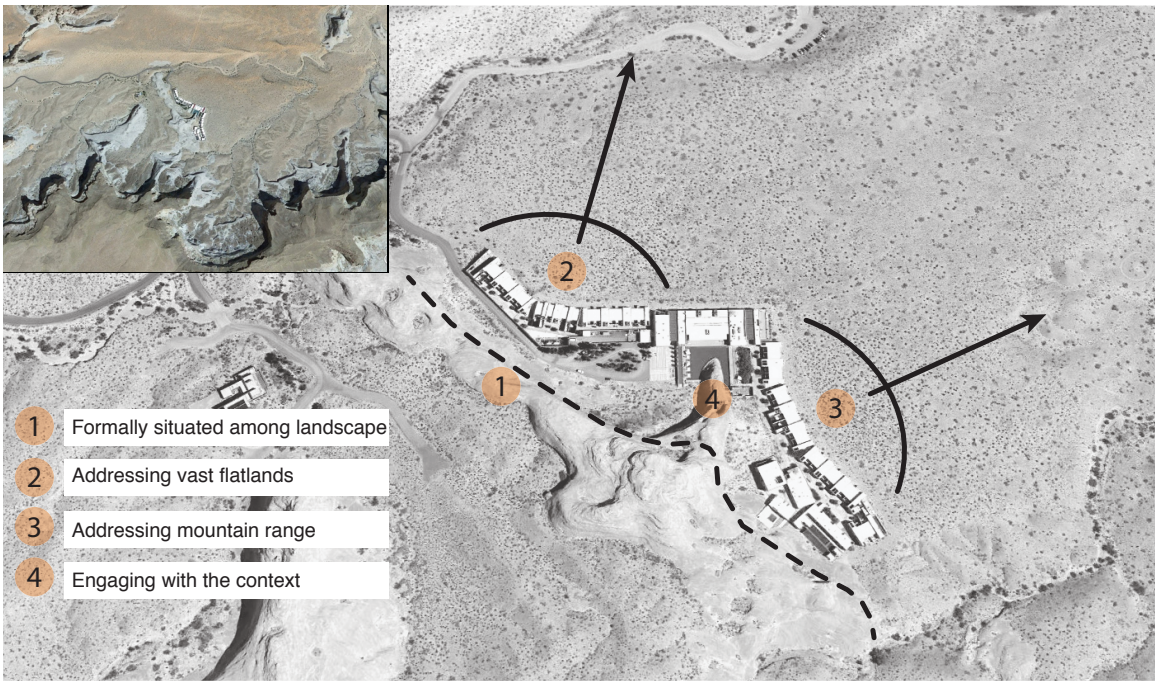
Facade detail at grade of Rick Joy's Convent Ave Studio (Jacobson 2002)

Engaging the landscape (Design Boom 2013)

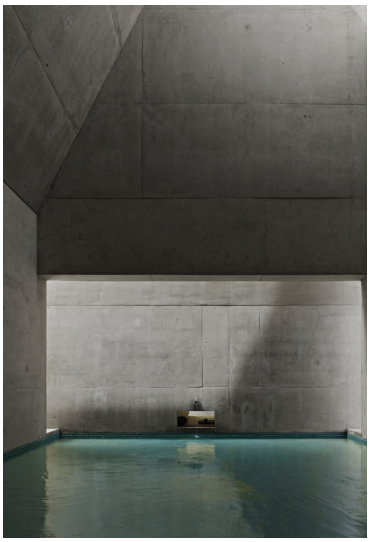
Framing significant landscapes (Design Boom 2013)

Situating within landscapes (Design Boom 2013)

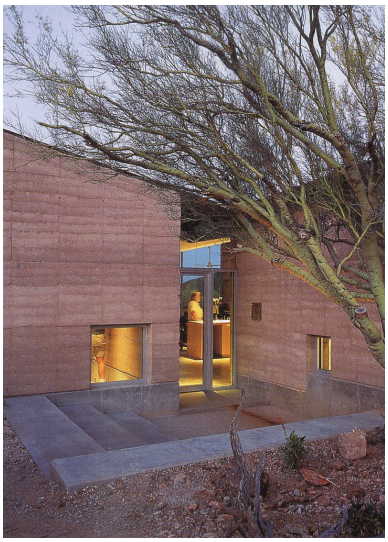
Reflecting the landscape (Design Boom 2013)



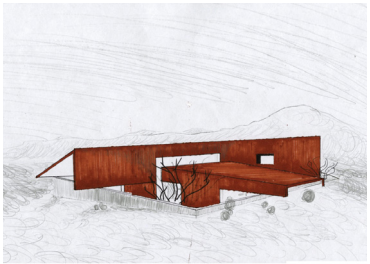
Diagramming the placement of Rick Joy's Amangiri Resort through responses to context (base map from Google 2015)



Within the landscape
(Jacobson 2002)

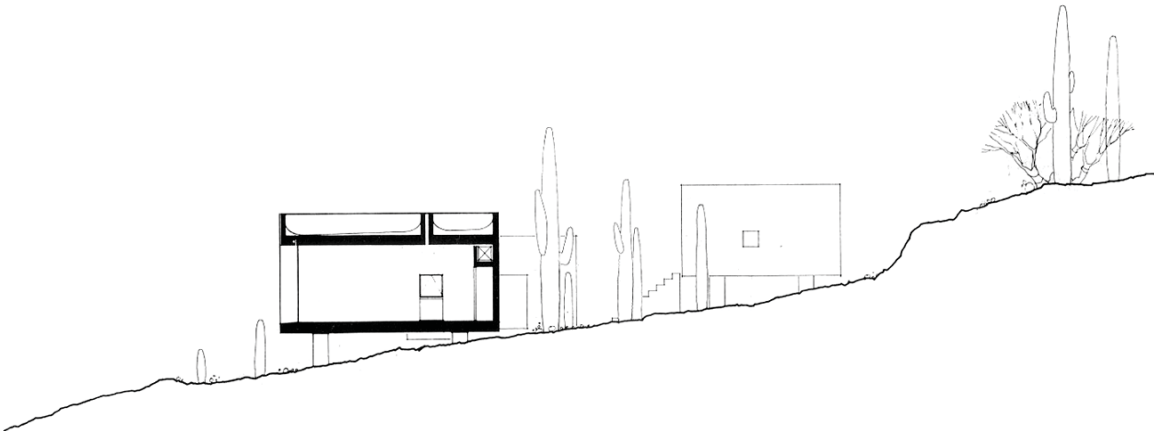


Expressing grade
(Jacobson 2002)

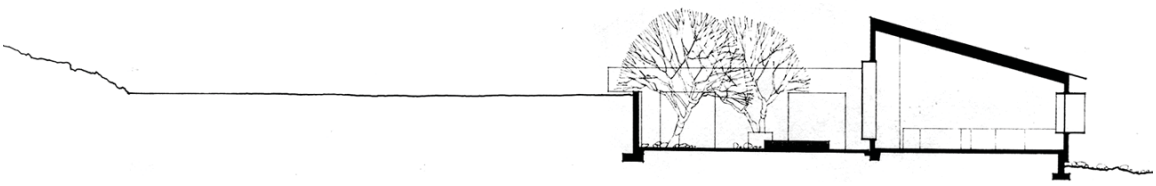


Reflecting surrounding tones
(Wordpress 2011)

Illustrating material application through detailed construction methods (Jacobson 2002)



Rick Joy, Desert House: over the landscape
(Jacobson 2002)



Rick Joy, Tubac House: in the landscape
(Jacobson 2002)

and their surroundings. Formally the architecture engages the landscape, clearly articulating how it is being integrated; expressing whether one is in or on the landscape, part of the land or guided to a significant view in the distance. With his designs, the surrounding environment becomes as much a part of the architecture as it is part of the existing setting.


Framing the context (Patkau 2015)

This discussion of site specific intention, among the more broad spectrum of regionalism, is central to the practice of John and Patricia Patkau, of Patkau Architecture in Vancouver, BC. Over time the Patkau's have developed a term called 'found potential' as a central figure to their principles of design. They describe 'found potential' as "those aspects of site, climate, building context, program, or local culture, for example, that would facilitate the development of an architectural form which is evocative of circumstance" (Patkau 2013). Hence, their architecture becomes one of response by analyzing the immediate context and then precisely crafting the architecture within it. The Patkau's expose the nature of a specific site and articulate a clear relationship between it and the architecture. Similar to Joy's work, their explicit use of material and construction methods are fundamental in defining place both physically and socially. In the 'Barnes House' they employ a basic, yet strict material discipline; where the exposed wood rests gently on steel, which becomes grounded by concrete. Similarly at the 'Canadian Clay and Glass Gallery,' John Patkau describes the construction to have "an obvious hierarchy of materials. Wood sits on steel

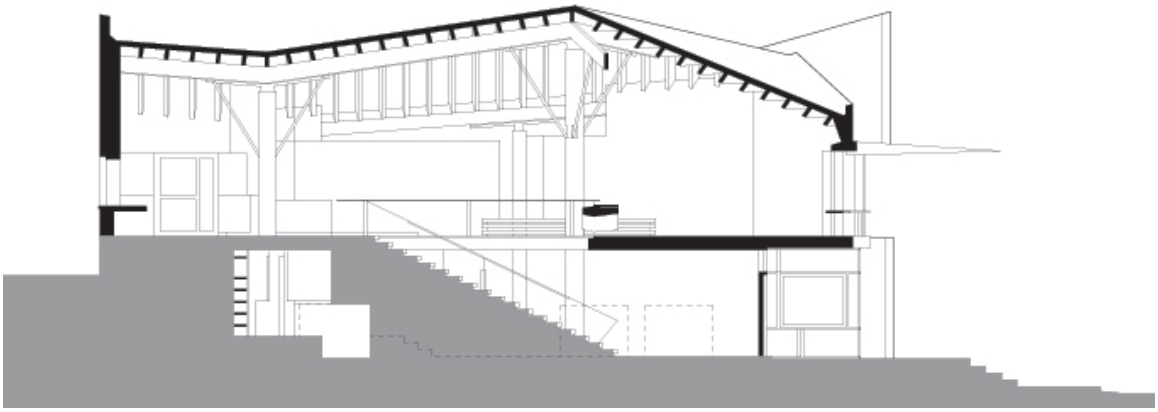

Integrating intervention and context (Patkau 2015)


Expressive hierarchy in construction (Patkau 2015)

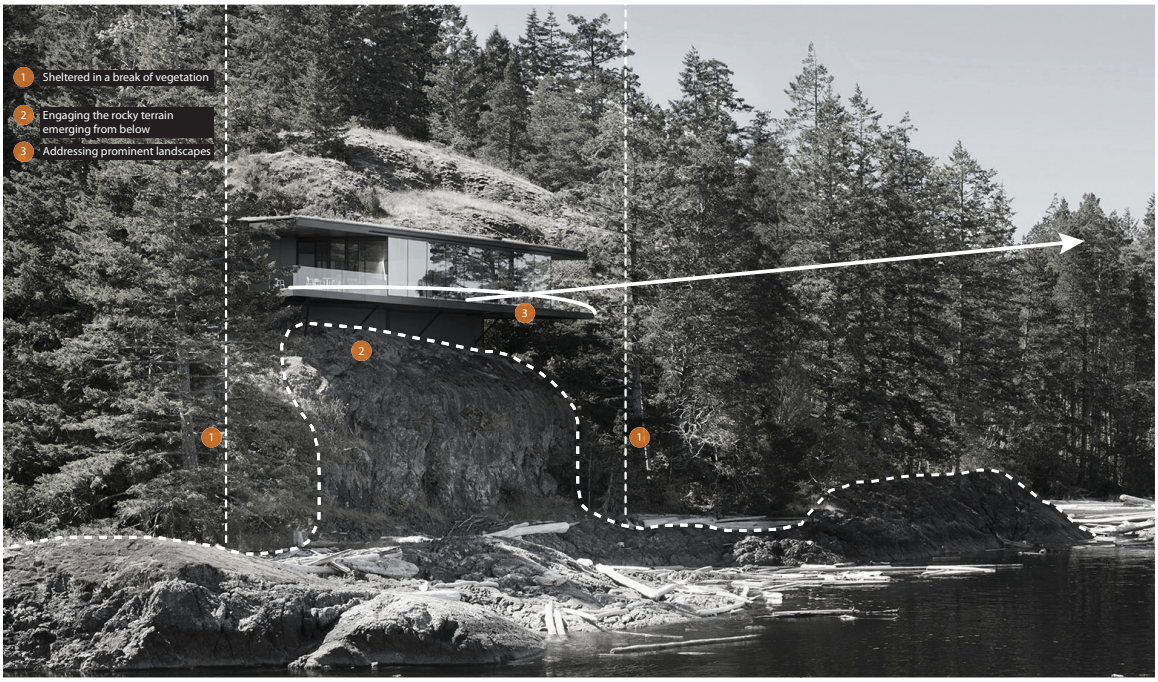
Addressing climate
(Patkau 2015)

Formal response
(Patkau 2015)

Engaging landscapes
(Archdaily 2015)



Patkau - Barnes House Section
(Transdisciplinary Studio One 2012)



Diagramming aspects of the 'found potential' for Patkau's Tula House
(base image from Archdaily 2015)

which sits on masonry. It's really straight-forward... we feel that the texture and the brutality of the block creates a powerful juxtaposition to the fragile, delicate character of glass and clay" (Patkau 1994, 17). The Patkau's concentration to the site specific establishes an architectural language that develops from circumstance; making the architecture not only appropriate to region, but also authentic to site.

Identifying Site Specific Regionalism

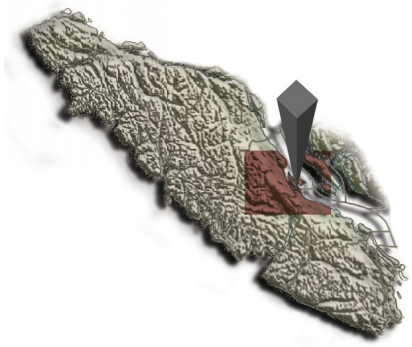
The creation of regionally appropriate architecture is becoming increasingly necessary to counterbalance the overwhelming influence of globalization. This thesis is developing a methodology for approaching the design of architecture that is both regionally appropriate and authentic to a place. To do so, the proposed method focuses on designing architecture in response to the context. It argues climate, landscape, technology and culture are the defining principles of context that must be addressed to effectively create responsive architecture. Climate refers to the light, temperature, precipitation, humidity, and wind qualities of a region. Landscape describes the physical features of place, such as topography and seismic activity, as well as natural resources such as vegetation, geology, water and the existing built environment. Meanwhile, technology refers to the translation of materials into built form, which includes the materials, systems, techniques and resulting formal compositions. Initially, these three physical principles are investigated on a regional scale to understand the geographic context that is

being designed in. They are then focused at the site specific scale in integration with an analysis of the local culture to understand the identity and dynamics of a place. The synthesis of regional and site specific context analysis strives to produce architecture that compliments its surroundings while emphasizing the authenticity of a place. The proposed method for regional design aims to be applicable to any facet of context, but for the purpose of this thesis it is being investigated through the context of Deep Bay, British Columbia, Canada.

Locating BC in Canada (base image from Wikimedia Commons 2014)

In defining this method's position among the larger discourse, a personal hierarchy was established for defining the principles of context; arguing that climate, landscape, technology and culture are the contextual principles that need to be analyzed to generate effective architectural responses to the surrounding environments. Zooming in to respond to the context at the site specific scale enables opportunity for what Bohlin Cywinsky Jackson call 'the nature of circumstance," and as previously discussed, what John and Patricia Patkau consider the 'found potential' of site. This attention to the site specific context, in addition to the regional comprehension, is integral to creating architecture of response; aiding it in being both regionally appropriate and authentic to place. Including culture in the definition of context is critical, as it focuses the initial three physical principles of context though the design to provide both a physical and social understanding of a place. Furthermore, the cultural analysis acts as a generator for developing appropriate program

Locating Vancouver Island in BC (base image from Wikipedia 2014)



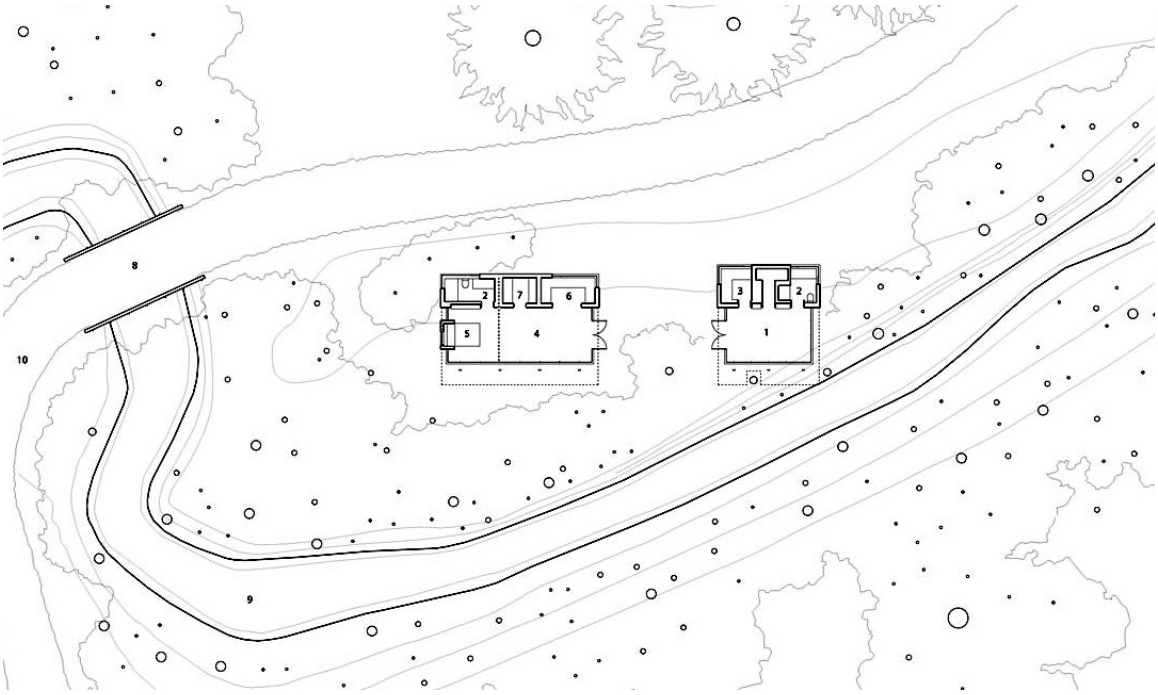
Locating Deep Bay on Vancouver Island (base image from Wikipedia 2014)

responses, as well as implementing local identity into the design strategies. Overall this methodology focuses on architectural responses to context that aim to express a place through the architecture. It strives to support Glenn Murcutt's understanding that if we are to make an architecture that responds to our land, place, climate, technology and time, then as architects, we must work toward an architecture of response, rather than an architecture of imposition (MacKay-Lyons 2015, 131).

Bohlin Cywinsky Jackson - Combs Point Residence (Bohlin Cywinski Jackson 2010)

Thesis Question

How can the synthesis of regional and site specific context be used to generate responsive architecture that is both regionally appropriate and authentic to a place?



