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2016

TRANSITION

An exploration of spatial flexibility in primary schools

BY

DANIEL EDWARD JOHN CROOKS

A 120-point thesis
submitted to the Victoria University of Wellington
in partial fulfilment of the requirements for the
degree of Master of Architecture (Professional)

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TRANSITION*

[tran-zish-uh n,-sish-]

Noun

1.movement, passage, or change from one position, state, stage, subject, concept, etc., to another; change.

2.Music.

a - a passing from one key to another; modulation.

b - a brief modulation; a modulation used in passing.

c - a sudden, unprepared modulation.

**This thesis is titled TRANSITION as it looks into transitional space within learning environments. It is to be viewed as a movement or passage towards alternative future primary schools that can be used as a reference in passing from the current New Zealand Innovative Learning Environment Framework to influence the next generation of learning environments.*

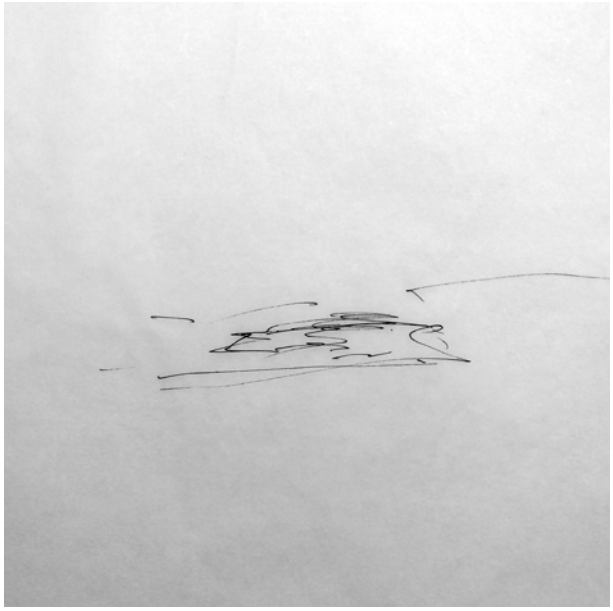
ABSTRACT

This research aims to develop a design model for a future primary school in New Zealand (NZ), which promotes flexibility and privileges the role of outdoor learning environments within a child centred approach to education. The NZ public primary school typology is undergoing a period of reform in response to current global pedagogical developments. This has lead the Ministry of Education (MOE), architects and designers to develop a 'large open plan' studio approach to current educational typology. Often creating expansive space in which educationalist must shape environments of learning through 'flexible furniture' layouts.

This thesis highlights the importance of **architectural flexibility** to the design of primary schools, as well as the importance of **external environments** for learning. It is proposed that there should be a more engaging solution between pedagogical development and future primary school contexts within NZ.

The design case study (DCS) proposes an active environment of interaction that is capable of transition to engage multiple axis of site and community connectivity. The nature of the design case study pushes away from current trends of the 'large open plan' studio, and activates façade enabling spatial and environmental engagement.

In plan, a flexible use of space is provided so that the school community can shape space to their needs and desires. Site and community can be viewed as a continuation of the classroom, as highlighted by principles of a Holistic approach to education. The chosen site for the DCS was selected due to its topological location and relationships with is neighbours as well as its involvement in the Christchurch School Rebuild Programme (CSRP). Overall, the research in response to current pedagogical ideals, proposes a flexible outdoor learning orientated school complex is a desirable alternative to the 'large open plan' studio.



▲Fig 1.1.The Journey Begins*

* Fig 1.1. Is the first frame of 180 in an sketch exploration animation during part four (Preliminary Design) of this thesis.

CONTENTS

GLOSSARY

CAB - *Cells and Bells Model of Schooling*

CCA - *Child-Centred Approach*

COLA - *Covered Outdoor Learning Area*

CSRP - *Christchurch Schools Rebuild Programme*

DCS - *Design Case Study*

DQLS - *Designing Quality Learning Spaces*

ILE - *Innovative Learning Environment/s*

MLE - *Modern Learning Environment/s*

OAC - *Open-Air Classroom Model of Schooling*

OECD - *Organisation for Economic Co-operation and Development*

UVR - *UltraViolet Radiation*

ON THE COVER

▲Fig 1.2.The above symbol is attached to select images in this thesis. It represents that the image is an interactive 'scanamation' in which the provided sheet (inset in the cover) can be slid over to create illusion of movement.

INTRODUCTION

CONTEXT

The NZ MOE is presently undergoing a reform of both pedagogic and property infrastructure termed “Modern Learning Environments (MLE) or Innovative Learning Environments (ILE)” (Ministry of Education, 2015b). The event of the 22nd Feb 2011 Christchurch earthquake accelerated this initiative, due to damage caused to the school infrastructure and the need for new schools.

In total 115 schools in the greater Christchurch region are due to be rebuilt or renewed by 2022 (Ministry of Education, 2012). These schools, in addition to other new schools around the country are being designed into the new MLE/ ILE Framework. It is the role of architecture to explore how these changes can be designed for.

▲Fig 1.3.Examples of Recent Online Articles

►Fig 1.4.Creative Futures , using research to inspire change.

Current responses to the NZ educational infrastructure has led to new schools* being designed as 'larger open plan' learning studios, which does enable an advancement in spatial flexibility over the traditional 'cells and bells' (CAB) model of education. However, these solutions are often centred in spatial planning of allowing for different size rooms for different group sizes, following models such as "Campfires in cyberspace" (Thornburg, 2007).

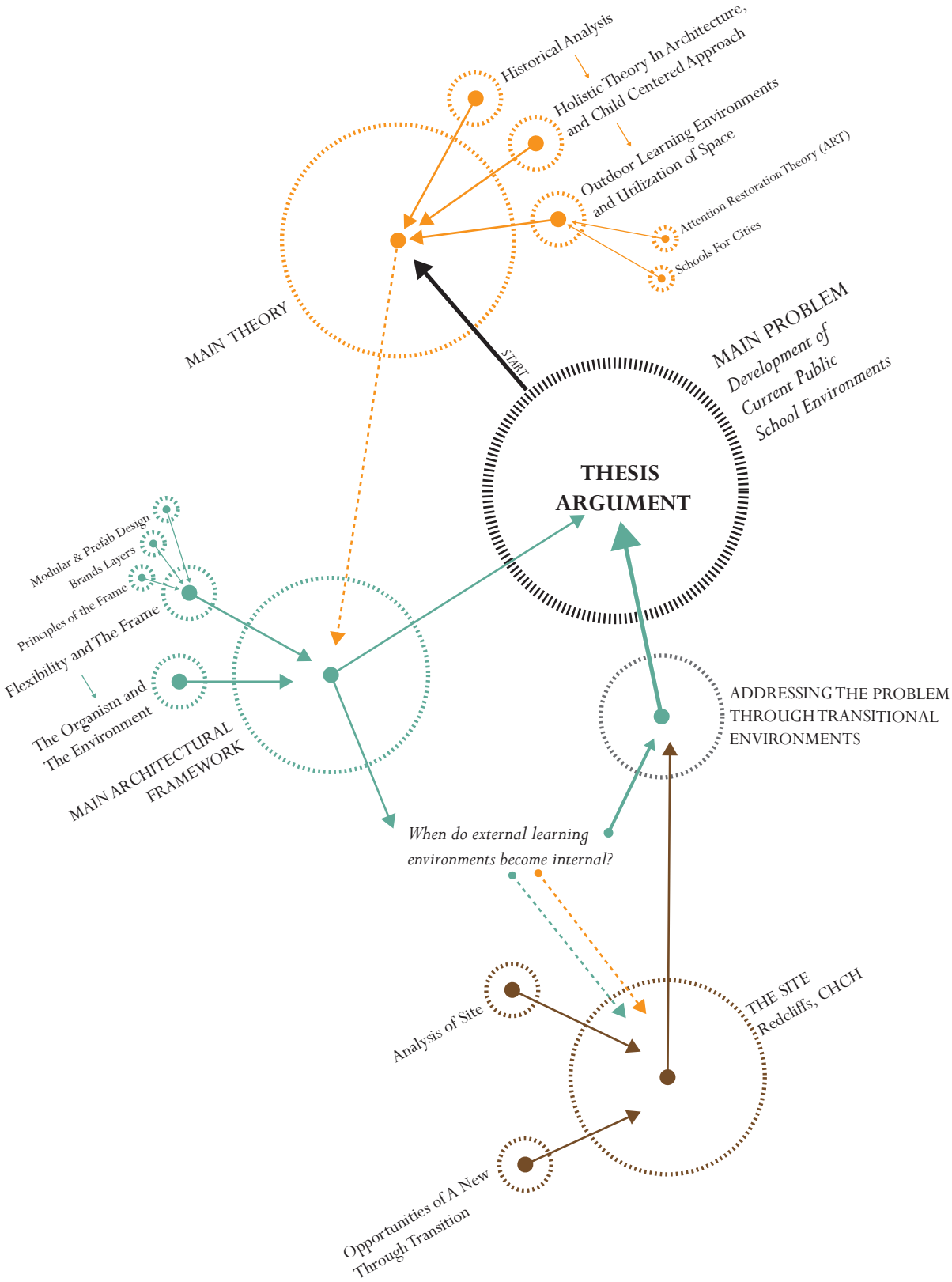
This raises questions of engagement between the user groups and the architecture and context of these spaces. The initial chapter questions, how can new educational facilities further develop to advance educational opportunity? This question is explored further in subsequent design chapters , that examine flexibility and outdoor leaning within learning environments.

** Refer to Modern Learning Environment case studies in part two.*

PROBLEM STATEMENT

A move away from the 'big barn'

There is clear indications that school environments have an impact on children's development. Multiple studies document links between spatial characteristics of schools and academic development (Kapadia, 2014; Schneider, 2002; Tanner, 2008; OECD, 2013). The current MLE/ ILE framework in NZ has resulted in a response to educational facilities that mainly consists of 'large open plan' learning studios often lacking in flexibility and effective connection to the natural and external environments. This thesis proposes the need for a different approach, where external learning environments and indoor outdoor transitional flexibility is core to the design principles of educational space.


Historical Analysis
Holistic Theory In Architecture, and Child Centered Approach
Outdoor Learning Environments and Utilization of Space
Attention Restoration Theory (ART)
Schools For Cities
MAIN THEORY
START
MAIN PROBLEM
Development of Current Public School Environments
THESIS ARGUMENT
Modular & Prefab Design
Brands Layers
Principles of the Frame
Flexibility and The Frame
The Organism and The Environment
MAIN ARCHITECTURAL FRAMEWORK
ADDRESSING THE PROBLEM THROUGH TRANSITIONAL ENVIRONMENTS
When do external learning environments become internal?
Analysis of Site
THE SITE Redcliffs, CHCH
Opportunities of A New Through Transition

AIMS AND OBJECTIVES

Analysing current discussions on MLE/ILE frameworks, and a Child Centred Approach (CCA) to education, this research **aims to develop an alternative design model to the large open plan studio for future primary schools in NZ.** This aims to generate discussion rather than a solution. This research establishes an alternative approach by developing a pedagogical position that places importance of **natural environment connectivity and flexibility of space to enhance learning opportunities.**

The DCS iterations aim to respond to a developed brief and discovered principles of school design (Established in Part One). It explores how educational space may be formed and what opportunities and complications may come from this acquired framework.

The nature of the DCS pushes away from current trends in educational architecture design, it aims to activate facade and wider site connections to promote a blurred line transitions between interior and exterior learning space, community and school. In plan, a flexible use of space is provided so that the school community has potential to shape space to their needs and desires using a transitional environment.

Limitations of Scope

- The design case study has been developed on a particular site in Christchurch which was chosen for its situation, or lack thereof, in the Christchurch School Rebuild Strategy. However, the conclusions can be viewed as universal to all other locations in NZ but with adaption to different climatic zones.

-The research focuses specifically on public primary schools within NZ, although budget is not considered as to not limit design exploration.

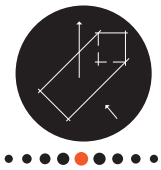
- The thesis is disassociated with a brief from MOE level and any particular client group. In practice specific clients would play an important role in forming the design outcome.

THESIS STRUCTURE

The body of this research is divided into four parts:

Part One - Literature, Project, and Programme.

This section explores and analyses literature and precedent case studies. It commences with a brief historical survey which leads onto the formation of Design Criteria for exploration in Part Three of this thesis. This section includes proceedings from an interview process undertaken throughout this research.

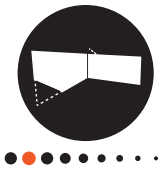


Part Three - Design Explorations

Design Explorations are undertaken in parallel to Parts One and Two and have been grouped in Part Three to allow reading in chronological order related to Critical Review.

Part Two - Site and Context

Site and Context are analysed to provide specific insights and issues for Design Exploration in Part Three.



Part Four - Design in Review

Presents a developed DCS and an argument for an alternative framework for future MLE/ILE environments. This section leads onto a critical reflection, which discusses the implications and findings in response to the aims and objectives of the thesis.

PART ONE
LITERATURE AND PROGRAMME

CONTENTS

INTRODUCTION

The image (opposite) is representation of an experiment undertaken on primary age children by researcher Elad Segav PhD (Roscorla, 2013). Students were firstly asked to draw the 'correct' picture. Most of the test subjects completed the drawing as a house. However, when asked to finish the picture there was an array of drawings, each unique and unlimited in terms of imagination.*

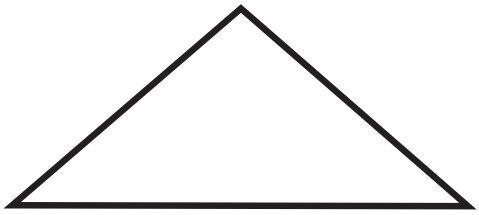
This experiment shows the value and strength of individual creative thought when one is not trying to abide to preconceived notions. Open ended questions allow for exploration and an enquiry into a subject matter, therefore the investigation in this thesis began with a similar methodology, in terms of what is perceived as the correct answer to educational design.

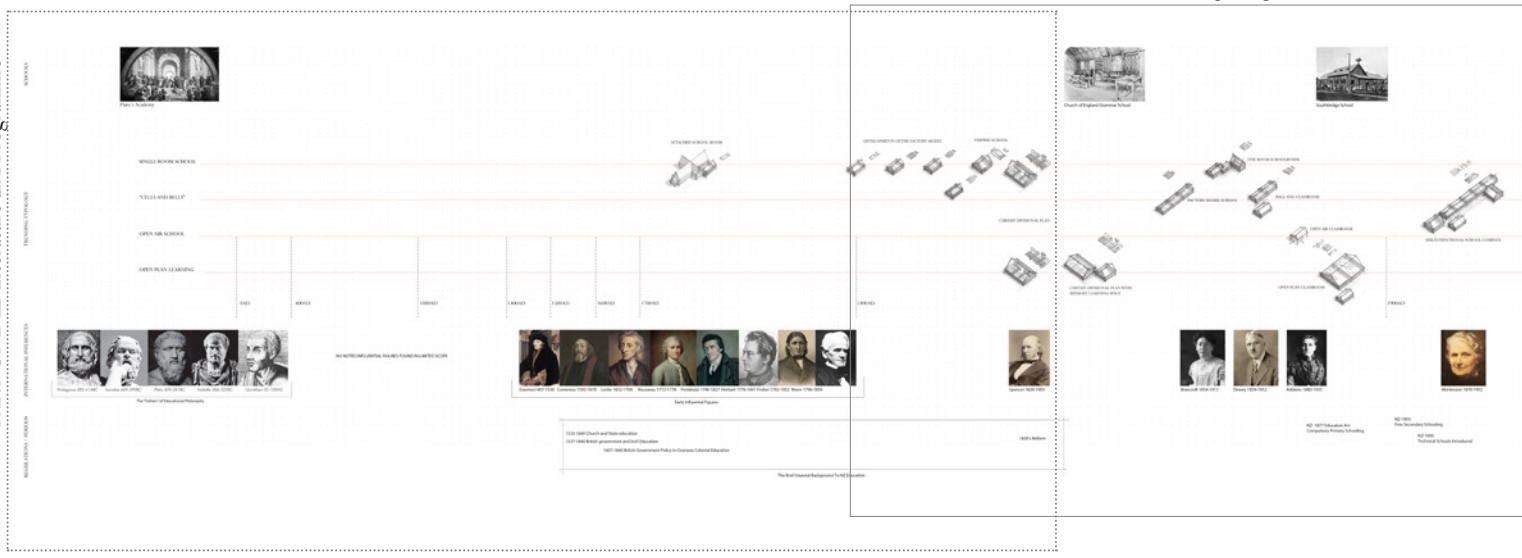
An extensive analysis on the history of educational theory and education as architectural typology was undertaken to understand present preconceived notions associated with educational architecture, (and the influences behind the architectural form of public educational institutions.)

Along this process, it was discovered that the latest approaches to educational architecture, a Child Centred Approach (CCA), are based upon theory which backdates over 100 years. However, these theories were viewed as 'alternative education' at the time. According to the OECD (2013) todays educational theory finds a 'strong echo' with the alternative approaches of the past.

This chapter shares insights and discoveries about education as architectural typology. It broadens beyond the scope (Flexibility and Outdoor Learning Environments) as it is important to understand the background, complications, problems, and layers to the architectural programme that is education. This chapter should be considered as a combined *programme analysis*, *literature,* and *Project Review,* which concludes with an understanding and challenging of currently preconceived educational programme and architectural typology in NZ. The chapter ends with the formulation of a design strategy and assessment criteria for the design evaluation.

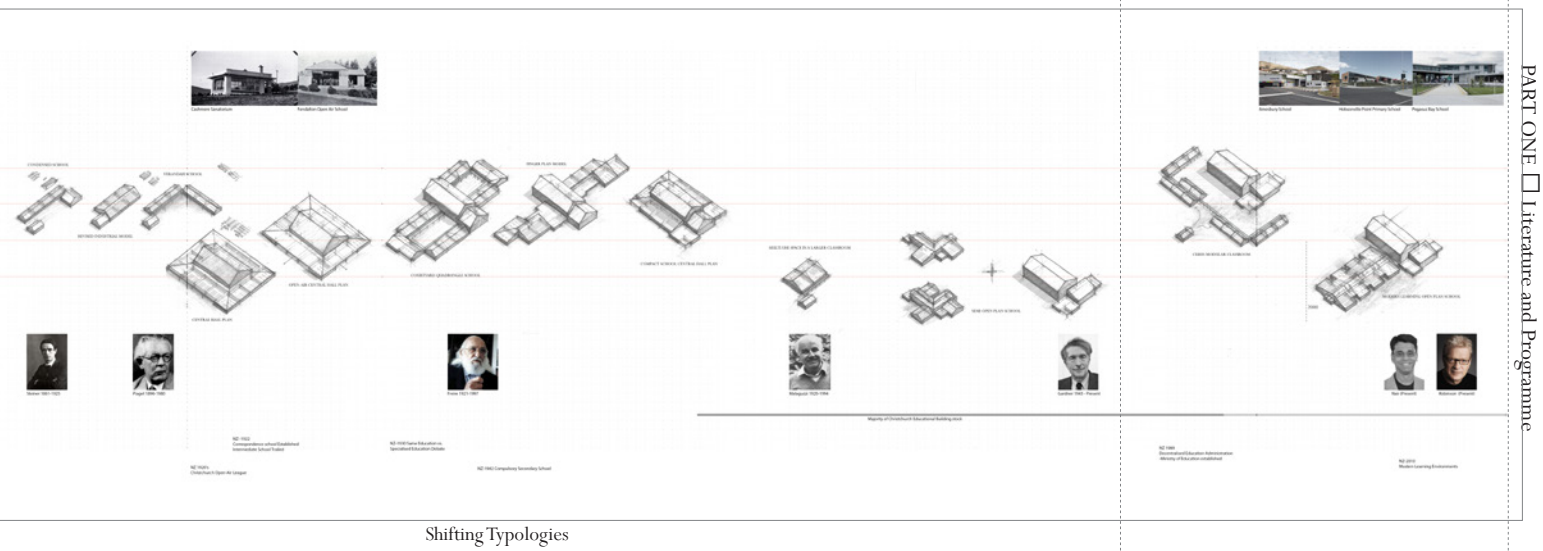
▶ Fig 2.1.The Experiment
* A link can be found here.
http://www.ourboox.com/books/when-there-is-no-correct-answer-a-lesson-in-creativity/





▲Fig 2.2.History Matrix

This matrix outlines, in a brief summary, the scope of the research undertaken to understand education as architectural typology. The following sub-chapter analyses its components in more detail to identify key influences and trends.



Shifting Typologies

Current Educational Structure in NZ

SCHOOLS

Plato's Academy

TRENDING TYPOLOGY

SINGLE ROOM SCHOOL

"CELLS AND BELLS"

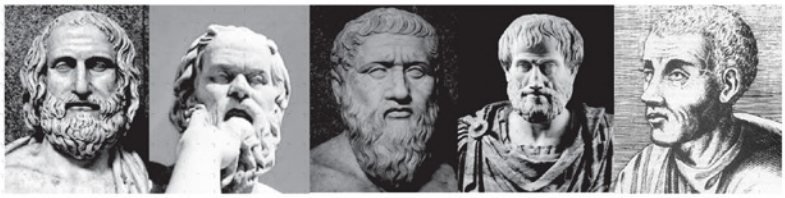
OPEN AIR SCHOOL

OPEN PLAN LEARNING

0AD

400AD

INTERNATIONAL INFLUENCES



Protagoras 485-414BC | Socrates 469-399BC | Plato 429-347BC | Aristotle 384-322BC | Quintilian 35-100AD

The "Fathers" of Educational Philosophy

NO NOTED INFLUENTIAL FIGU

REGULATIONS / PERIODS

HISTORICAL ANALYSIS

Shaping Education

There has long been philosophical views on education and knowledge; how we obtain knowledge; what knowledge is; what education is; what learning is; and so forth.

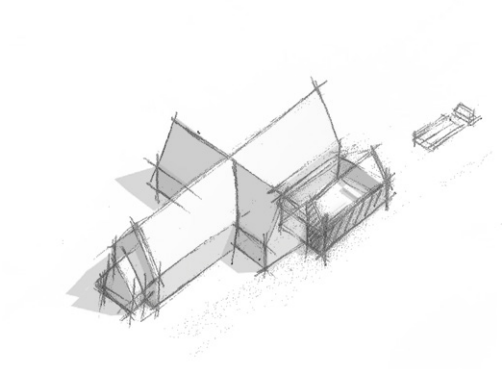
These have unfortunately helped to shape notions of public educational facilities into a container logic. Education and schooling were viewed in isolation from communities, preparing students for society rather than a continuation of society (Engelbrecht, 2006; OECD, 2013; Nair, 2014).

This is an issue, as the social realm and community involvement is one of four key dynamics of successful schooling (RSA, 2013). Author and international advisor on education in the arts Sir Ken Robinson, argues:

"We need forms of education, which engage this generation, in the processes by which our communities are organised and governed"

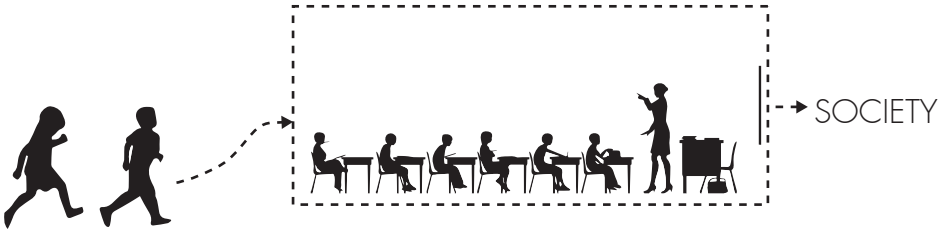
The 21st century school organism* must be able to readily interact and be a continuation of community, breaking away from this container logic.

**The word organism is used as a reference to the living system of schools rather than singling out one particular user group.*



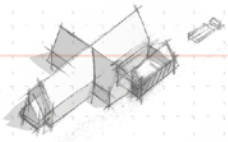
Early origins of public education

In education, container logic can be seen to have influenced the architecture of education from what is regarded as 'the origins of public education', the attached schoolhouse. Education was undertaken by Church and State in the 16th to 19th centuries (Nair, 2014) to teach basic needs to children in preparation for society, and only the high ranked would be educated beyond basic needs (Bailey, 1989). In western civilisation this pedagogical philosophy influenced public education to develop into cellular facilities that isolated the classroom from society (Bailey, 1989).



▲Fig 2.3.Container Logic, An Industrialised Model

ATTACHED SCHOOL-ROOM



1000AD 1400AD 1500AD 1600AD 1700AD

JRES FOUND IN LIMITED SCOPE

Erasmus1467-1536 Comenius 1592-1670 Locke 1632-1704 Rousseau 1712-1778 Pestalozzi 1746-1827 Herbart 1776-1841 Frobe

Early Influential Figures

1533-1840 Church and State education

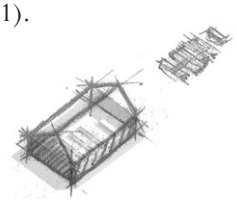
1537-1840 British government and Irish Education

1607-1840 British Government Policy in Overseas Colonial Education

Development of a public school typology

It wasn't until the early 19th century that civilisation saw a reform of education and the beginnings of state funded public schools as an independent architectural typology, the first of which was the 'single-room schoolhouse' (Seaborne, 1971).

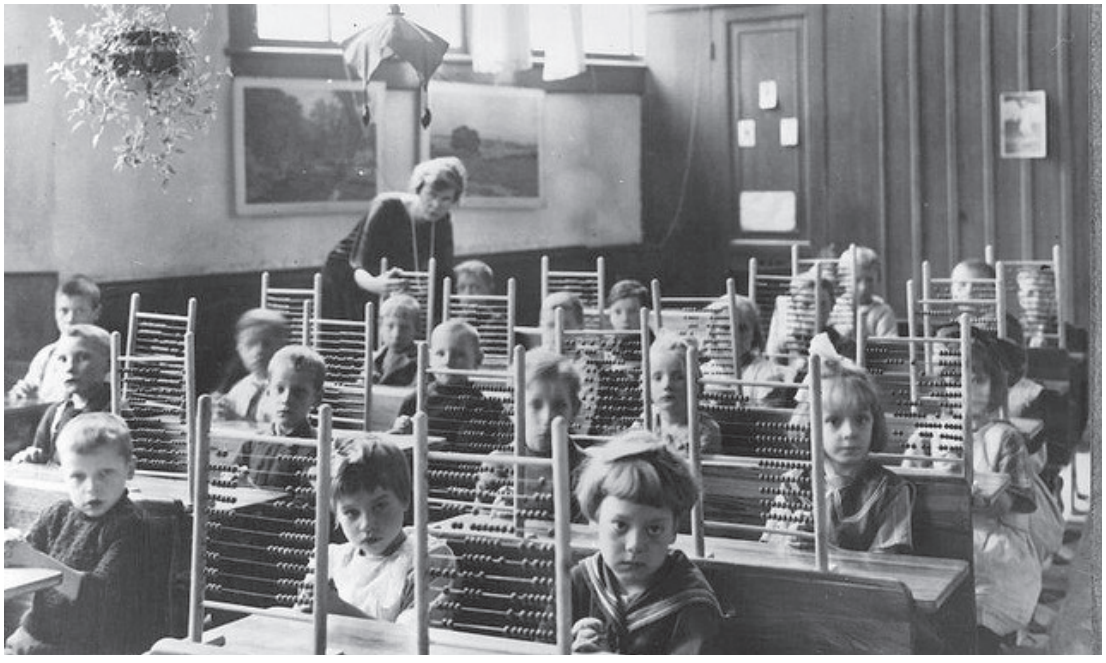
This typology bloomed as a result of the industrial revolution of the late 18th century, when schools were often established in the name of philanthropy (Alsaif, 2014).



Variations on an industrialised model

Single-room schools undertook many forms, accommodating to varying class size, pedagogy and specific curricular objectives. An economical solution came in the form of a standardised single room, 'factory model' school, developed by American politician and educational reformer Horace Mann, in the early 19th century which continued to be developed upon over the coming years (Baker, 2012).

As role numbers grew so did the classrooms, gallery seating was employed in some schools and in others a larger single room plan would accommodate multiple classes by the use of curtains as retractable divisions (Seaborne, 1971). The 'factory model' single-room school grew and transitioned between variants until spatial utilisation and curricular needs depicted multiple rooms of study.

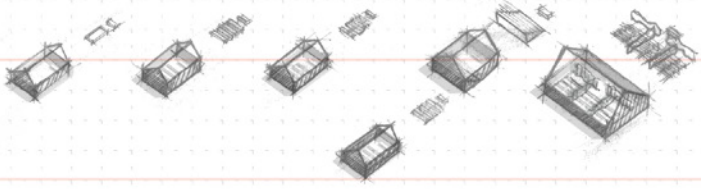


▲Fig 2.4.Factory model classroom displaying teacher centred orientation to spatial arrangement.

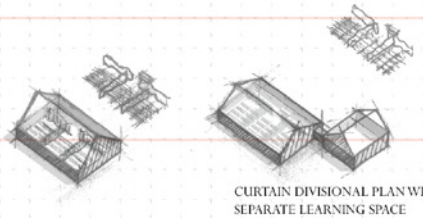
Church of England Grammar School

DEVELOPMENTS OF THE FACTORY MODEL

STEPPED SCHOOL

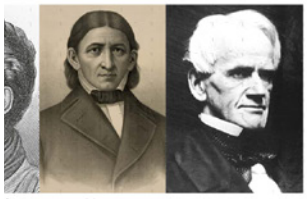


CURTAIN DIVISIONAL PLAN



CURTAIN DIVISIONAL PLAN WITH SEPARATE LEARNING SPACE

1800AD

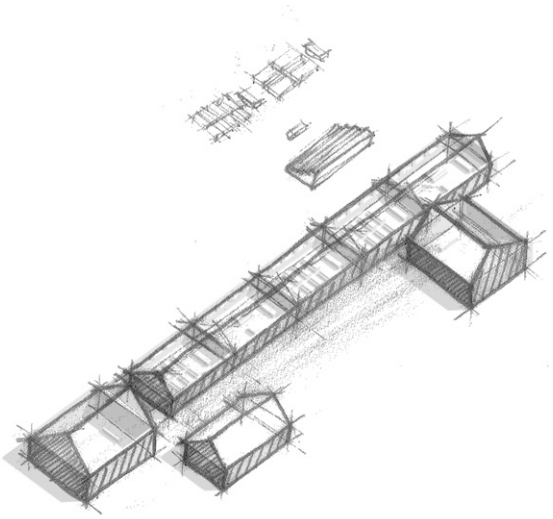


l 1782-1852 Mann 1796-1859

Spencer 1820-1903

1830's Reform

The Brief Imperial Background To NZ Education



The growth of a standard and of larger school models

The 'factory model' was adapted into multi room institutions. These developments were influenced by the formation of governmental standards in school design as well as a shifting views in society (Clay, 1929). UK formed minimal acceptable standards for schools in the 1860's, and passed a Compulsory Education Act in 1880; alongside the USA in 1870 and NZ in 1877 (Public Relations Section, Department of Education, 1989).

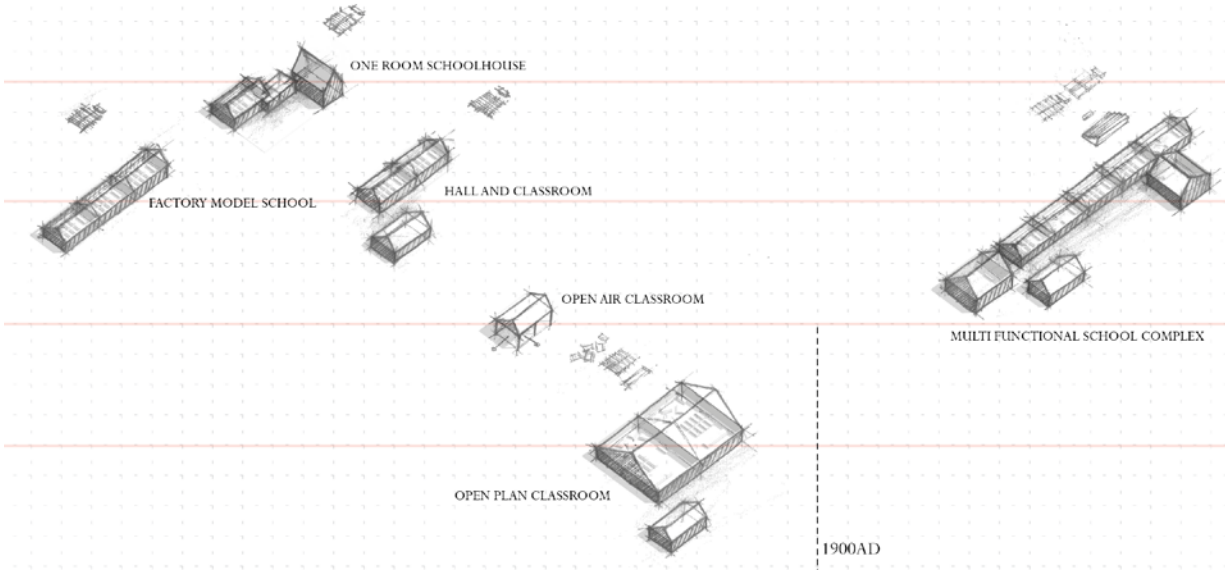
Schools, no longer defined as singular rooms, grew into large complexes with accompanying curricula additions such as for sciences and arts. Each block was tailored to its own set of architectural implications. However, problems emerged due to over-crowding, inadequate ventilation and lighting (Seaborne, 1971).

In the late 1800's, the numbers of students per class reduced in size, and additional facilities with their each with their own specific programmatic constraints were added to the complex. Because of budgetary constraints an adapted 'factory model' often took hold and classroom space was maximised in internal layout for student numbers (Seaborne, 1971; Pearson, 1972). The 'Cells and Bells' (CAB) model, where classrooms would be positioned in rows and classes would operate on strict time schedules, emerged as a preferred layout structure and design.

Notes on standards

The government has over-arching control on the programmatic standards that public schools must facilitate. However; social influences on these facilities; regionalised differences; and how programmes emerge in the day to day operations of the school are often accommodated by the school organism. The produces a need for flexible spatial design.

Southbridge School



Brancroft 1854-1912

Dewey 1859-1952

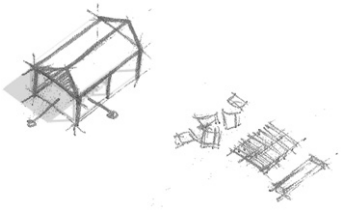
Addams 1860-1935

Montessori 1870-1952

NZ- 1877 Education Act
Compulsory Primary Schooling

NZ-1903
Free Secondary Schooling

NZ-1905
Technical Schools Introduced



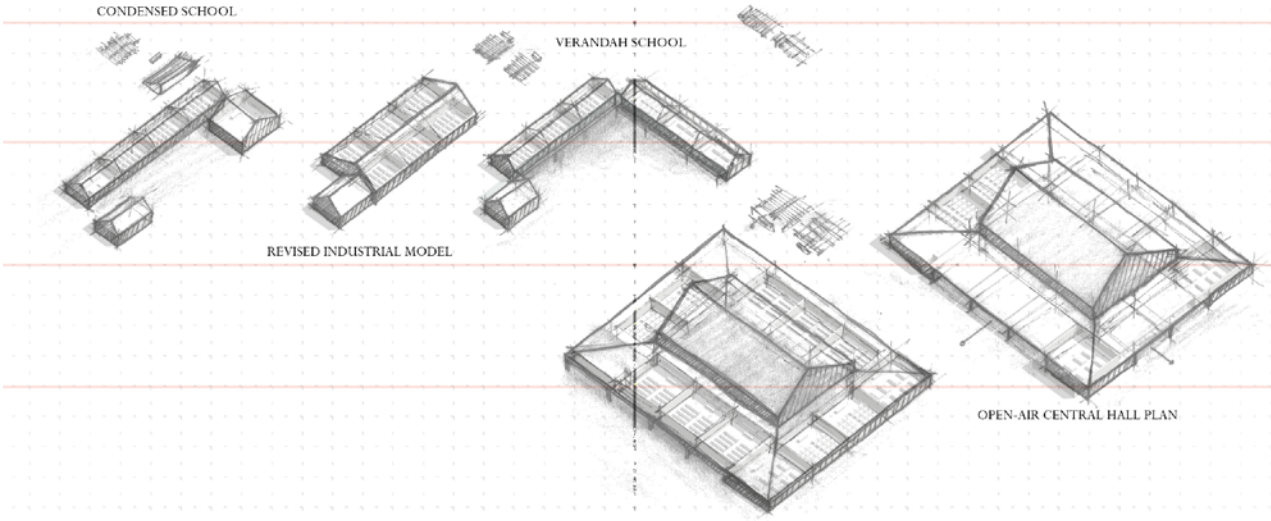
NZ Regional Educational Boards

From 1878, in NZ, each school had a regional educational board to make any pedagogical or property decisions. This management structure, which ended in 1988, meant that each region had the ability to make regionalised regulations that varied from the over-arching structure (Nimmo, 1989). A major influence on educational infrastructure in Christchurch occurred in the 1920's, when a group known as the Christchurch Open-Air League introduced the Open-Air Classroom (OAC) movement to the Canterbury Education Board (Carryer, 1991).

The Canterbury Education Board, convinced by the benefits that OAC provided such as natural ventilation and lighting, decided to 'roll out' OAC throughout Canterbury (Carryer, 1991). This occurred despite some complications of this framework to the programmatic functions of education Fig2.5. Some of these OAC, such as (Fendalton School, 2016), are still operational to this day and are highly valued in their communities.

Cashmere Sanatorium

Fendalton Open Air School



Steiner 1861-1925

Piaget 1896-1980

NZ- 1922
Correspondence school Established
Intermediate School Trailed

NZ 1920's
Christchurch Open-Air League

Notes on Open-Air Classrooms (OAC)

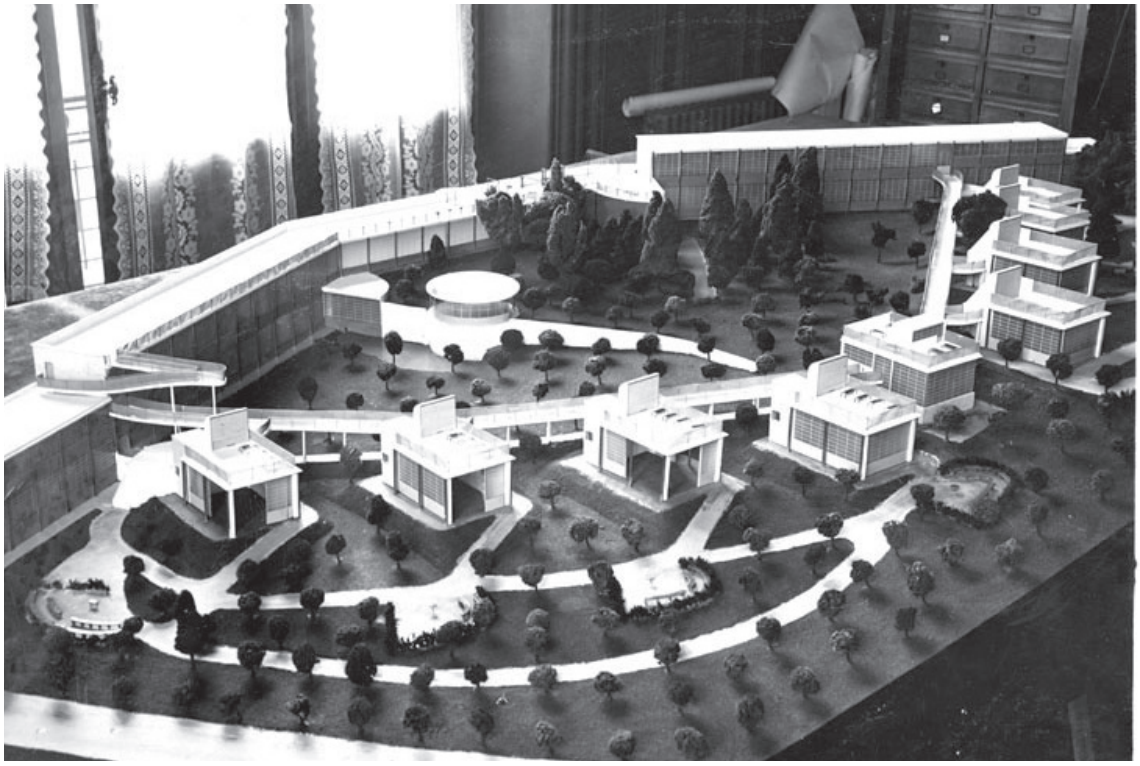
OAC were introduced internationally as a means of dealing with ongoing atmospheric problems developed by CAB model facilities. These usually featured at least one wall that had the ability to open fully to the external environment to allow for natural ventilation, outdoor connectivity, natural lighting and more. When environmental considerations of today's educational standards are taken into account it can be seen that this model of school creates many issues for programme as well as benefits (opposite).

OAC were, often smaller in size (with significantly lower ceilings), freestanding (not a part of a block as in the developed CAB model) and were able to have all four walls opened to the elements in one way or another (Carryer, 1991). They also featured the integration of light and easily moveable furniture, however they were significantly more expensive to build than the factory model of school at the time (Carryer, 1991).

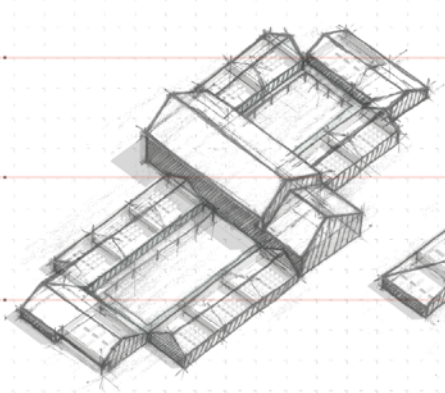
►Fig 2.5.OAC, Pros and Cons


Utilisation of space dependant on weather
CONS
Costly
Environmental Control, Wind and Thermal
Glare for working space
Natural Lighting
Sensory Connection and Natural Ventilation
Fresh Air and Health Benefits
Utilization of External Learning Space
PROS
Spatial Quality of OAC
Hetrogenous not Homogeneous

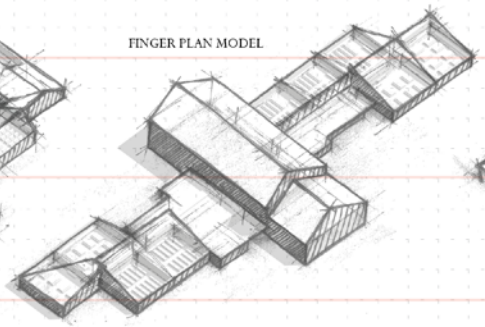
▲Fig 2.6.Space in Transition. OAC School in Paris-1935. Fully glazed learning space with one side fully openable to the exterior environment.



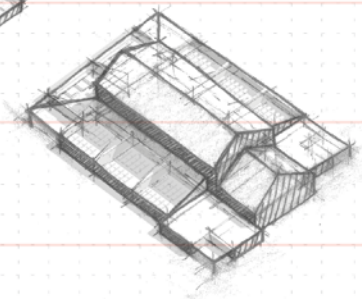
▲Fig 2.7.A Fragmented Model. OAC School in Paris-1935. Stand alone OAC surrounded by integrated landscape and the natural environment.



COURTYARD QUADRANGLE SCHOOL



FINGER PLAN MODEL



COMPACT SCHOOL CENTRAL HALL PLAN

Freire 1921-1997

NZ-1930 Same Education vs.
Specialised Education Debate

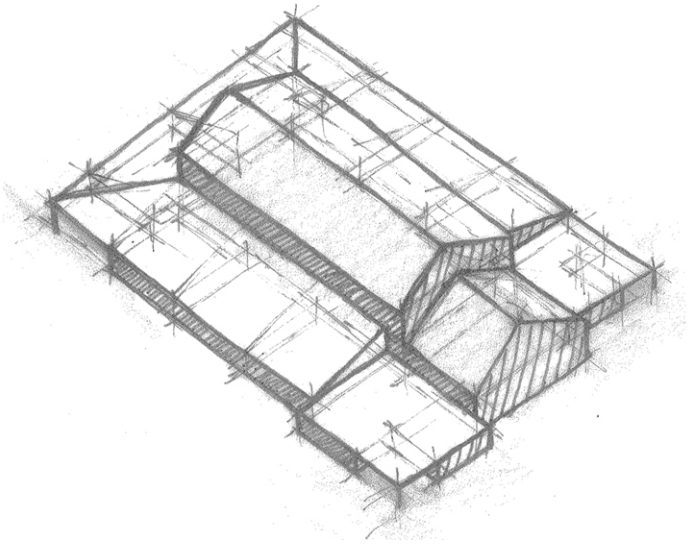
NZ-1942 Compulsory Secondary School

Multiple Typologies

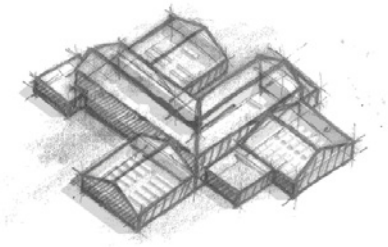
In the first half of the 20th century OAC were not the only architectural shift, in public education, to respond to issues in the factory model school. 'Verandah', 'Finger', and 'Central Hall' plans (examples shown opposite) were also developed as main typological trends.

"Nevertheless, the open-air schools movement deserves the credit for changing ideas on classroom design" (Carryer, 1991).

The 'Cental Hall' can be seen to be an early typology that adopts the use of open plan and shared learning space. Although at the time the pedagogical trends were teacher centred.



▲ Fig 2.8.Central Hall Plan Typical Layout, classrooms would open out into the central hall that would be utilised by all classrooms for shared activities.



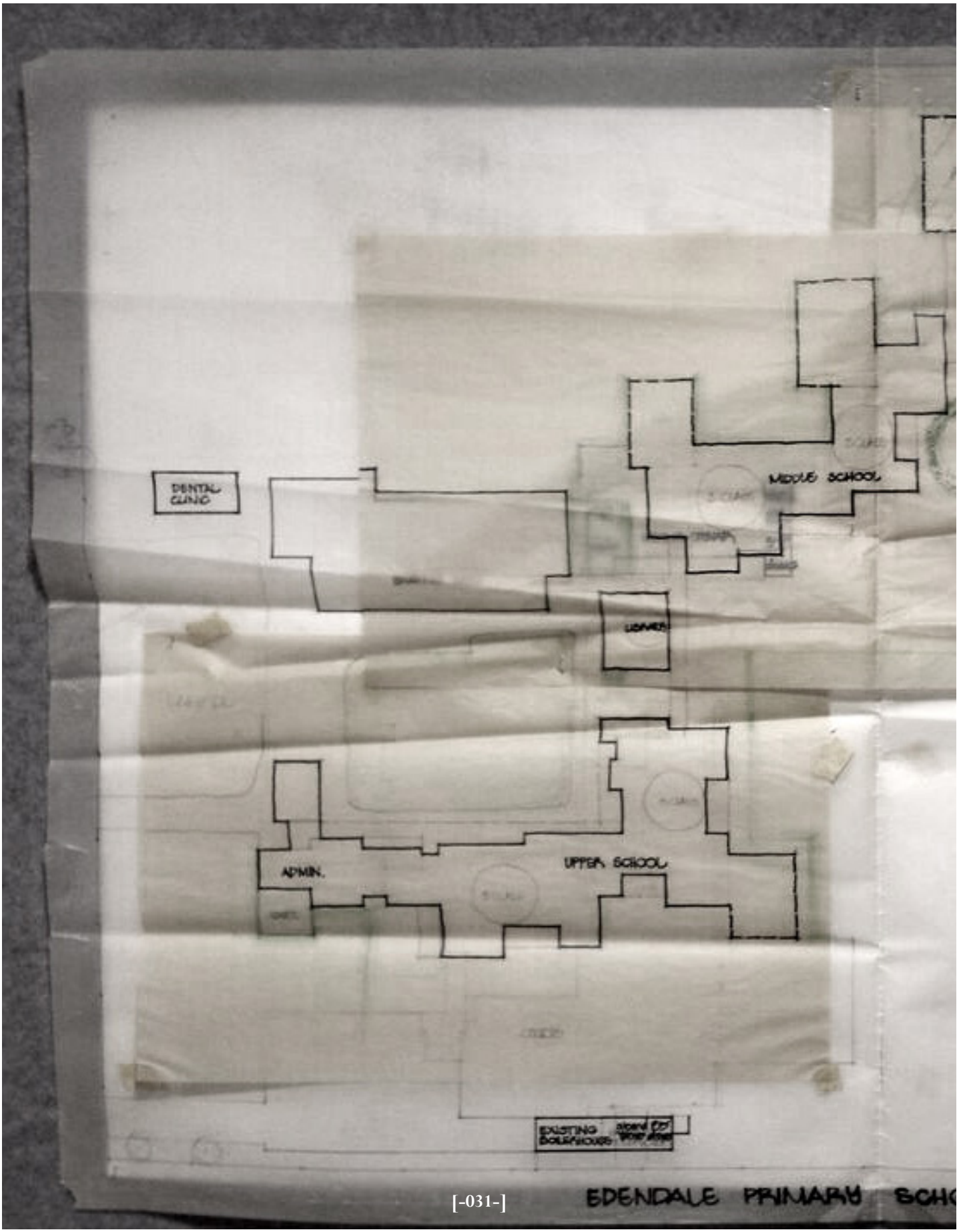
Towards a child-centred approach (CCA) for public schools

The teacher-centred approach to public education started to come under questioning internationally around 1970, partially due to cultural and social revolutions at the time (Frith & Whitehouse, 2009). Pedagogical ideas of a CCA came to the forefront of educational debate and spaces began to emerge designed as semi-open plan studios. However, due to the preconceived container logic enthralled by factory model schools of the past, "the dynamic and rich environment of an educational experience" had been frozen into "measurable units easily encased in institutional architecture" (Engelbrecht, 2006).

This influenced attempts of change in the 70's. Members of the educational community often resisted change. This resulted in an architectural form enthralled with preconceived teacher-centred pedagogical notions (Nair, 2014). From the last decade the CCA is at the forefront of educational debate with international education leaders* and effective standards promoting its approach (Nair, 2014; Robinson & Aronica, 2015; Ministry of Education, 2015b). Technological advances are playing a strong role in this change.

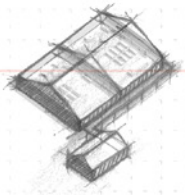
▶ Fig 2.9.Edendale Primary School, Site Plan. 1970's Semi-Open Plan School.

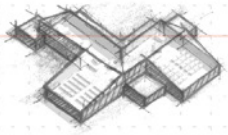
** Prakash Nair - President of Fielding Nair International, Architect and one of the "world's leading change agents in school design" (Fieldingnair.com, 2016).*

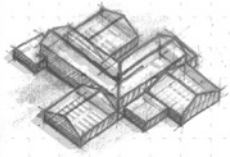


EDENDALE PRIMARY SCHO

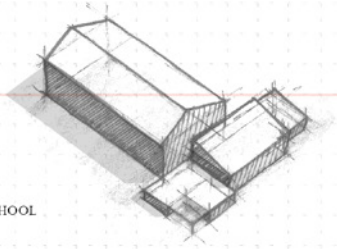
MULTI-USE SPACE IN A LARGER CLASSROOM

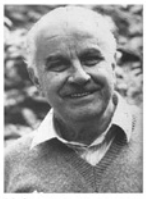






SEMI-OPEN PLAN SCHOOL





Malaguzzi 1920-1994

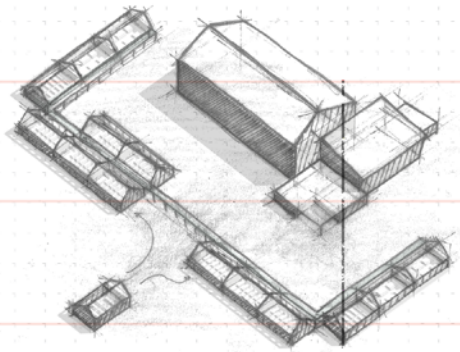
Gardner 1943 - Present

Majority of Christchurch Educational Building stock

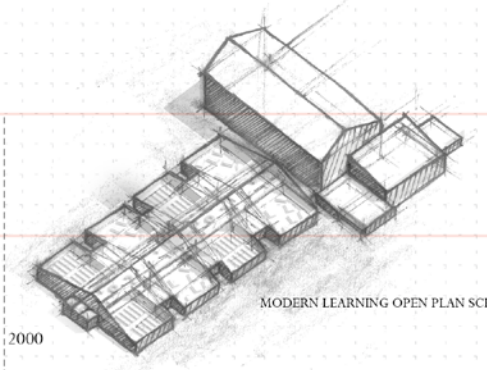
Amesbury School

Hobsonville Point Primary School

Pegasus Bay School



CEBUS MODULAR CLASSROOM



MODERN LEARNING OPEN PLAN SCHOOL

2000

Nair (Present)

Robinson (Present)

NZ 1989
Decentralised Education Administration
-Ministry of Education established

NZ-2010
Modern Learning Environments

HOLISTIC THEORY IN ARCHITECTURE & OUTDOOR LEARNING ENVIRONMENTS

This section briefly discusses Holistic Theory and the key figures in early 20th century alternative education, who argued for a Child-Centred Approach (CCA) to education. It further discusses how these 'alternative' educational theories and external environment integration can act as an agent for change to the current regime. An importance of integrating nature into the learning space and natural environment as a learning tool are highlighted. 20th century key architectural figures whom adopted these principles of design are discussed in relation to these importances. It is proposed that the integration of external learning and transitional space has the potential to enable advanced spatial optimization and flexibility for school facilities.

◀ Fig 2.10.External opportunities

Alternative influences

Influential educational figures; Dewey, Frobel, Montessori, Pestalozzi, Steiner, and others, argued that education should be viewed as operating as a continuation of society. They argued that, students should be viewed as members of a community, actively pursuing interests in co-operation with others (Firth & Whitehouse, 2009).

Their ideals, often categorized as a 'Holistic Approach', privileged the importance of the relationships to community and environment (natural and designed), as well as a freedom of choice or self-directed approach to learning (Firth & Whitehouse, 2009). In holistic theory equal weight is placed upon both external and internal space under the consideration that 'Every Space is a Learning Space' (McDaniel, 2014).

Time for a change

This belief that every space and architectural detail can effect the learning experience of education is important in the design of educational facilities (Firth & Whitehouse, 2009). Holistic theory provides a theoretical framework where every detail and aspect of design is to be equally considered, from furniture to mass form. It is however, unusual to find integrated and holistic school designs with equal consideration to all parts (Firth & Whitehouse, 2009).

▲Fig 2.11.& Fig 2.12.Crow Island School, USA, 1940, detail from custom designed easily moveable light-weight furniture to articulated landscapes involving external environment in learning space.

Movement towards Holistic space

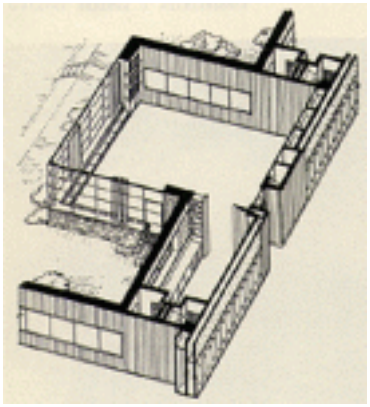
Architects Gropius, Saarinens, and Neutra adopted holistic views on education. The Bauhaus Building (1926) encouraged new relationships between internal and external. Neutra promoted engagement with nature, landscape and perception as well as freedom within the classroom. Neutra insisted that "nature be accessible so each classroom opened onto its own outdoor space" (Firth & Whitehouse, 2009).

Movements of integrating the internal and external, under a holistic approach, promoted a diverse and flexible work setting, by employing flexible and controllable space and natural integration (lighting and ventilation) that could be changed to the needs of the classroom (Firth & Whitehouse, 2009). As in the OAC movement, these methods of integrating external space into the typically internalised modern learning space have the potential to address the needs of future learning environments in NZ.

Today this realisation is being promoted increasingly, with top educational literature highlighting the need for better external environment integration into learning environments. Attention on external space for learning features in almost 20% of the list (ref appendix) in the book "*The third Teacher*" (Peterson et al., 2010). OLE are is highlighted by Nair (2014) chapter 7 as one of the key spaces in school design where there are further opportunities to be explored.

Could enhanced connections to the external environment promote flexibility and advance educational opportunity?

◀Fig 2.13.Crow Island School 1940, designed in co-ordination with Sarrinens. Outdoor integrated learning space and connections.



▲Fig 2.14.Crow Island School Classroom pod, showcasing near equal distribution of internal and external learning space.

Beyond Play

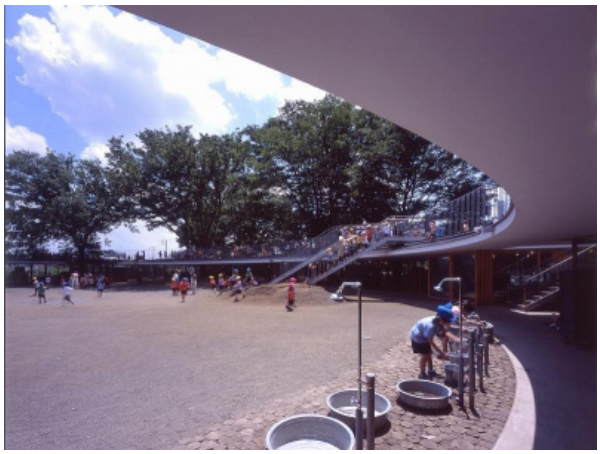
Often external space is considered in terms of where children spend their play time when they are not attending classes (Kennedy, 2003). However, the role of exterior space in educational facilities goes beyond 'gaps' to be utilised for play. Despite being "the first image kids* have when they visit a campus" (Kennedy, 2003) External integration can have many climatic benefits including air quality, natural ventilation and lighting (Schneider, 2002).

In addition to the climatic benefits, Professor of psychology at the University of Michigan, Stephen Kaplan (1995), argues that the integration of nature and external environments, to both work and educational space has many health benefits. His Theory, known as Attention Restoration Theory, suggests that a strong connection to the natural environment increases the capacity to focus attention and reduce stress (Kaplan, 1995).

This separation between external and internal form in play and work, and where the two interface, is an important area of research for school architecture. The potential benefits of increased external connectivity learning environments can be seen in Fuji Kindergarten (Right). These are often overlooked in today's educational facilities in NZ (refer to MLE/ILE Case studies).

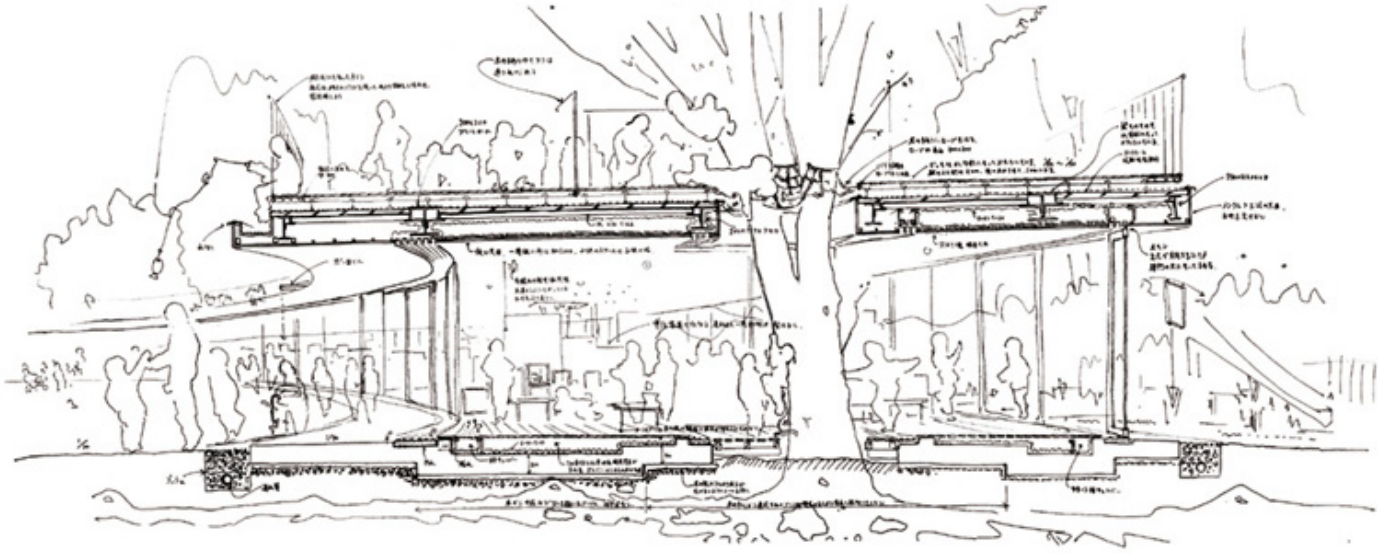
There are many perceived benefits if borders between play and work space start to break down. Kapadia (2014) argues that play allows children to simulate creativity, imagination, physical, cognitive and emotional strength. If the spatial borders break down, then work and play can become conversing learning opportunities.

*and people in the community.



▲ Fig 2.15.Fuji Kindergarten, Tokyo 2007. The external environment envelops this design. In this image it can be seen how the external and internal, natural and artificial worlds merge and overlap.

▲ Fig 2.16.Fuji Kindergarten. Every space is a transitional space with ability to engage the external environment as a direct extension of the classroom.



▲Fig 2.17.Transverse Section of Fuji Kindergarten. Trees penetrate the architectural form providing pockets of play and natural environment integration into the learning space. This is an example of transitional space that can 'externalise' spatial qualities due to most walls of the design being able to open to the elements.

Transitional opportunities

Usually when schools grow in size and increase in roll numbers (Educationcounts.govt.nz, 2016), outdoor spaces such as courtyards, fields, and more are getting absorbed by internalised built form. **Often with poor external connections due to climate control measures** (Observation from case studies & Interviews). This thesis proposes that **transitional** space [space between internal and external realms, or physically changeable space] has potential to engage these perceived problems and advance educational opportunities. This area requires a design focus for future schools.

