# URBAN WETLAND: DYNAMIC SYSTEM BETWEEN THE CITY AND THE SEA

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# ATTESTATION OF ATHORSHIP

“I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to substantial extent has been accepted for the qualification of any other degree or diploma of a university or other institution of higher learning, except where due acknowledgement is made in the acknowledgements.”

Jiaying Huang
2010



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# ABSTRACT

Urban Wetland is a design-led research project that explores the dynamic exchange system between the city and the sea. It proposes a redevelopment of Queen's Wharf in Auckland that includes a wetland park containing a water purification system and a series of public swimming pools, alongside the existing ferry service. The research project is a proposal for a wetland park to be constructed as a hybrid urban surface-scape that mediates and transitions people waiting for and disembarking from ferries. The structure will also be an active space for relaxation, physical exercise and environmental awareness. The research is largely process-driven, and has contributed to a perspective on reading the city that involves the flow of water, light and people in ways that blur boundaries of both natural and constructed objects, as well as the relationships between them. The concept of subnature, along with ideas on surface and subsurface, is utilised in order to conceptualise the functioning of the wetland. Considerations on indeterminacy also contribute to address the ambiguities of certain blurred features within this project. This project wonders whether such ambiguities can be reconciled.

# INTRODUCTION

The world has become a bio-physical system due to the tremendous proliferation of human beings and the accompanying expansion of constructed areas that modify the normal functioning of natural ecosystems. (Daily et. al., 1994: 469). The modern city, growing horizontally and vertically in a chaotic manner is a good example. This constitutes a huge challenge for any attempt to maintain cities as sustainable entities that are pleasant to live in, rather than just being conglomerations of decaying architecture sitting uneasily on cesspools, and surrounded by polluted air and soil.

Concern for the survival of the city is increasing all over the world, and attempts to attain a harmonious relationship with the natural environment are of great import for academics (Marzluff, et. al. 2008: 99), as well as being the mainstay of the green movement (Doherty 2002: 2), not to mention concerns of private citizens. Considerable interest has been accorded to so-called “green architecture”, but for all this, there has not yet been much research on the various connections between architectural design, ecological systems and the state of the environment, and the consequent integration that needs to be made between them (Mau 2010: 20-25). The green movement encompasses a large number of different approaches, ranging from pure philosophy to experimental technology, as well as political activism (Doherty 2002: 2). Unfortunately, green architecture is frequently very costly, which can prevent the majority of the population from enjoying its benefits. Additionally, it is often “elitist and class-based” (Gissen 2009: 24), further excluding it from general public access. My project attempts to be accessible to all, both physically and conceptually in its approach to

architecture with an ecological component. The importance of surfaces in our everyday lives is evident in the fact that they constitute the material world as we perceive it. The visual uptake of the environment that surrounds us is conditioned by the composition, layout and textures of surfaces (Stroll 1988: 122). In the past, a certain tension between surface and deep space could often be seen in architecture, usually through the use of glass and other transparent materials. At the present time, some architects collapse the depth of the interior into the outer surface of a building. This kind of "surface-play", a term coined by analytical philosopher Avrum Stroll (Stroll 1998: 171), dissolves the distinction between interior and exterior on one hand, and can also blur the boundaries between architecture and nature, which is a prime objective of my project.

Surface-play is closely linked to the concept of "reading the city". There are fundamentally two ways to visually contemplate a large constructed area. The first is from an elevated position, such as a skyscraper or an aircraft, by the means of what has been called the "celestial eye" (de Certeau 1984: 92). This perspective is similar to that of a map, as the main focus is two-dimensional, although by means of contouring, a third dimension can also be represented on a two-dimensional surface. In addition to horizontal contouring, I have proposed the concept of "vertical contouring" to read the city, as it has significant implications for issues of surface and depth of cityscapes. A key difference between these two types of contouring is that whereas horizontal contouring has an absolute zero point, which is sea level, the zero point in vertical contouring is subjective, being dependent on the sight-line of the viewer from any particular position. In this manner, the distinction between surface and subsurface becomes blurred.

A vertical perspective permits us to entertain the idea of "surface/subsurface," referring to a pairing of these two terms, that has been developed by Marion Weiss and Michael Manfredi (Weiss and Manfredi 2008). While surface exhibits a two-dimensional, visible condition, "subsurface alludes to the three-dimensionality of ground, which is deep, intensive, and lends itself to cutting, filling and exposing" (Weiss 2008: 78-79). This concept has particular importance for my work, as I have proposed the installation of a constructed wetland on Queen's Wharf in downtown Auckland. It will contain a natural water purification system, as well as several small swimming pools separately fed by potable water. Cross sections of the wetland will be visible from walkways that go below the surface of the wharf. The design closely considers aesthetic aspects, and the wetland area will have both an educational and a recreational focus.

# READING THE CITY

# HISTORICAL BACKGROUND

William Hobson was a British Royal Navy officer who arrived in the Bay of Islands in 1840 with the mission of colonising New Zealand (An Encylopedia of New Zealand, 1966 - Hobson, William). He immediately began seeking an appropriate location for the government to be based, and was told of an area called Tamaki on the Waitemata Harbour, several hundred kilometres to the south. (Ibid) This area had been largely abandoned by the local Maori belonging to the Ngati Whatua iwi (tribal group) approximately 20 years previously. After going ashore at various bays, Hobson moved his 310-ton boat loaded with building materials into Commercial Bay (Stone 2002:253), which is "roughly where the Ferry Building stands on reclaimed land today" (Roughan 2010: 8). Negotiations with Ngati Whatua from nearby Orakei resulted in an agreement, and the British flag was raised on a headland soon to be called Point Britomart (Stone 2002: 254), which constituted the official founding of Auckland, with Hobson as New Zealand's first governor. Commercial Bay, later renamed Store Bay, lay at the bottom of the Horotiu Valley, which would become Queen Street (Logan Campbell 1952: 218). The Horotiu Creek ended in "a swamp of flax and toe toe" (Ibid: 11). John Logan Campbell, one of the first Europeans to explore the region, called the lower reaches of the Horotiu "an unpassable flax swamp" (Logan Campbell, cited in Stone 2002: 269). Land reclamation and the building of the precursor of Queen's Wharf was initiated in 1851, which effectively destroyed productive shellfish beds and fishing access in the area (Ibid: 15). Basically, all of the flat land of downtown Auckland at the present time used to be either wetlands or foreshore (Ibid: 18). The original Queen's Wharf, a wooden structure, was built in 1852, to be replaced by a ferro-concrete version in the early 1900s, which was followed by the completion of the Ferry Building in 1912 (History - The Auckland Ferry Terminal, n.d.). In the latter part of the nineteenth century, people were able to walk down Queen's Wharf and look back at the city. Architect Graeme Burgess has noted that "Queen Street is defined by the wharf and the wharf is Queen Street" (Burgess 2010: B16). However, the same writer has noted that at the present time, Queen Street is a "perverted magnet" (Ibid: B14), because visitors who "walk slowly and aimlessly look up and around at their bland surroundings" (Ibid) assume that the lower part of the main downtown street of New Zealand's biggest city must contain important elements of cultural and historical relevance, as well as aesthetic value, "a reasonable expectation, but a joke." (Ibid) This situation is partly due to the fact that Queen Street has been cut off from its waterfront origins, about which more will be said later.

# AUCKLAND WATERFRONT
# 1863 - 2010 FOOT PRINTS



1863



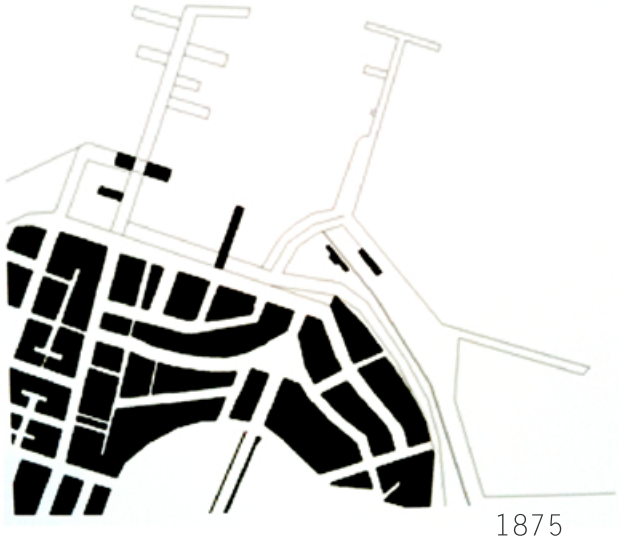
1948



1866



1966



1875



2010

fig.1a, b, c, d, e, f. Auckland Waterfront (2010).
The foot prints show the landscape changes of Waterfront over time.

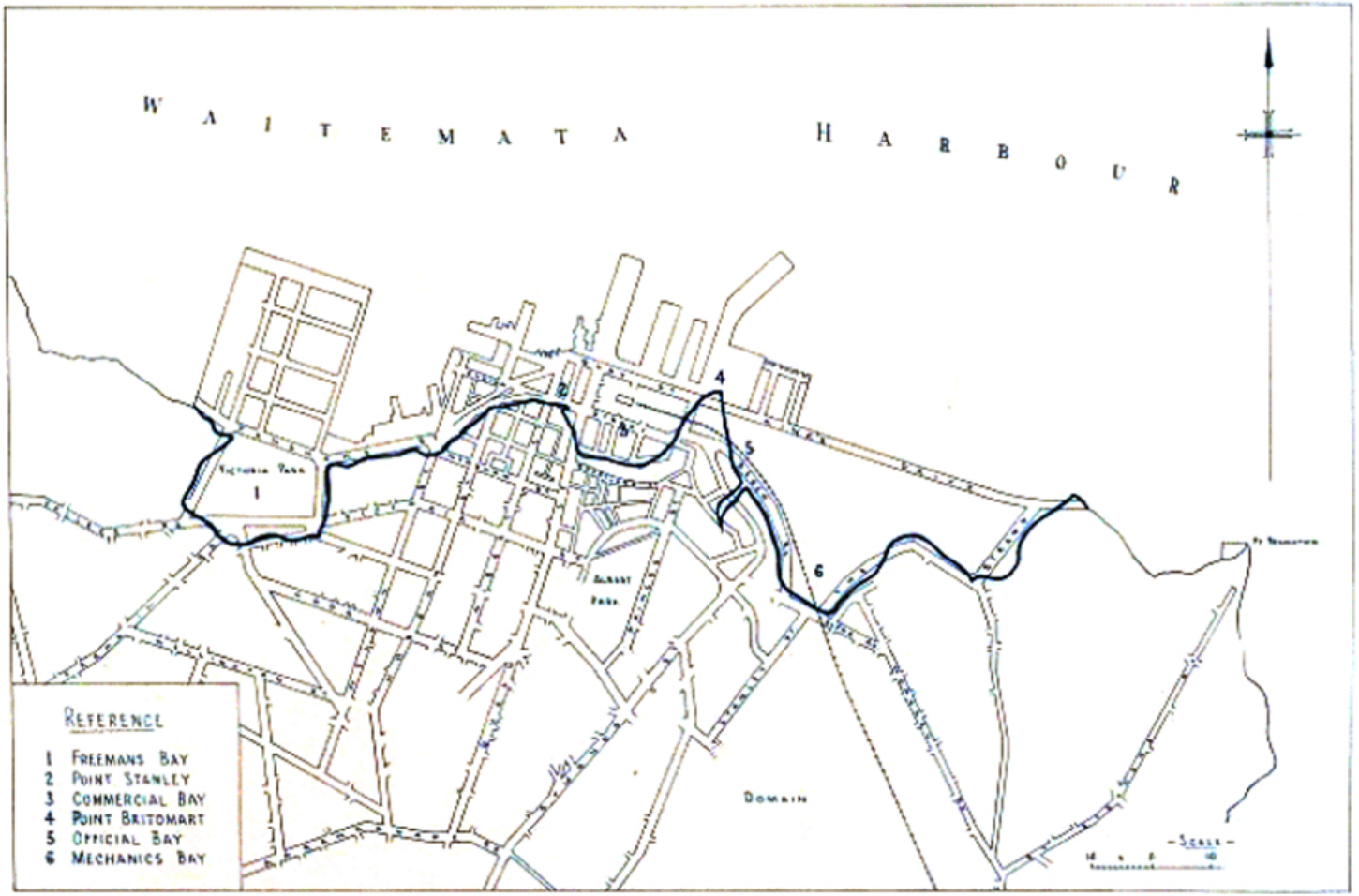
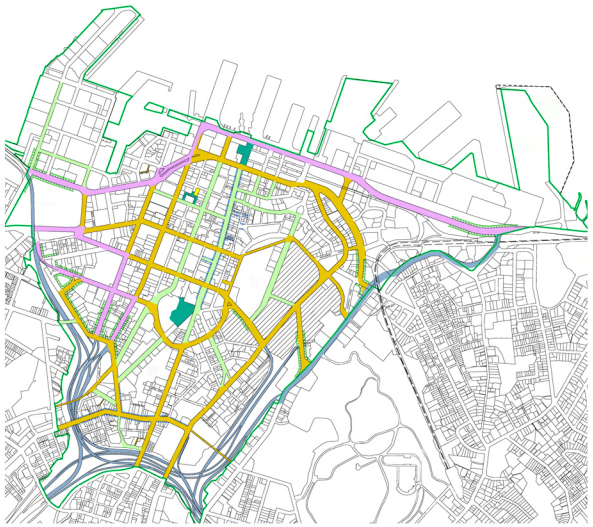
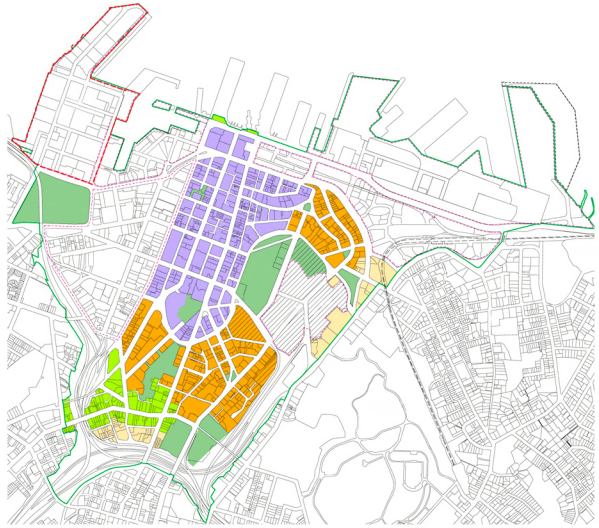



fig.2. The Plan of Auckland. The original shoreline in 1841



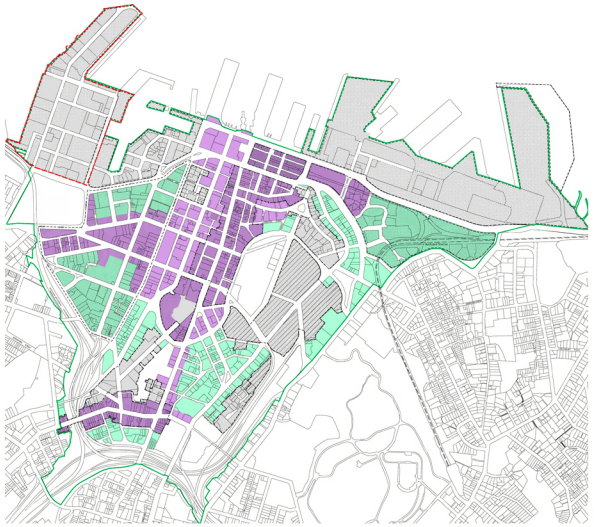
Road Classification Hierarchy

- Local Road
- Collector Road
- District Arterial Road
- Regional Arterial Road
- Strategic Route



General Height Control

- 15 metres above Mean Street Level
- 35 metres above Mean Street Level
- 50 metres above Mean Street Level
- Special height controls only
- Public Open Space Precincts
- Central Area Boundary



Activties

- Less Pedestrian - Orientated
- Pedestrian - Orientated
- Precincts and Quarters
- Central Area Boundary

fig.3a, b, c. CBD, Auckland (2010). Mapping of Auckland city infrastructure.

# PERCEPTION OF THE CITY

Even though there are no longer wetlands in central Auckland, I consider it valid to still conceptualise the city as wetlands for various reasons. As well as the probable existence of natural bodies of underground water beneath Auckland, there is a continuous flow of water beneath the city in the form of a complicated system of freshwater supply and two disposal systems - wastewater from buildings, and stormwater from rain that falls on the city. Additionally, there are other types of flow in the city, consisting of light and people, and even wildlife. This allows the city to be seen as existing in a type of fluid state, which is most apparent at the “edge”, that is, the waterfront. Like a wetlands area, the city constitutes a filter that in indeterminate ways effects the characteristics of water, light and bodies that pass through it. Freshwater undergoes changes after being used by humans and rainwater is altered when it comes into contact with toxic materials on the city’s roofs and streets. Light is also altered as it is obstructed, deviated and reflected by buildings, streets and vehicles. Different light qualities between spaces arise when they have different degrees of transparency. These factors constitute a flow, in that light is not static, and due to constantly changing angles of the sun rays during the day, along with the orientation, scope and intensity of artificial light at night, this flow influences our perceptions of the nature of the city. Wind patterns are also modified by city architecture and often in ways that are detrimental to elements of the natural environment. Erica Oberndorfer et al have noted that “buildings change the flow of energy and matter through urban ecosystems, often causing environmental problems” (Oberndorfer et al 2007:823).

It has been said that Queen Street is a dark, cold entity that funnels the wind, strengthening its intensity (Burgess 2010: B14). This has been a factor that has possibly contributed to a state of distress that many of the native nikau palms planted along the exposed surface of Queen Street are presently experiencing, seen in the thinning of their trunks. One native plant expert, Geoff Davidson, has interpreted this

situation as a sign of stress “probably caused by shifting native plants from their natural habitat to an urban environment” (Orsman 2009: NZ Herald online). Thus, it can be seen that attempts to re-instate native species in general and wetlands in particular in an urban environment can be met with difficulties that need to be overcome. But at least this recent upgrading of Queen Street contemplated the situation by which “the nikau have returned to remind us that this was a stream bed.” (Ibid: B16)

As the location that facilitates the operations of maritime transport facilities, the Queen’s Wharf is both significant as an entrance or gateway to the city, and as a point of departure. It constitutes a type of filter for the people who pass through it. In other words, it is a threshold between the city and the sea. However, at the same time, this boundary between these two entities is largely an abstraction that is highlighted by the blurred quality of the facility. The presence of the wetlands area and the swimming pools will alter the orientation of the public to the city. On one hand, when someone is floating in a pool, he/she will be able to view the city through reflective pools of water and vegetation. On the other hand, the viewer will also be able to see the coming and going of ferries from an aquatic and ecological perspective, instead of the conventional stance of someone on a concrete or wooden pier.

Another important component of the Queen’s Wharf is the issue of flow and exchange of people, water and light. In my project there is a modification in the dynamic relations between the static and the fluid, seen in the manner that the movement of ‘bodies’ is being slowed down. People are no longer just rushing into the sterile environment of a transport terminal with harsh artificial lighting, echoing sound effects and impersonal loudspeaker announcements. They are now surrounded by elements of nature - water undergoing purification treatment and native vegetation. Water too is often referred to as a body, and in this manner, both the sea and wetland areas are bodies. Movement of such bodies can be seen in the rise and fall of the tides and the flow of water through wetlands. Although the tides cannot be altered by the actions of humans, the movement of stormwater can be directed and slowed down in the case of an artificially constructed wetland, which can lead us to wonder whether such a structure is natural or artificial.

In regards to the actual design of the new Ferry Building, it will have glass facades, providing visibility of the city, the sea and the wetlands area, which will lend itself to extensive reflective and shadowing effects, due to both natural and artificial light. This will allow contrasts in perspective, especially at night, when different kinds of lighting can be employed in and around the building, as well as within the wetlands area itself. From the position of Queen’s Wharf being on the edge of the city, light from both the city and the harbour will play over it at night, with the vegetation attenuating any harshness. Instead, a constant interplay of shadows and shifting light patterns will soften the “hard edge” of the wharf, providing a “smudged” variant between the city and the sea.

# SURFACE

The concept of surface eludes any simple definitions, as it can be seen as both a physical and an abstract entity, depending on the context (Taylor 2000: 30). In accordance with the ideas of Stroll, surfaces are “thin spreads that form the outer boundaries of embodiment” (Stroll 1988: 208). In this way, he sees surfaces as “paradigms of spreads” (Ibid: 204). In its most basic architectural definition, surface is considered to be one of a number of supplementary properties of a plane, along with colour, pattern and texture (Ching 2007: 18). For the purposes of this study, different aspects of surface will be examined. Issues such as the relationship between surface and depth, or subsurface as well as the role that surface plays in reading the city, are placed in a context where architecture is integrated with different aspects of nature, in this case, the sea and a constructed wetland.