Bohlin Cywinsky Jackson - Dry Creek Outbuildings (Bohlin Cywinski Jackson 2010)

CHAPTER 2: METHODS

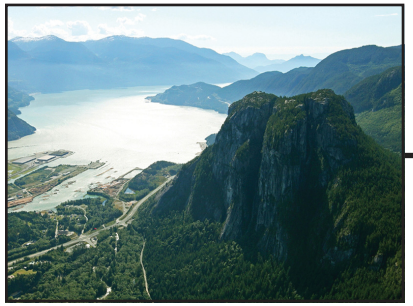
Regional Context Analysis

The contextual analysis at the regional scale focuses on the physical characteristics of place, defined here as climate, landscape and technology. This analysis aims to establish the prominent conditions that are present within the region. The goal of isolating these conditions is to address a series of challenges that need to be responded to through the architecture.

To begin analyzing the context, what constitutes the term ‘region’ must first be specified. A region can be defined multiple ways, including politically, culturally, or geographically. In architecture, British Columbia is knows for its consistent use of natural resources, specifically large softwoods, which is supported by a study done in 2014 by the Council of Forest Industries, showing over 60% of BC landscapes are covered by forest growth. However, the contextual challenges for architects in southern interior Kamloops (such as dry climate, surrounding mountains, and summer forest fires) are drastically different from those in coastal Tofino (extremely wet climate, surrounding open ocean, and tidal storms). In defining ‘region’ contextually for responsive architecture, it is most intuitive to specify it geographically. Therefore, for a politically defined BC, this requires a split into three distinct geographic sub-regions: Northern Interior, Southern Interior, and Temperate Coastal. The northern interior is defined by high altitude boreal forest conditions that result in large mountains, dense

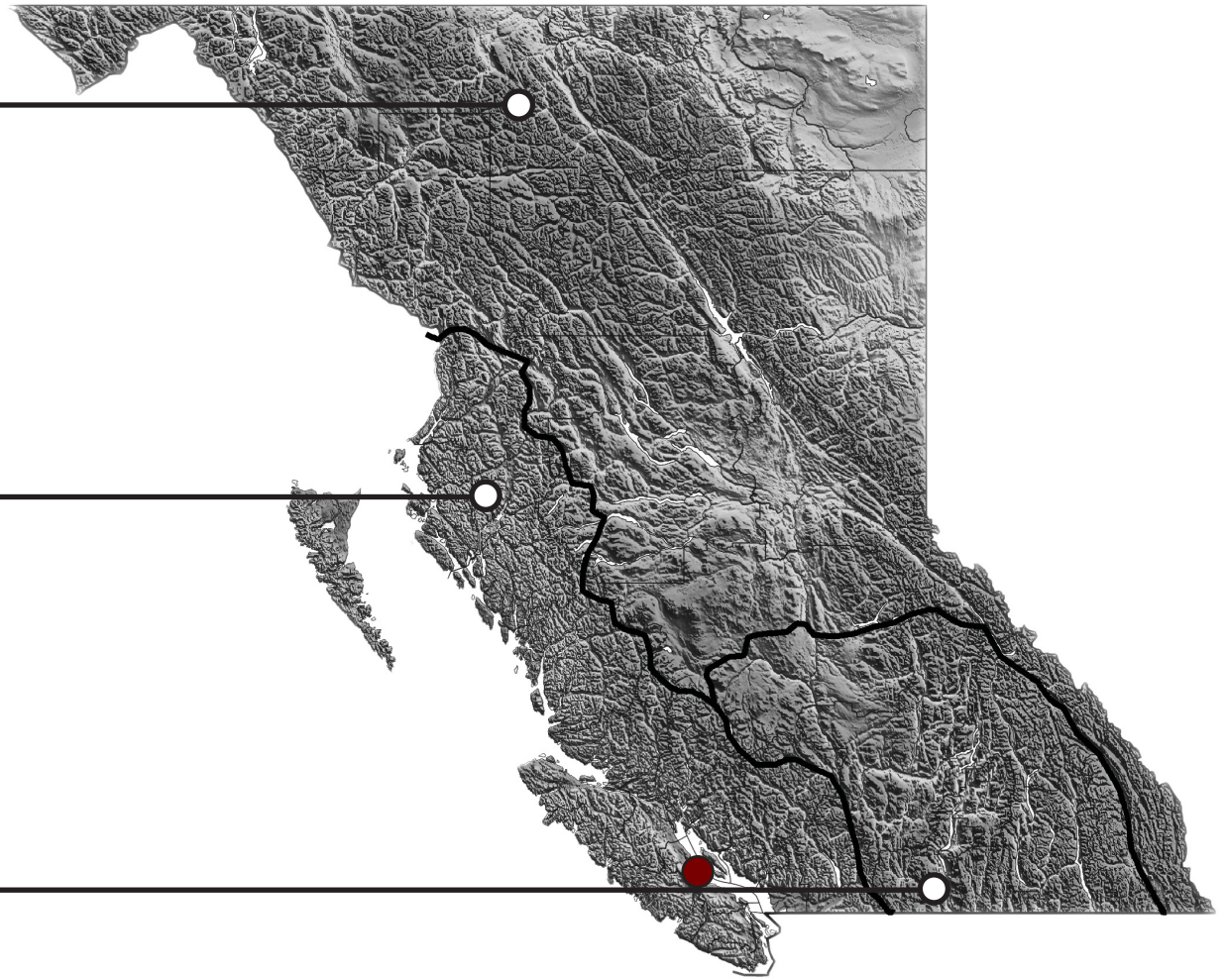
coniferous forests and cold temperatures with high precipitation year-round. The southern interior, with sub-tropic pockets, is characterized by extremely seasonal temperatures, dry climate, ample sunlight and rolling topographies with less vegetation than is typical to BC. Finally, the coastal region is considered to have a temperate rainforest climate, reflective of excessive precipitation, mild temperatures, dense vegetation and intense topographies that fall into the vast coastlines. As this thesis is focused in Deep Bay, the regional context analysis is of the temperate coastal region.

Northern Interior, Prince George, BC
(Sno Riders West 2014)



Coastal Rainforest, Squamish, BC
(HouseandHomes 2015)

Subtropic Interior, Osoyoos, BC
(Tripadvisor 2015)

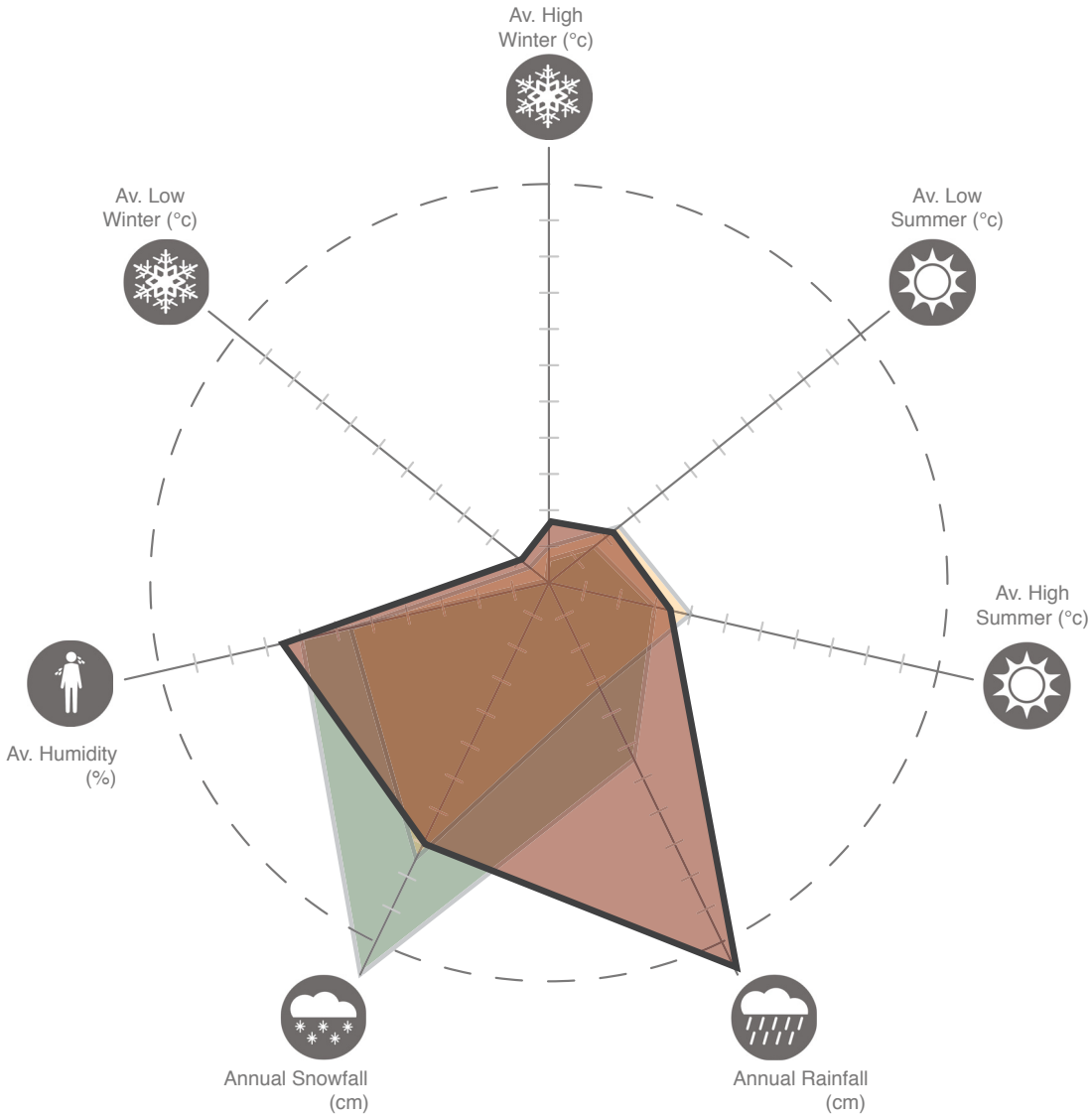


Illustrating the three subregions within British Columbia
(base image from Wikipedia 2014)

Climate

Coastal BC is characterized by an extremely wet climate, where cities typically receive between 1000-2500 millimeters of rain annually. However, due to its temperate climate, snow levels are moderately low, with cities typically receiving between 35-100 centimeters annually, except at periodically high altitudes (Environment Canada 2015). These high precipitation levels pose a critical consideration for architectural response, focused on the envelope and roof shelter. Designs in this region should consider sloped roofs with large overhangs to shed precipitation while keeping it clear of structural joints and infiltrating the building. In addition, site drainage and ground connection become important considerations. It is advised to raise ground connection to minimize water infiltration from ground precipitation build-up, and utilize pile connections to maintain natural site drainage. The building envelope should consider lapped cladding to effectively repel precipitation, as well as maintaining recessed openings, again to minimize water infiltration at opening joints.

The characteristically high precipitation levels results in large cloud cover that typically limits sunlight in the area to approximately 40% sun hours (Environment Canada 2015). Coinciding with a temperate climate, maximizing glazing in orientation to the sun path, and bringing in additional light from above become important design considerations. Another option in coastal regions for increasing light is to utilize



Comparing climate conditions of British Columbia’s sub-regions

reflective light off the surrounding waters. Also, in a coastal region with dull and cool natural light, the material application such as bright walls and light woods can improve the light quality and warmth of the interior architecture.

Temperature levels in coastal BC remain mild throughout the year, typically ranging between a maximum of -5°C to 30°C. In addition, humidity levels stay comfortable year round, averaging approximately 65% relative humidity (Environment Canada 2015). These neutral ranges reduce the risk of air vapor condensing within wall structures. However, because the temperature briefly lulls below zero, frost walls and insulated floors should be considered. Organizing massed walls to the north and glazing with the southern sun path can naturally balance heating and cooling for buildings. In addition, the suggested roof overhangs for precipitation can have dual usage by shading in high summer months, while maintaining solar intake during cooler winter months. Also, passive ventilation in roof ridge caps and soffits under overhangs are simple considerations that can keep dwellings cool and maintain air exchanges.

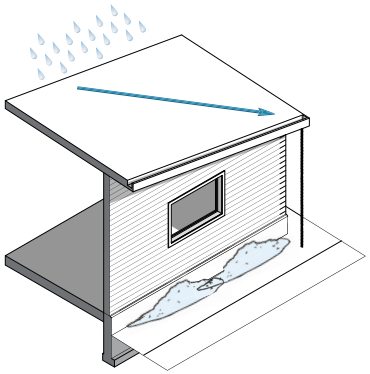
Lastly, the dense coniferous forests and dynamic topographies of coastal BC are effective at breaking winds that come off the coast of the pacific ocean. However, at low altitudes along the water’s edge, care should be taken to addressing wind loads, and storm surge set backs.

Illustrating climate conditions and responses by Arthur Erickson’s Hollenberg House (Erickson 2015)

Illustrating light quality in coastal BC and responses by the Vancouver Island University Marine Center (SAB 2015)

Precipitation

Heavy Rain (1100mm)
Mild Snow (70mm)
*annual figures



-Sloped roof with overhangs

-Lapped, water tolerant cladding

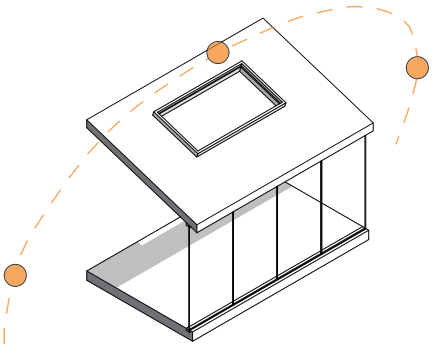
-Recessed openings and glazing

-Raised foundations

-Control site and building drainage

Light

Limited; Dull
40% sun hours



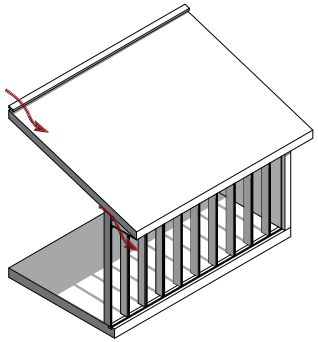
-Maximize light intake from sunpath

-Capture daylight from above

-Capture reflective light off ocean

Temperature

Mild; Temperate
Max: -5°c ⟷ 30°c
Avg: 4°c ⟷ 23°c



-Roof overhangs

-Passive ventilation

-Insulated systems

Illustrating regional climate conditions and responsive architectural considerations

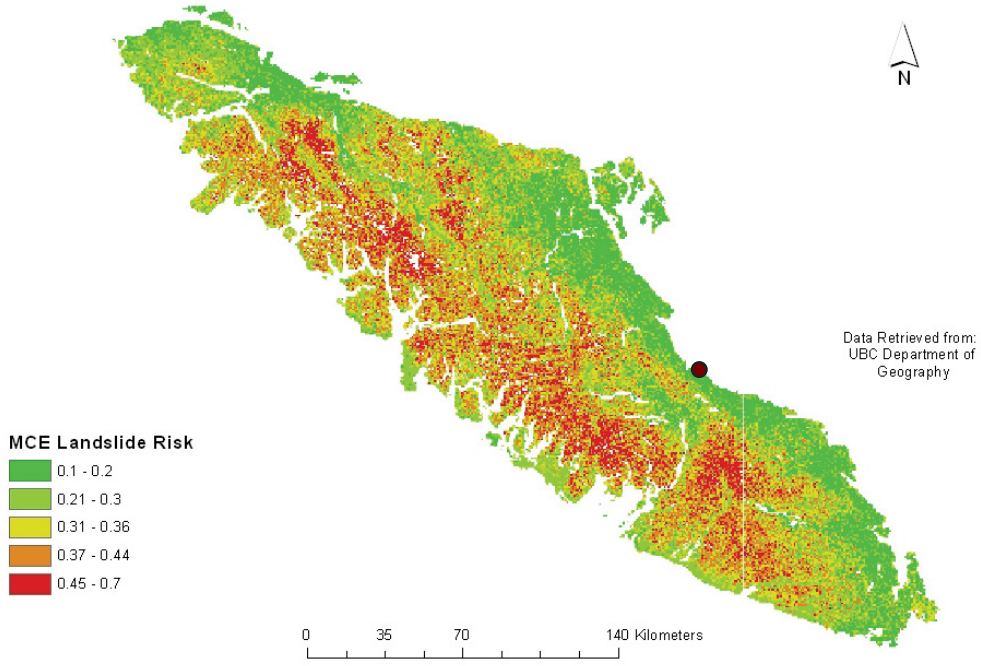
Landscape

The most definitive aspect of this region's landscape is the presence of an ocean. The ocean brings unique conditions to consider, such as weathering from both water and air salt content, and tidal zones that can become dangerous with storm surges. High salt content increases erosion of the earth and building materials. Metals often require coatings to prevent oxidization, concrete and stone need to be maintained, and exposed wood ends can rot over time, especially in a wet climate. Following the Japanese Tsunami in 2011, directly across the Pacific Ocean from Vancouver Island, architect Kengo Kuma was interviewed stating, "the problem with twentieth-century society is the arrogance of designers...every architect and engineer thought architecture was stronger than nature" (Dezeen 2014). It cannot be stressed enough that in coastal climates, erosion is inevitable, and if building along the shoreline the tidal range must be taken into account. With Deep Bay as a reference (sheltered from the open ocean), annual storm surges typically reach approximately 1 metre above high tide. In response, architecture should navigate this zone via safe setbacks or through implementing sacrificial architecture that plans to be maintained; it can be used as a form of break water to protect the integrity of the permanent structure. Also, as previously stated, the architecture should be oriented towards the coast to increase light intake by collecting reflective light off the water, as well as establishing visual, or tactile connections to this defining piece of the surrounding landscape.

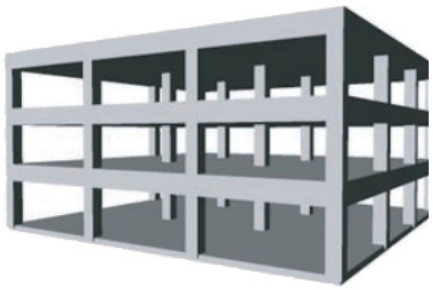
The second landscape condition to consider is topography. In this region the topography typically consists of dynamic slopes that dive right into the ocean. On Vancouver Island the altitude ranges from zero to 2.2 kilometres above sea level (Vancouver Island University 2015). The geology ranges from direct bedrock to a large portion of soft sandstone surfacing that extends 2-4 metres before meeting stable grade. In areas with the combination of intense topographies and soft grade slump-slides become a prominent consideration. They are essentially a coastal landslide that occur from soft soils eroding along the coast, in conjunction with deep rooted trees together causing rotational failure within deep sediments (Vancouver Island University 2015). In response to these issues, site drainage is important to minimize soaking the soft soils, foundations need to secure to stable strata, pile foundations should be used in sensitive landscapes to minimize surface pressure, meanwhile reducing material cost, and anchoring into secure ground conditions of a site, or imposing setbacks to fragile landscapes, are suggested responses to these topographies.