I ask this…

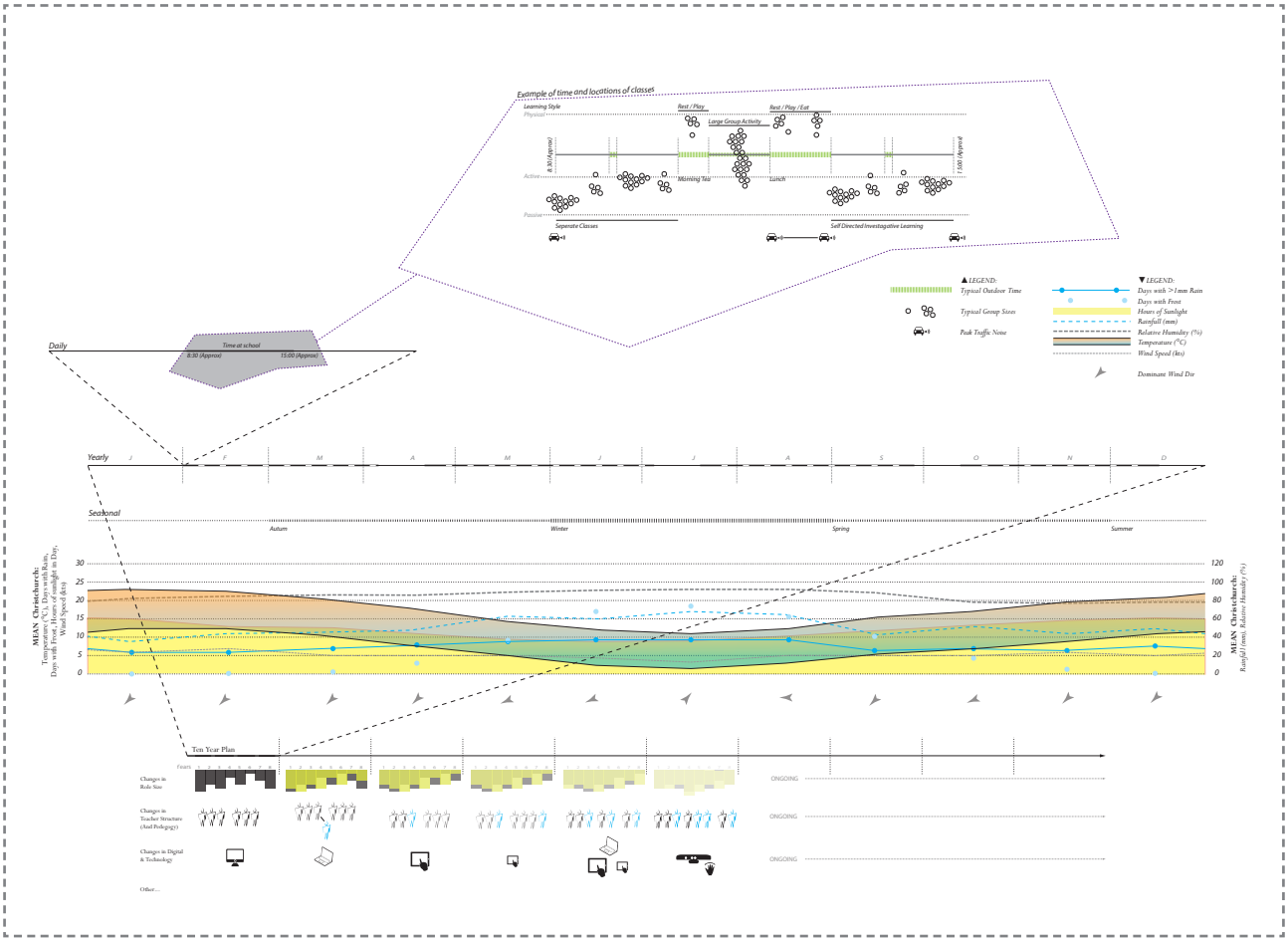
What happens in spatial utilisation when educational space is articulated in a manner that internal space and external space are interchangeable in a ***TRANSITIONAL*** *manner?*

Outdoor learning environments

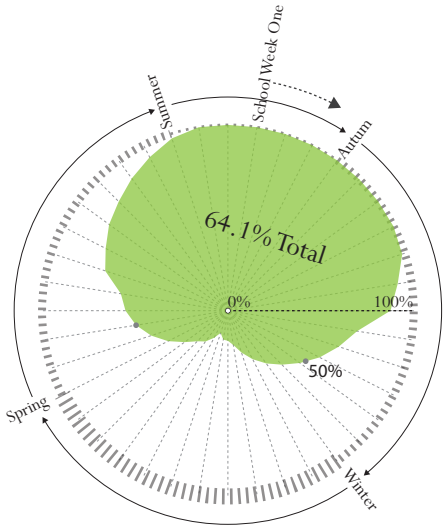
To fully utilise external environments in NZ, consideration of exposure to ultra violet radiation (UVR) must be placed at utmost importance. As NZ has approximately 40% higher amount of UVR radiation levels than countries at similar latitudes in the northern hemisphere (Cancer Society, 2014). Yet there are also concerns over vitamin D deficiency in many regions [including Christchurch], due to the lack of exposure in winter months (Cancer Council Australia, 2016; NIWA a, 2016).

To ensure correct levels of exposure to the sun adaptive shade structures or Covered Outdoor Learning Areas (COLA) should be provided (Gies & Mackay, 2004).

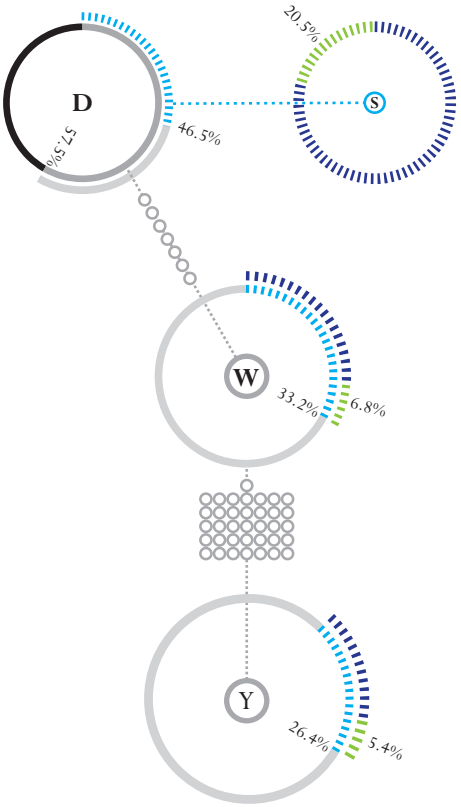
▲Fig 2.18.Warm shade, the use of transparent shade materials, has potential to shield UVR levels whilst providing for thermal comfort with infrared transmission (Mackay et al., 2014).



▲Fig 2.19.Environmental factors and dimensions of change Matrix, (see full size in Appendices). This matrix highlights five different time scales of change; Hourly; Daily; Monthly; Seasonal; and 'Ten year plan (Decade)'. It highlights Climatic variations and fluctuations in use.



▲Fig 2.20.Approximate percentage of time outdoor space is within temperature 16-24°C comfort levels.



▲Fig 2.21. Approximate percentage of time at school; day; month; year. Analysis of 'Environmental Matrix'

Interchangeability and space utilisation in schools

Outdoor shade areas have potential to be developed into flexible transitional space to further enable spatial utilisation. As the public educational system is dynamic and constantly changing, the utilisation of space in schools is often a main cause of spatial change (Seaborne, 1971; Pearson, 1972).

There are peaks and troughs in roll growth which makes it hard to accurately predict the enrolment year to year. Some years there are students with special spatial requirements that may require additional support. School hours are intermittent only operating certain hours of the day; and climatic conditions depict if outdoor (and sometimes internal) space is usable at any particular time (Williams, 2010). Transitional space has the potential to accommodate for these needs in educational facilities by enabling flexibility and spatial utilisation.

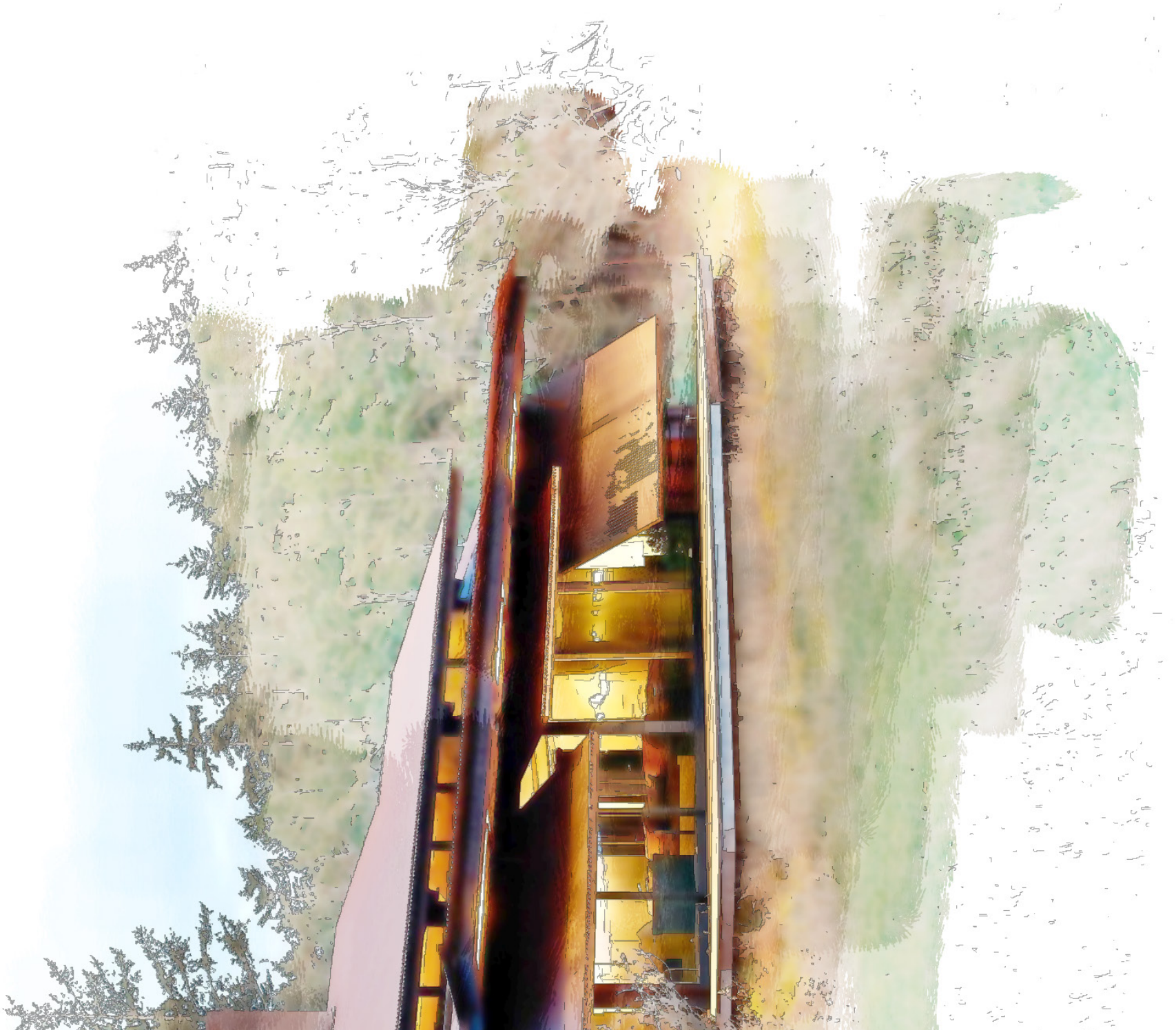
With the majority of public educational facilities in NZ designed today as relatively static rather than adaptive (refer to case studies). There is potential for future educational spaces to engage flexibility, in both the short and long term, through the promotion of transitional flexibility. To do this one must first define flexibility for educational architecture.

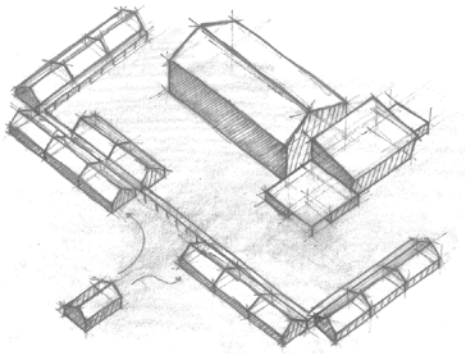
LEGEND
Sleep
Awake
Not at School
At School
Typical Time Indoors
Typical Time Outdoors

FLEXIBILITY AND THE FRAME

This section discusses principles of flexibility, how flexibility has been accommodated for in educational facilities, and what is needed going forward. It proposes an adaptation of multiple methods of flexibility into one modular framework, in which space can be configured and reconfigured in relatively non-disruptive transformation. It briefly discusses the benefits and arguments of modular design in education and proposes an reinterpretation on Brand's (1994) '*Shearing Layers*', and an expansion of Leupen's (2006) principle of the frame as key strategies behind spatial flexibility. These are analysed for their application in educational architecture and discussed in relation to the ability to engage external learning and transitional space.

▶ Fig 2.22.Transitional spaces, connecting external and internal environments.



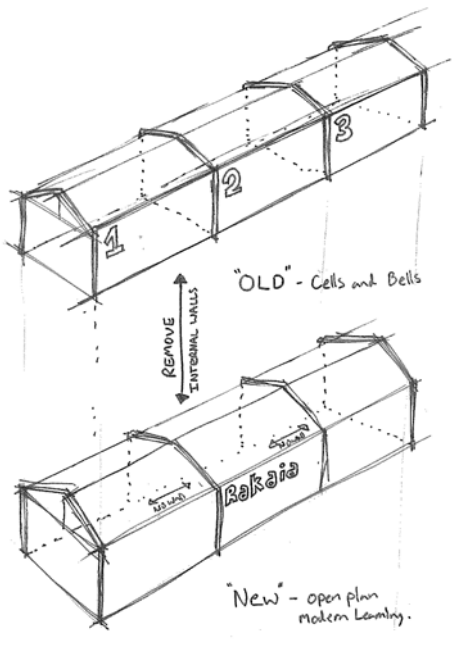


Prefab and Modularity in education - negative associations

In the late 60's, and 70's prefabrication made a big impact within Christchurch due to the arrival of the re-locatable 'CEBUS' model classroom (Nimmo, 1989). These re-locatable units were introduced to most schools throughout Christchurch for use in all areas except the gymnasiums.

Its sectional modular nature allowed these classrooms to be arranged in a variety of different layouts including to create outdoor courtyards (site observation). The 'CEBUS' model even gained recognition with the OECD (Nimmo, 1989, 71). From site observations around Christchurch, it is noted in many situations these re-locatable classrooms have remained 'as is where is' as permanent. This issue has been noted with modular educational facilities, due to costs of relocation, permits, and associated site works (Williams, 2010; Interviews). Additionally, reconfiguring these units is usually disruptive in relation to the perceived benefits of transformation. Without significant alterations, this model does not provide the necessary spatial requirements for a more flexible space needed for a CCA pedagogy.

From discussion with industry architects it has been noted that currently a selection of CEBUS blocks are being renovated by removing solid dividing walls and replacing with them with glazed sliding doors. However, this does not address wider considerations to CCA as outlined in Nair (2014) or the need for non-disruptive transformation (Hannon, 2012).



▶ Fig 2.23. Adapting the CEBUS model.

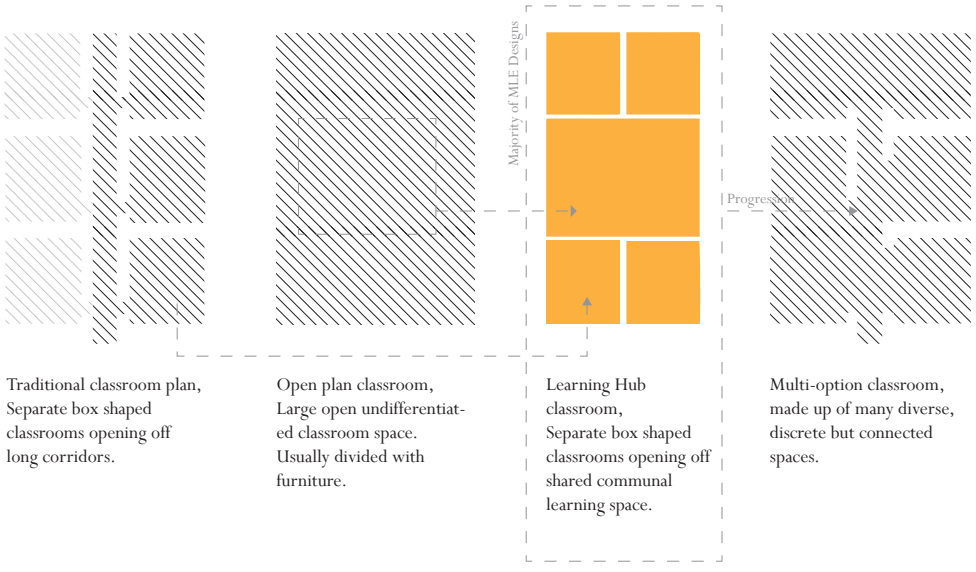
▲Fig 2.24.CEBUS model classroom these portable units have standard high level windows for cross ventilation. Usually installed on relatively flat sites, the sub-floor is enclosed.

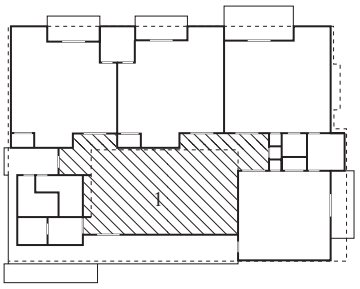
▲Fig 2.25.CEBUS Typical Module Junction. The junction is expressed, often with a bolted connection for easy disassembly.

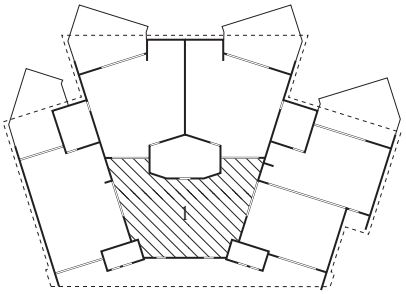
Recent Debate

Even though the limitations of prefab construction are known, the prefabrication of schools has recently been debated again in the UK (Emap, 2010). In order to reduce overall costs of educational procurement the UK government is promoting of the idea of prefabricated schools. However, there has been a mixed response from the architectural profession (Emap, 2010). There is a fear that modular and prefab construction will somehow limit flexibility (Emap, 2010), yet modular construction has the potential for exactly the opposite (Leupen, 2006).

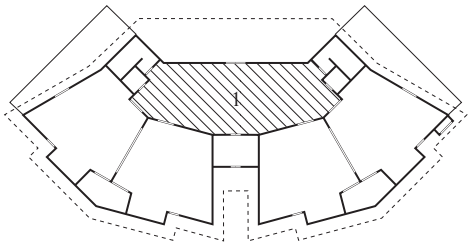
FOUR CLASSROOM SPATIAL TYPOLOGY CATEGORIES
(Adapted from MOE)

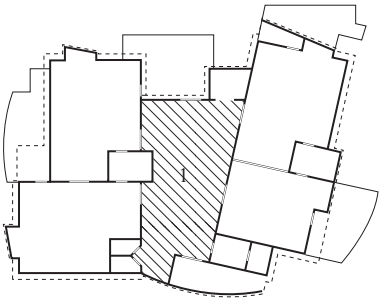






*1 = Shared Learning Space





After analysis it can be seen that educational facilities themselves are already inherently modular even if not constructed in a prefabricated manner. A prefabricated systems approach to educational design is not new by any means. However, today it has potential to address the overall life cycle cost of educational buildings and how to best design their facilities to allow maximum flexibility for the future (Gelfand & Freed, 2010; Ministry of Education, 2016).

This prompts the question 'what layers of educational design would benefit from being built off site in a prefabricated manner?

◀Fig 2.26.MOE Learning Studio Pilots. These floor plans were adapted from (Schools Infrastructure Group Ministry of Education, 2012).

Brand's Sharing Layers

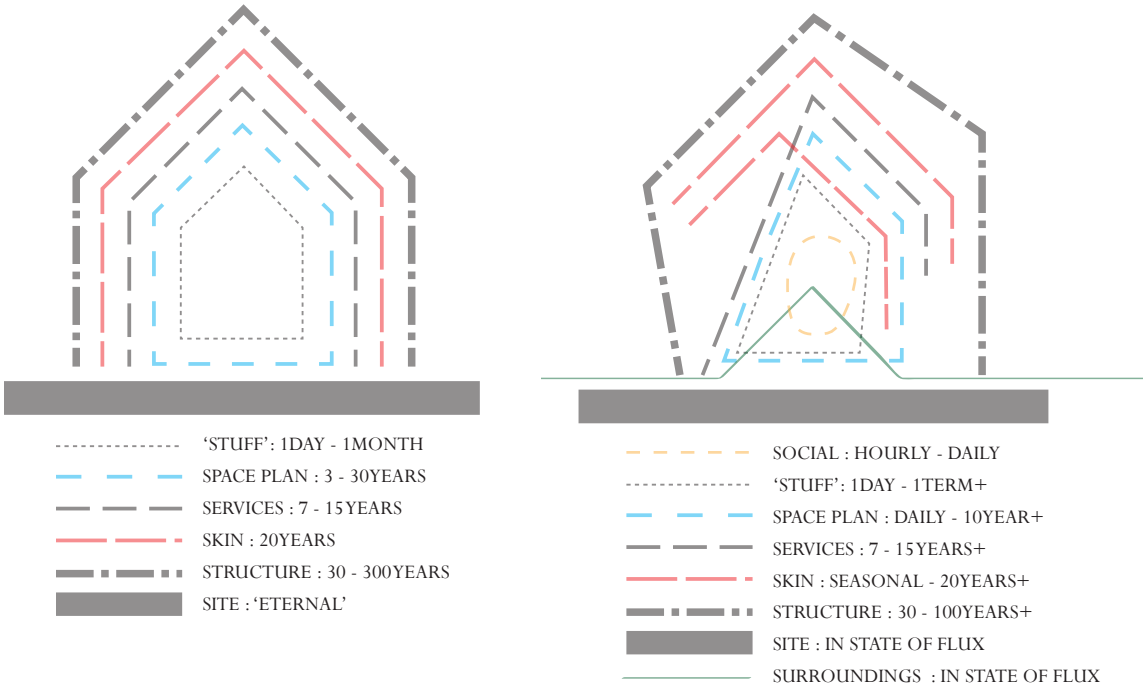
Stewart Brand (1994) proposed a layered approach to building design known as "Shearing Layers". This principle (shown below) divides architecture into six elements that change at different rates to one another. Although this addresses that there are different rates of change within architecture, it does not address the needs of fluidity and malleability needed in transitional space for education. This thesis questions this model by including the social interaction and dynamics of change in schools.

Questioning the notion in Brand's model that only the 'stuff' changes on a daily cycle, this thesis looks at the wider influences on educational architecture to ask what happens when…

Boundaries of these layers start to merge or overlap, and layers are added or duplicated?

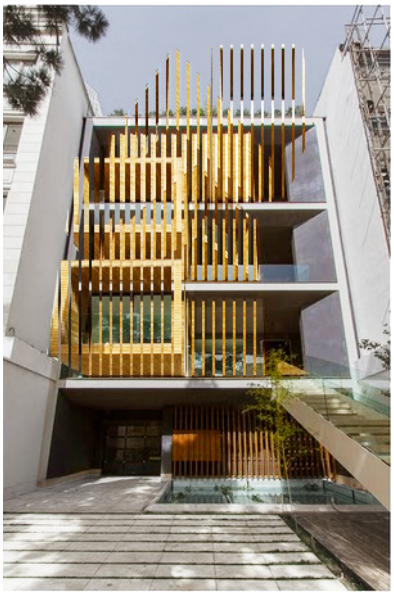
Facade becomes activated to promote change in the spatial and functional plan?

Site, as well as the surrounding context, get pulled into structure, viewing architecture as a continuation of site rather than a layered object on it?



▲Fig 2.27. Brands Shearing Layers and the proposed reinterpretation in response to the educational dynamics of holistic education.

SLIDE



▲Fig 2.28.Sharifi-ha House - Nextoffice - Alireza Taghaboni.Rooms pivot on the facade to extend space and alter internal climate conditions.

Learning from precedents

Some innovative 21st century architecture is beginning to address these questions and explore these issues. The following case studies are a selection of 21st century architecture that adopt principles of changeability. These are presented by the method of 'scanamation' to best represent the movement of areas in transition.

Case studies are as follows:

Shadowboxx - Tom Kundig - 2009

Wyly Theatre - REX- OMA - 2009

Resonant Chamber - RVTR - 2011

Loblolly House - Kieran Timberlake - 2007

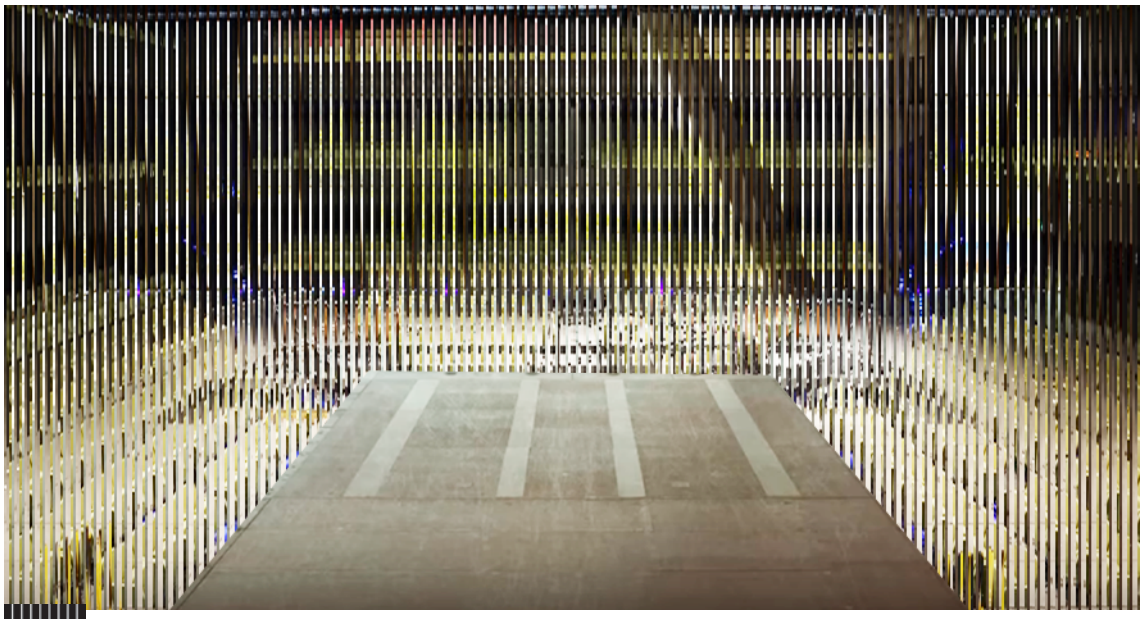
▲Fig 2.29.Shadowboxx. Facade in motion. Independent panels allow for diverse flexibility of enabling facade, allowing for multiple configurations of space.

SLIDE

▲Fig 2.30.Shadowboxx. An actuating roof is used to open an artists studio to the external environment taking advantage of counter-weights to allow for ease of movement

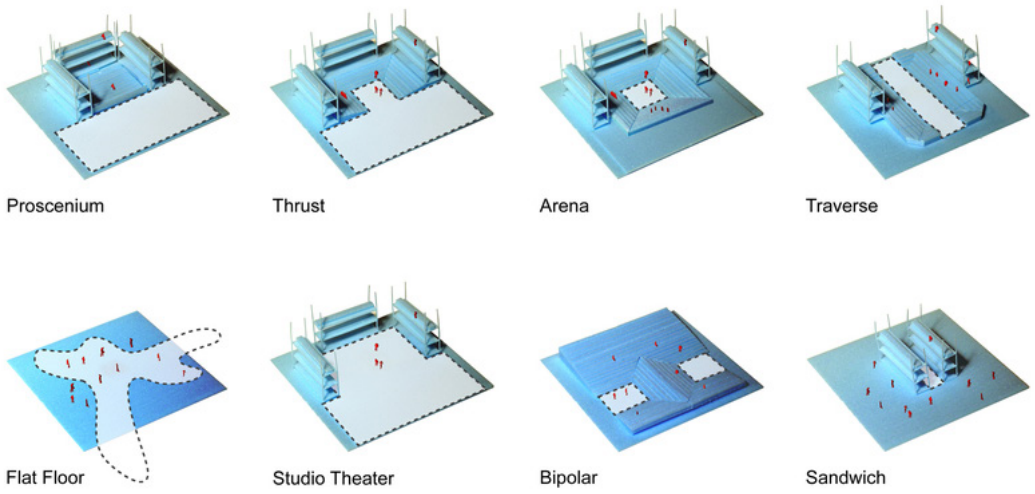
SLIDE

▲Fig 2.31.Shadowboxx. Actuating facade expands the internal space into the external environment. This transitional method allows for utilisation of the external space dependant on environmental conditions.



SLIDE

▲Fig 2.32.Wyly Theatre. Fully flexible internal open space with vertical storage systems allow adaptation to multiple configurations to suit different spatial needs of the theatre.



▲Fig 2.33.Wyly Theatre. Selection of potential arrangements of space (REX, 2009).

▲Fig 2.34.Wyly Theatre. An outdoor terrace converts to a auditoria when the facade opens up.

SLIDE

▲Fig 2.35.Resonant Chamber. Acoustically responsive ceiling panels are activated by microphone and controlled by dual hydraulic actuators on the back of each junction allow acoustic control.

SLIDE

▲Fig 2.36.Loblolly House. Awnings and a sliding double skin facade allow the internal form to open to the exterior. This undercroft becomes an extension of landscape and awnings shade the internal space.

THE FRAME
Defining Flexibility

Leupen (2006) discusses principles of changeability in the book 'Frame and Generic space'. Limiting his research to changeability during use, Leupen (2006) argues that spatial flexibility and functional flexibility can be achieved through the principle of the frame. The principle of the frame expands on multiple theories of layers in architecture; Laugier's primitive hut; Sempers four elements; Loos and Bekieldung's views on 'scenery; and Duffy's and Brand's Layers (Leupen, 2006).

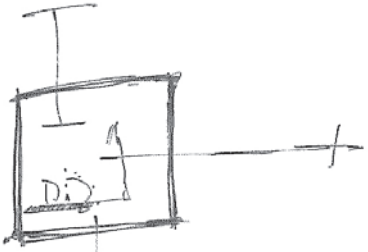
Whilst theories such as Brand's Shearing Layers discuss how architecture is layered and elements change at different rates in relation to each other. The theory of the frame argues that any one of these layers can "define the space in which the change occurs", thus making it the frame (Leupen, 2006). Leupen argues that the principle of the frame allows architectural space to constitute three levels of changeability, termed as:

Alterability - the ability to 'reconfigure space'.

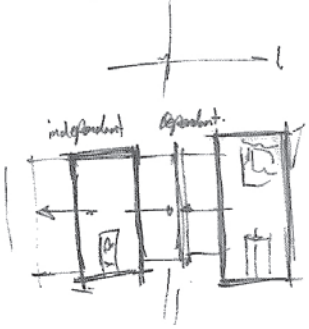
Extendibiliy - the ability to 'increase space'.

Polyvalence - open space in which amenities can be added or removed.

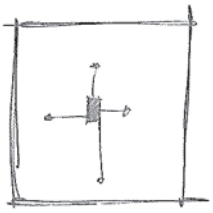
Alterability,



Extendibility,



Polyvalence.



This principle is not limited to individual layers, as it can consist of multiple layers or even split layers. Often referred to as the Matryoshka Principle (after the Russian dolls) layers are either related or independent to one another.

Critique of the Frame

Although the frame principle defines a set language to be followed to ensure space is changeable, it fails to address when one element switches between being the frame and generic space, or when the frame is the organism of inhabitation. In the theory of the frame, elements are discussed as either frame or change, however if frame is the element that "defines the space in which change occurs" (Leupen 2006), could the frame itself not be flexible?

If all layers are inevitably changeable then the principle of the frame should be viewed rather as defining of layers to be changed. Each having an influential effect, with degrees of independence and dependence on one another to construct architectural form in the evolution of the organism.

Change to promote enquiry and identity

When discussing change in pedagogy, spatial flexibility is often high up on the list to be discussed (OECD, 2013). However, change in education goes beyond the needs of spatial and functional flexibility. It has potential to promote enquiry and identity through the exploration and manipulation of architectural form, thus defining the environment as a learning tool itself. We are all born as active learners, as Dewey argues …

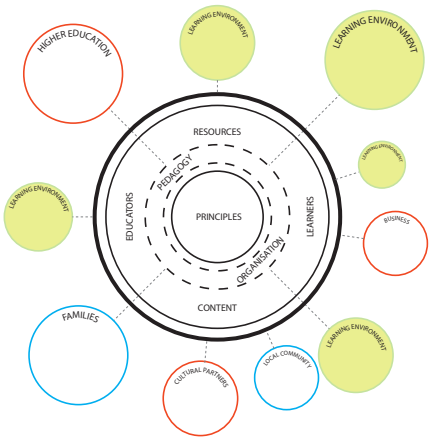
"Active manipulation of the environment is involved integrally in the process of learning from the start."

If the organism has the ability to define the frame then the frame can promote change and enquiry to be expressed in the active manipulation and continual design and evolution of the learning environment.

Changeable systems have great animation, they promote interaction and adaptability with little effort. If employed to educational architecture they have potential to advance interactions between the organism and environment as a learning tool.

THE ORGANISM AND THE ENVIRONMENT

There are clear indications that school environments have an impact on children's development. Multiple studies document links between spatial characteristics of schools and academic development (Kapadia, 2014; Schneider, 2002; Tanner, 2008; OECD, 2013). With the educational resources available today, this section briefly analyses how the interactions between organism and environment might look going into the future, and how architectural form could be used as a learning tool.



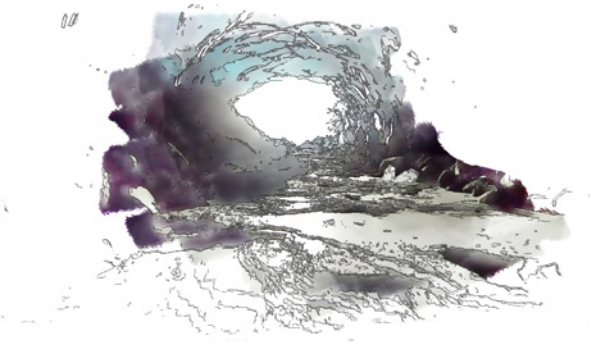
▲Fig 2.37.School Community Structure, Adapted from (OECD, 2009)

Most spatial and functional flexibility in education is currently addressed through predicting the spatial needs of different group sizes. Dr David Thornburg, educational advisor, (2007) discusses these scenarios through 'primordial metaphors' as illustrated. Whilst in a similar manner, Nair (2014) describes how to define space for child-centred learning in his book "Blueprint for Tomorrow". However neither really question the interactions between the organism and the space, neither look beyond group sizes and understanding how open space is defined by the user.

► Fig 2.38. Primordial Metaphors. Top to bottom The *Campfire* - Space where people gather, tell stories and share expertise (teacher centred learning), the *Watering hole* - Space where wider networks of groups gather and share information (peer learning), and the *Cave* isolated space to spend time with oneself and learn (individual learning). (Thornburg, 2007)

Campfire

Watering Hole



Cave

The Third Teacher

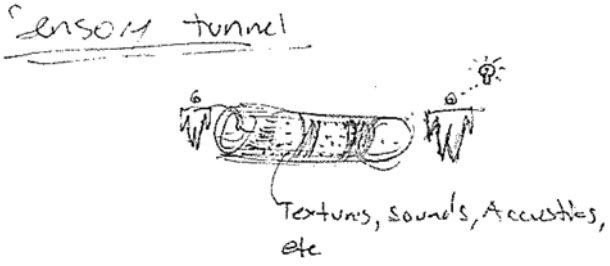
An early figure in the 20th century, Maria Montessori, was one of few educationalists who analysed the child and their interactions with the environment. Her studies and philosophy is often referred to as "The Third Teacher" (Luther, 2013). The first being oneself, and the second an external educator such as a teacher.

Her insight's, which have been further developed by others, including Loris Malaguzzi who developed the famous Regio Emilia approach, emphasize independence in children by allowing freedom of choice within the limits of the learning environment.

These theories and their impact on education pedagogy and space are being advanced by the integration of technology into the classroom (Istance & Kools, 2013; Groff, 2013; Mishra et al., 2013). Nair (2014) describes that technology needs to be viewed as the buildings themselves, as a key agent to change. Sirkemaa (2014) argues technology should only be adapted or used in ways that support the learning processes, not replace it.

Technology, plays an important part in current and future educational experiences. With limitations on predicting what might come next, the architecture of modern architectural spaces can only aim to be flexible enough to adapt to needs.

▶ Fig 2.39.The Child Explorer. Children are born with the want to explore the world and gain knowledge. The environment has the potential to act as 'the third teacher' to support and enrich the learning process.



◀ Fig 2.40.Interaction with environment. Textures, materials, acoustics and colours are play important roles in environmental stimulation.

In the special environment prepared in our schools, the children themselves found a sentence that expresses the inner need: 'Help me to do it by myself!

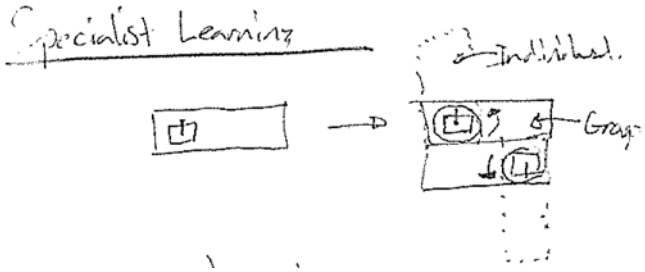
Maria Montessori, The Secret of Childhood

Defining Programme Requirements

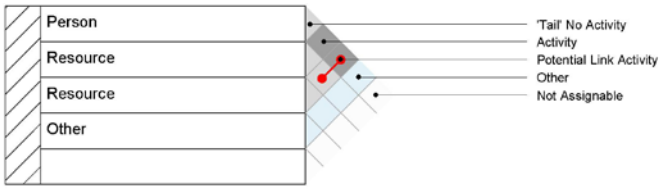
Educational experiences can occur between any number of people. The learning environment facilitates the opportunity in engaging in one of these experiences by providing academic resources, professional expertise, and/or a stimulating space that encourages exploration and discovery.

This matrix investigates educational opportunities typically associated with resources and personnel in learning environments. A selection of potential learning opportunities are highlighted along with spatial requirements to accommodate the needs of a particular programme.

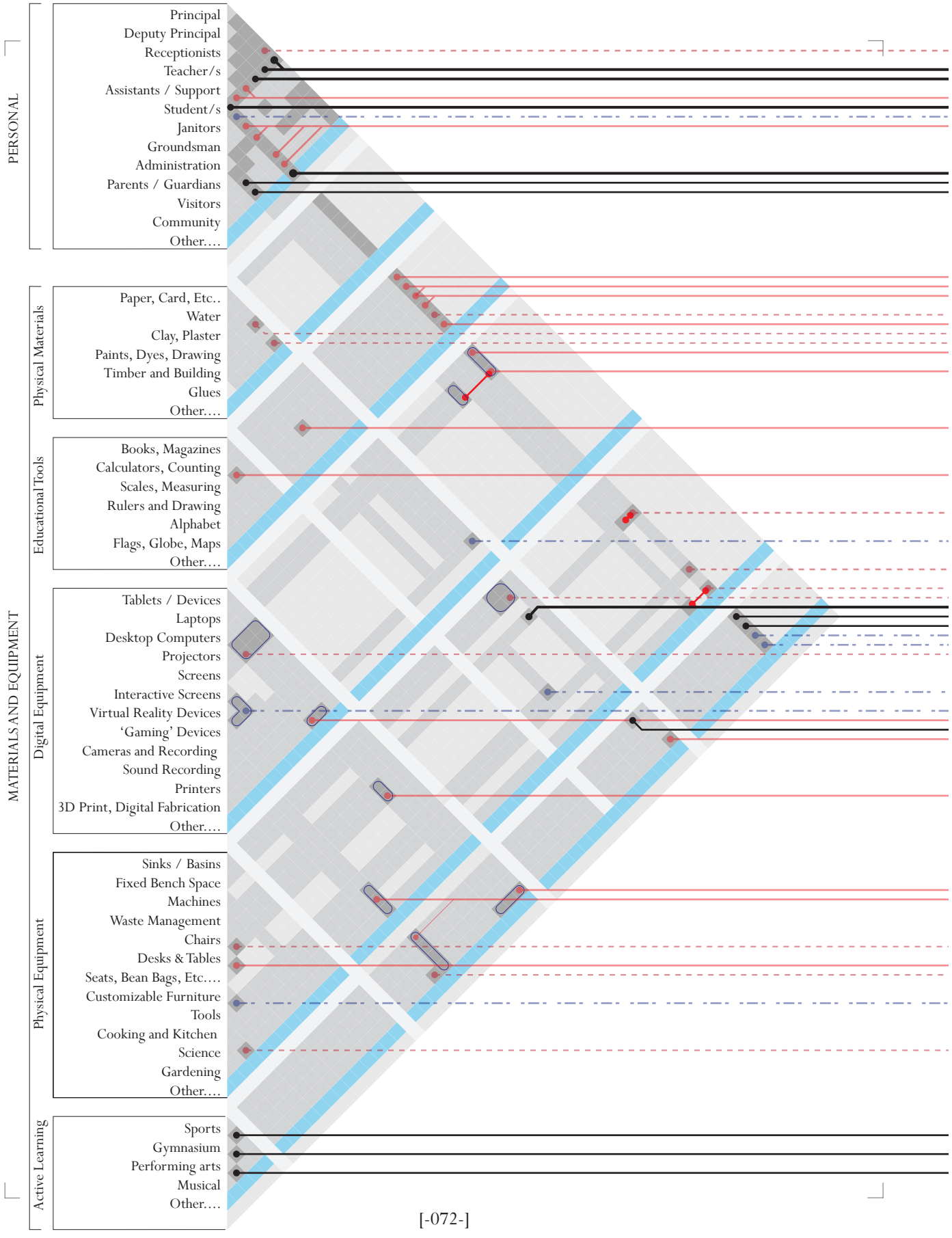
Although limited, due to endless possibilities, the matrix is a useful tool to establish an array of spatial needs that may be accommodated in a educational environment.

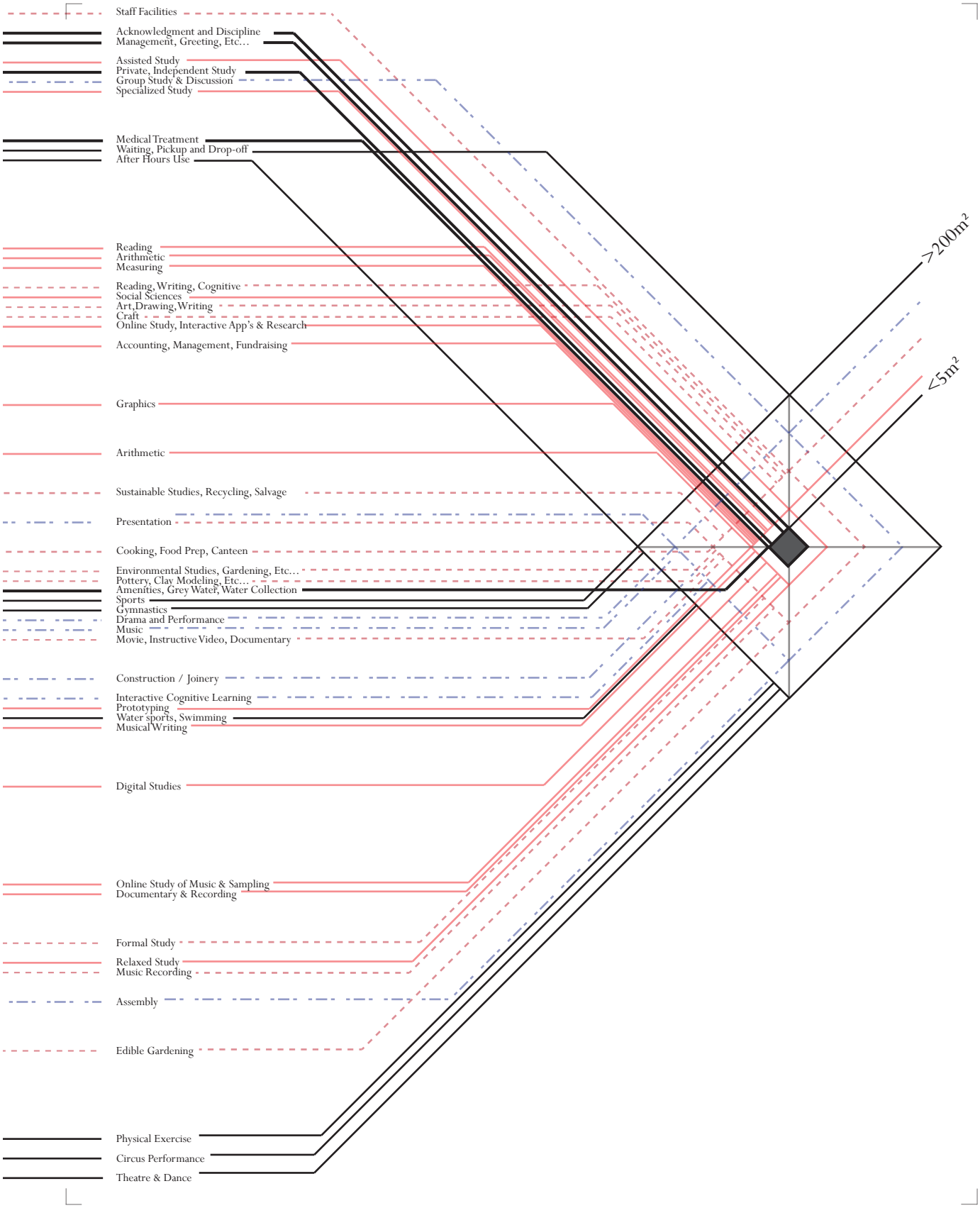


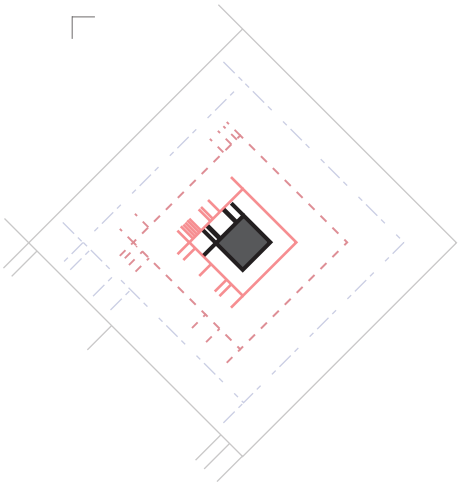
▲Fig 2.41.Interchangeability between group sizes and resource. The resources and environment should be flexible enough to accommodate for a range of educational group sizes.



▲Fig 2.42.Programme Matrix Key. The first half of this matrix (on following spreadsheet) is formulated as above. Personnel are highlighted and cross referenced to potential resources. When two resources can act in correlation it is highlighted by a red connection as above. The matrix concludes by listing a range of potential group and room sizes associated with each programme. Special design criteria are highlighted in association to each space.


PERSONAL
Principal
Deputy Principal
Receptionists
Teacher/s
Assistants / Support
Student/s
Janitors
Groundsman
Administration
Parents / Guardians
Visitors
Community
Other....
MATERIALS AND EQUIPMENT
Physical Materials
Paper, Card, Etc..
Water
Clay, Plaster
Paints, Dyes, Drawing
Timber and Building
Glues
Other....
Educational Tools
Books, Magazines
Calculators, Counting
Scales, Measuring
Rulers and Drawing
Alphabet
Flags, Globe, Maps
Other....
Digital Equipment
Tablets / Devices
Laptops
Desktop Computers
Projectors
Screens
Interactive Screens
Virtual Reality Devices
'Gaming' Devices
Cameras and Recording
Sound Recording
Printers
3D Print, Digital Fabrication
Other....
Physical Equipment
Sinks / Basins
Fixed Bench Space
Machines
Waste Management
Chairs
Desks & Tables
Seats, Bean Bags, Etc....
Customizable Furniture
Tools
Cooking and Kitchen
Science
Gardening
Other....
Active Learning
Sports
Gymnasium
Performing arts
Musical
Other....


ACTIVITY
APPROXIMATE ROOM SIZE
Staff Facilities
Acknowledgment and Discipline
Management, Greeting, Etc…
Assisted Study
Private, Independent Study
Group Study & Discussion
Specialized Study
Medical Treatment
Waiting, Pickup and Drop-off
After Hours Use
Reading
Arithmetic
Measuring
Reading, Writing, Cognitive
Social Sciences
Art, Drawing, Writing
Craft
Online Study, Interactive App's & Research
Accounting, Management, Fundraising
Graphics
Arithmetic
Sustainable Studies, Recycling, Salvage
Presentation
Cooking, Food Prep, Canteen
Environmental Studies, Gardening, Etc…
Pottery, Clay Modeling, Etc…
Amenities, Grey Water, Water Collection
Sports
Gymnastics
Drama and Performance
Music
Movie, Instructive Video, Documentary
Construction / Joinery
Interactive Cognitive Learning
Prototyping
Water sports, Swimming
Musical Writing
Digital Studies
Online Study of Music & Sampling
Documentary & Recording
Formal Study
Relaxed Study
Music Recording
Assembly
Edible Gardening
Physical Exercise
Circus Performance
Theatre & Dance
>200m²
<5m²



LEGEND

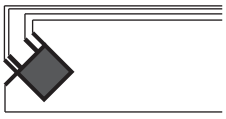
- Adjustable Lighting
- Advanced Temperate and Ventilation Control
- High Durability Finishes
- High Power Loading
- High Level Acoustically Treated
- Portable
- Secure Storage
- Temporary
- Wet area

* Grey Symbols = Possibility
Yellow = Visual conncetion only

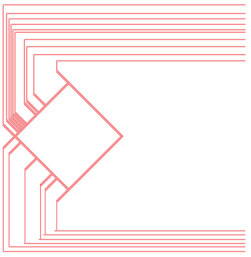
ROOMS

SPATIAL REQUIREMENTS*

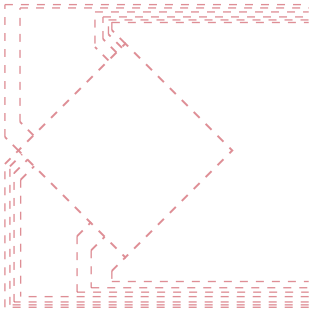
GROUP SIZE*



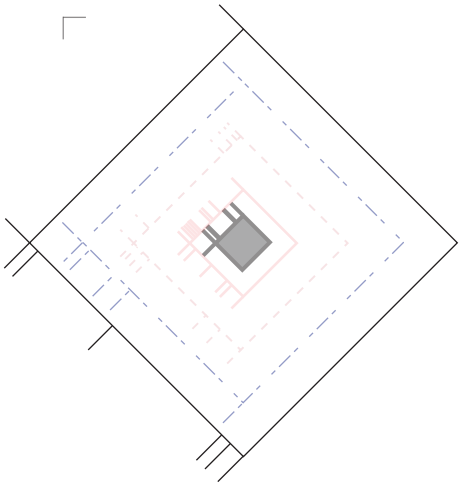
- Sick Bay, Accessible Shower and WC
- Quiet areas near/ in classrooms
- Reception office, Small meeting room
- Principles office, Deputy principles office
- WC, Grey Water Recycling, Water Storage



- Area within larger 'Learning hub', Storage
- "
- Administration office, Meeting room/s , Storage
- Server Room, Computer stations, & Docking station
- Area within larger 'Learning hub', Storage
- "
- "
- "
- Temporary meeting space
- "
- Informal quiet space 'Learning Hub'
- Small- Medium Room, Storage
- Quiet room
- Computer station for advanced computing
- Acoustic space, Storage
- Small - Medium ventilated Room, Storage, work area.



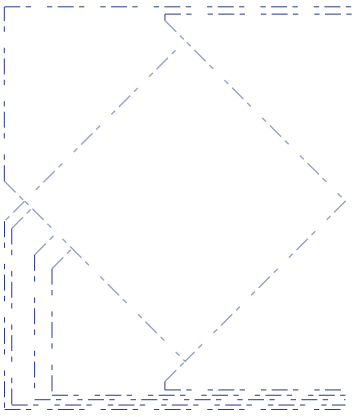
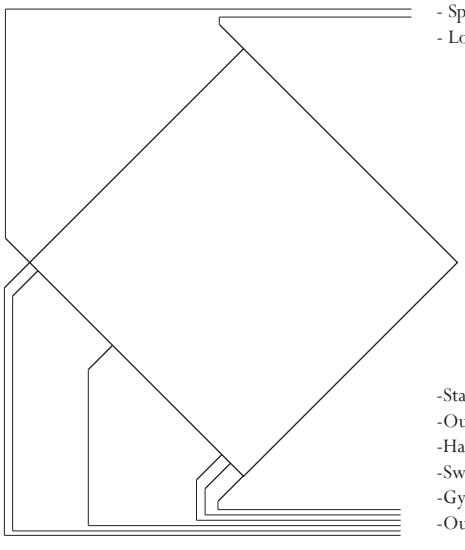
- Stage are with projection
- Recycling area/s, Display areas of Sustainable systems, Storage, wash room, landscaped area
- Workshop space
- Wet space, Storage
- Staff Room, Storage, Amenities
- Area within larger 'learning hub'
- Storage, Wash room, Outdoor garden space
- Wet area, storage, kiln.
- Learning hub
- 'Learning hub'
- Acoustic room, storage
- Environmental studies
- Kitchen & Severy, Cooking Class, Canteen



LEGEND

- Adjustable Lighting
- Advanced Temperate and Ventilation Control
- High Durability Finishes
- High Power Loading
- High Level Acoustically Treated
- Portable
- Secure Storage
- Temporary
- Wet area

* Grey Symbols = Possibility

ROOMS	SPATIAL REQUIREMENTS	GROUP SIZE
		
- Stage / alcove space	-	
- Larger open space	-	
- Large gymnasium	-	
- Large open space	-	
- Workshop	-	
- Temporary performance space	-	
- Temporary performance stage	-	
		
- Specialst facilities, Hall/Gym, Fields	- ,	
- Lobby, Reception, Outdoor space	- , ,	
-Stage, Hall, Storage	- , ,	
-Outdoor performance space	-	
-Hall, Exercise Yard	- ,	
-Swimming Pool, Esturary or Ocean?	- ,	
-Gymnasium / Hall, Equipment storage	- ,	
-Outdoor sports fields and possibly indoor courts, storage	- ,	

▲Fig 2.43.Amesbury Primary School. This space shown represents a diversity of internal furniture defining spaces which construct the modern learning environment.

Programme summary

It can be seen how complex education can be as an architectural programme, as this matrix only touches upon educational possibilities. The emergent environment that is education is unpredictable and should be flexible enough to accommodate a large array of activities and group sizes. Transitional space has the ability to address these issues and enhance spatial utilisation through the ability to accommodate for a variety of spatial relationships.

MOE's MLE/ILE framework sets out a spatial brief, and provides a set of guidelines termed as "Designing Quality Learning Spaces" (DQLS) (Ministry of Education, 2015a). While guidelines accommodate space planning however, it is the role of architects to question the architectural implications of these requirements.

The role of the 'third teacher' cannot be forgotten, as the school environment is more than a container providing different room sizes for education. As Harr (2002, p5) explains that schools are complex community facilities in which "the architect can serve as catalyst and collaborator, conscience and coordinator". The next section explores three MLE/ILE case studies in NZ and analyses them against the core scope of this thesis (Flexibility and Outdoor Learning Environments).


Amesbury Hall

MODERN LEARNING ENVIRONMENTS IN NZ

◀ Fig 2.44.Amesbury school main entrance

Analysis of the current model

Due to limitations of scope, this thesis does not attempt to explain in detail the MOE MLE/ILE strategy. Instead it looks into three key case studies in which have been implemented under this developing regime. These are…

Hobsonville Point Primary – Auckland -2013
Amesbury Primary – Wellington - 2012
Pegasus Bay Primary – Canterbury -2014

These case studies are analysed in terms of discoveries and learnings brought forward in the previous sections of this chapter. Outdoor learning environments and flexibility of space are both key points of analysis.

Assessment focus:

Articulation of Form

Outdoor Learning

Spatial Flexibility

'Transitional Space'

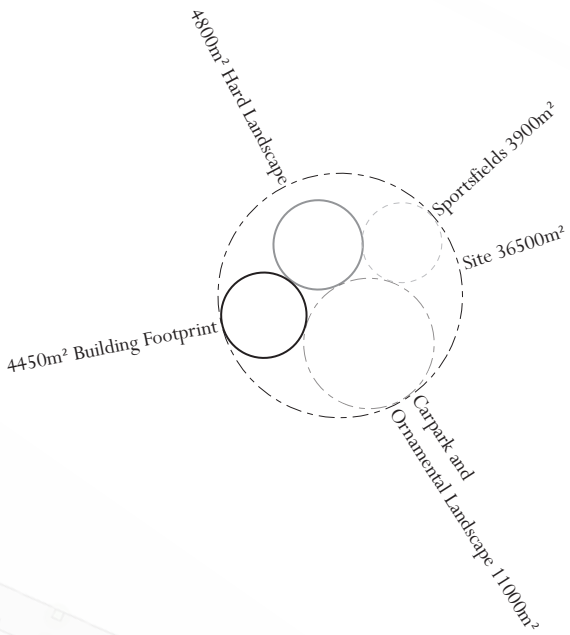
Wider Community

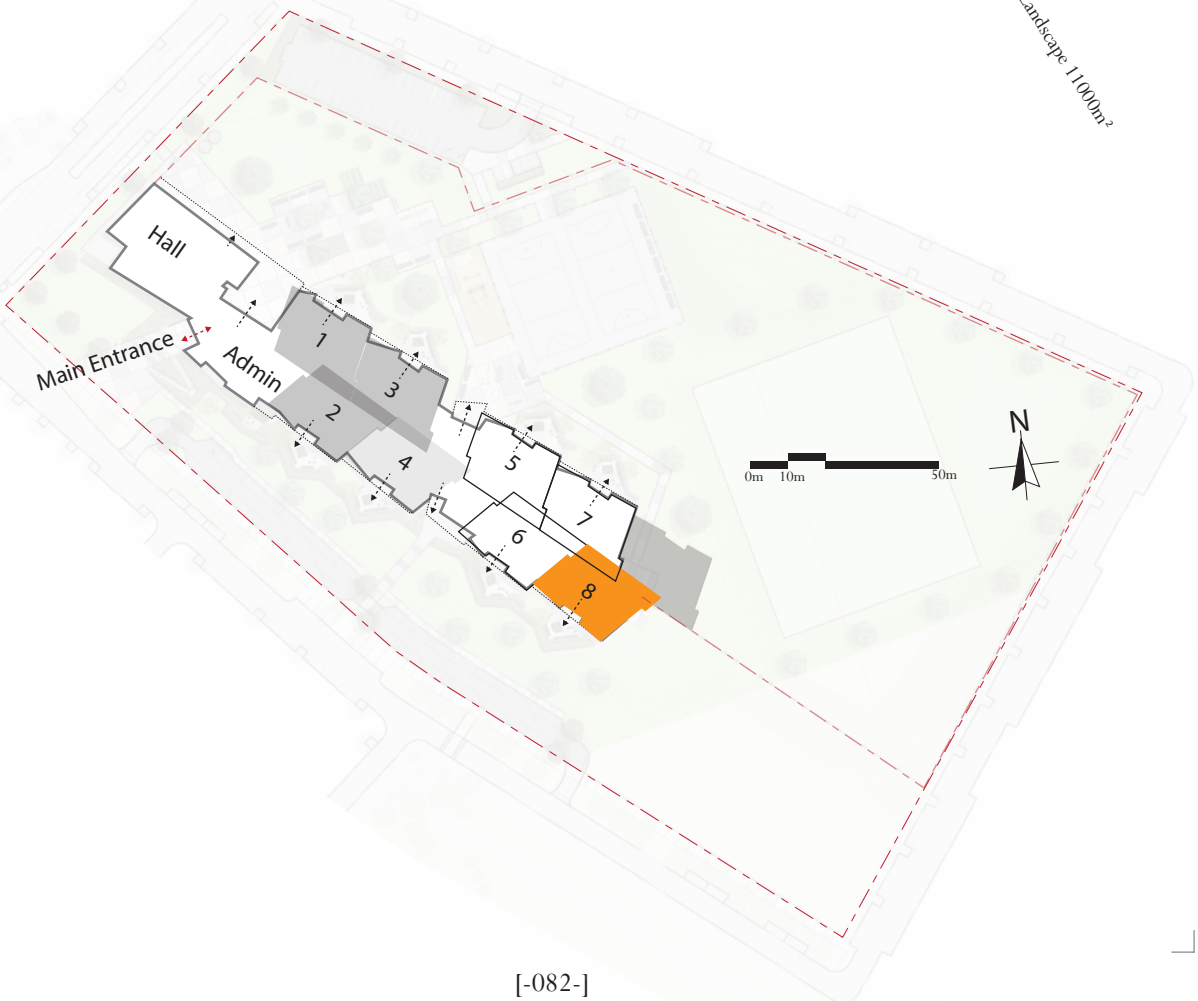
►Fig 2.45. NZ Map Case Study Locations


Hobsonville Point School
Amesbury Primary School
Pegasus Bay School

Hobsonville Point Primary

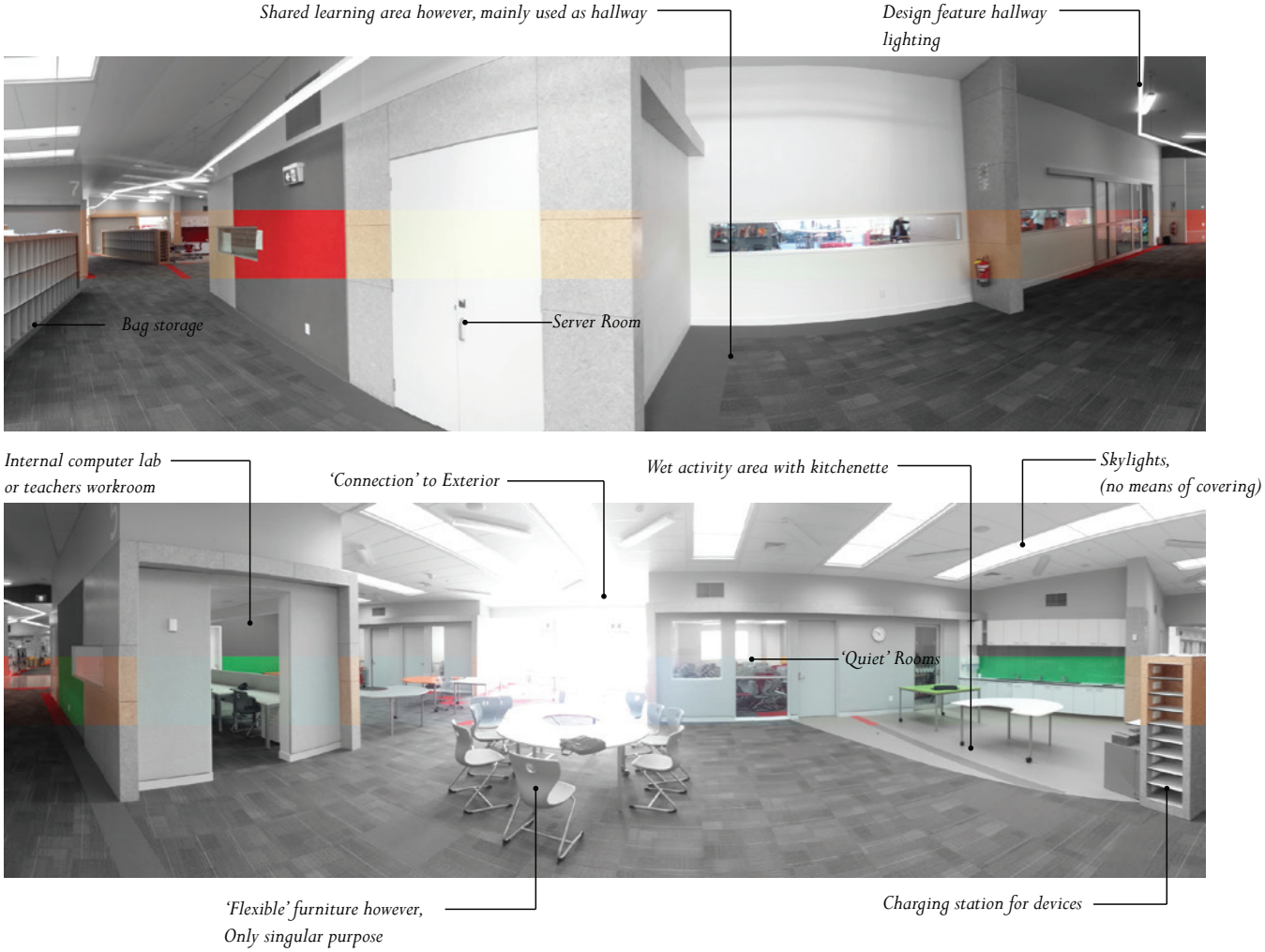
▼ Fig 2.46.Hobsonville Point Primary, Auckland, is situated on the South-Western border of the site. It is one large open plan structure with a Medium size hall and canteen area to the left of the entrance lobby and reception. To the right end of the building past reception and admin are eight 'identical' open plan inherently modular classroom layouts. Each space opens out to a small outdoor area, however this space is under utilised due to HVAC requirement for a closed interior and lack of flexibility, due to fixed furniture(site observation).



