



*by Henry R Coertz*

Please,  
I need time to speak

# Acoustic Sanctuary

The South African Ayres Sensory Facility located on the foot of Naval Hill

Henry Reginald Coertz  
2014037457 | HenryCoertz@gmail.com

This project centres around repurposing a historical water reservoir and pumpstation located on the foot of Naval Hill, Bloemfontein into an alternative speech therapy centre, where architecture plays a critical role in speech therapy arguably equal to that of any professional pathologist. Apart from a reimagined speech pathologist office, the South African – Ares Sensory facility (SA-AS Facility) also incorporates a sensory park. The impetus of this project is the sensory park and the freedom of therapy that it represents. Freedom to mend a speech disorder at the tempo of the patient, though neurologically stimulating garden structures. Similar to gymnasium equipment, these follies allow patients to exercise their neurological network of senses that all contribute to address speech disorder, hence the phonic gymnasium description of this SA-AS facility.

This dissertation covers complex therapeutic and theoretical topics, and the information from each chapter contains the chronologically necessary information to understand the chapters that follow. Chapter one directly starts with what is known about speech sound disorders. Chapter two contains the reinterpretation of Frank Lloyd Wright’s concepts of organic architecture in order to establish a physical form of the essence of this dissertation. From here, the discourse starts to question the communication process at an anatomical level and therefore translates the auditory defect of speech impairments to that of musical melodies and architectural rhythm. These phonic applications are then explored within architectural precedents while being related back into sound correction (Speech therapy) and mobility (occupational therapy). Chapter 3 clarifies and analysis the project goals and location within these mentioned ideals. While chapter 4 refines all the information provided into three conceptual models. These physical manifestations investigate the architectural application of scientific research and therapeutic discourse. The final chapters explain the design development and folly rationale before leading to the final design.

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*“Architecture is the art of reconciliation between ourselves and the world,  
and this mediation takes place through the senses” - Juhani Pallasmaa*

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## Declaration of original authorship:

**Department of Architecture, Faculty of Natural and Agricultural Science, University of the Free State:**

This dissertation is submitted in partial fulfilment of the requirements of the degree M.Arch (Prof) 2021-2022  
Henry Reginald Coertz | 2014037457 | HenryCoertz@Gmail.com

### **Supervisors:**

Prof. J.D. Smit; Mrs. P. Jooste -Smit; Mrs M. Bitzer; Mr H. Raubenheimer; Dr HA. Auret

### **Declaration of original authorship:**

I, Henry Reginald Coertz, 2014037457, am at the time of this dissertation, a registered student at the University of the Free State and enrolled in the Master of Architecture (Professional) course of 2021-2022. I declare the following:

I am currently aware and understand that plagiarism (stealing, using, or creating an impression that work that is present, that is not the intellectual property of the author is presented as the author's original own work as well as making use of other authors' work without their permission and/or without the acknowledgement from the original creator is prohibited. I confirm with confidence that the work submitted required for the Magister Architecture course is my own, unless where indicated otherwise. All contributions, graphics images, ideas, concepts and text, that is not my own input is acknowledged with a reference and a source is provided.





## Background

*“You have not opened your eyes, you are still following common rules. You have not suffered enough. Go home and suffer some more” - Ram Dass*

If your phone call is answered, but you do not hear a voice on the other end, do not hang up. It is me trying my best to squeeze out the word “Hello”. No one is internally ready to stop stuttering, only until they reach a point of absolute depression, and they commit everything to overcome this struggle. I am not saying that therapy is absolute. On the contrary, therapists are extraordinary people and have guided many to a vocal future. The truth is that you need to pledge to a life that will not be limited by your voice.

An alternative speech therapy facility and sensory park will revolve around the topic of social tension within sound adaptation. A therapeutic facility engaging in a method that can only be described as a “phonic gym”, is a self-catering therapy space that is open to the public. The lucidity of this topic expands into speech therapy and occupational therapy in a singular facility, designed for everyone to engage in, without needing to frequent expensive therapy sessions. Through investigating various methods of therapy regarding speech impairments, as well as exploring standard and unconventional therapy techniques, this speech facility and sensory park aim to adaptively reuse and embody an abandoned heritage structure to reveal its hidden beauty.