Coastal BC resides along two major fault lines along the Juan de Fuca plate. Along with many minor faults throughout the province, the coastal region is at risk of earthquakes in a seismically active zone. Furthermore, it increases the opportunity for slump slides in this coastal region. The seismic issue becomes an important consideration for architecture. There are three basic systems for seismic resistance: moment-resisting frames, braced frames, and shear

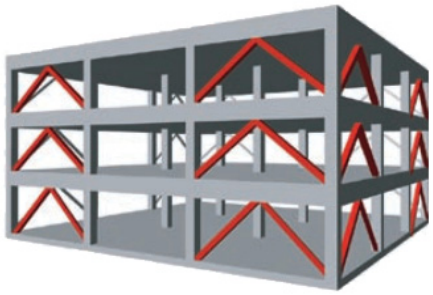
Illustrating coastal slump slide failure (Vancouver Island University 2015)



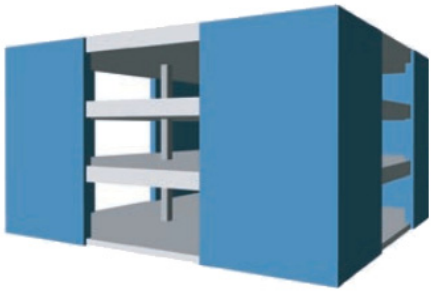
UBC Landslide Risk Assessment for Vancouver Island (University of British Columbia 2015)



Moment-resisting frame
with diaphragms

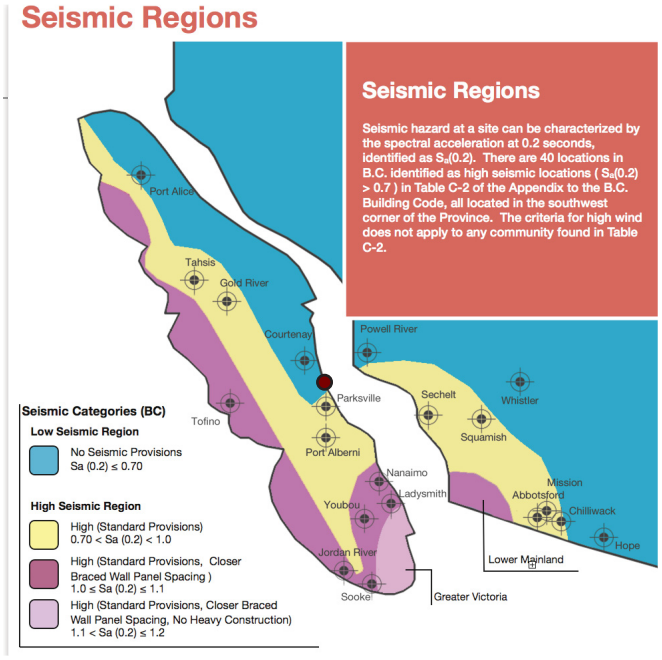


Braced frame
with diaphragms



Shear frame
with diaphragms

Illustrating three basic seismic-resisting systems (FEMA 2006)



BC Building Code Seismic Zoning (BC Building Envelope Council 2012)

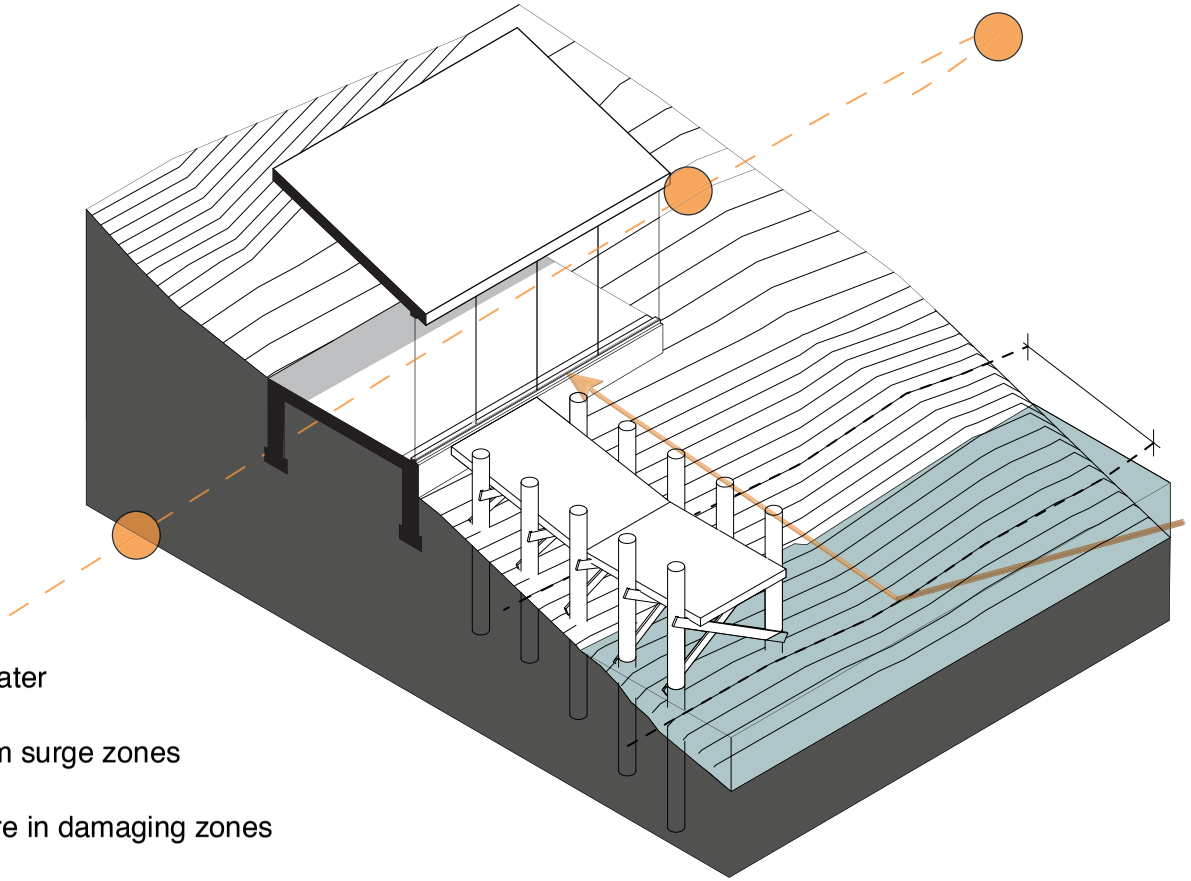
walls (FEMA 2006, 5-3). There are now examples of hybrid systems that integrate two of the basics. An example of an effective hybrid system is the use of a shear core structure with a moment-resisting frame perimeter (FEMA 2006, 5-3). Horizontal diaphragms are also suggested in combination with all three systems to establish rigid horizontal planes. An alternative system is to use lead-rubber isolation joints on foundations, which enables the foundations to shift and absorb the shocks, while significantly reducing stress on the superstructure.

The other landscape consideration becomes the utilization of natural resources. British Columbia is well known for its resource dependent economies, from logging, to mining, fishing, shellfish harvesting, and agricultural pockets. The coastal region offers a massive amount of large softwood trees, such as western red and yellow cedar, amabilis and douglas fir, as well as multiple species of pine. These woods are all used structurally and as finishes in architecture. In particular, cedar's were important to coastal aboriginals, and remain valuable today, because of their red color, natural durability against water, and resistance to decay and insect intrusion (Nabokov 1989). This makes them a great option for exterior wall cladding, roof shingles, trims and finishes. Mining aggregates are used for concrete, stonework and sands to make glazing. Furthermore, the shellfish that cover low tide beaches are harvested and the leftover shells can be utilized as aggregate for concrete, or be crushed and used as an alternative for paving. Oyster shells have a

natural ability to absorb oils, which can minimize oil runoff into the surrounding oceans that is caused from hard-scape parking lots and roadways. Lastly, the wet coastal climate provides ample water that can be collected and redistributed to washrooms, mechanical systems, and landscaping, such as gardens or ponds.

Coastal Conditions

Salt water, weathering and
active tidal zones



Considerations

-Capture reflective light off water

-Awareness of tidal and storm surge zones

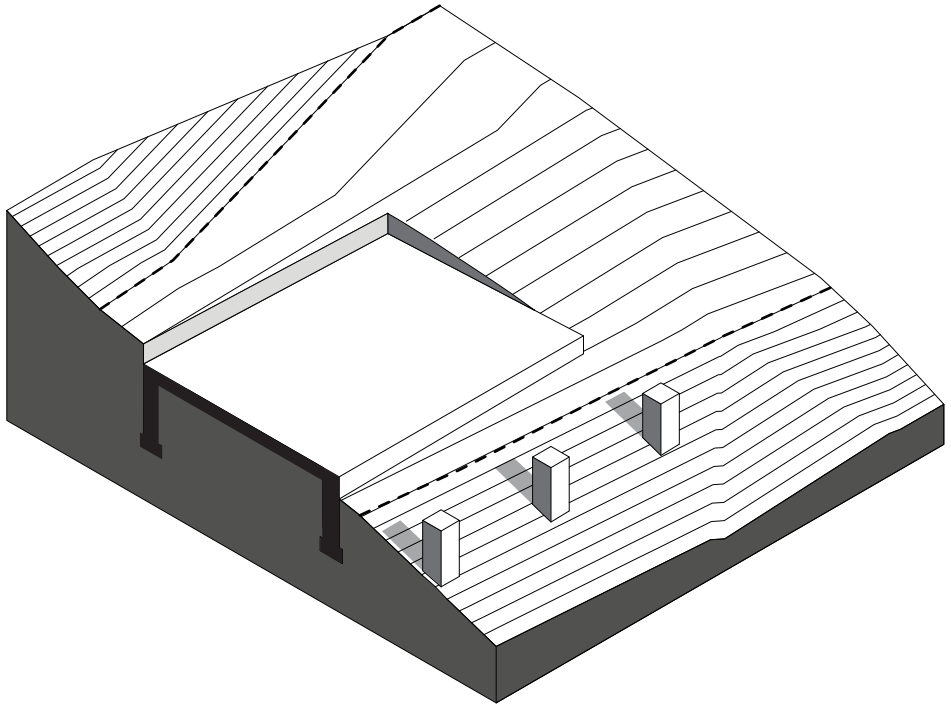
-Sacrificial/flexible architecture in damaging zones

-Create visual connections to the surrounding context

Illustrating coastal conditions and architectural considerations

Topography Conditions

Dynamic slopes and soft sandstone



Considerations

-Anchor to secure ground

-Piles imbed into more fragile ground

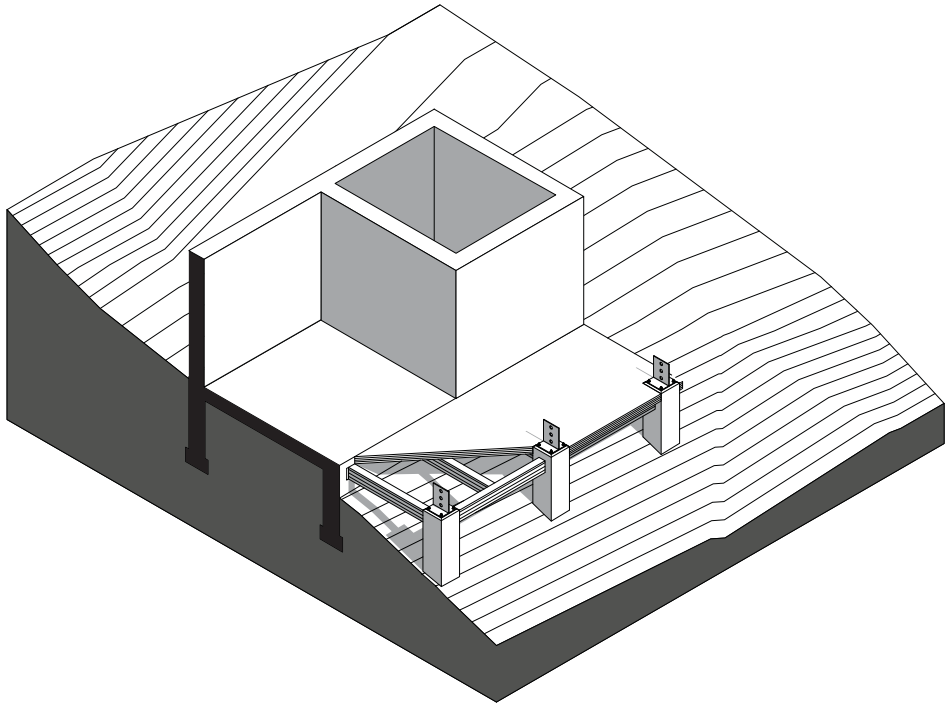
-Stable strata reached between 2-4m

-Site drainage important with moist, soft soils

Illustrating topography conditions and architectural considerations

Seismic Conditions

Ground quakes, Slump-slides
and tsunami’s



Considerations

-Shear core structure

-Moment-resisting frames

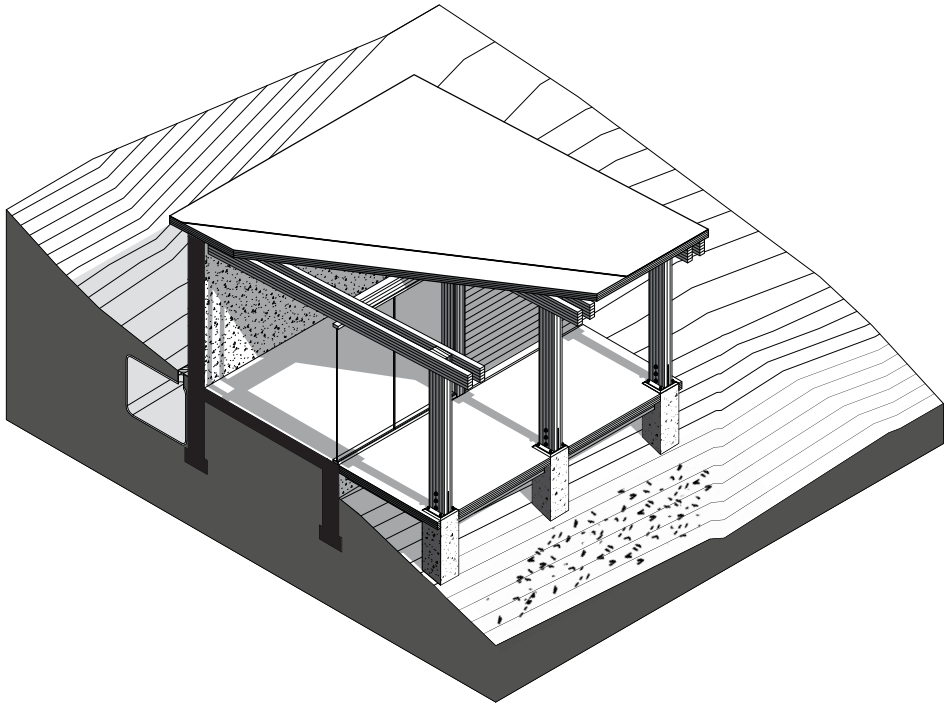
-Horizontal shear diaphragms

-Lead-rubber isolation joint options

Illustrating seismic conditions and architectural considerations

Natural Resource Conditions

Large softwoods, Oyster shells
and water



Considerations

-Groundwater collection

-Oystershell crush site surfacing

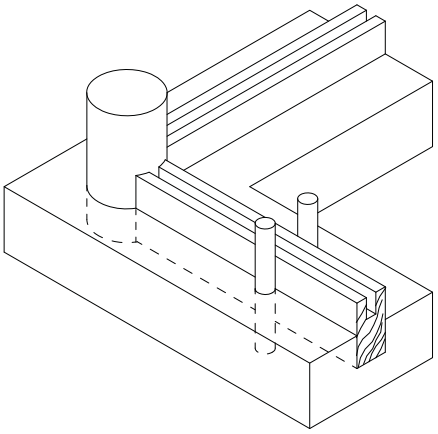
-Oystershell aggregate in concrete

-Local softwoods for superstructure

Illustrating natural resource conditions and architectural considerations

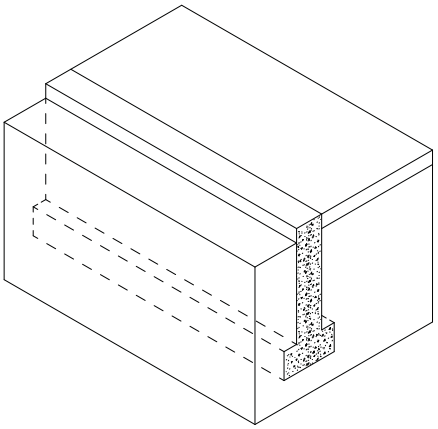
Technology

The building culture in coastal BC is well documented through the works of numerous native tribes, predominantly the Haida, Salish and Kwakiutl, as well as prominent architects such as Arthur Erickson, the Patkau's, and Michael Green, to name a few. To understand why certain technologies are applied, traditional and contemporary methods are documented and analyzed from this region. These methods establish a foundation of building systems to be adapted and developed into the site specific design intentions.

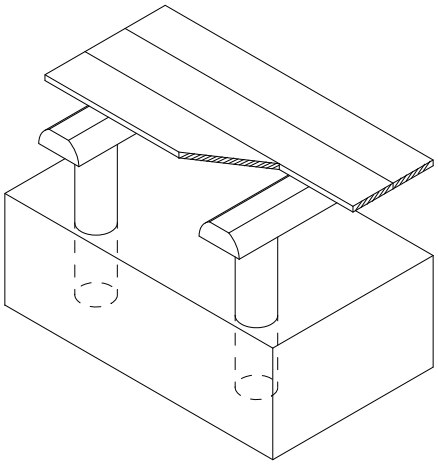


Corner detail, native wood sill beam foundation

Continuing from the seismic and topography considerations of the landscape section, foundation methods in the area come in two main ways: full frost wall foundations, and pile foundations. Coastal native tribes, in the late 19th century, used wood sill beams that were partially dug into the earth and stabilized by flanking pegs (Nabokov 1989, 271). These pegs were sometimes larger poles that extended to also support plank siding boards. Corner columns were also dug into the ground and detailed to secure intersecting sill beams. The main concern with this system is the wood rotting in the moist ground conditions of the regional climate. It would also allow ground moisture and frost to penetrate into the building. Contemporary concrete walls address these two major concerns by reaching down below the frost line to footings, as well as using a more water-resistant material. Modern coatings and insulations also aid this system in becoming

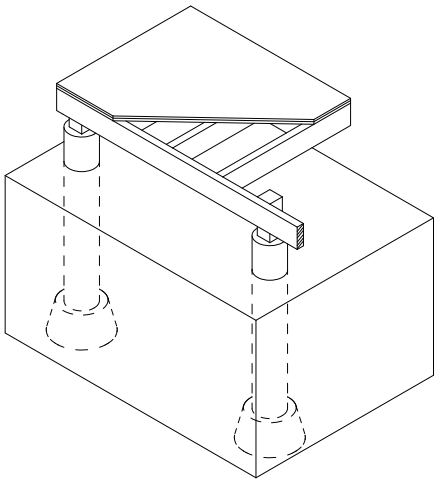


Contemporary concrete frost wall



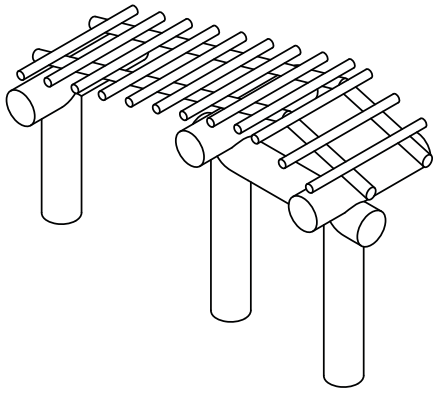
Traditional wood pile foundation

stronger at water resistance, and at insulating floor structure and its sub soils. As discussed in the landscape section, this region is accustom to intense and potentially fragile topographies where the use of heavy concrete frost wall foundations becomes a concern. A good response is the use of pile foundations that imbed deep into the ground and create point-loads. These systems minimize both ground pressure and material usage significantly. It also typically raises the floor structure above the ground, requiring an insulated floor now that open airflow is fully circulating underneath it. Traditional techniques are still used on occurrence today, where wood piles are driven into the ground. Native methods typically used half-sawn beams that sat upon the piles with plank boards as decking above. It is more structurally sound now to use concrete piles, for similar rotting purposes to traditional wood foundations, that are then framed over with joist systems and decking, or shear diaphragms. However, the benefit of using wood piles is that they are easily maintained and could be used as sacrificial architecture along the damaging coastline, or in perimeter structure areas.