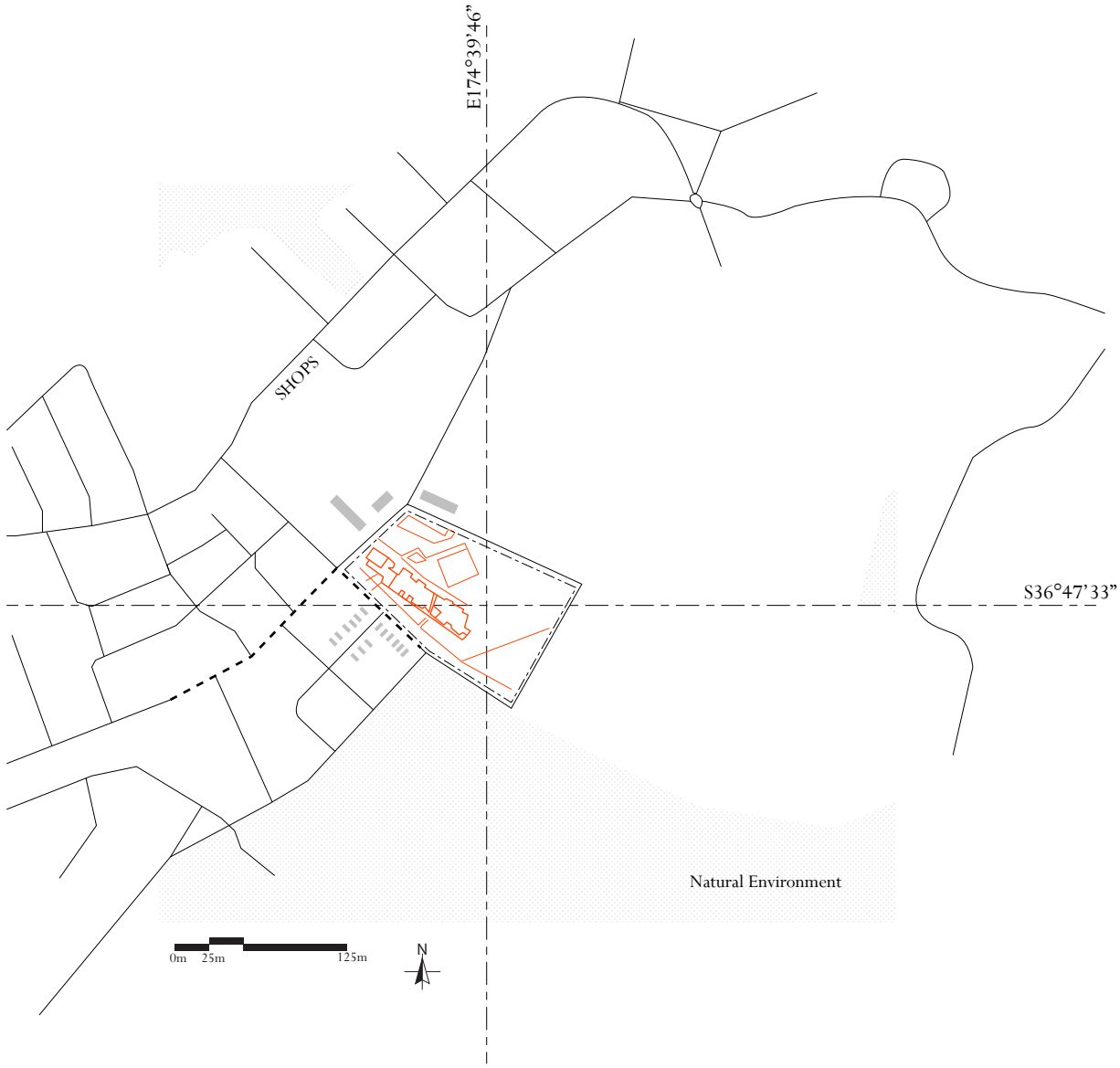


▲Fig 2.47.Classroom adjacent COLA, poor use of space due to lack of effective shade and layout and fixed furniture. Each space is formed as an enclosure, minimising potential benefits from the nature landscaped environment.

▲Fig 2.48.Main shared COLA, limited use of space due to fixed seating and inability to enclose from Nor-East winds (Principles remark on site visit).



▲Fig 2.49. One of many presently empty classrooms. This school is designed to have a maximum roll of 600. However, currently running at approximately 1/3 of its potential without potential flexibility to divide internal areas.



▲Fig 2.50.Site Location, the school is located in the heart of a new sub-division within close proximity to neighbouring shops and natural environments. This location allows potential for the learning environment to extend beyond the grounds of the school with relative ease.

Amesbury Primary

▼ Fig 2.51. Amesbury Primary school, Wellington, is situated towards the North Western side of a larger integrated park. The layout of the school isolates the school community whilst insuring that connections remain. The design is comprised of two separate buildings with one additional building to be built. The first building is a double story hall, admin and library area with 2 double classroom pods that breakout into shared learning spaces glazed sliding doors. The second building is a repeat of this classroom layout with 6 classrooms in total. The design maintains strong connections to the external environment however, no transitional space is provided.

▲Fig 2.52.An outdoor terrace is present of each classroom, however there are no provisions for wind control or enclosing the space and all furniture is fixed in place near the exposed edges of the space.

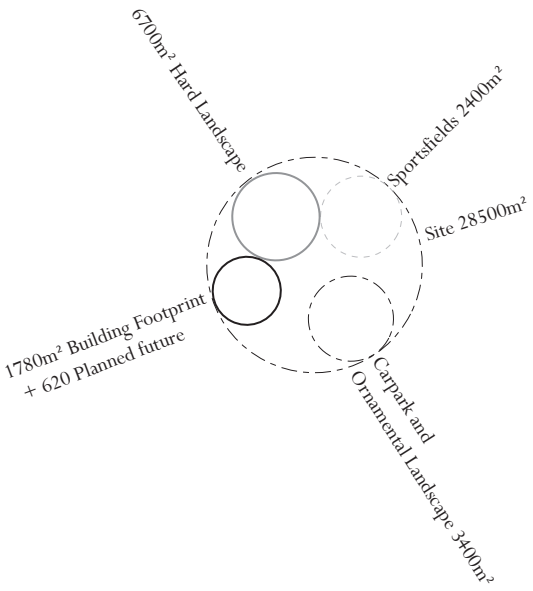
▶ Fig 2.53. Currently operating lower than maximum capacity the classroom spaces have a large quantity free space. This is enhanced by the positions of the furniture which dictate that the spaces remain open rather than being isolated.

▶ Fig 2.54.Compact storage is a feature of the library space to ensure optimum spatial utilisation.

▲Fig 2.55. Site Location, the school is located in a new sub-division within close proximity to surrounding housing. The school grounds open up to the community through the sports fields which draws the community onto the site and enables interaction between the community and school.

Pegasus Bay Primary

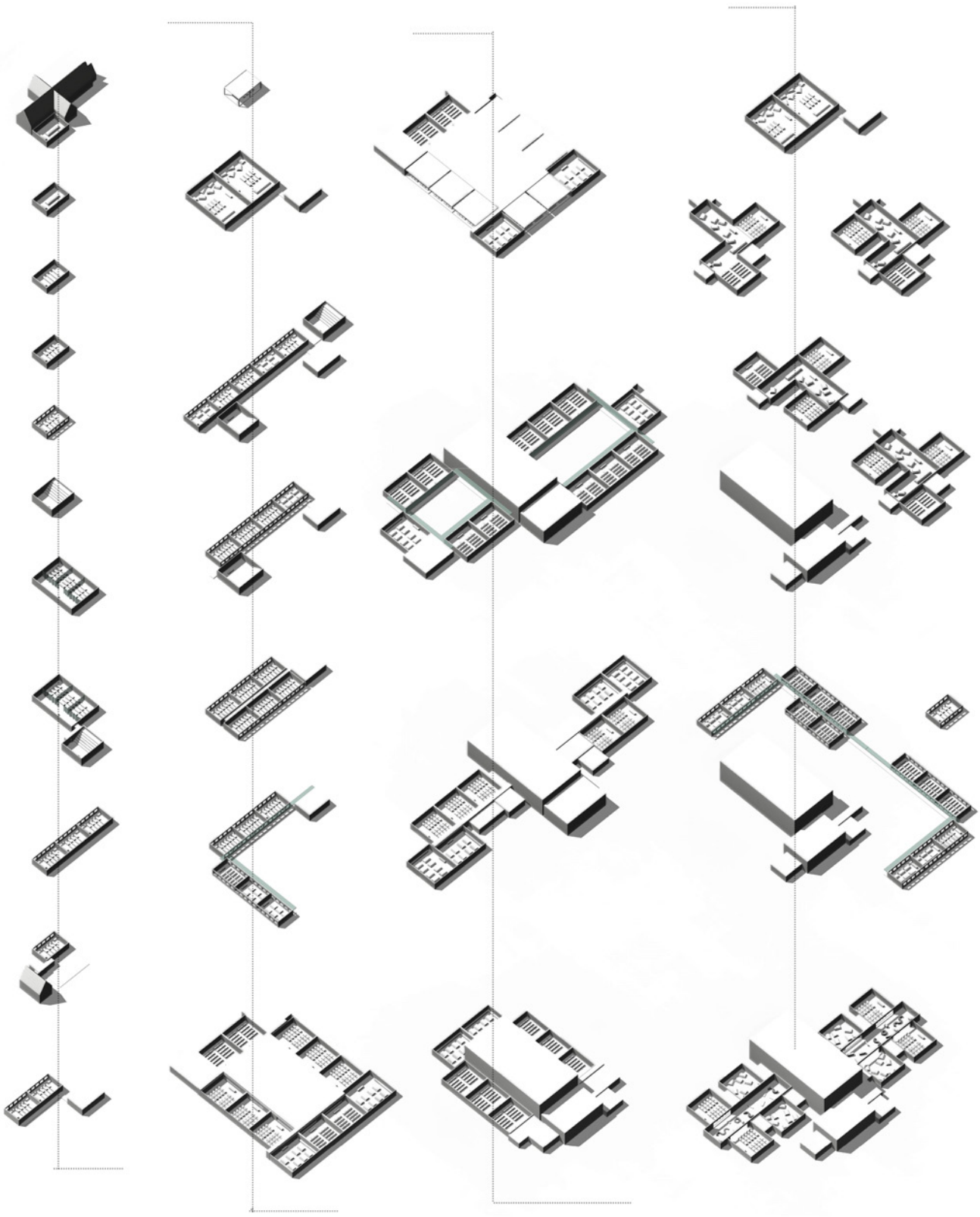
▼Fig 2.56.Pegasus Bay Primary school is one of the latest complete new builds to be constructed under the MLE/ILE framework. It's situated at the south east corner of the site with external facilities towards the west. The design is comprised of one large U shaped structure which is built up of three inherently modular classroom clusters and a centralised hall and admin core.



▲Fig 2.57.Direct connections to the outdoor environment are present from nearly each space. However, there is little in the way of covered outdoor space, or even trees for future shading of play areas. Solar panels are an additional feature of this school however, in the future, these features should be a requirement.

▲Fig 2.58.On average two classrooms share each learning space, the classroom arrangement allows for multiple group types to be active in one area simultaneously however, there is little transitional flexibility beyond small furniture layouts.

▲Fig 2.59.Site Location, the school is located in a new town surround by four streets and housing. Completed in 2015 this school focus more on internal connectivity rather than expanding beyond the site.



Conclusion and reflection

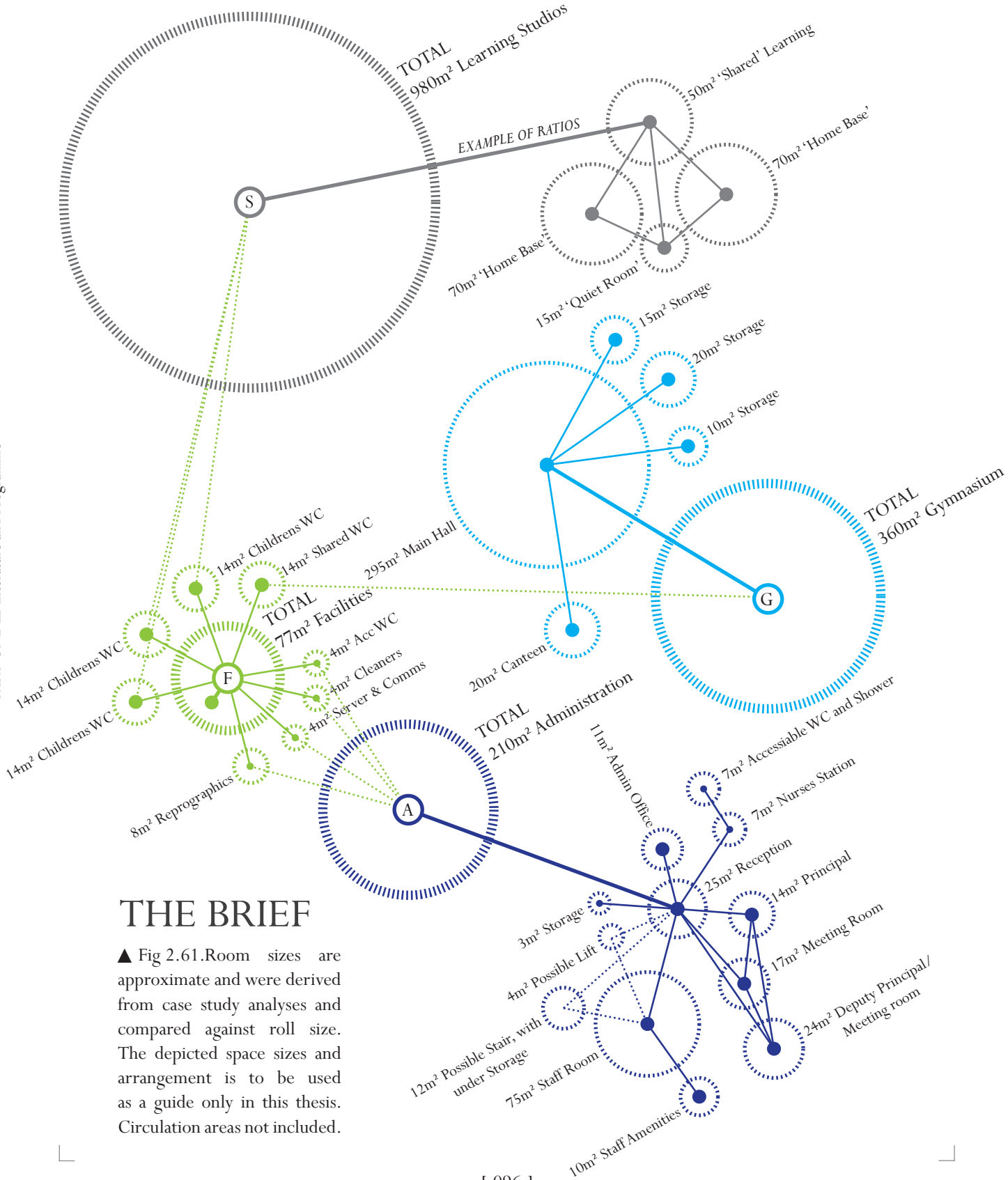
This chapter highlighted that educational architecture is always in TRANSITION. Education constantly evolves and reshapes; trends come and go; pedagogical ideals have their time and place; and technology constantly gets outdated by something new.

The true extent in which these factors influence the architectural form of educational space is still being understood by many educational researchers and professionals. However, learning environments must be flexible enough to accommodate future needs.

It is proposed that a holistic approach to educational design, that integrates flexibility and Outdoor Learning Transitional space as core principles, can enable further flexibility and advance educational opportunity for future primary schools.

The brief and evaluation criteria outlined on the following pages aims to develop a framework of principles that enable architectural form to respond to an emergent curriculum where the planned or formulated structure can change and evolve, to the needs of the organism overtime.

◀ Fig 2.60.A brief selection of evolution of typology from the past. What will be next?



THE BRIEF

▲ Fig 2.61.Room sizes are approximate and were derived from case study analyses and compared against roll size. The depicted space sizes and arrangement is to be used as a guide only in this thesis. Circulation areas not included.

Criteria for evaluation of design explorations

The following criteria is in summary to the previous chapters and is to be used as an evaluation criteria and framework for the subsequent design explorations.

- Connectedness

The design should promote active community engagement and outlook (Physical and Visual).

However, safety is an important factor to consider. On one hand the design should be able to open up to community and enable social interaction, whilst, on the other it must provide a safe and comfortable environment of educational opportunity.

- Learning Space Thresholds

Every space should be considered a learning space.

As such equal weight should therefore be placed on the importance of all areas in the school precinct.

- Transition and Transitional Space

Particular attention should be played to the ability of space to act in transition and as an outdoor learning environment.

Transitional space and the integration of outdoor environments with the classroom has many benefits for flexibility and exploration of the environment as a learning tool. *Transitional space* can actively change the environment. *Transition* can allow the design to change over time and enable advanced flexibility.

- User Customising

The design must incorporate a high level of flexibility and diversity in spatial and environmental layout.

There is variation in the needs of pedagogy as well as programmatic constraints to CCA and a Holistic education, therefore an increased level of flexibility to allow user customising of space is desired.

- Identity

The design should have the ability to showcase the identity of the school and surrounding area.

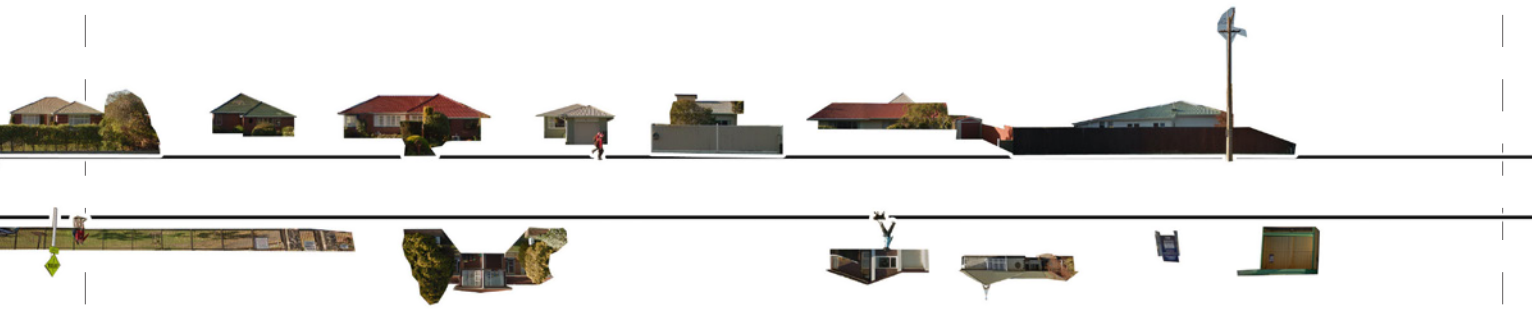
As a public community amenity the design must both respect scale and density of the area whilst 'standing out' to become a representation of community. Areas should allow for display of child generated work and showcasing of the learnings of the school.

- Accessibility

The design should take into account accomodating for accessibility, however due to the limited scope this will not be analysed.

PART TWO

SITE AND CONTEXT



CONTENTS

INTRODUCTION

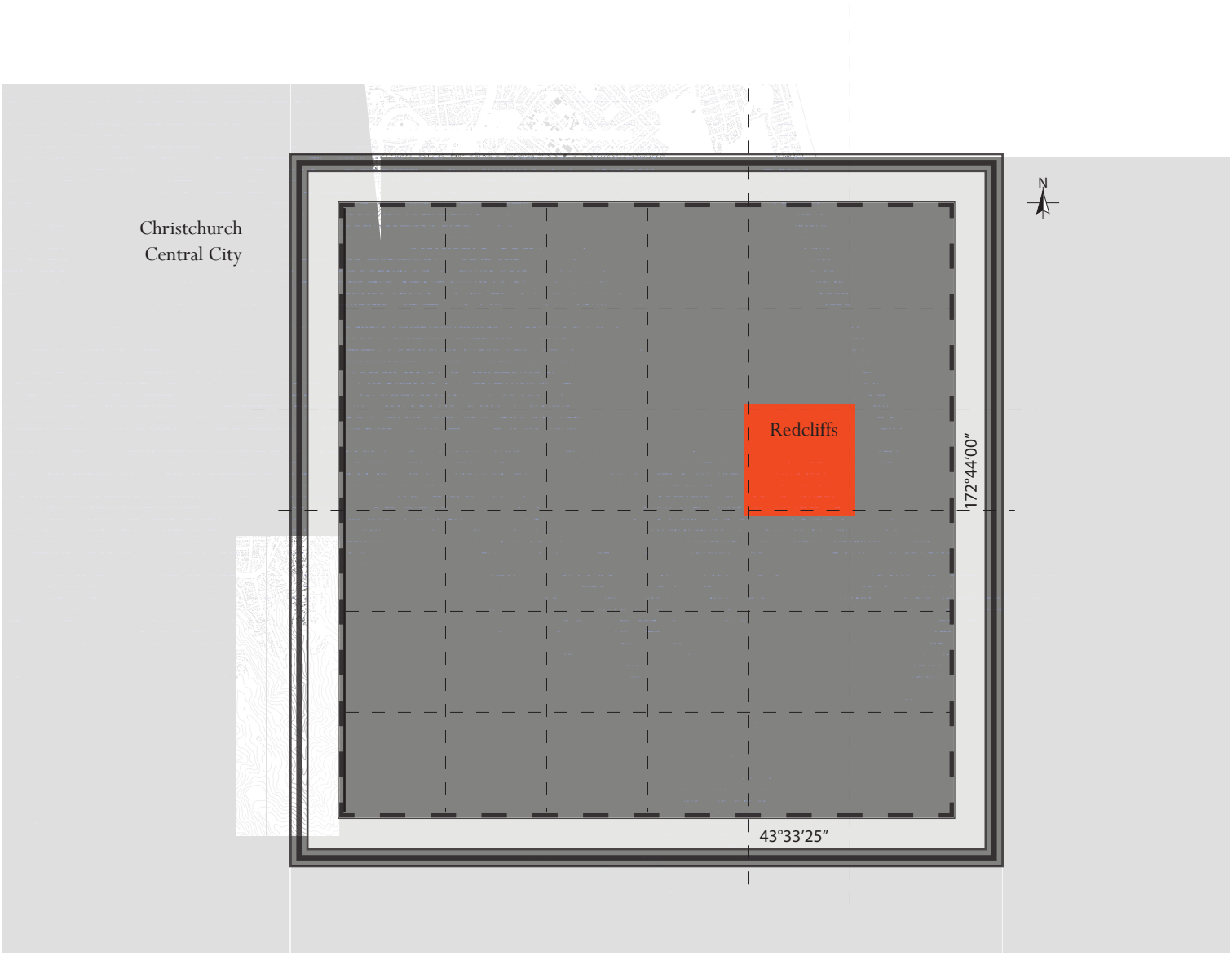
Redcliffs, Christchurch, NZ was selected as a catalyst region and site for this thesis due to its involvement, or lack there of, in the Christchurch School Rebuild Programme (CSRP). The former Redcliffs Primary School is scheduled to be permanently closed at the end of 2016 due to dangers of the neighbouring cliff-face post earthquake.

The Redcliffs community is in strong opposition to this closure and as Haar (2002) notes, schools can perform as a social hub serving as a catalyst for "strengthening and revitalising the entire community." The integration and resilience that a school facility can promote in communities became even more apparent in Christchurch after the 2011 Earthquake, in the post-quake recovery phase when their functions became more than school.

▲ Fig 3.1.The temporary camp ground. Mt Pleasant school field post earthquake.

This section analyses a potential site for a new School complex within the Redcliffs region and situated on the existing Redcliffs Park, which is in close proximity to the existing 'unusable' site.

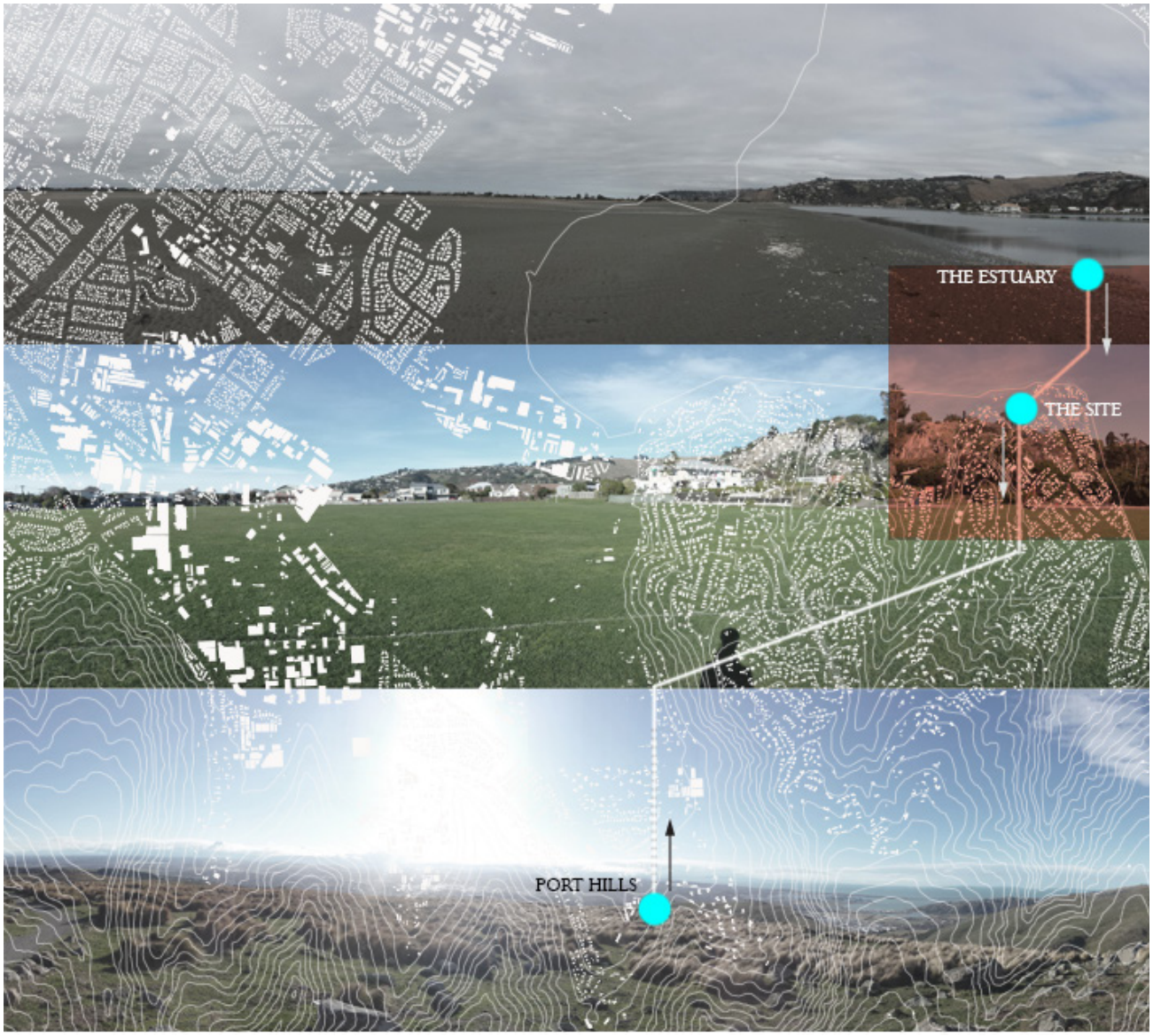
It is argued that the proposed site engages the local topography and community connections by situating itself on the junction of major axis within the region. This provides for advanced learning opportunities that provide opportunities to integrate site as a learning tool, and an opportunity for the school to develop into a new community and social learning hub.

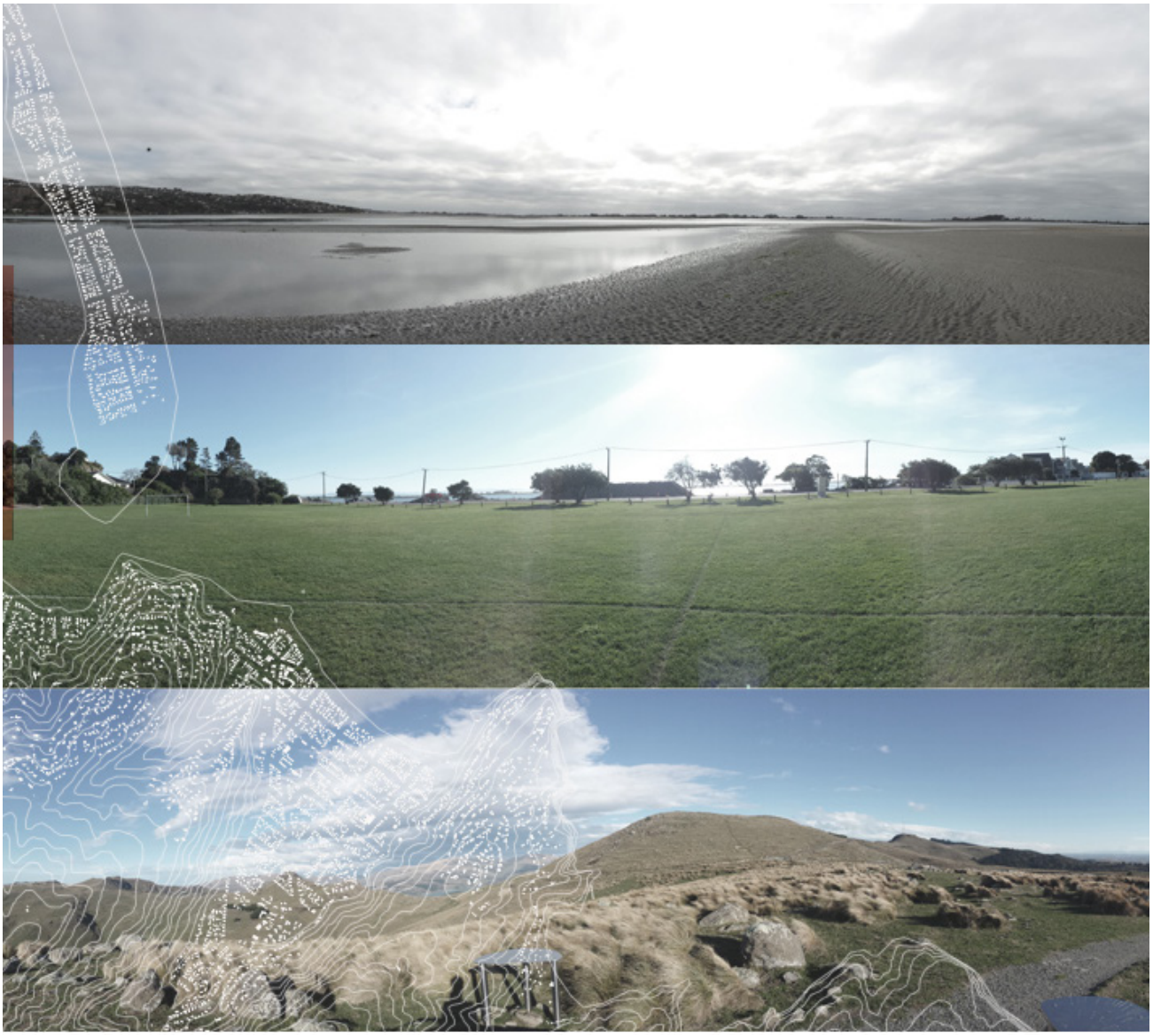


▲ Fig 3.2.Redcliffs Site Location Map

SITE PROXIMITY

In convergence between two worlds



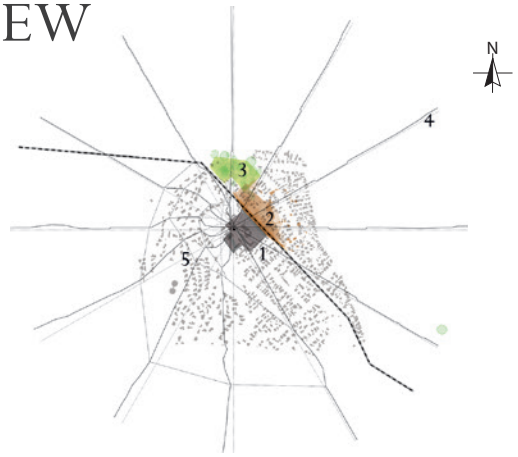


▲ Fig 3.3.Situated in transect between the Port Hills (lower image) and the Avon-Heathcote Estuary (upper image) Redcliffs is emerged in a world of transition, it is where the rivers meet the sea and the hills. This dynamic of site places utmost importance in the situation of Redcliffs as a suburb as it converges with the natural systems that surround and run through it.


Tunnel from Port
Train from Port
To Lyttelton port
To City
N
Esplande Walk/ Cycle Track
A
B
REDCLIFFS
Population - 6500
To Sumner
C
Esplande Walk/ Cycle Track
Sumner
Taylors Mistake

OPPORTUNITIES OF A NEW

Site selection and analysis



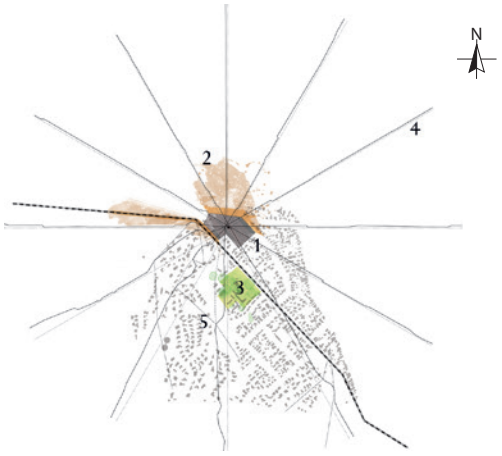
▲Fig 3.6.Site A - Analytical Summary Diagram*

Three open land sites in the Redcliffs region were chosen for a site selection analysis.

Site A - The former Redcliffs primary school site (however reduced in size due to the unstable cliff face that juxtaposes two site boundaries.

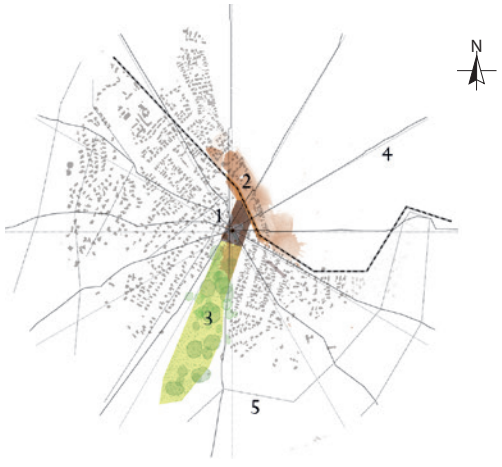
Site B - The current Redcliffs park site. Similar in area to former school site before earthquake. This site relates to the cliff on the adjacent side from Main Road and to the estuary to the north.

Site C - Current Barnett Park site. Largest site in area however it is removed from the heart of the Redcliffs suburb.



▲Fig 3.5.Site B - Analytical Summary Diagram*

◀Fig 3.4.Redcliffs Suburb, Population approximately 6500, Three potential open space sites are highlighted for development of a new primary school complex.



▲Fig 3.7.Site C - Analytical Summary Diagram*

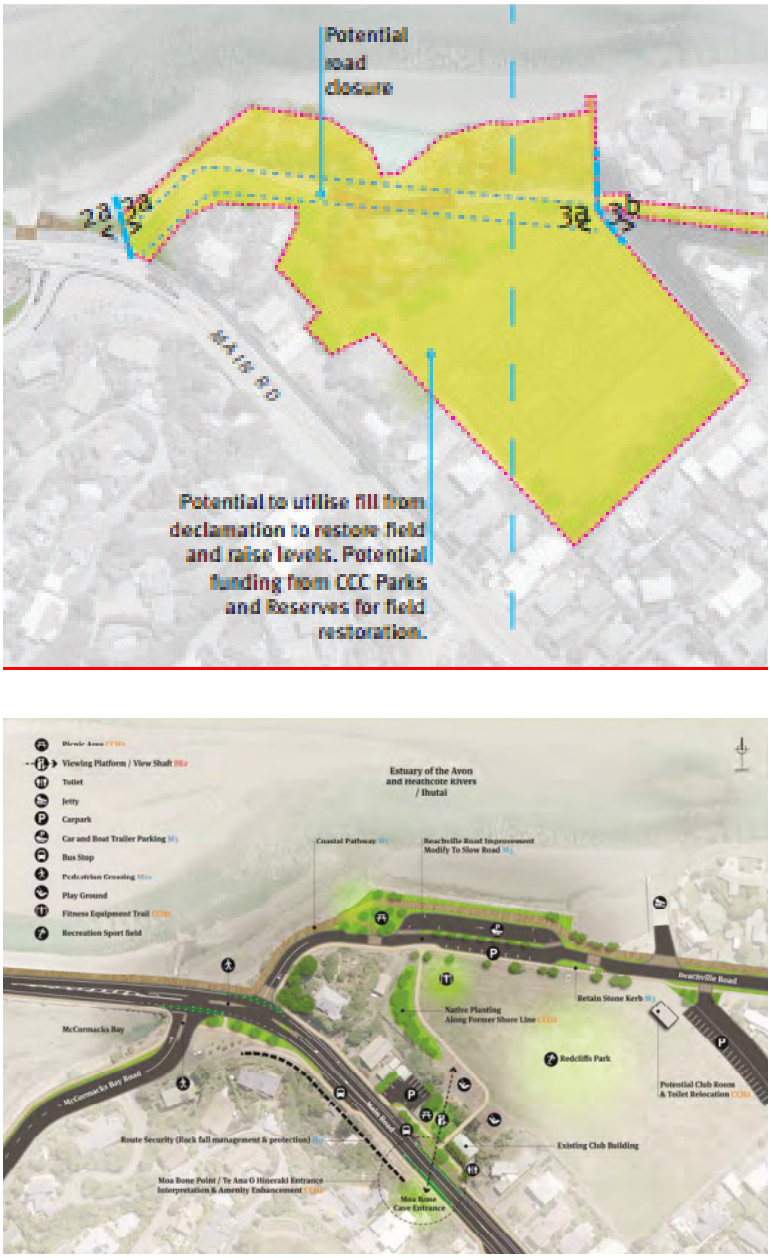
* Legend
1= Site,
2= Outlook to Communal space,
3= Neighbouring recreational space,
4 = Land contour sections,
5= Ridge lines connecting sections.

The chosen setting -Site B (Existing Redcliffs park)

▲ Fig 3.8.Looking at the site from potential future shared road area. Current occupation is 'blank land'.

Site B is in a unique position. Currently as the existing Redcliffs park, this site is close to the former 'hazardous' school site. Being roughly the same site area, with potential to engage beyond the constraints of the site (Fig 3.9. Opposite). The site holds the ability to address access from multiple streets and retain park functions outside of school hours.

This area is set to be redeveloped to include the new Christchurch coastal cycle way (Fig 3.9. opposite), it will pass by the northern border of the site allowing for an integrated and safe school community forecourt and slow road (Coastal Pathways, 2016). Current plans dictate the closing of this road and the restricting of the park however it provides a unique opportunity to address school safety concerns around access from Main Road.



▲ Fig 3.9.Potential site expansion limits, and revised site plan. Whilst the image (top) highlights the potential for the site to engage with the estuary, the proposed plan suggests that there will be a disconnect between the two due to the proposed abundant amount of car parking.

SITE CONDITIONS

A net (kupenga) for change

Due to the Christchurch earthquake many areas in Redcliffs have been 'Red-zoned*'. This has vast effects on the built form of the area making most of the area around the cliff face 'bare land'. Currently there are some dwellings still situated within this zone, however they are currently in the process of being removed. Once these are removed there is potential to be a strong connection between the green space left behind and neighbouring sites.

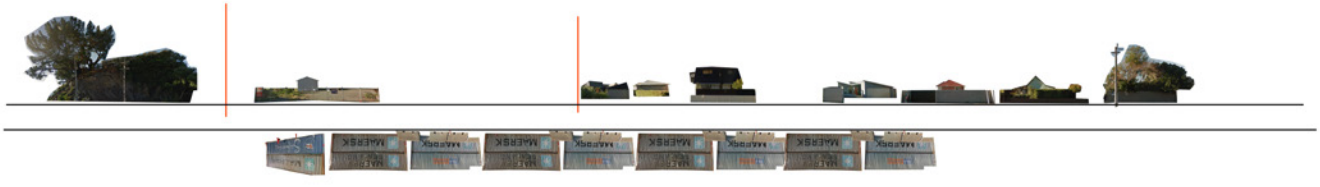
The selected school site situates itself at the end of this 'red-zone' in connection with the Avon -Heathcote estuary, acting as a net between. It is proposed that this relationship and flow is important to this site and the built form should reflect and engage with these wider connections. These connections could be allowed for in the provision of outdoor learning transitional space.

*Red-zoned = Land unsuitable for building.

► Fig 3.10.Site images

► Fig 3.11.(Opposite) Site conditions and main road elevation conditions.


N
0m
50m
200m
Estuary
Cliff Face



ENVIRONMENT

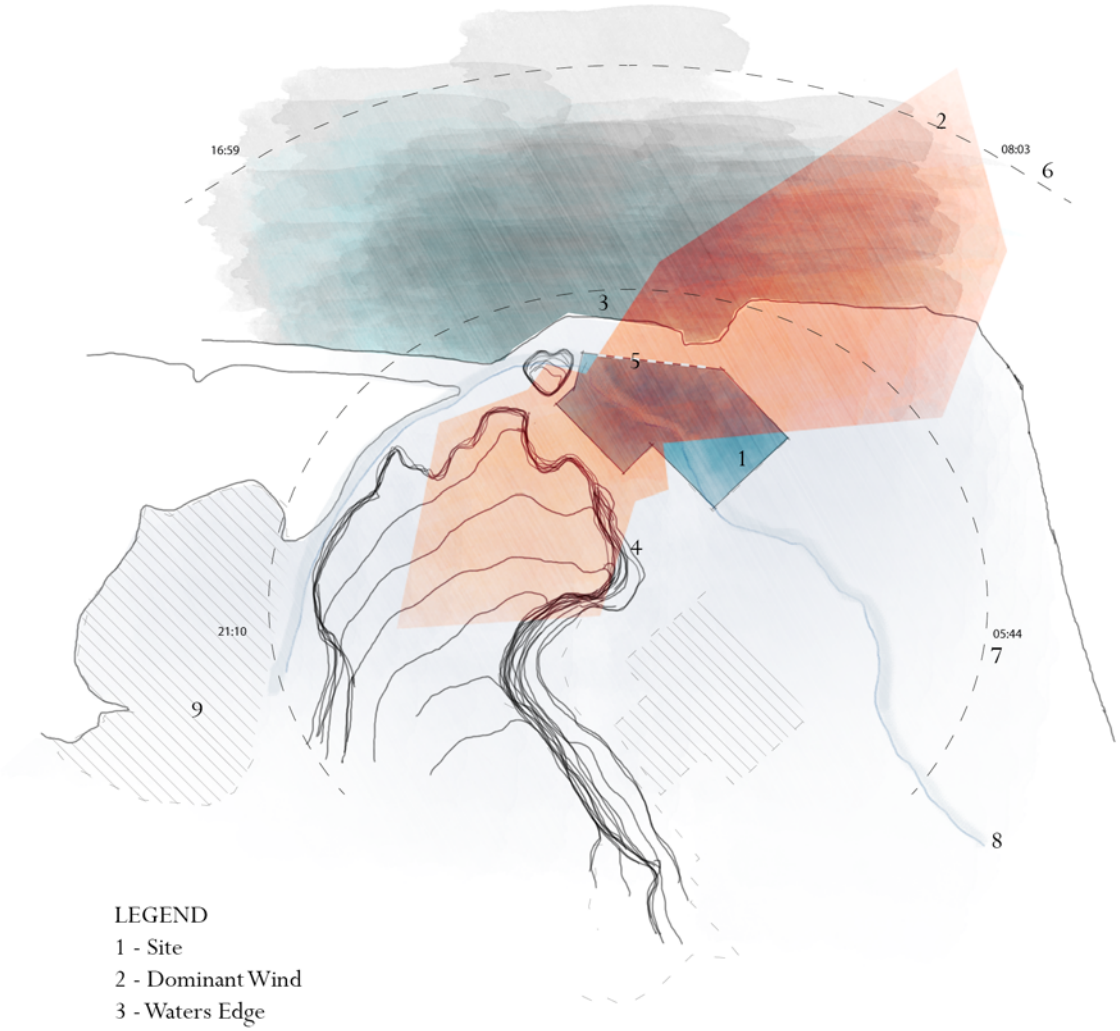
A transect of two fronts

This diagram highlights environmental factors of site and exposure to weather temperaments. The site is situated at the crossroads of many environmental factors, however at the same time is sheltered from overwhelming effects. Prevailing Nor-East winds are partially blocked by surrounding houses, whilst the chilling south-west wind is mostly blocked by the surrounding cliff face.

The surrounding public green space, in combination with surround waterways provide unique learning opportunities and engagement between the school organism and the wider site.

The generated designs are to take into account the highlighted climate conditions.

► Fig 3.12.(Opposite) Site Environment



LEGEND
1 - Site
2 - Dominant Wind
3 - Waters Edge
4 - Cliff Face
5 - Wind Effect on Site
6 - Solar Exposure Winter
7 - Solar Exposure Summer
8 - Potential 50year Flood Plain
9 - Public Green Space

0m 50m 200m

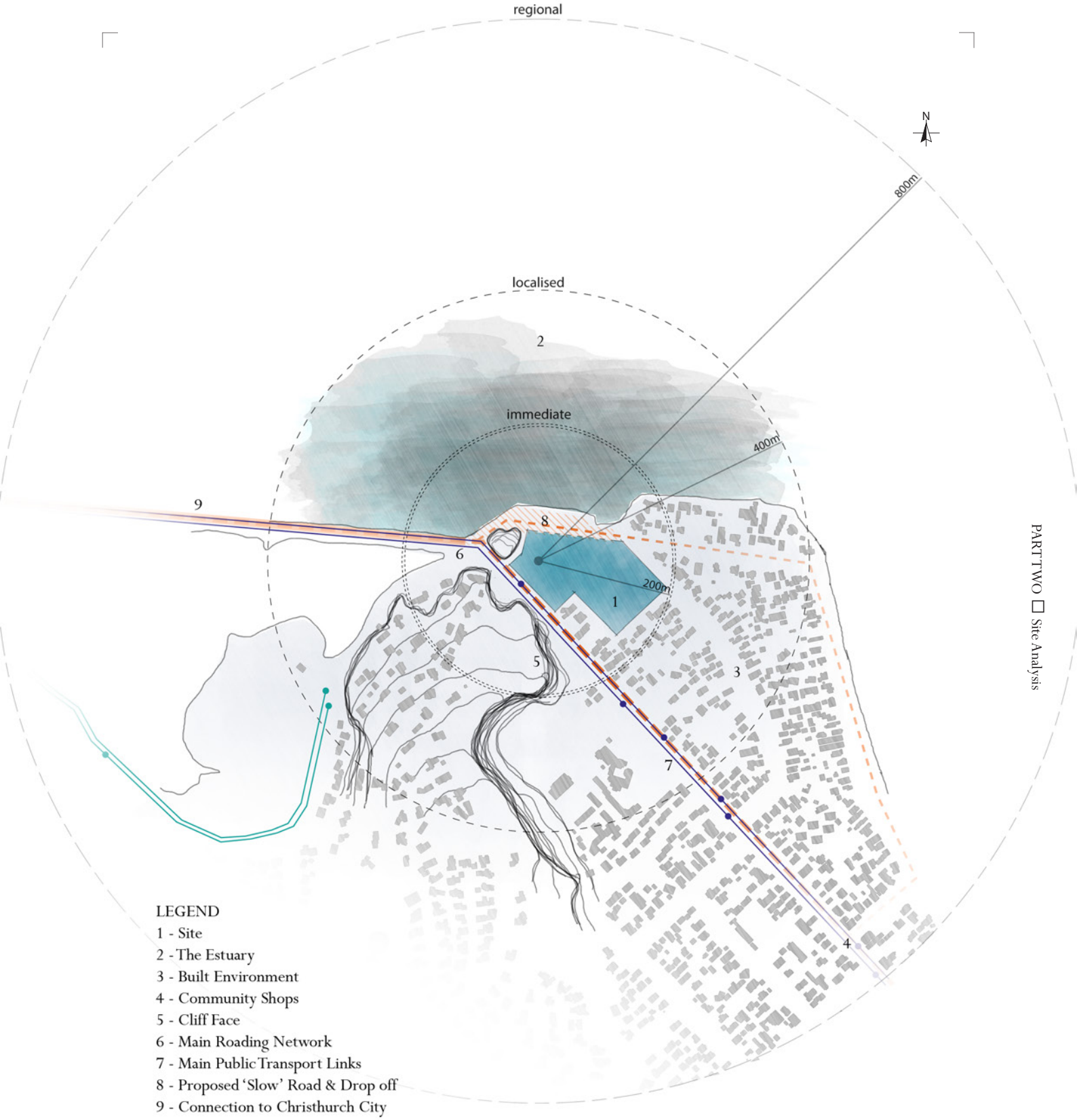
NETWORKS

Engagement with community

The following diagram highlights the networks in connection with and to the site. The natural surroundings help to understand the ecology and history of the site. A sense of relationships between the ephemeral and permanent pivot themselves around the site drawing connections between, in an ongoing narrative of change and emergence.

Whilst the built environment relationships frame the site and engagement potentials. The connections to the local, regional and wider communities are expressed through main transport links. The site could be framed as a gateway to the Redcliffs community, as highlighted in the next section.

► Fig 3.13.(Opposite) Site Networks

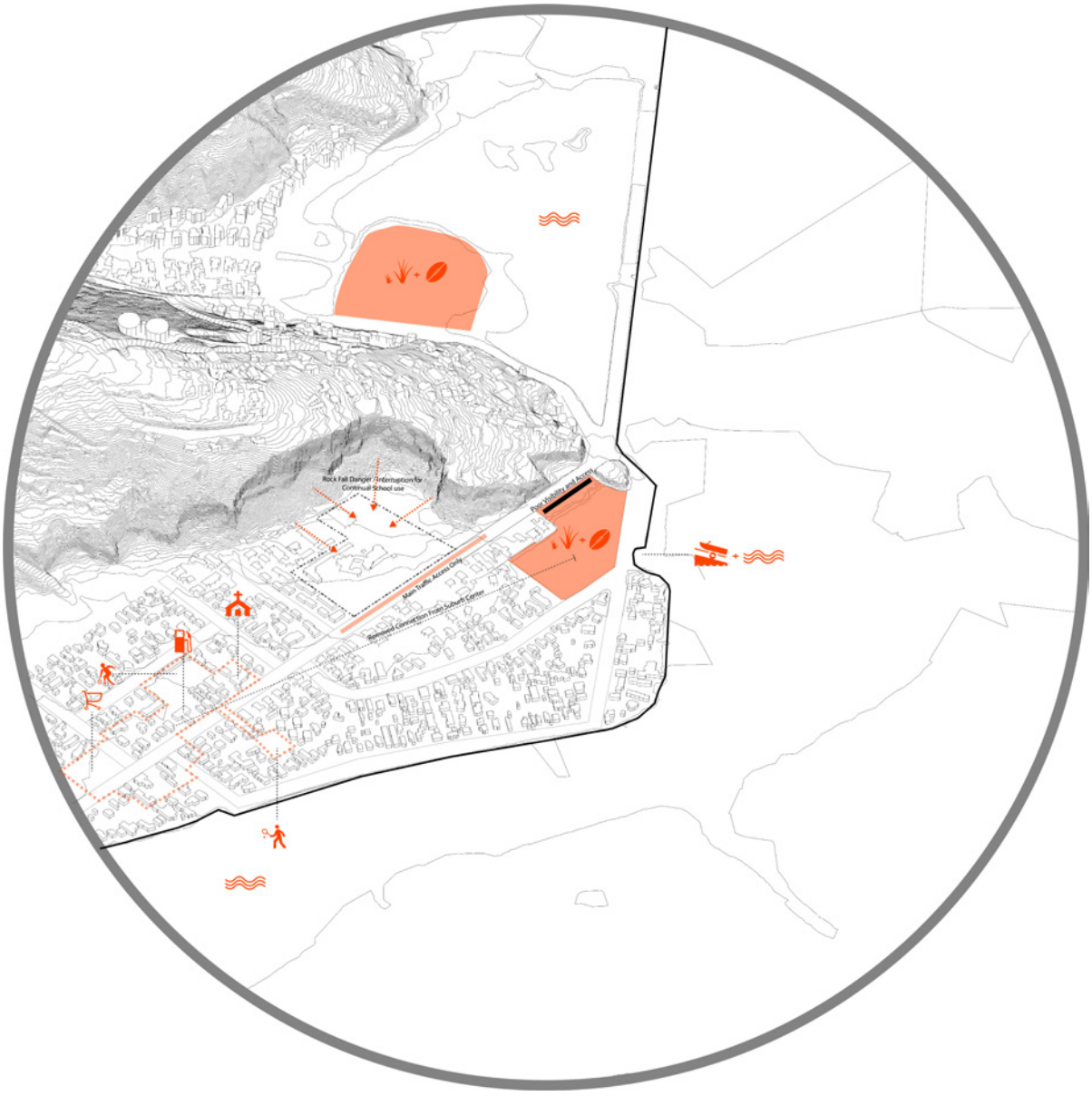


LEGEND
1 - Site
2 - The Estuary
3 - Built Environment
4 - Community Shops
5 - Cliff Face
6 - Main Roading Network
7 - Main Public Transport Links
8 - Proposed 'Slow' Road & Drop off
9 - Connection to Christchurch City

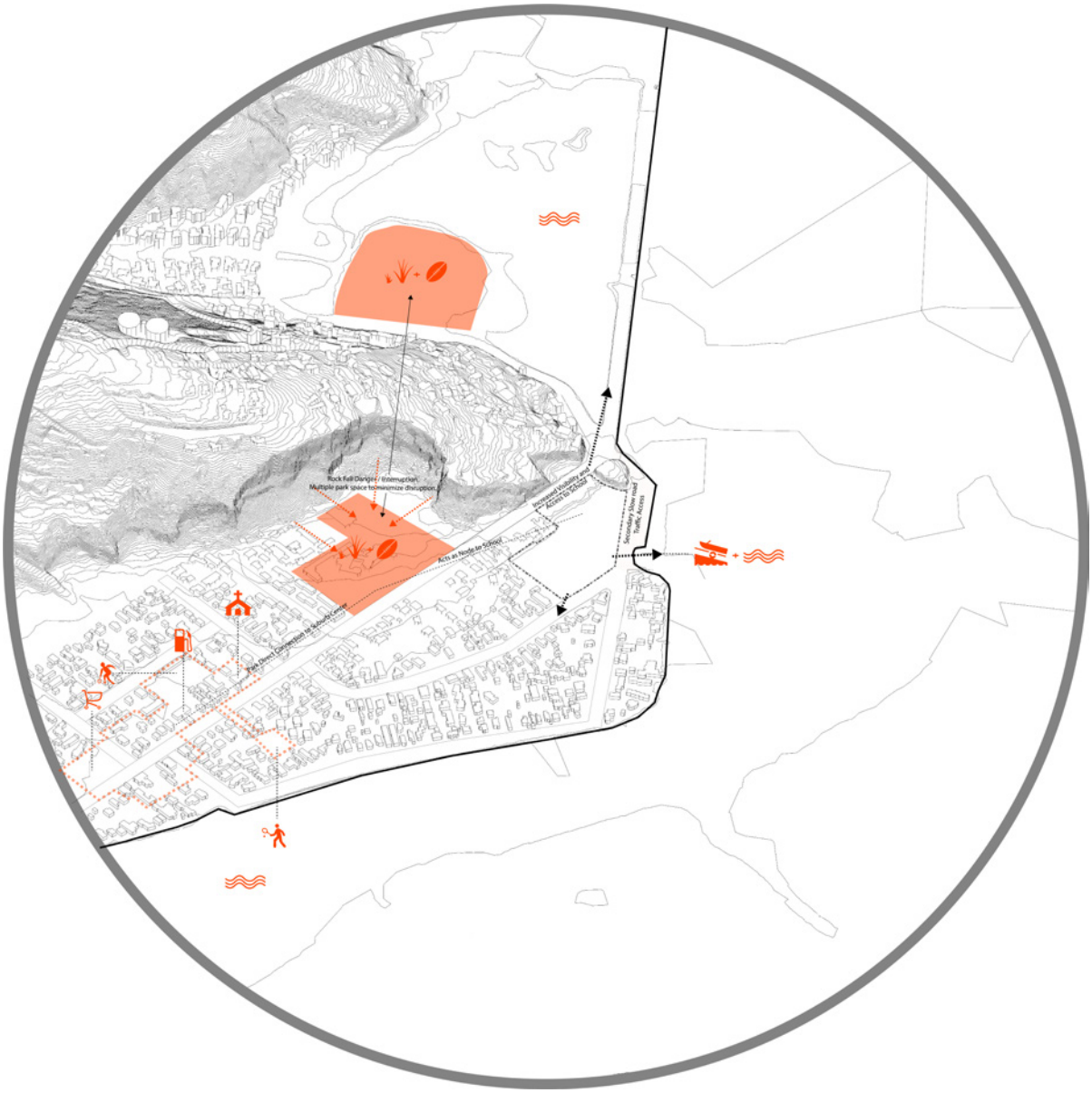
0m 50m 200m

THE SWITCH

A proposal in changing programme of sites



▲Fig 3.14.Transiting Programme - Former School Site Proximity



▲Fig 3.15.Transiting Programme - Proposed Site Proximity

LEARNING FROM THE NEIGHBOURS

An investigation into neighbouring school typology

To understand the local school infrastructure and site typology a study into 12 neighbouring schools took place. In investigation of the neighbouring schools in south eastern Christchurch it is established that:

The majority of site plans consist of buildings positioned at one site edge, providing area for sports fields in the remaining space.

Each school consists of a main entrance in which admin is typically a focus as well as multipurpose hall facilities.

Schools within the region are mainly single storey, with only a few two story blocks.

Most schools have a multipurpose hall facility.

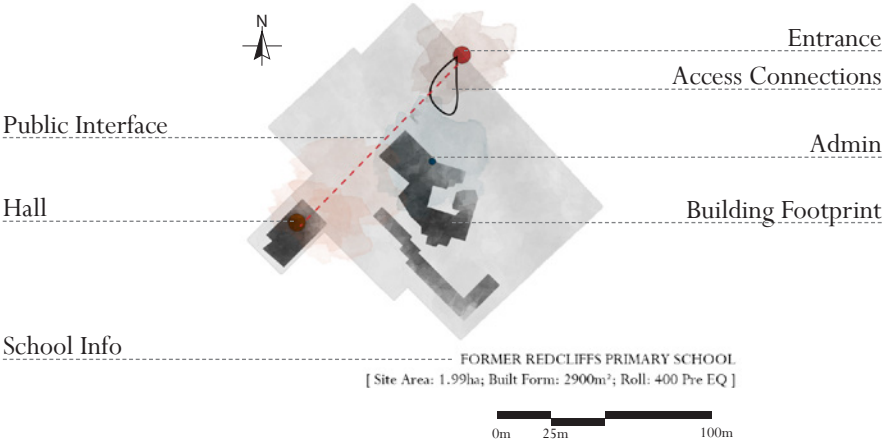
Nearly every school consists of at least a few relocatable classroom units, i.e. CEBUS models.

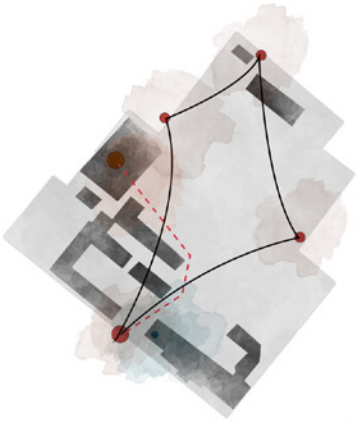
▶ Fig 3.16.(Opposite) Former Redcliffs school

▼ Fig 3.17.(pg122-123) 12 Neighbouring schools

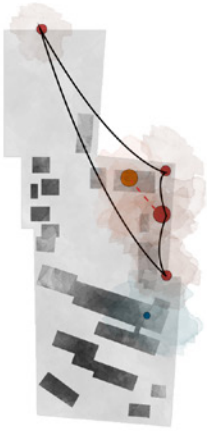
Area typology analysis

12 schools in the region are summarised in a site plan diagram (generated from google maps and site visits) as per below. This analysis allowed insights into values and an understanding of typical primary school programme and diversity in the region.