Stroll has noted that there is “no such thing as a perception of space without the perception of a continuous background surface” (Stroll 1988: 122). In other words, when we view surfaces, we are directly seeing objects that have these surfaces. However, it is not a simple matter to distinguish between objects that have surfaces and those which do not. Stroll considered the many variables that may be present when one examines a surface, noting that the visual field may exhibit irregularities (seams, pits, curves, etc.), “ingredients” (colours, textures, shapes, etc.) (Ibid: 171), different types of light (strong, weak, reflective, absorbing, etc.) that exist in the visual field, as well as even a person’s stance (scrutinizing, gazing, glancing, etc.), He then concluded that no pre-existing theory can encompass all of the above (Ibid).

Islami has noted that the problem of border is of interest to architecture, due to the face that it must consider the demarcation of boundaries through creation of surfaces.” (Islami 2007: 679). The author continues by saying that this need to create borders is becoming increasingly problematic in a culture

where borders are often challenged and even rejected (Ibid).Therefore, Islami has proposed the use of the word “surfacing” in reference to giving something a surface. The author explains the term by means of an aquatic metaphor,“relating potentiality and depth to actuality and surface” (Ibid: 680). For example, in the ocean, the deep currents, along with the surface effects created by them, are both integral elements of the ocean. However, while the former are virtual and not able to be observed, the latter are “real”, in the sense that they are visible. This same principle is applicable to architecture and experience, in that surface and depth are part of the same architectural ocean. This pairing of surface and subsurface raises issues of indeterminacy, which will be examined in the following section.

# NATURE/ARCHITECTURE

# INDETERMINACY

Ned Cramer has noted that the concept of “blur” can be utilised to describe the indeterminacy of contemporary life (Cramer 2002: 58). For the purposes of my project, this concept has mainly been applied to the boundaries between what is artificial and what is natural. When these boundaries are not clear, confusion often arises and questions can be posed regarding ecological, ethical and political concerns, among other issues. Such blurring creates tension between what is artificial and what is natural, in reference to architecture and its relationship to natural phenomena, and whether one is more dominant, or controlling, than the other. Leatherbarrow laments the “disastrous dichotomy” between the two, and calls for us to go beyond the concept that the cultural world, or the city, is something “for us” and the natural world is something “in itself” (Leatherbarrow 2008: 11). Indeterminacy can create dynamic tension between the city and the park. Does the city always have to be dominant in a park? My project aims to shift the tensions between the dominant cityscape and the landscape. The rest of this section consists of two parts: first of all, there is a short introduction to eco-architecture, which is then followed by analyses of various projects that relate to my work both conceptually and materially, involving issues of indeterminacy.

# ECO-ARCHITECTURE

The field of eco-architecture seeks to exist in harmony with nature. First of all, the location, siting and orientation decisions regarding a proposed structure should be made on ecological grounds (Broadbent and Brebbia 2006: xi). Then, the building itself should have "positive, reparative and productive consequences for the natural environment" (Yeang 1999: 8), while simultaneously being integrated with the most significant aspects of the local ecological system. Such a task does not just consider architectural and engineering design, but should also include landscape planning, recycling technology and anti-pollution measures, among others (Ibid). In the same manner that ecology is concerned with relationships, that is, "linkages, interdependence and creative adaptation" (Ibid: 33), architectural design should be a type of applied ecology. Ecological design seeks a symbiosis between man-made systems and natural systems (Ibid: 57).

A topic that has received considerable attention in recent years is the relationship between architecture and water. Architect Wolfram Schwenk has stated that "Water is by nature formless and passive, and only shows its particular qualities when interacting with its surroundings. These qualities constitute its significance in the context of nature." (Schwenk 2001: 106).In nature, the character of water is determined by a variety of factors: setting, containment, movement, lighting, wind, colour and depth (Woodward 2001: 12). Such factors must be taken into account in any architectural project where water has a dynamic role. Integrating water into public spaces highlights its role in our urban experience. Novel ideas involving the use of water in the city are not only blurring the boundaries between natural and man-made phenomena but also "between domains of art, architecture, ecology, landscape and urban design." (Nyka 2007: 26).

In my project, the interface between architecture and ecology needs to be explored. David Leatherbarrow has noted that people usually erroneously assume that building sites have definite limits, and that we should consider "the process of revealing an object's ties to otherwise unseen elements of its vicinity." (Leatherbarrow 2008:9). This issue of subsurface has validity for the case of the Queen's Wharf Wetland, where the sources of water of the wetland, which effectively provide the sustenance of the wetland, are located largely underground within the stormwater piping systems. Although it operates along ecological lines, the wetland is fed by subnatural elements that arrive at their destination by wholly artificial means. Even then, "the artificial" does not disappear. There is no such thing as a natural wetland that is suspended above the ground or sea, and we must keep in mind that the channels where water is bioremediated are made of concrete, not to mention the fact that a constructed wetland needs to be constantly monitored and often adapted to suit changing conditions. Indeterminacy in regard to the relationship between natural and artificial aspects of a constructed wetland. The following sections illustrate various projects that address the issue of indeterminacy in architecture.

# BLUR BUILDING

As their contribution to the Swiss Expo 2002, the New York-based architectural firm Diller + Scofidio designed a structure to be constructed slightly off the shore of Lake Neuchatel in Switzerland. Named the Blur Building, its internal component is “a structure reduced to a framework construction” (Nyka 2007: 23), giving it the appearance of a maritime oil rig. Attached to the structure is a complex computerized system of pipes, pumps and nozzles that produce a fine spray producing mist, a small cloud, that completely covers the structure and obscures it from those who view it from outside. Elizabeth Diller, one of the creators of the project, has stated that the Blur Building is “featureless, depthless, scaleless, spaceless, massless, surfaceless and contextless” (Diller, cited in Cramer 2002: 58). However, Diller did not mention that it is not timeless. The misty exterior that gives the building its “blur” quality materialises or vanishes depending on the position of an on/off switch. The elements also play a role in the existence of the building, as gusty winds or heavy rain will not allow the water vapour to envelope the steel structure.

Cramer refers to the “misty skin” (Ibid) of the Blur Building, which raises a provocative thought: Can clouds have a surface? Stroll tends to believe that they cannot, placing them in the same category as shadows, rainbows and lightning (Stroll 1988: 32).. Such a view would relegate blurred surfaces to a category that does not have defined boundaries. In other words, the boundary has only a partial surface quality, something that Stroll has not addressed in his work. However, he did raise another question that has relevance for the Blur Building: Is it possible to see something without seeing its surface? This was in reference to the case of the surface of Venus, which is always covered by clouds (Stroll 1988: 69). The case of the Blur Building is a type of inversion of the Venus example because it is the “cloud cover” that constitutes the actual building and not the steel framework structure behind/inside it.

In relation to my project, the Blur building-Venus inversion is relevant to the issue of determining surface raised by Alicia Imperiale. Although the Blur Building is a very different spatial proposition from my proposed urban wetland, both projects contribute to the understanding of the nature of surface and how boundaries can often be blurred. In the case of the Blur Building, the boundary between water and sky is blurred, due to its cloud cover which materializes and dissipates in a combination of technological and meteorological effects. On the other hand, the Queen’s Wharf wetland is a meeting point between land and sea where the boundary between water and sea is purposely blurred. When someone walks into the Blur Building, their spatial orientation is affected and their bearings become blurred, as all horizons vanish in the mist. On the other hand, when someone walks into the Queen’s Wharf Wetland, time and space become somewhat indeterminate. One’s pace is slowed down and the layout encourages sightlines to be lowered toward the ground. Certain elements of the wetland hamper the ability to orientate to the space we find ourselves in, as confusion is raised regarding the distinction between what is natural and what is artificial.

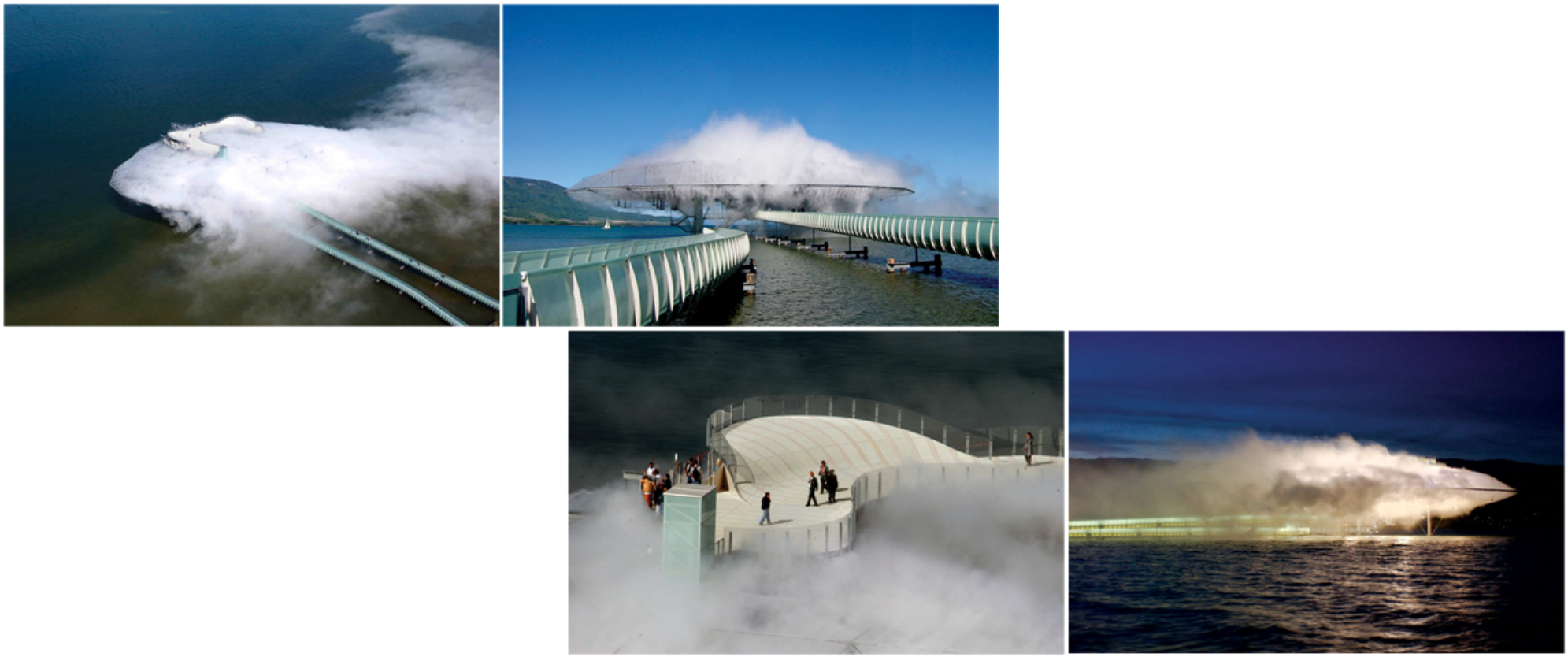


fig. 4a, b, c, d. The Blur Building (2002). Diller + Scofidio



fig.5a, b, c, d, e, f. Water Pavilion (2008). Milla Digital Design Group

# WATER PAVILION

The Digital Water Pavilion is another example of a building made of water. In 2008, the Milla Digital Design Group created this structure as part of the Expoagua presentation in Zaragoza, Spain. The project brings water together with digital technology in a minimalist expression in a relatively small physical space. It is however, a sophisticated high-pressure machine that causes a "building" to appear and disappear almost instantly, thanks to a system of hydraulic pistons. The spaces produced are dynamic and interactive, due to the action of "water curtains" (the walls of the building), digitally controlled by electro-magnetic values (Introduction, n.d.). The liquid curtains can be programmed to show images or messages. As people approach the structure, they are sensed and the water automatically stops to let them pass through. Carlo Ratti of the SENSEable City Laboratory at the Massachussetts Institute of Technology has noted that in order to understand the concept of digital water, we need to conceive of "an inkjet printer on a large scale, which controls droplets of falling water" (Richards, Patti, 2007).

Do the walls, or curtains of the Water Pavilion have a surface? Stroll noted that water in a lake can be rough or smooth, and that it is possible to talk about the lake's surface. However, "when water gushes out of a hydrant, no surface-talk is possible" (Stroll 1988: 10). The case of the Water Pavilion seems to fall between these two cases. On one hand, the water curtains can provide the optical illusion of a solid, or at least constant object. But, if we were able to zoom in to closely examine the curtain, we would notice that its "surface" is a series of falling drops of water, that although are not chaotically and randomly gushing like a hydrant, nevertheless do not constitute a united, uniform entity.

In the case of the Wetland Park, there will be a dripping or spraying effect at the end of the water channels, depending on the wind, where water falls into the harbour. Unlike the Water Pavilion, where water takes on a sheet-like quality, the falling water in my project will form very random, abstract patterns, without any digital manipulation. It should also be noted that the curtains of the Water Pavilion, as well as the water entering the sea from the Wetland Park, only appear to have two dimensions.

# THE HIGH LINE

In 1934 an elevated rail line was constructed on the West Side of New York City for the purpose of taking freight trains off the streets of Manhattan (High Line Park Information, n.d.). The railroad was abandoned in 1980, whereupon it became “a typical shard of industrial blight, left to rust and grow wild with weeds” (Sternbergh 2007). The structure can be said to belong to the category of “industrial ruins” (Doron 2007:16) that is neither a part of history (the official past) nor the present, but at the same time is rooted in both. Gil Doran explains that if an industrial ruin does not undergo preservation or documentation it will fall outside the domain of history and if it does, it will lose all the attributes of an ‘industrial ruin’ and become a ‘dead ruin’” (Ibid).

Narrowly escaping demolition, the area became a public park in 2009, due to the efforts of two architectural groups: James Corner Field Operations and Diller Scofidio + Renfro (High Line Park Information, n.d ). At present, the park measures 2.33 kms in length but is only approximately 20 mts wide, an area of almost seven acres in total (Ibid). Meandering concrete pathways were installed alongside naturalistic landscape inspired by the self-seeded grasses, weeds and even hardy trees that had sprung up in the gravel on the disused train tracks, sections of which have been incorporated into the park design (Croughton 2009). Parts of the walkways imitate the tracks, with exposed concrete and steel in parallel lines (Ibid). The park has been variously referred to as “a suspended green valley in the Manhattan alps” (Sternbergh 2007) and “an aerial greenway” (Croughton 2009), a case where “an elevated railroad line becomes a meadow” (Blum 2009). With ample seating, grassy areas, lighting and easy street access, the High Line project illustrates how a park “built on a junk heap became a glamorous brand” (Sternbergh 2007). Located in what is now a “grit-chic neighbourhood” (Ibid), the park is surrounded by reclaimed gallery spaces, as well as trendy restaurants and boutiques alongside the old warehouses, illustrating the fact that this constitutes a “remediated industrial area”, according to writer Andrew Blum.” (Blum 2009).

Abandoned railway tracks that go nowhere and are overgrown with weeds are eloquent examples of what Gissen terms subnature. In this respect, rust and unwanted plants belong to the same category as polluted water. In the High Line project, a new focus, that of a use value, is placed on these first two elements by blurring subnature together with modern design. In my project, a new focus is accorded to unwanted water, also an element of subnature, that emerges from a subsurface area to become exposed to the forces of nature on the road to what will hopefully be a happy ending.

Another similarity between the two projects is the fact that they are both elevated structures, where people are encouraged to visit and view innovative changes that have been implemented. Before continuing with other case studies, the nature of elevated architecture is discussed. If we can talk of the subsurface of architecture in reference to elements that are hidden from view by surface(s), then we should be able to speak of a second surface of an architectural site, one suspended above another that we could playfully call a “sur-surface”.

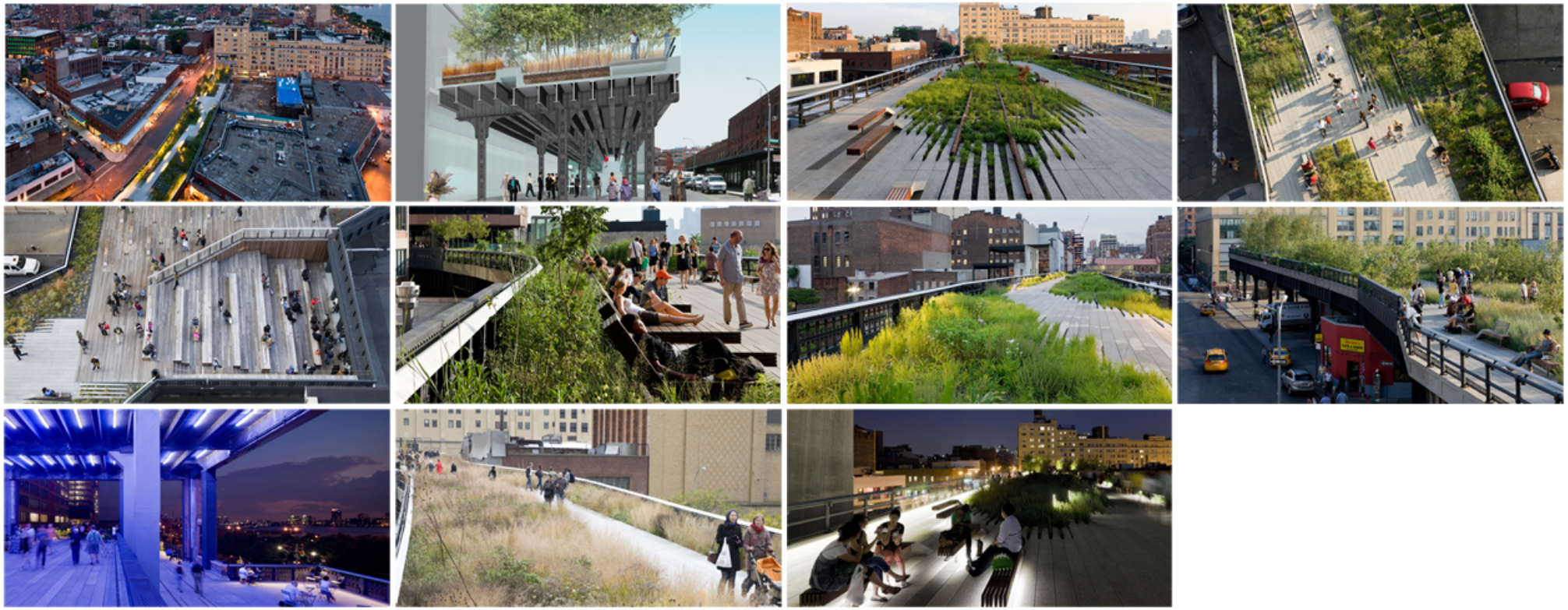


fig.6a, a, b, c, d, e, f, g, h, i, j, k. The High Line (1934). Diller Scofidio + Renfro

# “SUR-SURFACE” ARCHITECTURE

Detaching architecture from the ground has been termed “modernism’s archetypal gesture” (Ruby and Ruby 2007: 33), but is the act of elevating a structure above water relevant to discussion on the “the liberation of architecture from the fetters of the ground”? (Ibid: 33). Beginning in the 1920s, architect Le Corbusier designed houses on stilts, or pilotis, which soon became a pervasive type of building in the modernism movement (Ibid: 9). Such structures allow for a “doubling” (Ibid: 9), or “sur-surfacing”, of the ground, whereby a construction sits on a platform, providing a new elevated level zero. In the same manner, the constructed wetland on Queen’s Wharf has been lifted off the foreshore, but instead of the ground below, it is seawater that is allowed to maintain its independence and visibility. Rather than simply replacing seawater with a solid mass, the wharf leaves the maritime ecology underneath it visually undisturbed, apart from the minimum invasive presence of the pilings, or pilotis, that hold it well above the surface of the water. In this sense, the act of buildings replacing land, said to be “architecture’s original sin” (Betsky 2002: 5) does not fit such a characterisation, due to the fact that the area underneath the wetland remains open, having contact with sunlight and air, and retaining its original

relationship to the horizon. The act of suspending a wetland above the sea gives it an additional value, as the space between construction and water helps to illustrate the relationship between the two, as well as demonstrate the fact that water from foreshore wetlands eventually reaches the sea. Instead of reclaiming land from the sea, in the manner of Auckland's landfill projects, my project, if not reclaiming sea from the land, at least reclaims wetland, a transition area between the two. The project respects the appearance and behaviour of the sea manifested in the movement of waves and the rise and fall of the tides. Unlike constructions of skyscrapers, churches and libraries, for example, that are celebrations of all that is not nature (Betsky 2002: 7), my wetlands park project is a celebration of nature in a manner similar to that laid out by Aaron Betsky, who in his book 'Landscrapers' (Betsky 2002), considers novel ways to build with the land that take into account specificities of the natural surroundings, attempting to integrate them with architecture. Another person who has challenged the boundaries of architecture and its relationship to nature is architect Francois Roche, whose work will be examined in the next section.