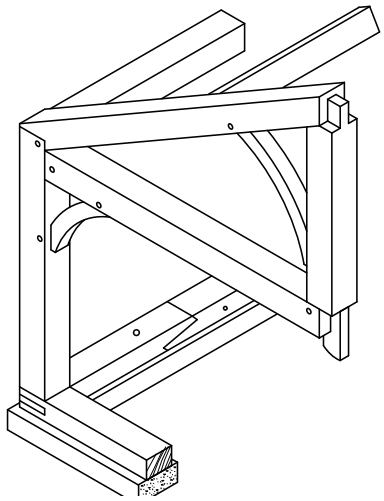
Contemporary concrete pile foundation with ‘big-foot’ footing

Framing systems in this region, and across British Columbia, typical utilize local wood resources. The coastal Kwakiutl and Haida tribes are known for their use of log post-and-beam framing. The system minimized parts by establishing large spans with minimal material. It also creates point-loads that benefit in soft coastal soil conditions. However, working with round logs requires more skilled labour

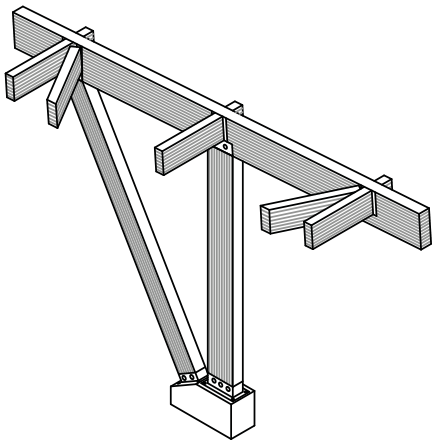


Traditional native log framing

to effectively secure joints. Timber framing can have many different styles, but traditional European-derived timber frames create very strong structural systems that act well against seismic concerns. It is a system that provides design flexibility for openings and wall infill. Though the biggest issue with this system is that it requires very skilled labour, even craft, for the notched wood joinery. Alternatively, contemporary engineered wood can be used in both post-and-beam or shear form. Engineered wood is typically found in three styles: Glue laminated (glulam), where dimensional lumber is laminated over one another. Parallel Strand Lumber (parallam) where chipped wood is bound together with adhesive, becoming strong without natural knots, and often utilizes recycled wood. Thirdly, mass timber, commonly used as Cross Laminated Timber (CLT), which is more commonly used to create shear panels. These systems are significantly stronger than traditional wood, and when combined with steel connections, create a rigid, ductile moment-resisting frame. These frames are effective against seismic activity and can be designed to accommodate all three fundamental systems discussed before (moment-resisting, brace or shear). They are also light weight, and can be used in combination with either pile or frost wall foundations.



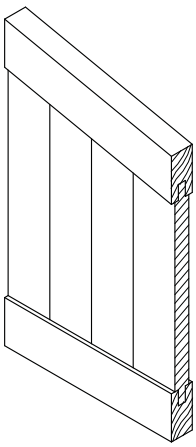
Traditional timber framing derived from European methods



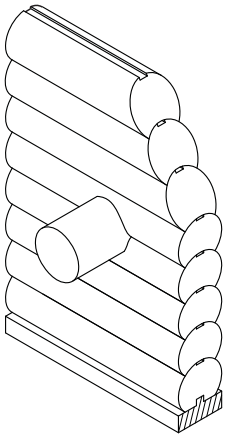
Contemporary engineered wood post and beam framing with steel joints

Shear walls are important considerations for resisting the seismic activity present in the region. Traditional examples of native structures are well documented by the Haida. They carved a slot in the large sill and top beams, and fit thick wood planks between

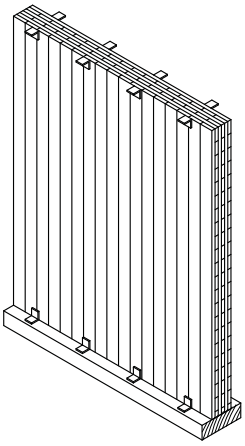
them that were secured into the notches (Nabokov 1989). This method creates a solid jointed wall that acts as a shear unit. It is adaptable to varying roof slopes, but its biggest disadvantage is that the vertical slots are susceptive to water infiltration; either through capillary action or imprecise hand cut planks that could leave small gaps between parts of the boards. The stacked log construction stems from European settlers in the 19th century. There are varying ways to notch and profile the logs for joining, however the simple cope method of creating a notch along the base of the log allows gravity to mould the notch to the log below due to the softness of wood, and the weight above. Contemporary systems employ small foam gaskets over the top of the logs to aid in creating a full air-tight seal. The logs also provide good insulating quality, and longer fire ratings when using the large softwoods of this region. Downsides to this method are the unique labour skill sets, heavy system for wood construction and requires larger amounts of full log material. A more contemporary option is to use engineered wood, specifically CLT panels. Well documented in architect Michael Green's "Tall Wood," engineered wood is pushing the boundaries of contemporary wood construction. CLT acts as a rigid shear panel, or horizontal diaphragm, that have both proven to be light-weight options that are effective against seismic activity (Green 2011). These systems are flexible to integrating with mixed materials as the connections are adaptable, and simple for labour. The option to add additional thin layers (typically layered in



Haida panel wall on sill foundation



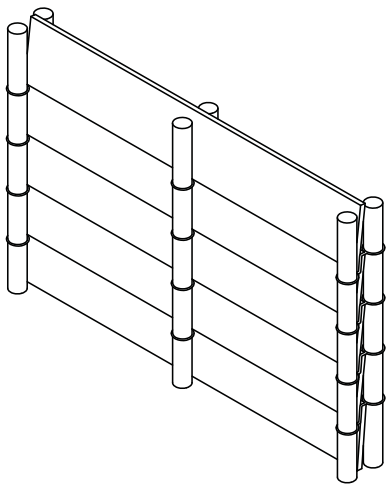
Stacked log shear wall with foam gasket inserts to create a full air seal



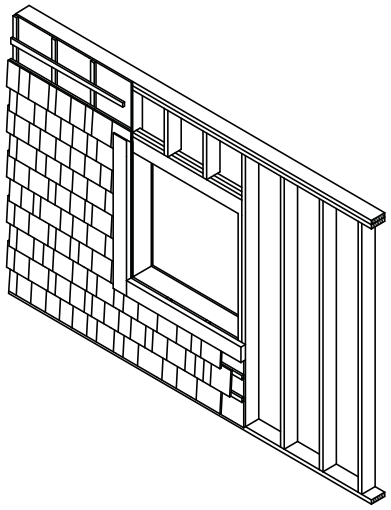
Engineered CLT wall that can also be used as a horizontal diaphragm

increments of standard dimensional lumber: 3/4” or 1-1/2”) provides protective char layers. These layers are sacrificial and protect the structural integrity of the wall when exposed to fire. As they are still made of wood, they are not advised to be used in the earth as foundation walls, however can be easily secured to typical concrete systems.

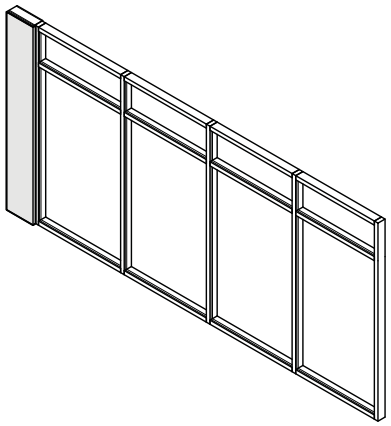
Envelope is an essential aspect to consider when in a wet region. Once again, looking back on traditional native building practices, the coastal Salish recognized the durability of cedar early on. Cedar was cut into long, wide planks and overlapped between poles to effectively shed moisture (Nabokov 1989, 236). This lapped cladding principle is still used around the world today, and cedar remains a primary material used for clapboard and shingle cladding systems in this region. As technologies have developed, contemporary framing systems -such as platform framing- enable far greater insulating and structural support that are easy to incorporate with this effective cladding method. Platform framing utilizes dimensional lumber in a cheap, easy construction system where single-story walls are framed, erected, sheathed, insulated and finished. A very smooth process that allows for modern mechanical systems to be processed through the walls. Furthermore, openings are easily framed into these walls with strong supports and flexible placement opportunities. The strength of this system, however, is less effective than the CLT shear panels -especially against seismic forces- and is typically seen in residential scale designs.



Traditional Salish lapped cladding with cedar plank boards



Platform frame with lapped shingle cladding and recessed glazing



Conventional curtain wall glazing recessed from surrounding walls

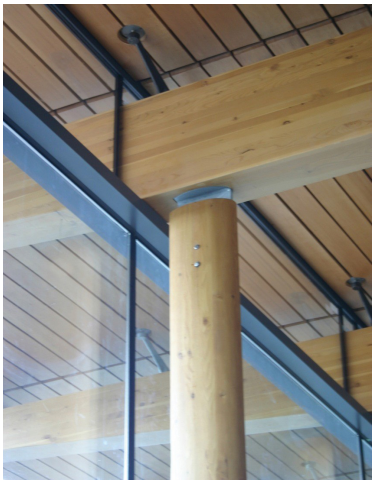
Finally, as modern technology becomes more efficient, and the desire to increase light intake is important in this region, glazing must be discussed as a prominent envelope option. Due to the temperate climate, glazing does not pose a severe threat with its low R-values for insulating purposes. They should, however, be recessed from surrounding walls and sheltered by overhangs in order to prevent water infiltration at these major joints. In a salty climate, it is advised to use coatings on aluminum systems to prevent erosion, or to use timber structural components that thrive in this natural setting. A benefit to curtain walls is they can utilize structural glazing if required, or remain non structural, except for dealing with wind loads.

Haida ‘six-beam house’ (Nabokov 1989)

Integration of traditional native methods; primarily cedar siding over post-and-beam framing (Wedler Engineering 2015)

Overhanging glazing within integrated post-and-beam system (Erickson 2015)

Anchor, transition, and pile ground connections navigate a dynamic topography (Erickson 2015)



Steel jointed post-and-beam (Green 2015)

Engineered CLT shear diaphragm and post-and-beam (Green 2015)

Resulting Site Strategy Principles

A summary of the regional context analysis provides opportunity to establish site strategy principles that act as responses to the regional conditions. These principles are used as conceptual guidelines that become focused when designing for a specific site.

The dynamic topographies and coastal edges lead to beginning with a reading of the landscape to identify focal points, fragile zones, and prominent transitions in the grade. This immediately addresses the nature and character of the landscape being designed on.

The wet climate and soft surface soils along varying terrains require careful consideration to ground connection and site drainage. Coinciding with a moderately active seismic zone, these conditions combine to advise a concrete shear structure that anchors into secure ground conditions of the site. Building full foundations will require consideration to site drainage, redirecting water around the building or collecting and redistributing it to mechanical or landscape components. Together, these conditions also support the use of pile connections over more fragile landscapes to reduce surface loading for potential slump-slides, and maintaining site drainage.

Building up over the foundations, the shear core can be used in a hybrid system with a moment-resisting frame that extends over the pile foundations. The use of horizontal diaphragms, specifically concrete slabs on grade and CLT panels over grade, can tie the structures together and provide horizontal

rigidity above the foundations. This hybrid system is effective structurally, but can also express the transitions in the landscape below, changing from a more heavy, grounded shear core, to a lighter elemental frame. This transition can be duly picked up on by the program strategy, circulation, organization of voids and enclosures, and the material application of finishes.

The limited light conditions promote an important consideration to address the sun path. Southwest facing glazing that incorporates overhangs, in combination with northeast massing can be naturally productive towards both increasing light intake, shading intense summer glare, and retaining insulated heat. As the landscape is also typically covered with dense forests and high altitude mountain ranges, using the roof to create additional light intake is important. Clearstory systems gesturing to the sky can bring in plenty of extra light in a climate where there is limited sun hours. Furthermore, the benefit of being in a coastal environment is the ability to consider reflective light off of the water. The orientation of glazing towards the water not only promotes light intake, but simultaneously gestures to the surrounding views of the defining landscapes.

After establishing these conceptual site strategies, they are used as guidelines for the design. But, it is the adaptation of the principles within a site, and the integration of the design intentions and program requirements from the cultural analysis that come together to emphasize the authenticity of the place.

1. Define focal points and transitions, addressing the nature of the landscape

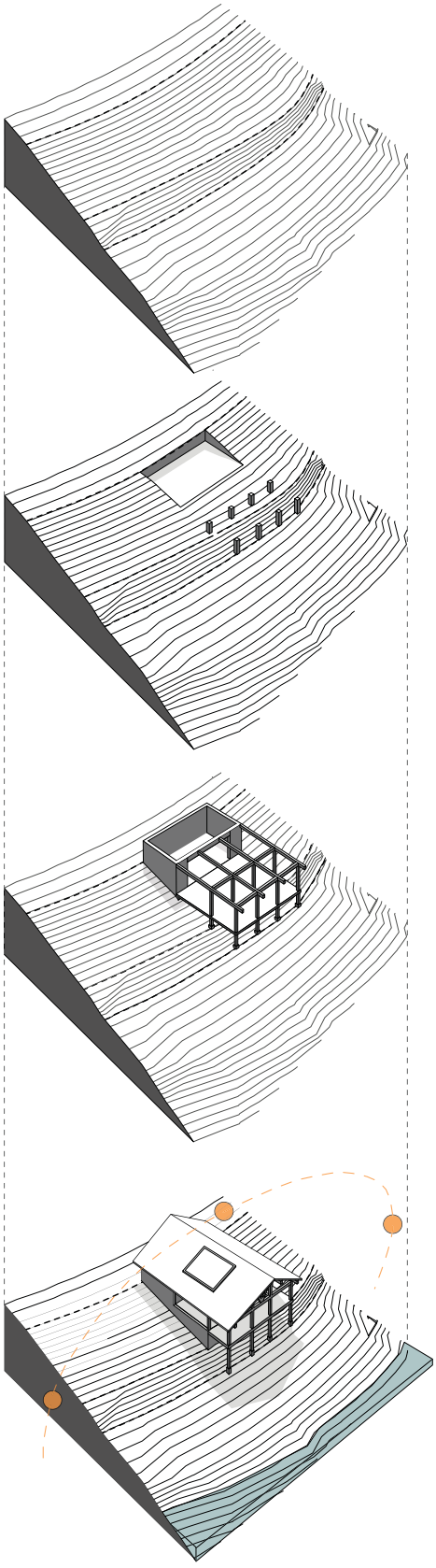
2. Anchor into secure ground conditions;

   Imbed piles into more fragile landscapes to reduce surface loading

3. Shear core structure shifts to a moment-resisting frame, reflecting transitions in the landscape

4. Address sun path and surrounding water to increase light intake;

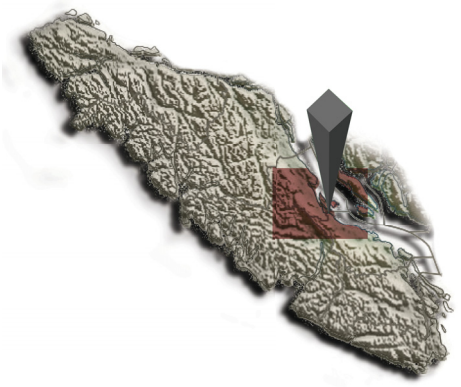
   Gesture to surrounding context



Illustrating conceptual site strategy principles

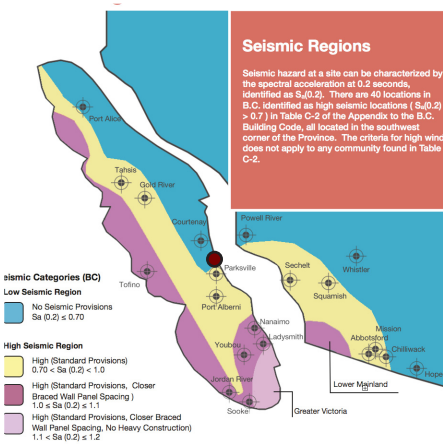
Site Specific Context Analysis

The regional considerations can now be focused to the site specific with an understanding of the larger context being designed in. Within the coastal region of BC, Deep Bay rests sheltered in the Georgia Strait on the east coast of Vancouver Island. It maintains many climatic conditions that are typical to the region, such as a mild, temperate climate, high precipitation levels and limited sunlight hours. A benefit of being on the east coast of Vancouver Island is the more severe winds and storms from the open Pacific Ocean are buffered by the central mountain ranges that create a 2 kilometre high barrier. These conditions collectively promote precipitation, light, and temperature as the essential climatic factors to be addressed while designing at the site specific scale.