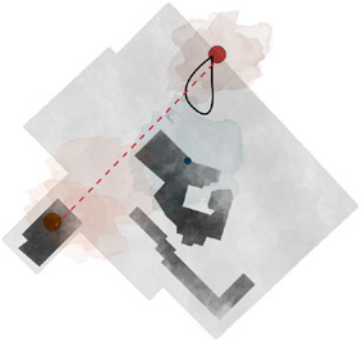




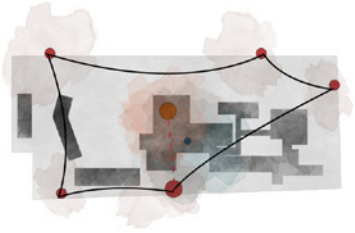
SUMNER PRIMARY SCHOOL
[Site Area: 2.30ha; Built Form: 4200m²; Roll: 450]



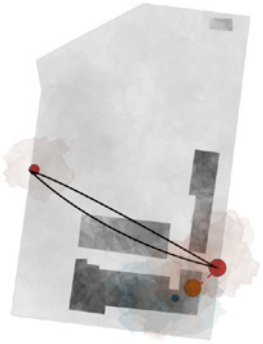
ST MARTINS SCHOOL
[Site Area: 1.60ha; Built Form: 3200m²; Roll: 520]



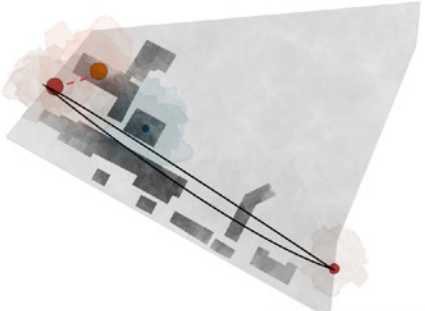
FORMER REDCLIFFS PRIMARY SCHOOL
[Site Area: 1.99ha; Built Form: 2900m²; Roll: 400 Pre EQ]



BECKENHAM SCHOOL
[Site Area: 1.43ha; Built Form: 3200m²; Roll: 440]



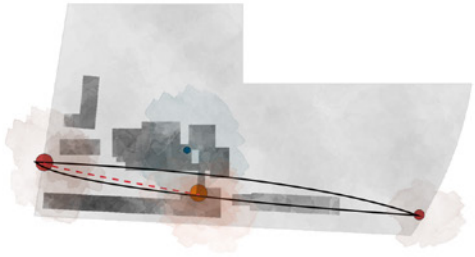
MT PLEASANT PRIMARY SCHOOL
[Site Area: 2.01ha; Built Form: 3000m²; Roll: 340]



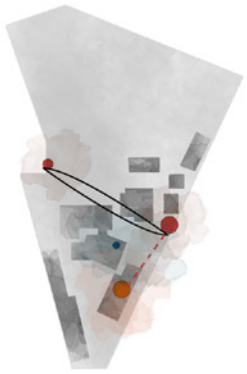
THORRINGTON PRIMARY SCHOOL
[Site Area: 2.43ha; Built Form: 3000m²; Roll: 450]

0m 25m 100m

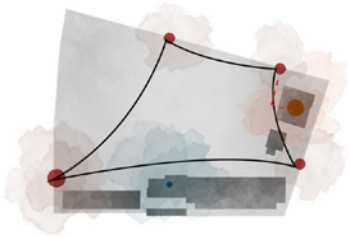
N



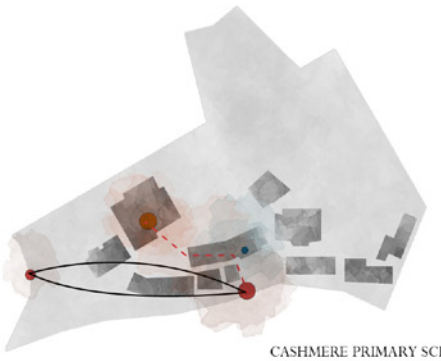
OPAWA SCHOOL
[Site Area: 2.34ha; Built Form: 3300m²; Roll: 400]



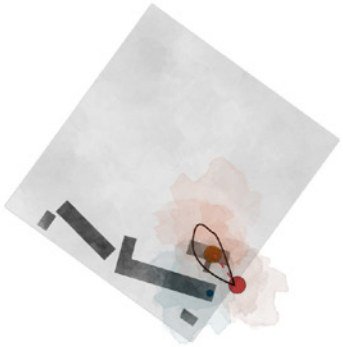
HEATHCOTE VALLEY PRIMARY SCHOOL
[Site Area: 1.54ha; Built Form: 2500m²; Roll: 250]



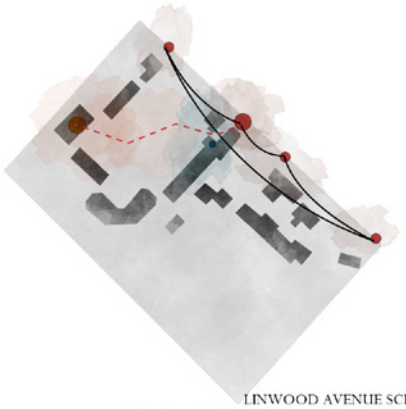
WALTHAM SCHOOL
[Site Area: 1.34ha; Built Form: 1935m²; Roll: 175]



CASHMERE PRIMARY SCHOOL
[Site Area: 2.41ha; Built Form: 3600m²; Roll: 480]



BAMFORD SCHOOL
[Site Area: 1.89ha; Built Form: 1200m²; Roll: 115]



LINWOOD AVENUE SCHOOL
[Site Area: 2.22ha; Built Form: 2600m²; Roll: 310]


LEGEND
1 -Main public access to school
2 -Slow road/community interface and drop-off zone
3 -Main Road rear access and visibility of school
4 -3m embankment - potential to take advantage of this transition in level
5 -50year flood plain level
6 - Flat land - potential to utilise for sports fields to be access by community from slow road
7 - Neighboring dwellings, respect boundary and views.
8 - Potential wind break raised rock embankment
N
0m
25m
50m
1
2
3
4
5
6
7
8

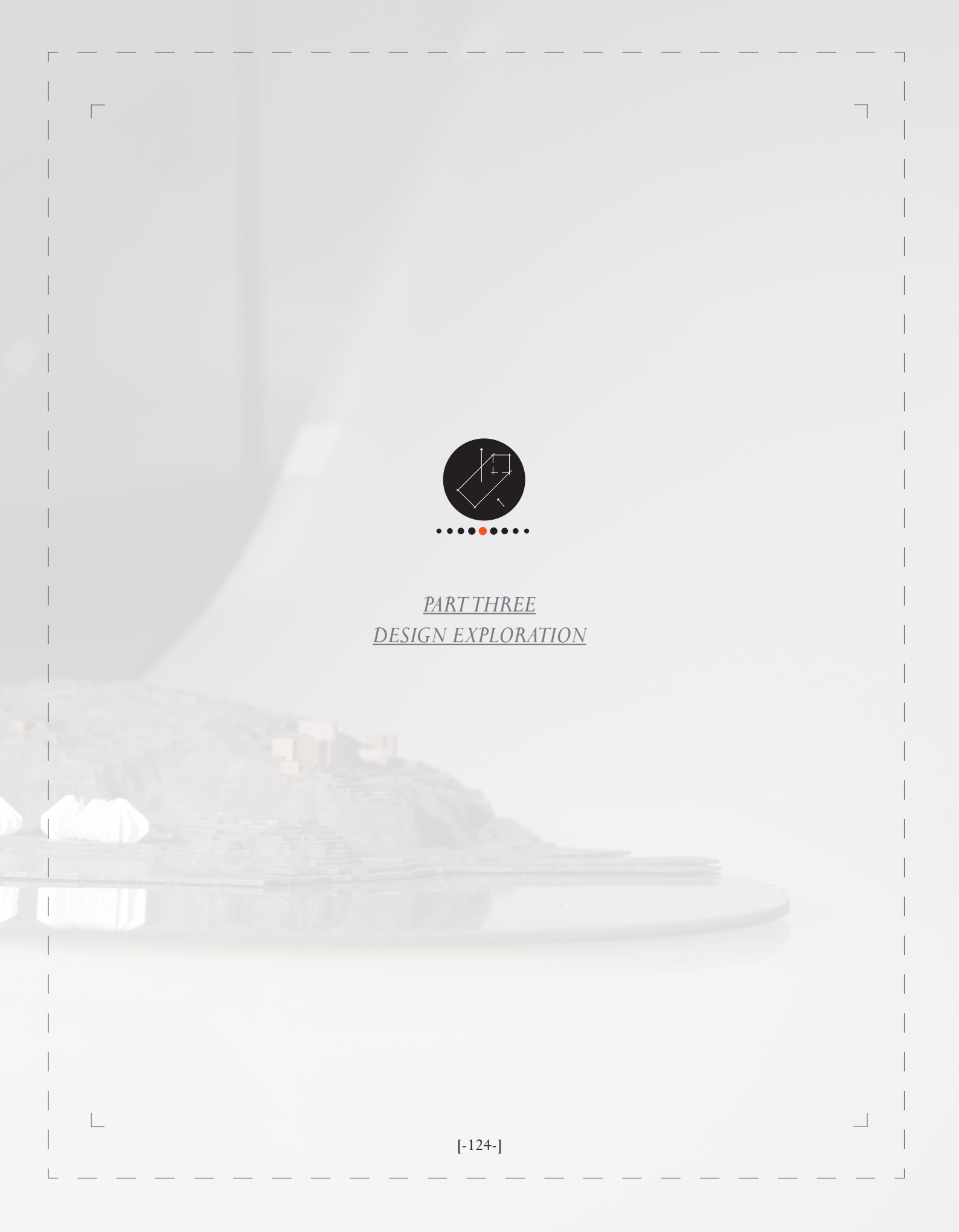
CONCLUSION

A reflection of site and establishment of design goals

Redcliffs finds itself in a unique position, with the current school due for closure at the end of 2016 this community is at risk of losing one of if not its most important community facility. However the selected site showcases that there is a potential opportunity for the Redcliffs region to keep their school and develop a new community integrated learning hub.

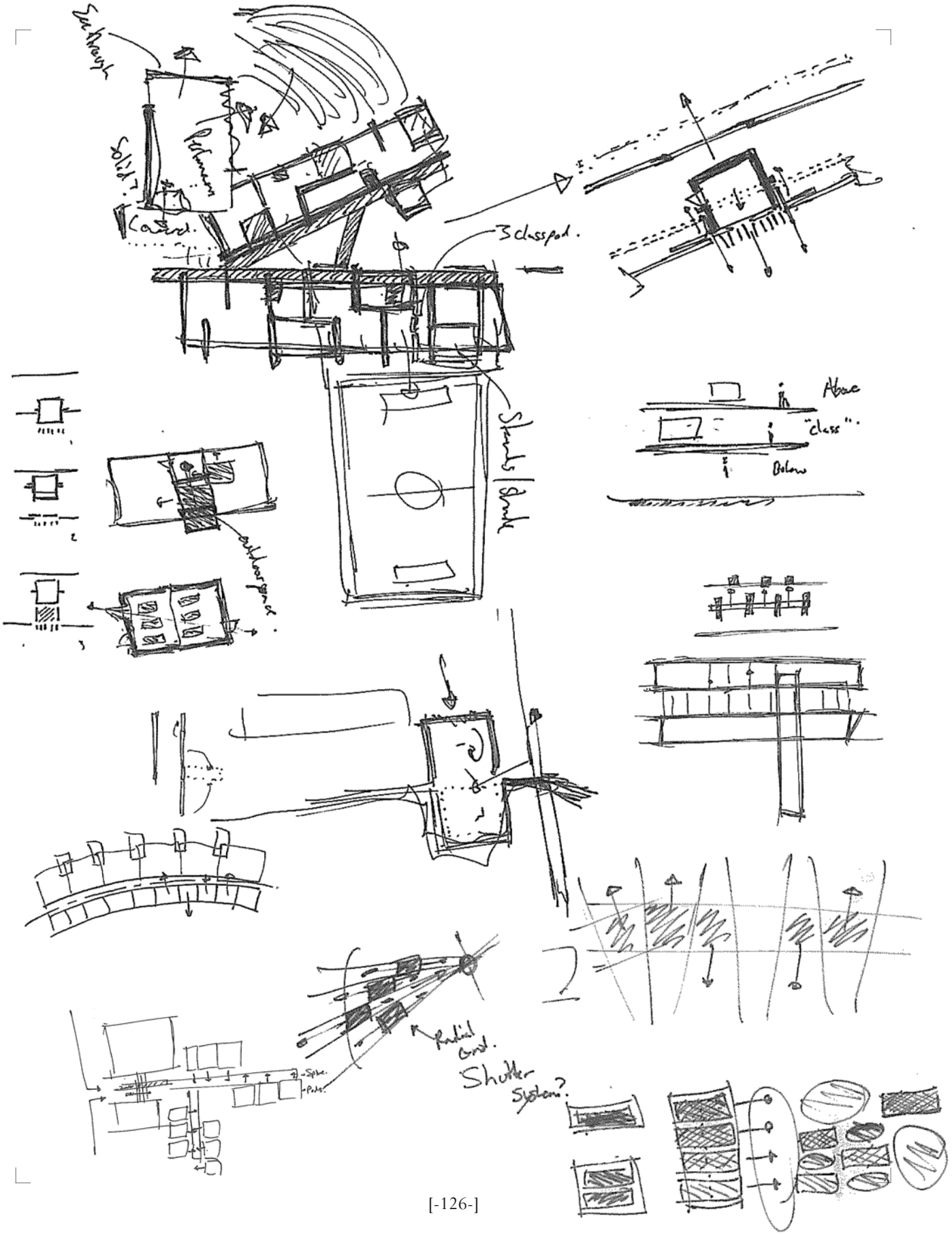
The site situates itself at the crossroads of natural and artificial networks in a constant reflection of change. This transect provides for additional learning opportunities that expand beyond the site. Although the site is at risk of 50 year flood events, it also holds a unique ability to take advantage of a split level via the south-western embankment and a restructuring of the landscape to mitigate any flood potentials. This landscape mitigation has the potential to be integrated into the design of the facility and be used as a learning tool.

◀Fig 3.18.(Opposite) Site design criteria



PART THREE
DESIGN EXPLORATION

CONTENTS


See through
Solids
Voids
Lateral.
3 classpod.
Above
"class".
Below
Stands
Radial Grid.
Shutter System?

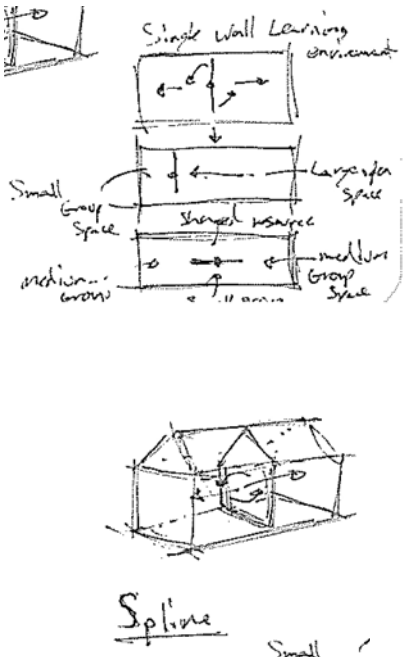
THE DESIGN PROCESS PART A

Conceptual explorations of primary school architecture

Within the limits of the selected programme, time, and site, this thesis followed a process of iterative conceptual design in parallel to literature and project review. Throughout this process there were a number of shifts in thinking to explore the dynamics between programme, flexibility, and site. These experiments aided in developing a better understanding of relationships of site and programme as well as principles of flexibility and the frame.

In reviewing these experiments it can be seen that exploration started by testing programme in relation to site on an mass typological scale, in order to construct a position on contextual relations, and programmatic arrangement. These experiments were discussed at the three month review and were critiqued in relation to programmatic goals.

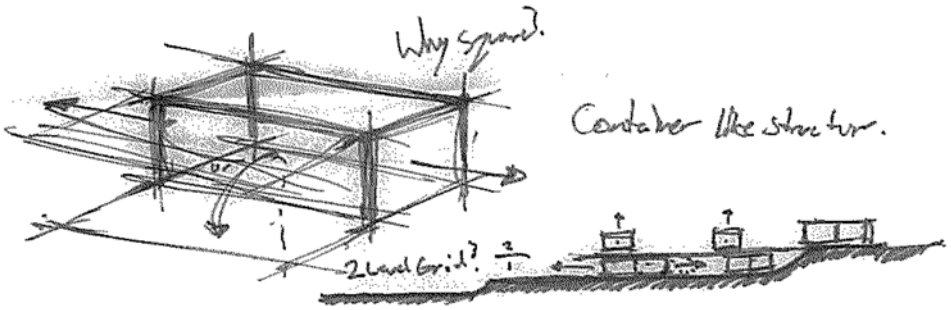
These discussions led into generated criteria for further refined design explorations which were undertaken in parallel to experiments of flexibility and the frame. The conceptual design exploration concludes with an established plan and programmatic layout in addition to design criteria which is discussed at the six month review. These conceptual explorations flow directly into the early stages preliminary design exploration and are developed upon in further detail.



◀Fig 4.1.Collage of preliminary design sketches during earlier phases.

PHASE ONE - MASSING TYPOLOGY

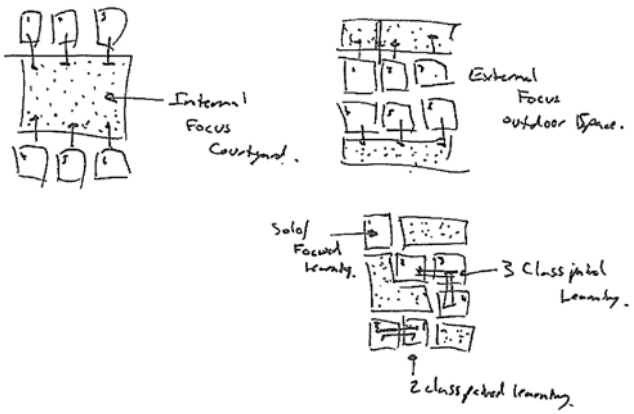
An investigation of form driven by typology and site.



Massing typology is an initial experiment that was undertaken by constructing a 1:1000 laser cut site model with 1m contours. A series of nine quick mass models (opposite) were generated from common materials. These models focused on how form interacted with site, which allowed a cross relation of ideas to be compared in the same medium.

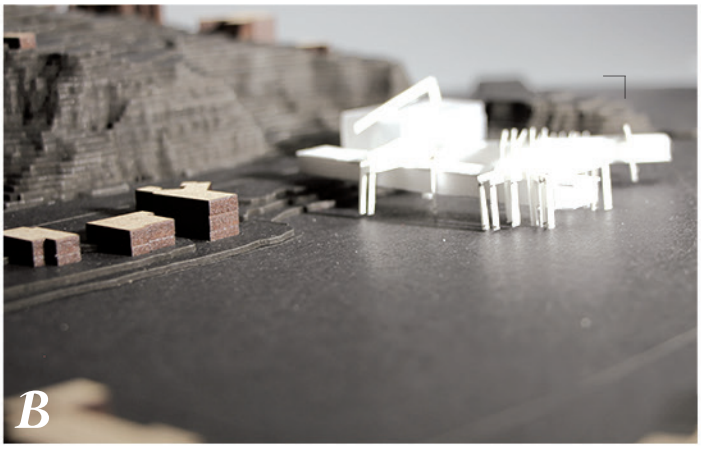
This 'top-down' process allowed quick exploration of many initial design ideas generated by studies in Part Two. A selection of which (right) enable the complex to become overlapped and intertwined with site, while others (pages 144 & 147) force the design to sit on site rather than become a continuation of it.

The primary criteria for assessing each exploration was the amount in which it can be seen to affect site flows and external connectivity with internal form.

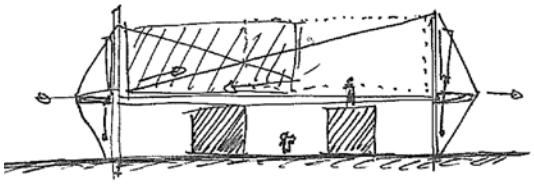


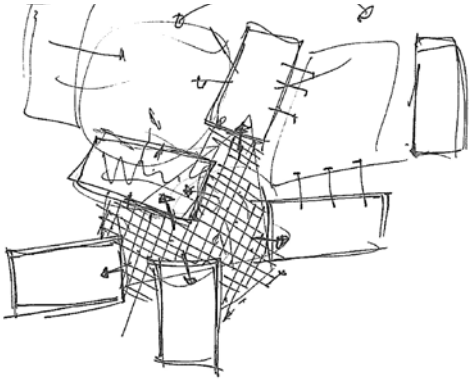
► Fig 4.2. A : A modular grid. Adapting principles of the frame this concept allows for built form to slide along axis to reconfigure spatial layouts, refer sketches above. This however limits the engagement with the natural flows and connections of the site.

► Fig 4.3. C : The selection of initial conceptial design explorations.

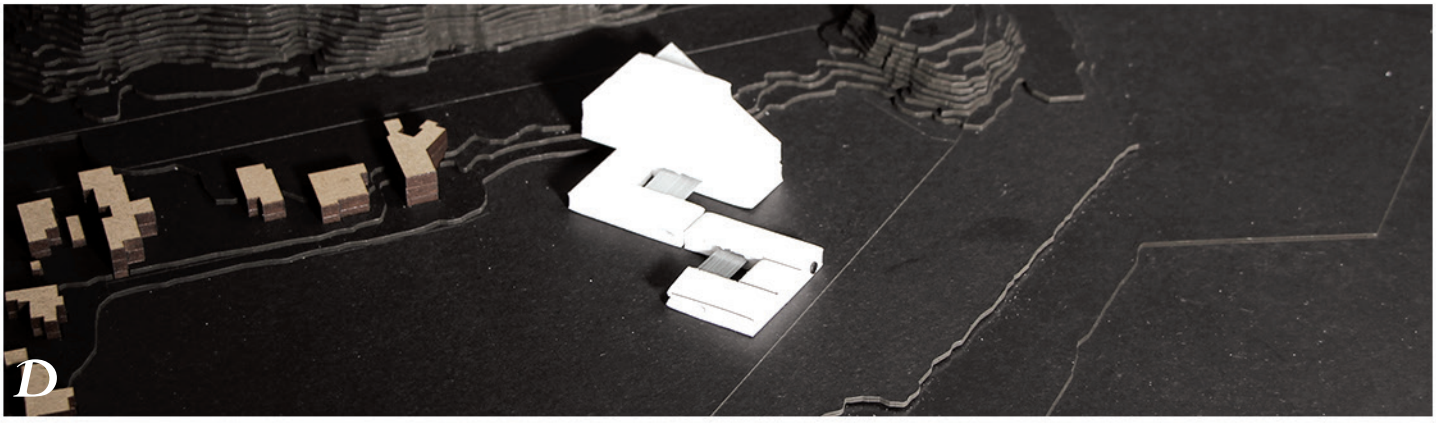


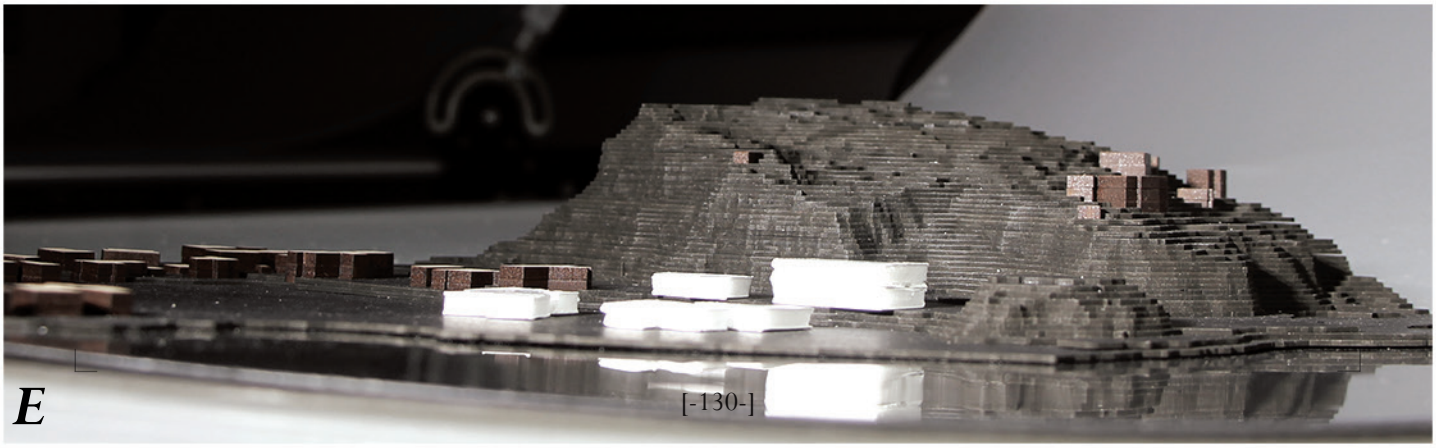
▲Fig 4.4. B: Raised frames. By adapting principles of the frame two axis are used to shape internal and external spaces. Utilising the embankment a series of frames along these axis enable the internalised form to be suspended to create covered outdoor learning areas underneath , refer sketch below.

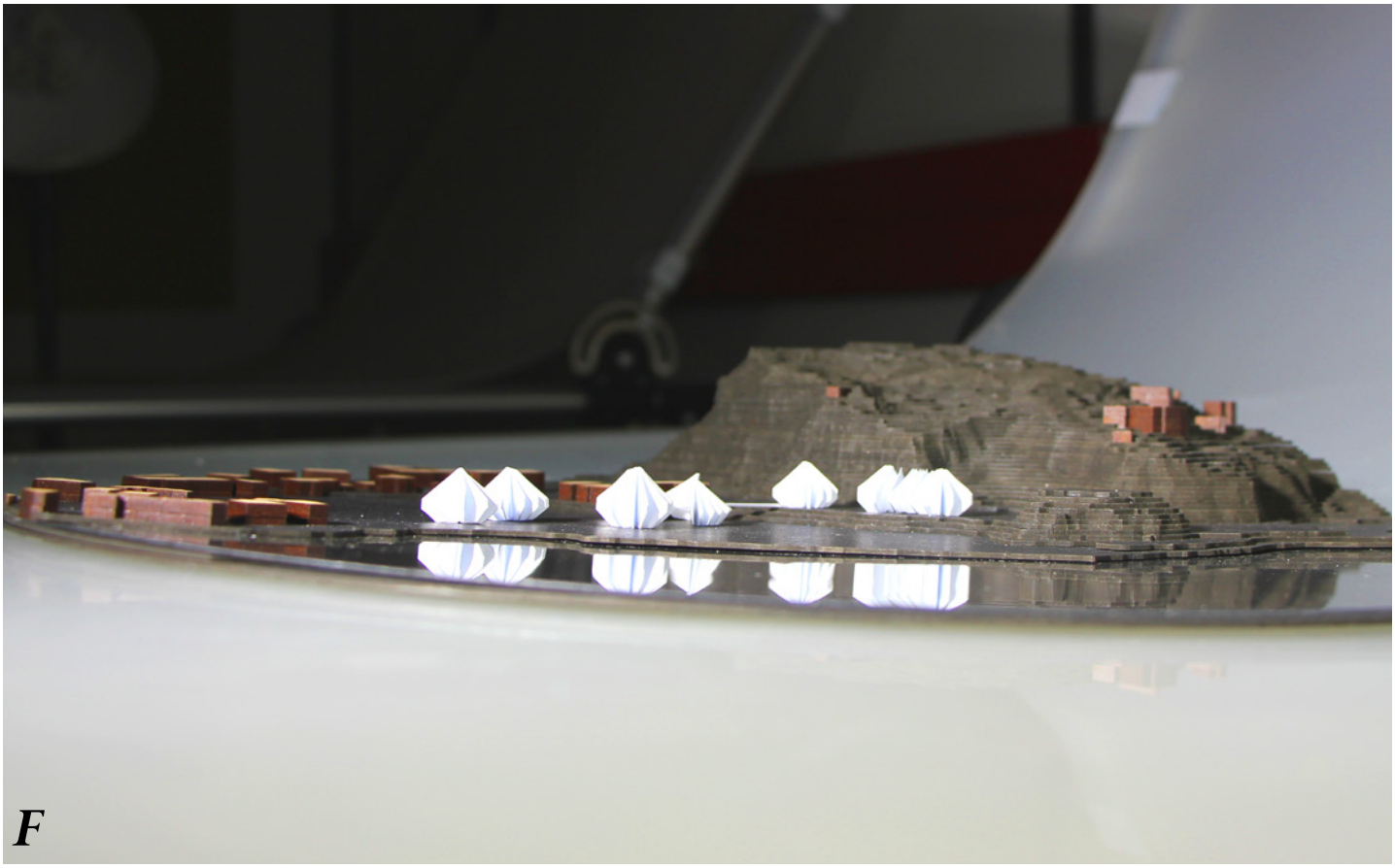




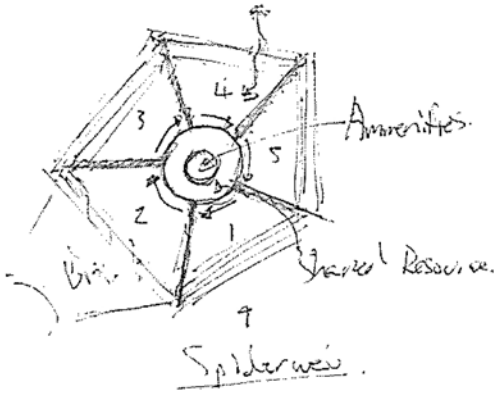
▼ Fig 4.5. D : Spine & E : Learning Studio. The typical response to new educational facilities in NZ has been predominantly these two approaches. D adopts a CAB linear style arrangement which turns on itself to provide interlinking courtyards. Whilst E adopts a learning studio cluster approach where studios of up to three classrooms are 'dotted' around site. It can be seen that whilst approach D is imposing on the site (due to its scale and orientation), approach E allows for cross connectivity through the site and possible connections between architectural forms, refer sketch left.

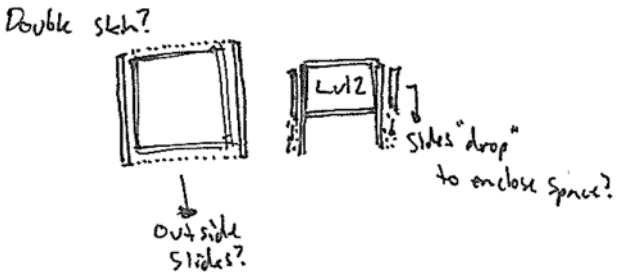


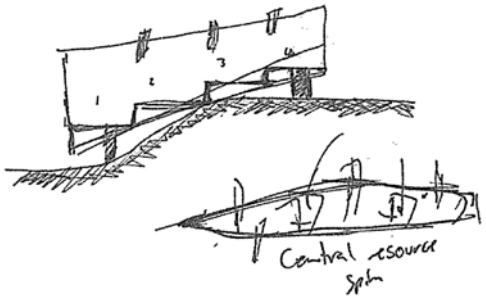


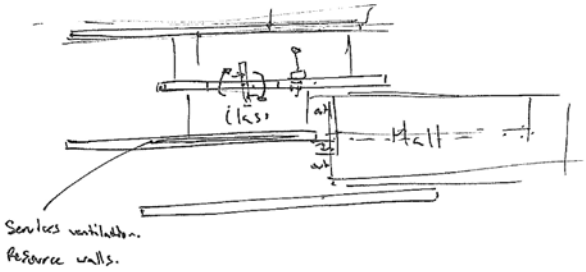


▲ Fig 4.6. F : Pods. This experiment is the first that attempts the use of a modular pod network of building forms. This arrangement breaks down the scale of the school facility allowing external and external space to merge into continuous form. Each pod consists of a buildup of modules to allow for adaptive expansion and customisation of space. This promotes both flexibility of form and freedom of space.

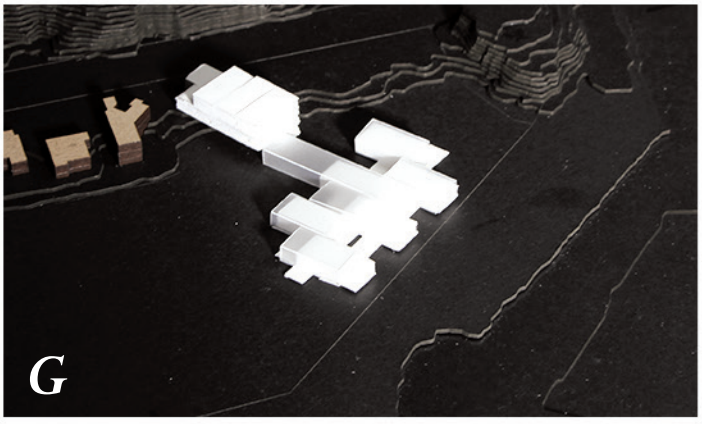


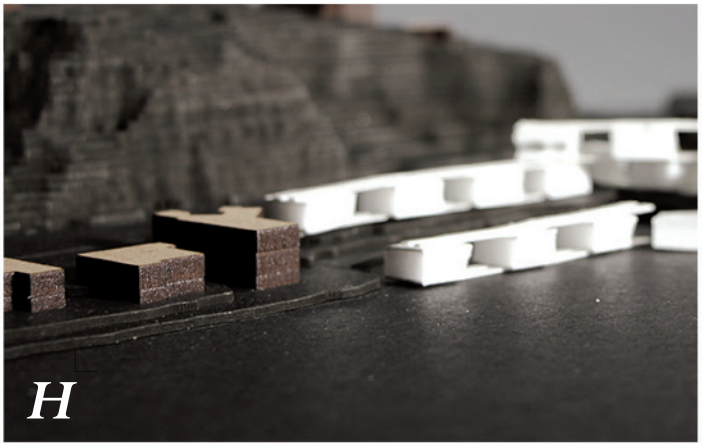


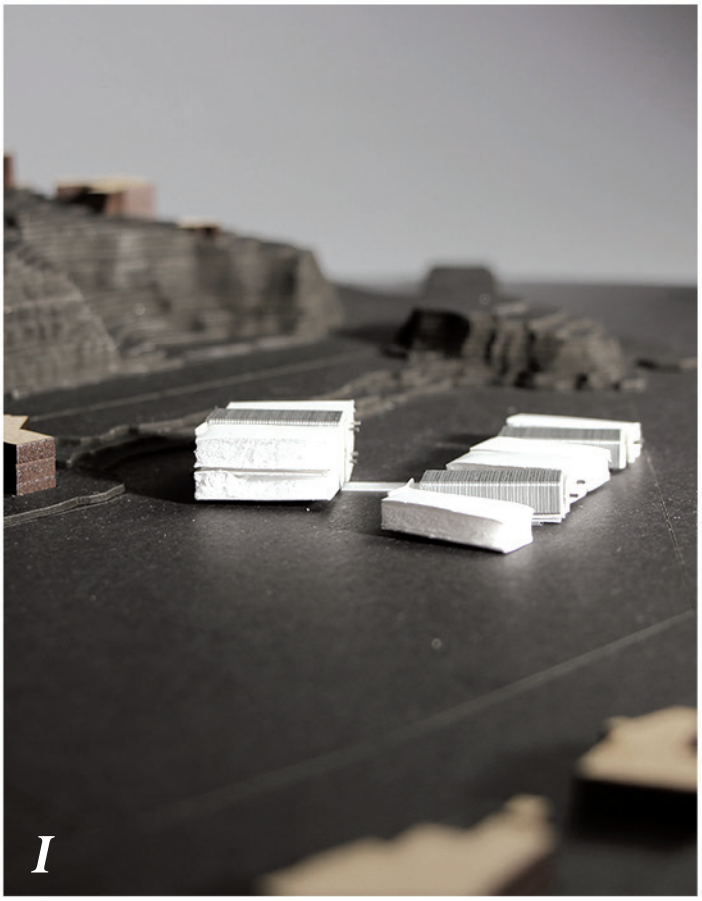


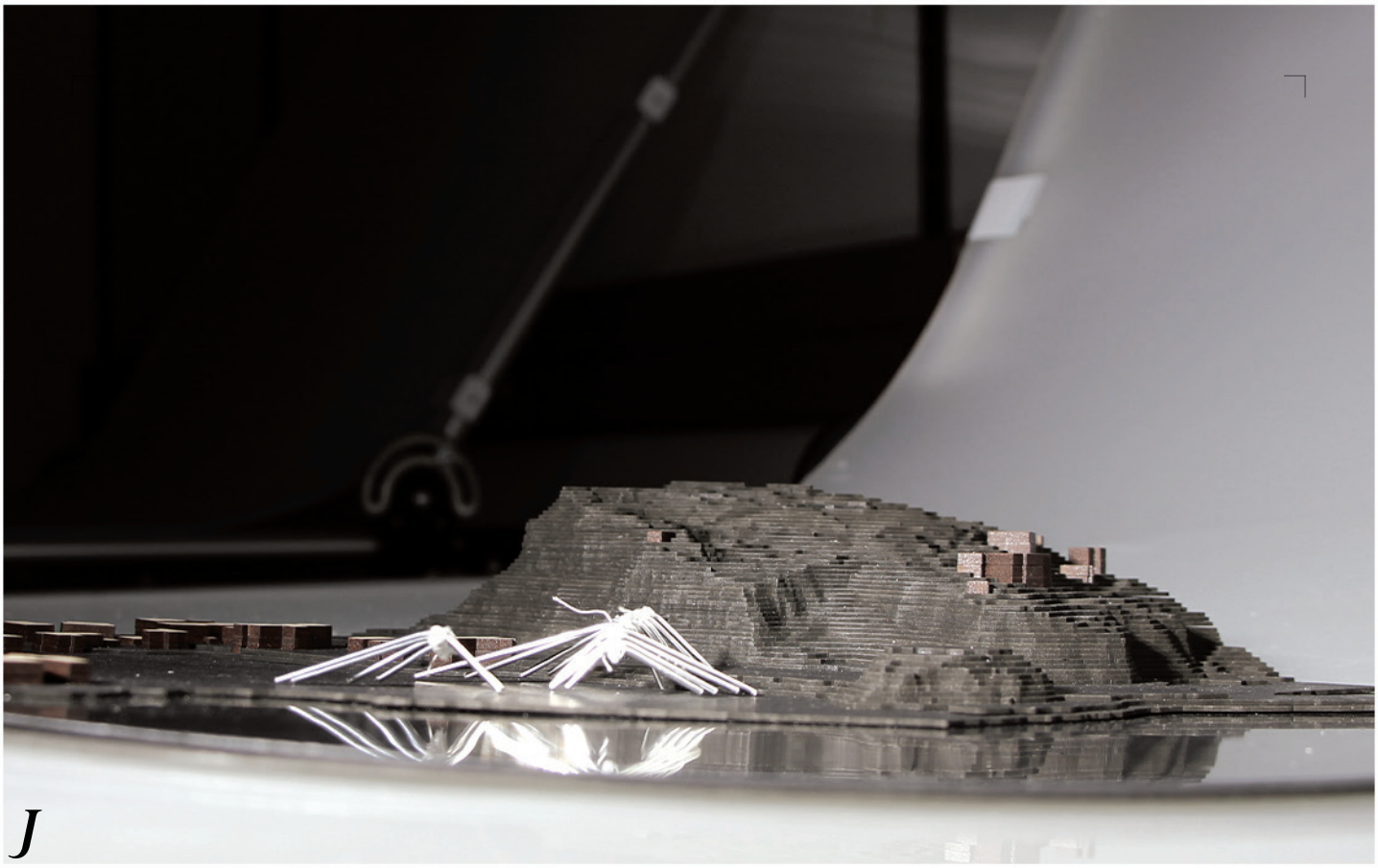


▼ Fig 4.7. G,H, & I. Explore relationships of form and flexibility in relation to the site. They explore concepts of alterability and extendability as outlined in flexibility and the frame. Externalised and internalised form become interchangeable with the ability to use a fixed frame as resource walls between these interchangeable spaces, refer to below sketch.







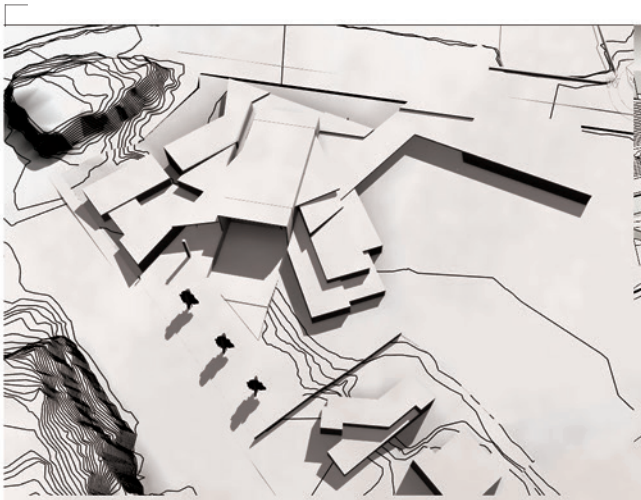


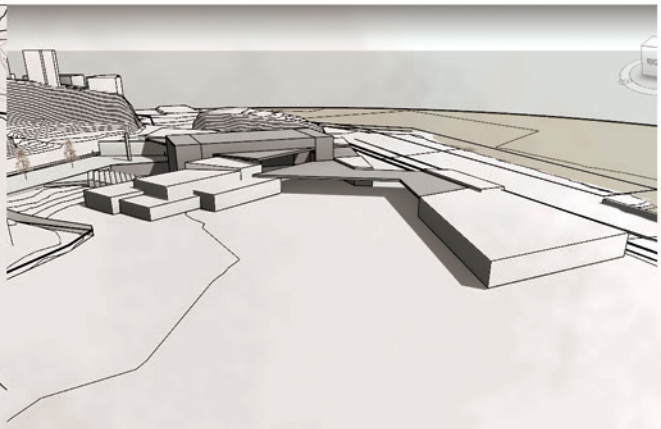
▲ Fig 4.8. J : Explores the use of a large canopy to create a controlled environment. This concept, termed polyvalence allows flexible use of space within the extents of the canopy structure. However, it does form an imposing mass in relation to the site context and internalise relationships of programme.

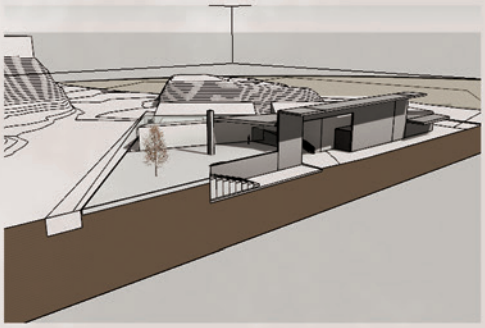
CONCLUDING REMARKS

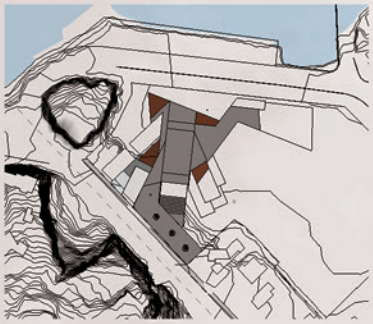
From this first exploration of design approaches in relation to site it can be seen that larger mass arrangements provide less engagement between site and architectural form. Whilst a smaller building footprint and separation of form allows external integration of space into the learning environment in a blended environment.

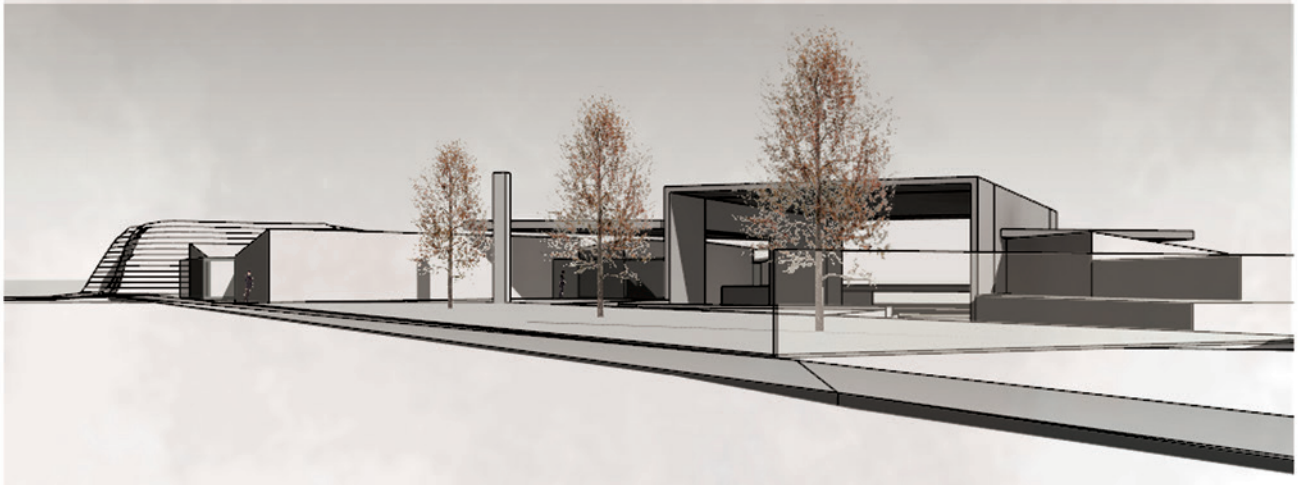
Principles of flexibility employed in the concept studies also show that the interstitial space can be utilised through transitional forms which become specific to their environment by how they are formed on site.











PHASE TWO (A)

An exploration of programme and site

Whilst Phase One focused on externalised influences on form, phase two considers how the programmatic requirements may shape space and how programmatic functions relate to one another.

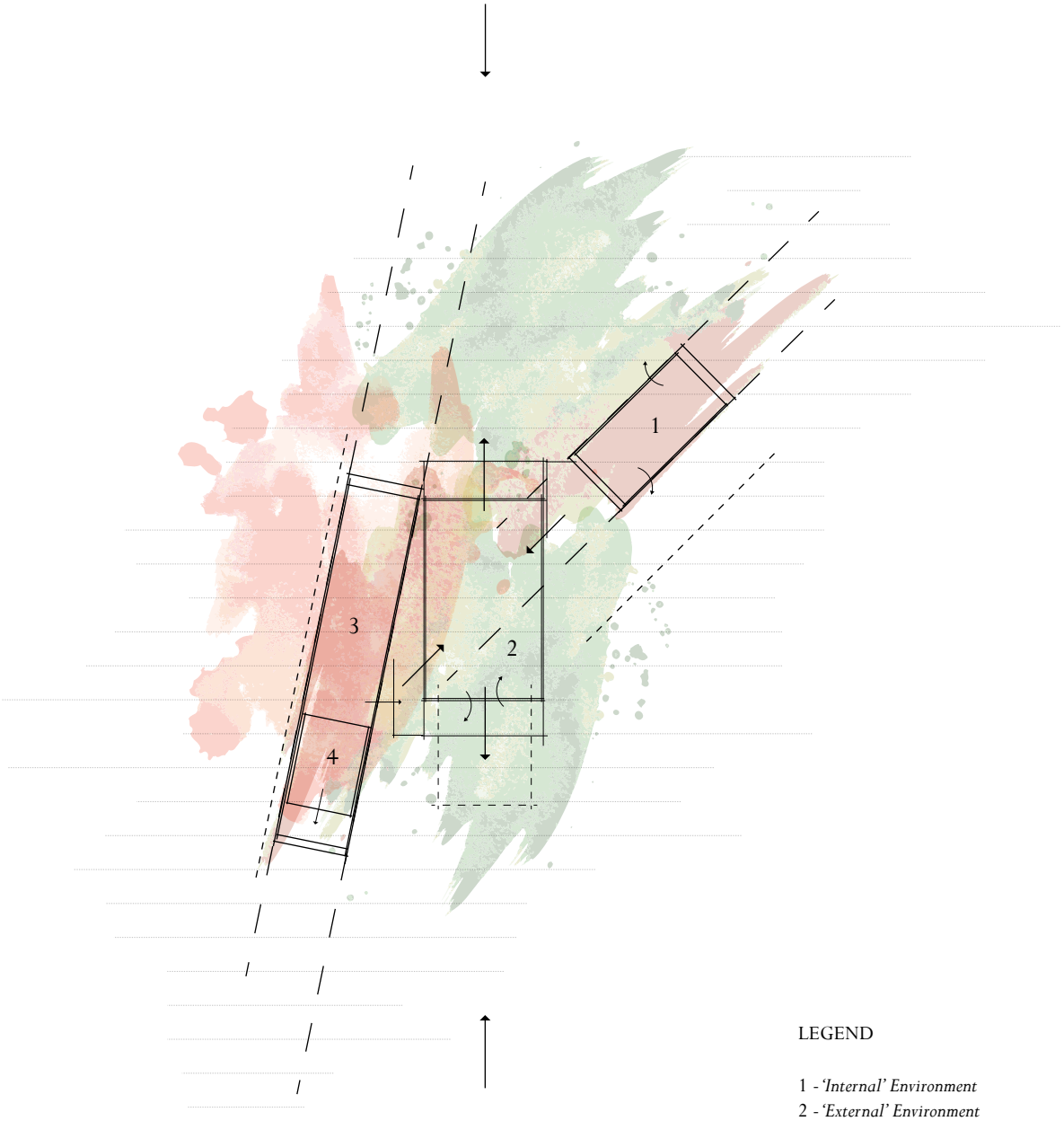
Phase Two is split into two parts.

Part A - Explores two approaches to architectural design where a design concept is generated from each.

Part B - Tests principles of flexibility and the frame in a bottom up approach to design.

Both parts were undertaken in parallel; each influencing decisions on the other.

◀ Fig 4.9.Exploring Imbrication model through digital design software.



LEGEND

1 - *'Internal' Environment*
2 - *'External' Environment*
3 - *Architectural form*
4 - *Portable interior form*

IMBRICATION*

[im-bri-**key**-sh*uh* n]

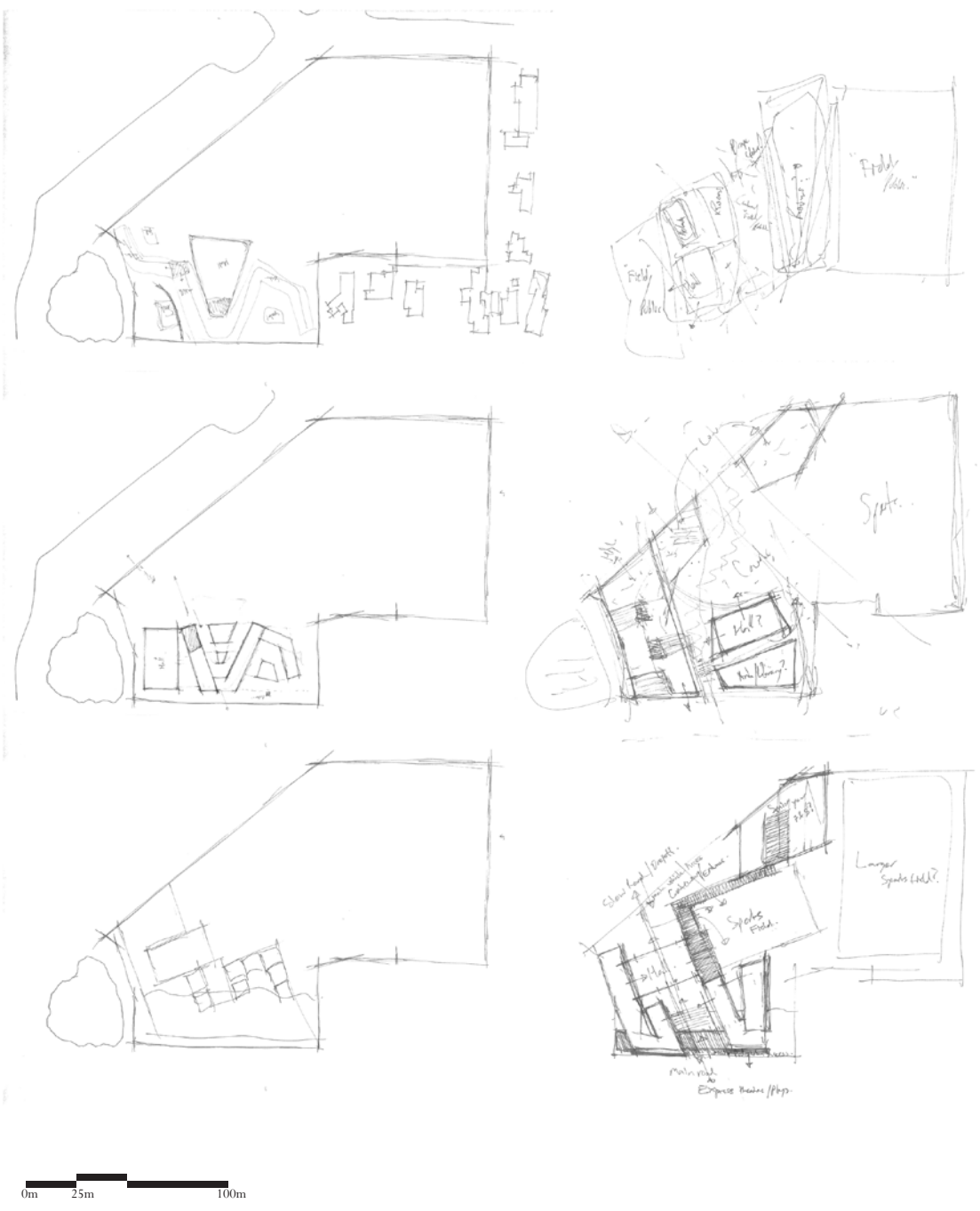
Noun

1.An overlapping, as of tiles or shingles.

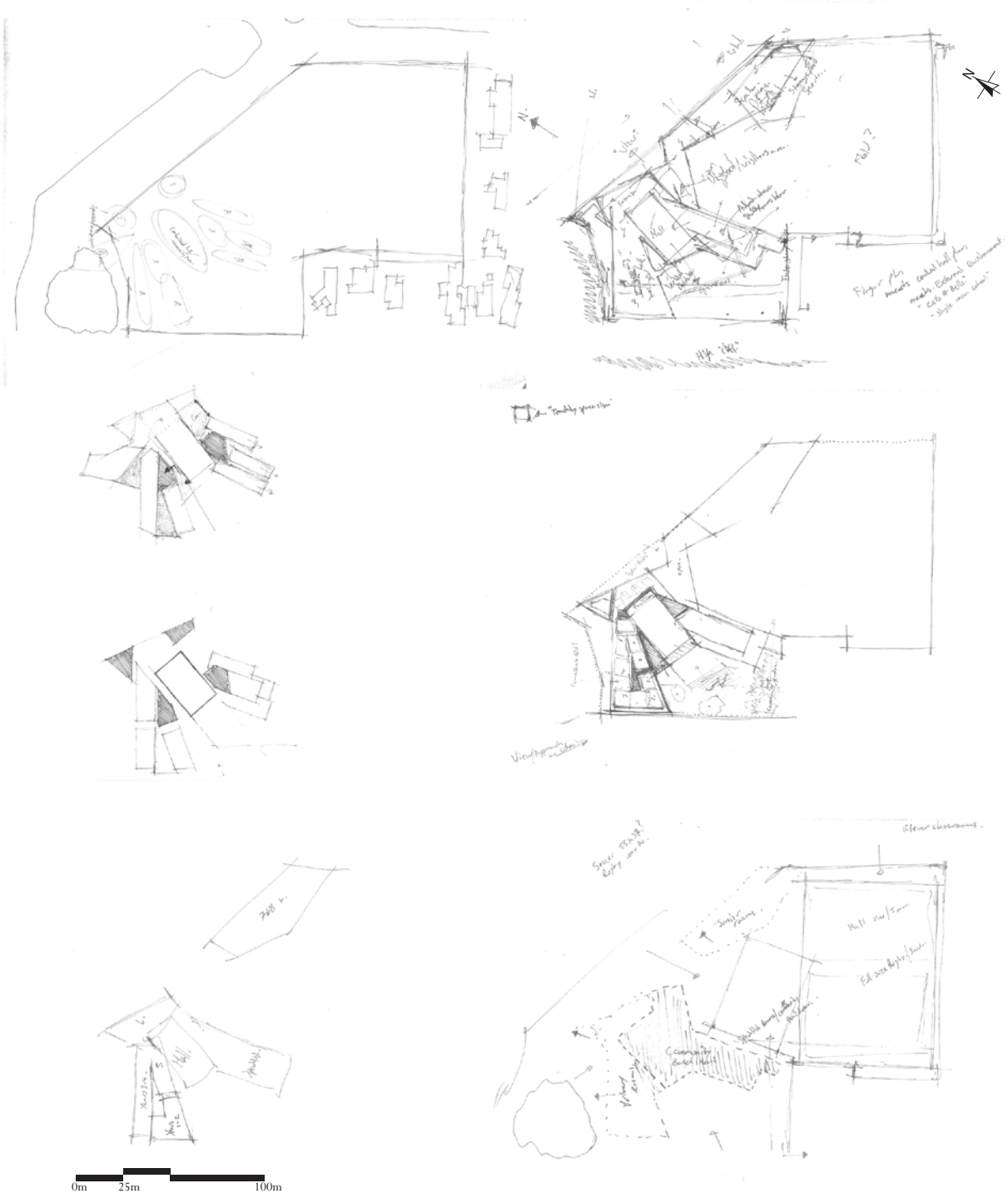
2.A decoration or pattern resembling this.

**The method of imbrication investigates a patterning of overlap in programme and site where, interior and exterior merge into a continuos pattern of educational opportunities and active community engagement.*

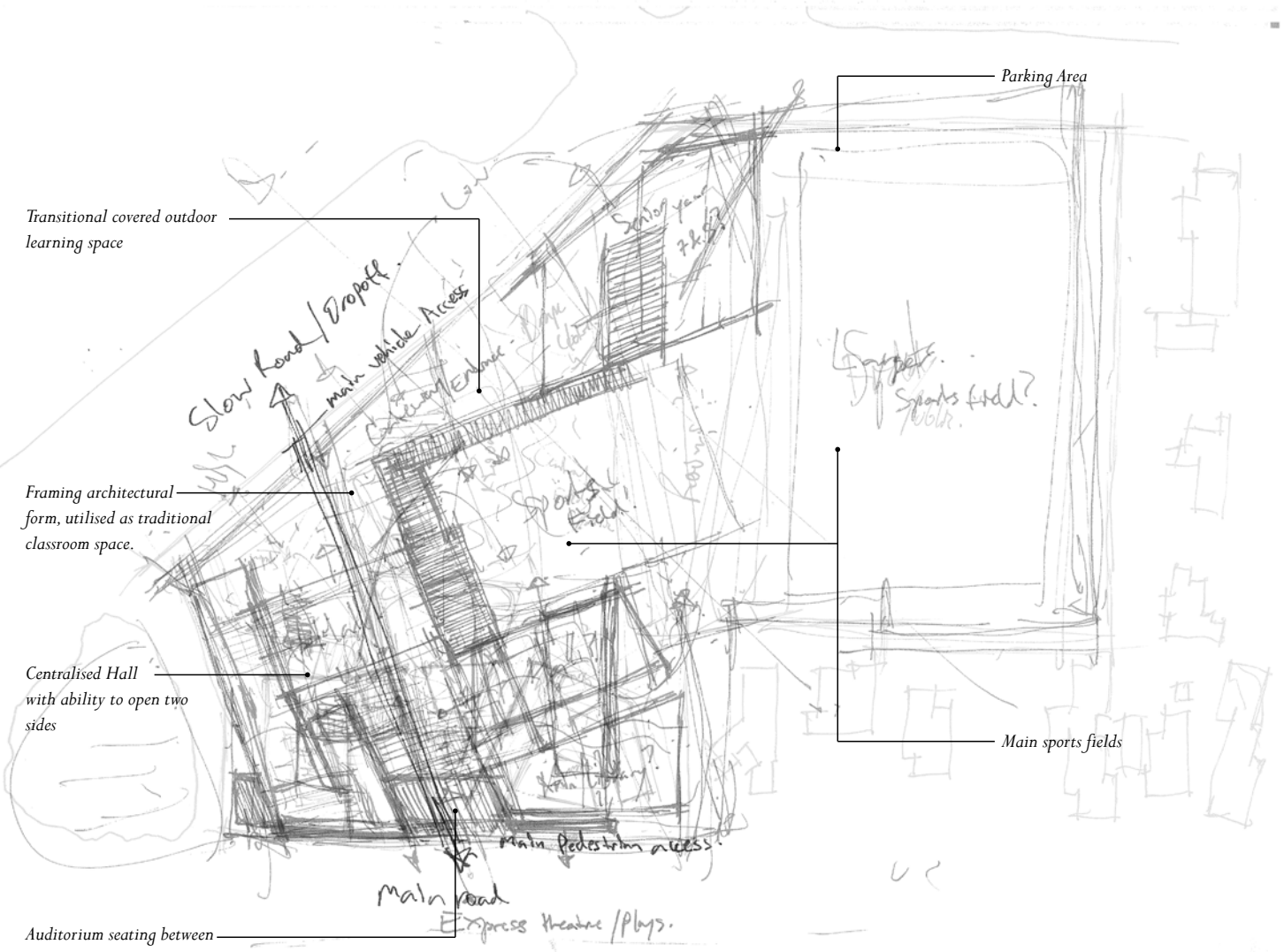
These overlaps create transitional opportunities for the spatial organisation of the school allowing a seemingly larger building mass to break down and open up to community.



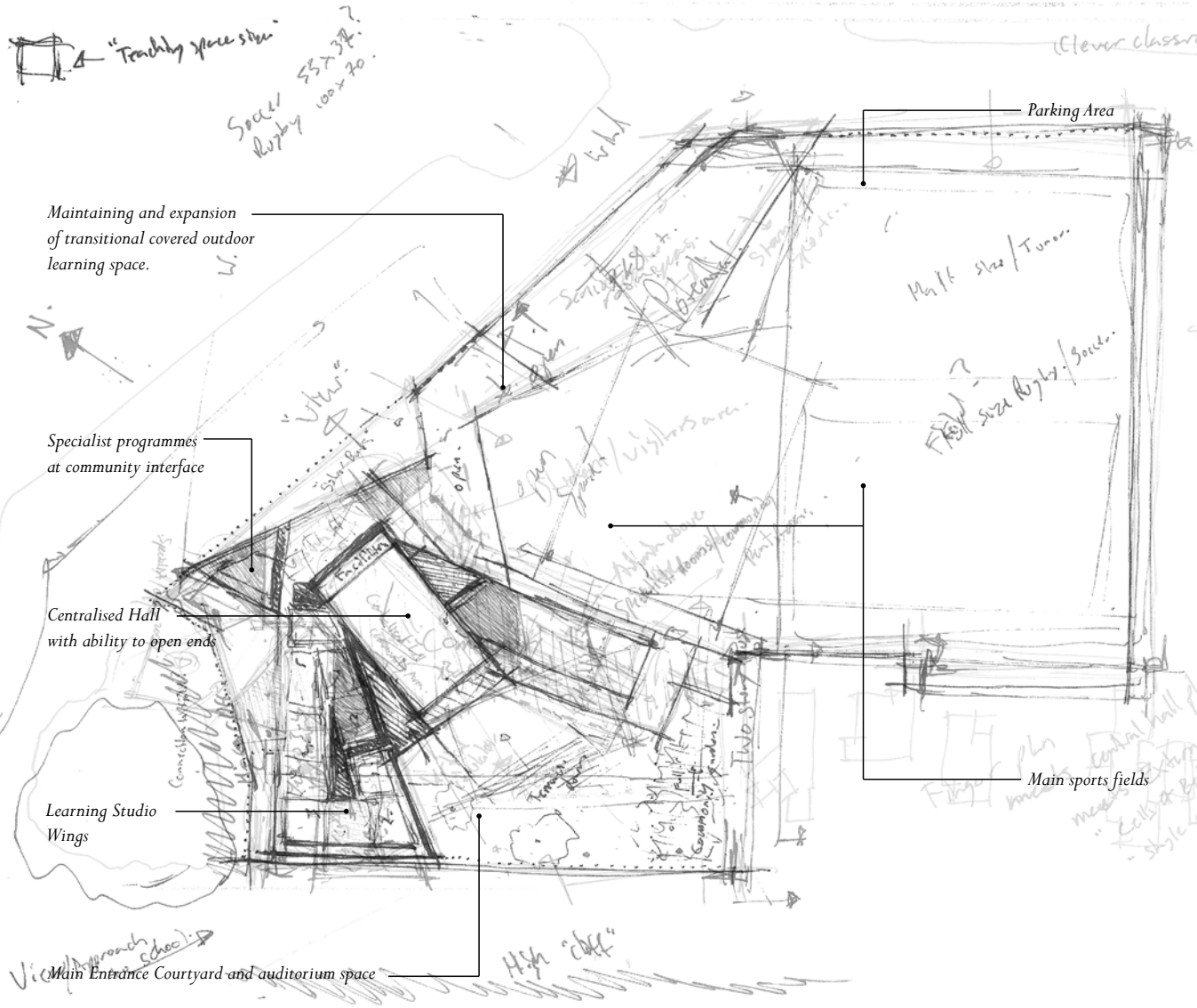
▲ Fig 4.10. Early exploration through imbrication developing upon massing models, this exploration looks at shaping form from internal programmatic function, establishing connections between programme and external space to create a transitional environments.



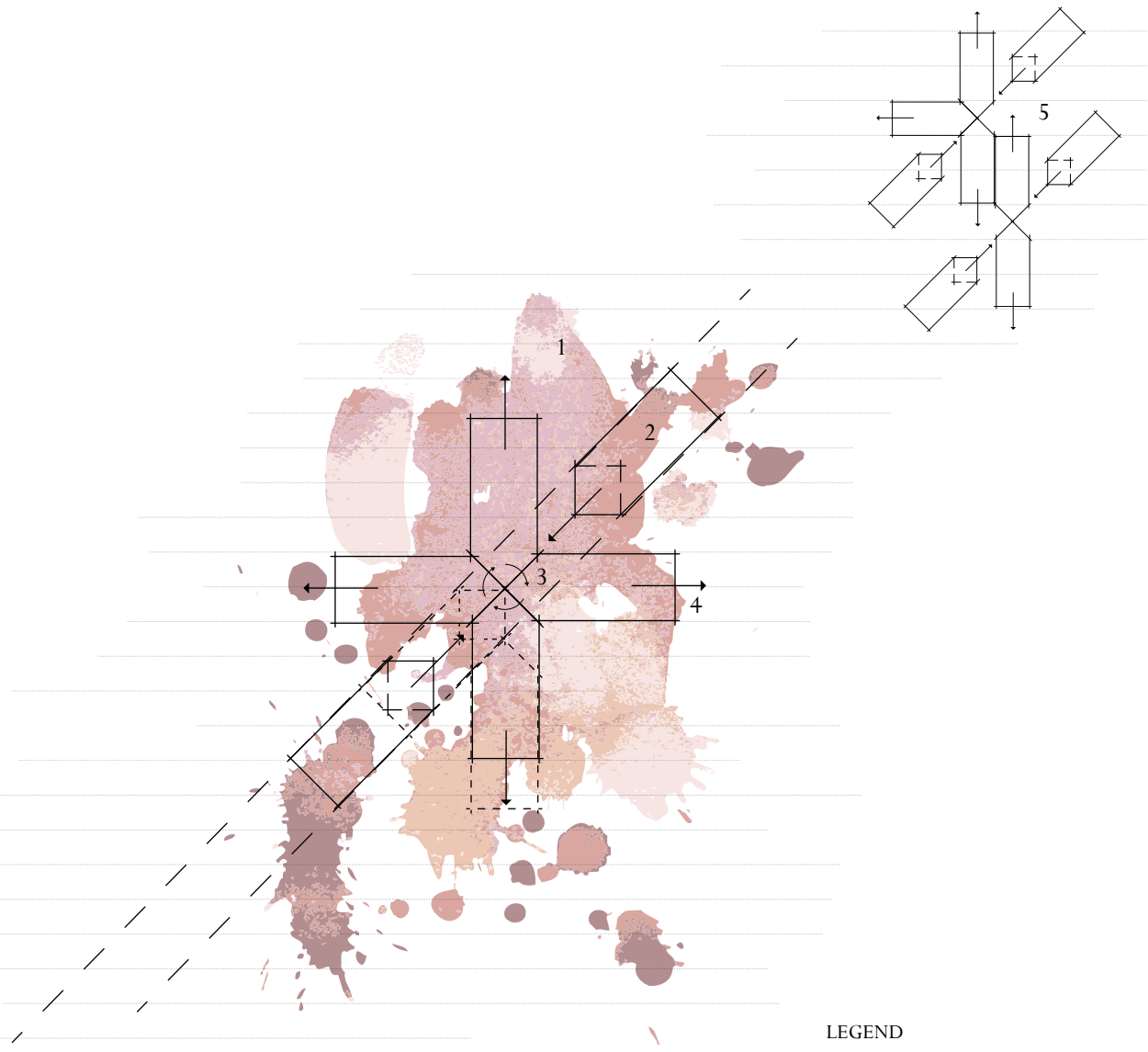
▲ Fig 4.11.Development through imbrication, based upon early explorations this concept develops multiple wings/clusters around transitional form. Overlapping communal and private functions.