# BUILDING BIOLOGIES



fig. 7a, b, c. I'm Lost In Paris (2008). R & SIE(N)

The work of Roche, based at the design studio R&Sie(n), advocates the experimental use of certain biological effects applied to architecture that reach "beyond the realm of physiological transfers" (Roche 2008: 68), in that they present the possibility of new spatial relationships. In 2008, Roche proposed a new take on the concept of the ecological house. He portrayed nature as a "partly human artifice which is both alien and personalised" (Arbona 2010: 47). In his work, he attempts to overcome our alienation from nature at the same time he aims at reinforcing it (Ibid: 48). To a great extent, this is a reaction against types of eco-architecture, or green design, that reaffirm the separation between humans and nature, while apparently "seeming to close it" (Ibid). In his house there is no façade, just plant walls, where the plants seem "exaggerated, fertile and wild" (Ibid), growing like a giant Chia Pet. The ferns utilised in the project required a hydroponic system with bulbous glass beakers that allowed the materialisation of a 'living wall' ('Lost in Paris' house, by R&Sie architects 2009). It seemed that Roche designed his house to be "simultaneously a mechanised delight and an organic fright" (Arbona 2010: 53). Such a provocative piece of work, not without an element of humour, is designed to make people think about the indeterminacy surrounding ecological houses. "People are always curious when they walk by but sometimes they find the system creepy, or even dangerous to some; it is a game of attraction and repulsion." (Roche, quoted in 'Lost in Paris' house, by R&Sie architects 2009.)









fig. 8a, b, c, d. I'm Lost In Paris (2008). R & SIE(N)



fig. 9a, b. Green Gorgon (2005). R & SIE(N)N

In collaboration with Philippe Parreno, Roche developed a museum project denominated Green Gorgon, to be located in Lausanne, Switzerland. The design of the building rests on several basic strategies, some of which coincide with the aims of my project. In designing the museum, one aim was to draw attention to "the deceit of its natural environment" (Roche 2008: 69) which is a polder (reclaimed land) development on the lake. This condition is on a parallel with the fact that the Queen's Wharf area was formerly covered by the waters of the Waitemata harbour, prior to receiving landfill. Roche and Parreno also aimed to blur the boundaries between different perceptions of the term "nature", that is, constructed natures, such as "hydroponic façade, biodynamic green hairs" (Ibid), as well as urban natures with uncanny qualities, "which altogether generate a hybrid, non-identifiable new landscape" (Ibid). To achieve this, Roche acknowledges different natures, such as "urban nature", "artificial nature" and "haunted nature" (Green Gorgon, n.d.), which are amalgamated in the museum. It was inspired by "a reflection in water of branches and undulating gnarled forms", and is "a strange and enchanting dream, Ophelia's hair, or one of Grimm's fairy tales that takes place in the middle of a forest" (Ibid).

Another objective of Green Gorgon is "to use the photosynthesis of all green façades to recycle and clean wastewater" (Ibid), which coincides with one of the ideas regarding my constructed wetland project. Roche mentions the "confusion between artificial and domesticated nature" (Ibid), which can be applied to the concept of a constructed wetland that I utilise in my project, consisting of structures which define its boundaries, layout, as well as surfaces and subsurfaces, encompassing a mix of architectural and natural features. Vertical contouring permits surface and subsurface to be examined and the next section describes several ways this concept has been applied to my work.

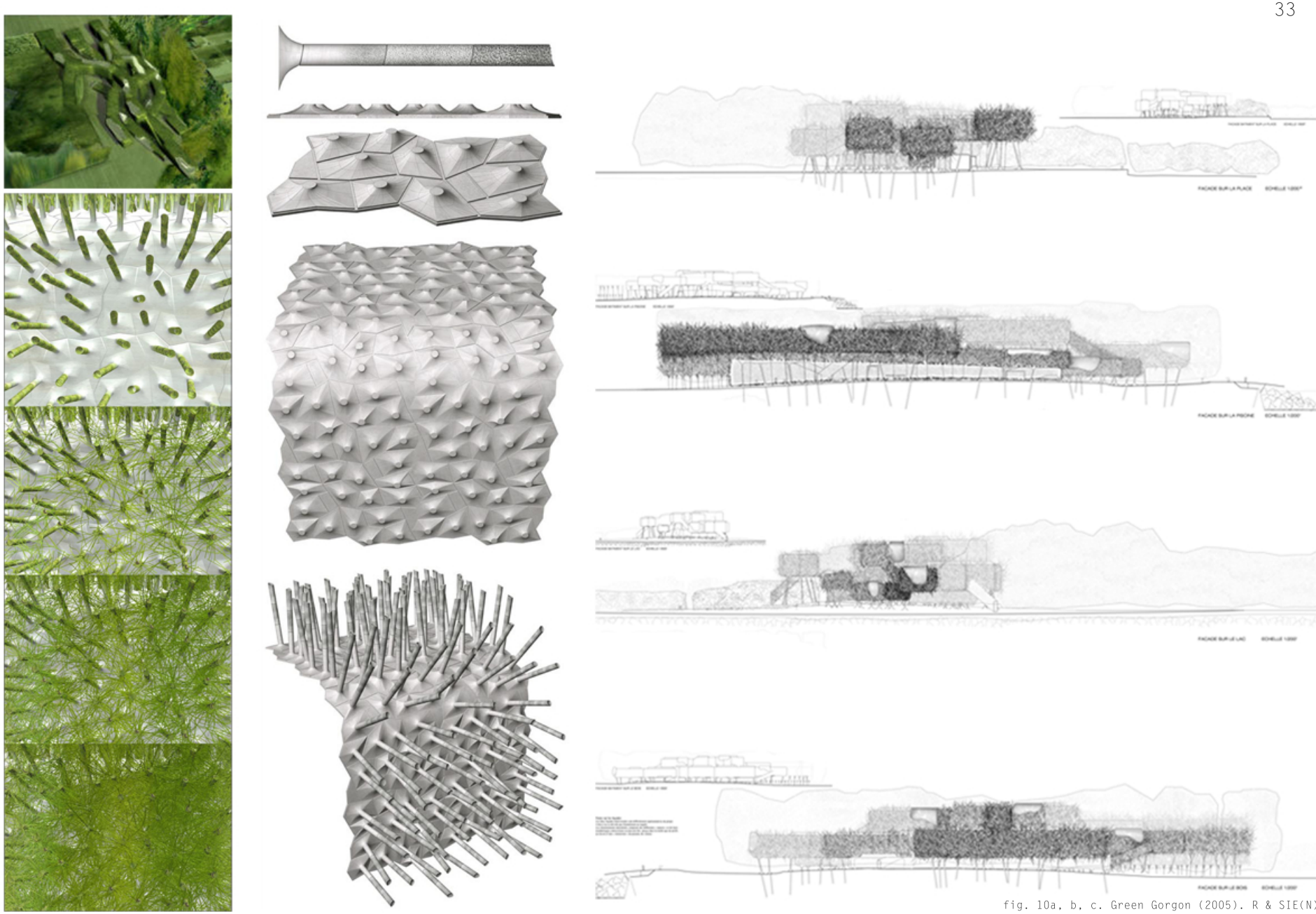


fig. 10a, b, c. Green Gorgon (2005). R & SIE(N)

# VERTICAL CONTOURING

fig. 11a, b. Sectioning the Queen Street.





A tool I have explored and found useful in the application of ideas regarding fluidity and surface is the concept of vertical contouring. This approach has more fluid dimensions than conventional horizontal/bird's eye contouring. Whereas traditional contouring allows for the presentation of three dimensions on a two-dimensional medium, vertical contouring has an infinity of possibilities due to the viewpoints being determined by the distance and angles relative to the subject matter. Vertical contouring can be applied to both natural and man-made phenomena. In the case of the wetlands area for example, plant life, such as trees and bushes can be examined from the perspective of verticality in relation to the surfaces that can be perceived. This perspective allows for changes in space (as one moves around the area) and in time (as the vegetation grows). The same holds for constructed objects. Another application for vertical contouring is the practice of sectioning, which involves taking photographs at regular intervals as one follows a particular trajectory though a section of the city. As can be seen in the conceptual models that I constructed out of watercolour paper, this activity permits us to appreciate visual aspects of the city not evident in a static view. Michel de Certeau, in his essay *Walking in the City* noted that the city dweller, or what he calls "the ordinary practitioner" (de Certeau 1984: 93), lives below the thresholds at which visibility begins. In his view, when pedestrians "follow the thicks and thins of an urban 'text', they write without being able to read it" (Ibid). In other words, people are using spaces that they cannot see. However, I consider that these spaces actually can be seen in an indirect manner, by means of the inter-relationship between the changing perspectives provided by the sectioning photographs.

I carried out a series of sectioning activities on Queen Street in the sight-line of Queen's Wharf with the use of the camera. Photographs were taken every ten steps in a trajectory, in all, a total of 72 images, after which they were polarized in high contrast with the negative parts cut out. In this way, I implemented a system of vertical contouring, which shows changing perspectives from different points in space. Thus, the models can be "read", as the spaces created by removing the negative areas of each image provide the opportunity to appreciate the presence or absence of man-made and natural mass (e.g, buildings and trees) in any particular image and in the model as a whole.



fig. 12a, b, c, d, e, f. conceptual sectioning model.

By cutting out each negative part from my sectioning images and joining them together, all the negative parts recreate a series of new spaces in between the positive parts. I consider this to be the interesting part that is hidden behind the surfaces city and that we cannot normally see. By introducing this unique type of reading, I have the opportunity to investigate the relationship between nature and man-made elements, as well as how “surface play” occurs in the city.

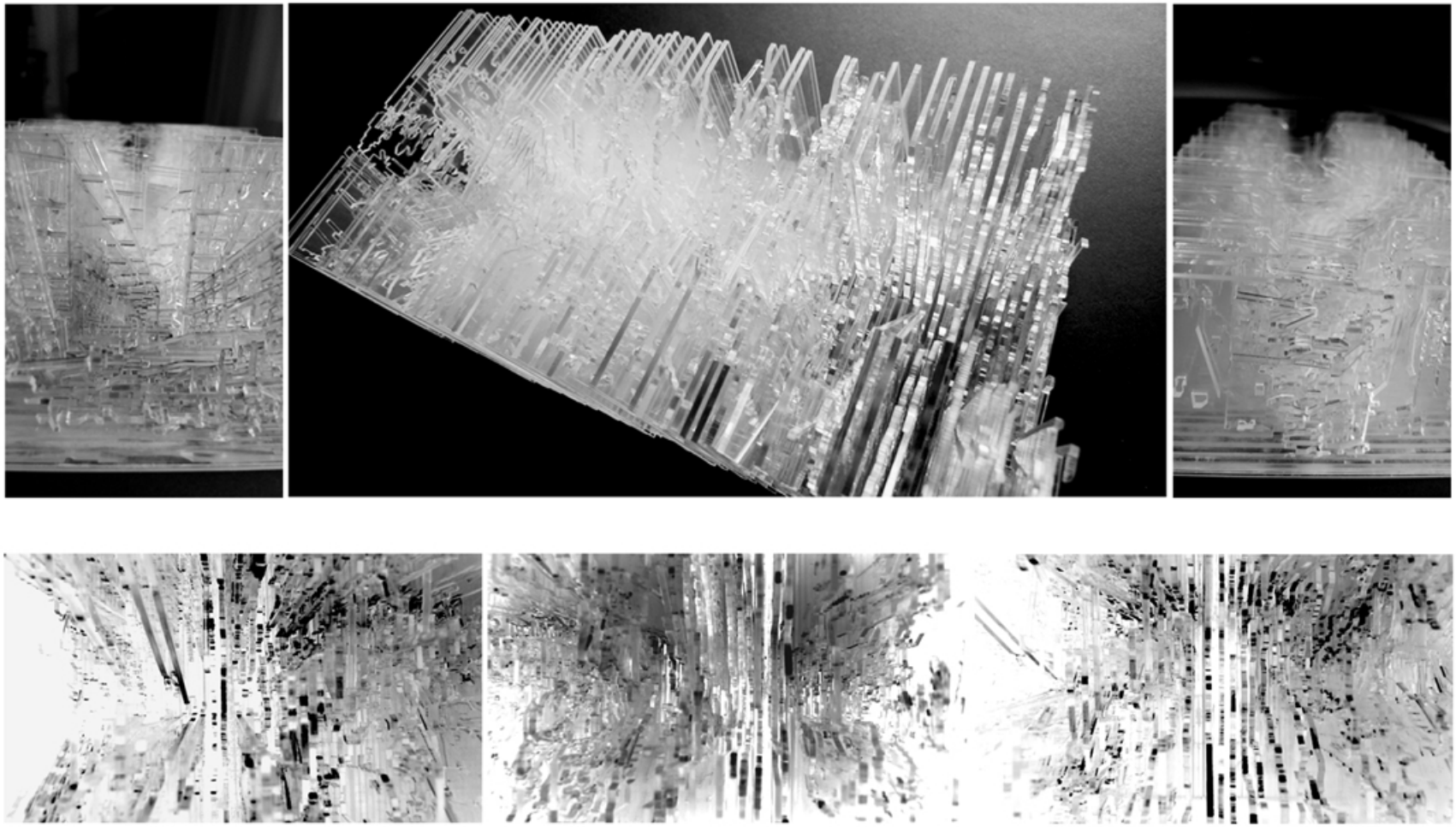


fig. 13a, b, c, d, e, f. Developed sectioning model.

From the model I had made with watercolour paper, I decided to change the material to transparent perspex, making it on a larger scale. This sectioning model can be read as a filtration channel for the city. When things surface, they become evident or apparent (Remember that ‘surface’ is a verb as well as a noun). This water-based analogy is very appropriate for the case of the real, constructed filtration channels next to the ferry building, into which stormwater from the streets and grey water from the ferry building will flow for its purification by natural processes. Another reading of the sectioning model, is that the different horizons along Queen Street create a new landscape, or as S. Yahya Islami says: “surface-scape” (Islami 2007: 672).

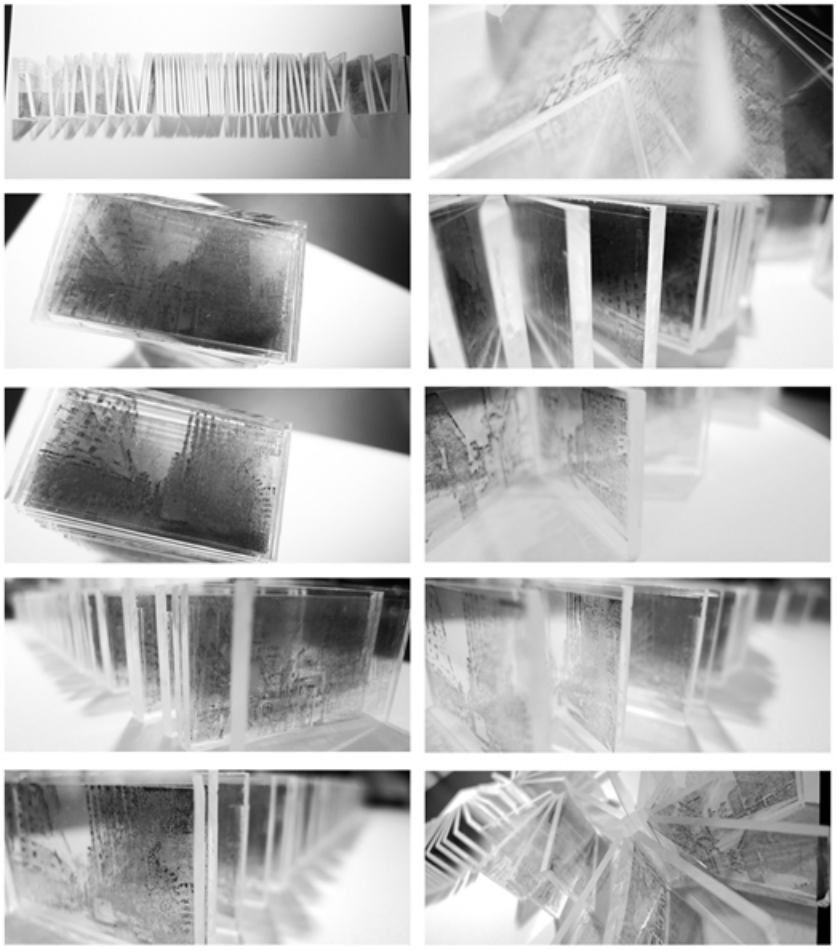


fig. 14a, b, c, d, e, f, g, h, i, j. Further developed sectioning model.

The transparent perspex material allows reading Queen Street in certain effects of subnature, consisting of peripheral and usually undesirable forms of nature, such as dust, smoke, dirty water, in contrast with desirable forms of nature such as the sun, clouds, trees, wind, etc. The images show aspects of the city that we don’t normally notice, such as blurry effects caused by shadows and darkness.

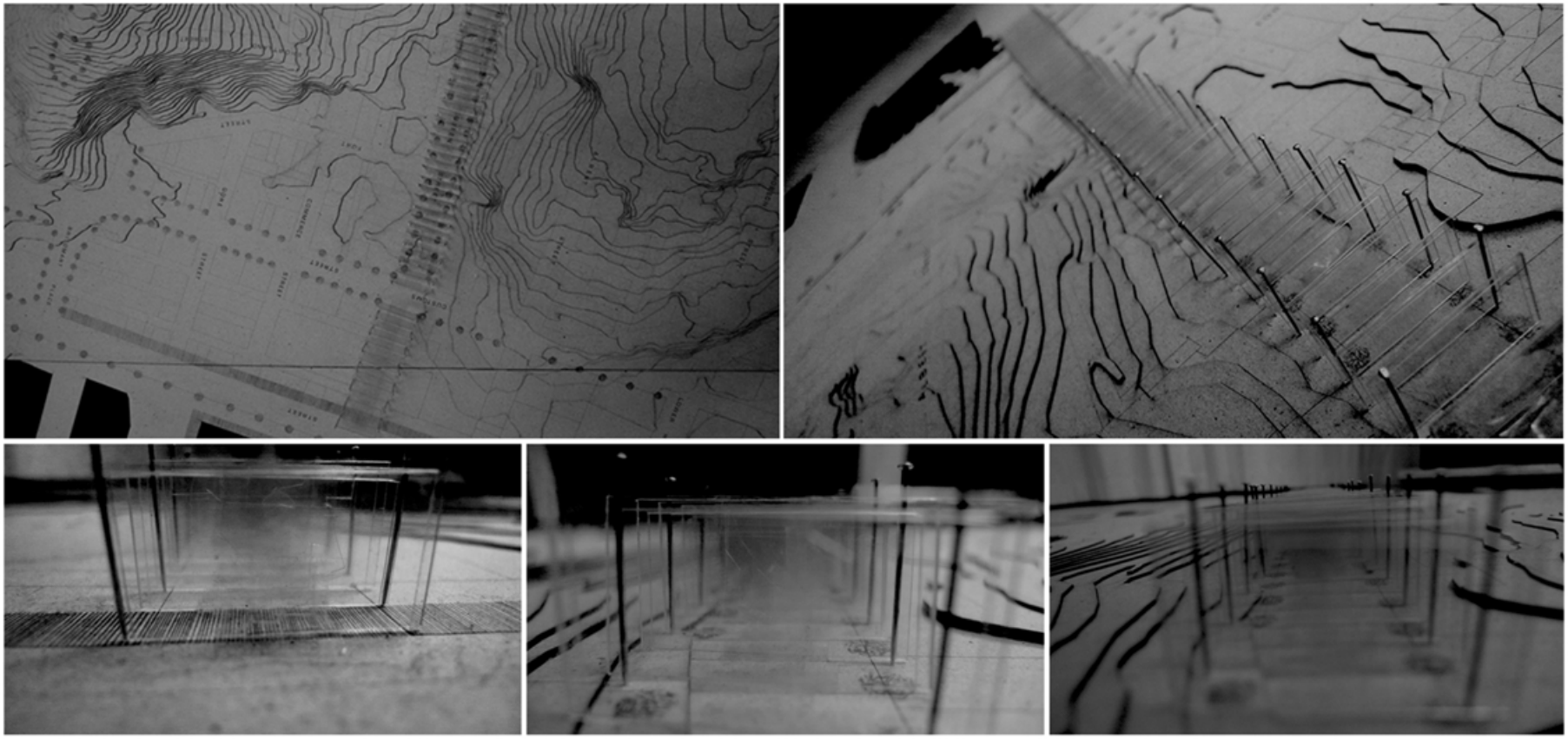


fig. 15a, b, c, d, e. Sectioning model superimposed on a site model.

To complete the series of sectioning models, I have superimposed certain two-dimensional sectioning images onto a three-dimensional Queen Street site model. This serves to contextualise the sectioning components in the topography of downtown Auckland, with three-dimensional horizontal contouring interfacing with the vertical contouring of the site. The surrounding objects of Queen Street become blurry, as well as the boundaries between man-made and natural phenomena. With the use of these images, surface acquires depth that can be appreciated in the model.