Locating Deep Bay on Vancouver Island (base image from Wikipedia 2014)

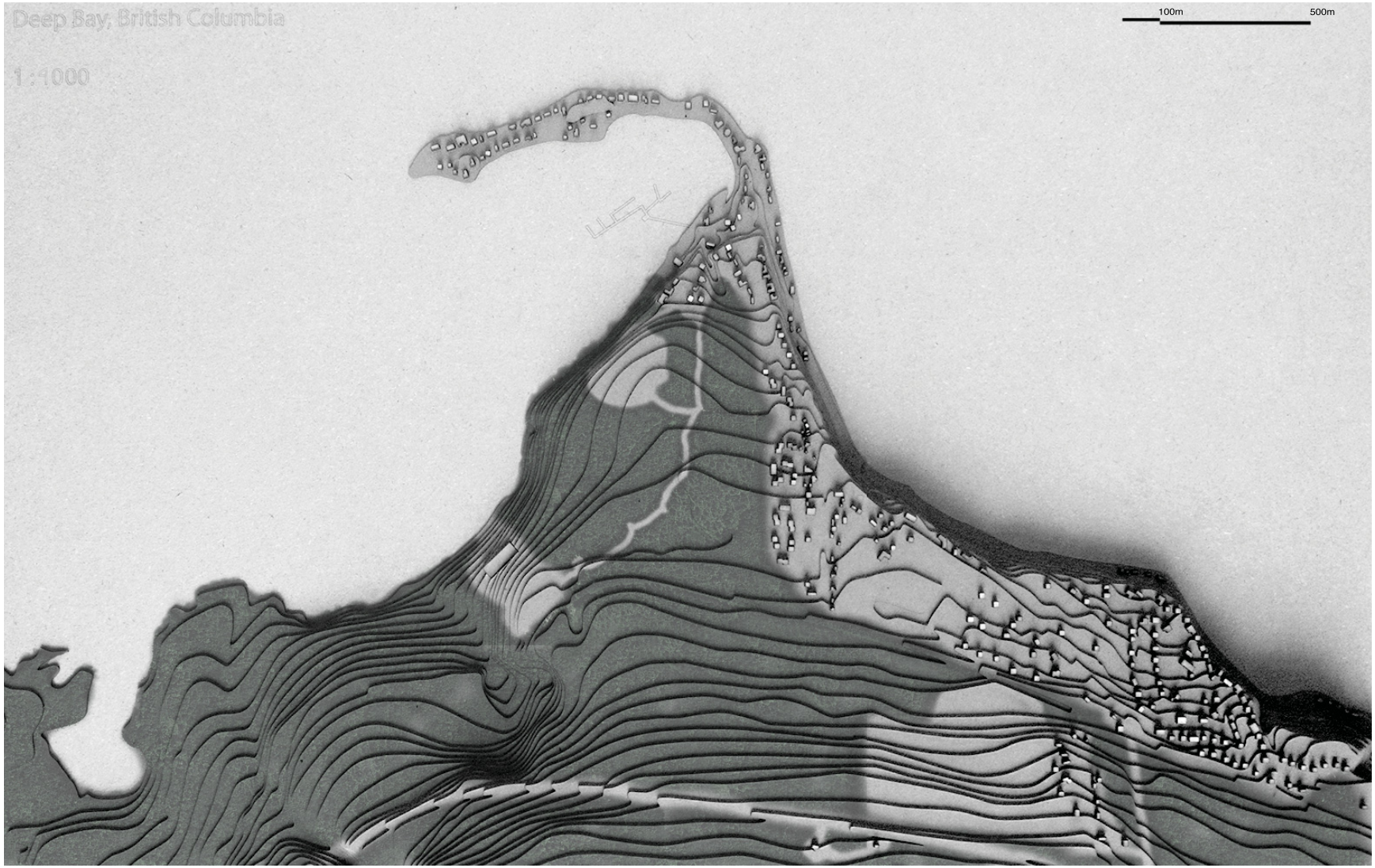
In addressing the landscape conditions, Deep Bay is surrounded by an abundance of natural resources. The large softwood forests are a key feature, but more uniquely, Deep Bay houses a large shellfish population that is central to the local culture. With excessive oyster shell remains leftover, local businesses could profit from selling these shells; while their incorporation in design would be an expression of the local identity and culture. Its situation on the interior coast of the Island shelters the community from major storms, though minor storm surges still need to be considered while building along the shoreline. According to the BC Building Code revisions of 2012 (BCBEC 2012),



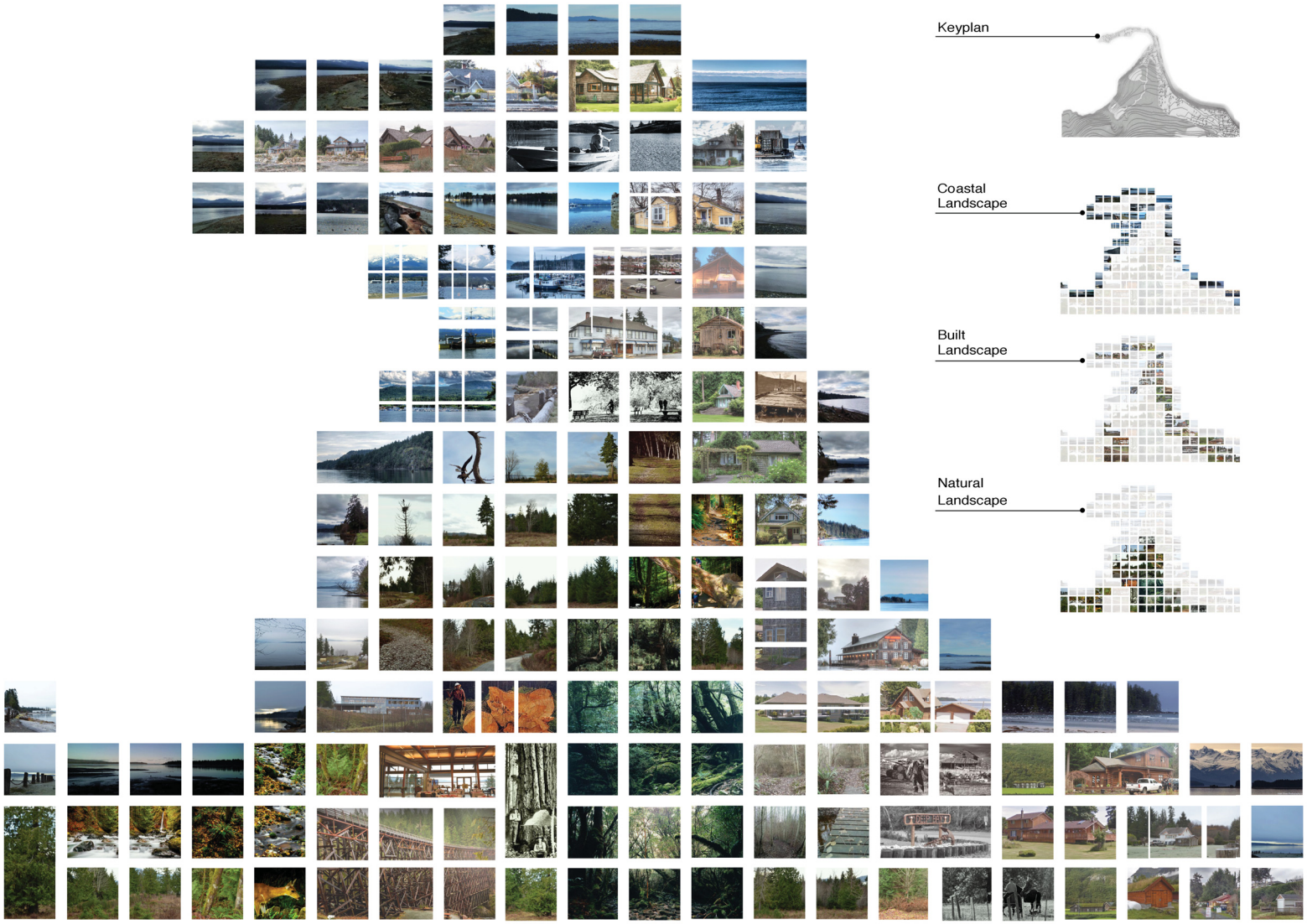
BC Seismic Zoning (BC Building Envelope Council 2012)

Deep Bay resides in a lower activity area within the highly seismic coastal region. Nevertheless, in combination with the soft surface sandstone, secure foundations and site drainage systems become primary landscape considerations. A failure to address these factors could result in detrimental slump-slides. A lack of awareness toward tidal zones and storm surge potential could likewise be just as damaging. Ultimately, using the abundance of local materials from the surrounding landscape becomes an appropriate consideration for the design of regionally appropriate architecture.

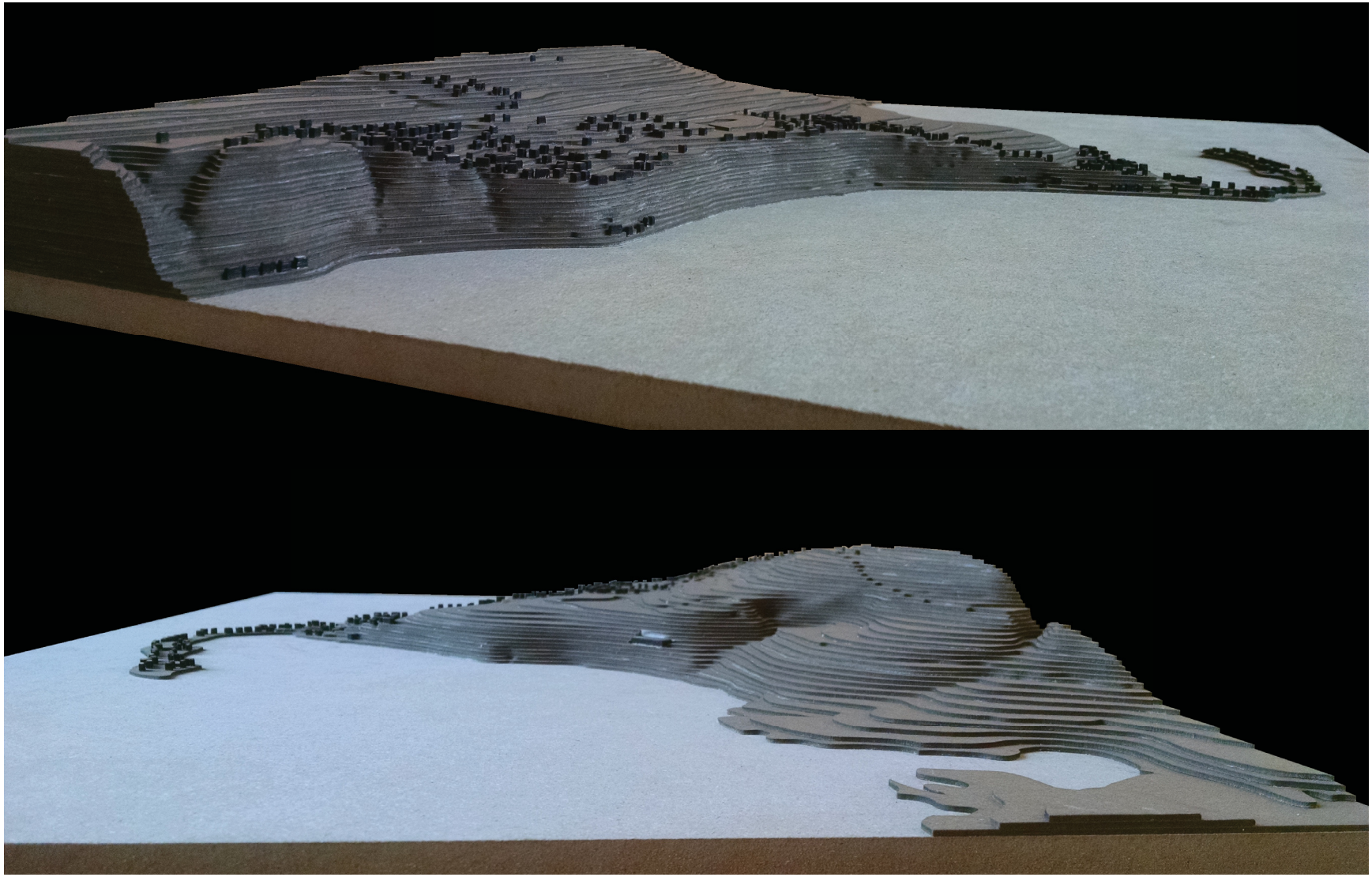
The community resides along a steep coastline that recommends the consideration of a hybrid structural system. In integration with the site specific landscape considerations, a hybrid shear core and moment-resisting frame system arises. As the architecture navigates the dynamic terrains, pile foundations can be beneficial to minimize surface loading, raise floor plates above moist ground conditions, and coincide below a post-and-beam frame superstructure. The combination of local topography and moderate seismic activity in the area suggests light weight structures. These conditions can be addressed by the use of CLT shear panelling and wood post-and-beam framing; where ductility is added through steel moment connections. Also, in responding to the limited light qualities, temperate and wet climate, the use of lapped cedar cladding and protected glazing are focal factors to consider with envelope design.



1:4000 Deep Bay site model illustrating the local landscape and contrast between built and surrounding natural environments



Cultural collage of Deep Bay



1:4000 site model of Deep Bay illustrating dynamic coastal edges

Local landscapes - View of the Bay from the spit

Local landscapes - View of the coastline from the Vancouver Island University Marine Center

Culture

The landscape plays a critical role in the local identity of Deep Bay. As previously discussed, British Columbia is largely comprised of local resource dependent economies, which holds true here. The community was settled by Europeans as a logging, fishing and shellfish harvesting community in the late 19th century (Travel British Columbia 2014). The rural community houses a small building footprint that is nestled among the natural landscape. Until recently this community had maintained a rural population just under 1000, but over the past fifteen years Deep Bay has seen a population increase to approximately 1600 (City Data 2014). This jump is a direct result of three new social populations: a retirement population, timeshare vacationers and outdoor enthusiasts, and an academic population that coincides with the introduction of the Vancouver Island University Marine Research Center in 2011. The Marine Center signifies the beginning of a development in local identity that stems from the fundamental culture of the area while adding new layers of activity to the community. For example, the Marine Center houses programs that include oceanography, marine biology, forestry, environmental sciences, and culinary activity (specializing in seafood, specifically the local world-famous oysters) that all build upon the roots of the local culture. Though these new populations have arrived because of the local culture, whether for recreation, relaxation, education, or work, these new groups remain disconnected both socially and physically.

(Cathedral Grove 2015)

(Flickr 2007)

(Flickr, Vancouver Island University Deep Bay 2015)

(Flickr, Forestry Vancouver Island University 2015)

(Flickr, Vancouver Island University Deep Bay 2015)

(Flickr, Vancouver Island University Deep Bay 2015)

Illustrating the importance of local culture to both traditional work and developing academic activity (forestry, shell fish harvesting and culinary)

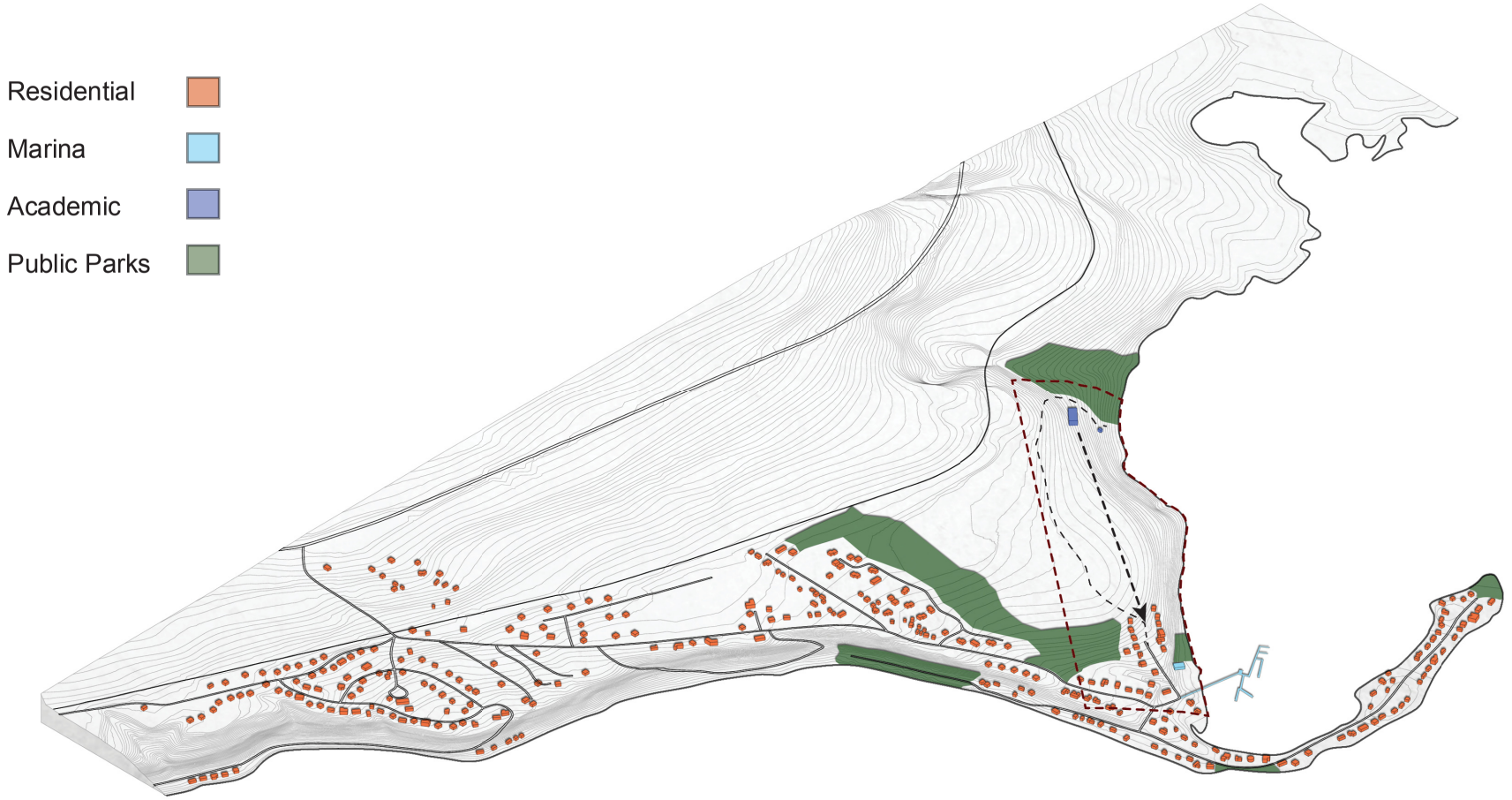
The Marine Center initiated a growth in local identity that can be further built upon to embrace this growth while remaining true to the local culture of Deep Bay. One of the main reasons this gap remains is because of a lack of public infrastructure to accommodate the increased activity in the area. Providing culturally significant public infrastructure would both support the increased activity and promote integration between the new and existing populations in this rural community. Addressing the growth in identity could also establish Deep Bay as a small hub for the surrounding rural communities.

Public program should consider building off the local culture, responding to support the increased activity in the area, yet not imposing upon the existing community. Programmes such as small business, education, recreation and dwelling could be used to create effective public spaces for the area. A local cafe provides a universal opportunity to increase public dwelling, support a small business, and benefits retirees, visitors, or students looking for a place to study. A visitor center is a way to build off the community education from the Marine Center, educating on the history and culture of the area. Furthermore, building on the education of culinary classes at the Marine Center, a restaurant looks to provide the culturally significant foods for the local communities, while also creating a public dwelling opportunity. In keeping with food, residents currently have no supermarkets. A farmers market would enable local produce and sales of seafood, as well as providing retirees with a place to sell art. In addition,

outdoor interaction is important to the local lifestyle. Therefore, increasing access to the existing hiking trails, beaches, and water that all attract locals and visitors to the area would be great for facilitating the current growth.

To summarize, the current identity advancement that has introduced new populations and increased activity is being addressed by designing a public axis for the community. This axis intends to facilitate the growth, bridging the physical and social gap that remains between the new Marine Center and the rest of the community. The development links the two existing public facilities together, connecting the Marine Center from one end back to the heart of the town at the Deep Bay Marina.