In review: This Concept creates walls to the site which blocks out the community which is an undesired effect.



In review: This concept turns its back on the potential northern connections as a community facility. The main entrance faces the passers-by rather that the user group.



LEGEND

1 - *'Blended' environment*
2 - *Transitional architectural form*
3 - *Pivotal center*
4 - *Stackable nature*

ARTICULATION*

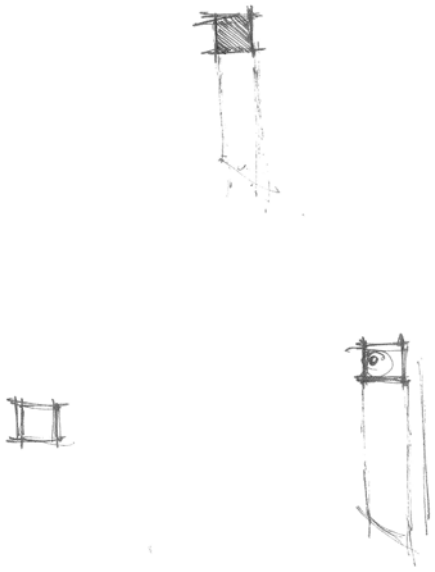
[ahr-tik-*yuh*-**ley**-sh*uh* n]

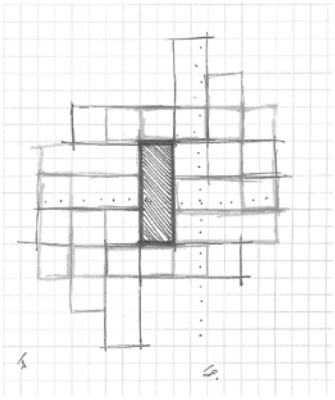
Noun

1.An act or the process of articulating.

2.Phonetics - the adjustments and movements of speech organs involved in pronouncing a particular sound, taken as a whole.

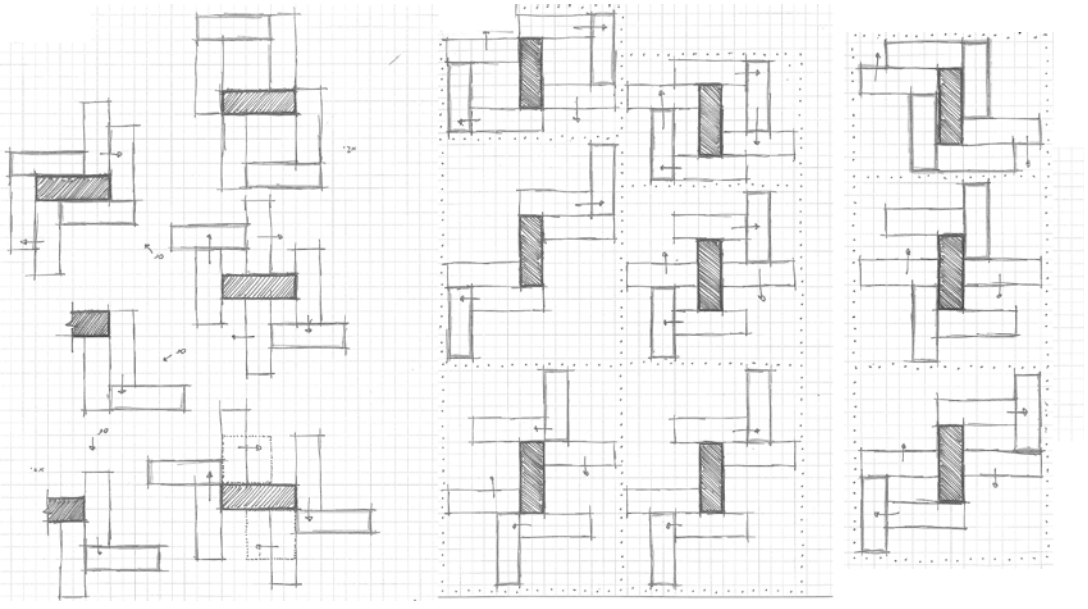
**The method of articulation explores how internal and external form can become interchangeable in a network of modular built forms.*



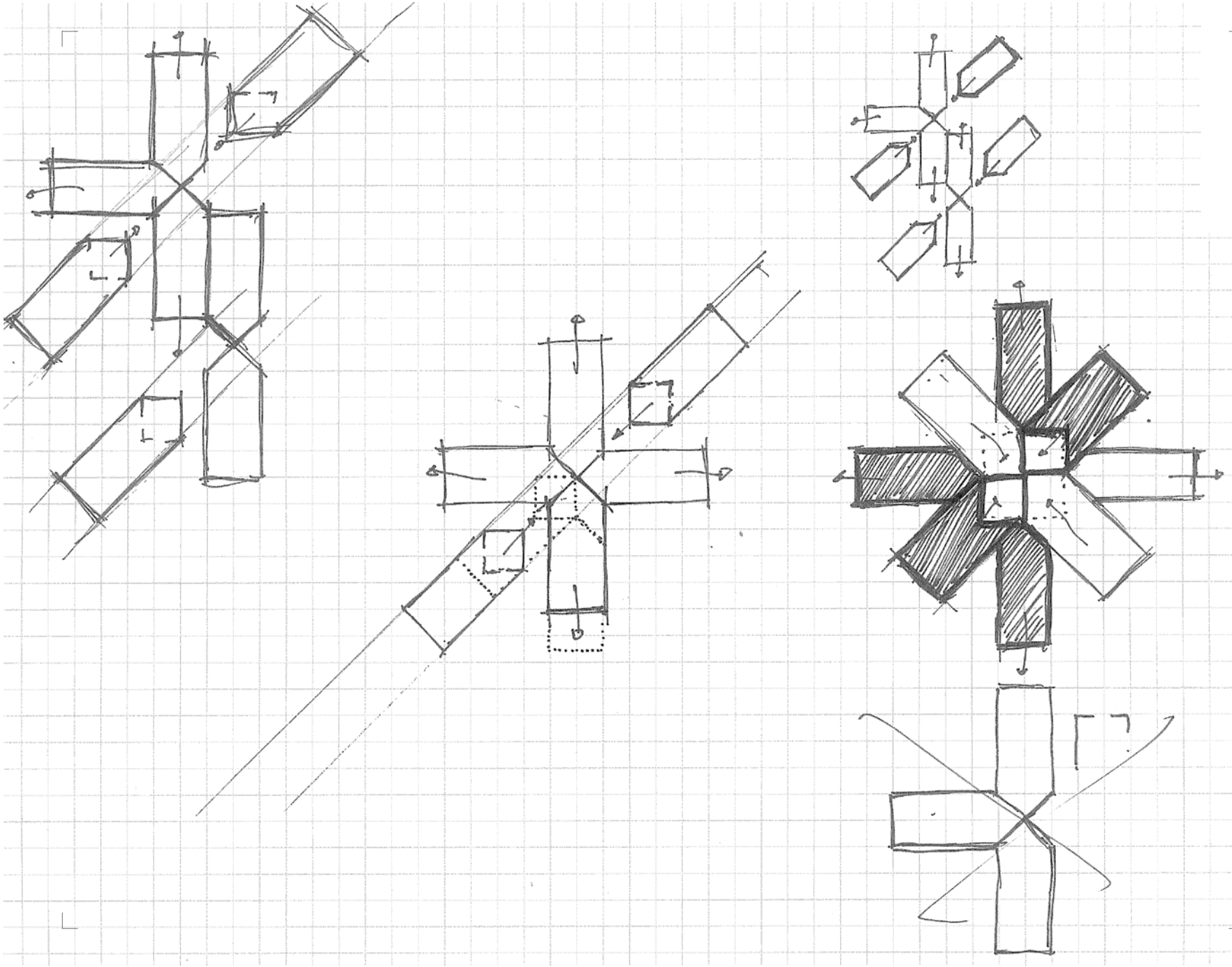


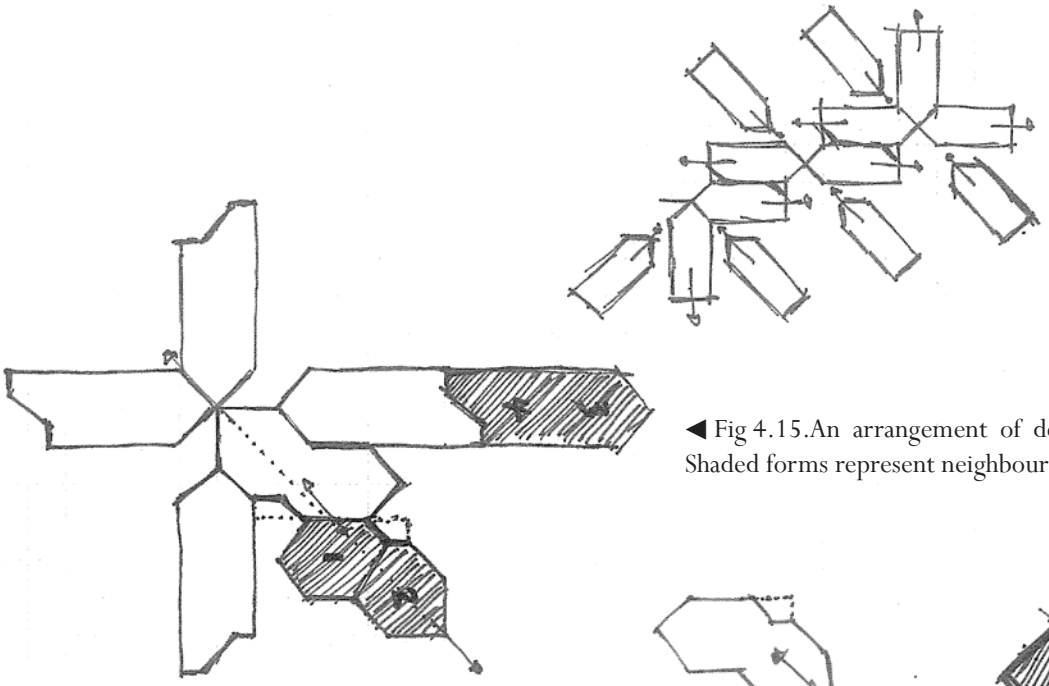
▲ Fig 4.12. Using one unit to produce over a dozen layouts in design by intertwining interior and exterior form.

▶ Fig 4.14.Adding in a diagonal axis to explore how form could respond to topological site flows.

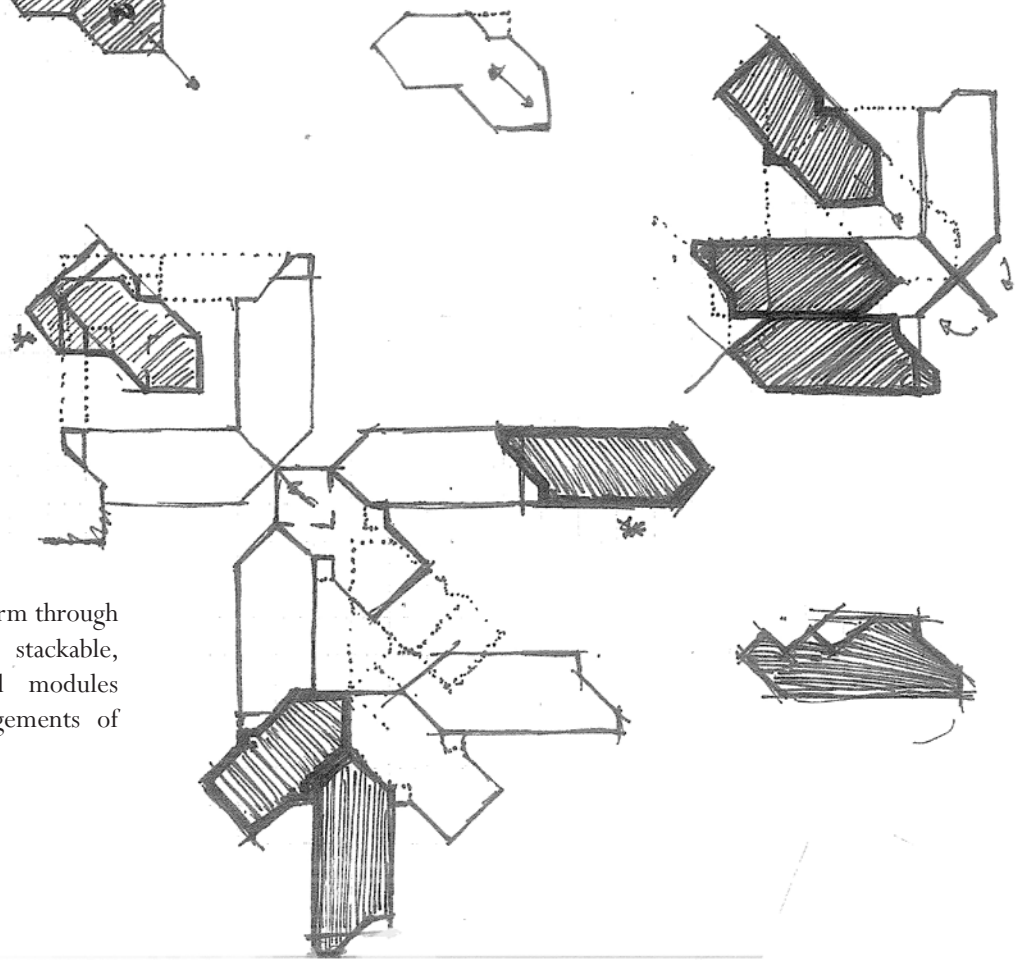


▲ Fig 4.13. Arranging a slidebar modular unit around a centralised core. Many configurations are possible through this simple gesture. However this only explores two orthogonal directions limiting site integration.

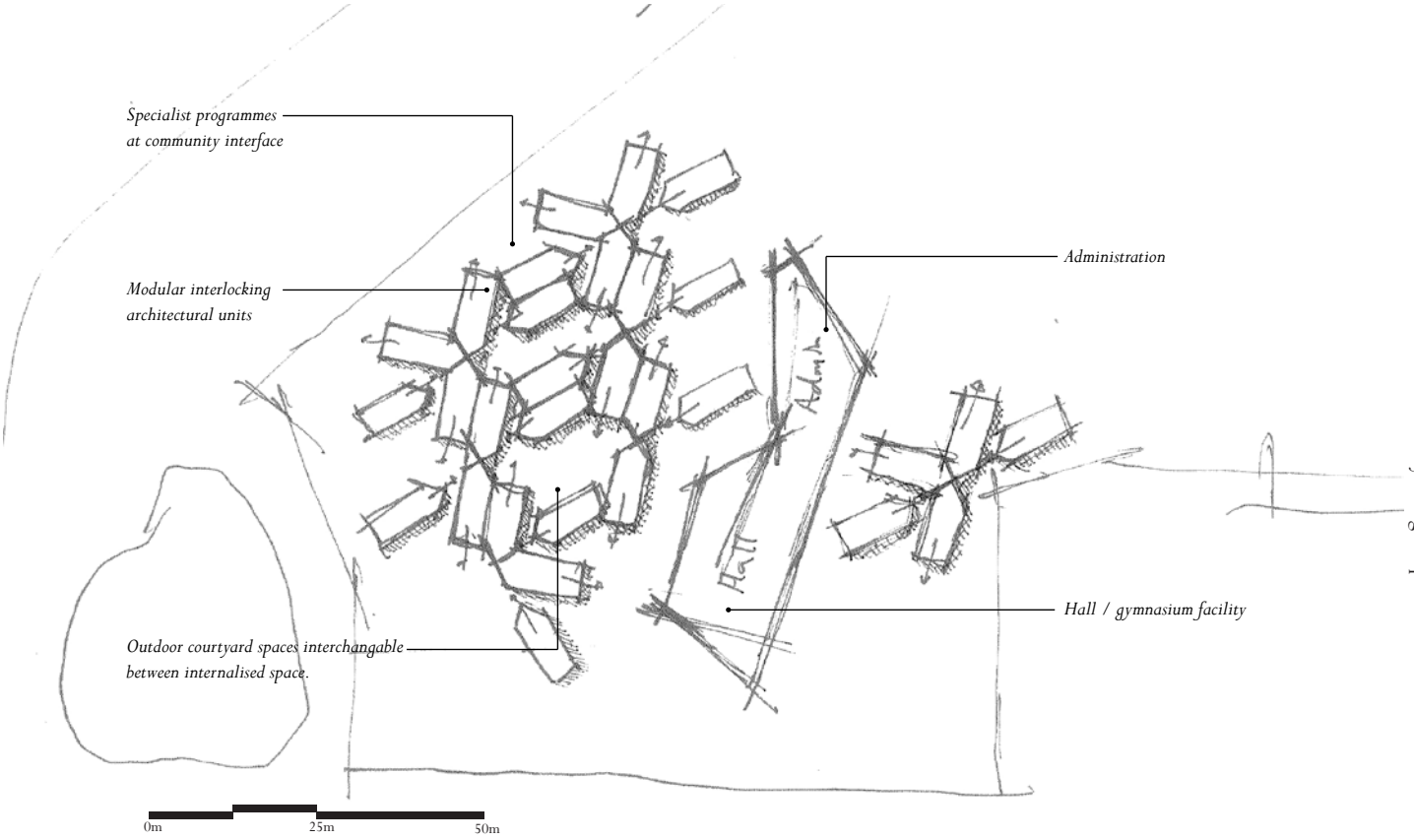




◀ Fig 4.15.An arrangement of developed form. Shaded forms represent neighbouring modules.



▶ Fig 4.16. Shaping form through movement. Creating stackable, moveable intertwined modules creates diverse arrangements of form.



▲Fig 4.17. Stackable nature can create transitions between internal and external form. However, due to size constraints of the hall and gymnasium facilities make it difficult to arrange these modules to fit this programme. In review, although these movable systems enable flexibility of space they determine that surrounding landscape must also be flexible enough to enable built form to transition over.

PHASE TWO (B)

An exploration of flexibility and the frame

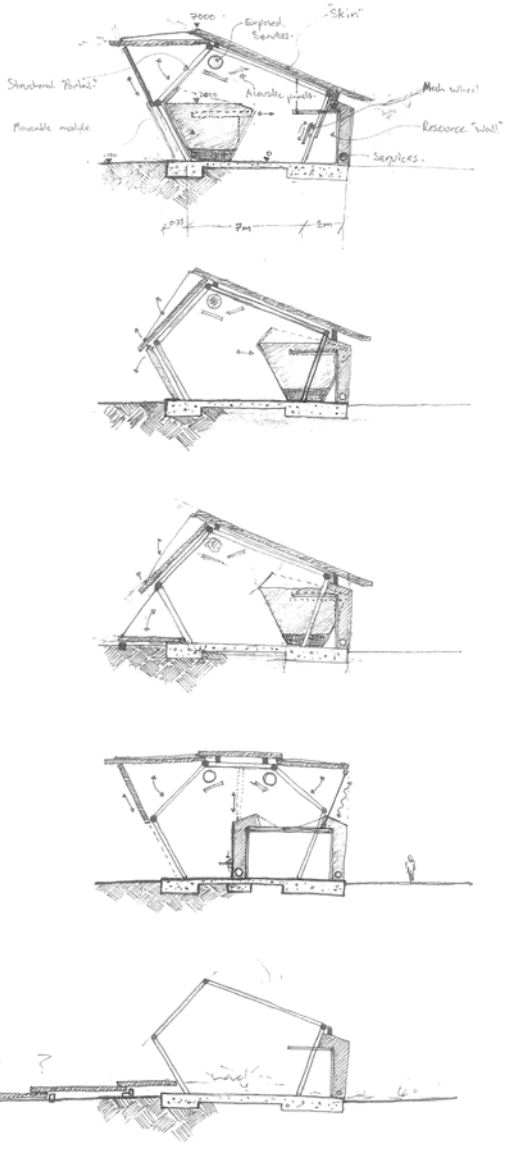
In opposition to previous methods of exploration Phase Two B explores a bottom up approach in which form is a result of detail in a response to an architectural need. It is a continuation of 'Articulation' as this phase analyses how the tectonics of the individual space work in isolation and as a whole. These experiments are isolated to allow an exploration of flexibility without constraints of site.

They follow onto Phase Three which combines principles of Imbrication and Articulation into the first design test concept.

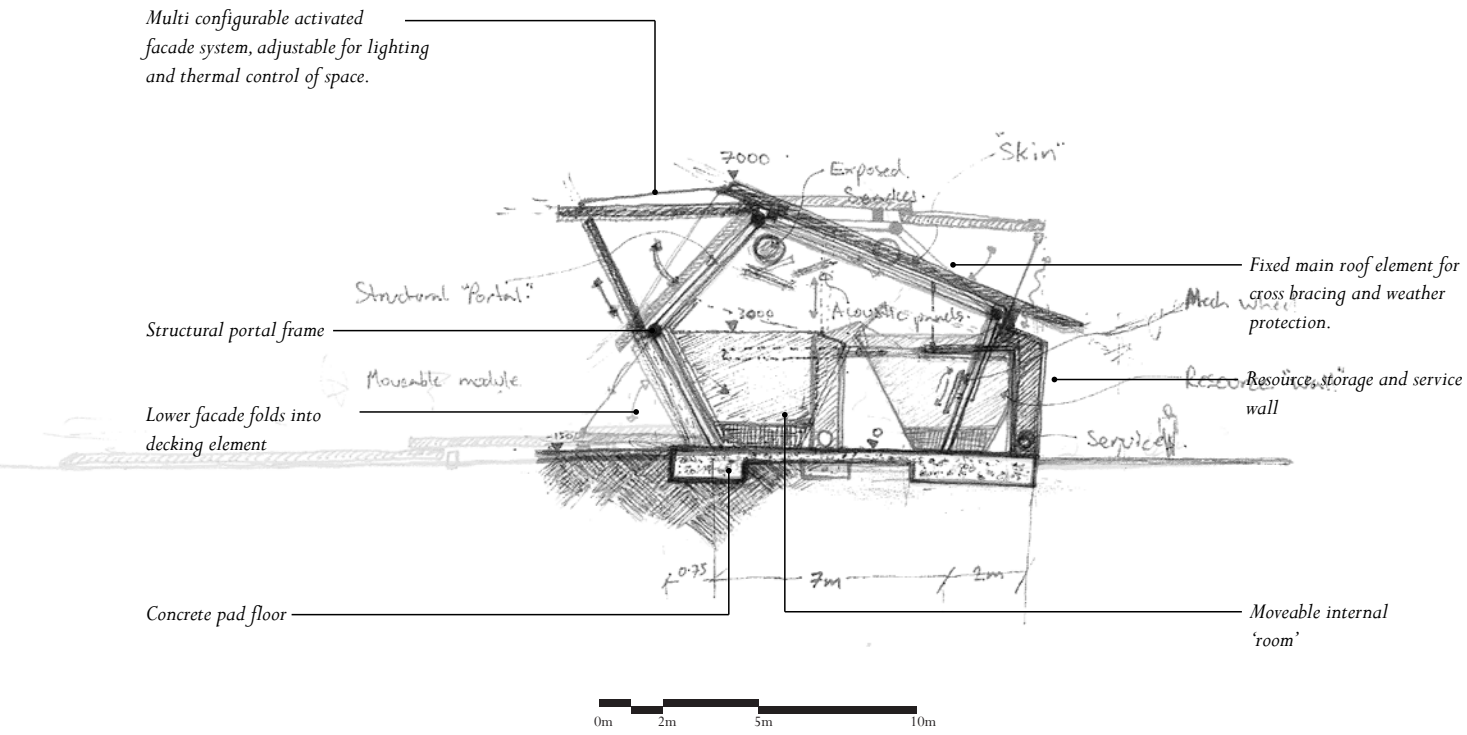
◀ Fig 4.18.Designs are explored through digital design to test functionality in a digital realm and through 3D Printing.

ACTIVE FACADE

This module explores relationships of adaptability between articulated facades and moveable internal spaces. The activation of facade allows for interesting connectivity opportunities between external and internal form, creating transitional space. In addition, the separation of facade panels and the frame allows for a flexible and interchangeable design module.

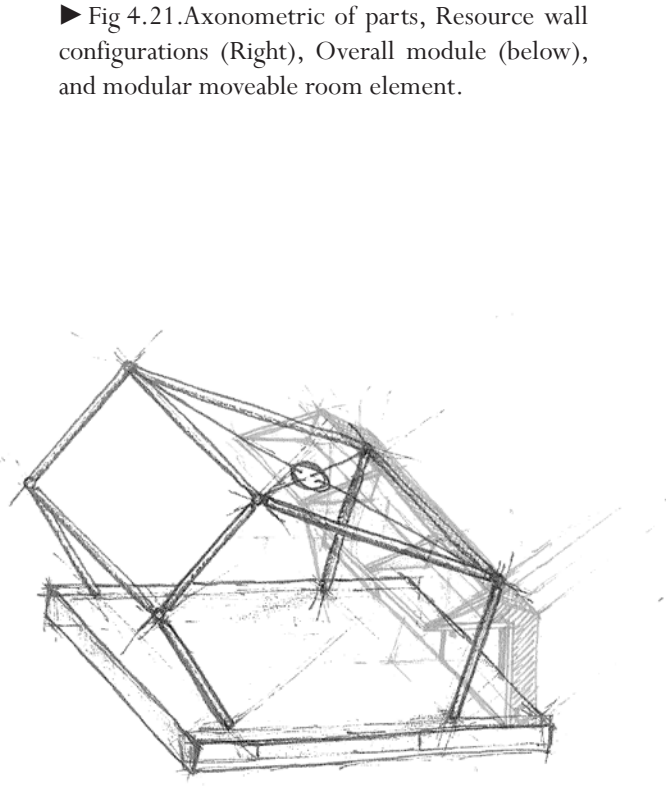


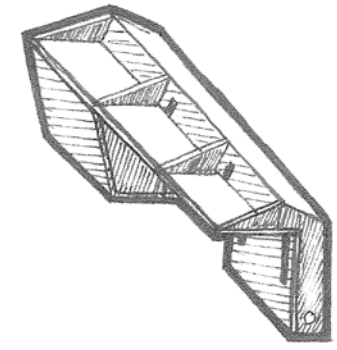
► Fig 4.19.Development sketches

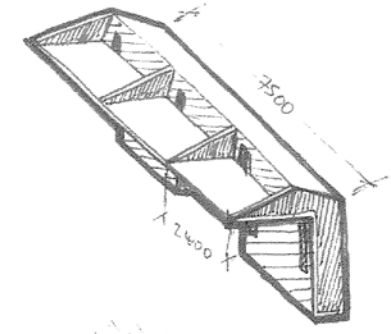


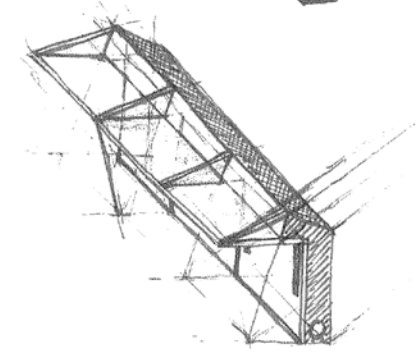
▲Fig 4.20.Dynamics of the Active Facade, a combination of interrelating components.

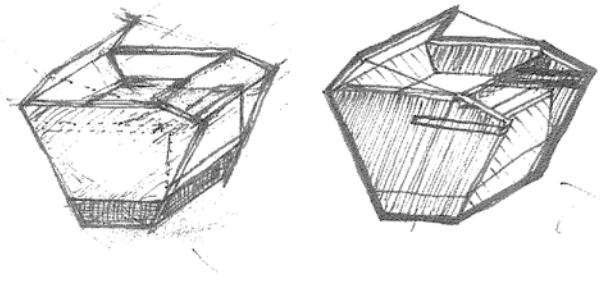
► Fig 4.21.Axonometric of parts, Resource wall configurations (Right), Overall module (below), and modular moveable room element.



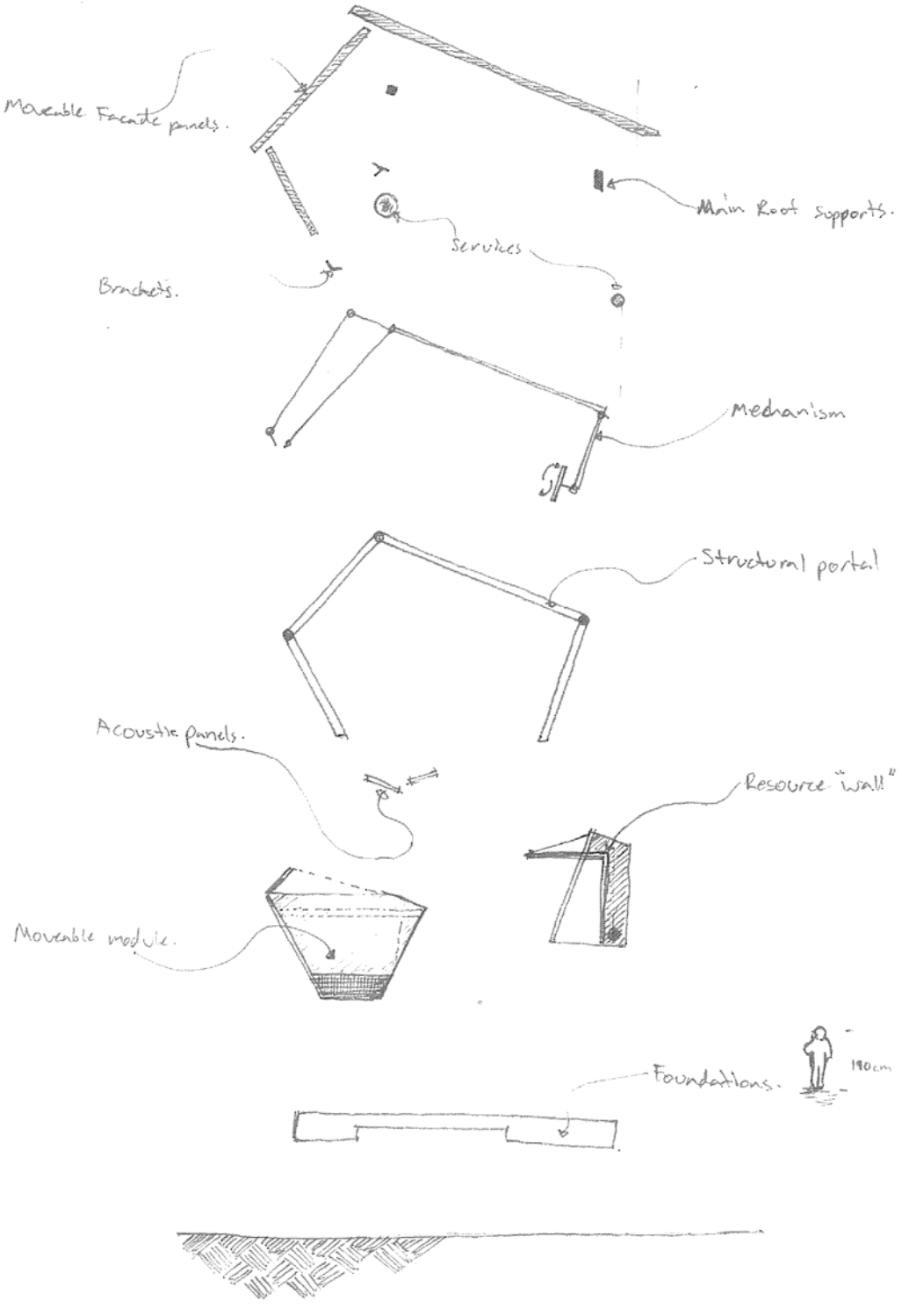






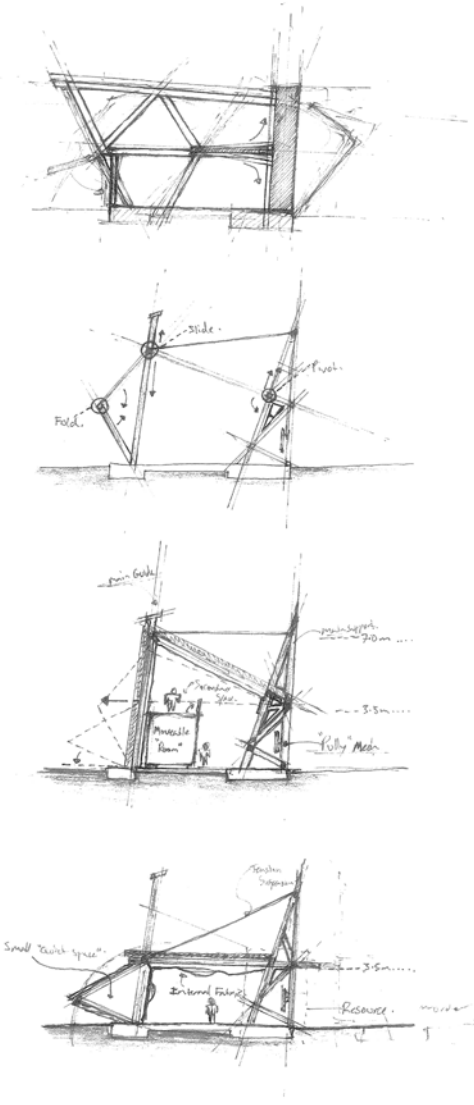


► Fig 4.22.Exploded layers, analysing kitset of parts.

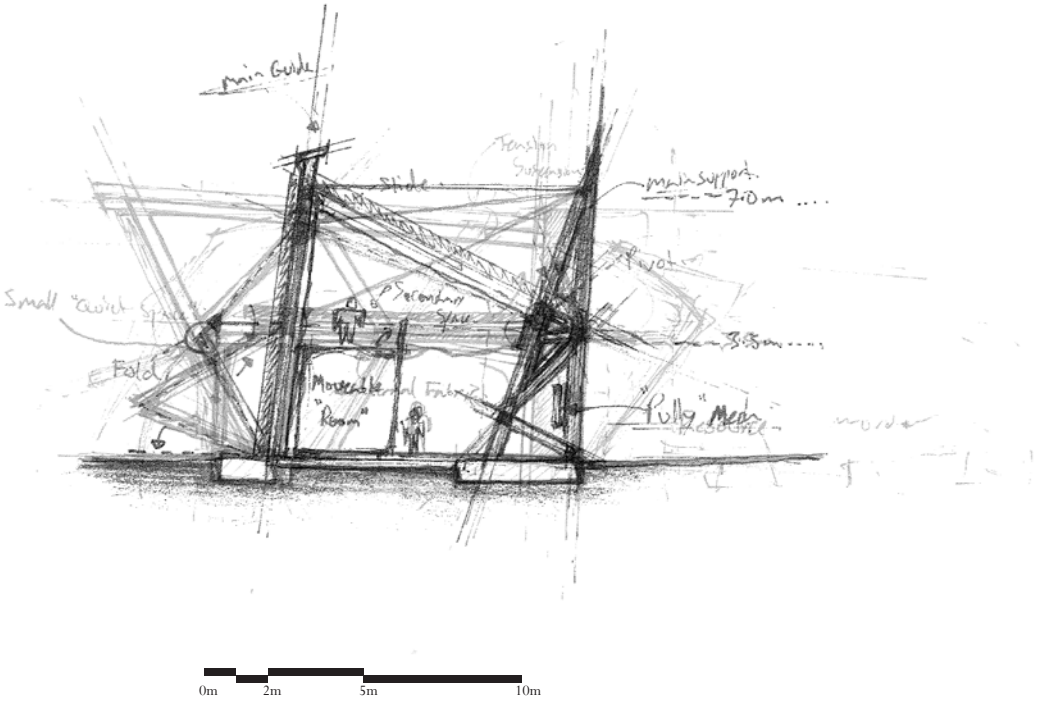

Movable Facade panels.
Main Roof Supports.
Services
Brackets.
Mechanism
Structural portal
Acoustic panels.
Resource "wall"
Movable module.
Foundations.
190cm

IN TRANSITION

This set of design sketches represent a range of background exploration diagram that develop from the previous concept into the next.



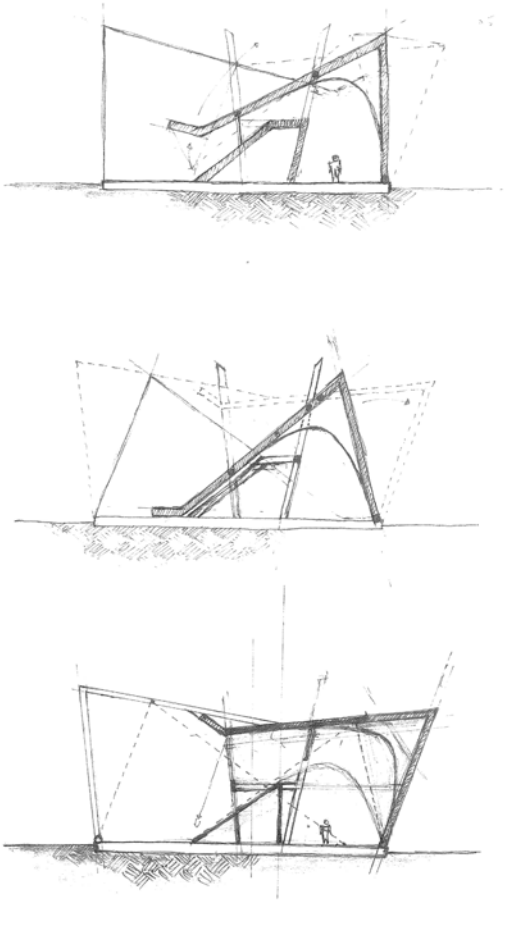
▶ Fig 4.23.Development sketches



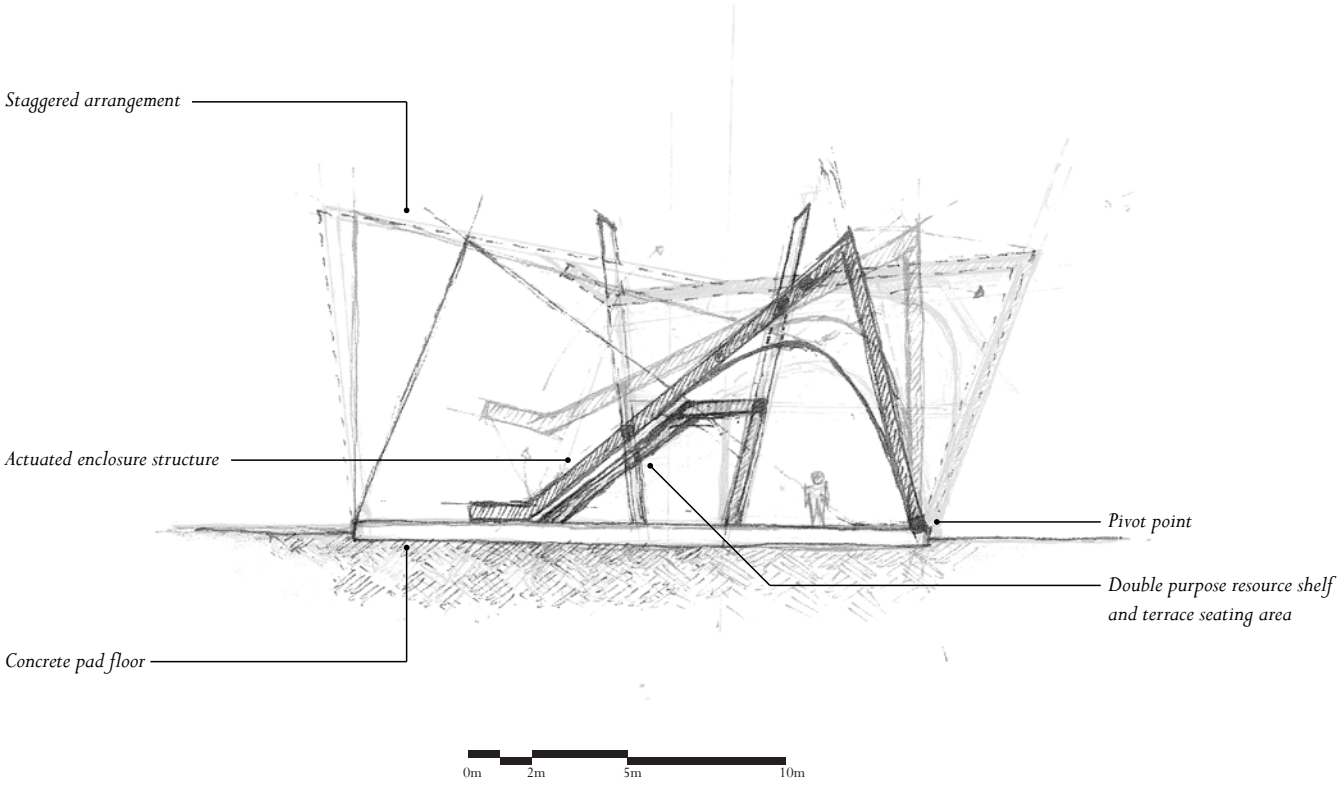
▲Fig 4.24.The transition from an active facade to an actuated enclosure.

ACTUATED ENCLOSURE

This second design model engages a dynamic of extendability to establish relationships between form and programmatic use. A grand gesture of a pivotal enclosure structure enables this module to expand from a single storey mezzanine structure to a double story structure with covered terrace seating.



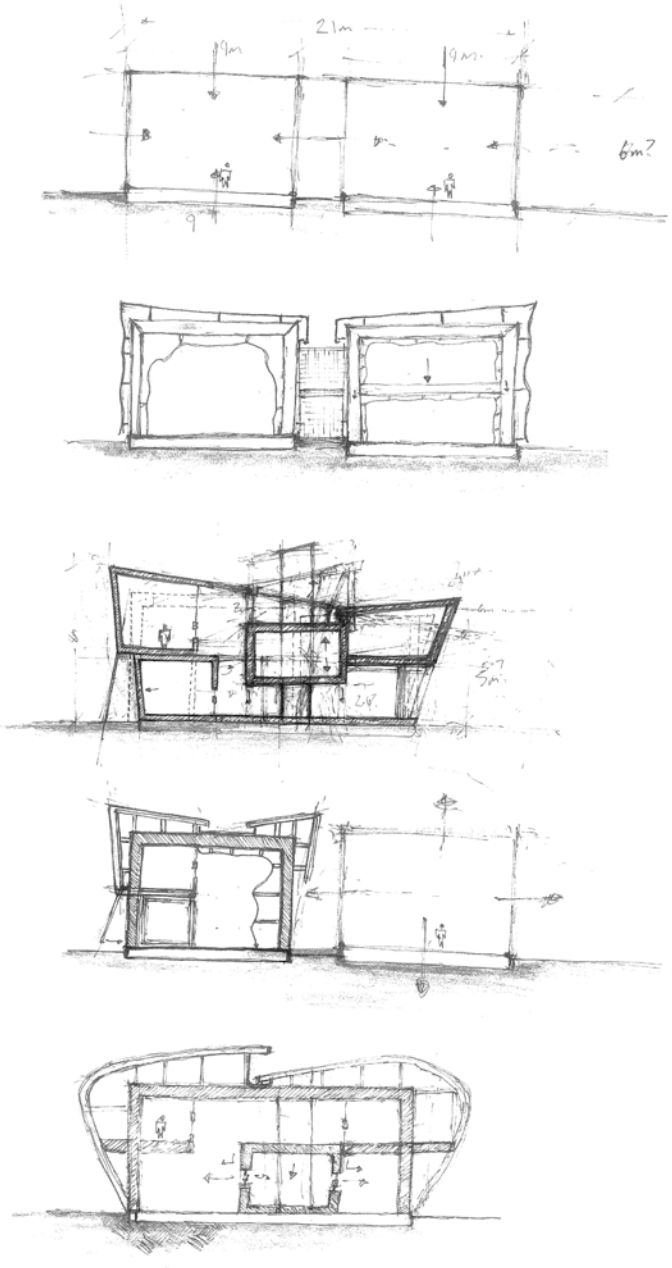
▶ Fig 4.25.Development sketches



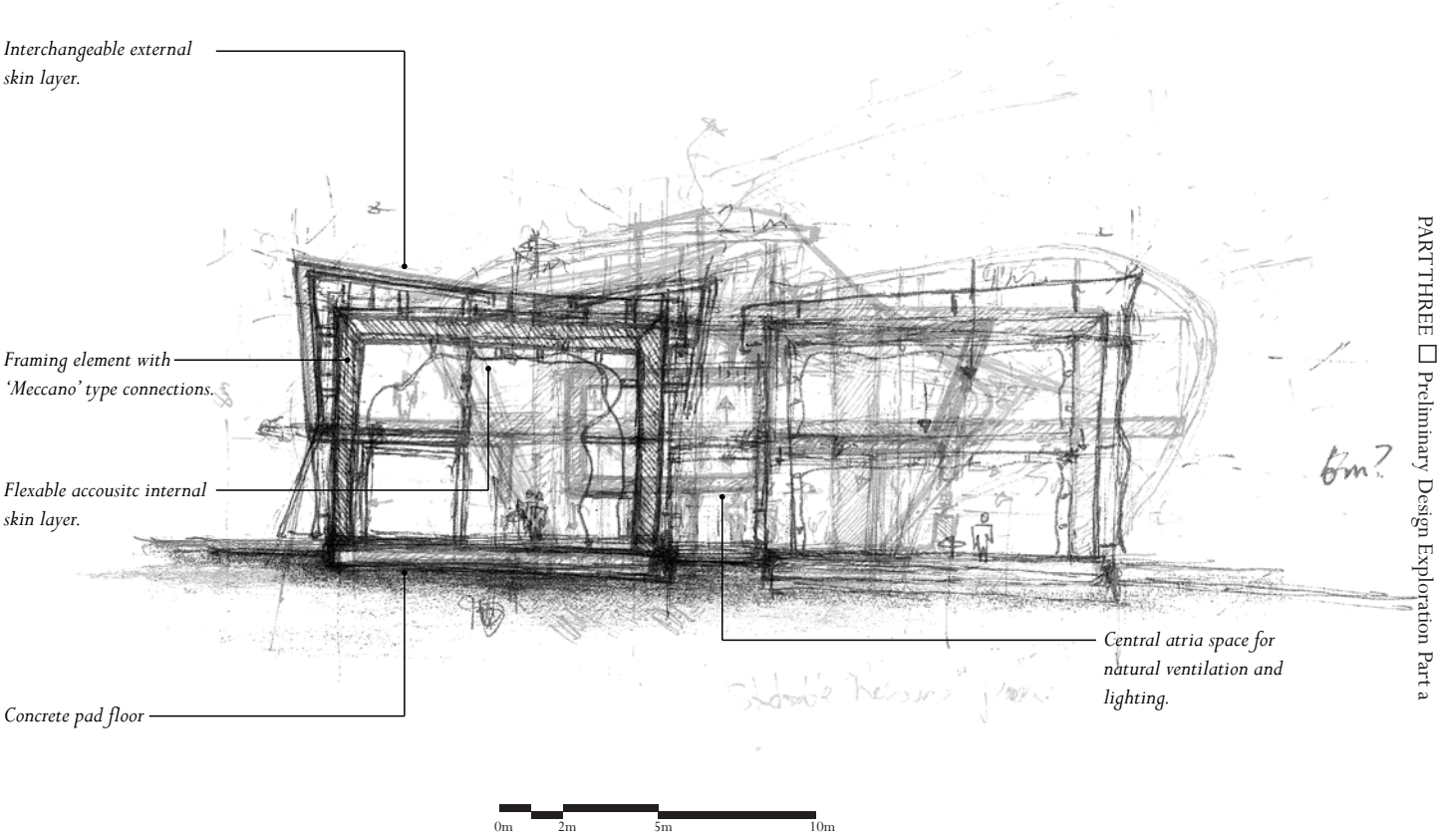
▲Fig 4.26.Dynamics of the Actuated Enclosure, Layers of structure and skin combined.

ENVELOPED FRAME

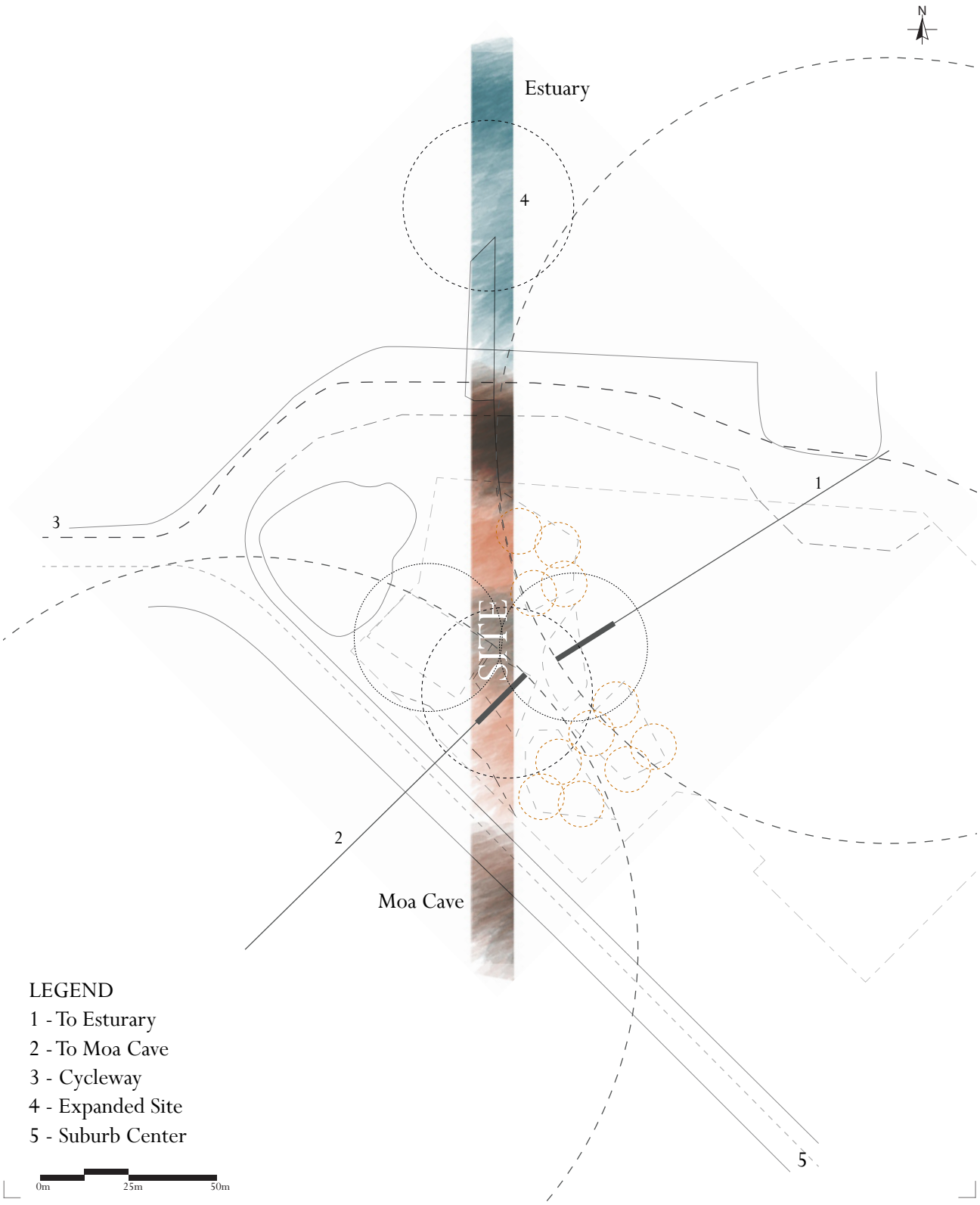
The final of three modular studies utilises the concept of polyvalence to construct a frame in which form can be flexible both internally and externally.



► Fig 4.27.Development sketches



▲Fig 4.28.Dynamics of the Enveloped Frame, layers in suspension off a frame.


N
Estuary
4
3
1
SITE
2
Moa Cave
5
LEGEND
1 - To Esturary
2 - To Moa Cave
3 - Cycleway
4 - Expanded Site
5 - Suburb Center
0m
25m
50m

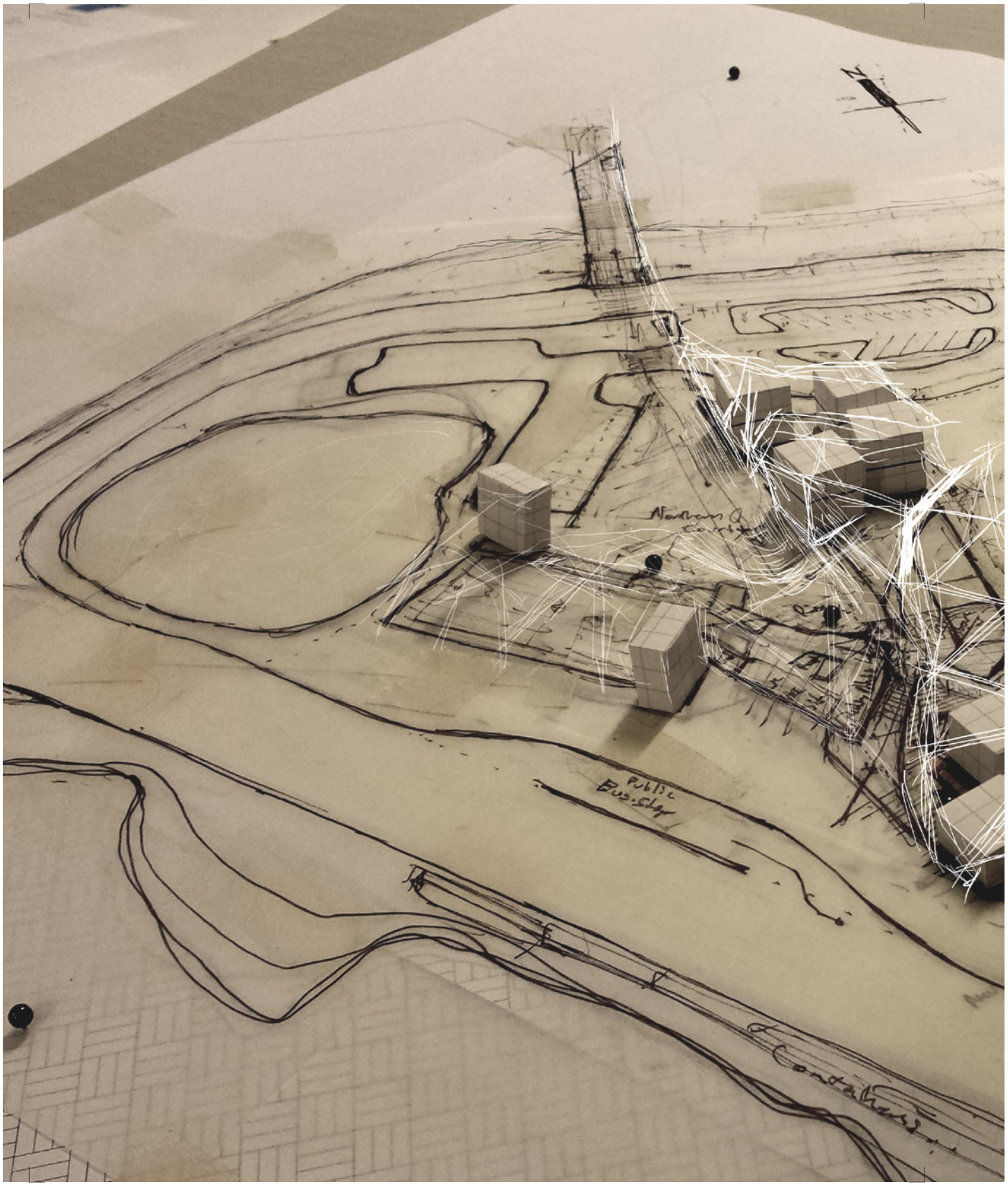
PHASE THREE

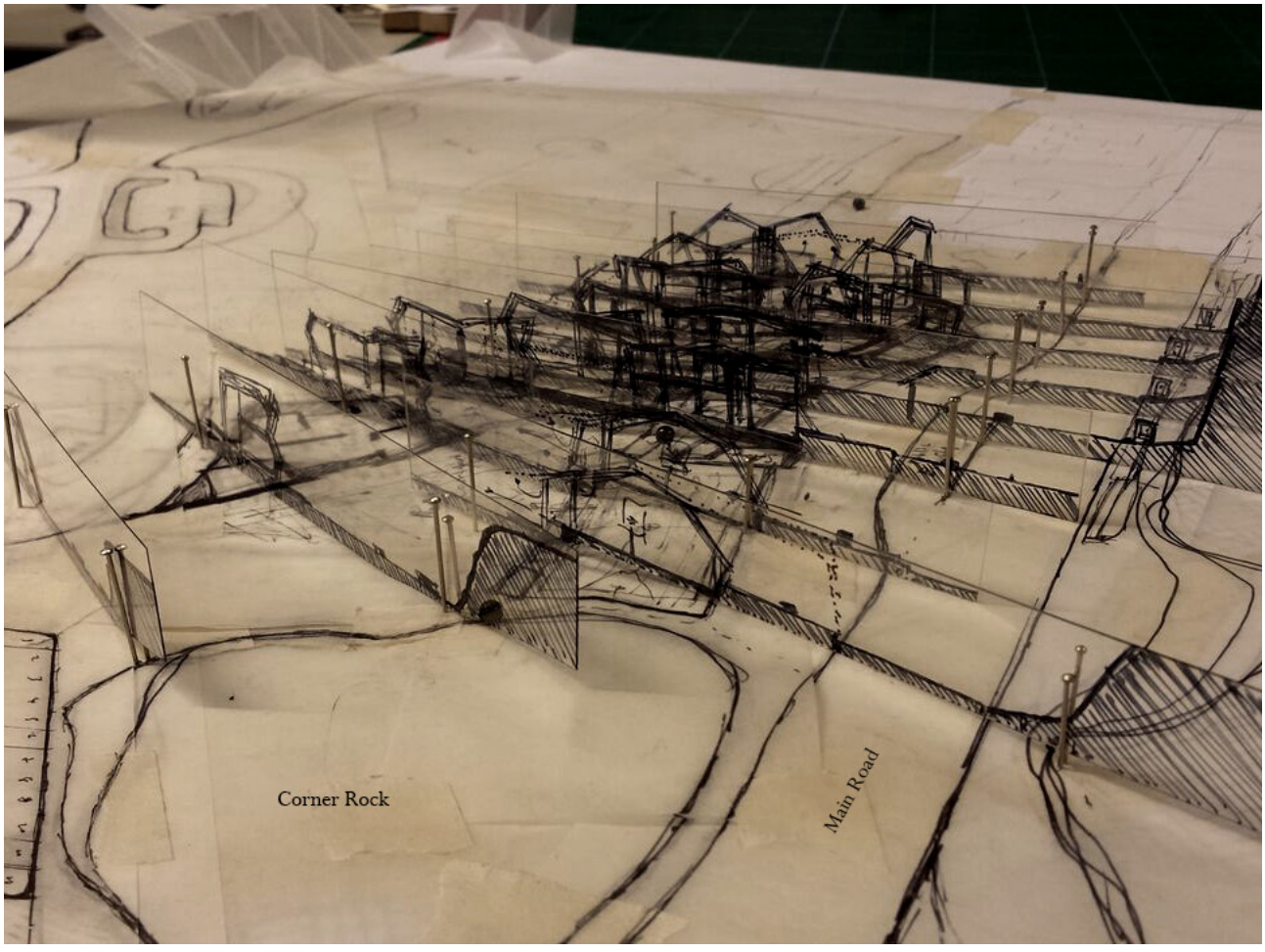
Design Case Study One

Phase Three consolidates previous design experiments into an adaptable outdoor focused learning environment.

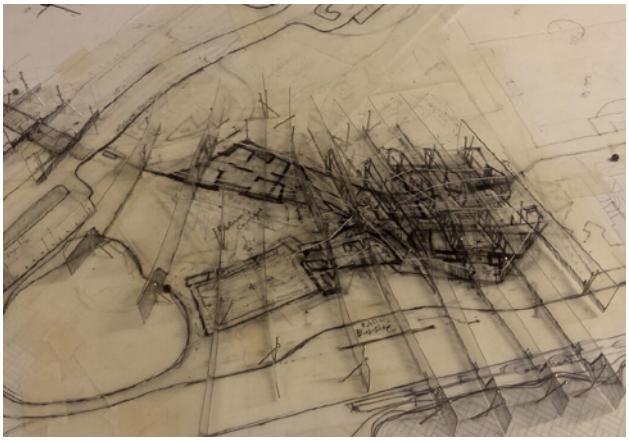
This concept returns to site to encourage a more active engagement with external connections. The school is positioned on two tangents on the thresholds between the estuary and the historical Moa Cave. This concept aims to develop and respond to a site transect which is permeable to community connections and engagement in a layered approach.

◀ Fig 4.29.Outline of the relationships to this site transect.

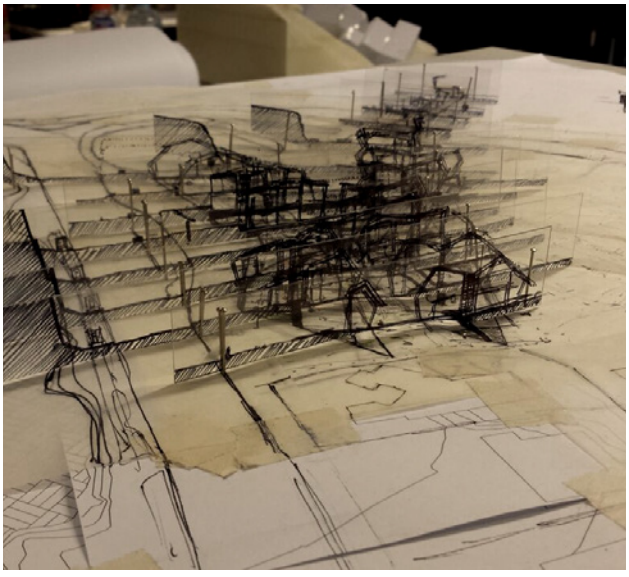

Public
Bus Stop


Corner Rock
Main Road

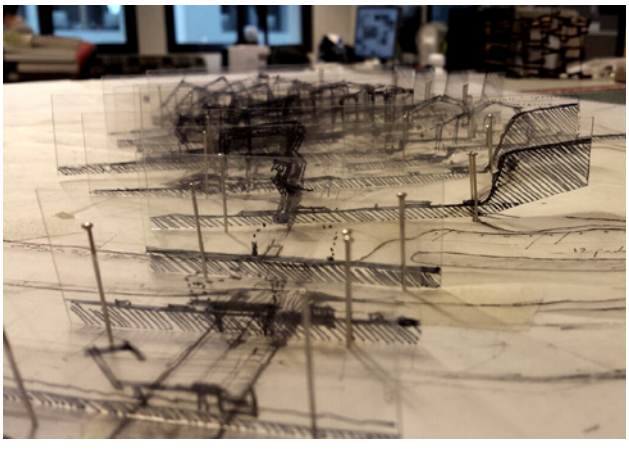
▲ Fig 4.30. (Previous) This design phase was explored through analysing site and section in a physical 1:500 site model. Initial exploration started with a layering of concept sketches and the determination of 'classroom' spaces positioned through basic modules.