# SUBNATURE

Whereas architecture is usually considered to be a refuge from nature, the interface of architecture with what has been called subnature has recently been examined (Gissen 2009). This term refers to “peripheral and denigrated forms of nature, when nature threatens inhabitants or material formations” (Ibid: 22) and it includes such elements as smoke, weeds, dust, debris and puddles, among others. One example of subnature is the discharge of fluids into sewer systems and water networks. This consists of wastewater from the interior of buildings and water running off the constructed surfaces of the city (e.g., roofs, streets, etc.) into sewers and stormwater systems.

In developed countries, stormwater and sewage are usually channelled into two different networks. In this manner, a street can be conceptualised as a “strata of sloped and interconnected layers for effectively managing liquid waste streams” (Gissen 2009: 104). In my project, only stormwater disposal and not sewage will be considered. Stormwater usually gathers toxic organic and inorganic elements, such as oil, petrol, heavy metals and tire dust, and other materials. As will be noted later in the text, increasing attempts are being made in various parts of the world, including New Zealand, to manage or reduce these streams of liquid waste in various ways, such as by the use of wetlands and water filtration. The constructed wetlands area of my project will serve to make the invisible become visible, as it will be fed by wastewater and stormwater that normally ends its underground journey through the drainage system by being discharged into the harbour near Queen’s Wharf. In this way, an aspect of subnature will be transformed into an aspect of nature.

# CITY NETWORK

one week



two weeks



fig. 16a, b. Moldy model- effect after one week and two weeks time.

With certain ideas of subnature and weathering in mind, I made a gelatin model demonstrating networks of human circulation within the central city. In order to cause subnature and weathering effects, I placed the model in a closed locker, where I knew the temperature and absence of fresh air would stimulate the growth of mold. The presence of mold, along with slow “melting” or breakdown of the gelatin, produced a rather blurry and more fluid aspect that could demonstrate the two above-mentioned processes, which do not necessarily always have to be negative. On one hand, although blurry circulation could have adverse effects on how people move around the city, blurring effects in relation to architecture and nature, as well as land and sea, can have an integrating effect. On the other hand, this latter aspect is also relevant in regard to the aspect of increased fluidity, in that it contributes to a greater integration of the above-mentioned factors. A rough analogy can be seen between the filtration of water though the city (through wastewater system and in my case, a water purification channel), and the filtration of people though the city, and again, in my case specifically, through the new ferry building complex.

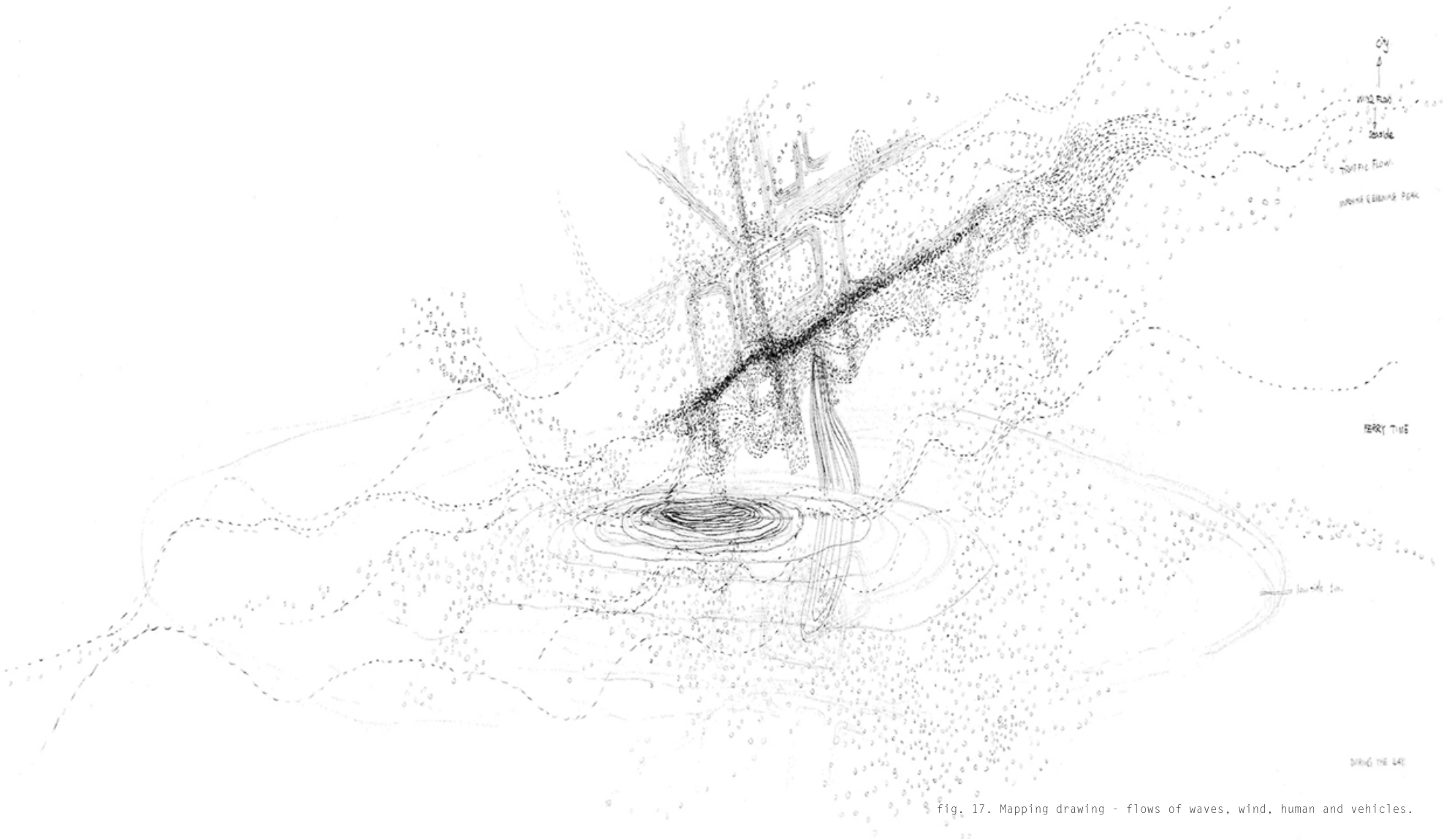


fig. 17. Mapping drawing - flows of waves, wind, human and vehicles.

This drawing maps out the flows of waves, wind, humans and vehicles. It provides a better understanding of the dynamics of the area that my design addresses. Subnatural elements, such as dirt and dust, by-products of the movement and activities that take place in the city, can also be read in this image, and seen in a positive, aesthetic way. Human experience in this situation should be considered as being just one of many elements, both natural and sub-natural. In the same way that light, shadows and wind move around the city, so do people and vehicles. Humans can even be seen as fragments of dust and dirt that percolate through the street and buildings of the city.

Some of the flows listed above occur in city parks but in the Queen's Wharf wetland park, there is an extra feature that makes it particularly dynamic. This is the movement of surface and subsurface water that makes up the water purification system. Movement of plants in the wind and through their growth, as well as movement of birds and insects complement the movement of people. The next chapter deals with wetlands because in order to properly contextualise the concept and feasibility of a wetland being constructed on Queen's Wharf, an extensive discussion on this topic is necessary. This will include diverse aspects, such as aesthetic issues, historical and cultural factors, natural biological processes and ecological conditions, as well as relevant technological information.

# WETLANDS

# PRELIMINARY CONSIDERATIONS

A wetland can be considered as a type of landscape, and so, from the perceptive of landscape aesthetics, it is necessary to consider certain aspects of the nature of perception, when we try to explain why people have preference for one kind of landscape over another. In the opinion of psychologist Stephen Kaplan, the term “affordance” is relevant to the perspective of landscape aesthetics. This term, developed by J. J. Gibson (Kaplan 1992: 45), refers to what something that is viewed, such as object or an environment, offers the viewer, or in other words, what function it can have for the viewer. Going a step further, one must discern between environments, for example, and establish preferences for one or another. Although it could be assumed that preference judgements vary randomly from person to person, and thus reduce aesthetics to a trivial expression with no underlying consistency, Kaplan considers that “preference judgements are neither random nor highly idiosyncratic” (Ibid: 46), citing a large number of studies that confirm this statement (Ibid: 46). For this author, the best approach is “ferreting out the unique’’ (Ibid: 54). Some writers have stated that the more unusual a landscape is, the more valuable it is. However, such an interpretation, which is an economic argument dependent on scarcity, does not apply to the reaction that people have to nature, which is essentially non-economic. In contrast, Kaplan proposes that there is another way that uniqueness can be appreciated, which is when a place is very distinctive and has “a sense of place” (Ibid: 54). In the case of a large city, this could be linked to ease of access to the place in question. For example, if a wetland is the only natural environment in a downtown area, then it is unique in a significant way. Additionally, if such a location contained a functioning water purification system, as well as traditional park elements such as facilities for relaxation and recreation then it could be said to have “unique content”, which would undoubtedly contribute to the preference factor. When this is linked to historical and cultural factors surrounding the site in question, then it could exercise a powerful attraction for the general public.

My project will explore the concept of surface(s) of a constructed wetland. Can we speak of surface in regard to the concrete base,

the top of the planted layer (gravel, sand, etc.) and the overlapping levels of vegetation above? This question has relevance for an issue raised by Alicia Imperiale, who has noted that in relation to the outermost layer or covering of an object, that she calls “skin”, a doubt arises as to whether it is surface or depth or both. She considers that in architectural thought, there has been a movement away from dialectical relationships, in other words, from the opposition between surface and depth. Instead, there is an increased awareness of the “oscillating movement” (Imperiale 2002: 55) from one into another. She explains how the early twentieth century modernists attempted to represent tension between surface and deep space at the same time, usually through glass and other transparent materials. This established a “dialectical division” (Ibid: 56) between the exterior and the interior of a building. However, in recent times, some architects have collapsed the depth of the interior into the outer surface of a building. Such “surface-play” not only dissolves the distinction between interior and exterior but can also blur the boundaries between architecture and nature, which is a prime objective of my project.

# THE SIGNIFICANCE OF WETLANDS

Freshwater is a finite resource on our planet, a fact that is becoming more apparent with the advance of global warming. It constitutes only 0.1% of the world's water (Izembant and Le Bondec 2008: 4) and is constantly circulating in the form of evaporation and precipitation. Wastewater is a part of this cycle through runoff or infiltration, often polluting the waters that receive it, which can lead to adverse effects for agriculture and aquatic life, as well as posing dangers for humans bathing and consuming drinking water. Natural wetlands have been referred to as "nature's kidneys" (Wong, n.d.: 12), but in their absence, the necessity to construct new ones has arisen, in order to cope with increasingly polluted water sources. The constructed wetlands ecosystem is a type of technology that can be termed bioengineering or biomimcry (Oberndorfer et al, 2007: 831), of which more will be said later. These ecosystems constitute microcosms containing different plant species, and are very dynamic, as they involve the "restoration of degraded water" (Stitt 1999: 382), and require appropriate assembly based on a knowledge of the niches and natural history of the organisms that make up the different components, by means of involving a "calculated determination of their individual fit into the unique constellation of organisms being assembled" (Ibid: 381).

In recent years it has been shown that so-called "root-zone" systems clean wastewater more efficiently than the conventional wastewater treatment systems that use costly technology and require high maintenance (Steinfeld and Del Porto 2004: 44). These natural systems are all located in areas referred to as "wetlands", which is actually an umbrella term for a large variety of different ecosystems characterised by slow drainage or accumulation of water. Various classification systems exist and undergo modification as research continues in this area. Around the world, wetlands have been variously referred to as bogs, marshes, swamps, soaks, fens, peatlands, wet meadows, carrs, among other terms. Although constructed wetlands to treat wastewater is still a relatively new, and largely experimental, concept, they already exist in the thousands, primarily in northern Europe and the U.S.A. One of the largest is a facility constructed in Kingman, Arizona, which has the capacity to handle three million gallons a day (Gelt 1997: 2). Other much smaller projects may service a farm or just a single household (Ibid). Within the sub-discipline of ecological design, constructed wetlands lie in the category of what have been termed "living ma chines", because they are comprised of "interrelated parts that function together in the performance of some kind of work (Todd and Todd 1999: 381). They are characterised by methods that involve no complex technology, where plants and microorganisms are the primary agents in the process of bioremediation, using sunlight as their primary source of energy. At the same time they are new, contained environments (Todd and Todd, op. cit.: 381), and the constituent parts of the water treatment system must be assembled in an appropriate manner in accordance with a sound knowledge of the unique local ecological conditions.

# NEW ZEALAND WETLANDS

A definition of the New Zealand wetlands situation has been provided by the 1991 Resource Management Act: "'Wetlands' includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions" (cited in Johnson and Gerbeaux 2004: 7).

In the Maori language, the word for bog is "repo" and swamps are called either "matata" or "nowaiwai", and the words 'swampy' and 'boggy' have a total of eight different Maori words (Ryan 1997: 411, 702). Such a variety of terms indicate the importance that wetlands had for traditional Maori life, as they constituted one of their food sources. Wetlands have similarly had economic importance for many cultures around the world, for purposes such as bird-hunting and peat-cutting for fuel. However, in the last several hundred years they have received attention for another reason. As wetlands are relatively flat and are also often adjacent to rivers, lakes and natural harbours along coasts, they have been systematically destroyed by the construction of drainage systems and landfill, in order to accommodate the expansion of agriculture and areas of human settlement. In New Zealand this is no exception. Over the last 150 years, the disappearance of wetlands has been estimated at 90%, making the country "an unenviable world leader in wetland loss" (Kleinpaste and Roxburgh 2010: Foreword).

The majority of the country's major cities are built on areas that were formerly wetlands – "estuaries have been reclaimed and inland areas heavily drained to support a growing land-hungry population." (Peters 2010: 2). This process has continued to the present day, even though the important ecosystem services they provide, along with accompanying economic, environmental, cultural, and recreational factors, are well recognised and understood. However, at the present time, many attempts are being made by a diverse group that includes government agencies, schools, iwi, scientists, community groups, among others, to restore wetlands to their former state as healthy ecosystems (Ibid).

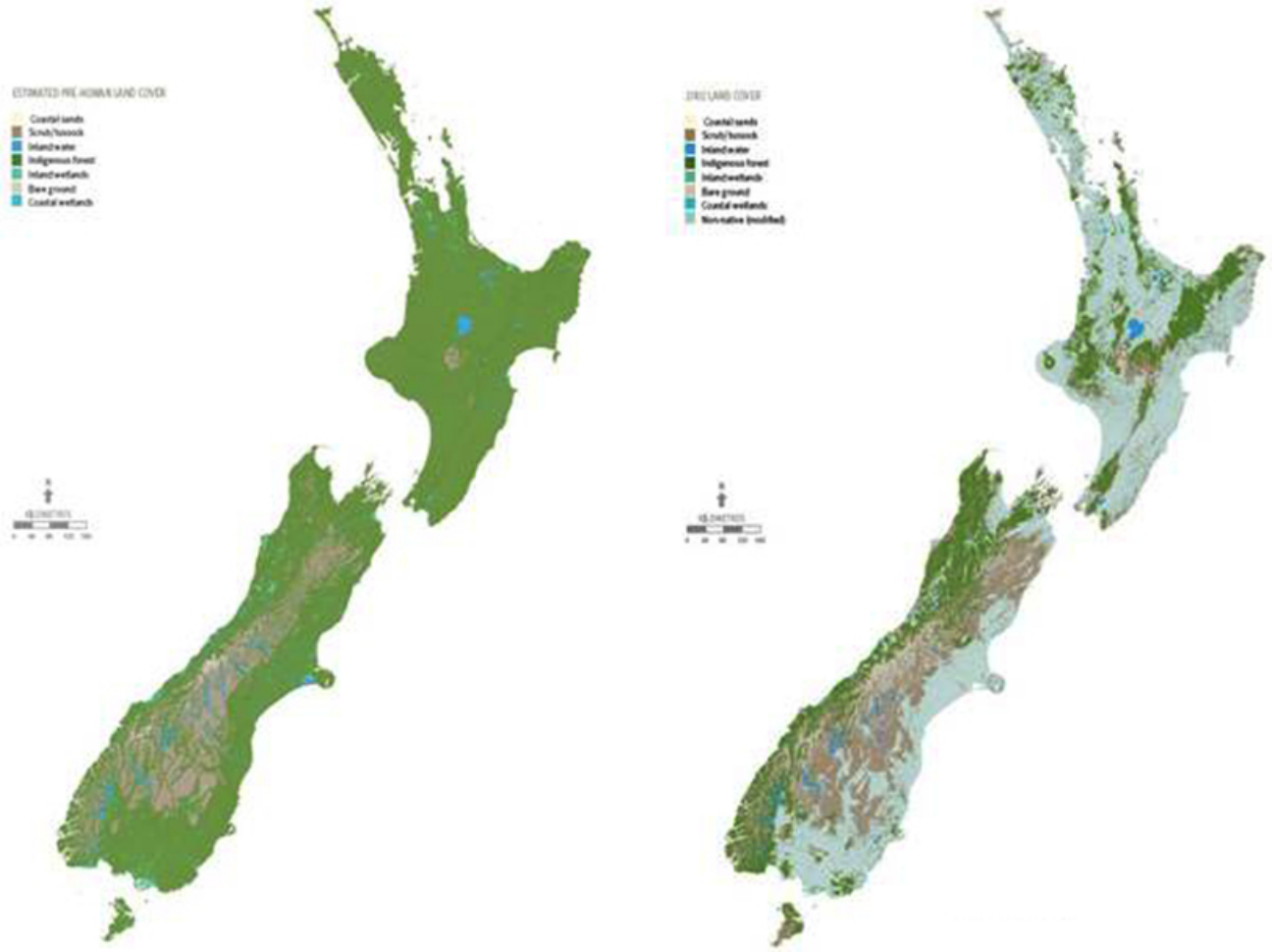
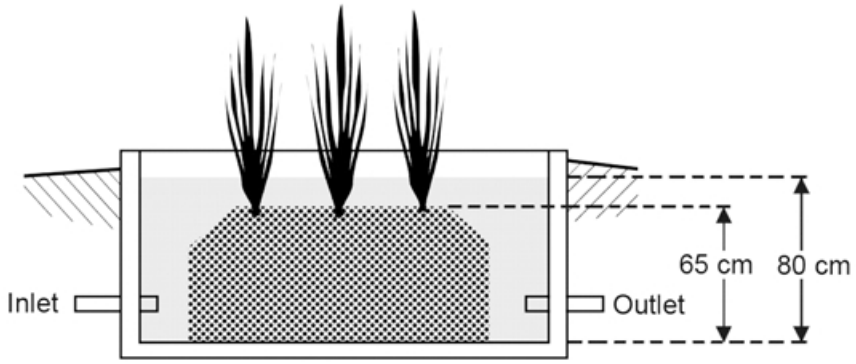
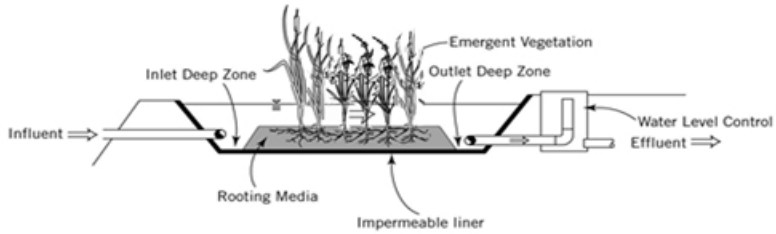



fig. 18a, b. The decline of New Zealand's freshwater wetlands.