Photographs of the existing trail networks



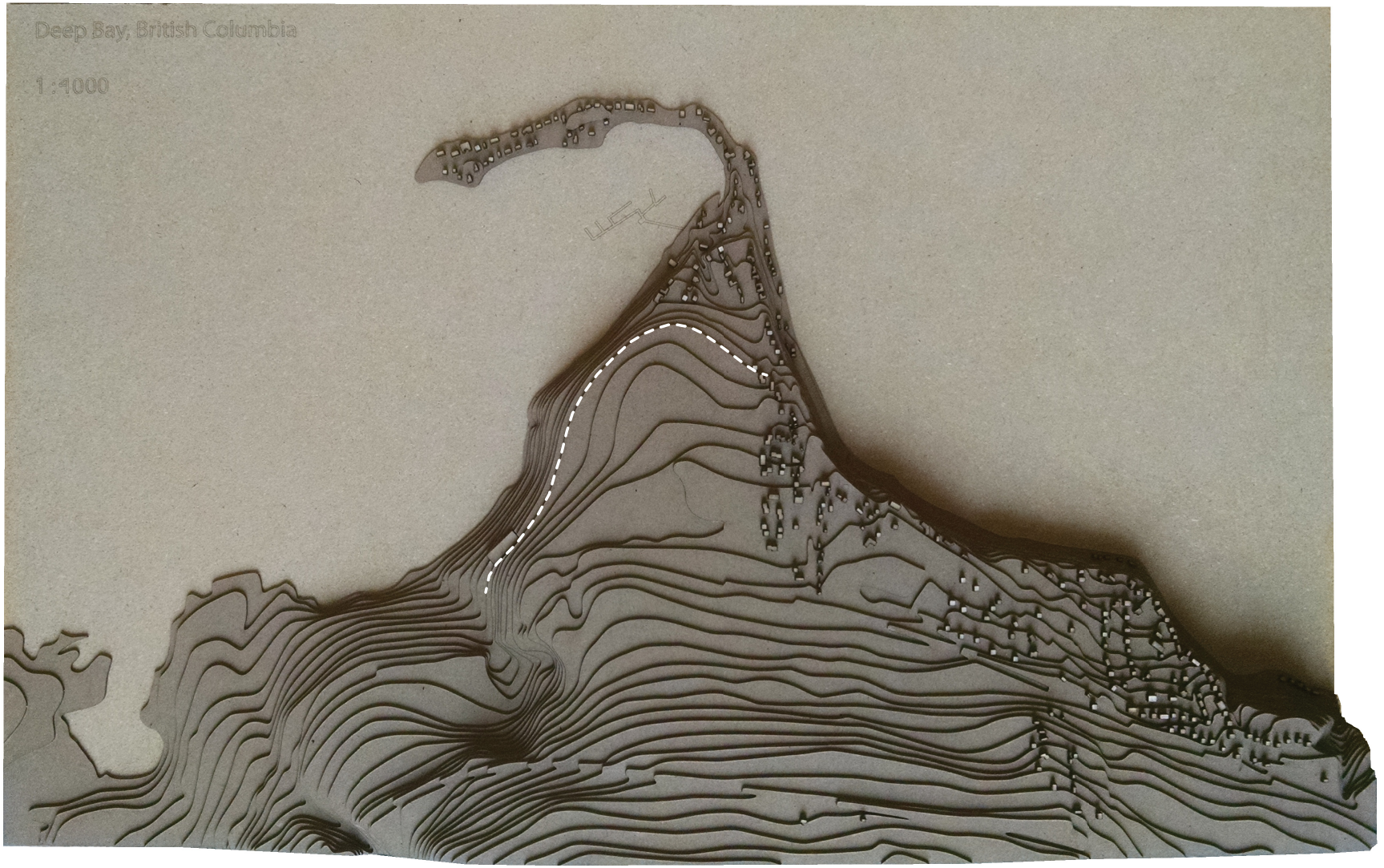
Mapping the social dynamics of Deep Bay, as well as isolating the proposed site that is being used to bridge the gap between social groups by connecting the Marine Center back to the central Marina

CHAPTER 3: DESIGN RESPONSE

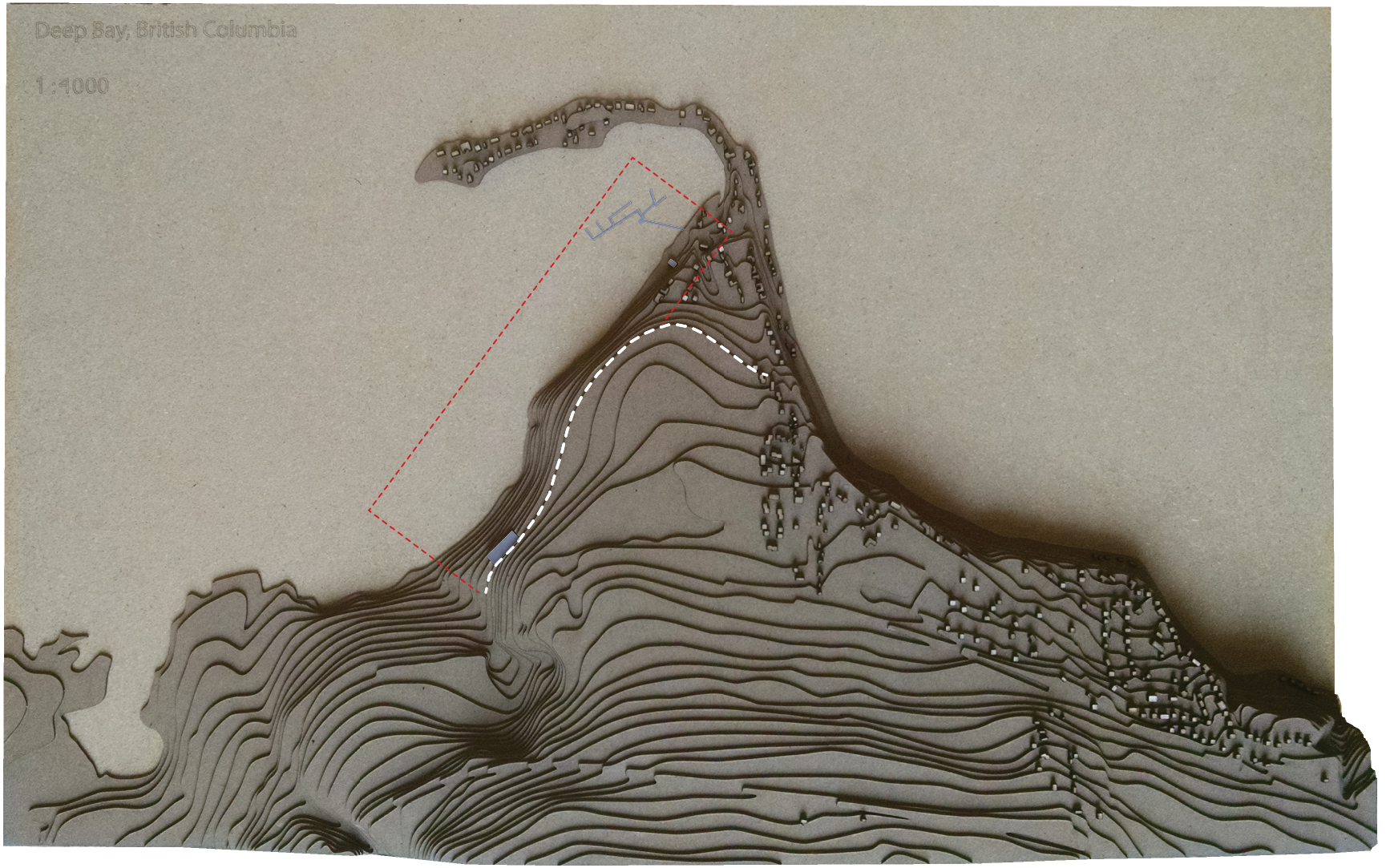
Site Analysis

The developed site strategy is first implemented at the master plan scale, beginning with a reading of the landscape to identify focal points and transitions that characterize the nature of the site. The most defining element of the proposed site is a large plateau region that pushes out toward the central harbour; creating a drastic contrast between it and the compressed slopes that descend toward the bay. This dramatic transition is isolated as a key component to organize the site development. The plateau's edge holds a wide position as a node that the town revolves around, which endorses it as a vehicle circulation route to create easy access through the town; simultaneously minimizing vehicle traffic from the coastal edge. This path highlights the edge of the plateau, acting as an anchor, or datum, that organizes the site in front of it towards the bay. By using this edge as a datum for the site, it advocates public spaces to engage with the characteristic landscapes, as well as addresses the importance of the harbour to the identity of the community.

There are two additional focal points well defined in the landscape and surrounding context that support smaller building sites within the larger master plan. The first is a prominent point that juts out along the coastline, pulling back into the rural landscape towards the Marine Center. To the south of the point, a river exists that structures a southern edge for this



1:4000 Site model of Deep Bay illustrating the prominent landscape transition between plateau and coastline

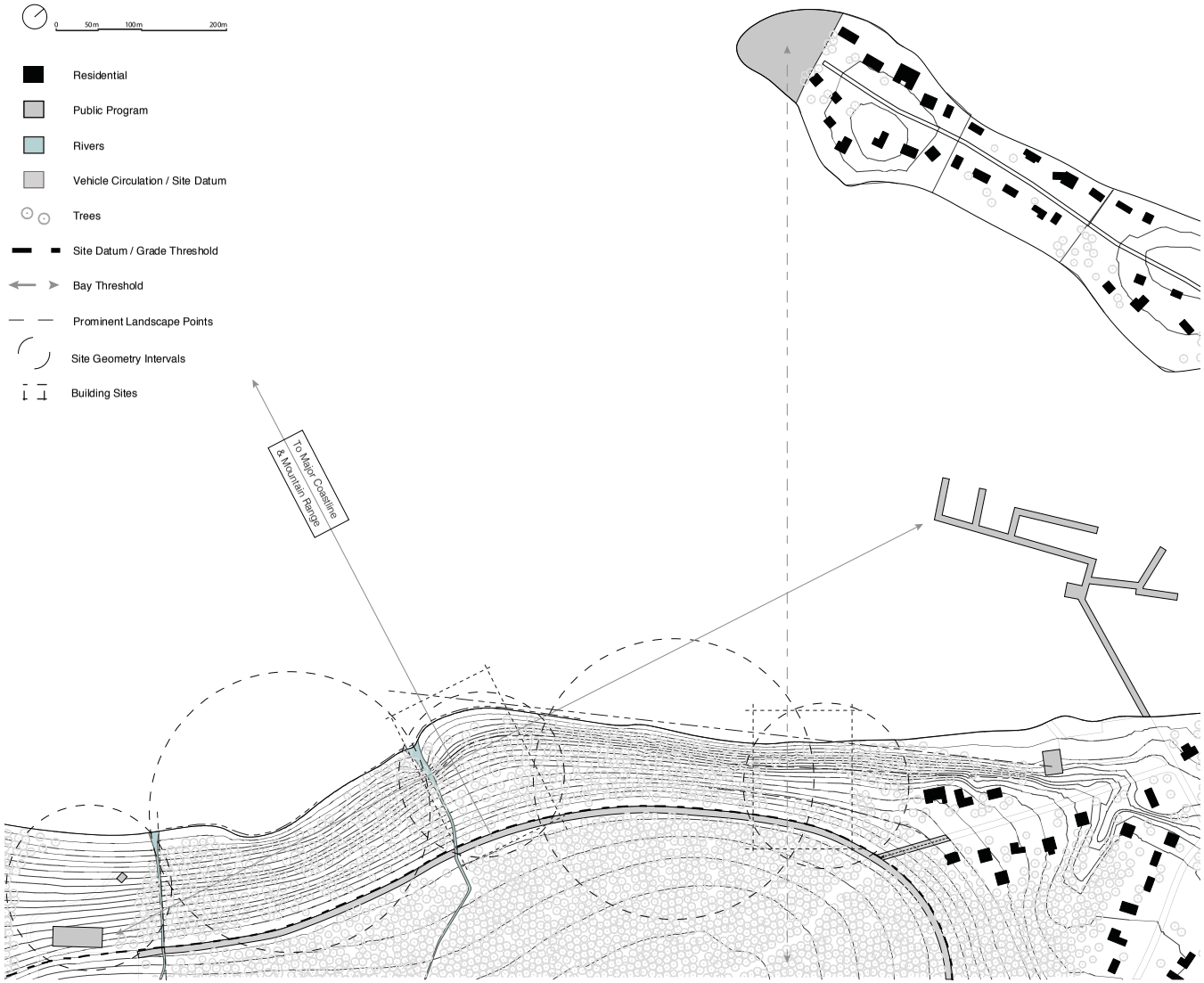


1:4000 Site model of Deep Bay highlighting the proposed master plan site within the community

defined site. The point is also a geometric center to the approximate 1 kilometre distance between the Marine Center and the Marina.

The second point-of-interest is highlighted by a threshold between the existing built community around the bay and the natural landscapes beyond. Here the threshold extends perpendicular from the coastline across the bay to the public spit, which is a characterizing landscape feature of the community. This site is intercepted by a steep landscape that cuts off the public space around the marina below. At this site the same contours join into the slope that is compressed between the plateau and the coastal edge. It is also part of a cleared area that was previously cited for a development that still has not been proposed to date.

Lastly, for the master plan site strategy, as the site shifts from the plateau's edge, down towards the coastline, pedestrian circulation becomes more prevalent. Existing trail networks are expanded upon to create pedestrian access from the marina to the Marine Center. There is an importance to physical exploration that assists in understanding cultural relationships between the user and their surrounding environment, both tactically and visually. The trail networks enable such an opportunity to explore and create personal sensorial experiences with the local context, while also reducing the requirement for locals to drive around the community.

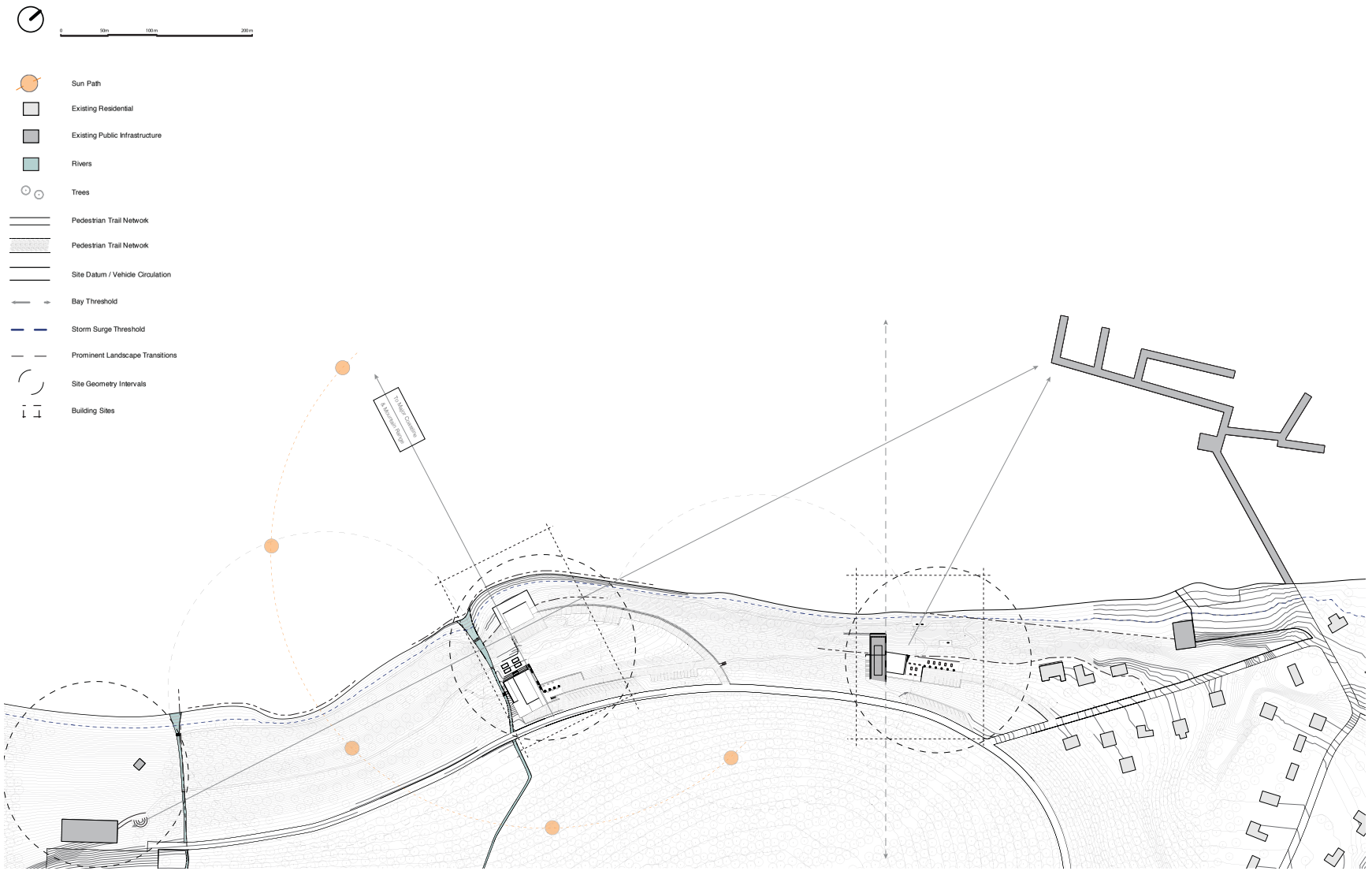


Master plan analysis illustrating the proposed public axis, addressing surrounding context, and deriving design sites

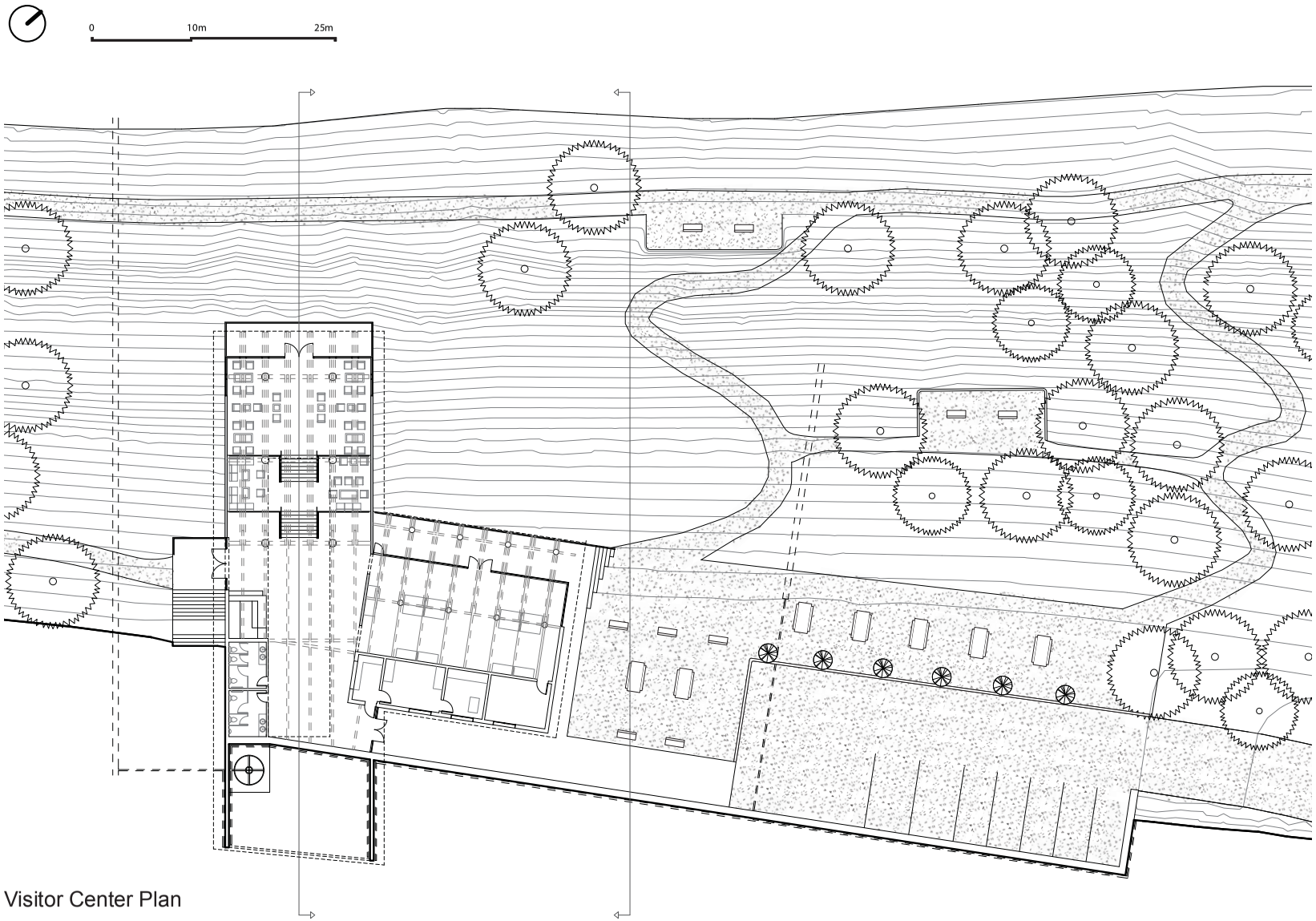
Design Interventions

Zooming into the individual design sites, the site strategy begins by analyzing the landscape, just as the site analysis of the master plan, but will further employ the building strategy aspects. Beginning with the site at the marina's edge, there is a steep bank that cuts off the public space around the marina below, while houses at the edge of the community reside on a small plateau above. Extending this elevation through the site defines a strong transition in the landscape, highlighting a gentler region that can be anchored into before the bank descends to the shoreline. This elevation also permits easy access from the proposed circulation route, sitting back off the coastal edge. The building footprint sits on the threshold between bay and ocean, community and nature. Hence the footprint is oriented toward the marina on one side, picking up on the contours being extended from the community. Meanwhile across the threshold the building is organized perpendicular to the coastline, gesturing to the public spit across the bay's edge.