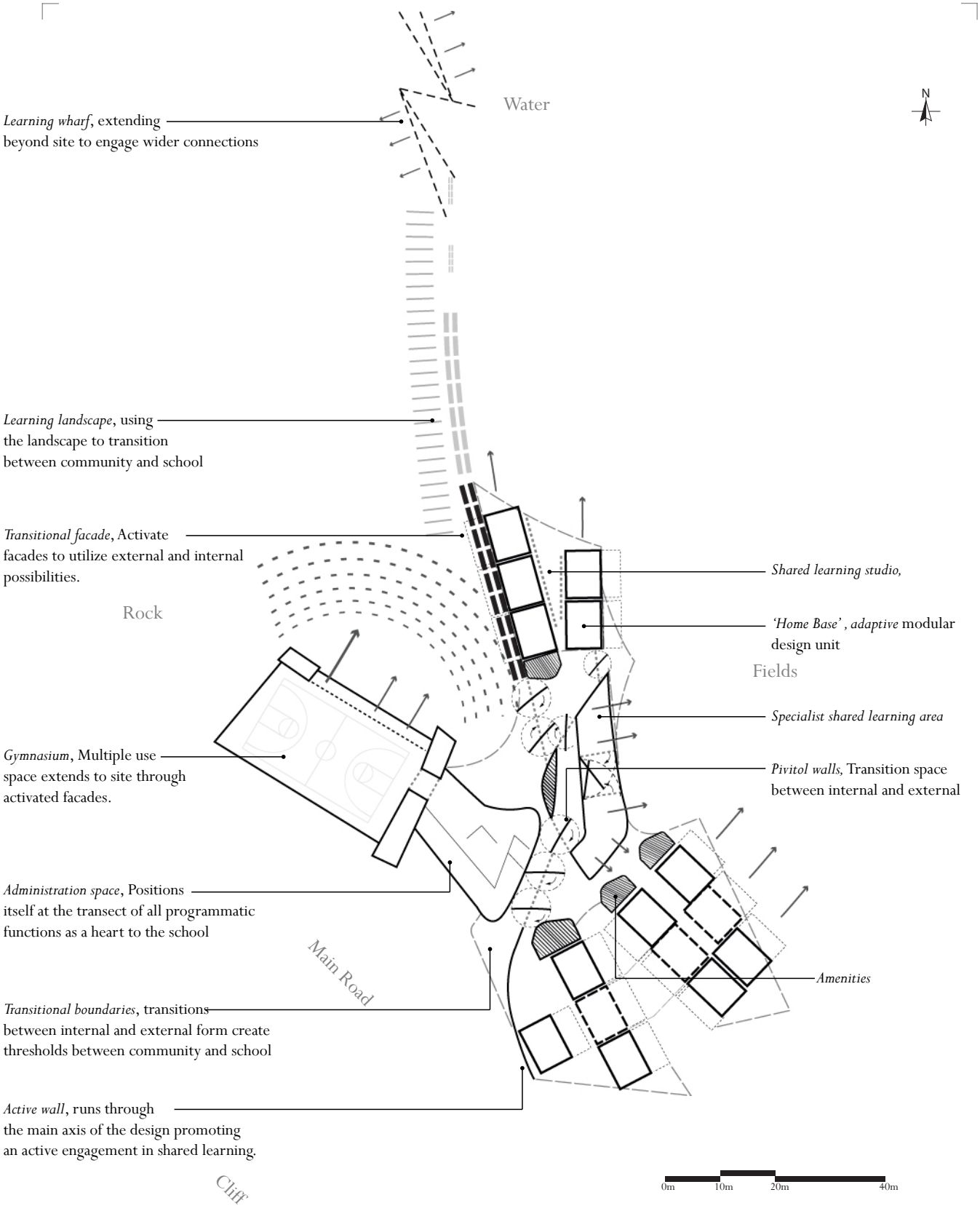


▶ Fig 4.31. 14 section cuts were taken through this base plan model to explore relationships between the built form and site. This process allowed verticality to be introduced to the concept model.



◀ Fig 4.32.(Opposite) relationships of the gymnasium and site. Elevated on the three metre bank this provides opportunities to engage the northern courtyard as an external amphitheatre whilst maintaining a 'billboard' for the school.




Water
N
Learning wharf, extending beyond site to engage wider connections
Learning landscape, using the landscape to transition between community and school
Transitional facade, Activate facades to utilize external and internal possibilities.
Rock
Shared learning studio,
'Home Base' , adaptive modular design unit
Fields
Specialist shared learning area
Pivitol walls, Transition space between internal and external
Gymnasium, Multiple use space extends to site through activated facades.
Administration space, Positions itself at the transect of all programmatic functions as a heart to the school
Main Road
Amenities
Transitional boundaries, transitions between internal and external form create thresholds between community and school
Active wall, runs through the main axis of the design promoting an active engagement in shared learning.
Cliff
0m
10m
20m
40m

Reflection of Design Case Study One.

Centred around a shared communal core the design uses transitional space to create outdoor learning opportunities that extend beyond internalised form. The two radial connections have produced an interesting arrangement of form in relation to the site and programme.

In reflection, whilst the positioning of the hall facility provides opportunities of external engagement, its location on site is inappropriate. In considering the scale of the hall facility and its relationship to the natural 3m embankment it would be better and easier built on the flat land. This would provide opportunity for community engagement after hours in connection with the sports fields.

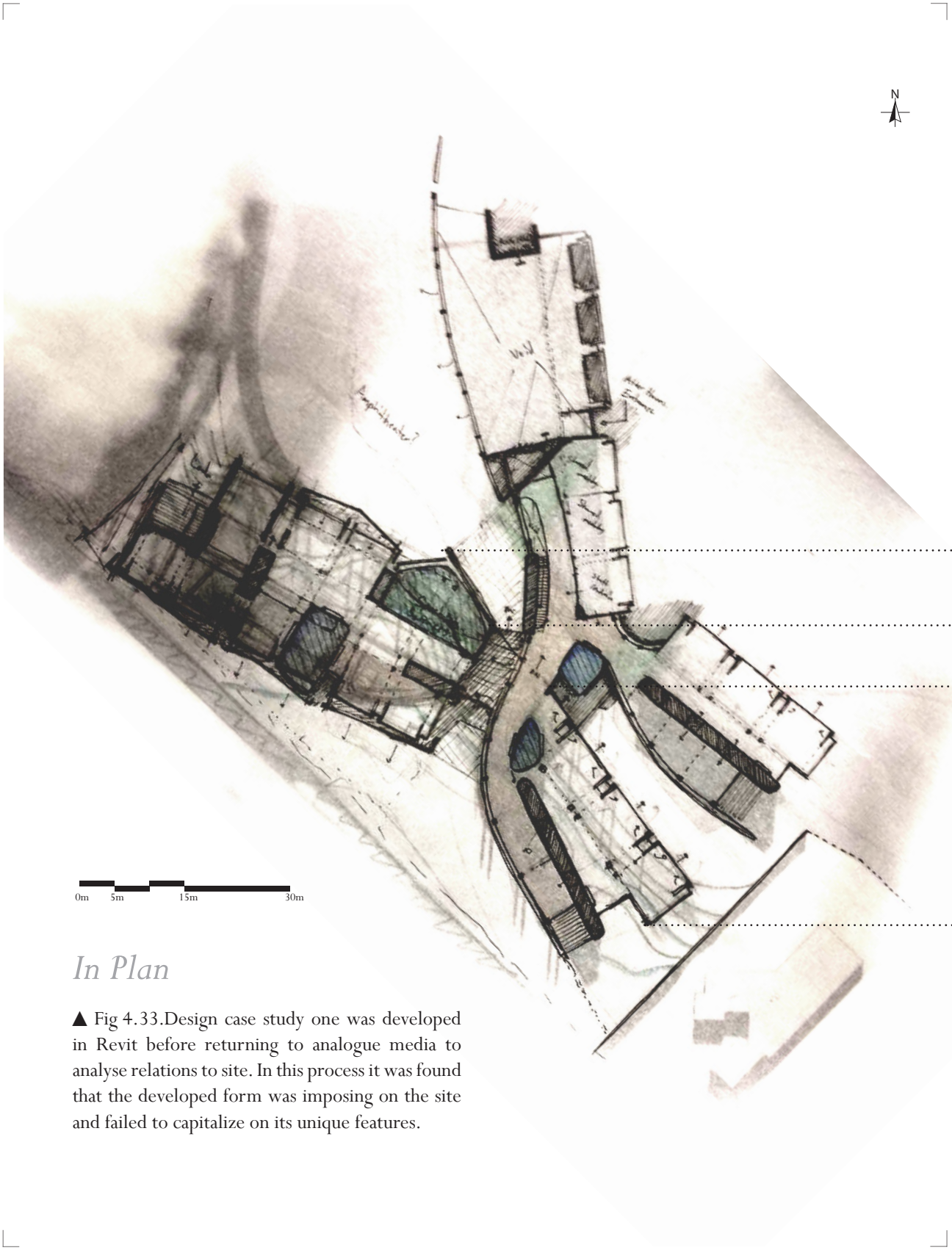
THE DESIGN PROCESS PART B

Preliminary explorations of primary school architecture

Design explorations focused on developing the initial design case study in preliminary exploration. Throughout this process there were a number of shifts in thinking between the relationship of site and flexibility. This preliminary design exploration adopts a modular framework to promote a flexible and blended learning environment.

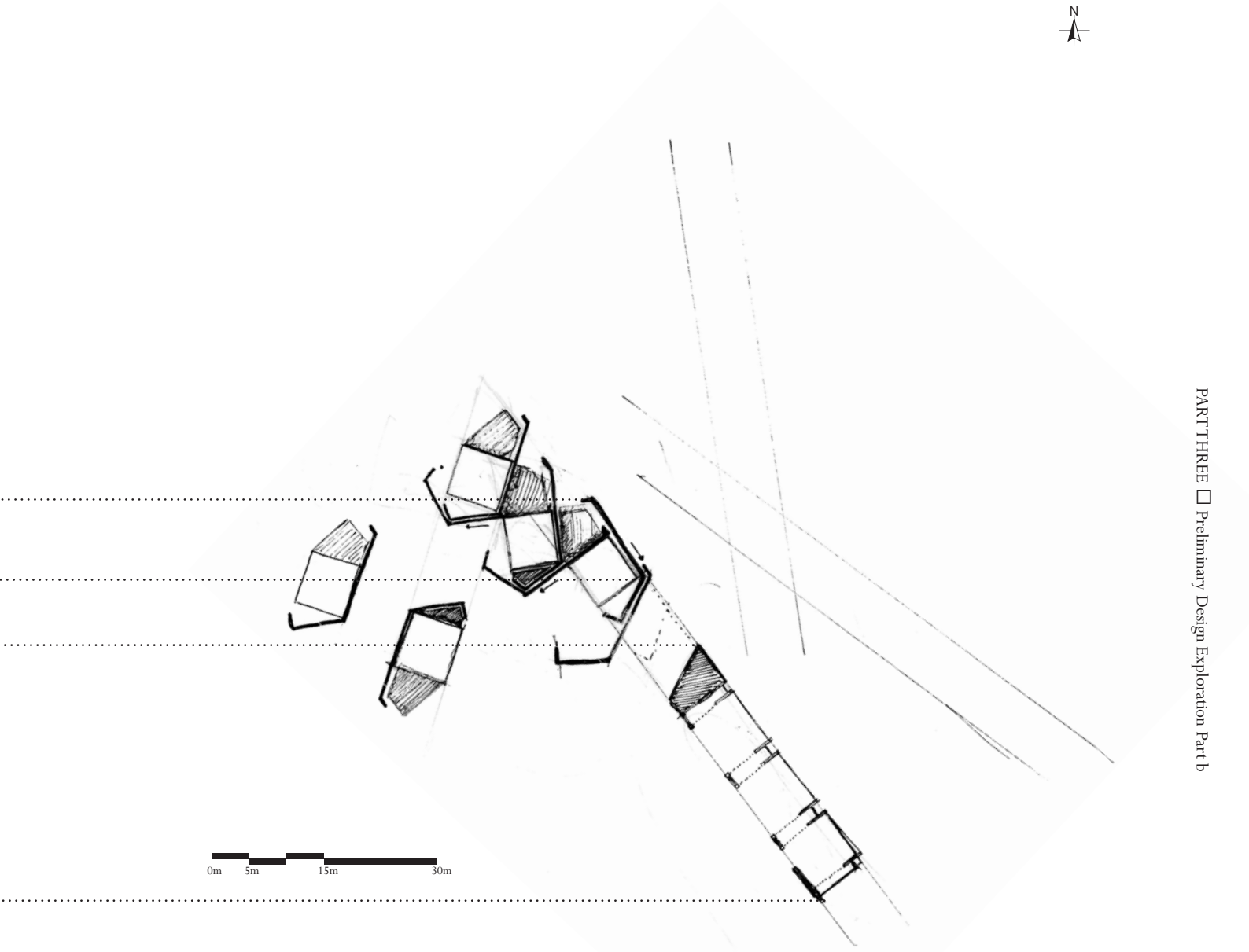
These explorations suggested a generated design objective of developing a modular framework that can respond and engage with the site to promote outdoor learning connectivity and flexibility within the school organism.

In review of this process it can be seen that a network of modular parts (in combination with site responsive elements) has potential to provide an interesting dialogue between site and architectural form.



In Plan

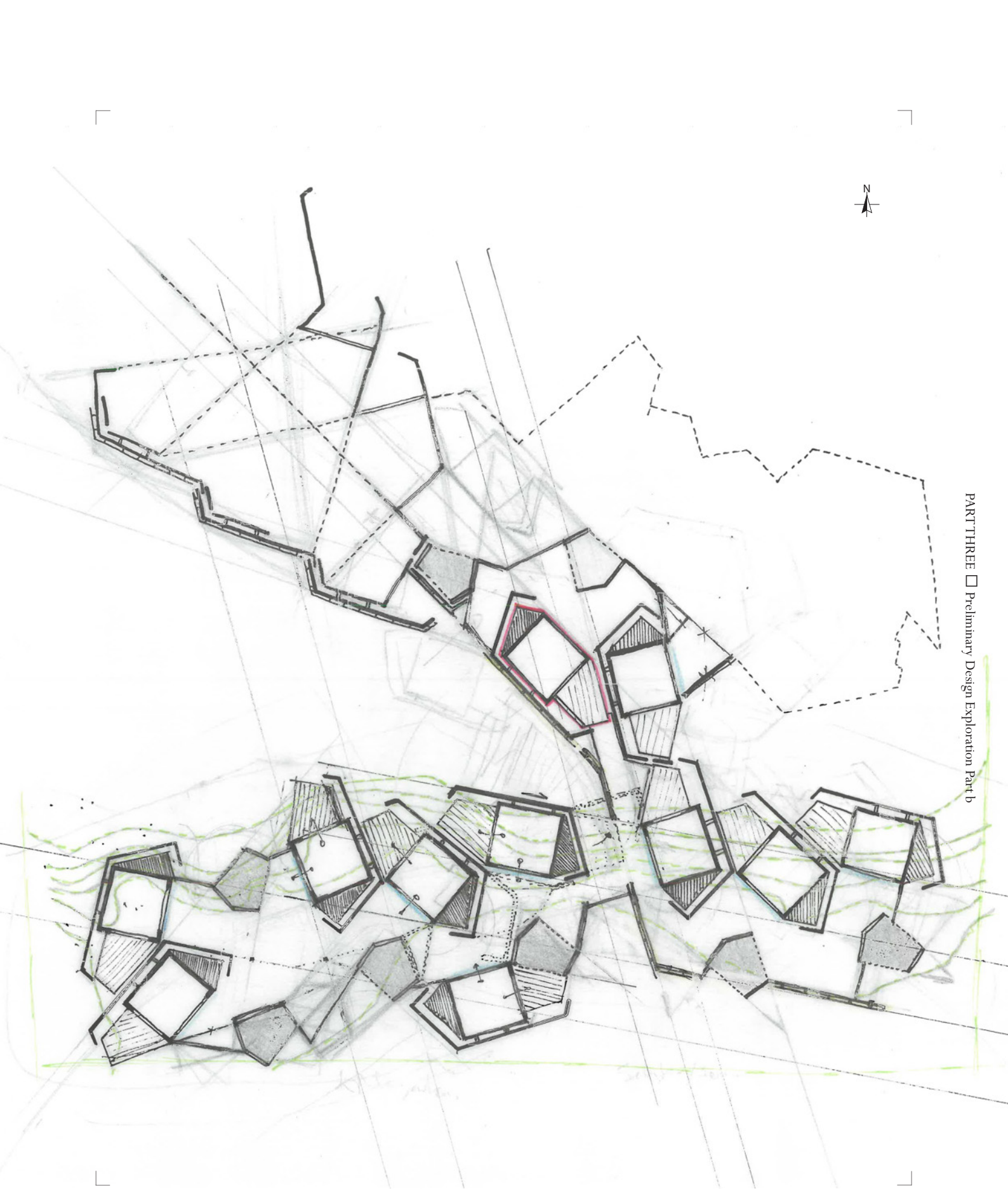
▲ Fig 4.33.Design case study one was developed in Revit before returning to analogue media to analyse relations to site. In this process it was found that the developed form was imposing on the site and failed to capitalize on its unique features.



▲ Fig 4.34. The Twist. In the process of relocating the hall programme and analysing Design case study one , the realisation of the dynamics between an inherently modular design framework in relation to site came under discussion. The above layout was developed in response to site contours and flows. The resulting twisting module provides unique spatial opportunities.

▲ Fig 4.35.Concept Ground Floor Plan. Modular pod framework with an adaptable layout to multiple pedagogical layouts. Orange highlights areas for administration functions, whilst red highlights potential removal of modules. The hall function adopts repetition of the modules however employs its own modular form.

▶ Fig 4.36.Concept First Floor Plan. A fluid shared space connects modules into a continuous transitional space.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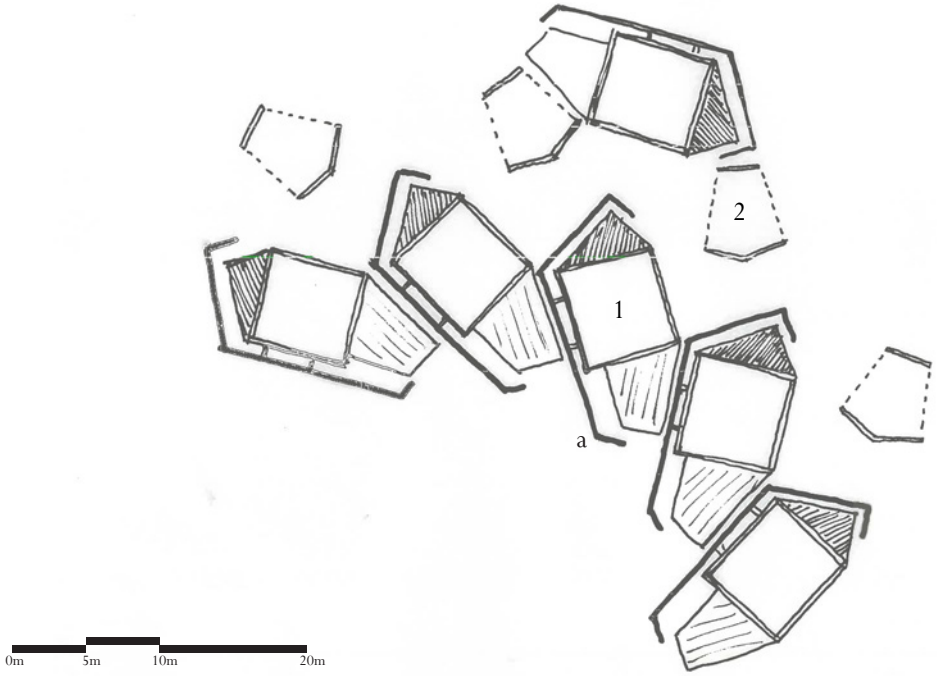
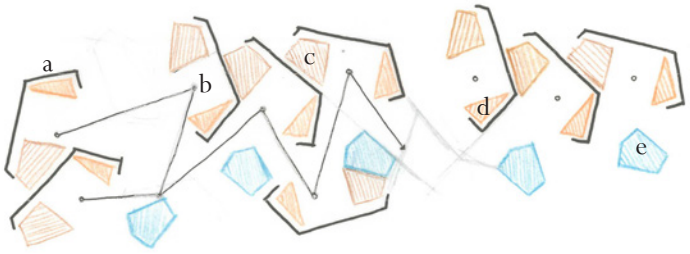
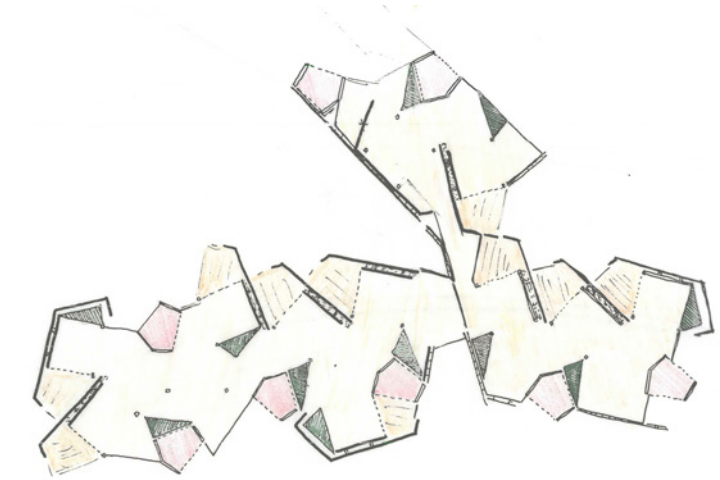
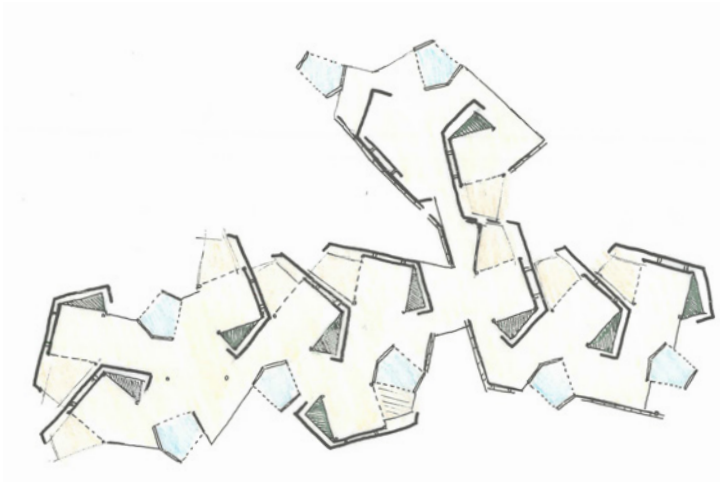


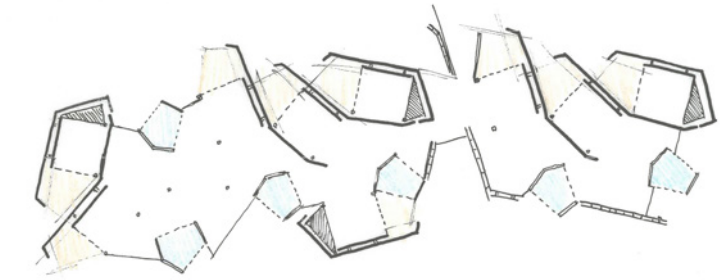
▲ Fig 4.37.Module 2 is shaped by the larger module component 1 featured sliding wall structure (a). That envelopes one side of the formulated trio of divergent spaces.

▶ Fig 4.38.A Network of Parts. (a) Sliding interchangeable wall structure, (b) 40m² Internalised space, (c) Transitional zone, (d) Storage module / modular moveable 'quiet room', (e) Wet services module / small room module.

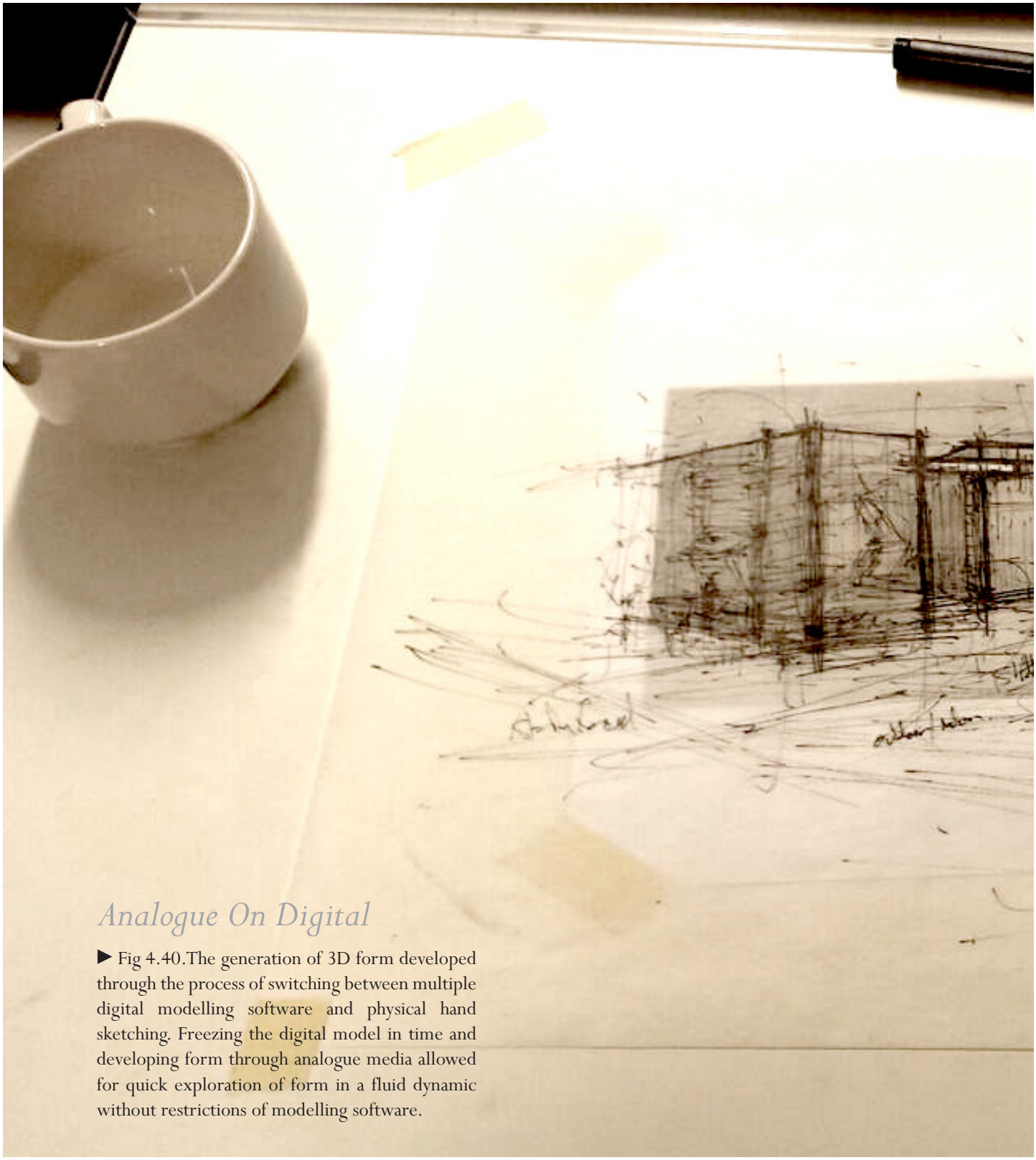








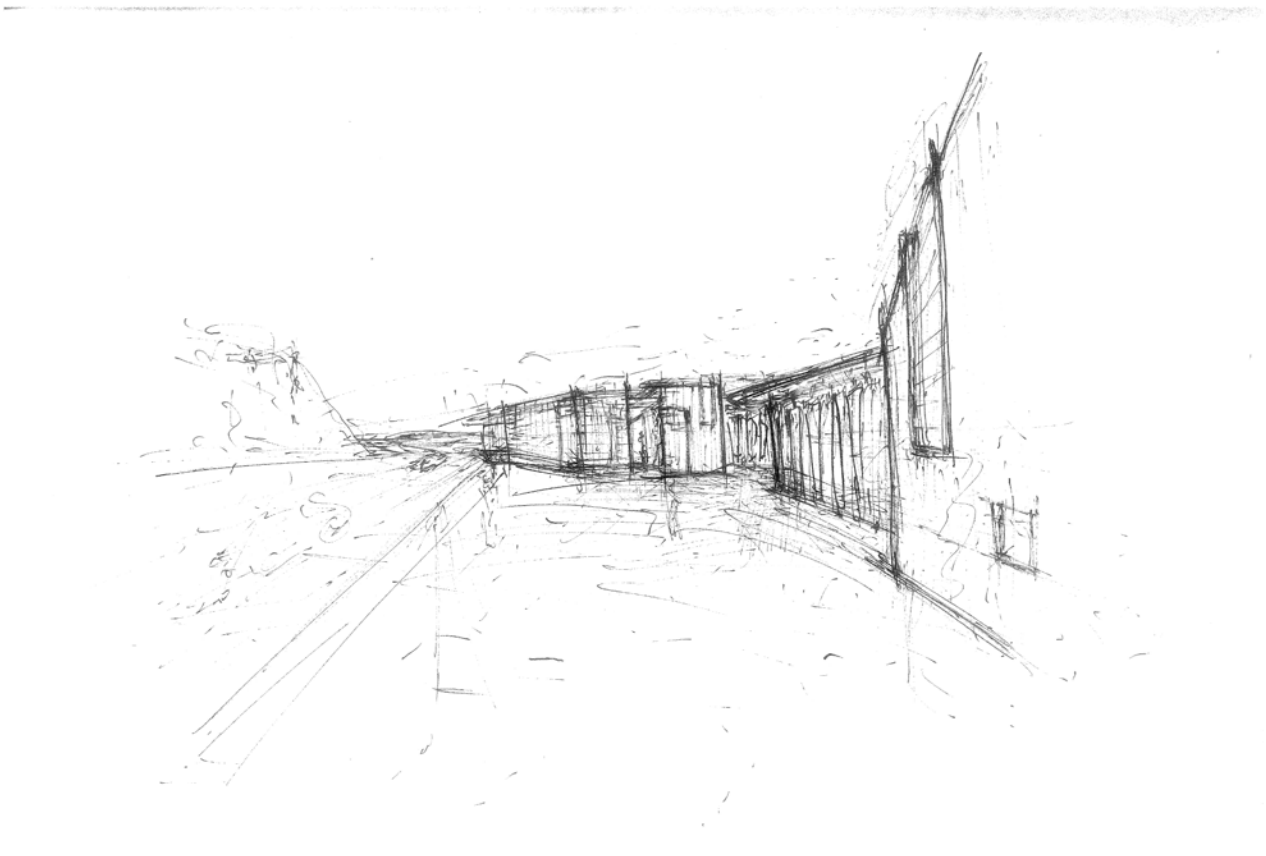
◀ Fig 4.39.Together, in plan, these parts provide for multiple configurations of internalised spatial layout, creating expansive open space containing enclosed learning alcoves.

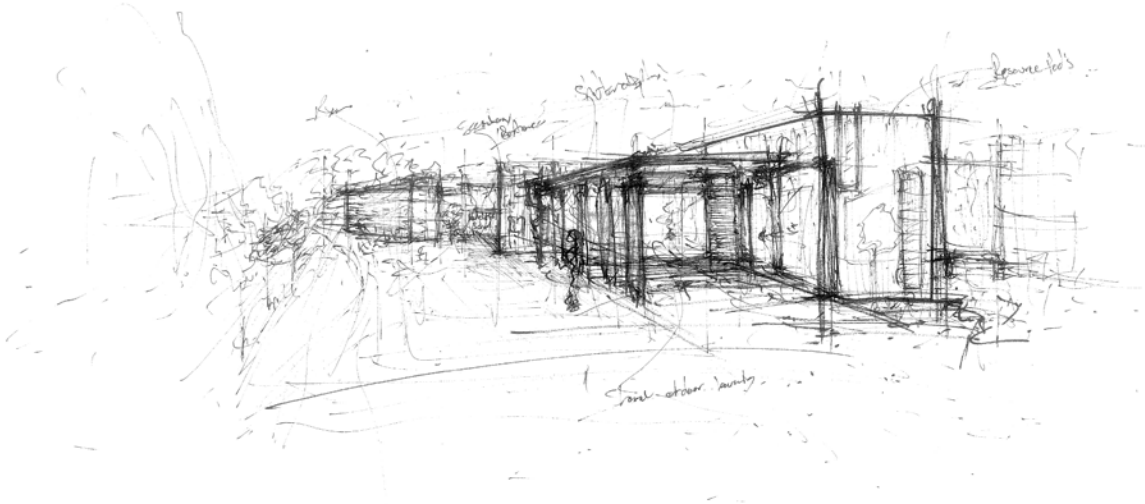


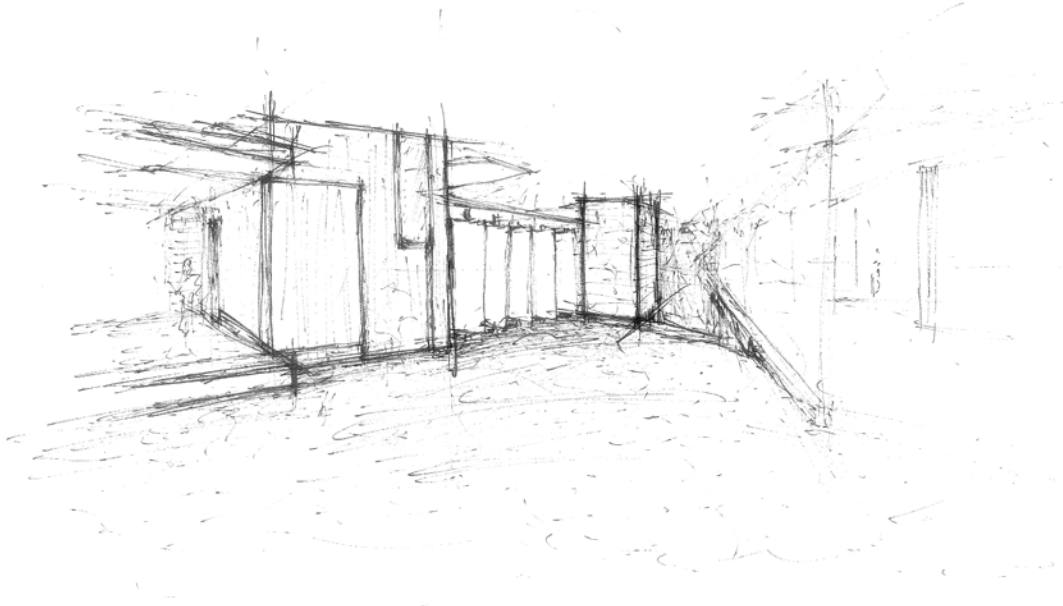
Analogue On Digital

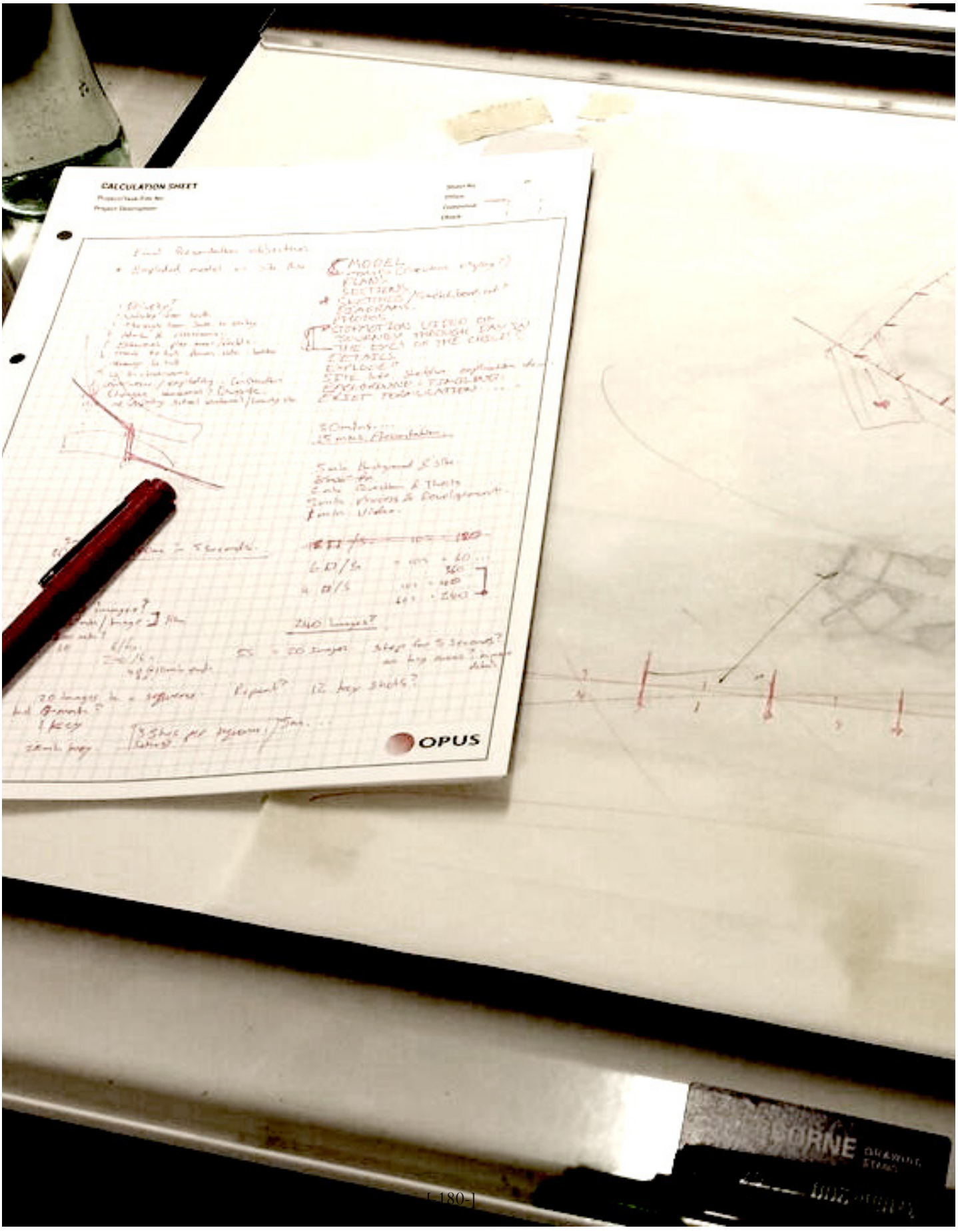
▶ Fig 4.40.The generation of 3D form developed through the process of switching between multiple digital modelling software and physical hand sketching. Freezing the digital model in time and developing form through analogue media allowed for quick exploration of form in a fluid dynamic without restrictions of modelling software.

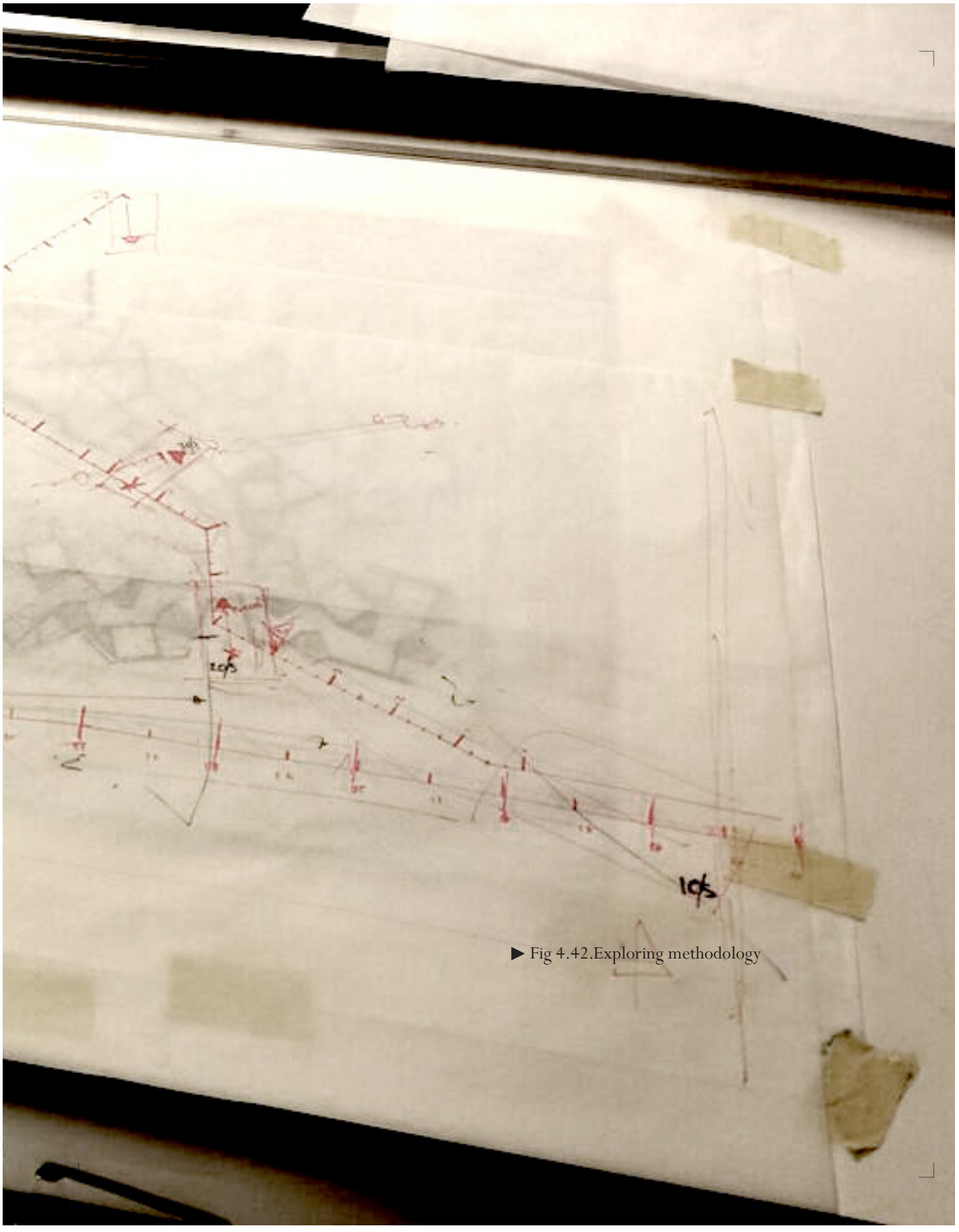
▶ Fig 4.41.These sketch explorations provided useful experimentation of 3D form generation. Initially key areas (as shown) were explored to be implemented into the digital model.These sketches proved to be a useful methodology for designing in more intimate detail. A series were developed in parallel to digital modelling to address design issues that arose.








CALCULATION SHEET
OPUS



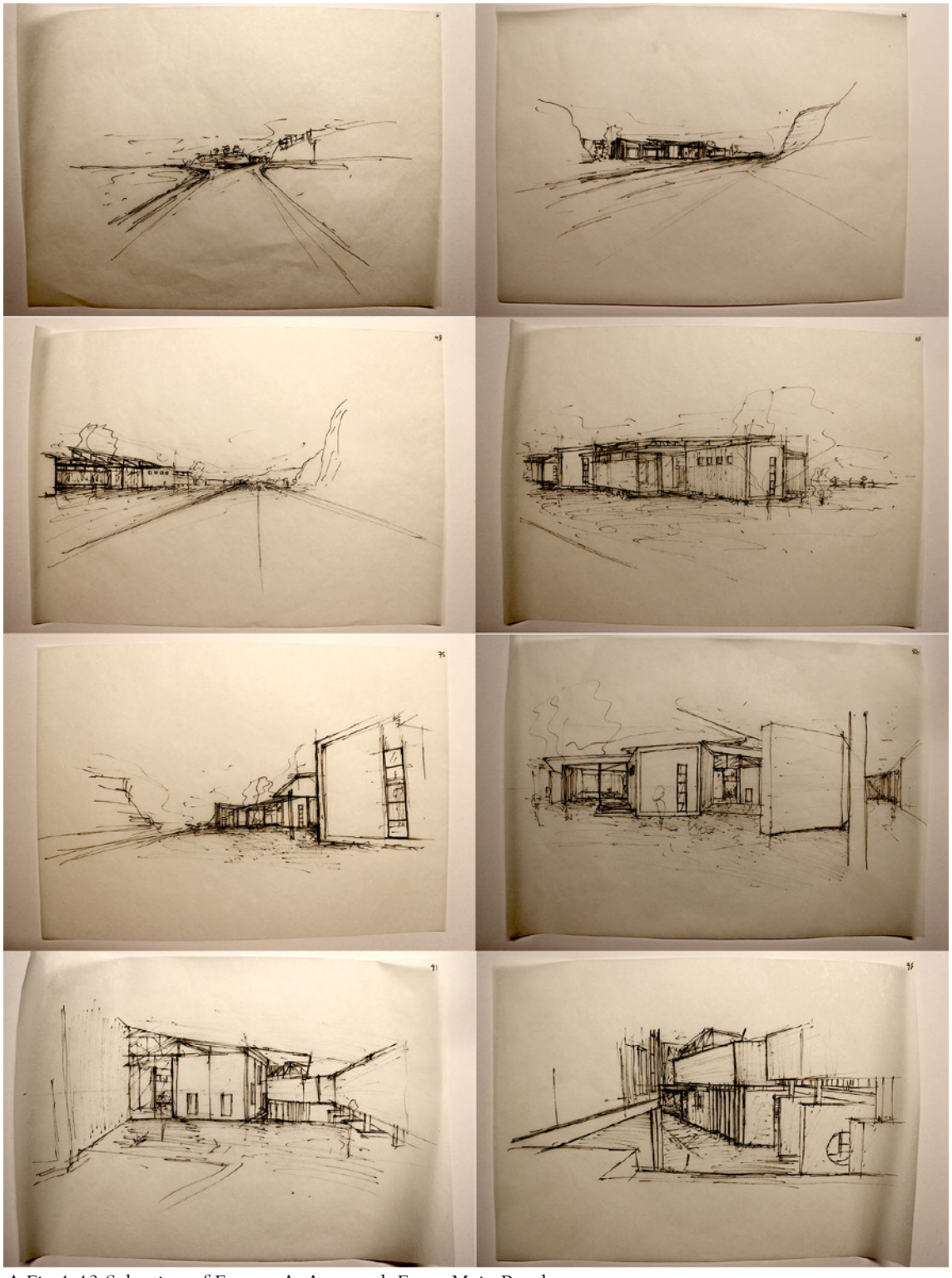
▶ Fig 4.42.Exploring methodology

Stop Motion Exploration

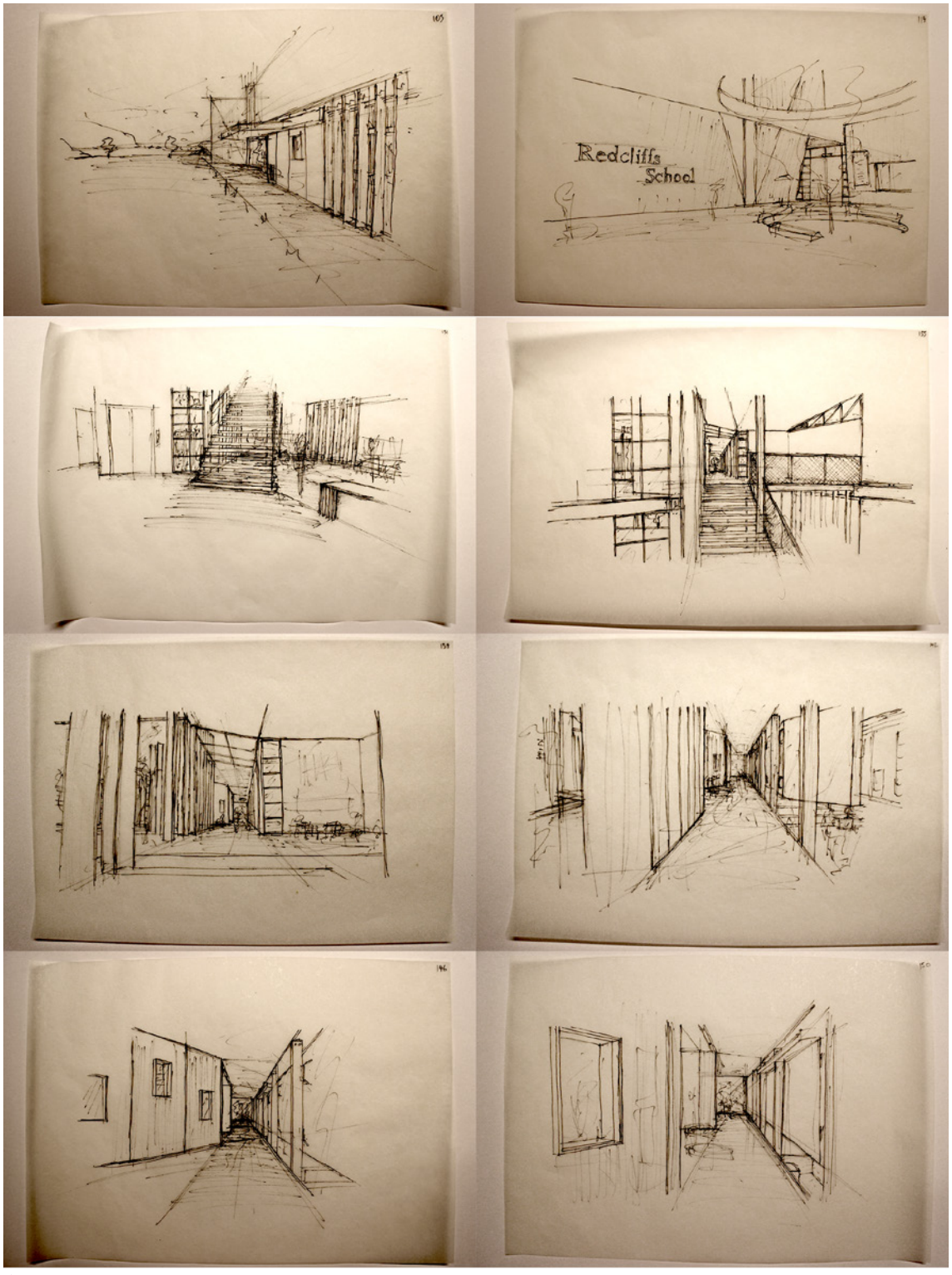
This design exploration method aimed to use a series of 186 'quick' 5-10 minute hand sketched perspective drawings (as in pages 180-181) to analyse and develop spatial qualities of the design case study. The design undergoes a development and resolution from a child's perspective journey through the spine of the complex.

Although brief, this one minute animation helped develop a understanding of spatial qualities by taking the time to analyse each area multiple times as the journey progressed through the buildings. An online link to this animation can be accessed below.

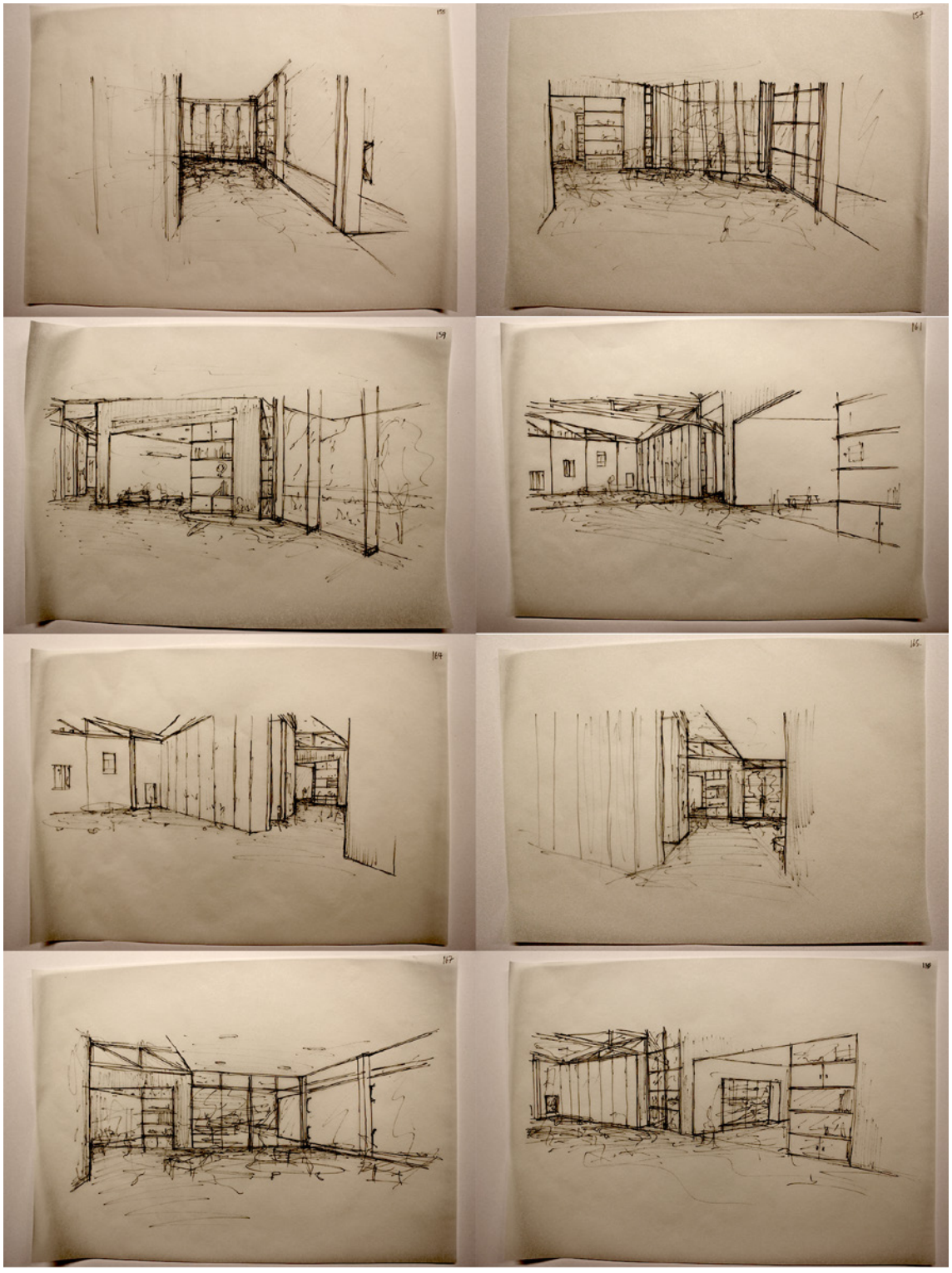
https://vimeo.com/159567190
Password: transition



▲Fig 4.43.Selection of Frames A, Approach From Main Road



▲ Fig 4.44.Selection of Frames B, Entrance and Main Internal Communal Space



▲Fig 4.45.Selection of Frames C, Learning Studio Space's

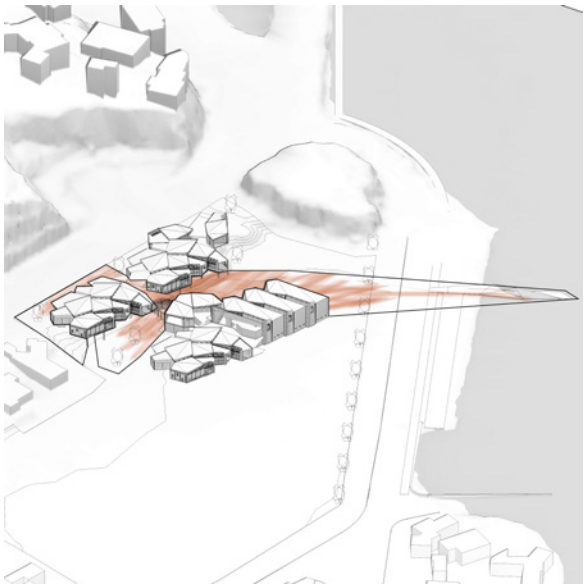
DEVELOPED PRELIMINARY DESIGN

Imbrication Through Transitional Articulation

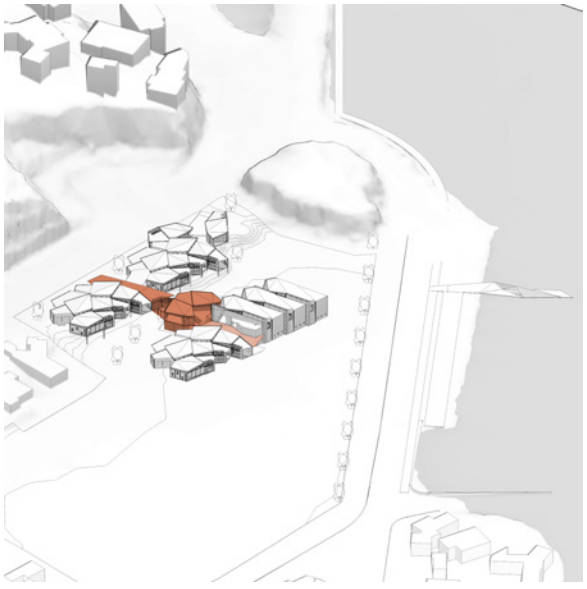
The articulation of a series of modular parts around a central site responsive spine allows for a site integrated network of overlapping programme and opportunity. This section showcases and discusses this developed preliminary design through a series of architectural media.

◀ Fig 4.46.Leading pathways into transition.

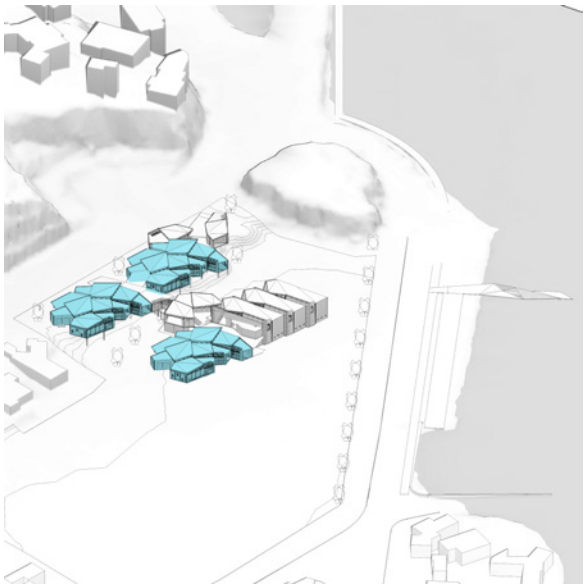
▲Fig 4.47.The preliminary design viewed from the East. It highlights natural corridors through and around the school in connection with the wider environment.



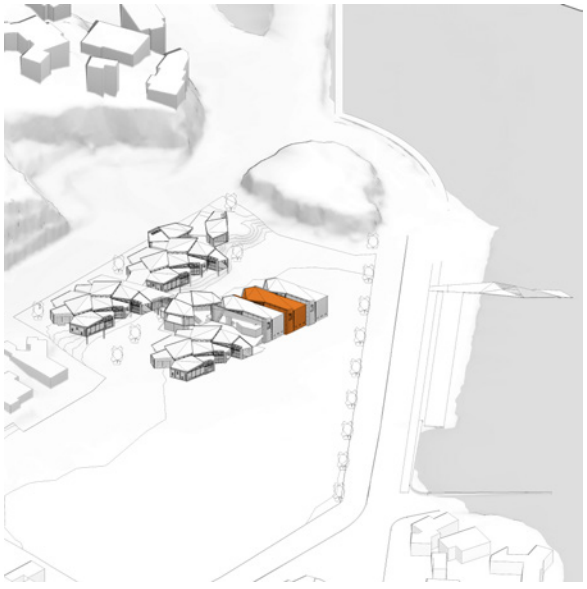
◀ Fig 4.48.Natural Environmental Integration. (Natural corridors place high importance in the role of external environment integration with transitional space)



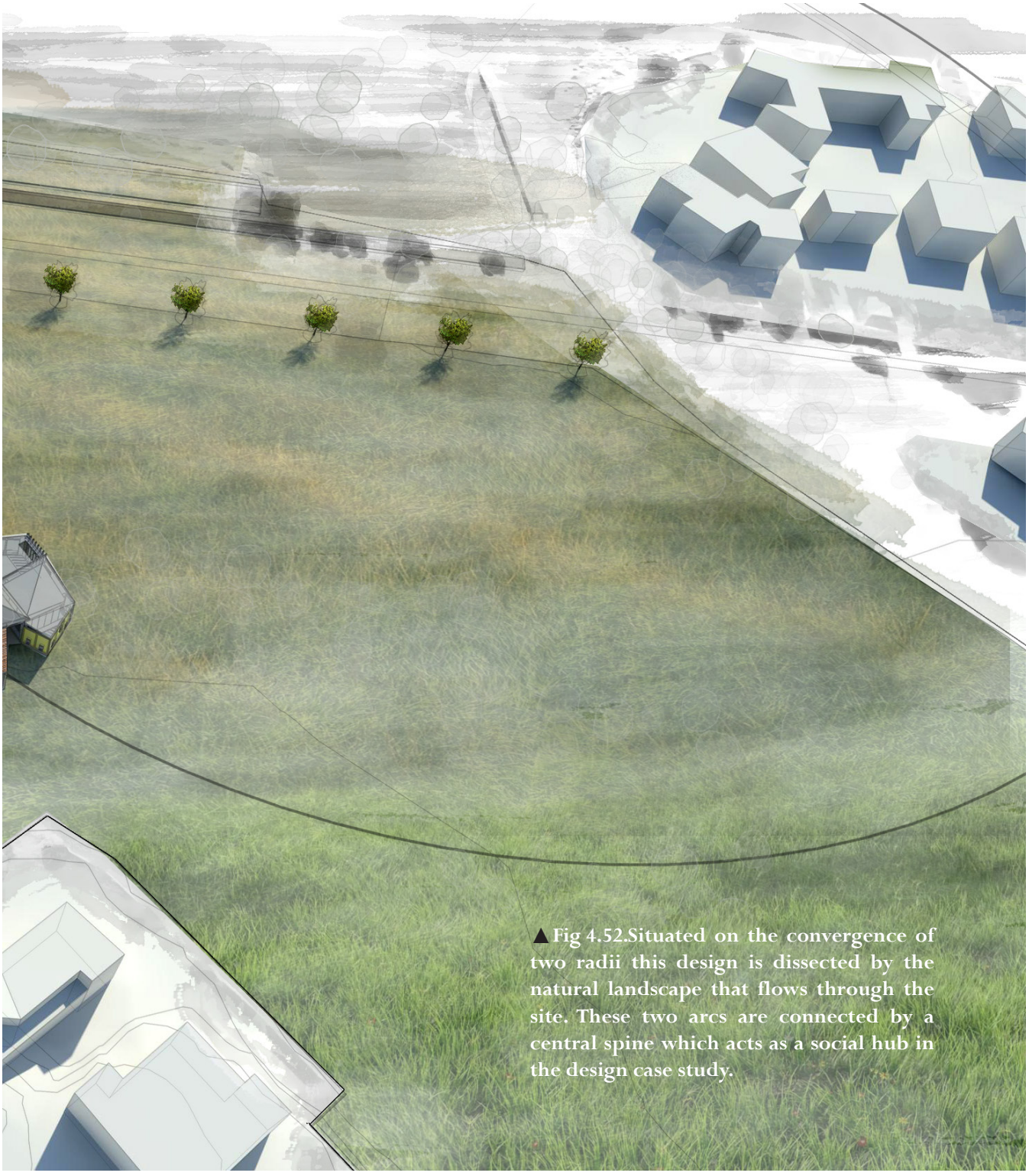
◀ Fig 4.49.Central Site Responsive Spine. (The developed module meets a central axis which connects the clusters together.)



◀ Fig 4.50.The Classroom Module Pod Cluster. (Three classroom modules share covered space with two wet service modules.)



◀ Fig 4.51.The Hall Module. (A difficult integration in the modular framework.)



▲Fig 4.52.Situated on the convergence of two radii this design is dissected by the natural landscape that flows through the site. These two arcs are connected by a central spine which acts as a social hub in the design case study.

▲Fig 4.53.North-Western courtyard looking towards entry. This social courtyard is composed of several surrounding landscaping typologies that interlink with building form. Classrooms perch on the edge overlooking interactions providing outlook and a shaded terrace below.