Additionally, this facility explores various ways in which a rejected structure can regain its voice while being reinterpreted and integrated back into society. This dissertation identifies and introduces the topic of speech impairments and sound speech disorders, along with the parameters associated with the project. Thereafter, it explores the grounding concept through extensive research and analysis that inevitably divided the theoretical approach. These branches were then applied to conceptual design principles toward a complete technical synthesis of architecture. This dissertation reflects and echoes the complexities of the investigation process, focused on the conceptual exploration, theoretical approaches, as well as research gathered within the development.

**Key words: Alternative, Speech therapy, Occupational Therapy, Naval Hill, Bloemfontein, Sensory Park, Speech impairments, Speech Apraxia**

# Project Summary

Speech impairments affect how a person creates sound with the hope to form understandable words in order to communicate. Speech disorder, as it is commonly known, is a label placed on extreme cases of incomprehensible speech. This is a disorder everyone can relate to; everyone has had experiences in life where saying a few words becomes the biggest challenge of the day, even though it is usually only during a speech or a nervous conversation with a crush.

People who struggle with this daily, regularly during mundane conversations, often feel helpless in a moment of stutter. Suddenly the speaker freezes, and the listener is left in ambiguity, seemingly staring into the eyes of a broken record. An awkward moment in mid-conversation, where eyes meet in ironic discomfort, aware of the speaker's dilemma and perplexed about how to respond appropriately. Should the listeners look away or just keep staring, while the speaker is stuck amidst a word and being stared down by the conversationalists?

This creates an atrocious harmony in tension. To relieve tension within a space, a patient can explore various instalments and methods of treatment. Within the space envisioned in this study, people will be free to practice their speech and reach a phase in their therapy where their observation trumps the belief of what is functional.

This project promotes an innovative and alternative method of treatment for communication disorders for all ages. Communication disorders impact many aspects of life and especially affect children's lives. This effect goes far beyond the domains of speech-language. Therefore, identifying functional triggers that may cause distress is important to plan comprehensive systematic evaluations and rehabilitation therapy.

To do this, speech therapists work coherently with occupational therapists, and together they formulate an optimal treatment. The most common disorder where these two professions work cooperatively is speech apraxia. Speech apraxia is a speech sound disorder where the brain has difficulty coordinating complex oral movements needed to create sound.

This is a fundamental motor disorder that disrupts speech-language. Focusing on a specific speech disorder such as speech apraxia ensures that the facility effectively combines therapy professionals from both fields within one facility, thus focusing the dissertation topic, as well as broadening the possibilities of the proposed facility. Treatments of this disorder combine the equivalent efforts of both speech and occupational therapists



## Function

Speech and occupational pathologists all agree that there is no heterotopian () space for people to practice their speech therapy, labelled in this dissertation as a vocal sanctuary. Seeing a therapist every week is not only expensive, but also limiting. Therapists can only see a limited number of people per week. This is highlighted by many local specialists in both the fields of speech therapy and occupational therapy, as well as by numerous research articles supporting this argument. There is a need for a space where people can go to practice their therapy at their own comfort and time, or in layman's terms "a Phonic gym". Speech therapy may also require an audience, and once a patient is comfortable they may need to be able to practice in a safe environment with their peers, for example in a drama group.

In summary, the functionality of the programme is proposing a speech pathology facility and sensory park with architectural and therapeutic devices, strategically placed for optimal therapeutic results, without limiting the end-user group, however, the focus lies on the ages between seven and twenty years.

Patients would arrive at the facility and be greeted by a trained professional, be subjected to a benchmark test, and obtain a list of activities and weekly goals. This enables the pathologist to see more patients and provides patients with the opportunity to explore and be guided by others within a situation similar to theirs, including being aided by specialists acting as "personal trainers".