The second principle is focused on engaging with the landscape. Utilizing the prominent topography shift on the site, the building anchors into the more secure ground behind it, similarly to the near by houses. This results in the footprint on the bay side being fully anchored into the land. Where as across the threshold the building reaches out over that edge, gesturing across the harbour. The ground connection reflect this shift, lightening from the concrete shear


0
50m
100m
200m
Sun Path
Existing Residential
Existing Public Infrastructure
Rivers
Trees
Pedestrian Trail Network
Pedestrian Trail Network
Site Datum / Vehicle Circulation
Bay Threshold
Storm Surge Threshold
Prominent Landscape Transitions
Site Geometry Intervals
Building Sites
TV Mast Obstacle
4 Mountain Range

Master Plan

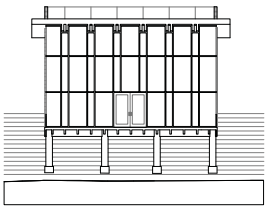


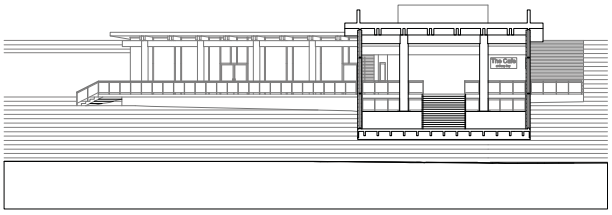
Visitor Center Plan

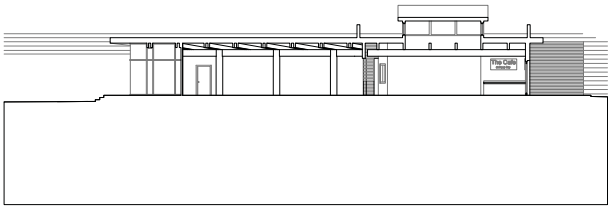
foundations, to concrete pile connections that lessen the surface loading on the more fragile land. Using concrete in all ground connections is important to resisting erosion issues in the wet soils.

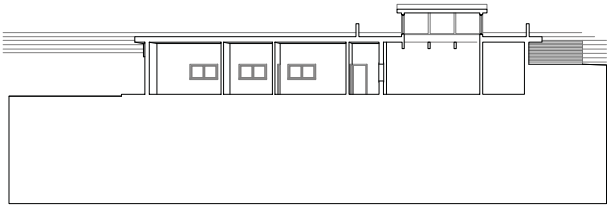
Building up, the shear core remains in tact while the pile foundations are met with a moment-resisting frame system above. This system is secured back to the shear core, acting as a strong hybrid structural system that is effective against seismic activity. Concrete slab-on-grade floors express the user's position on the landscape, while lighter CLT panel flooring acts as a horizontal diaphragm that secures the lighter frame system while expressing the user's position over the landscape.

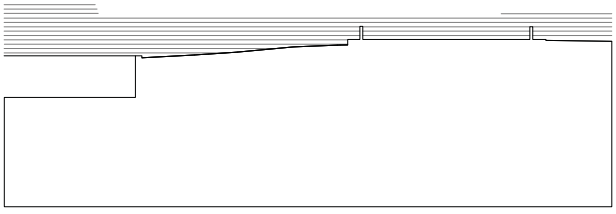
The final strategy principle relates to addressing the prominent climate factors and surrounding context. The building gestures towards the ocean, opening in section to create a sloped roof for water drainage. Ample glazing is used to add to the expression of a lighter position over the landscape, meanwhile bringing in reflective light off the water, and creating a panoramic connection with the surroundings. However, because the southern sun comes from behind the forest, a clearstory structure is lifted to bring in additional light from the sun path. Its form slopes back up the landscape, while glazing is punched into the sides. This system is in response to the climate, enabling a light from above but still protecting the openings from the excessive precipitation that occurs.



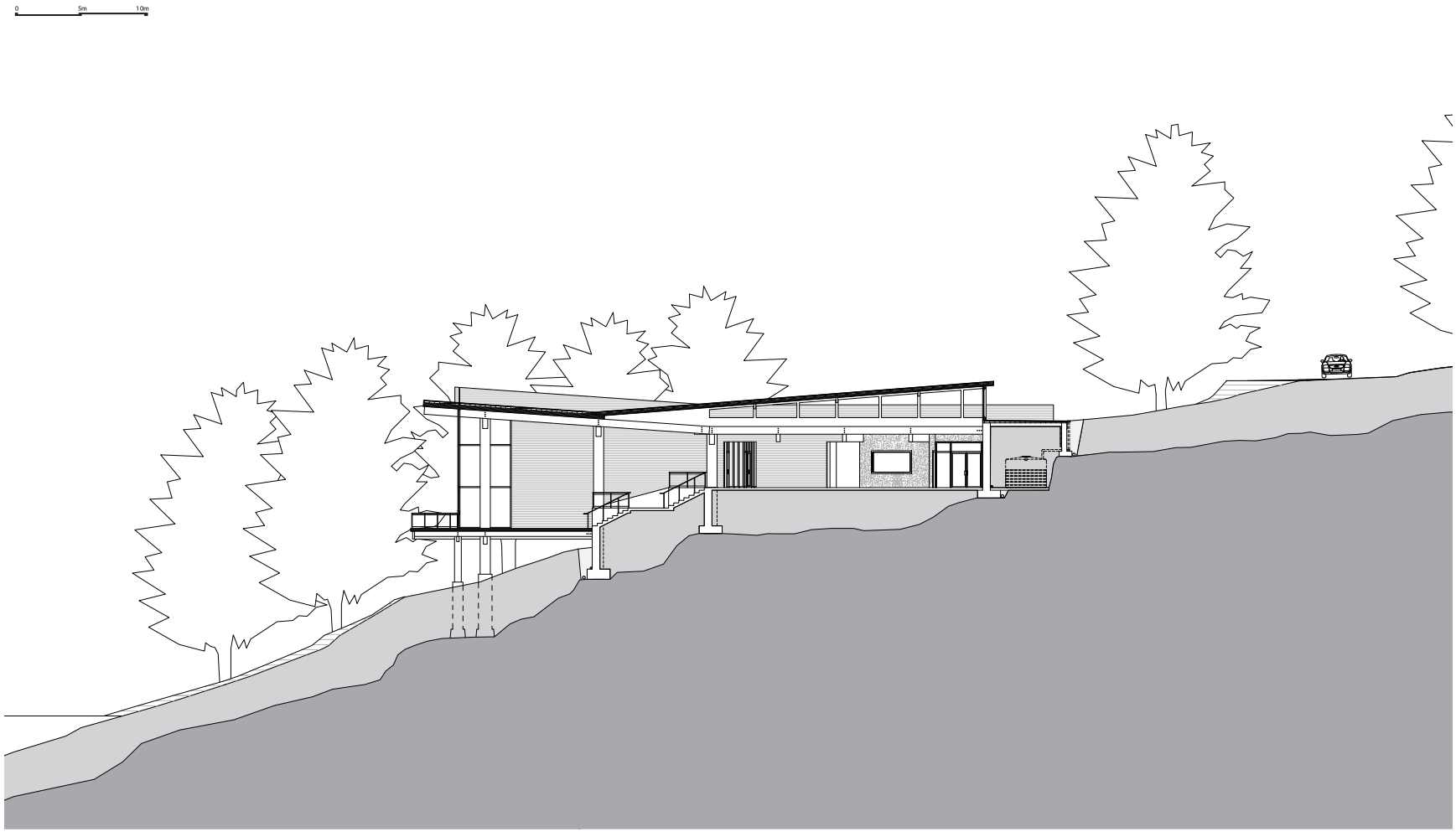




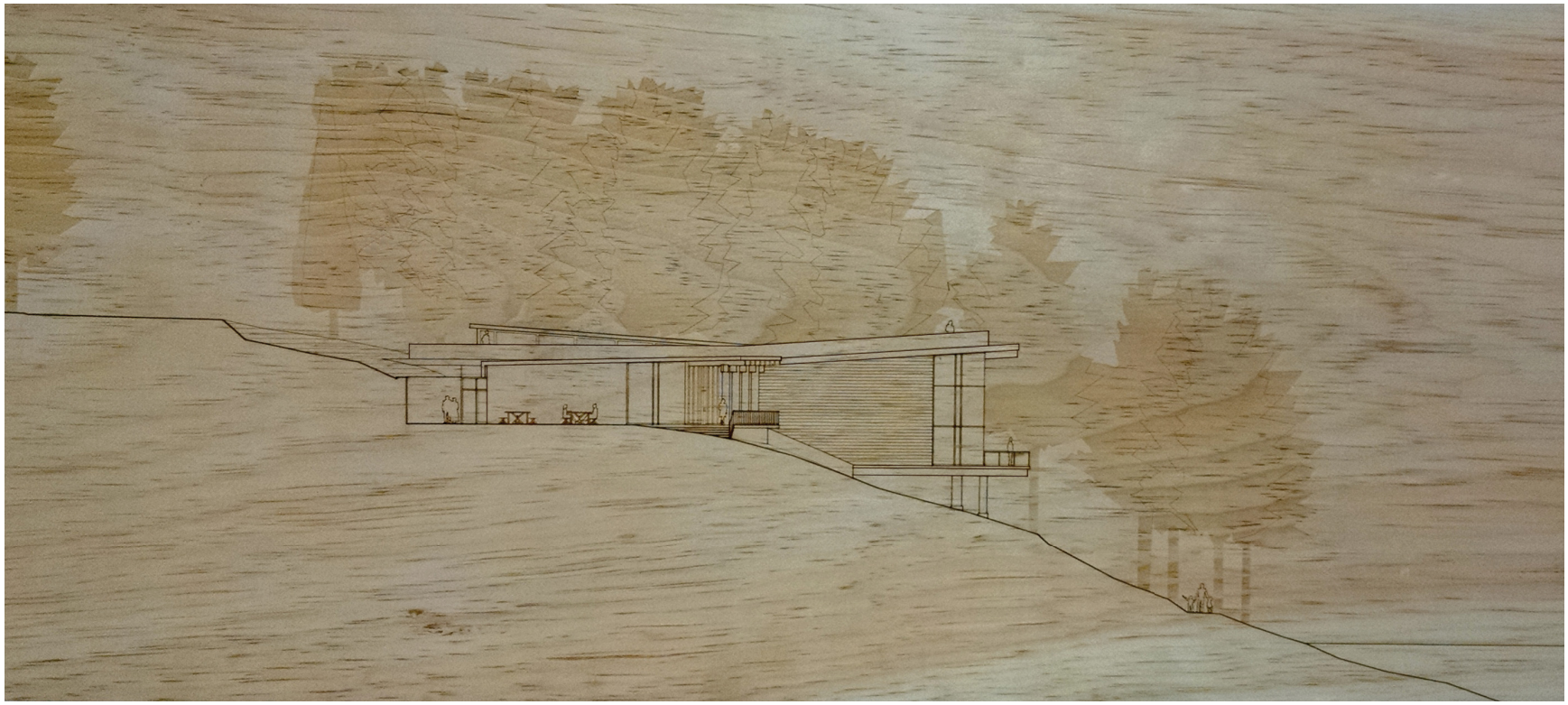




Visitor Center Sequence Sections: illustrating the transition in building systems as it interacts with the transitions in the landscape

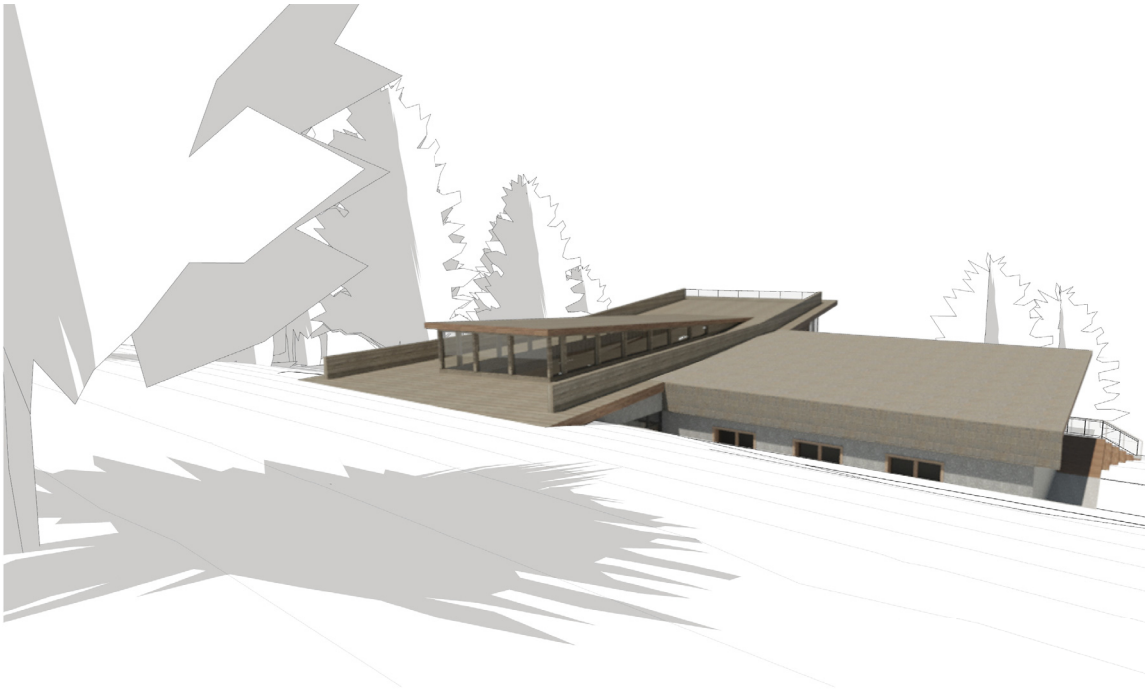


Visitor Center Section



Visitor Center NE site section in pine panel

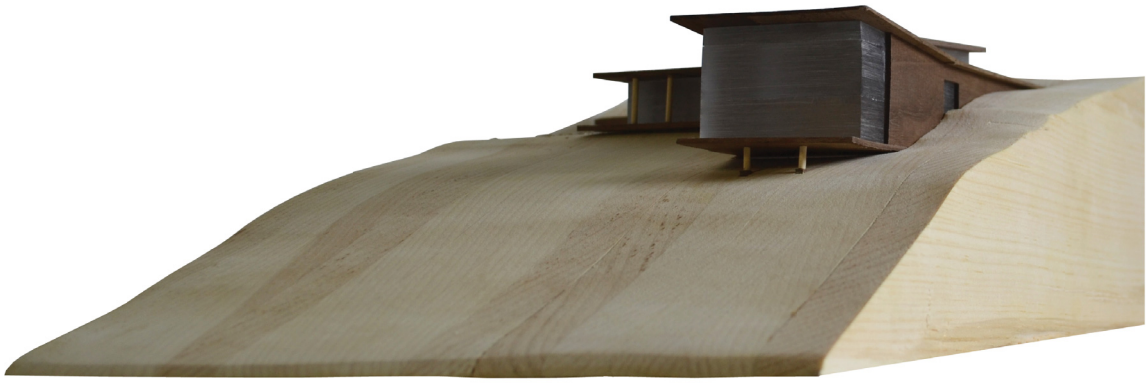
Visitor Center entry approach vignette



Visitor Center rooftop approach vignette

This site crosses the threshold between the existing community and new public infrastructure. Here, a visitor center is proposed to highlight the history and culture of the area as it progresses forward. An exhibition space to the northeast provides space for this program, while giving direct visual connections back to the center of the original community. A visitor center provides an opportunity to express the context through the architecture; striving to describe the sensorial experiences of the place. Therefore the spaces aim to be exploratory and highlight the surrounding context. The cafe is a chance to establish such a space; a space where retirees can meet for morning social events, business meetings can occur, or students can come to study. The building terraces down the landscape and uses a large wood post-and-beam systems inside that creates spaces to be engaged both visually and tactically that interprets the natural surroundings. In aspiring to integrate the architecture with the landscape, the roof is designed to be accessible, acting as a continuation of the landscape. This further expresses the desire to make the visitor center an exploratory space that can be engaged as an extension of the existing setting.

1:200 Visitor Center model



1:200 Visitor Center model

1:200 Visitor Center model

Visitor Center exterior site render

Render of the terraced cafe lounge in the Visitor Center

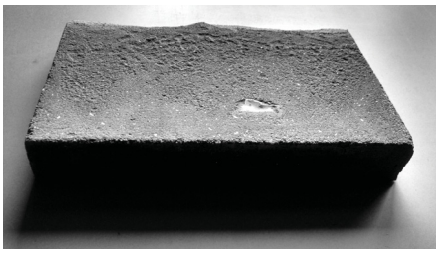
Visitor Center render framing the surrounding context

To the southwest at the central point site, a river on the southern edge organizing the site perpendicularly between the plateau and the coastline. The largest transition occurs half way up the site where a small plateau is established. This plateau effectively splits the site into upper and lower portions running parallel to the river, promoting multiple opportunities for program to terrace down the site. A central axis is drawn running down the site, acting as a pedestrian path that both connects the upper and lower sites from entry-to-entry, and aligns the buildings with one another. For this site the central plateau creates a secure ground condition for the upper building to be constructed upon. Meanwhile a small bank is present below that leads to a gentle expanse out to the shoreline. That bank creates an opportunity to secure into with a shear core structure that transitions out with a lighter pile connection. With limited light accessing the area recessed in the landscape, service spaces can be organized here. Progressing toward the shoreline the piles can act as sacrificial architecture, such as a type of break water for protecting the integrity of the core structure. They also elevate the floor well above the ground, maintaining security from tidal concerns and potential storm surges.