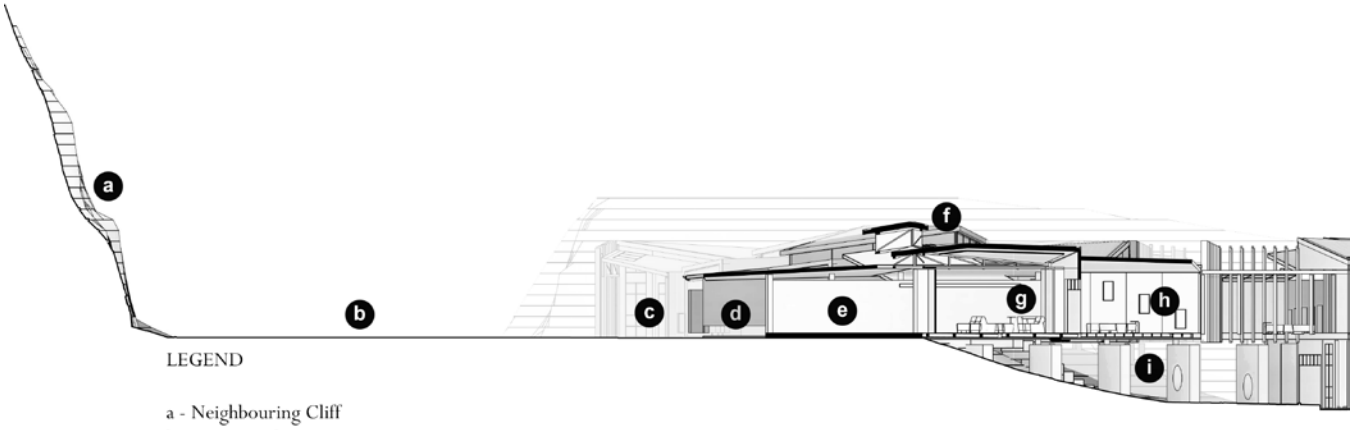
▲Fig 4.54.Ground Floor Plan, (Refer appendix for larger)

▲Fig 4.55.First Floor Plan (Refer appendix for larger)

▲Fig 4.56.A centralized communal hub provides for social interaction around a naturalised core. The exterior is drawn into interior through texture of materials in addition to opening facades.

◀ Fig 4.57. Site integrated precast walls support a pathway connecting the front and rear blocks together. This provides a sheltered play area near the embankment on the site, and takes advantage of site contours.

▼ Fig 4.58. Section of the rear block and connecting pathway elevation. In review, some areas created by this principle are unable to be utilised in the intended manner. Due to lack of space or environmental qualities. A critical reflection on the availability of use, and ground conditions as well as a waste management scheme would need to be undertaken to ensure these spaces remain pleasant. Which in review may render these areas unusable.



LEGEND

a - Neighbouring Cliff
b - Main Road
c - Rear Courtyard
d - Rear Entrance Portico
e - Shared Learning Studio
f - Roof Lantern
g - 'classroom'
h - Transitional space
i - Covered Outdoor Area

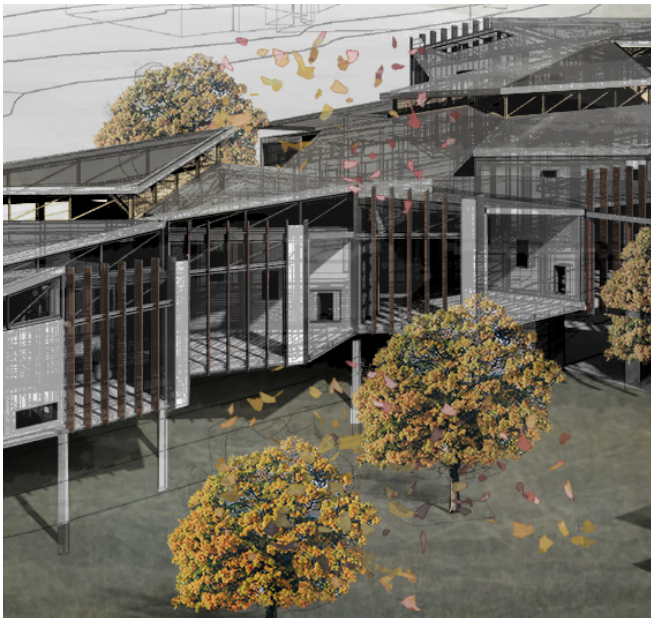
SITE SECTION

0m 2m 5m 10m

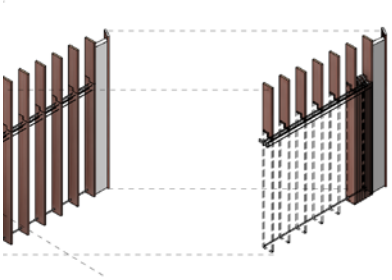
▲Fig 4.59.Rear entry and terrace. A variance on the module connects the two sides of this design whilst maintaining natural connections into the heart of the school. Terrace seating not only allows easy access down the embankment it also provides a point of gathering.

▼Fig 4.60.South - Eastern Courtyard looking north. This courtyard provides a 'wind free' environment for children to play, learn and explore, there is a diverse range of areas that intertwine with built form and promote engagement with environment through natural ecology restoration.

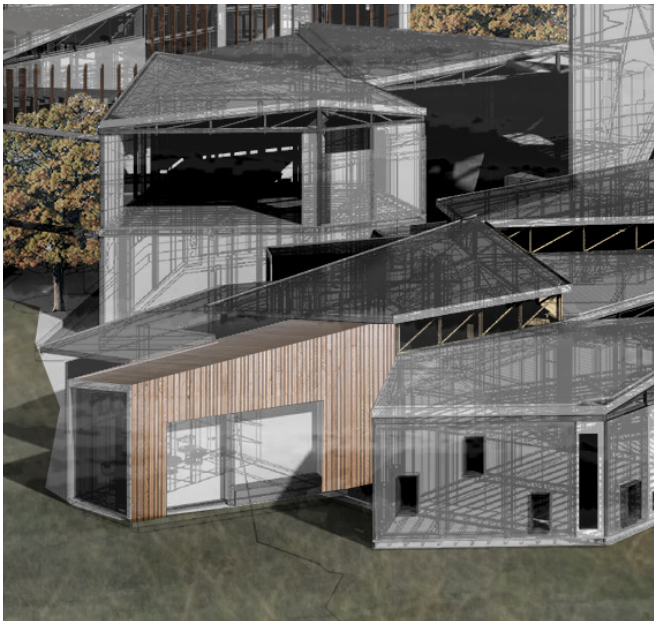
The modular network

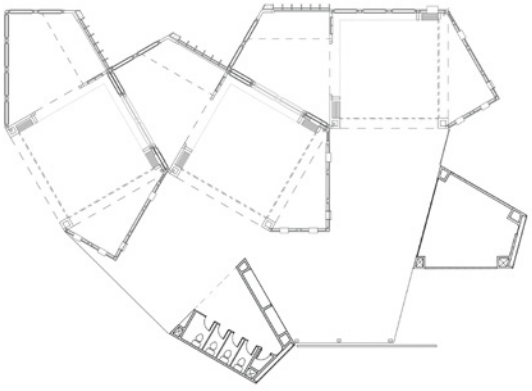


◀▼Fig 4.61.Natural ecology flows through and around built form. Sliding timber/Glass walls provide a point of transition allowing space to engage with these networks.

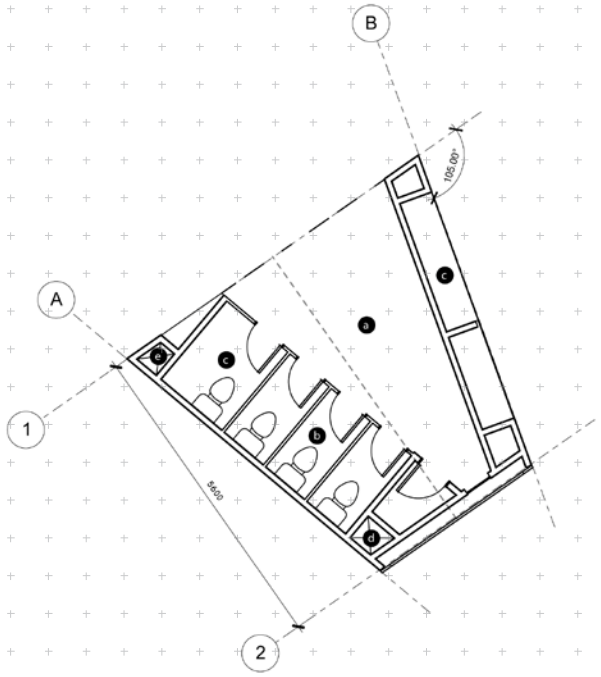


▶ Fig 4.62.Wet services module plans base plans and layout.





◀▲Fig 4.63.The complexity of form creates unique opportunities and alcove spaces throughout the design. However, careful consideration and a reflection of complexity of form is needed.

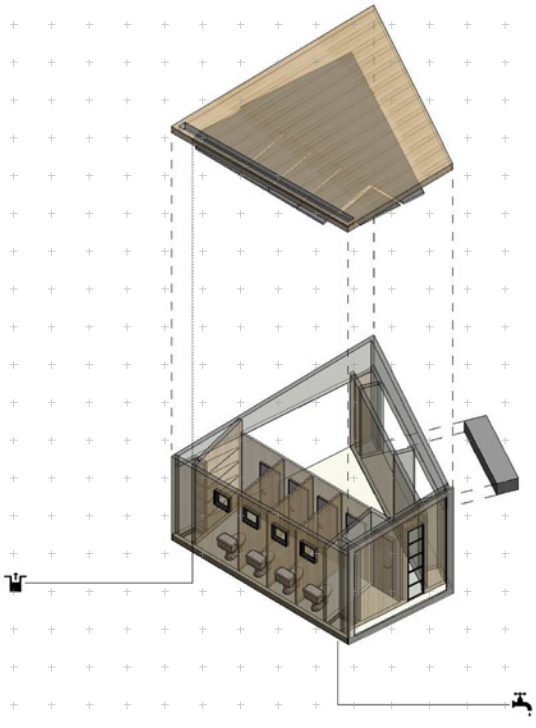


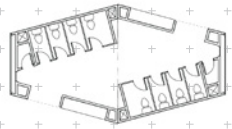
BASE FLOOR PLAN
POTENTIAL SPACE LAYOUT OPTION*:

Areas :

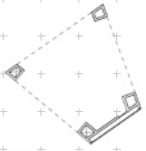
- a Shared Lobby space with wash stations
- b Toilet cubicles to suit
- c Customised kitchenette facility
- d Water inlet connection void
- e Rain & waste water void with display

*This modular pod is based upon a flexiable framework to enable multiple use layouts and fitout.

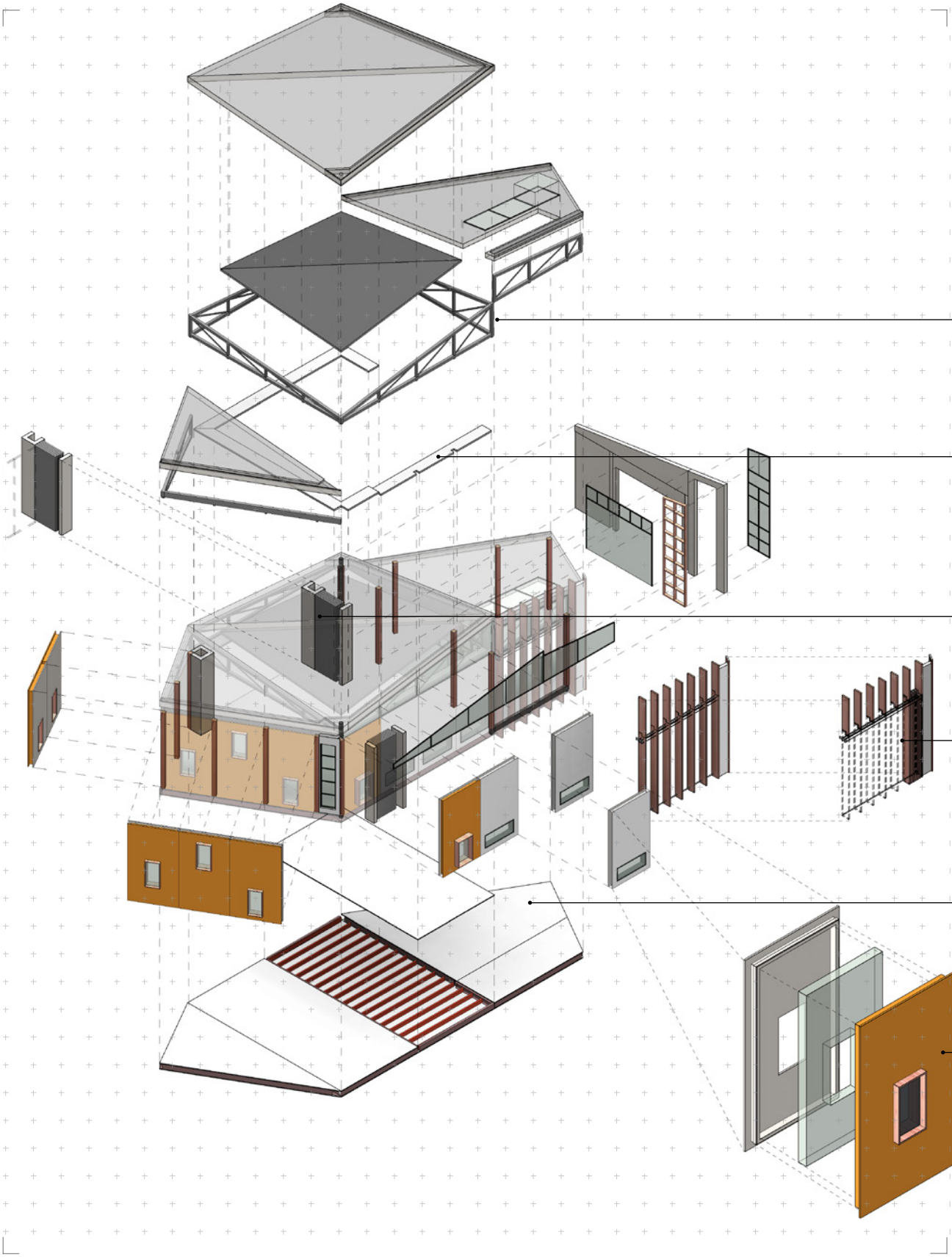




Centralised ammenities module layout

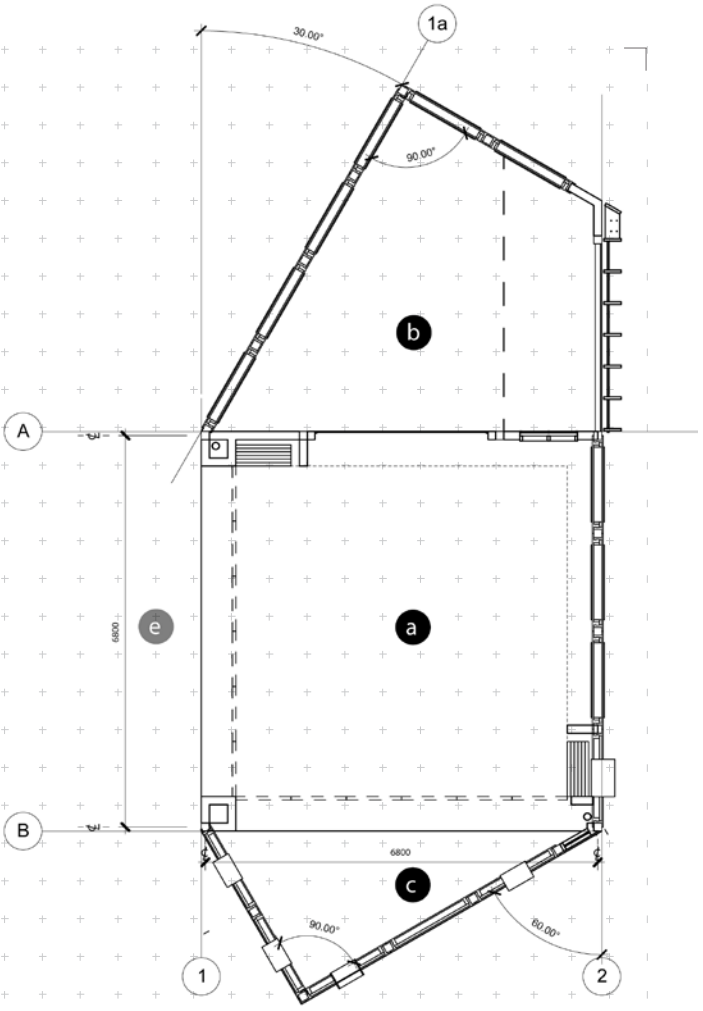


Base module for fitout



◀ Fig 4.64.Classroom Modular Cluster.

▶ Fig 4.65.Classroom Modular Cluster base plan and layout configurations.



Truss roof system.

Light shelf to block direct sunlight from upper windows.

Stackable acoustic room dividers.

Folding timber and glass screens.

Panelised flooring system.

To react to site and the needs of the school organism a modular panel size allows for full customisation of the classroom block..

BASE FLOOR PLAN
POTENTIAL SPACE LAYOUTS:

Layout 1 - Divided:
- a 45m² Cellular learning space
- b 28m² Cellular learning space
- c 9m² Cellular learning space
- e external learning space

Layout 2 - Enclosed
- a b c 82m² Cellular learning space
- e external learning space

Layout 3 - Multi purpose space:
- b 28m² Covered outdoor learning
- a e 45m² Open shared leaning alcove
- c 9m² Quiet small group space / Storage

+ Others:

CRITICAL REVIEW

Design Review

- Connectedness

This design promotes wider connections with the context through its composition of form and axis through the site. However, this does bring concerns of safety and security to the school organism. It is envisioned that this complex will work as an 'eyes on street' model rather than the traditional one gate entry. A centralised administration core allows for these axis to converge in the heart of the school to deal with these issues.

- Learning space thresholds

Learning space extends beyond the classroom. This is a principle that is embodied in this design with its connections to context, ecology and community. However the relationship between site and module is at times in at odds with these ideas. Creating spatial awkwardness and climatically undesirable outcomes.

- Transition

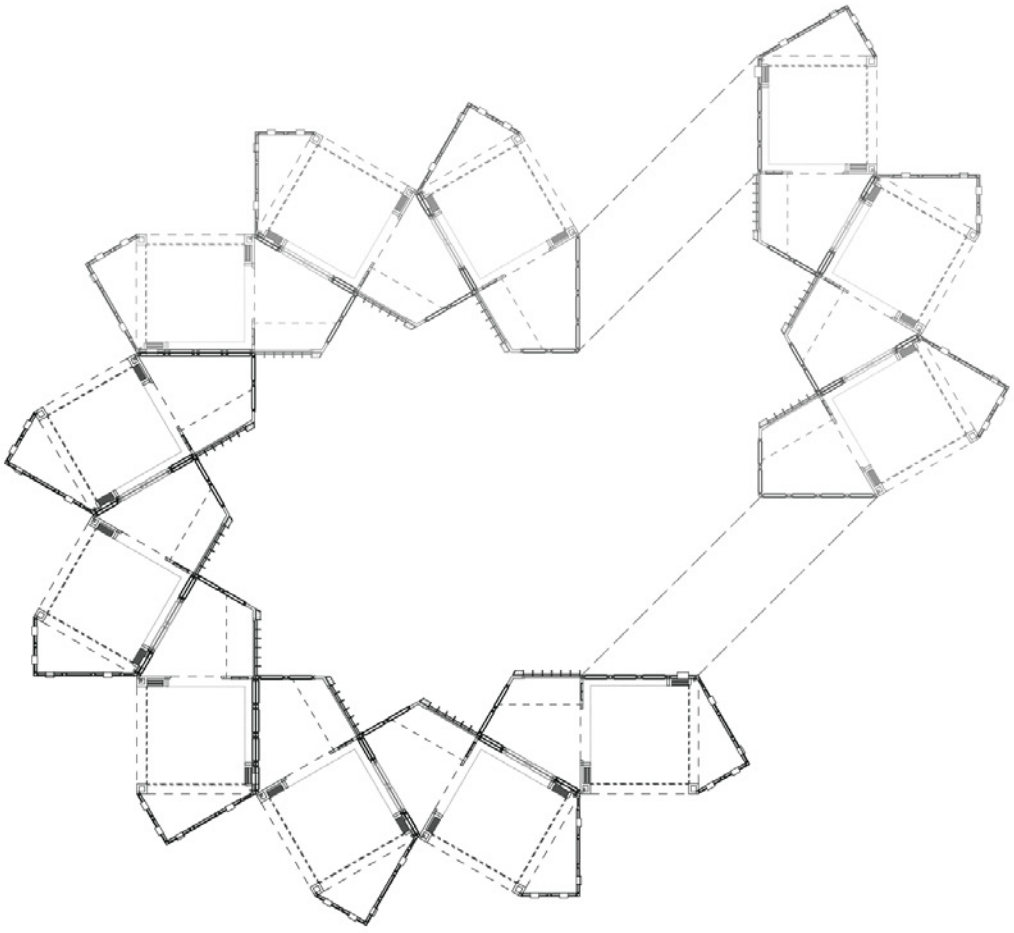
Transitional space is an important key principle to this thesis. The generated model has taken this into account through the use of transitional space in over one third of the module area. Whilst these spaces allow multiple configurations to take place, it is the in between areas that need further consideration, as well as other modules to promote this activity.

- User customisation

Through transitional space and a panelised system, user customisation can be done with ease and at relatively low costs. Although this allows flexibility it is limited due to any design having to work around the modules constraints.

- Identity of organism

This design has been generated in reflection of Redcliffs identity, its roofing structure and is and light weight feel is in essence of the neighbouring waterways. However, through user customisation this design will have the ability to start to shape incrementally towards the developing needs and identity of the school. This identity can be further displayed through an arrangement of work display areas around the site.



▲ Fig 4.66.The twist

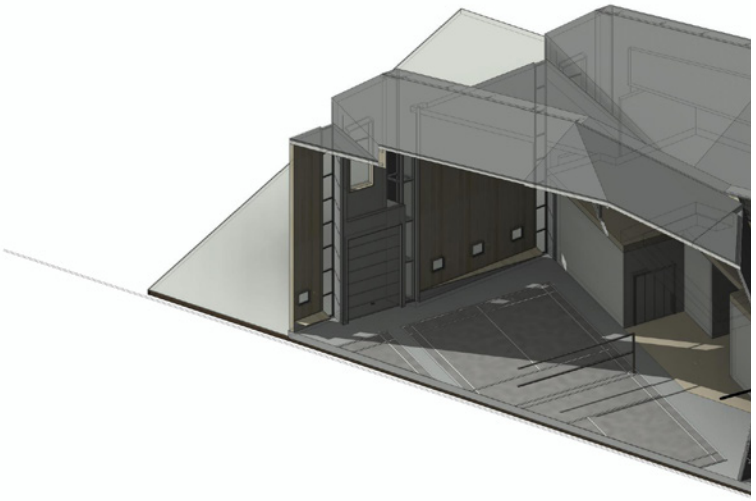
Complications

- Modularity and the Hall

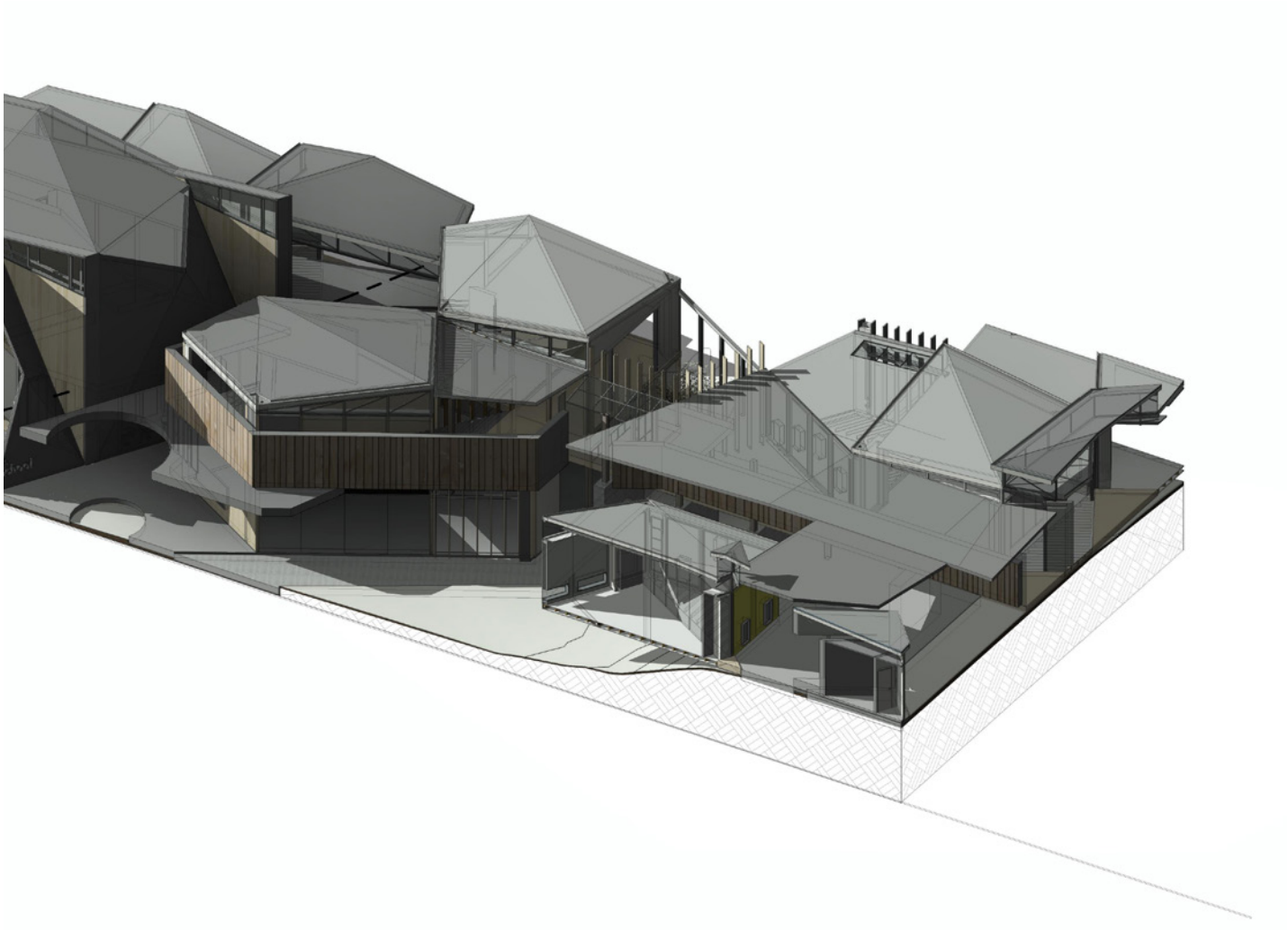
A main complication of this design came from the need to facilitate a hall function. Due to the size constraints of this programme it does not easily fit into the modular structure. Efforts have been made to adapt the modular form to suit these constraints without impacting on functionality through a hall scaled module.

- Complexity of form

This design has developed into a complex arrangement of parts that assemble to make the whole. In reality, this would be prone to many issues including construction and weather-proofing. A critical analysis of the complications of this form would need to be undertaken in a real life application.



► Fig 4.67.Sectional axonometric cutting through and projecting diversity of forms.

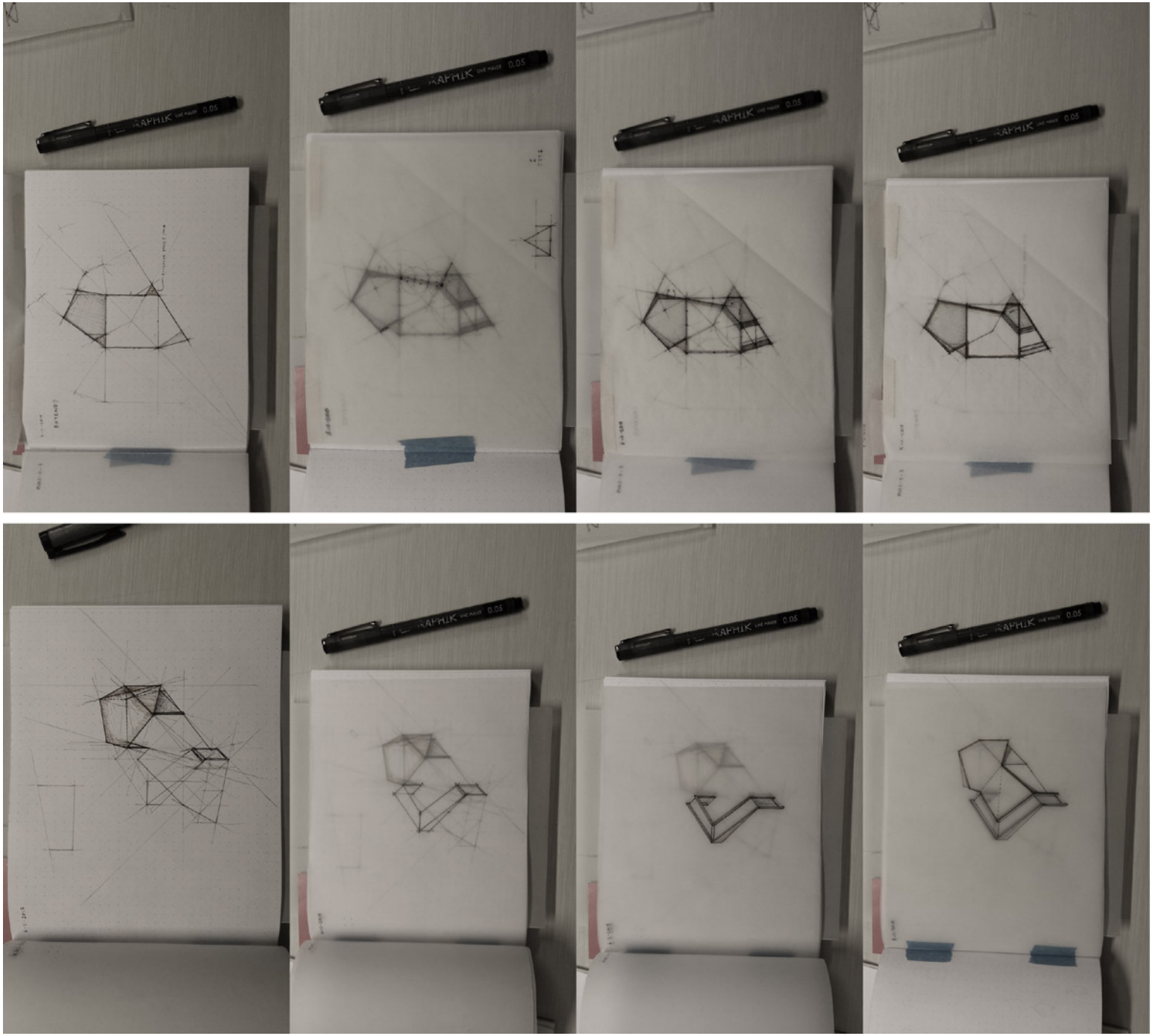


Further Experimentation

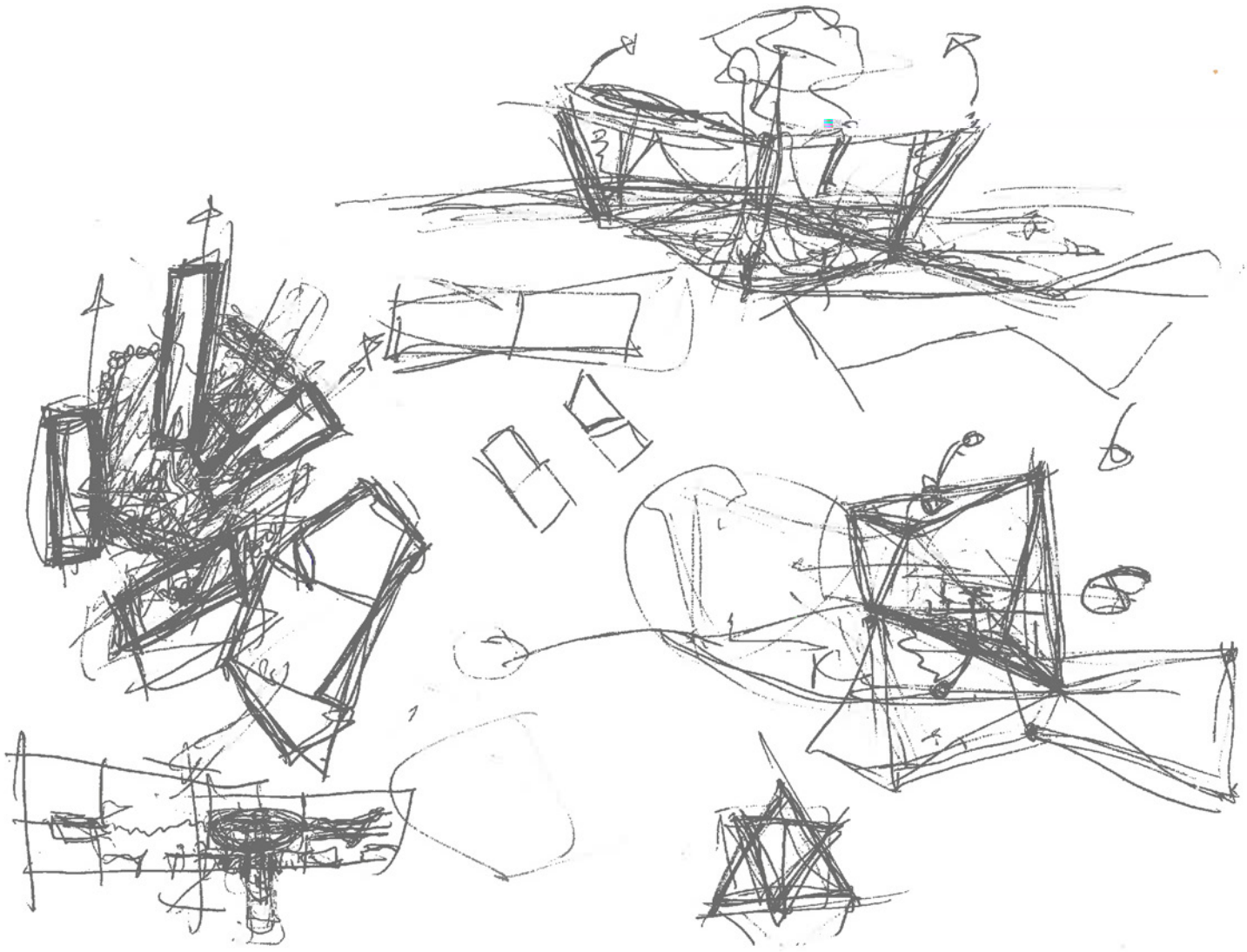
- Design in review

In light of these insights, an exploration of design in review has taken place. Whilst this could be addressed through the development of this module as shown (opposite), it was decided that in order to test the design framework a new design was generated as in the subsequent chapter.

▶ Fig 4.68.Brief exploration in developing the module.

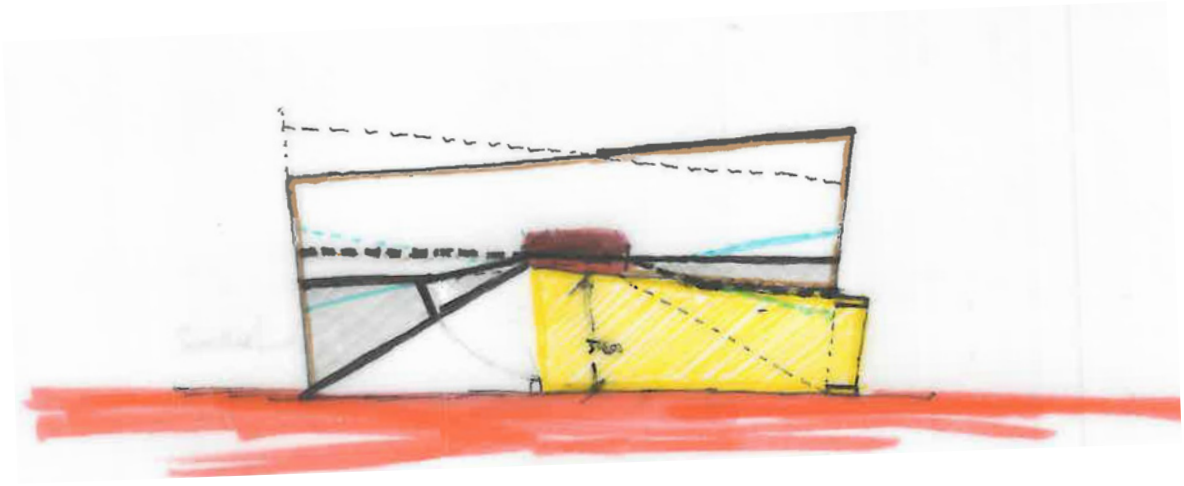


PART FOUR
DESIGN IN REVIEW



DESIGN IN REVIEW

An experimentation of design framework

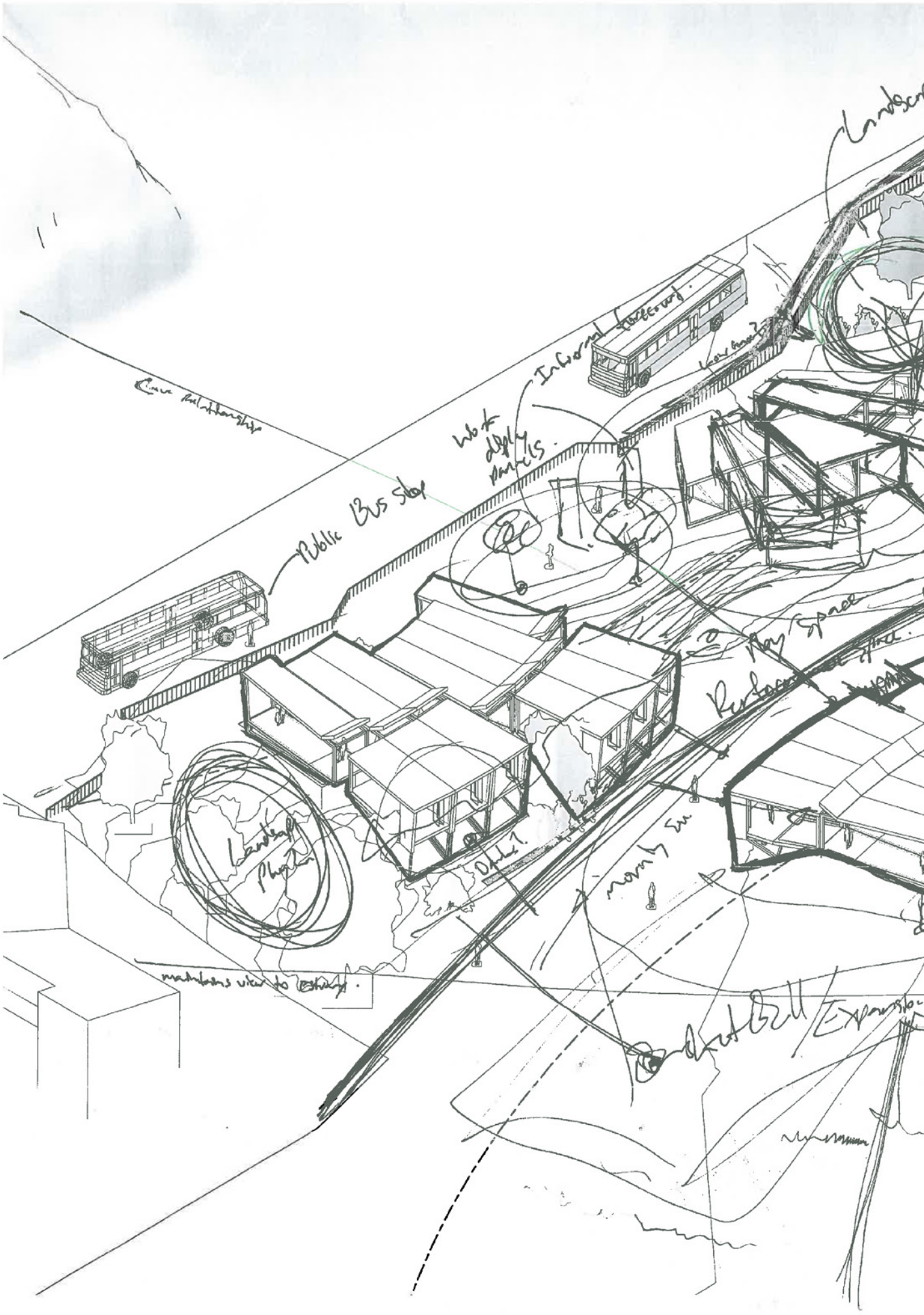


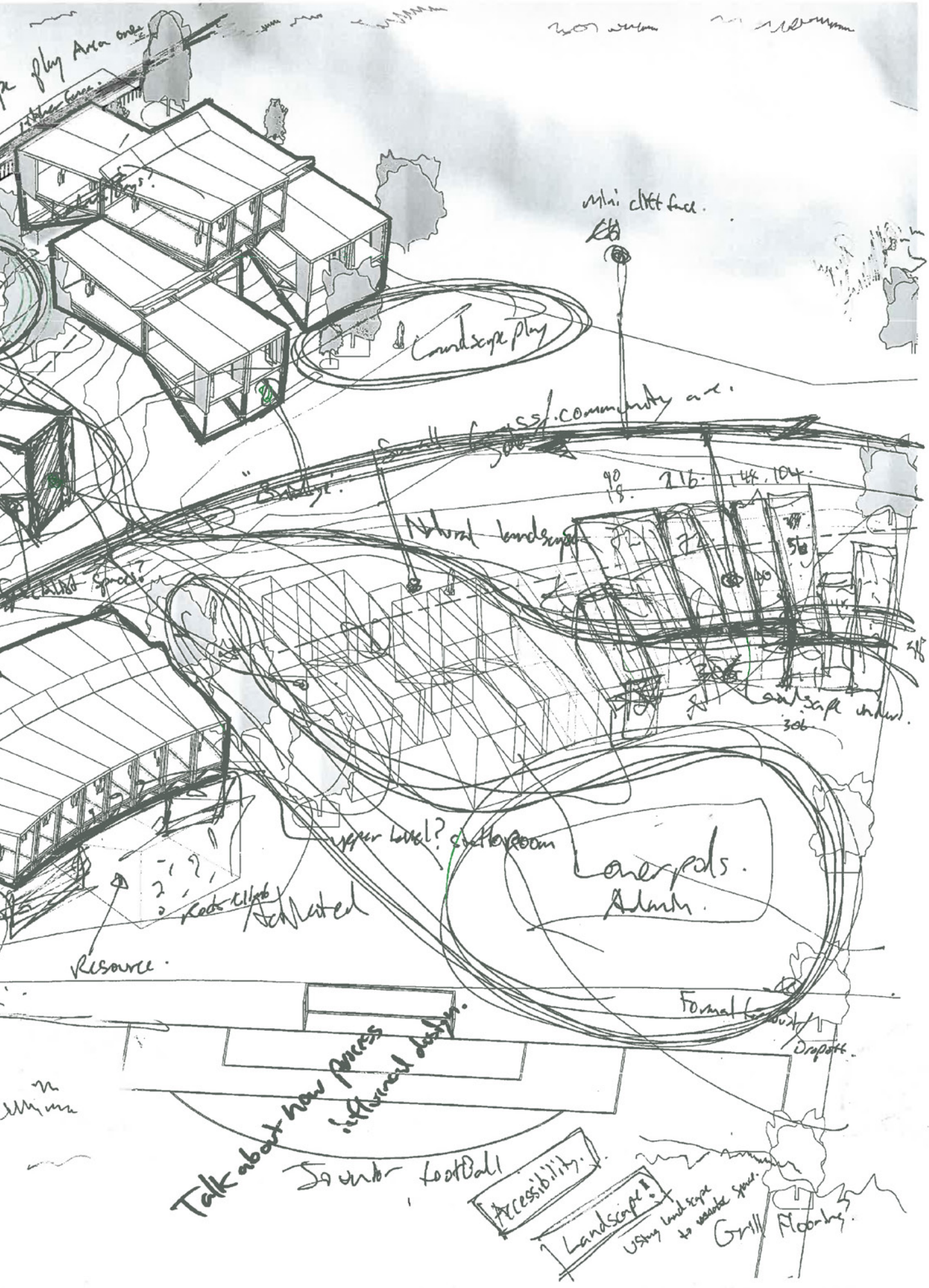
The scope of this design in review is limited to an exploration of new modules and their relationship with site. It explores a new design development that is based upon the same site response and programmatic layout as the previous model. Due to time constraints it focuses one modular cluster and the hall facility. Some areas such as the administration block have been left as a mass. In conclusion shows an alternative design that starts to address some of the concerns raised from the previous. The main driver behind the design was to explore the integration of the site as an ecology.

▲ Fig 5.1.(Previous) Development concept plan.

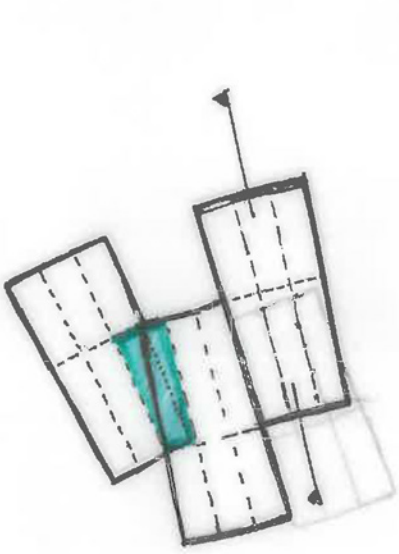
◀ Fig 5.2.Initial concept sketch explorations

▲ Fig 5.3.Initial concept, a stacking module.


Public Bus stop
Landscape Planting

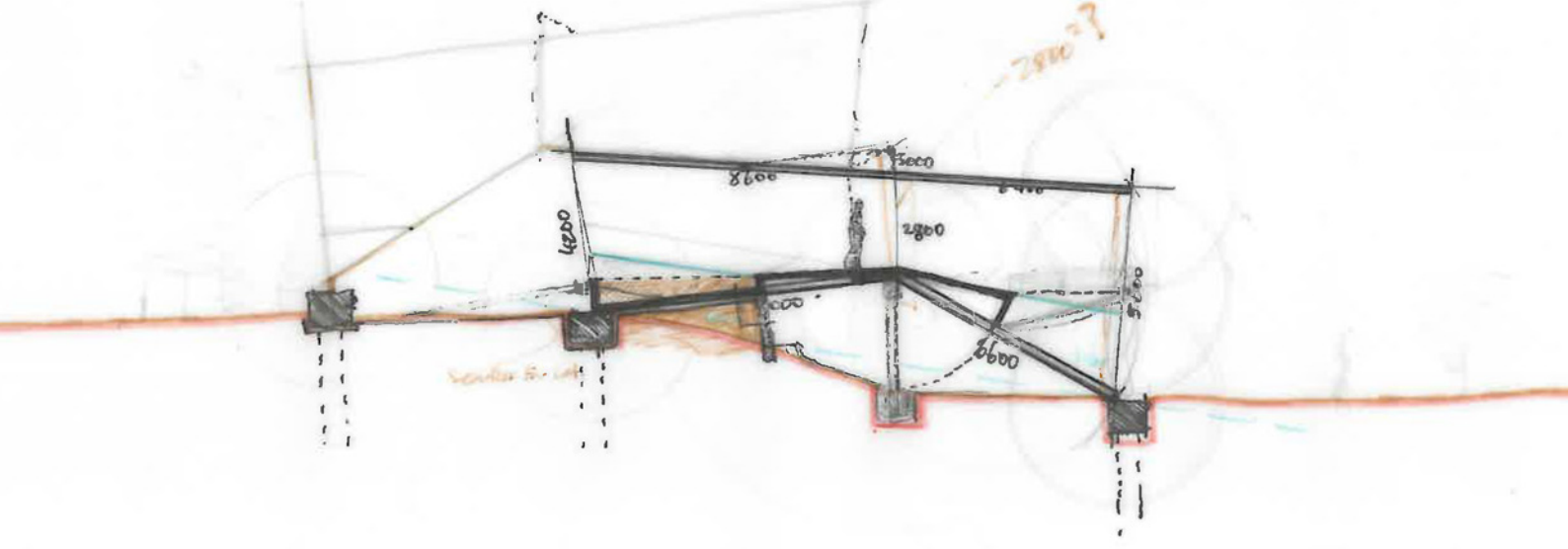

play Area
Landscape play
Natural landscape
Talk about how process influenced design.
Accessibility.
Landscape!
Grill Floorings.

▲ Fig 5.4.(Previous) Development concept overall site planning. Bringing external ecology into the site planning.



▶ Fig 5.5.Section reference plan and arrangement of modules. Two modules form a 'bow-tie' shape in a twisting module.

▼ Fig 5.6.Development sketch section. Two points for a bridge to create minimal contact with site. This creates a spacious undercroft area to be used as an extension of the classroom.

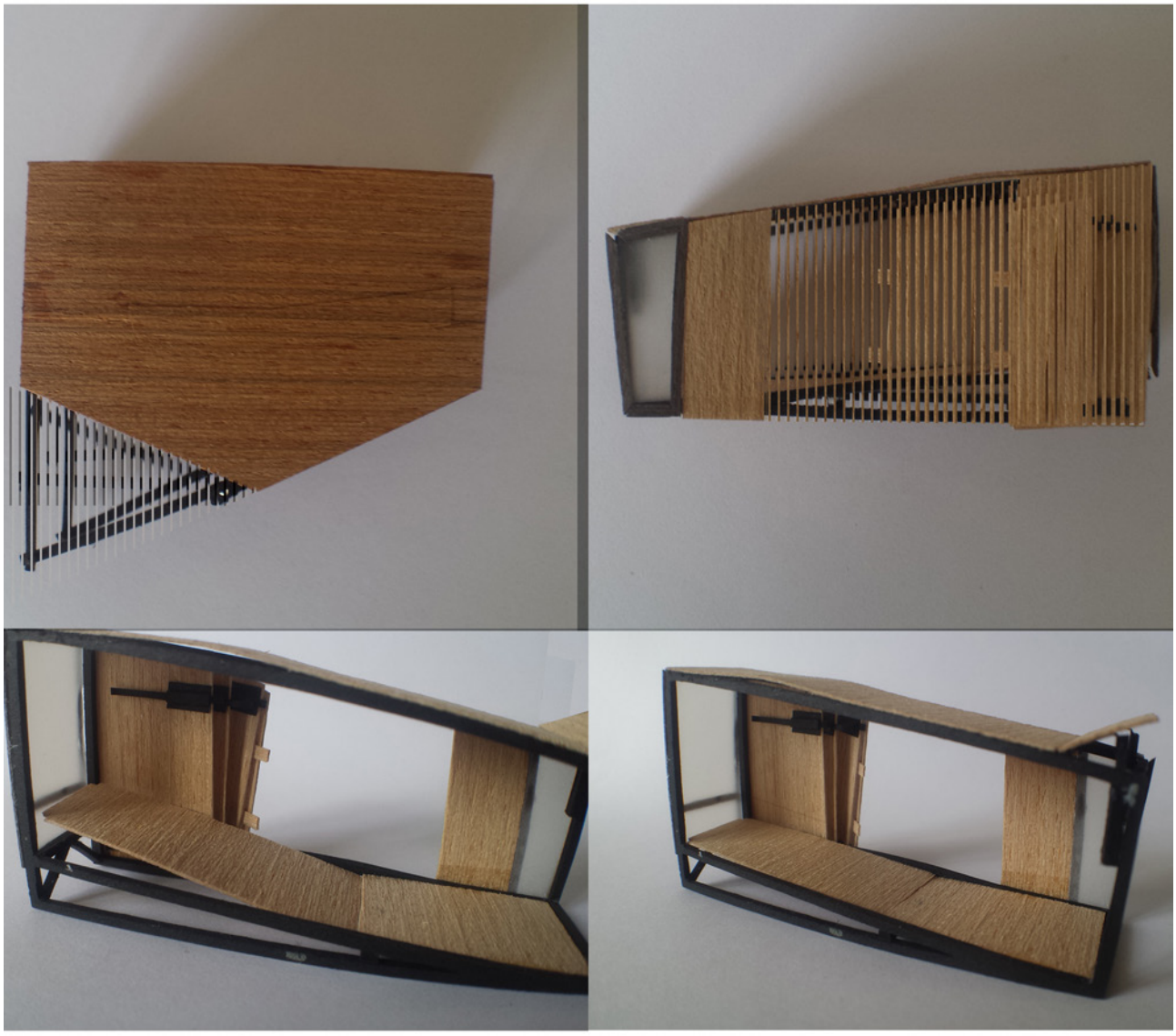


▲Fig 5.7.This model explored and tested the moveability of parts.

▲Fig 5.8.The form is sympathetic to neighbouring dwellings an a developed natural easement address Main Road.

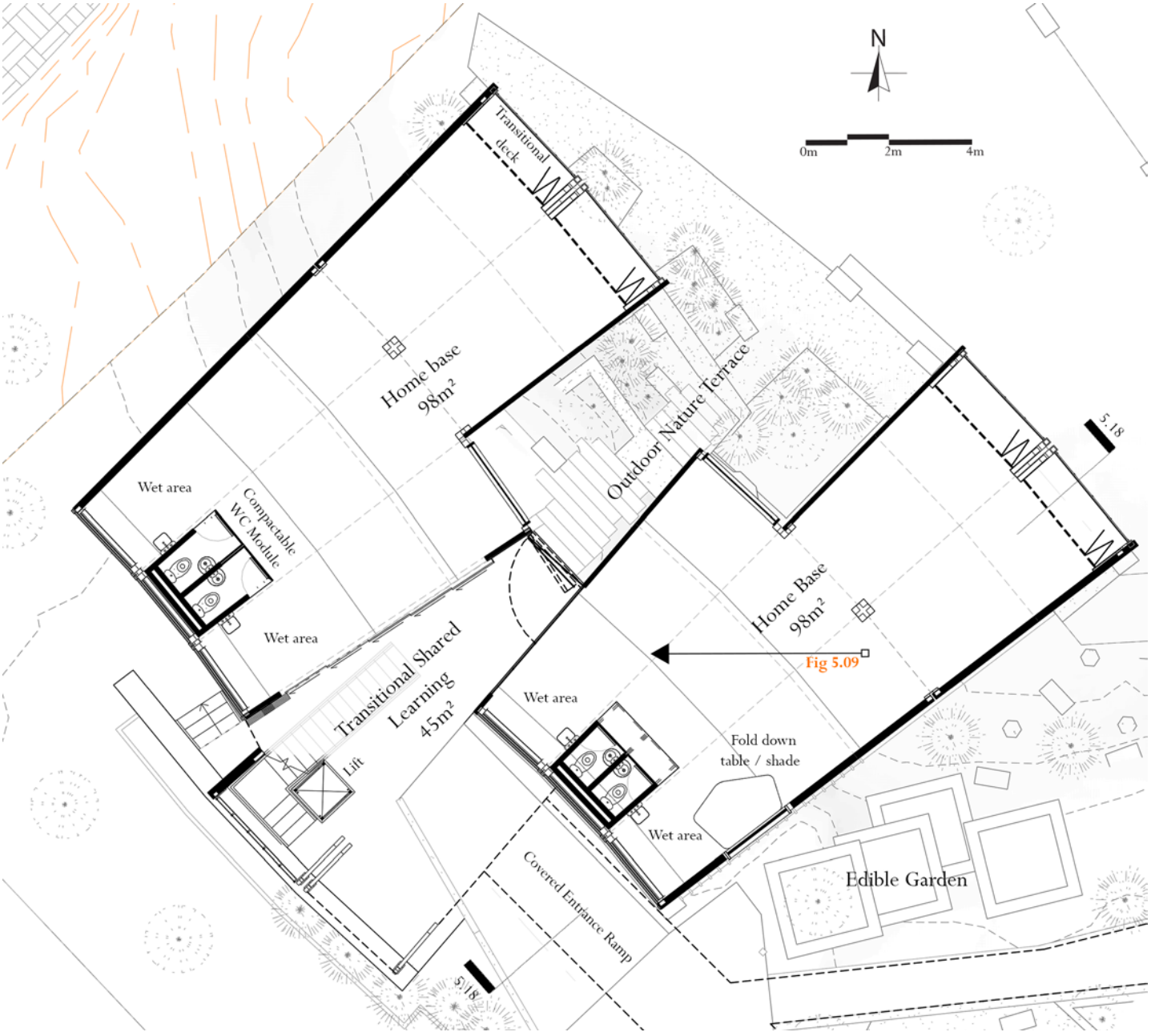
SLIDE

▲Fig 5.9. Classroom Interior. Transitional walls and penetrating landscape allow a diverse arrangement of space with high levels of natural integration.

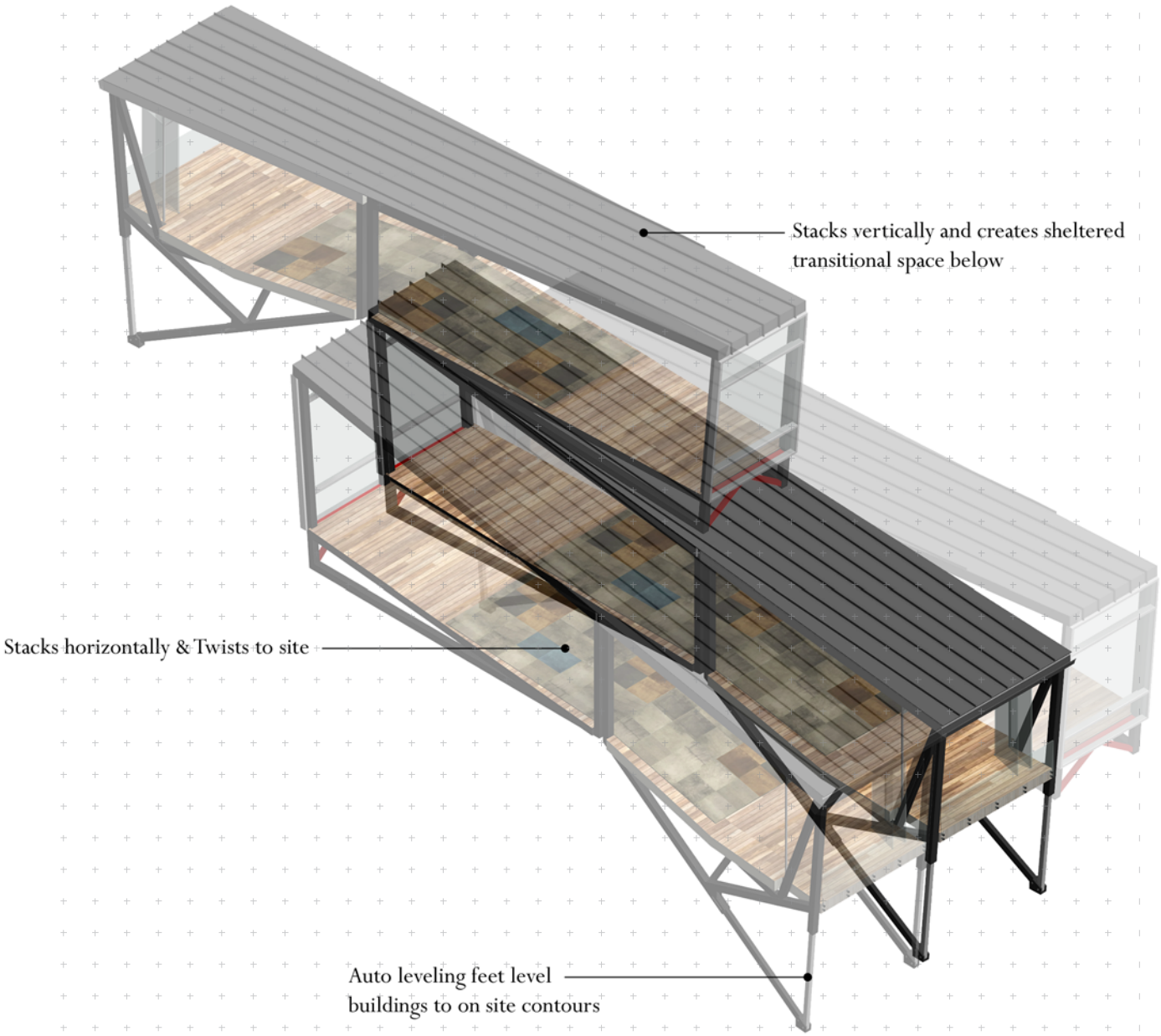


SLIDE

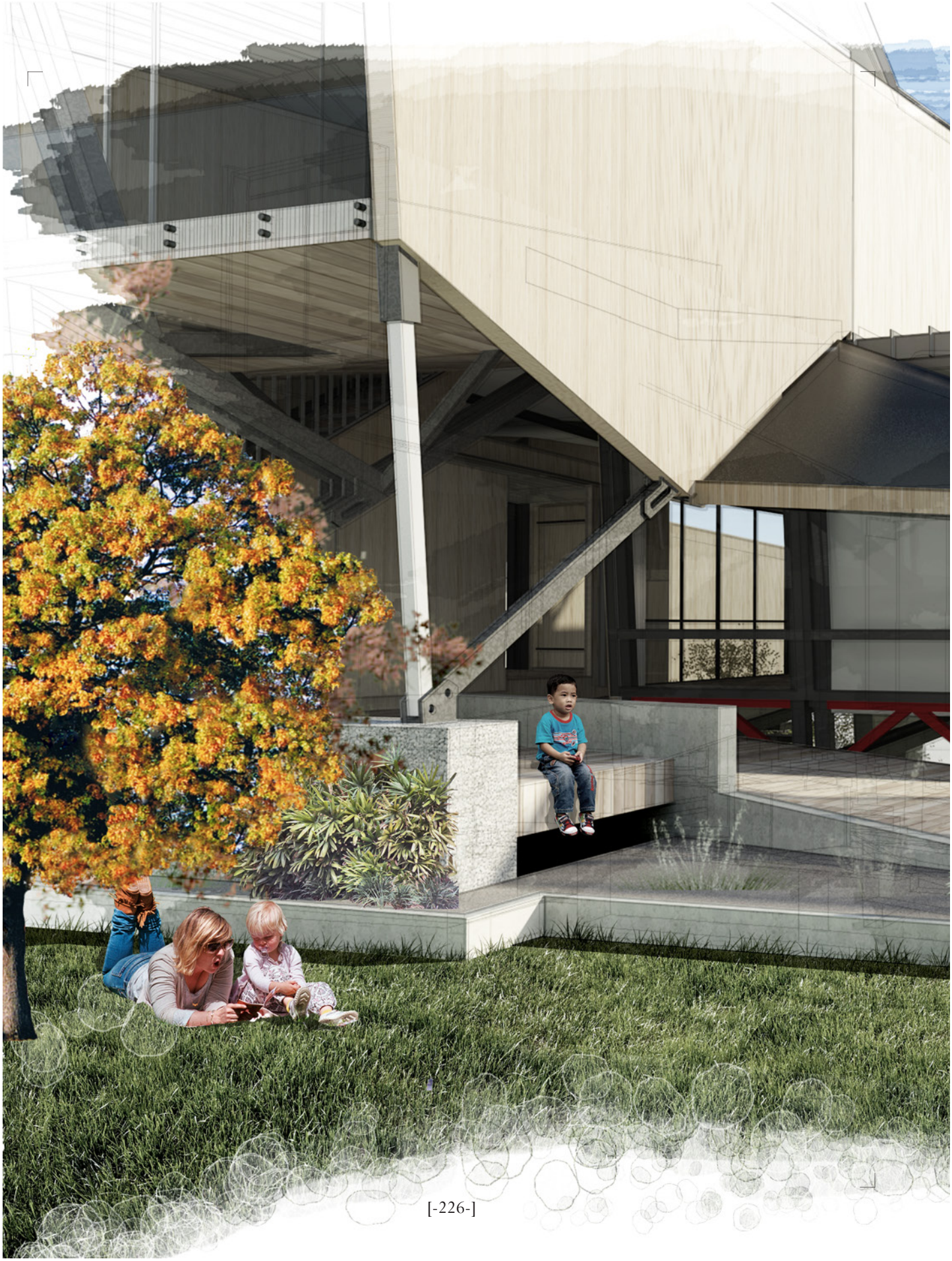
▲Fig 5.10.Physical model, showing movement.