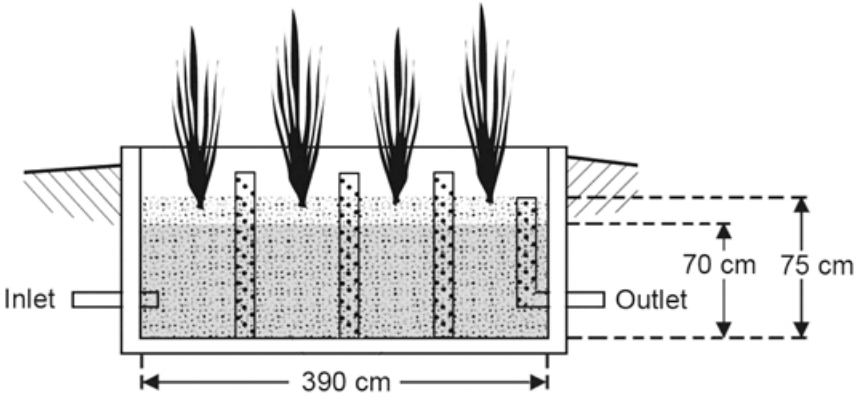
# CONSTRUCTED WETLANDS IN NEW ZEALAND

In 2002, a total of 80 constructed wetland sites were reported to be operating in New Zealand, with many communities showing interest in this cost-effective method of wastewater treatment that additionally involves the restoration of environmentally valuable wetland ecosystems (Tanner and Sukias 2002: 1). A hybrid design incorporating both surface and subsurface flow components has been proven to be effective, and in 2002, 14% of the country's constructed wetlands belonged to this category (Idid: 3), a trend which seems to be progressing in the same direction. The following two sections address cases of constructed wetlands that serve as points of comparison for my project and that have actually informed some of the practical considerations surrounding the Queen's Wharf wetland park.




surface wetland



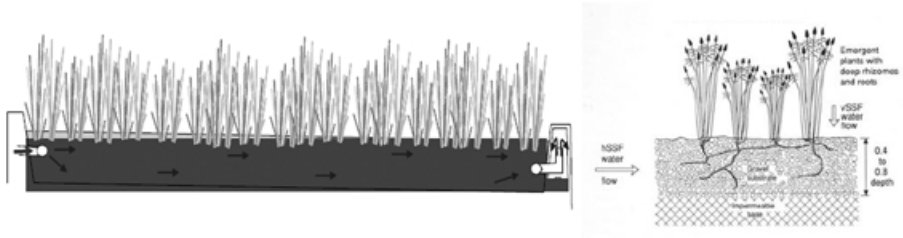



fig. 19a, b, c, d. Sections and details of surface and subsurface wetland.

subsurface wetland

# WAIATARUA RESERVE



fig.20. Photograph of Waiatarua Reserve.

In 2006, the Waiatarua Reserve, located in the Ellerslie suburb of Auckland, was the largest urban constructed wetland in New Zealand (Wet and Wild - Urban Wetland Wins Awards, n.d.). Occupying an area of 57 hectares, this wetland presents challenging geological conditions, because it has a thin surface crust "underlain by as much as 8 mts of soft peat" (Ibid). It is also susceptible to flooding, due to the large catchment area that feeds into it. For this reason, natural and engineering measures were taken to remove contaminants, as well as reducing sediment that used to flow into the Orakei Basin on the nearby Waitemata harbour, deteriorating both water and beach quality (Waiatarua Stormwater Upgrade, n.d.). A network of drains and sediment traps is distributed through the wetland, with a system of channels, bunds and weirs to slow down the flow of water and control flooding (Ibid). Extensive planting of native trees and grasses was undertaken to encourage birdlife and a series of walkways was constructed to facilitate public access (Ibid). Mature trees, including a stand of tall pines, grow around the perimeter, which contribute to the prevailing rural atmosphere of the reserve, even though it is completely surrounded by residential development. The wetland affords long, relatively horizontal sightlines with various open, grassy areas that tend to focus the visitors' attention on the grasses and rushes located in areas of surface water. Apart from the walkways and small wooden bridges, there is virtually nothing in the reserve that reminds us of the urban setting in which it is located.











fig.21a, b, c, d, e. Photographs of Waiatarua Reserve.

# WAITANGI PARK

Another excellent example of a constructed wetland project is Waitangi Park, located on the waterfront of the city of Wellington, which was inaugurated in 2006. The project has two main strategic aims. The first is to offer the public an urban park with both constructed and natural landscape within a context that reflects the local history, culture and ecology. The second aim is to basically "integrate stormwater treatment within the landscape facilities and features of the site" (Wong, n.d.: 6), before it enters the harbour. As a practical application of what is called water sensitive urban design [WSUD] (Wong, n.d.: 6), a comprehensive scheme was put into operation. It consists of a system comprised of the following elements: a pump to channel the water; an oil/grit separator to remove coarse sediments prior to water entering the wetland; subsurface wetland to reduce pollutants; UV disinfection to reduce bacterial levels, particularly faecal coliform; and finally, a linear wetland area. (Wong, n.d.: 9). This so-called "treatment train"(Wong, n.d.: 22) is necessary as the totality of stormwater pollutants cannot be removed by one single treatment. The subsurface layer naturally filters the water and promotes the growth of biofilm which coats toxic particles. The importance of this process lies in the fact that most pollutant removal in wetlands is due to microbial activity (Practical as well as pretty-urban wetlands, n.d.).

The park is divided into several different areas characterised by variations in the types of vegetation and ground cover, as well as the specific use intended for the public. For example, one section contains children's swings with a synthetic, rubberised ground cover and a skateboard facility paved with concrete, while others are simply walkways with long wooden benches and in some places, steel railings and wooden slat fences, which serve as windbreaks. Ground surfaces vary considerably from concrete to wood and various mixes of sand, gravel, shells and pebbles. Sometimes the ground cover is even a combination of wooden beams and gravel/sand mix constituting the surface. Rocks can be seen at random intervals half-buried in the gravel and concrete cubes have been place at regular intervals in a straight line. These two sets of objects can be interpreted as references to the history of the Wellington foreshore, and how it transitioned from its original natural state to a constructed entity covered with wharfs, roads and buildings. Stark contrasts are evident between the straight-line design and 90-degree angles that are perhaps rather too prevalent at the park, although there are exceptions, such as concrete benches with a

diagonal undercut sloping inwards, which makes them more comfortable by providing more space for leg and foot movement.

It should be mentioned that not all of the Waitangi project is oriented towards wetlands. Along with "rain gardens" (Waitangi Park Introduction, n.d.) which channel stormwater and runoff from adjacent streets and parking lots, there are also "dry gardens" (Ibid), containing non-wetland plant species from the Wellington area. The most common types of vegetation at Waitangi Park are various native grasses, sedges and rushes. One such grass that has no common name, either in Maori or English, [bolboschoenus fluviatilis] (Waitangi Park Vegetation list, n.d.) constitutes the plant that covers the greatest area of the park's vegetated sections, occupying long sections of surface water. This wetland grass forms tubers under the water, which greatly contribute to contaminant removal (NZ Plant Conservation Network, n.d.). On one walkway, this bright green grass forms a dense strip of long leaves waving in the wind, the whole surface undulating in constantly-changing patterns. The grass grows right up to the low concrete barrier, and the action of the wind blowing around and over it effectively blurs the boundary between its constructed confinement and its natural freedom of movement. The other side of the walkway contains subsurface water and is planted with primarily flax and mingimingi [swamp coprosma] (Swamp coprosma, n.d.). The former was of economic importance for Maori culture, as it was extensively use for clothing and basketry. Elsewhere in Waitangi Park, endangered species have been planted, such as coastal sedge, or pingao, which effectively binds sand, which helps to stabilise dunes (The Native Plant Centre, n.d.). These are just two examples of how cultural and ecological elements are incorporated into the park design.

The termination of the linear wetlands of Waitangi Park are located at the edge of Lambton Harbour, consisting of two areas where water discharges into the sea, by means of two different outlets. One is simply a pipe protruding from the wetland construction, which I considered to be very ineffective, as water simply runs out of what is clearly a man-made object in an ordinary manner. However, the other outlet is at the edge of a concrete wall, consisting of a slit several meters long, from which a thin, continuous sheet of water issues, which immediately sprays in different directions, due to the blustery wind. This produces a rather dramatic effect that would play havoc with the digital water curtains of the Water Pavilion, but nevertheless is appropriate for a city well-known for its windy conditions.

fig.22a, b, c. Two outlets of Waitangi Park.

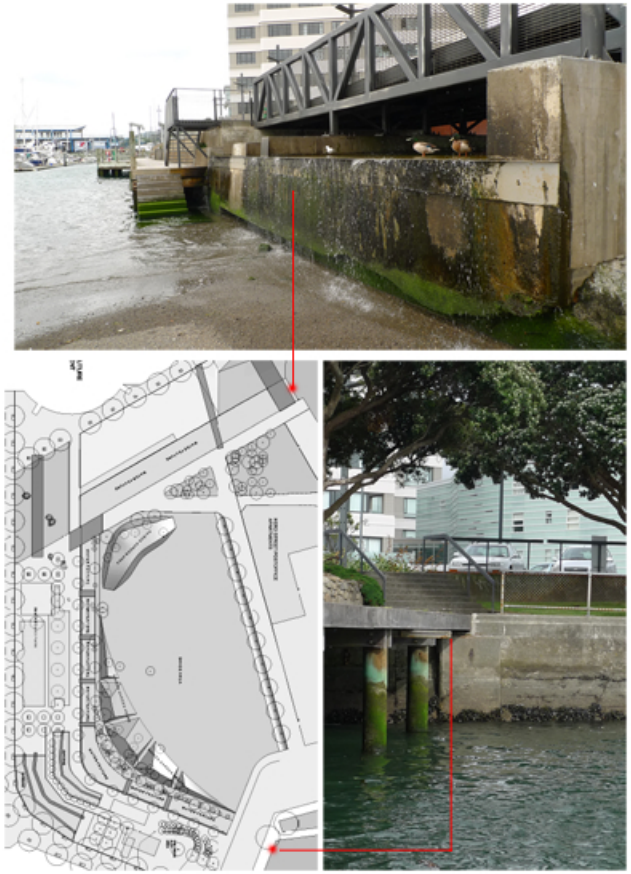




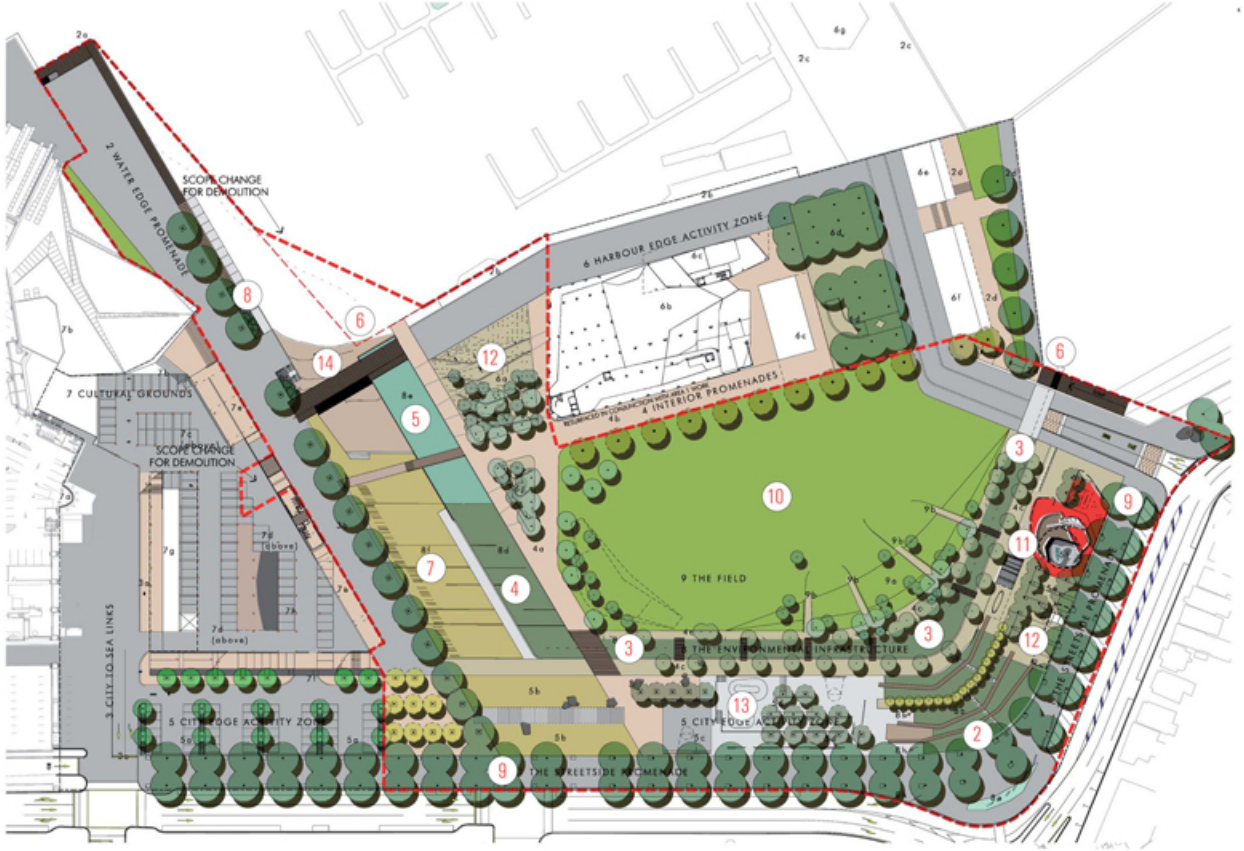








fig.23a, b, c, d, e. Photographs of Waitangi Park.




KEY

| | |
|---|---|
| 1 | Stormwater Collection (Offsite) |
| 2 | Sub-surface wetland |
| 3 | The Stream |
| 4 | Polishing wetland |
| 5 | Storage pond |
| 6 | Stream discharge point |
| 7 | Rocky coast garden |
| 8 | Graving Dock |
| 9 | Street-side promenade |
| 10 | The field |
| 11 | Children's Playground |
| 12 | Petanque Court |
| 13 | Skatepark |
| 14 | Canoe Landing Beach |

fig.24. Master plan of Waitangi Park.



fig.25a, b, c, d, e. Photographs of Waitangi Park.

# QUEEN'S WHARF WETLAND PARK

My project attempts to contribute to the eventual rectification of the disconnection of Queen Street from the harbour, by introducing an innovative structure that provides a link between the city and the sea. This link will provide new sight-lines oriented both toward the land and the water, primarily due to the mediation provided by the constructed wetlands. A whole panorama of surface-play will be opened up with the interface between the city, the Ferry Building, wetlands area and the sea, which will be evident in the changing perspectives at different times of the day and night. The surfaces of the wetlands that evoke the original natural environment of the waterfront area contrast with the glass, steel and concrete of the city that reflect light to and from Queen's Wharf. Reading the city in relation to the waterfront, and vice versa, will now be possible for the first time in a hundred years.

The benefits of the existence of a wetland area in downtown Auckland are many. The implications of constructed, or better said, reconstructed Horotiu wetlands has considerable symbolic value for the historical record of former Maori occupation of the area and subsequent efforts of the colonial settlers to improve the quality of their lives. A constructed wetland also has considerable educational value, in that it illustrates how wetlands function, as well as how polluted water can be purified by natural methods. The practical aspect of previously unusable water irrigating vegetation in a public park should also be taken into consideration. Additionally, the restorative value for wildlife, especially birds, should be mentioned. The recreational benefits of a wetland area cannot be overestimated. Downtown Auckland has few areas where the public can walk and rest in a natural environment and there is nowhere where people can enjoy a swim surrounded by native vegetation. Finally, the aesthetic aspect of the wetland should be emphasised, due to the unusual juxtaposition of skyscrapers with a native New Zealand ecosystem. Visitors to the area can choose to focus on the beauty of the vegetation, the design of the channels, pathways and swimming pools, or the views of the city and harbour that the park affords.

The entirety of Queen's Wharf will be occupied by a wetland. It will be fed by a huge holding tank under Quay Street, which will receive stormwater from the water catchment area that is presently discharged into the harbour via five




fig.26. Photograph of Queen's Wharf and the stormwater outlets.














fig.27a, b, c, d, e, f. Photographs of Queen's Wharf.

outlets located at the bottom of Albert Street (fig.26).The process followed will be quite similar to that of Waitangi Park; in other words the The process followed will be quite similar to that of Waitangi Park; in other words the linear system with different stages of treatment. The stormwater will be pumped into an oil/dirt separator located under the ferry building, after which water will enter the wetland via a channel having a hair-pin design that will run the whole length of the wharf. Ultra-violet disinfection, a cheap and extremely effective practice (Wong, n.d.: 9), will be carried out by means of an underwater U.V. lamp located in a small area unobstructed by filtering materials.

The subsurface section consists of water flow through porous material, such as gravel and aggregate, in which different types of vegetation will be planted. It is designed to allow sedimentation, fine filtration and nutrient uptake, all of which contribute in the removal of pollutants from the water. As to the actual vegetation planted, a variety of plants will be used, all proven to have "ecological acceptability", according to studies carried out in New Zealand wetlands fed by wastewater (Tanner 1995: 60). Several types of bulrush, reeds and sedge will be planted, all of which are tolerant of local climate, pollutants and waterlogged conditions. They propagate readily and have a "high pollutant removal capacity" (Ibid). As well as the underwater plant surface area, they also exhibit a variety of above-growth, which is significant for the aesthetic values of the wetlands area. In other words, these plants are "emergent macrophytes" [visible to the naked eye] (Vymazal 2010: 531). Despite the abundance of vegetation in the park, high-rise buildings maintain connectivity to the urban context, unlike the situation at Waiatarua. In this manner, visitors can choose different sightlines to explore.

In addition to the exclusively hydrophytic species (inhabiting water), other plants such as flax will also be planted. Unlike Waitangi Park, which contains some deciduous trees to provide more light in winter (Waitangi Park Introduction. n.d.), the species at Queen's Wharf will all be natives, in order to help evoke the ambience of the pre-colonial Horotiu Creek. The vegetation will undoubtedly attract insects and birdlife, completing the characteristics of a healthy wetland area. In this way, the system becomes a place of discovery, as well as a production site (Izembart and Le Boudec 2008: 17). However, at the present time Queen's Wharf would still be just a featureless paved structure if it were not for the presence of two huge storage sheds that are in the process of being demolished. It has been said that "every city now wants to reclaim its waterfront" (Weiss 2008: 14), and Auckland is no exception. The problem is that city waterfronts are clogged with infrastructure, such as port facilities, train lines, highways and industrial installations. This is because "cities were built from the inside out, while trade grew from the outside in" (Ibid). The question is how that relationship can be inverted. Unlike the city of Wellington (and to a lesser degree, New Plymouth), which has a magnificent waterfront with cultural facilities, historical relics, recreational areas, and above all, ample public space, the waterfront of Auckland from has long been privatised and shielded access by the general public. Decisions concerning the politics and financing in regard to developing this area have been slow in coming, but the situation is gradually changing. The next section details some of the forces that are at play in bringing about the transformation of this important part of the city.

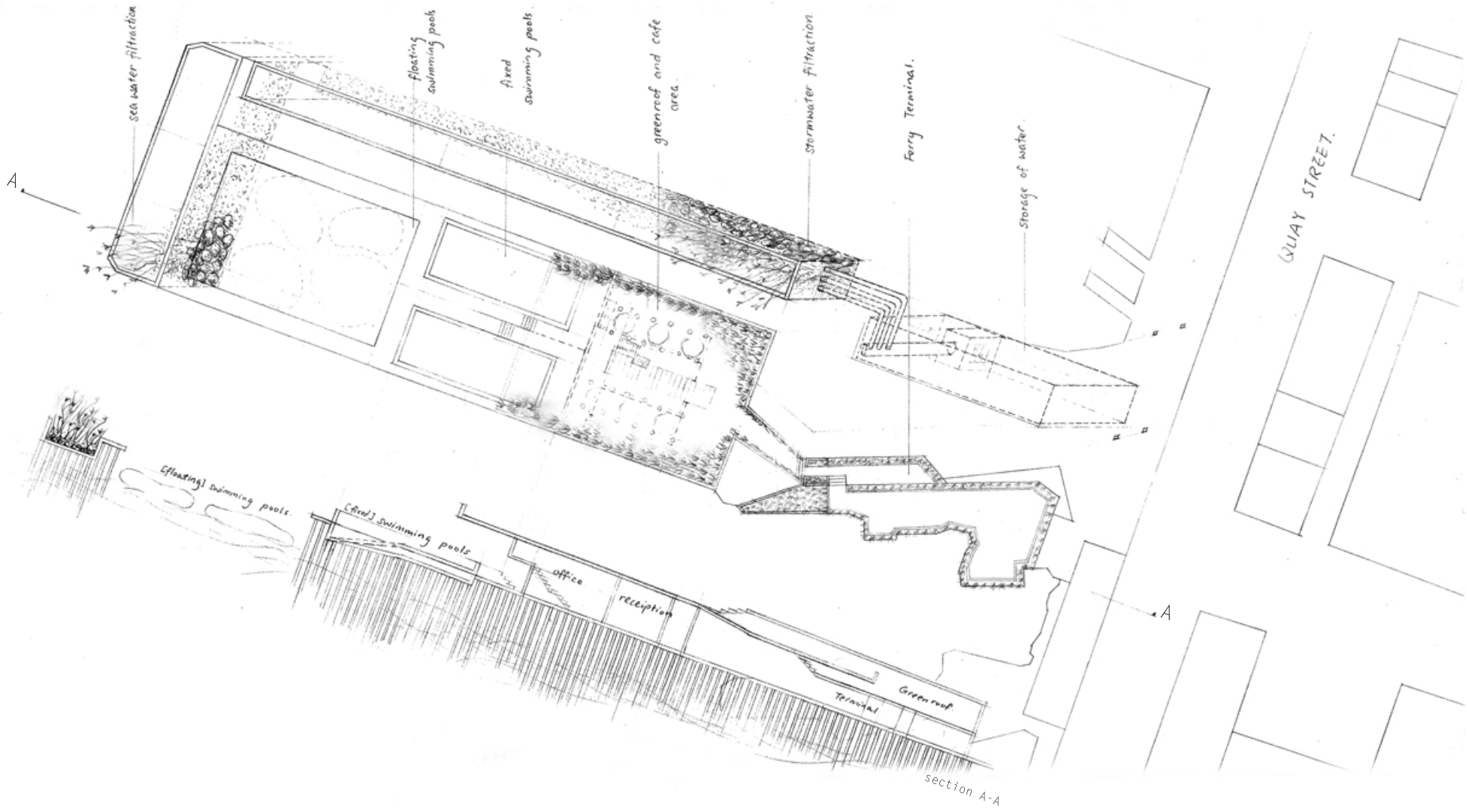



fig.28. Conceptual plan and section drawing.