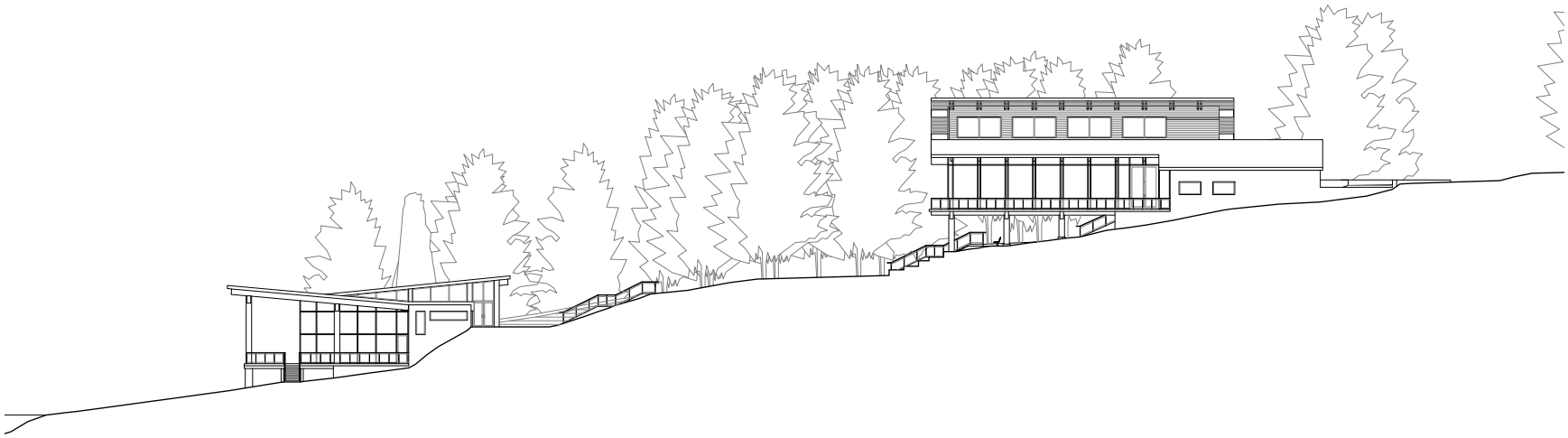
While considering program options for this terracing site, food becomes a central figure. As previously discussed, a farmers market could act as a central public space along the axis. It provides sales of local produce, seafood, and merchandise, such as a place for retirees to sell art. Placing it at the top of

the site allows it to engage with the higher vehicular traffic and loading requirements. The market is also a very interactive space, so placing it above allows it to engage with the vast central area of this site. The central plateau offers a flat area to incorporate community gardens that can be harvested for the market, be worked on by locals, or simply enjoyed by the general public. Continuing with food as the central program theme for this site, the lower section that engages the coastline is a great place for a local restaurant. By descending users in from above the dwelling areas are engaged with the coastline alone and become more intimate than the market above. The restaurant would promote the specialized seafood dishes that come from the surrounding waters; and would also give the culinary students opportunity to get experience in a working environment close to their education.

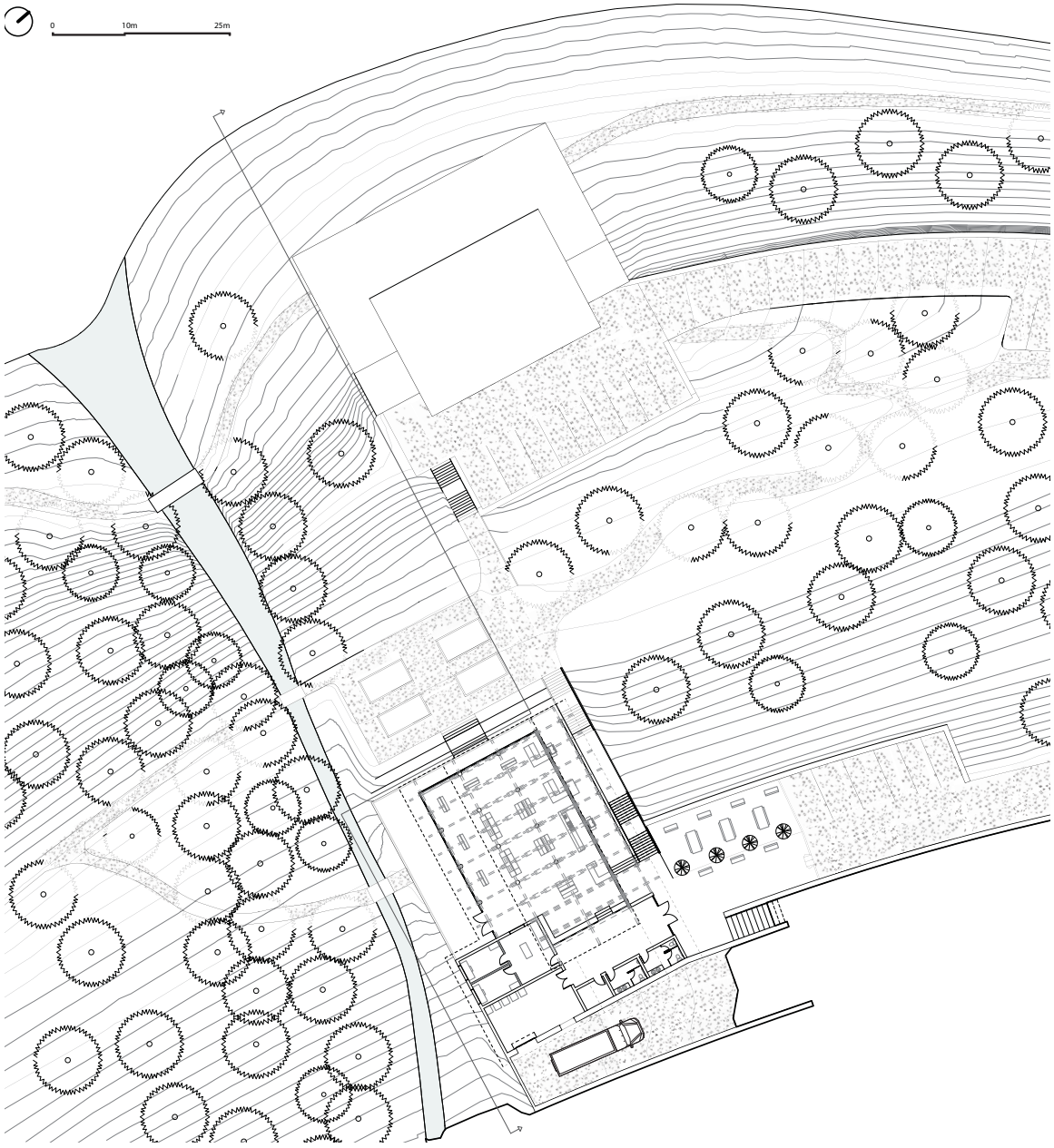
Moving back through the site strategy, the concrete shear walls and slabs utilize local oyster shells that are broken down into aggregate; creating a further connection to the identity of the place. Both levels of the site offer opportunity to extend over the sloping landscape with lighter moment-resisting frames and CLT shear panels that do not integrate with the moist ground conditions. At the market above, this results in the creation of a covered exterior space for people to take shelter from the rain. The use of log columns for the post-and-beam system also creates a space that reflects the personal engagement of walking through a forest of columns.



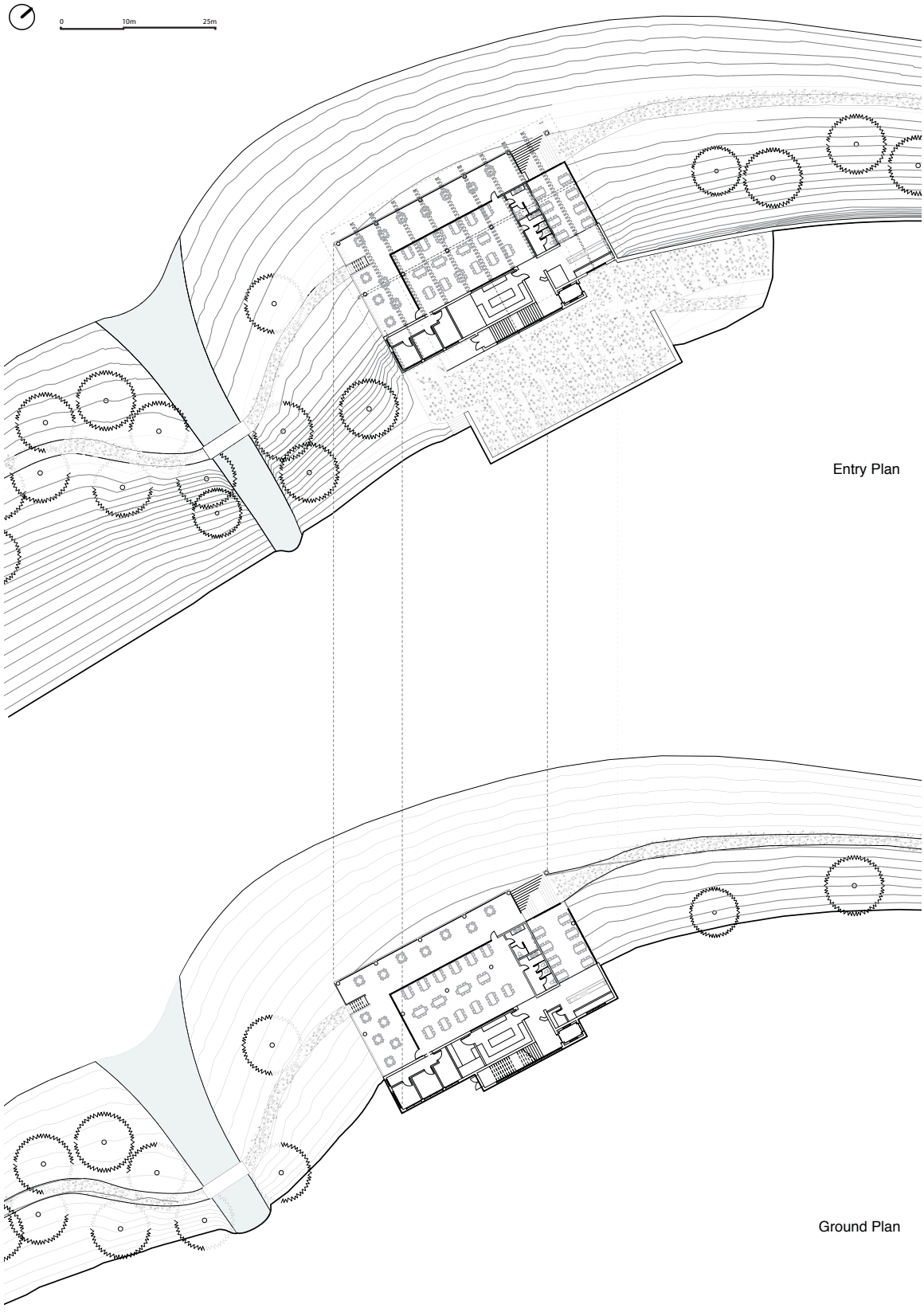
Sample model using oyster shell aggregate in concrete



Point site section



Market Plan



Restaurant Plans

The river that orients this site flows southeast to northwest, which indicates that the southern sun comes down from behind the rising topography and surrounding forest. As the higher site is tucked back into the slope, an important consideration is to open the roof towards the southern sky, bringing light in from above the surrounding forest. Also, as the building gestures toward the water, the wood post-and-beam enables ample glazing options to create visual connections with the culturally defining landscapes.

The restaurant resides along the shoreline, driving the main intention of creating an integration of interior and exterior space, bringing the coastal environment into the experience of the building. To create this experience curtain walls are extended from floor-to-ceiling facing the ocean to minimize the threshold between spaces. In addition, the exposed structure continues out to the exterior spaces. With the building being secured into a bank on the southern side, a clearstory structure is again lifted to bring the southern light in from above. A cultural benefit to bringing light in from above through an elemental wood structure is its reflection of the sensorial experience of having light filtered through the dense trees of surrounding forests.

Collage illustrating the local phenomenon of experiencing filtered light from above

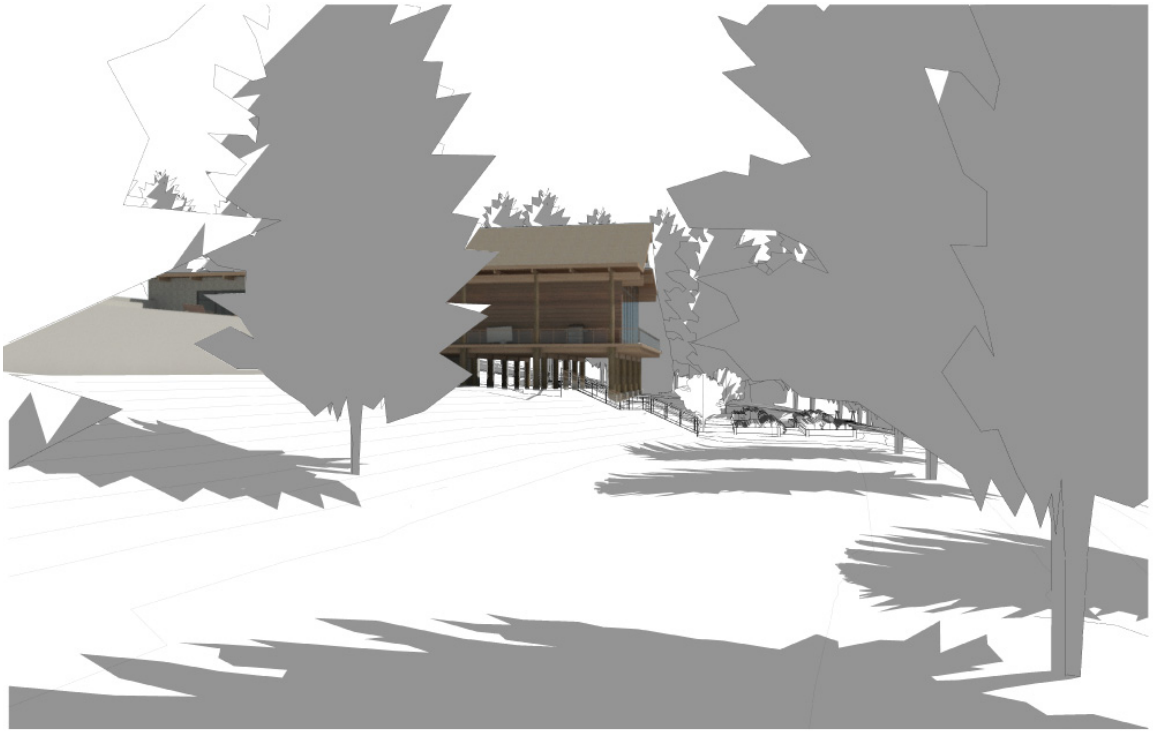
Site section of the point site in pine panel

Vignette looking up the point site

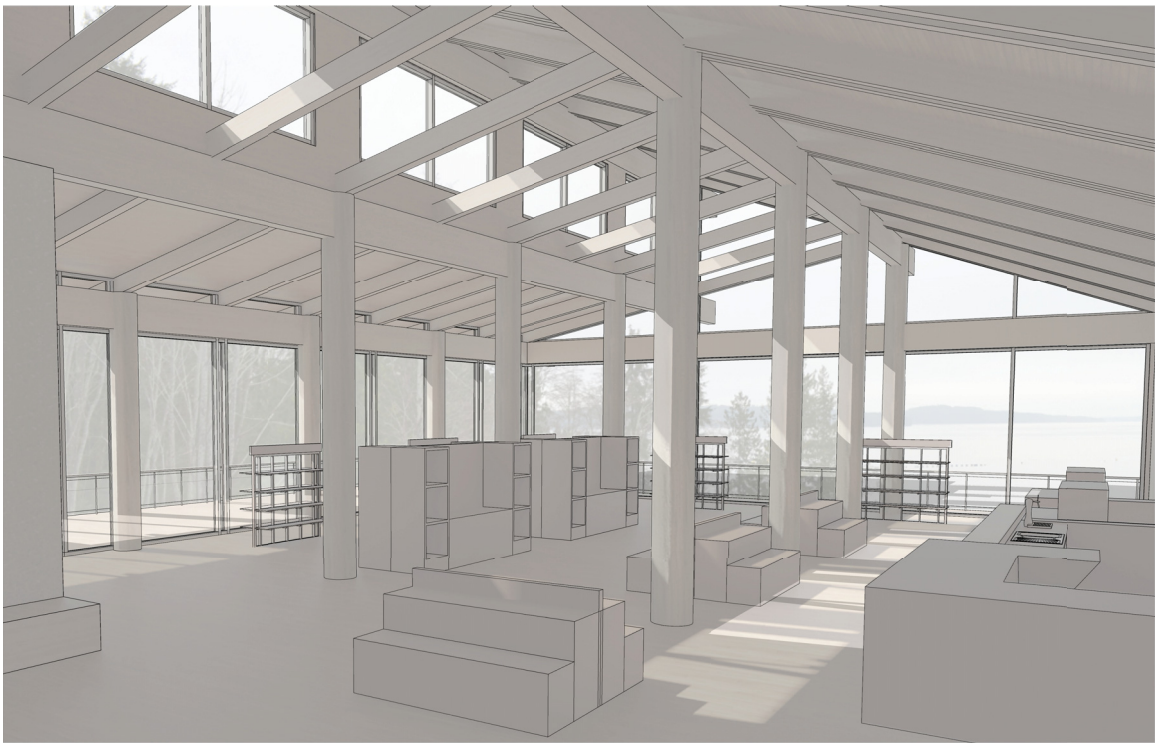
Vignette of the Restaurant patio

Exterior Restaurant render

Exterior render of the Restaurant at night



Vignette of the pedestrian trail approach to the Market



Vignette of the Market interior

Exterior Market render

CHAPTER 4: CONCLUSION

This thesis has develop a method for approaching the design of architecture that is inspired by context and articulated to integrate with place.

Glenn Murcutt states, “If we are to make an architecture that responds to our land, place, its climate, the flora, fauna, culture, technology, and time, then as architects we must work toward an architecture of response rather than an architecture of imposition” (MacKay-Lyons 2015, 131).

This thesis strives to do just that; to create architecture that responds to its climate, landscape, technology, and culture, interpreting an understanding of the context into an expression of the place.

For Deep Bay, incorporating sloped roofs and clearstories with overhangs recognizes the excessive precipitation levels, requirement for light intake, and the seasonal temperatures. Diversifying ground connection in the varying terrains, implementing seismically stable structural systems, and utilizing local materials are considerations that respond to the unique landscapes of the area. Learning from the regional building culture establishes an appropriate foundation for developing technologies that are adapted for the specific site. The attention to culture provides avenues for integrating these design moves into expressions of the area, its local phenomena, and gesturing to significant aspects of the surrounding context.

Deep Bay is a small community with a developing local identity. The choice to apply public program aims to facilitate this growth, while not imposing upon the existing culture. The proposed designs aim to highlight this developing community moving forward, building off of the identity that has fueled it from the past.

This method for responsive regional design with site specific intention can be applied to any facet of context. As architects we are problem solvers trying to create answers through our interpretive solutions to a given set of conditions; and context will always provide informative suggestions to build upon.

The specificity that arises from local contexts will always challenge the inappropriateness of ubiquitous design and building practice globally. However, it will alternatively enable designers to develop strategies that strive to find the solutions that truly portray an understanding of place.

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