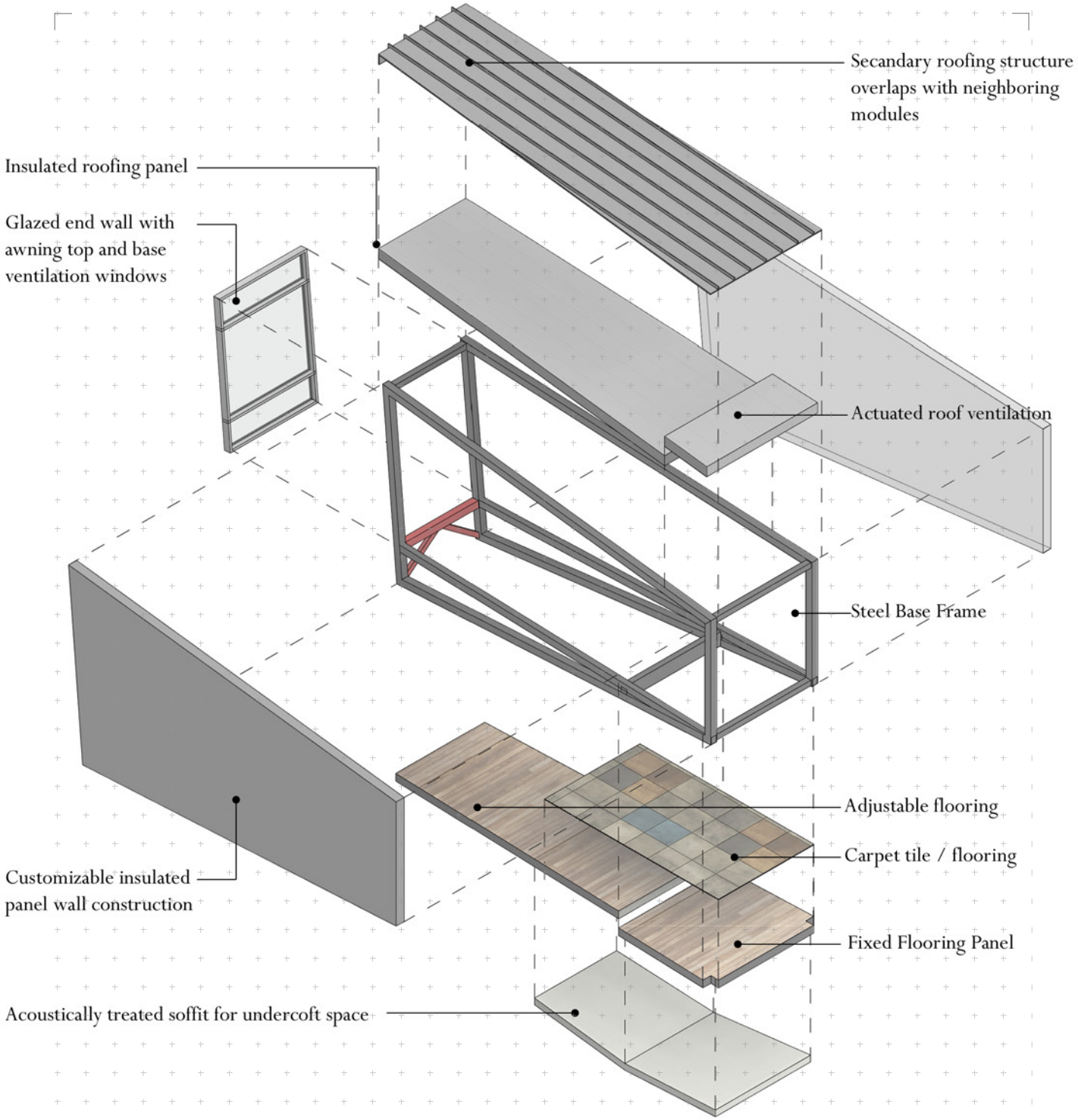
▲Fig 5.11.Example module plan configuration



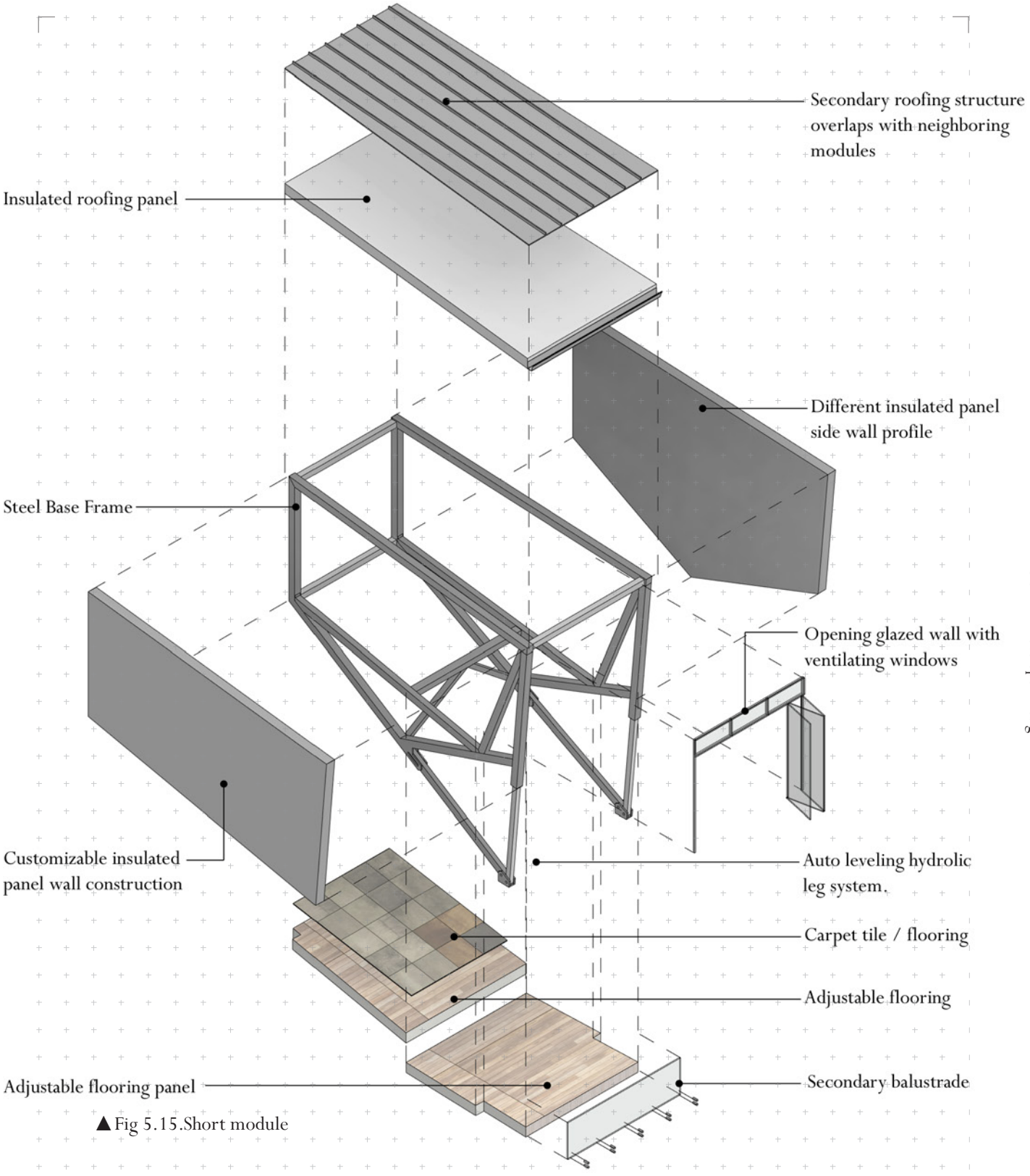
▲Fig 5.12.The stackable nature of the module.



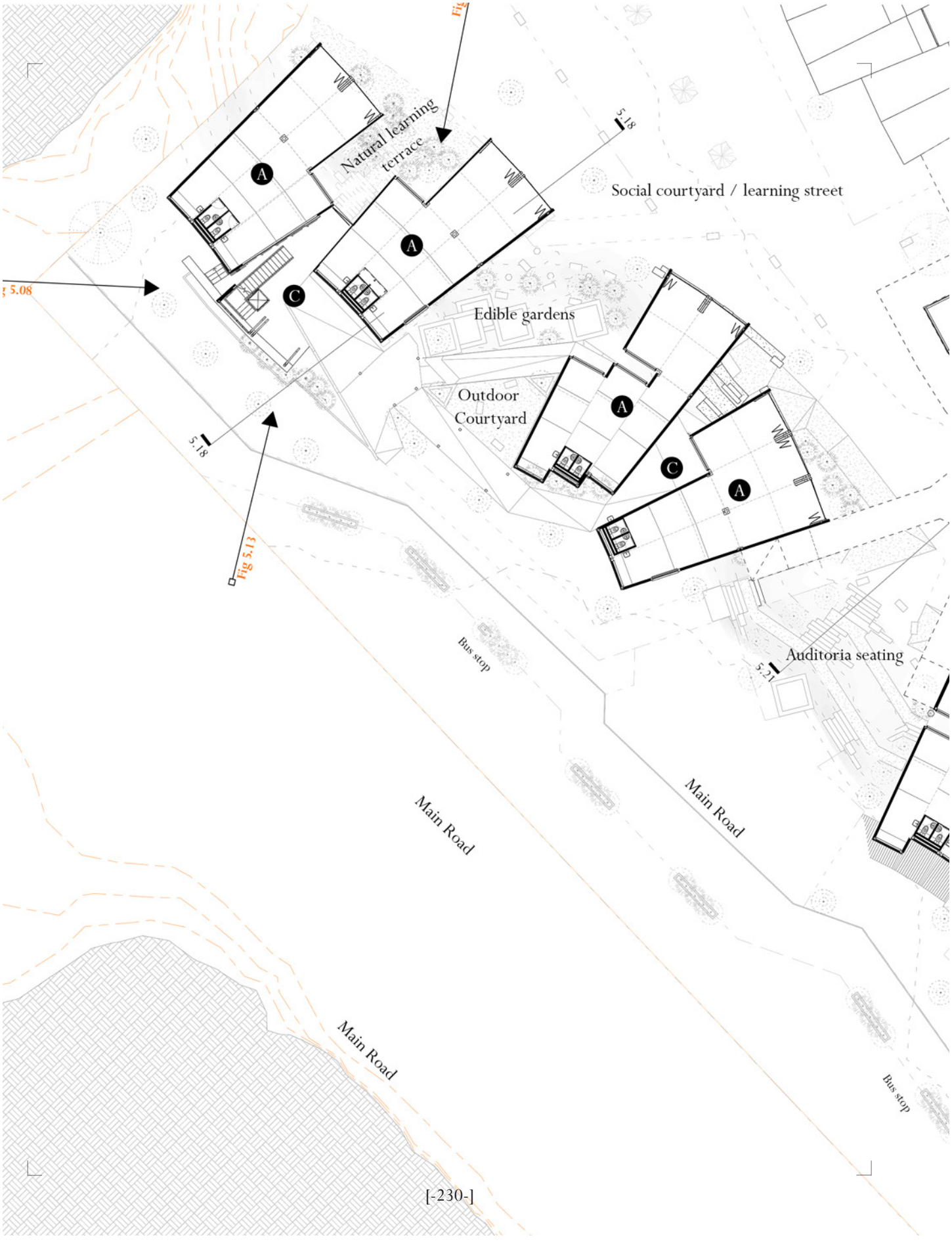
▼Fig 5.13.Rear access to a classroom cluster. Highlighting stackable nature and additional areas created under the module.



▲Fig 5.14.Long module



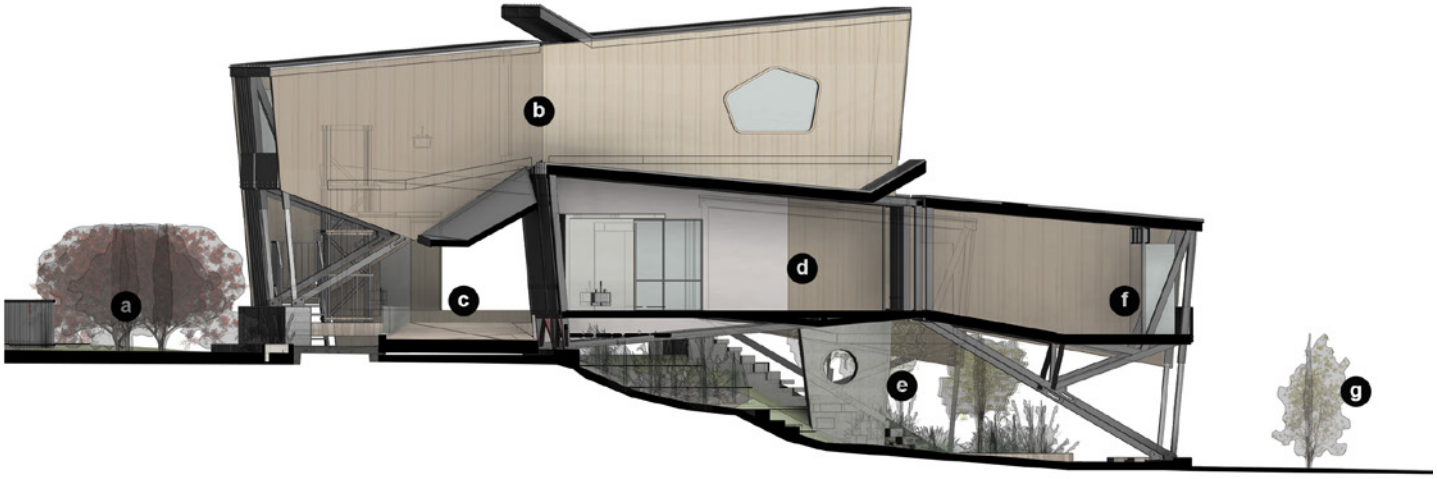
▲Fig 5.15.Short module


Natural learning terrace
Social courtyard / learning street
Edible gardens
Outdoor Courtyard
Auditoria seating
Bus stop
Main Road
Main Road
Main Road
Bus stop
5.18
5.18
5.21
A
A
A
A
C
C
W

▲ Fig 5.16.Upper bank floor plan

SLIDE

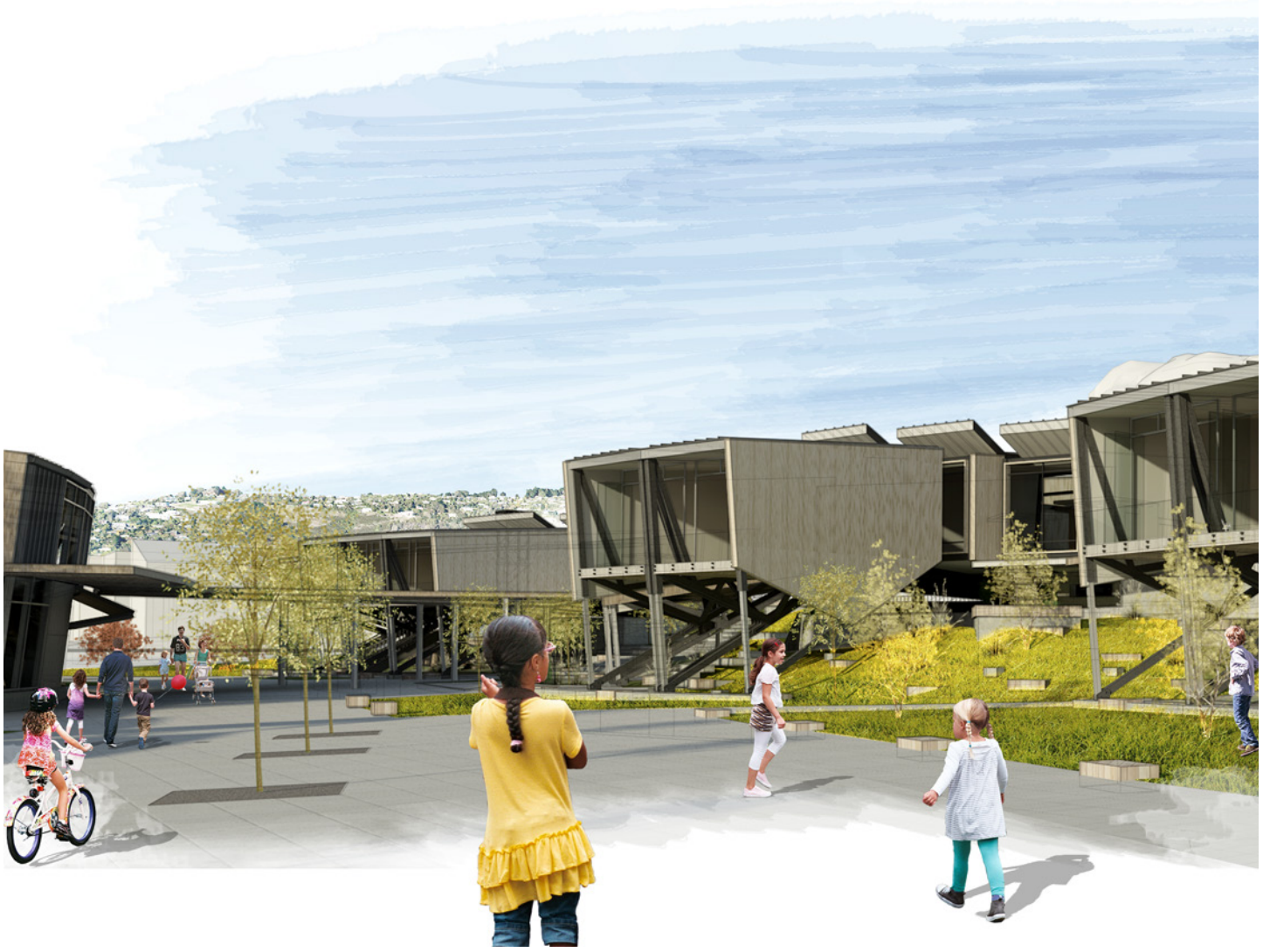
▲Fig 5.17.An example of how under space may be used.



LEGEND

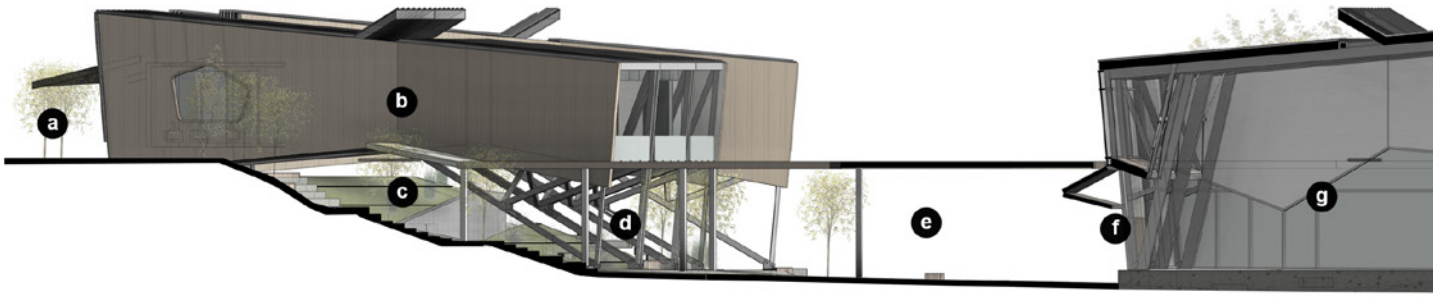
a- Rear garden easment
b- Transitional Undercroft/ Shared learning
c- Upper home base
d- Lower home base
e- Covered natural terrace
f- Lower learning area
g- Learning street courtyard

▲Fig 5.18.Relationship with embankment, creating additional learning space.



▲Fig 5.19.The Learning street.

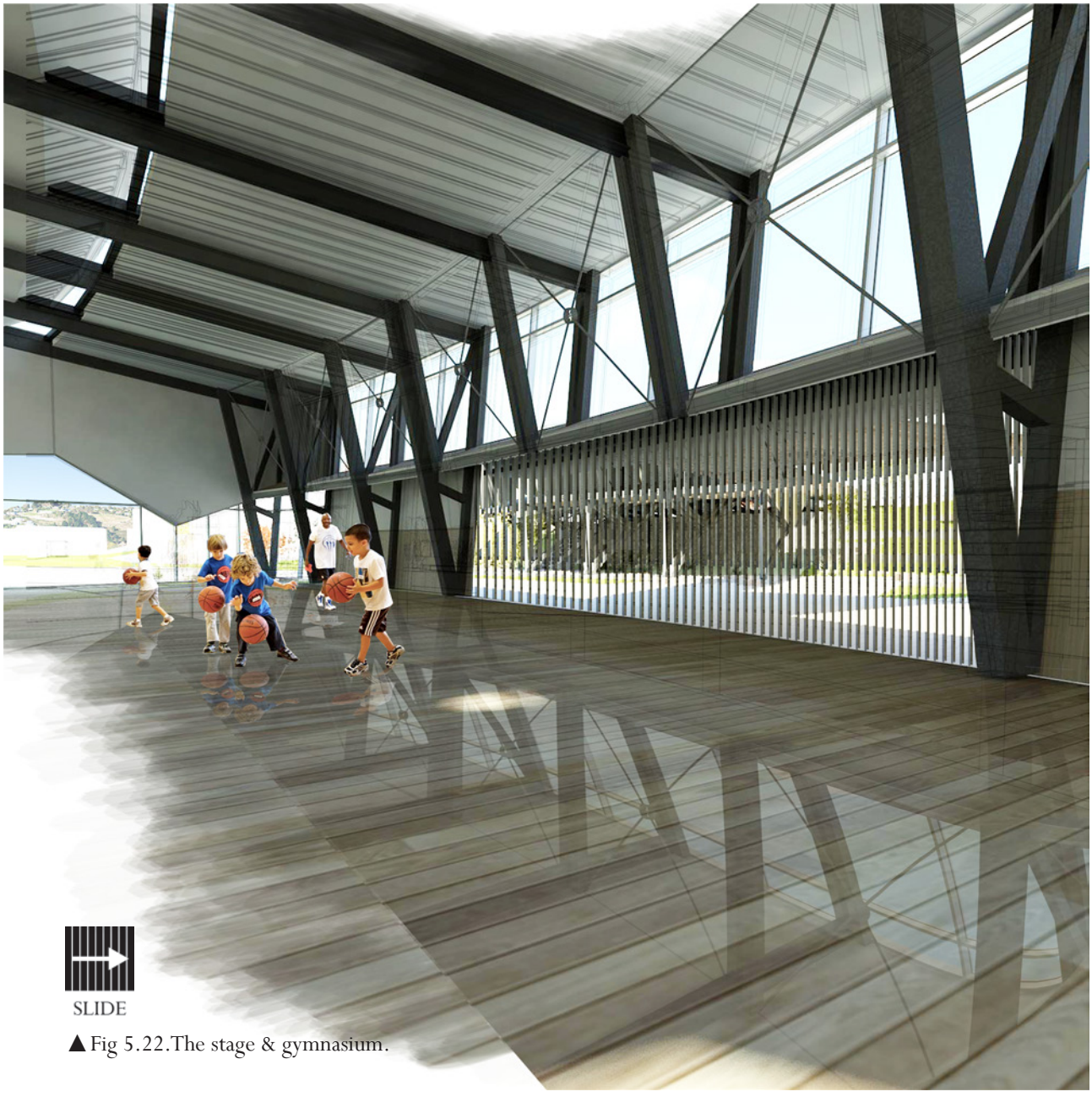
▲ Fig 5.20.Taking advantage of the slope, an exterior amphitheatre



LEGEND

a- Rear entrance forecourt
b- Rear learning studios
c- Auditoria bank seating
d- Sheltered Undercroft
e- Learning Street
f- Actuated stage facade
g- Multipurpose Gymnasium

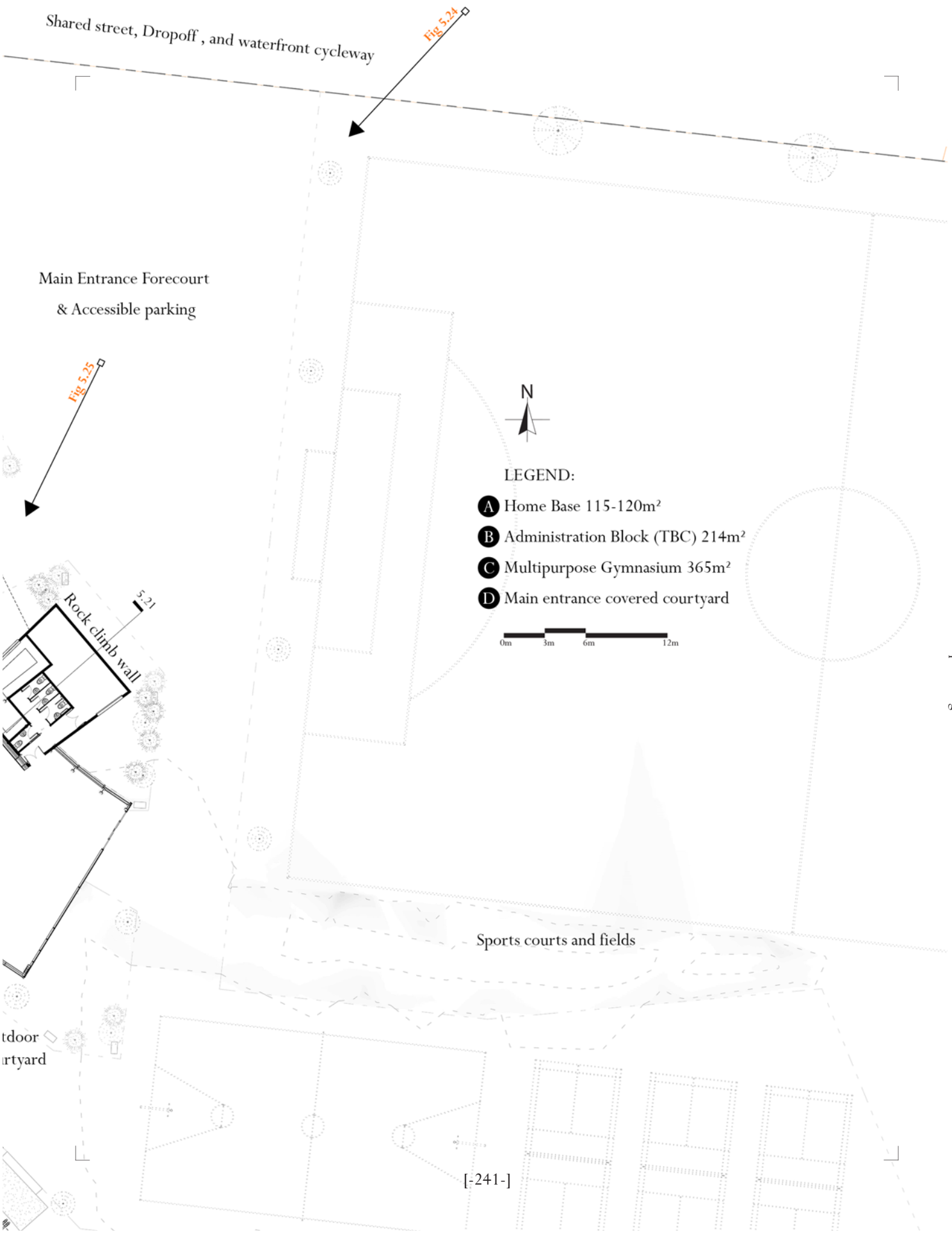
▲Fig 5.21.Section through learning street



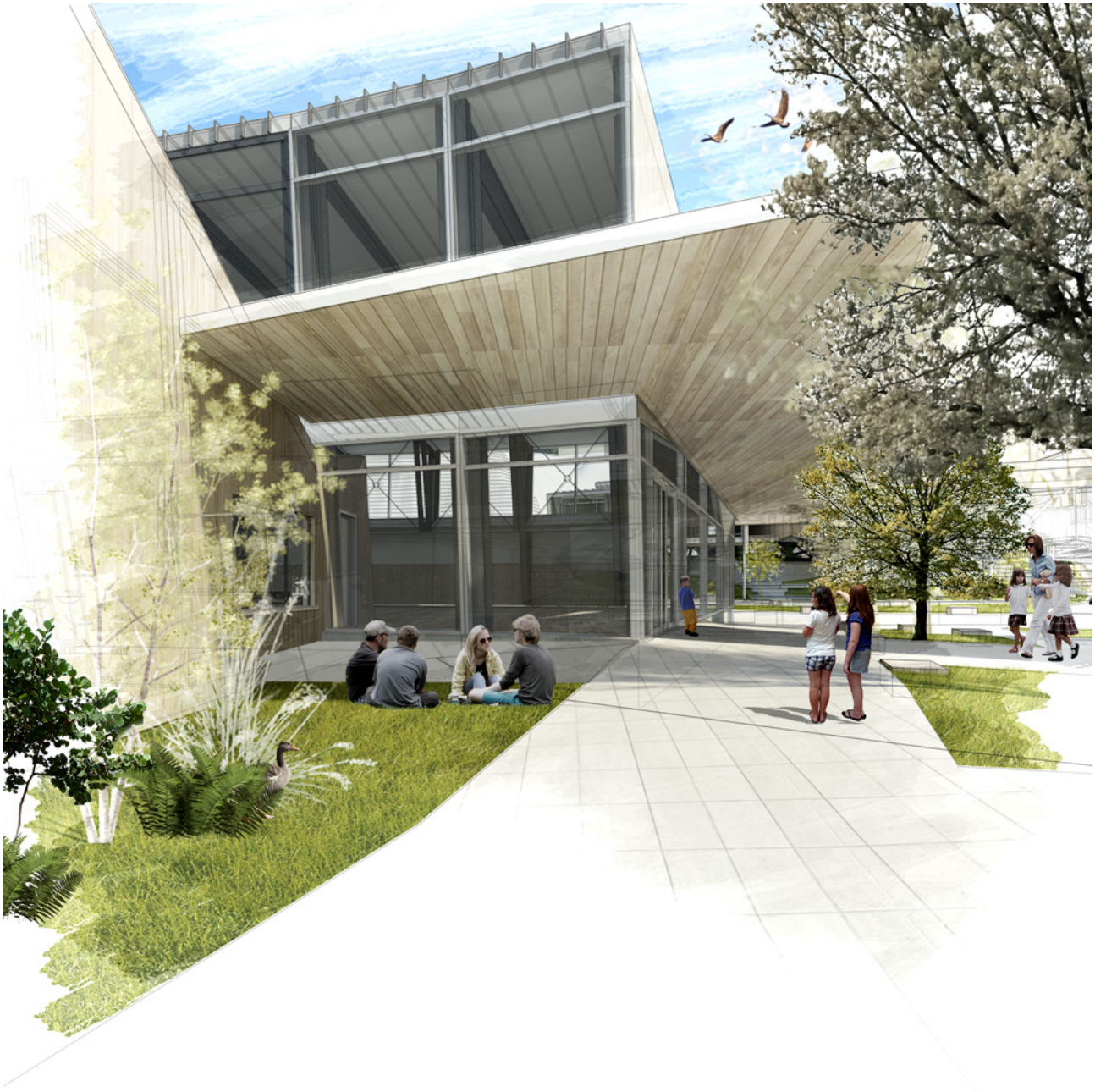
SLIDE

▲Fig 5.22.The stage & gymnasium.

▲Fig 5.23.Lower level floor plan

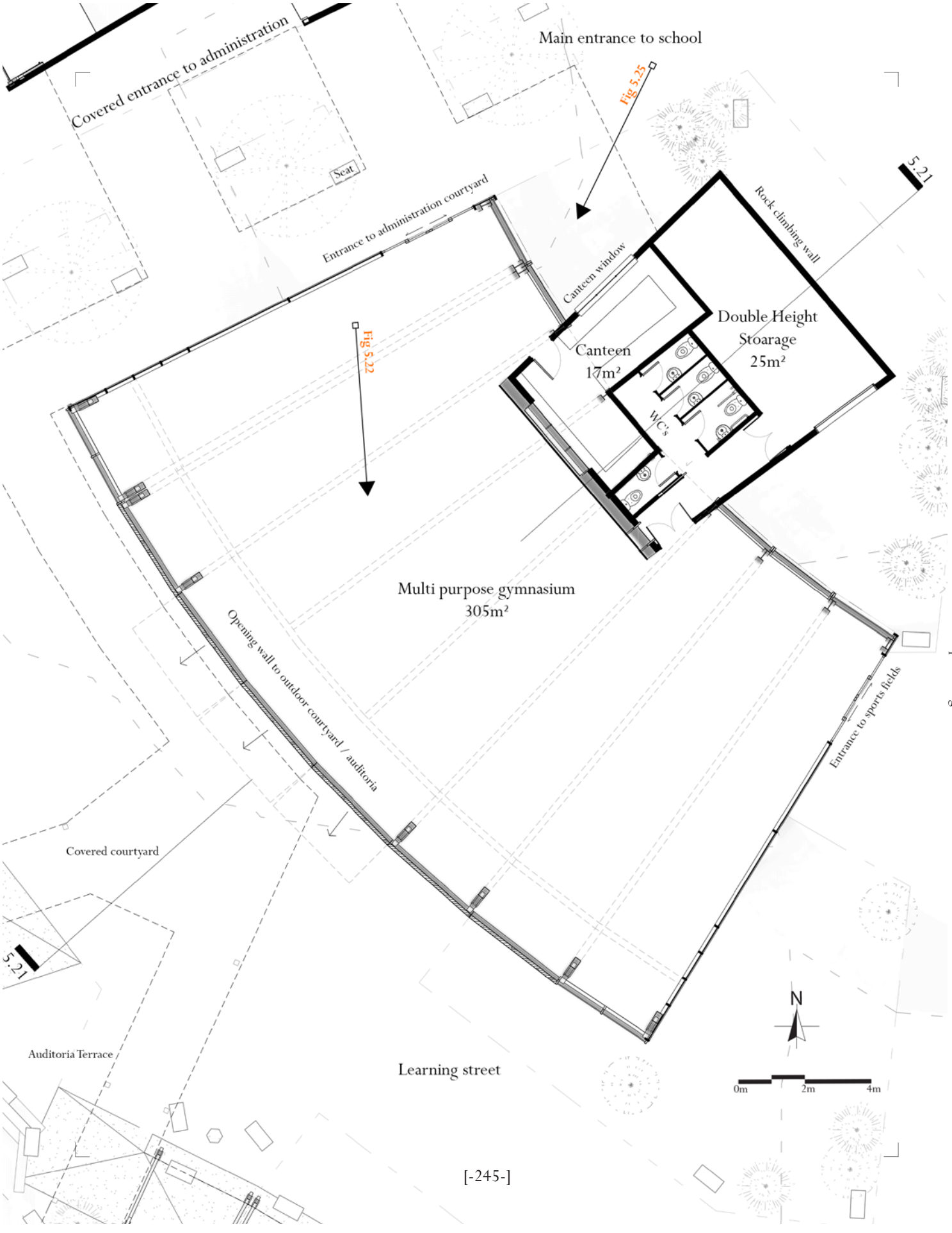

Shared street, Dropoff , and waterfront cycleway
Fig 5.24
Main Entrance Forecourt
& Accessible parking
Fig 5.25
N
LEGEND:
A Home Base 115-120m²
B Administration Block (TBC) 214m²
C Multipurpose Gymnasium 365m²
D Main entrance covered courtyard
0m 3m 6m 12m
5.21
Rock climb wall
Sports courts and fields
tdoor
rtyard

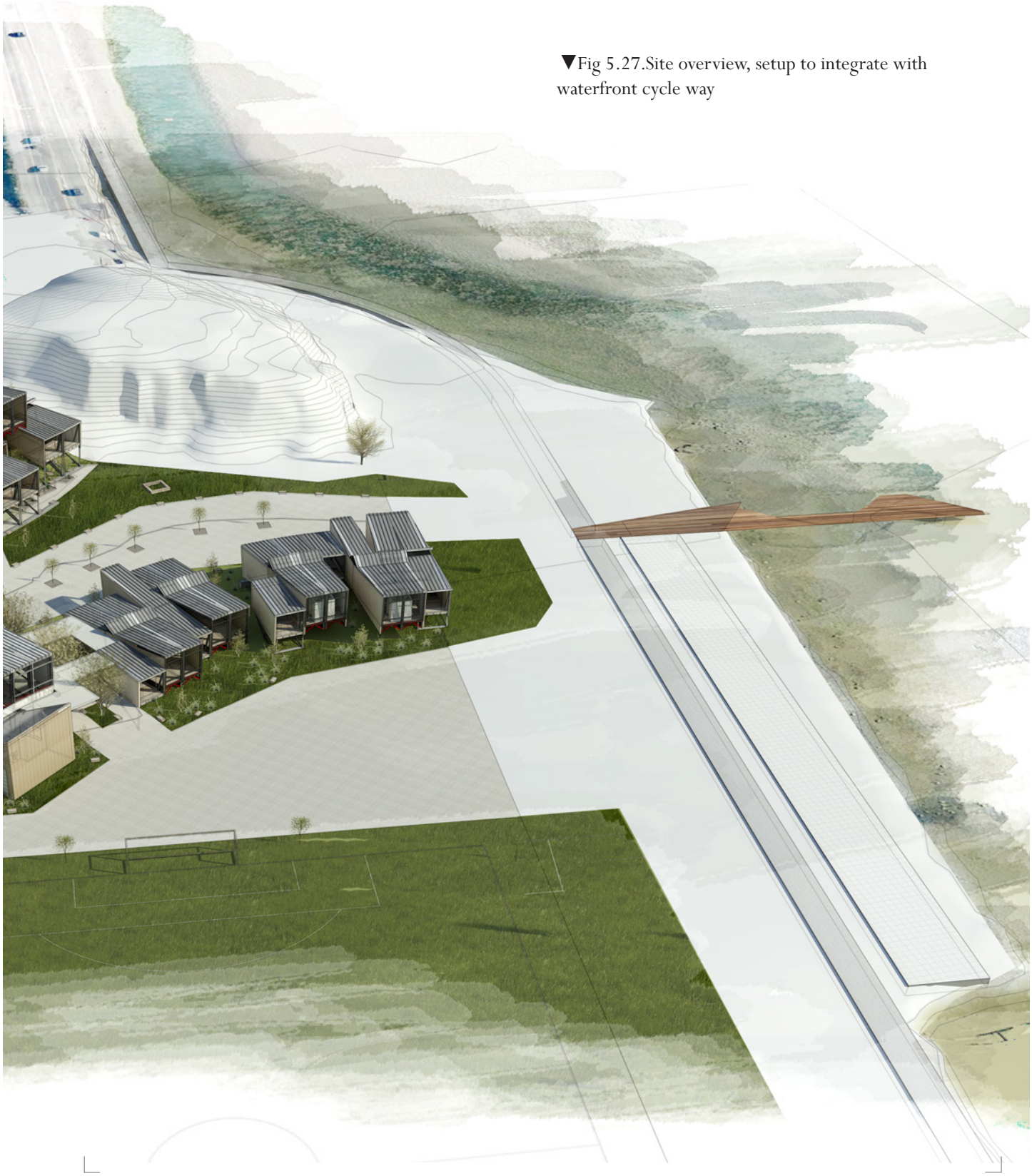
▲Fig 5.24.Main entrance and community engagement.



▲Fig 5.25.The administration street. Hall and canteen window shown left.

▶Fig 5.26.The multipurpose gymnasium


Main entrance to school
Fig 5.25
Covered entrance to administration
Seat
Entrance to administration courtyard
Canteen window
Rock climbing wall
5.21
Fig 5.22
Canteen
17m²
Double Height
Stoarage
25m²
W/C's
Multi purpose gymnasium
305m²
Opening wall to outdoor courtyard / auditoria
Entrance to sports fields
Covered courtyard
5.21
N
Auditoria Terrace
Learning street
0m
2m
4m



▼Fig 5.27.Site overview, setup to integrate with waterfront cycle way

FINAL CONCLUSION AND REVIEW

CONCLUSION AND REVIEW

PROCESS

Through an broad and layered initial literature review and programme analysis, this thesis establishes that the need for flexible space within educational environments needs to be explored through design. This initial research highlights issues in integration of outdoor learning environments, spatial utilisation, and intergration of emergent pedagogical developments in education. It formulates criteria for design exploration that proposes these needs of education have potential to be addressed through TRANSITIONAL spatial integration, enabling flexibility in spatial environment experience and programme.

SITE

The site, Redcliffs School, provided for divergent interactions with site to be explored, and enable diverse testing and development of developed ideas. The relationship/s between built form and site are highlighted as an area for further research to take place, as design experiments and educational opportunities are constantly in convergence with site. The experiments in this thesis reveal that a TRANSITIONAL modular construction framework, can be site responsive through integration with site specific design elements to optimise the potentials that modulatrity brings. However, to enable enhanced flexibility of the adaptable building form, the landscape must also be relatively flexible to allow expansion, thus being in contraction of the design enabling site.

INITIAL DESIGN EXPERIMENTS

Initial design experiments [in phase one] generate general principles of design approach to site. These do not specifically align with the research topic however, they form a basis for further design experiments to take place. Phase two (A&B) expands on this basis and explores architecture in TRANSITION through two opposing design methods undertaken in parallel. These experiments aim to define how flexibility and TRANSITIONAL space could be designed for in response to programme and form. They shift focus onto form as a way to enable programmatic flexibility, and form in relation to site. This develops into the first site responsive design case study.

DESIGN CASE STUDY ONE

Issues of this developed design case study became apparent at the six month review. Although the design is sensitive to its context, it did not showcase that it had enough flexibility and spatial qualities to enable TRANSITION to take place. It became apparent that flexibility of these environments, and the spatial qualities, are areas for development in further design iterations, to ensure an element of TRANSITION to the design.

DEVELOPED PRELIMINARY DESIGN

The developed preliminary design formulates on the realisation that, for educational architecture, careful consideration of an inherently modular programme and form, is needed of the design to enable a dynamic and flexible environment in response to site.

Two main modules are arrayed and positioned in relation to site, around a site responsive core. This enables TRANSITIONAL engagement with the wider community, and activation of the heart of the school as a social hub. In plan a flexible use of space is provided, so that the school organism has potential to shape space to their needs. This generates a design methodology that pushes away from the current approach of large mass facilities to learning environments in NZ, and articulates façade and form on a child scale. Although overall movements in form are responsive to site, this design highlights the need for a balance between an inherently modular system and site responsive design to enable TRANSITION whist engaging with environment.

DESIGN IN REVIEW

This design addresses issues raised in the developed preliminary design through adopting a simpler form and generating enhanced relationships to site. It further dissects form enabling stronger connections to outdoor learning environments. The design in review enables testing of generated principles in the thesis, and discussion and insight into how TRANSITION may be integrated into further design exploration.

FINAL SUMMARY

Principles and framework developed through extensive research forming part one of this research were tested through a range of iterative design experiments. These experiments focused on an exploration of spatial flexibility within school design at all scales. Questioning how educational space may be formed with TRANSITION as a core principle.

These experiments propose that TRANSITIONAL space as core facility has the ability to enable enhanced flexibility, diversity, and advance educational opportunity.

With clear indications that school environments do have an impact on children's development, and the need for new schools within NZ, the research in conclusion proposes:

In response to current pedagogical ideals. A flexible, outdoor learning focused school complex with transitional space at its core, is a desirable alternative to the 'large open plan' studio to enable flexibility and an enriched learning environment. However, further research and design experimentation is needed to test and understand implications of this framework in practice.

WHERE TO...

The following would provide beneficial to further research.

Climate testing (building performance)

Although designed with climate in mind, no testing or climate research of the designs was undertaken.

Client testing

Virtual reality testing with students and teachers would be beneficial to develop the a more purpose fit design model, as no client group was consulted throughout this process.

Accessibility

An accessibility assessment and rational could provide for further incites to building form and thresholds of transition.

Landscaping

Evaluation of landscaping ecologies and their appropriateness for learning environments.

Times of transition are strenuous, but I love them. They are an opportunity to purge, rethink priorities, and be intentional about new habits. We can make our new normal any way we want.

Kristin Armstrong

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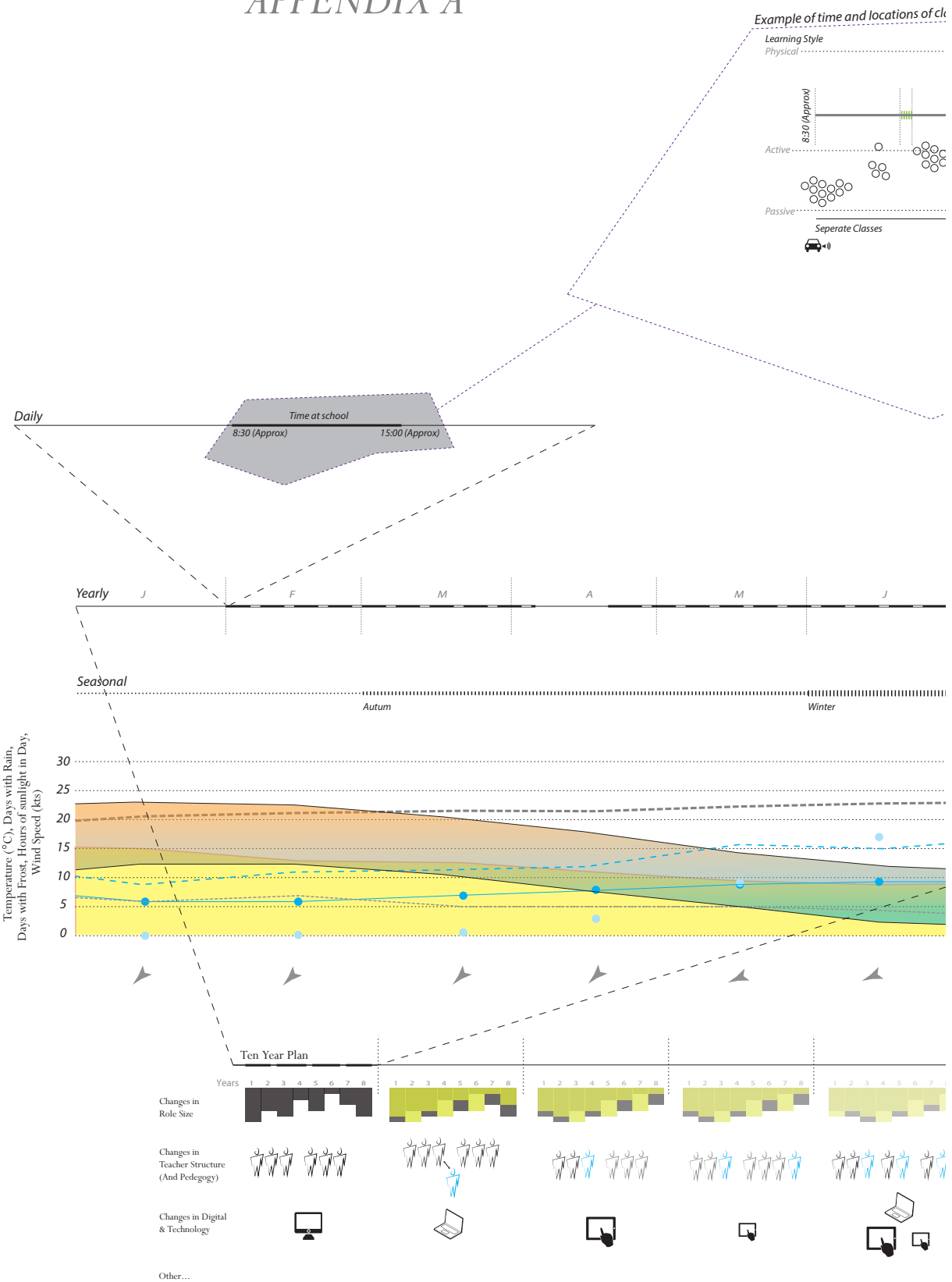
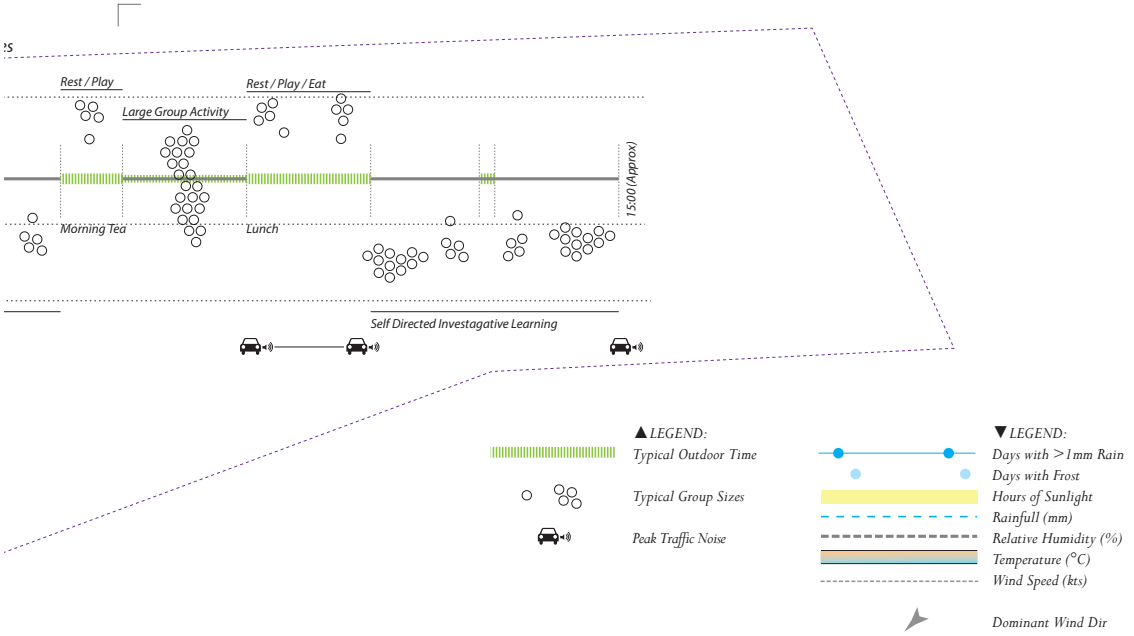
APPENDICES

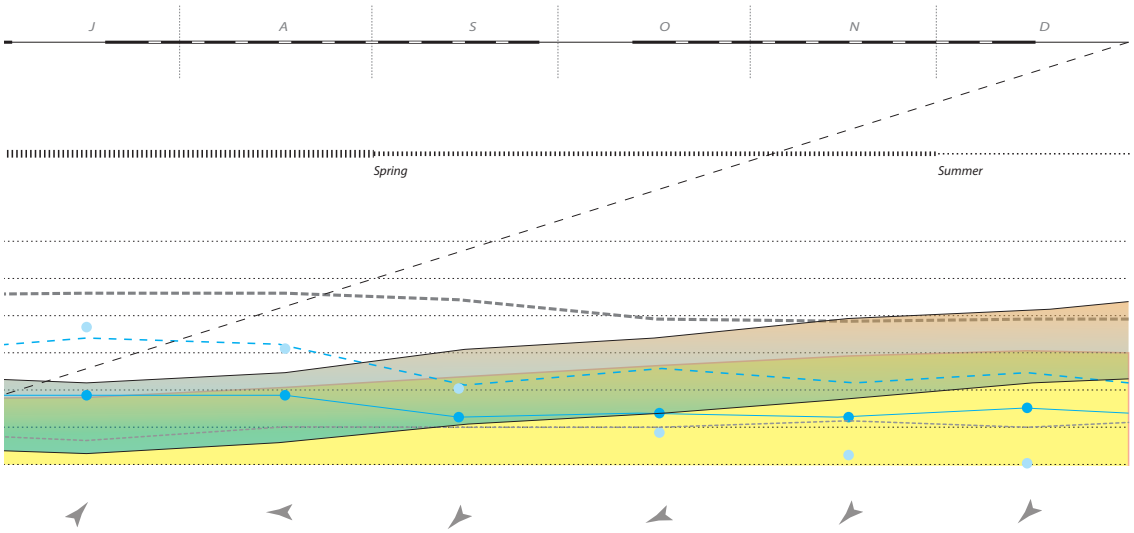
APPENDIX A


Example of time and locations of cl
Learning Style
Physical
8:30 (Approx)
Active
Passive
Seperate Classes
Daily
Time at school
8:30 (Approx)
15:00 (Approx)
Yearly
J
F
M
A
M
J
Seasonal
Autum
Winter
MEAN Christchurch:
Temperature (°C), Days with Rain,
Days with Frost, Hours of sunlight in Day,
Wind Speed (kts)
30
25
20
15
10
5
0
Ten Year Plan
Years
1 2 3 4 5 6 7 8
Changes in
Role Size
Changes in
Teacher Structure
(And Pedegogy)
Changes in Digital
& Technology
Other…

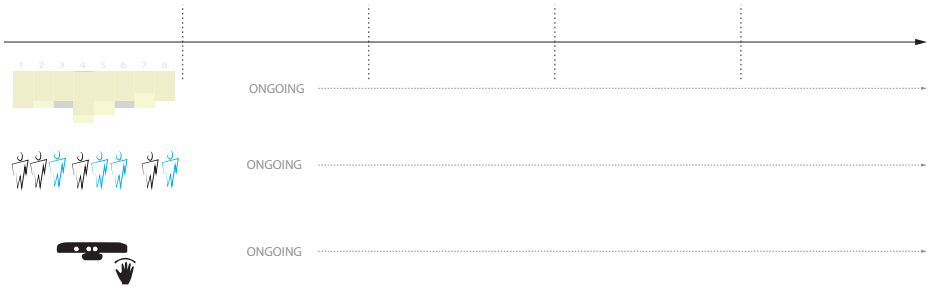


▲ *LEGEND:*
Typical Outdoor Time
Typical Group Sizes
Peak Traffic Noise

▼ *LEGEND:*
Days with >1mm Rain
Days with Frost
Hours of Sunlight
Rainfall (mm)
Relative Humidity (%)
Temperature (°C)
Wind Speed (kts)
Dominant Wind Dir



MEAN Christchurch:
Rainfall (mm), Relative Humidity (%)



APPENDIX B

TheThirdTeacher+ BY CANNONDESIGN

79 WAYS YOU CAN USE DESIGN TO TRANSFORM TEACHING + LEARNING

Keep learning at:
http://thethirdteacherplus.com
contact@thethirdteacherplus.com

BASIC NEEDS

1. Everyone can be a designer
2. Do no harm
3. Cherish children's spaces
4. Put safety before study
5. Think Small
6. Assign the solution
7. Make janitors guardians
8. Design for speech & hearing
9. Let the sunshine in
10. Shuffle the deck

MINDS AT WORK

11. Make it new
12. Support great teachers
13. Build neural networks
14. Multiply intelligences
15. Display learning
16. Emulate museums
17. Form follows function
18. Unite the disciplines
19. Bring the outside in

BODIES IN MOTION

20. Make peace with fidgeting
21. Decide on dynamic
22. Swivel to attention
23. Make classrooms agile
24. Respect fitness facilities
25. Take the "ground" out of "playground"
26. Promote healthy play
27. Naturalize play spaces
28. Scale the wall
29. Free choice

COMMUNITY CONNECTIONS

30. Build close to home
31. Let your grassroots show
32. Build for change
33. Move in together
34. Imagine like a child
35. Consult widely and early
36. Roll up your sleeves
37. Blaze the way
38. Make them proud
39. Be a good neighbor
40. Build a nest

SUSTAINABLE SCHOOLS

41. Leapfrog LEED
42. Reveal how stuff works
43. Get eco-educated
44. Highlight the site
45. Attract like minds
46. Let students lead
47. Rally the results
48. Do your homework
49. Get out of the city
50. Slow the pace

REALM OF THE SENSES

51. Make caterers caretakers
52. Spend now, save later
53. Grow your own
54. Think hands-on
55. Trigger the senses
56. Design in multiple dimensions
57. Paint by function
58. Define the learning landscape
59. Slip off your shoes
60. Open the doors

LEARNING FOR ALL

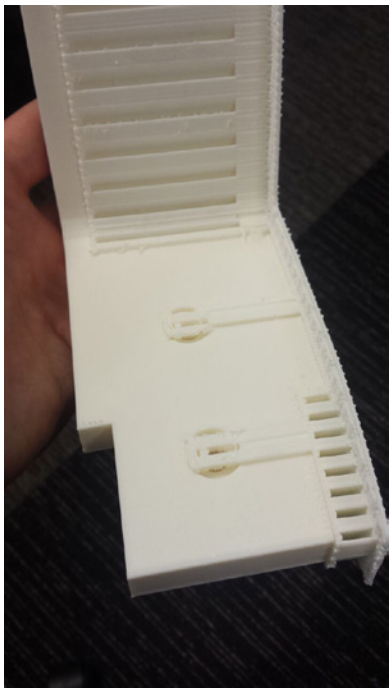
61. Adopt a young mentor
62. Put the fun in fundamentals
63. Design with words
64. Recruit difference
65. Get accessibility aware
66. Break down social barriers
67. Make it feel good
68. Take it to the top
69. Domesticate classrooms
70. Create a movement

REWIRED LEARNING

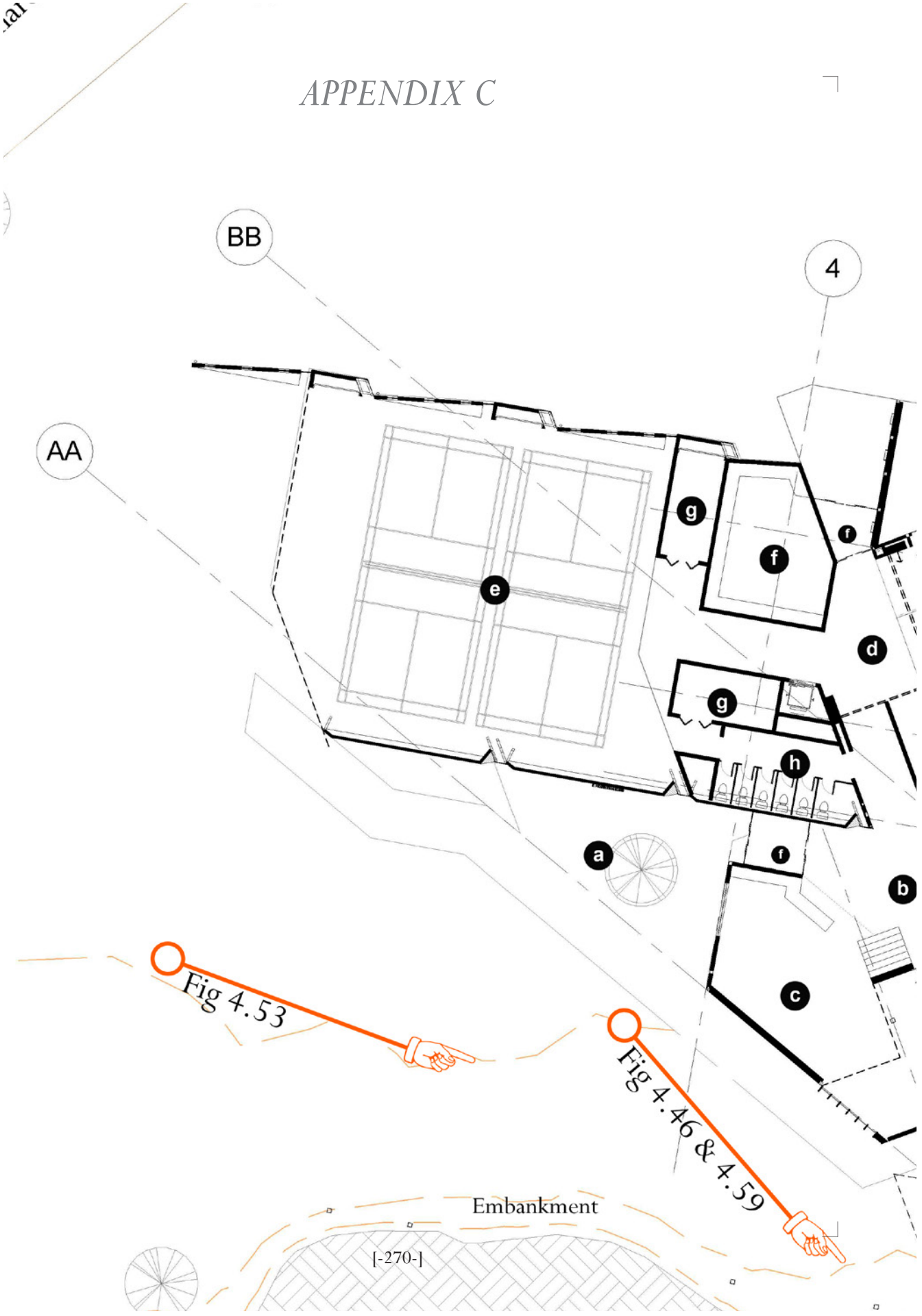
71. Consult with kids
72. Put theory into practice
73. Expand virtually
74. Embrace purpose
75. Plan for the unknown
76. Unleash learning
77. Bridge the digital divide
78. Dream big and be brave
79. Add to this list

APPENDIX C

MODEL EXPLORATIONS



APPENDIX C



LEGEND

a - covered entrance portico
b - parent area and display
c - reception and admin facilities
d - shared gymnasium reception lobby
e - gymnasium
f - canteen and cooking facilities
g - storage
h - amenities
i - acc wc
j - sick bay
k - server

X - Modular Cluster

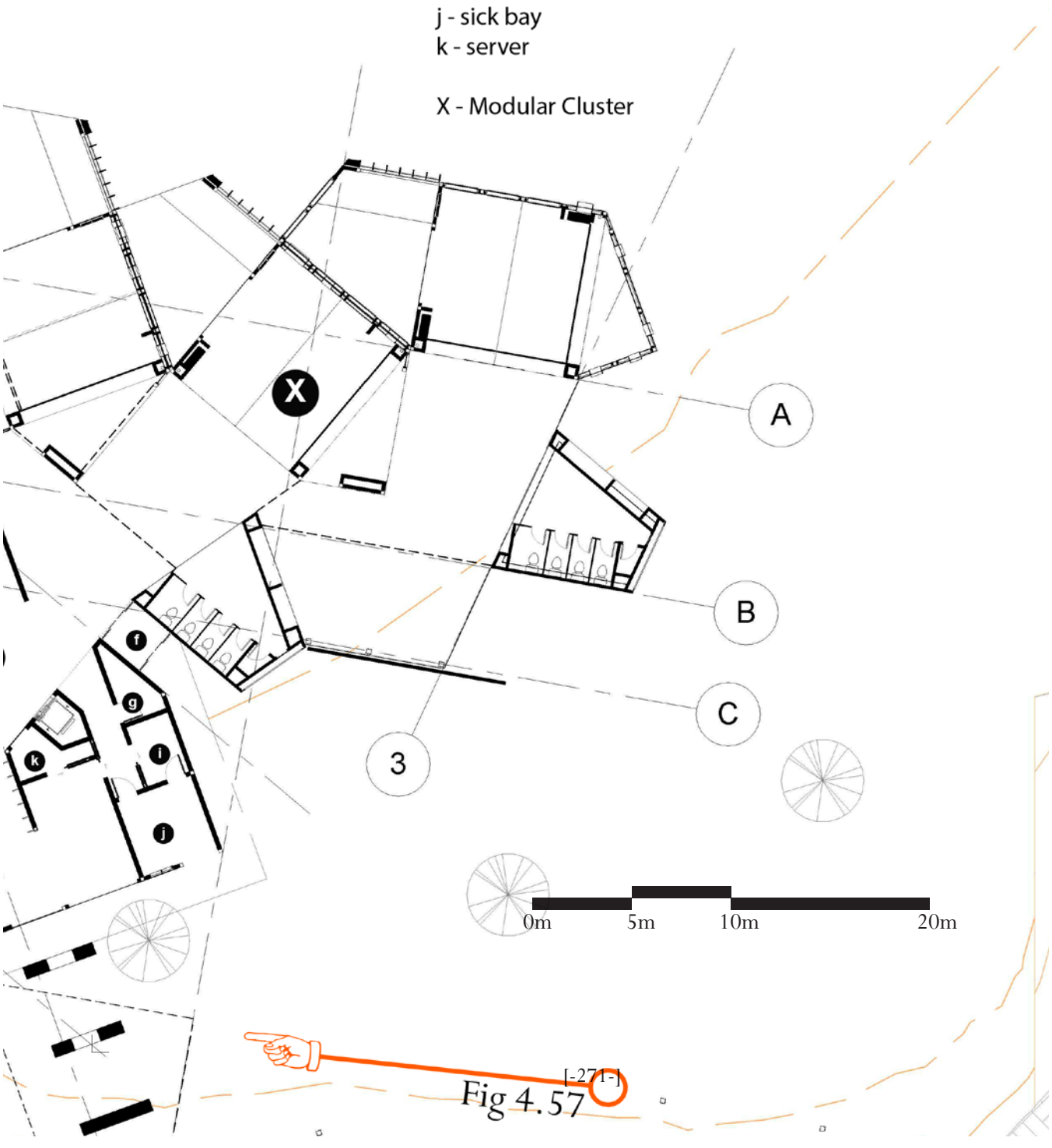


Fig 4.57


I
Void
E
Embankment
X
q
1


Section Fig 4.58
Fig 4.56
Neighboring
Dwellings
A
B
C
D
F
G
H
J
ZZ
2
m
n
o
p
r