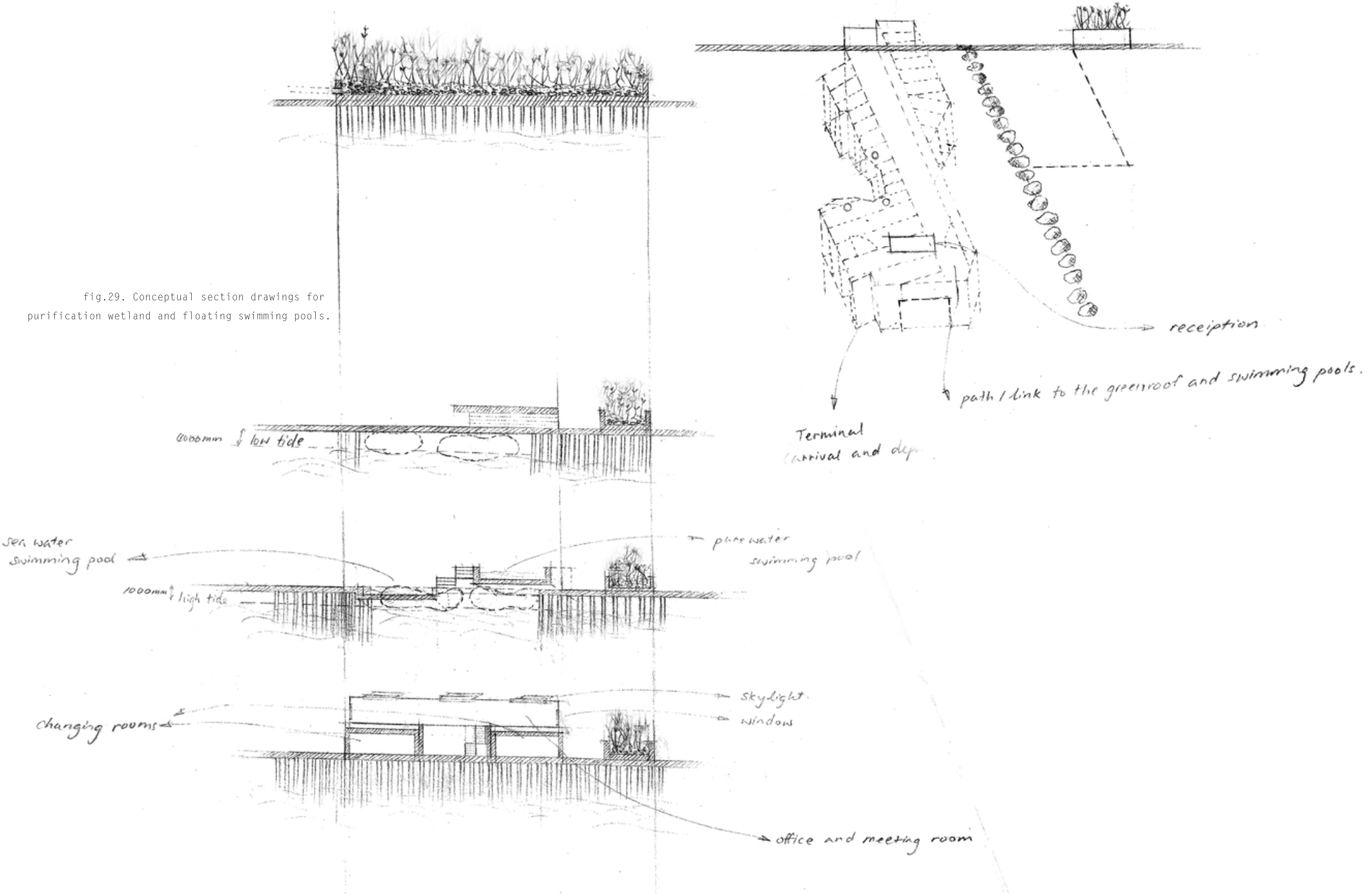
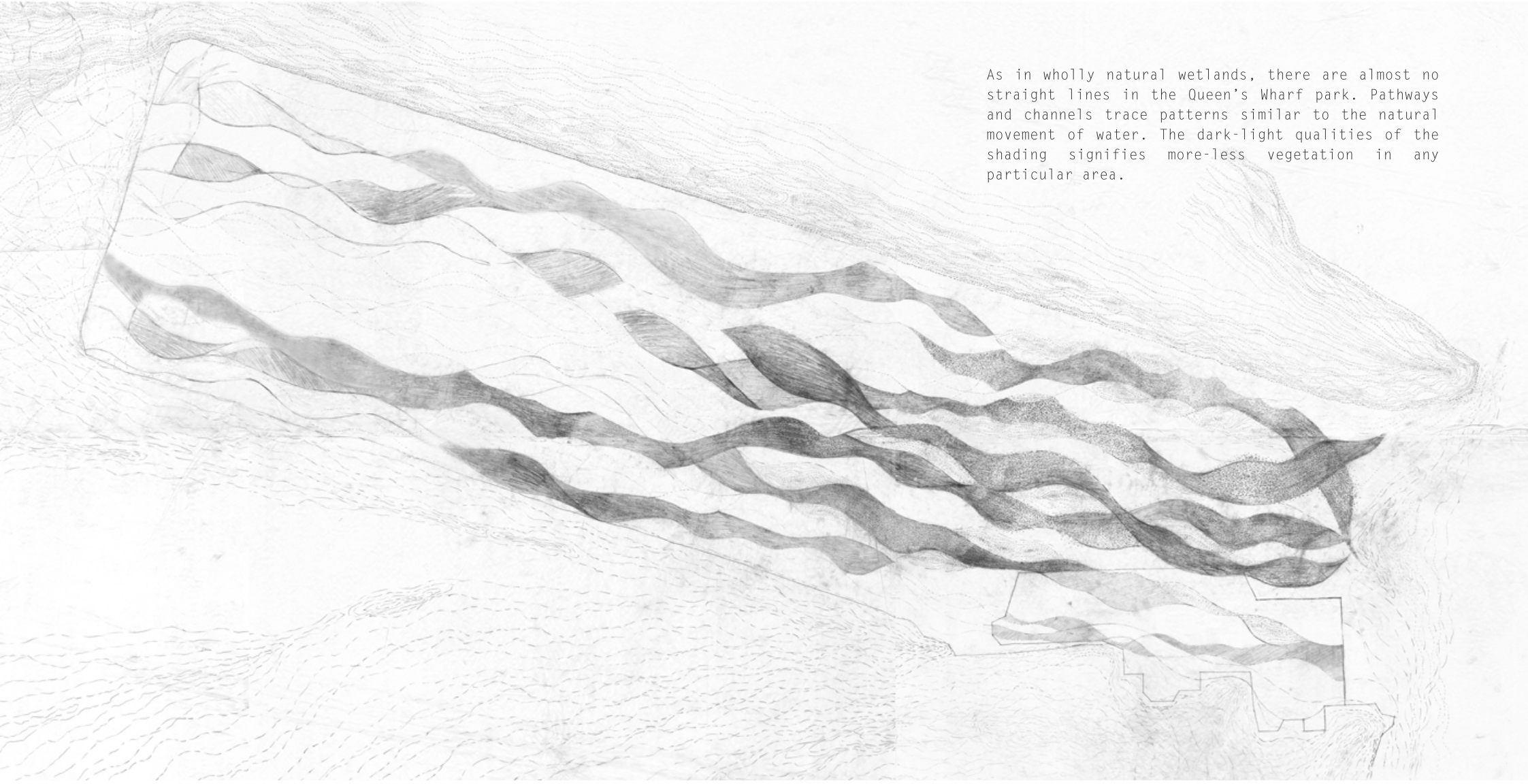



fig.29. Conceptual section drawings for purification wetland and floating swimming pools.



As in wholly natural wetlands, there are almost no straight lines in the Queen's Wharf park. Pathways and channels trace patterns similar to the natural movement of water. The dark-light qualities of the shading signifies more-less vegetation in any particular area.

fig.30. Developed conceptual drawing for purification wetland design.



This three-dimensional conceptual model highlights sloping pathways and vegetated areas with a layering of surfaces that must be viewed from different angles in order to appreciate their diversity.



fig.31a, b. developing model with zeta paper.



fig.32. developing model with cardboard.

Upon changing the material to cardboard, a model emerges, demonstrating sloping pathways and planted areas that would be more feasible in reality. Unlike paper, carboard has no transparency and so the interplay of light is less than when using paper. As light is one of the important elements of my project, I needed to experiment with different types and thicknesses of materials to test degrees of transparency and opacity, in order to be able to select the most appropriate materials for my final design.

# POTENTIAL OF WATERFRONT

Development of the waterfront in Auckland's central business district has long been an important topic of public interest reflected in the lively discussion generated by proposals put forth by the Auckland City and Regional Councils. Along with the Viaduct Harbour project, stimulated by New Zealand hosting the America's Cup in 1995, and followed by extensive plans for the nearby Wynyard Quarter (Auckland's CBD Waterfront, 2010), the area that has attracted the most attention in recent years has been Queen's Wharf. As part of the festivities surrounding the Rugby World Cup, which will be held in New Zealand in 2011, it was proposed that the wharf could serve as 'Party Central' and media centre during the rugby matches. Not without controversy, several proposals were put forward before it was finally decided that a temporary structure made of glass and steel would replace the two non-descript shabby sheds that have stood on the wharf for almost one hundred years (The Government has revealed its plan for the Rugby World Cup party central at Queen's Wharf, 2010). On the Sunday following the official announcement of this decision, the area was opened to the public and among thousands of others I was able to pass through the gates of Queen's Wharf and walk to the end of Queen Street's original trajectory. From there, it was possible to look back at the city and straight up Queen Street, something ordinary citizens have not been able to do in many decades. The following section will provide a graphic description of a very different kind of walk on the wharf, one that entails intimate contact with a healthy, functioning wetland.


a



b


c


d

fig.33a, b, c, d. Auckland Waterfront developments, real and imaginary

# THE NARRATED TOUR OF THE WETLAND PARK

When you approach Queen's Wharf from Quay Street, you will notice that the entire width of the structure is open. This entrance stretching onto the wharf is paved with stone and also has gravel areas, with some areas of low vegetation. In front of you is a large structure incorporating tall with wave-like features structure with polarised glass walls and wooden poles supporting the roof. Upon entering via any one of a number of entrances you can note a large glass section of the floor in the centre. Here you can see stormwater flowing on its way to the entrance of the wetland. On the left side you can buy ferry tickets at the counter, behind which are three exits leading to the three terminals. On the right side is an information centre with low screens covered with visual images and text, as well as computer stations, where relevant information on the history, ecology and technology surrounding the project can be accessed and videos can be viewed.

The entrance to the wetland is directly in front of you. A wooden pathway takes you outside and in the foreground you notice an elevated walkway stretching over the path, as well as a large area of the wetland. As you advance, you notice that other pathways branch off and you realize that none of the paths are laid out in straight lines. Rather, they all gently curve in different trajectories. On either side of the pathways there are extensive areas of gravel with large rocks placed randomly and areas with flax, bulrushes and other low vegetation. Wooden benches can be seen at regular intervals. When you look over to the sides of the wharf, you notice a barrier constructed of wooden palings, in front of which is a continuous line of varied vegetation. Parts of the pathway have areas with slats instead of joined wood, from which sounds of the sea below emerge. Approximately halfway down the wetland, you notice a pathway sloping downwards and you take a detour to see where it goes. After a short distance, you pass a gate and realize you have reached below ground level. As you walk you can see that sections are made of glass, through which you are obtaining a vertical perspective of the subsurface wetland. When you reach a point where you are able to exit this underground passage or continue, you decide to leave and once more continue your walk in the light of day.

Suddenly you hear the sounds of children splashing and laughing, and realize that you are approaching a swimming pool. It is surrounded by a paling barrier with a solid gate that you suppose will be kept locked at night. Looking inside, you admire the pool design and notice changing facilities partially hidden by bushes.

Before you reach the end of the wharf, you will have seen several other elevated walkways, from which people are enjoying a wider panorama of the wetland, the city and the harbour. After looking out across the sea, you turn left on the curving pathway and head back toward the city. You have been informed that the purification channel has a hair-pin configuration and as you continue walking you begin to see water on the surface and thicker vegetation. It is then that you realize that the wetland is divided down the middle with a very slight downward slope on the right side continuing downward on the left side, which assures the gradual movement of the water. This is not visually evident, due to wooden beams laid on the ground in different patterns which border vegetated areas. At this moment, it occurs to you that you are actually in two spaces simultaneously. You are both on Queen Street and on the Horotiu Creek bed. In other words, you are both on an extension of Auckland's main thoroughfare and in a wetlands area. Your urban wetlands excursion is almost over as you approach the ferry terminal, with people waiting there to travel across the harbour to Devonport and others arriving from Waiheke Island. Crossing through the ticket office, you are soon back on Quay Street.

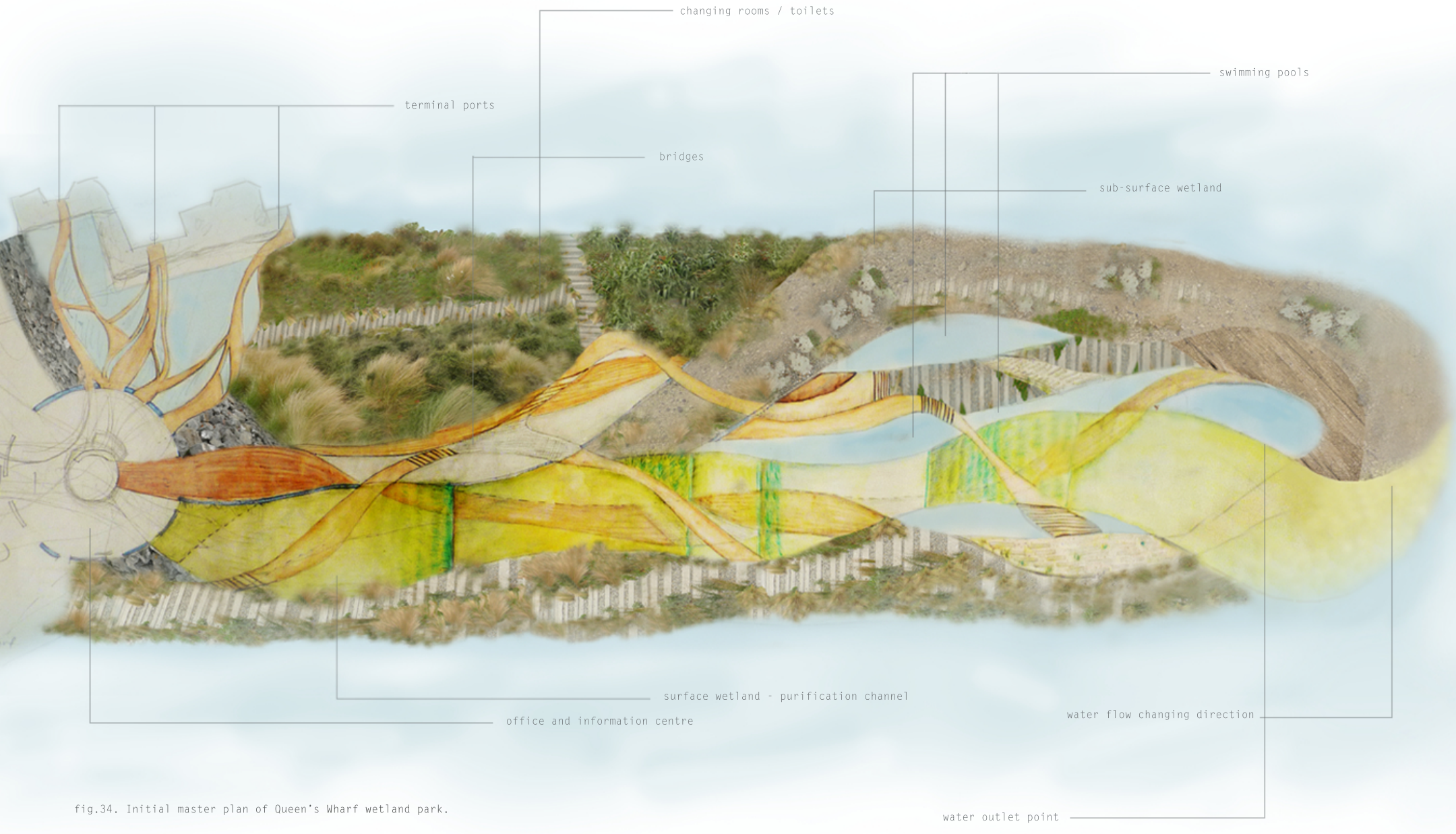



fig.34. Initial master plan of Queen's Wharf wetland park.

# FINAL THOUGHTS ON SURFACE

In regard to the ordinary person's manner of speaking, Stroll has posed the question of whether a certain "folk physics" (Stroll 1988: 10) is in operation in order to describe the world. He notes that "surface" belongs to "the geometry of speech" (Ibid: 11), along with other words such as cube, side, top, corner, centre, verge, boundary, among others. The writer considers that the ordinary, commonsense notion of a surface, is "pre-technical or non-technical" (Ibid: 11). In modern life, these can be at odds with mathematical and scientific concepts, because in ordinary speech there are many different and even incompatible opinions of the nature of surfaces, "each one internally coherent" (Ibid: 13), as in the case of "abstract entity versus physical entity" (Ibid: 13).

It would be hard to argue that not everything has a surface. As examples, Stroll mentions lightning, rainbows and shadows (Ibid: 32). However, in regard to water, I do not agree with the philosopher that it is impossible to entertain "surface-talk" about water gushing out of a hydrant. I believe it is technically feasible to digitalize the image of a split-second of such an event, from which a three dimensional model could be constructed, which includes every gush and droplet that can be seen; such a model would obviously exhibit a surface. As water has mass, it cannot be placed in the same category as effects of lighting involving electricity and blocking the passage of direct light sources.

In the Queen's Wharf Wetland there are two types of water: surface and subsurface. Obviously the water that we can see in the channels has a surface, but what about the subsurface water? Although it has mass, its surface is invisible, because the water level is below the ground amongst the gravel and plant roots. However, in the cross-section view behind glass afforded by the walkway below ground level, the surface of the underground water flow is exposed, and can be appreciated.

# CONCLUSIONS

The tension between natural and artificial, or constructed, phenomena is an issue that encompasses many aspects of our thinking and our lives. It has political and personal connotations and can be both intellectual and emotional in nature, including approaches that can be ecological, technological, philosophical, historical, psychological, religious, or combinations thereof. I consider that the value of my wetland project lies in the fact that it will hopefully instigate debate leading to positive changes, by raising to consciousness issues that affect the future of our planet, such as pollution and ecological sustainability.

When we consider the different components of a constructed wetland, and divide them into artificial and natural categories, we could ask the question: Is the true surface the constructed part(s) or the natural part(s)? However, this is a sterile issue, one that cannot be resolved. It is fruitless to seek rigid, absolute borders between artificial and natural features, because the boundaries between them are indeterminate. Blurred features cannot be disambiguated and neither should we want them to be, as “grey areas,” for which categorical thinking has no patience, are often more germane to the topic at hand than the “black and white” issues.

In my exploration of the interface between architecture and ecology, I have completed a circle that achieves a balance in the environment of the Auckland waterfront. Into the blurred boundary between the Horotiu Creek and the Waitemata Harbour, capitalist development introduced a hard edge between land and sea, in the form of landfill and wharfs. My project provides the possibility for dialogue around a situation where nature and technology can peacefully coexist.

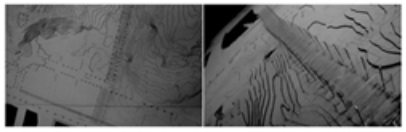
# EXHIBITION



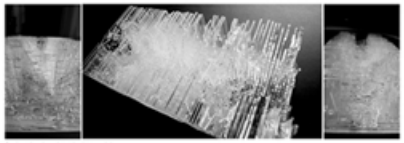
images of sectioning Queen Street I



images of sectioning Queen Street II

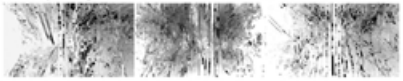


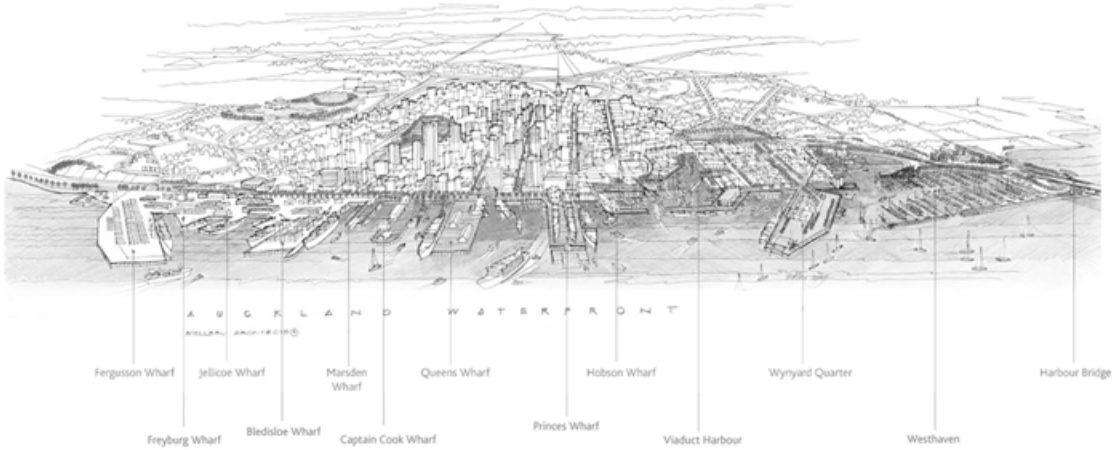
SUPERIMPOSE two-dimensional sectioning images onto a three-dimensional site model

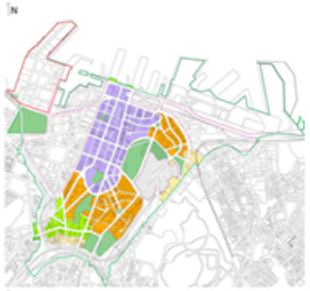


further developed sectioning model









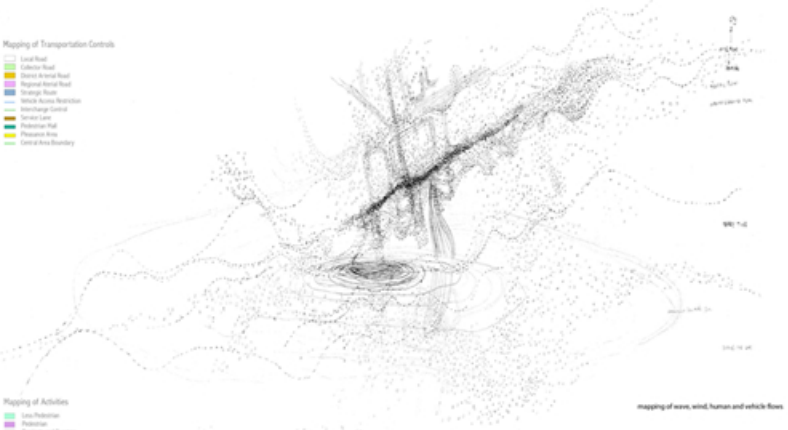

modly model - effect after one week






modly model - effect after two weeks



mapping of wave, wind, human and vehicle flows

## SOLO PARK



The name says it all. Silo Park, at the western edge of Jellicoe Street, features the retained 35 metre Golden Bay cement silo and 'six-pack' in recognition of the area's industrial heritage. Bookmarked by the marine sector's superyacht berth and fit-out facility, Silo Park will offer westward views of Westhaven Marina and the Auckland Harbour Bridge with cinema on summer evenings.

## NORTH WHARF



North Wharf was the first site to be developed in Wynyard Quarter with the seismic strengthening of its old sea wall. Two new building structures alongside the refurbished old Red Shed have been set back from the wharf edge to allow for a wide public promenade. Visitors will be able to enjoy a lazy stroll, sit and have a coffee and watch as fishing boats unload their catch.

## VIADUCT EVENTS CENTRE



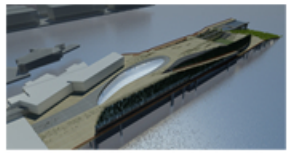
This 4000m2 exhibition, meetings and hospitality space going up on the edge of the Viaduct Harbour in Wynyard Quarter will be a standalone, multi-purpose events centre, surrounded with plenty of open space and a viewing deck. Minutes' walk from some of Auckland's best accommodation and enter tainment, the Viaduct Events Centre will host major events taking place in the waterfront including the Auckland International Boat Show, Auckland Seafood Festival and New Zealand Fashion Week.

## VOYAGER NEW ZEALAND MARITIME MUSEUM

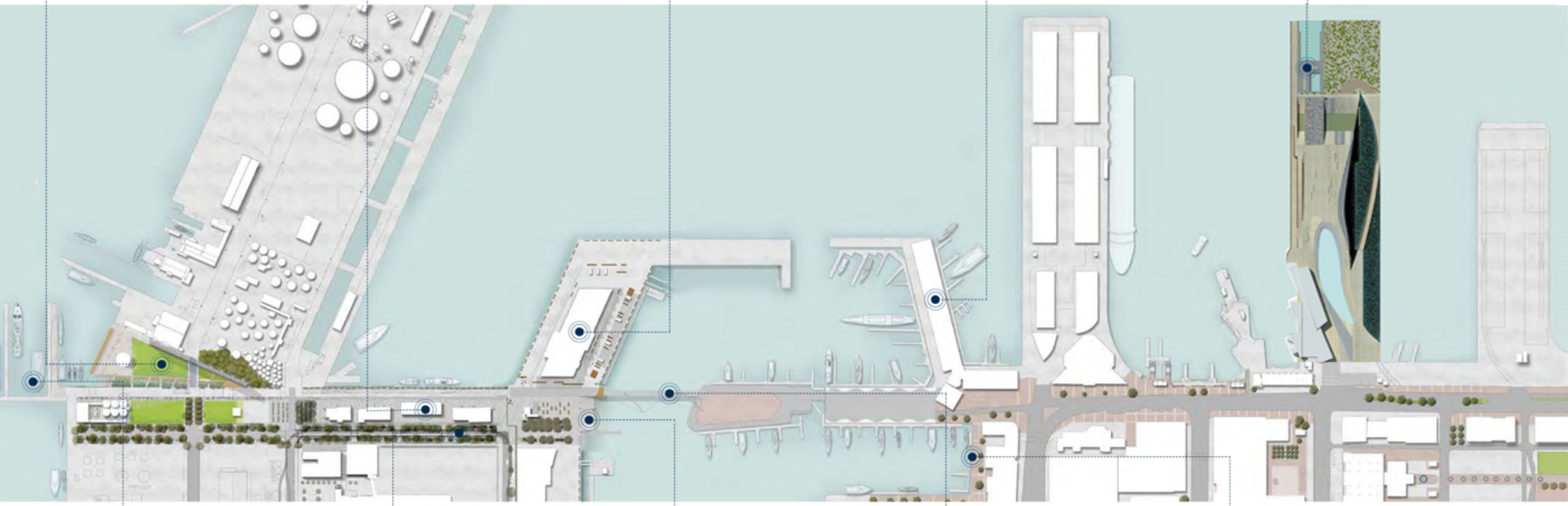


Run by the NZ National Maritime Trust Board, the Voyager New Zealand Maritime Museum focuses on the seafaring voyages of exploration and discover y that have helped to create our nation. Visitors can retrace the steps of the first human settlers to sail to New Zealand, char ter one of three heritage vessels and see 'Blue Water Black Magic', a permanent tribute to Sir Peter Blake. www.maritimemuseum.co.nz

## URBAN WETLAND



Urban Wetland is a design-led research project that explores the dynamic exchange system between the city and the sea. It proposes a redevelop- ment of the Queen's Wharf in Auckland that includes a wetland park which includes a water purifying system and a series of public swimming pools, alongside the existing ferry service.



## SUPERYACHT BERTHS AND MARINE SITE

Three new 90 metre superyacht ber ths will supplement a new 1.6 hectare marine industry re-fit site on the western edge. This development will significantly expand the existing marine precinct and is forecast to increase annual industry earnings by millions of dollars.



## JELLICOE PLAZA

Directly adjacent to North Wharf will be the tree-lined Jellicoe boulevard leading west to Jellicoe Plaza at the intersection of Daldy Street. This grassed public space will accommodate Michio Ihara's Wind Tree Sculpture and will become a great place for foodies.



## GATEWA PLAZA

This large public plaza will feature seating, ar t and steps down to the water's edge. Gateway Plaza is the western landing point for Wynyard Crossing, connecting the eastern waterfront with Wynyard Quarter.



## WYNYARD CROSSING

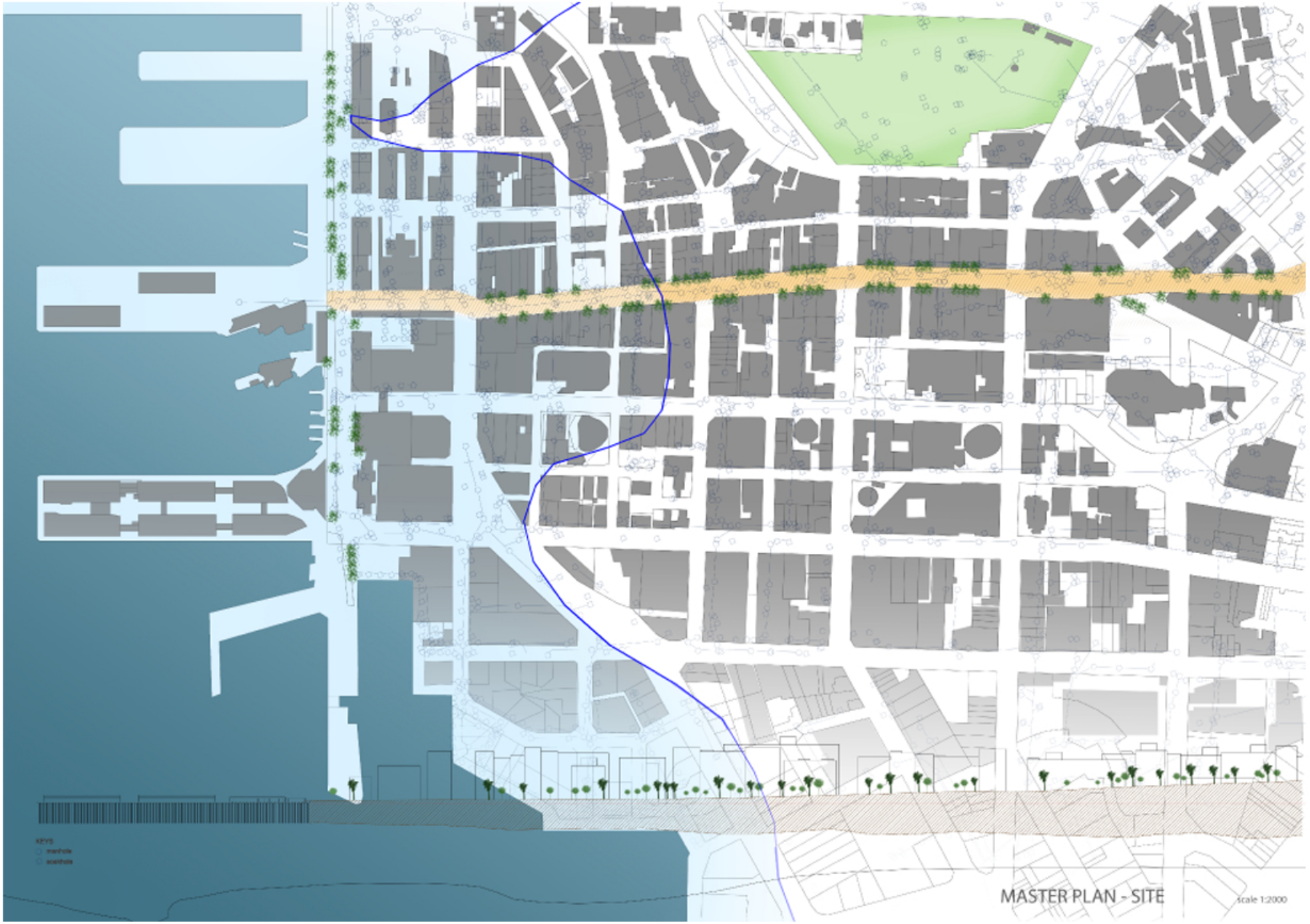
The Wynyard Crossing is an interim pedestrian and cycling bridge, due to be completed by mid-2011. The bridge will link the Eastern Viaduct (Te Wero Island) with Gateway Plaza, Jellicoe Street, the Viaduct Events Centre and Nor th Wharf within Wynyard Quar ter.

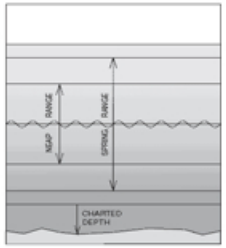


## VIADUCT HARBOUR

Viaduct Harbour is home for more than 20 bars and restaurants with which to dine and relax on the water's edge. A first-class residential, commercial and entertainment precinct, Viaduct Harbour accommodates 150 marina berths hosting commercial vessels, pleasure craft and superyachts. The area hosts many fabulous events including the past America's Cup defences, Louis Vuitton Regattas and Volvo Round the World Race stopover March 2012. www.viaduct.co.nz




KEYS
manhole
scenhole
MASTER PLAN - SITE
scale 1:2000

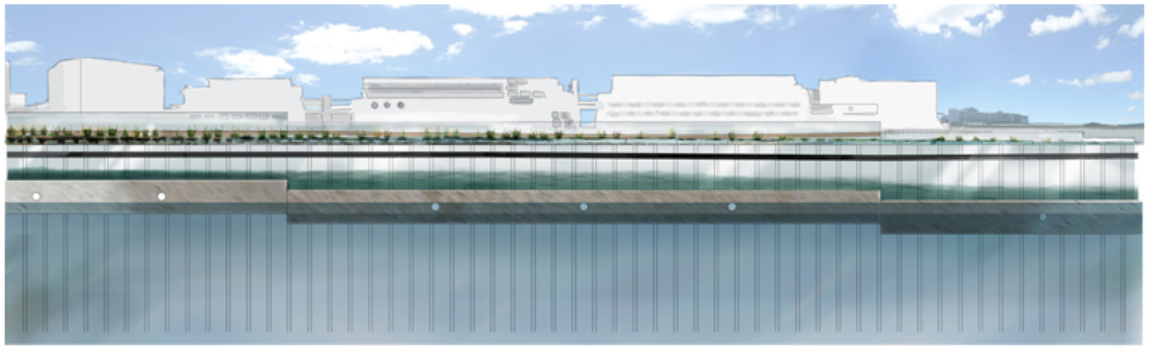



Highest Astronomical Tide (HAT)
Mean High Water Springs (MHWS)
Mean High Water Neaps (MHWN)
Mean Sea Level (MSL)
Mean Low Water Neap (MLWN)
Mean Low Water Springs (MLWS)
Lowest Astronomical Tide (LAT)
Chart Datum (CD)

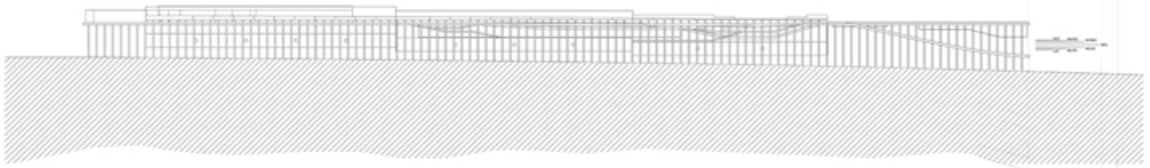
Terms and Definitions

MSL
The average level of the sea surface over a long period or the average level which would exist in the absence of tides.

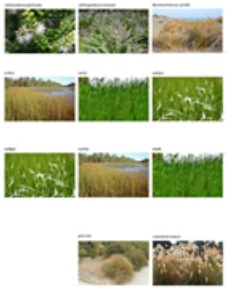
MHWS and MLWS
The average of the levels of each pair of successive high waters, and of each pair of successive low waters, during that period of about 24 hours in each semi-lunation (approximately every 14 days), when the range of the tide is greatest (Spring Range).

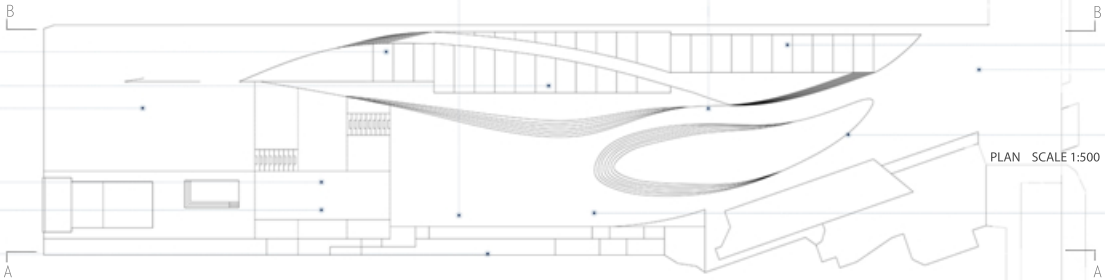


DETAIL SECTION A-A SCALE 1:200



NORTH WEST ELEVATION SCALE 1:500





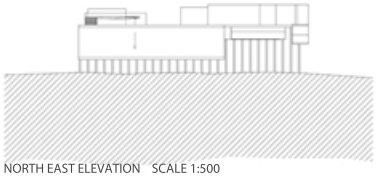

PLAN SCALE 1:500

MHWN and MLWN
The average of the levels of each pair of successive high waters, and of each pair of successive low waters, during that period of about 24 hours in each semi-lunation (approximately every 14 days), when the range of the tide is least (Neap Range).

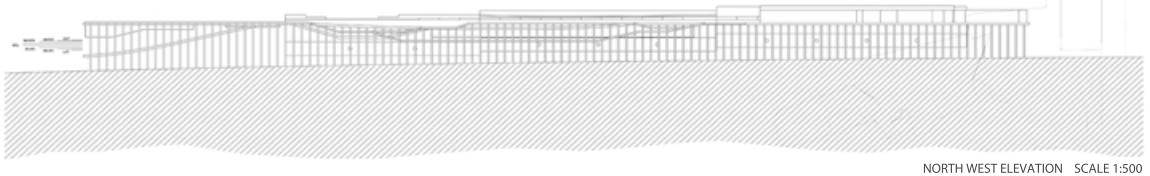
HAT and LAT
The highest and lowest tidal levels which can be predicted to occur under average meteorological conditions over 18 years. Modern chart datums are set at the approximate level of Lowest Astronomical Tide (LAT) and Tide Tables list the predicted height of tide above Chart Datum. It should be noted that water level may fall below the level of LAT if abnormal meteorological conditions are experienced.

CD
A water level so low that the tide will but seldom fall below it. When meteorological conditions are such that sea level is lowered, the tide will fall below the predicted low water heights, and at a place where Chart Datum is at a comparatively high level, the actual depths at or near low water may be considerably less than charted.





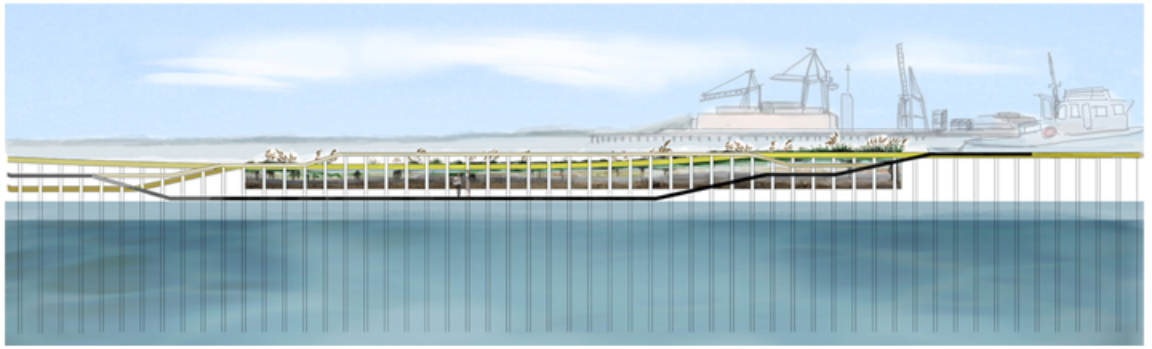
NORTH EAST ELEVATION SCALE 1:500



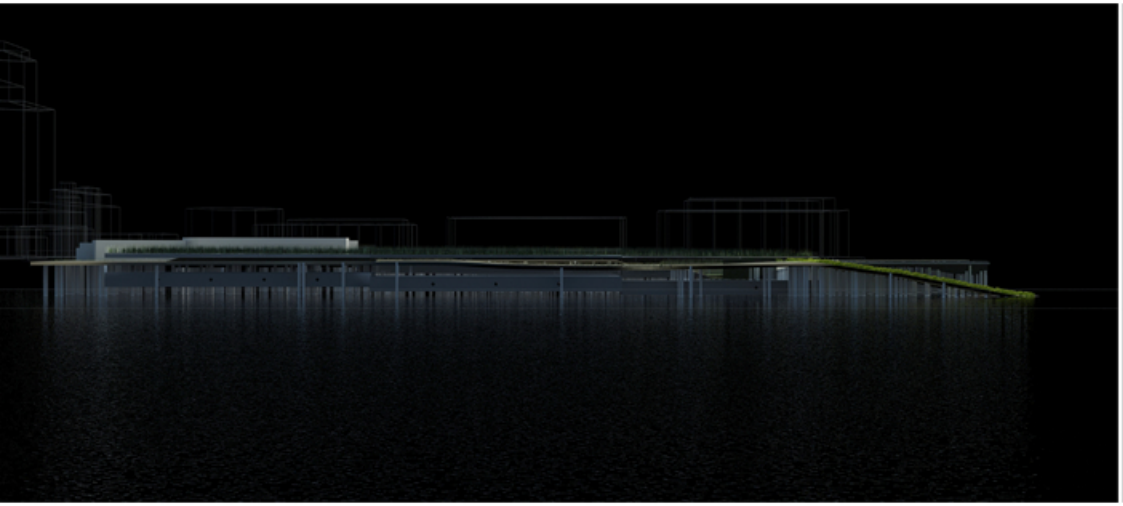
NORTH WEST ELEVATION SCALE 1:500

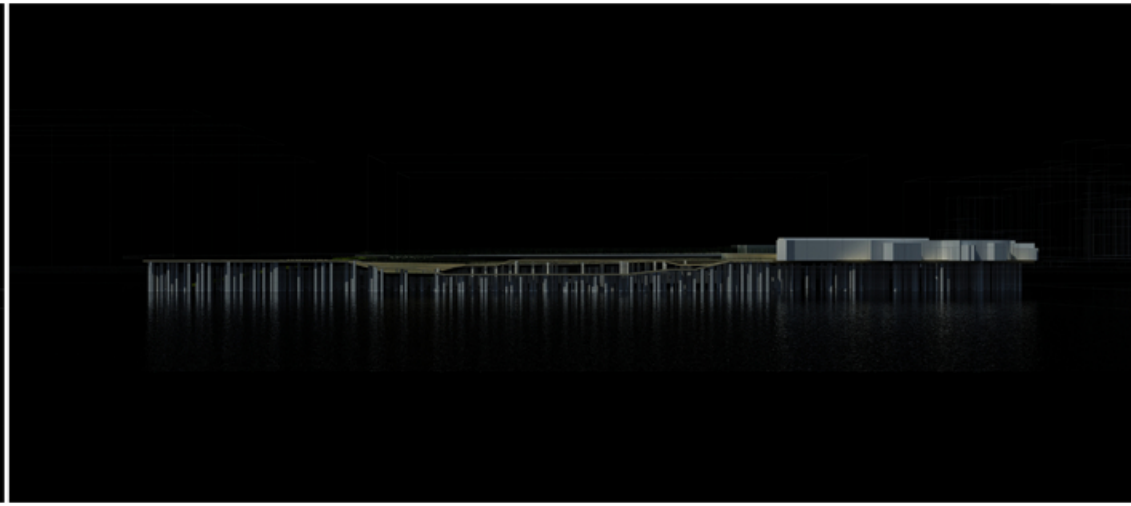


SOUTH EAST ELEVATION SCALE 1:500

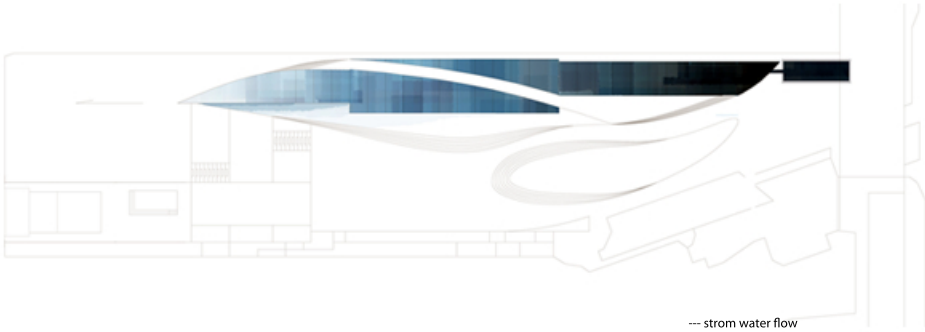


DETAIL SECTION B-B SCALE 1:200

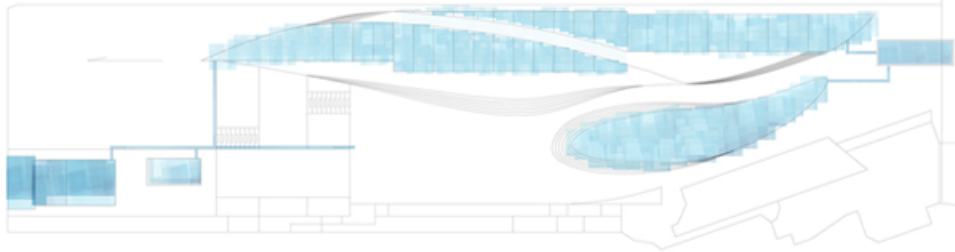




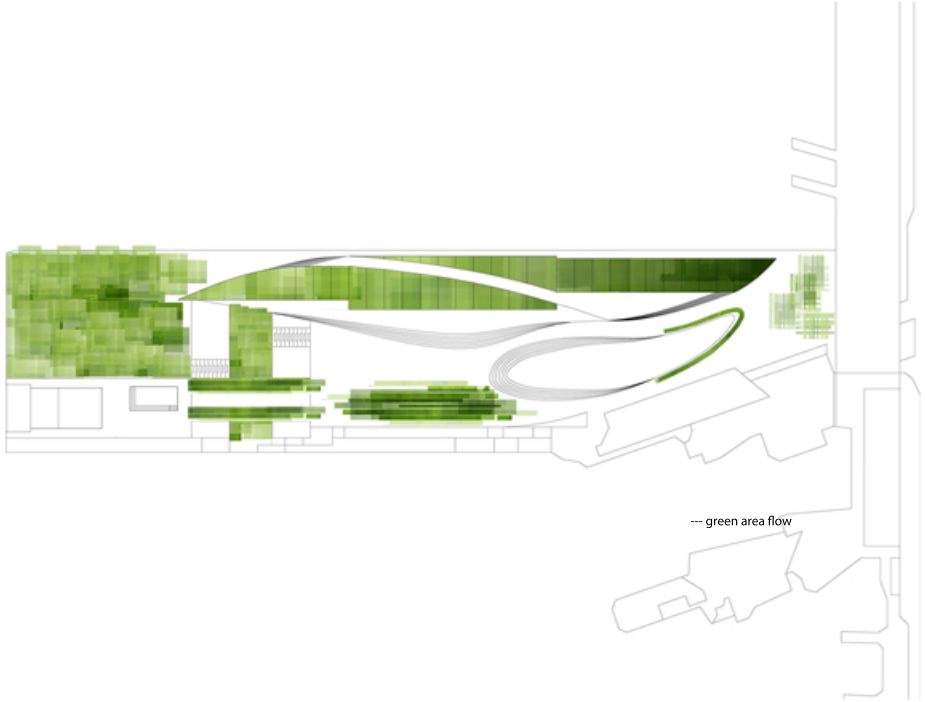
--- perspective views



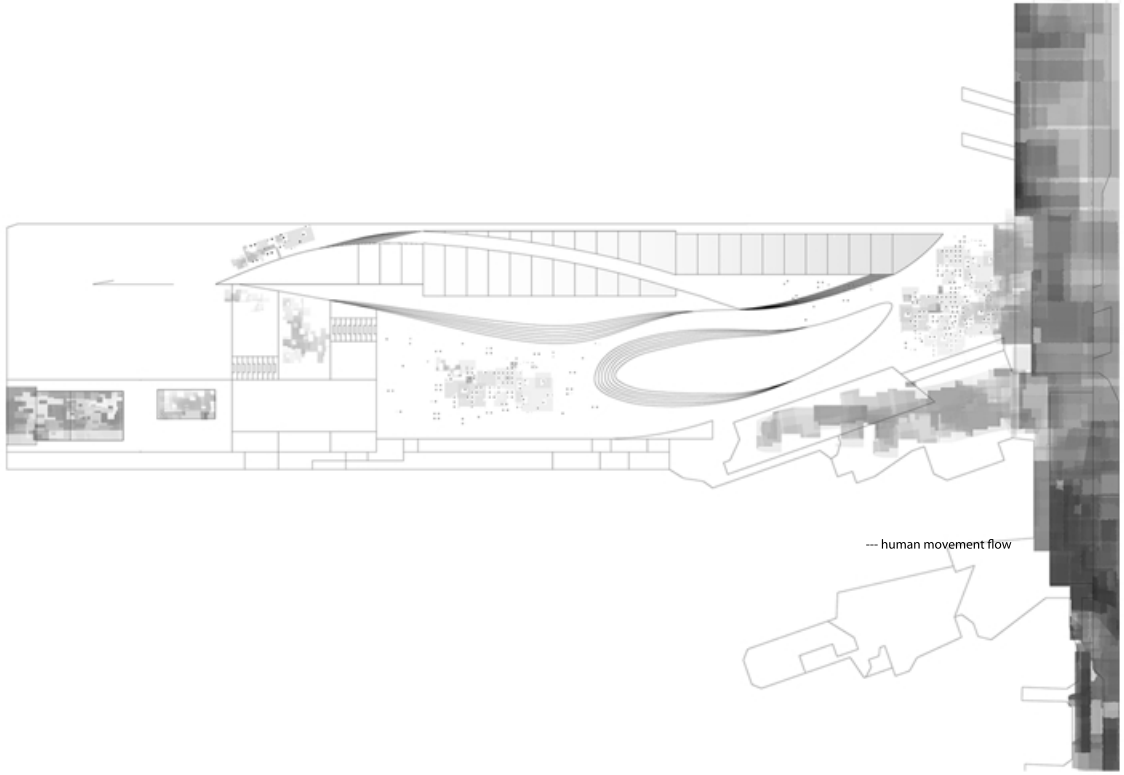
--- strom water flow



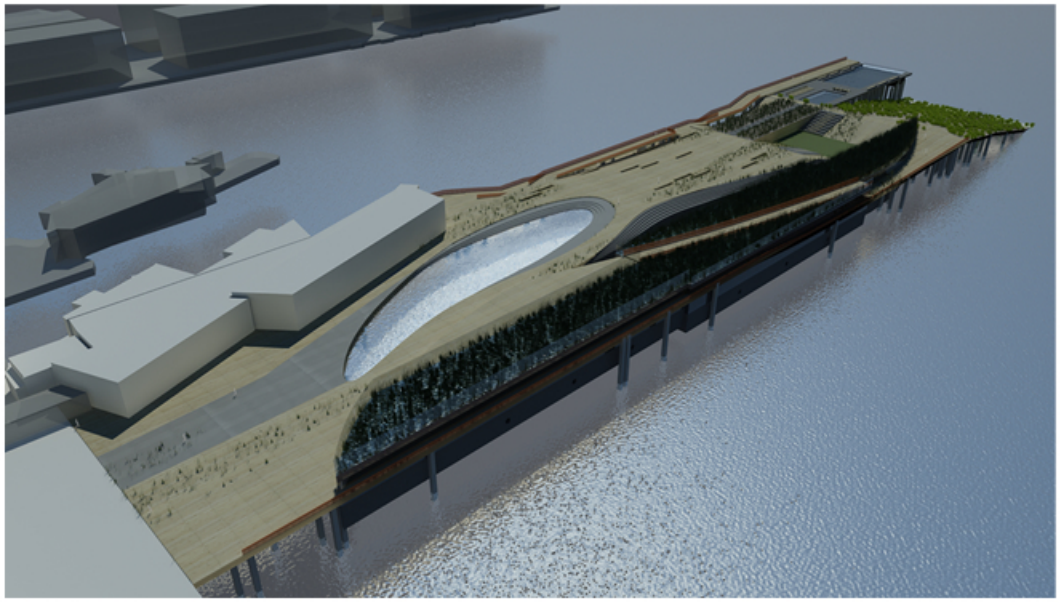
--- fresh water flow

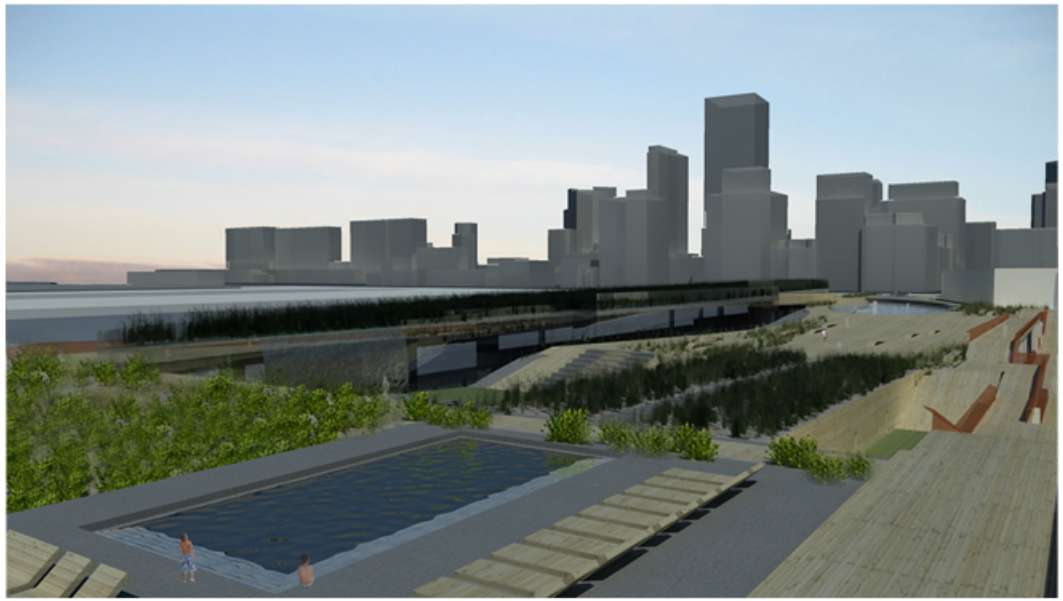


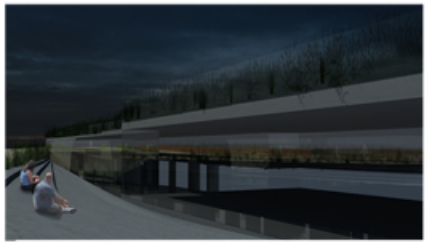
--- green area flow



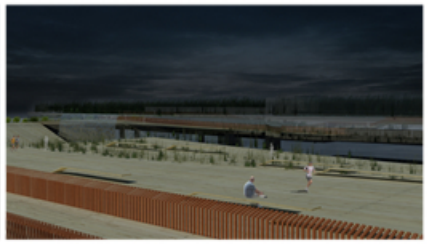
--- human movement flow

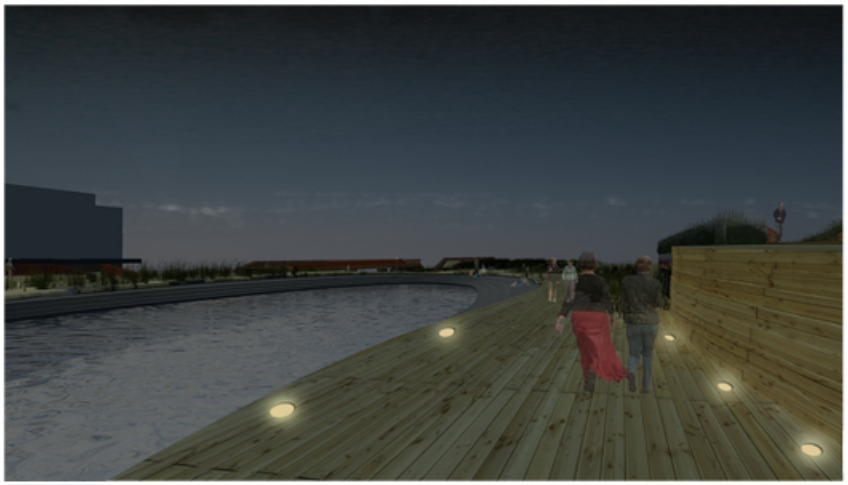


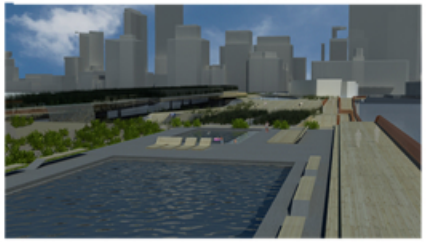


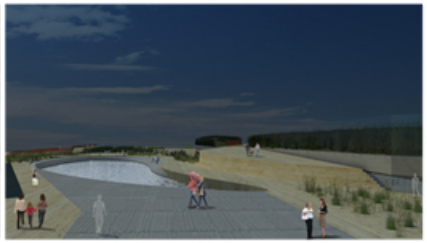


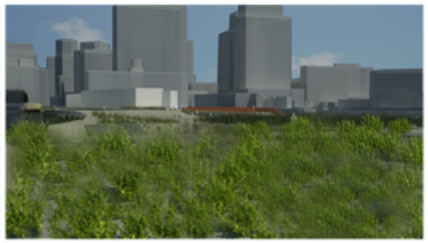


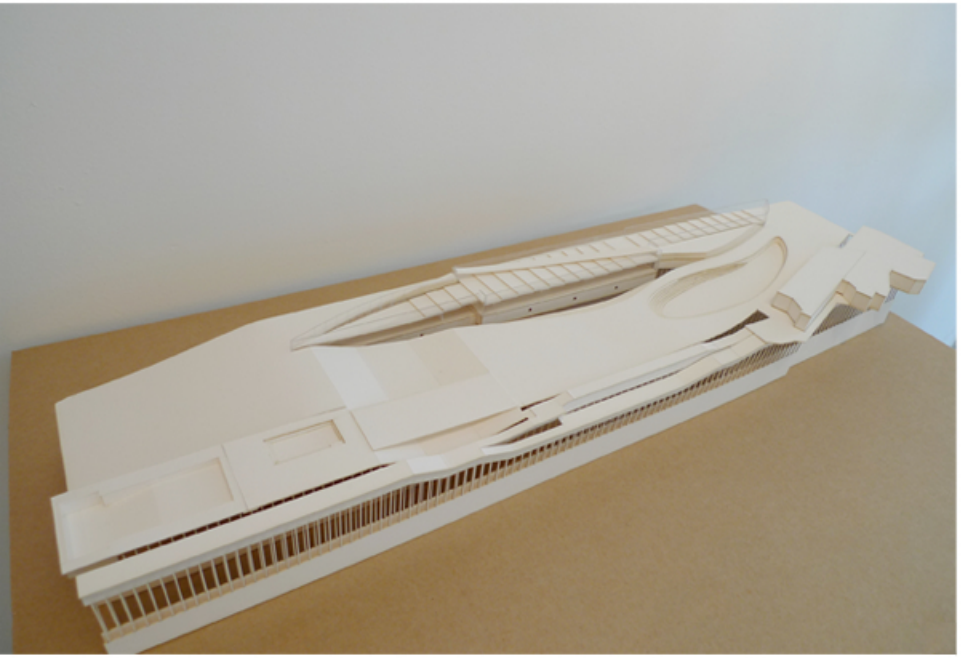















physical model of my design

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Fig.15a,b,c,d,e. Jiaying H. 2010, May. Photographic Documentation. Auckland: Property of the designer.

Fig.16a,b. Jiaying H. 2010, May. Photographic Documentation. Auckland: Property of the designer.

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Fig.27a,b.c.d,e,f. Jiaying H. 2010, November. Photographic Documentation. Auckland: Property of the designer.

Fig.28. Jiaying H. 2010, August. Conceptual Plan for Queen's Wharf. Auckland: Property of the designer.

Fig.29. Jiaying H. 2010, August. Conceptual Section drawings for wetland park. Auckland: Property of the designer.

Fig.30. Jiaying H. 2010. October. Developed conceptual drawing for purification wetland design. Auckland: Property of the designer.

Fig.31a,b. Jiaying H. 2010. November. Developing model with zeta paper. Auckland: Property of the designer.

Fig.32. Jiaying H. 2010. November. Developing model with cardboard. Auckland: Property of the designer.

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