## Site

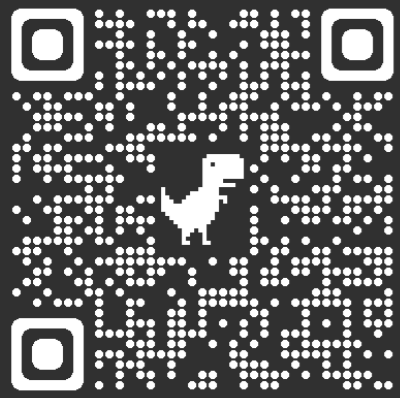
Situated next to the entrance to Naval Hill and the Franklin Reserve in Bloemfontein, a historic pumpstation, completed in 1889 currently stands abandoned and fortified. The windows and doors are reinforced with improvised metal burglar bars, welded shut to eliminate any suspicion of the displaced individual habituating the space. It is located on the edge of the city and at the foot of Franklin Nature Reserve, which according to cadastral documents (South Africa History online, 2022), is part of Naval Hill's erf, implying that the boundary fence remains malleable.

## Programme

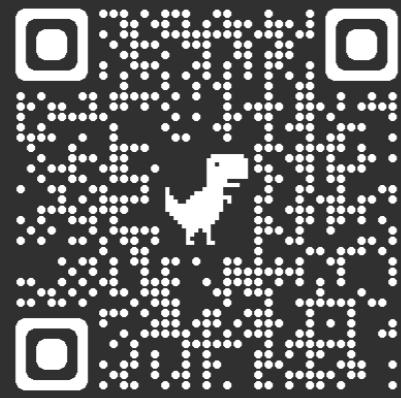
Merging two therapy fields, namely Occupational Therapy and Speech Therapy, along with introducing new methods of therapy that can be applied in an architectural setting needs to be accommodated in the proposed programme. Initially, this seemed as if it would be as simple as combining elements from therapy into a bigger form placed in a garden. The complexity quickly rose once the theory behind the therapy methods become apparent, but not the physical application. Having to constantly direct the facility towards the implementation of sensory therapy meant that many aspects had to be invented and reinvented.

The facility's programme involves therapy rooms, general office spaces, and everything concerned with a generic therapeutic facility. However, the focus is on the sound application, where an audible problem can be mended by sound, while incorporating optimal therapy spaces for occupational therapy as well. Therefore, these therapists would make use of the same therapy rooms, while having their own private office spaces. The separation of the therapists' practice spaces and administrative facilities meant that many functions are grouped together, combined to work coherently, for the optimal result and other elements.

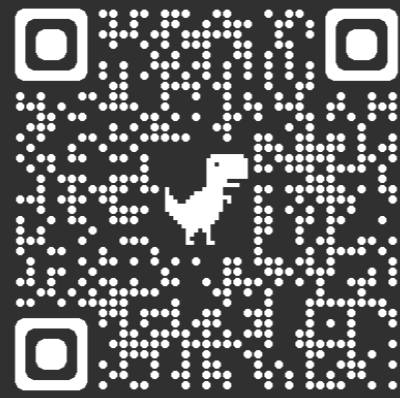
x *Figure 3: Photo taken on site of the existing pump facilities, (Author, 2021).*  
*Figure 4: Imaginative image of what Emotional expression this project strives for within a park, (A Spratt, adapted by author, 2021).*



**01**  
e-book



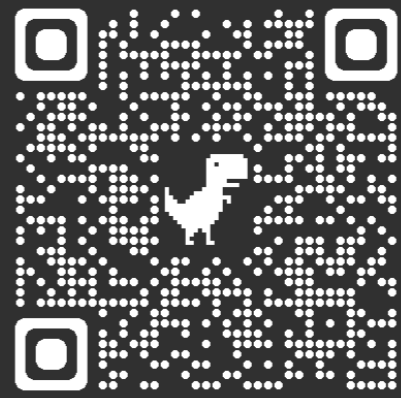
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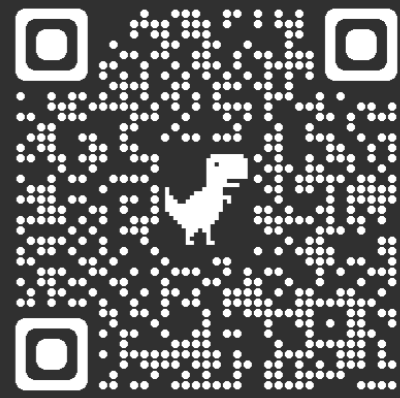
**03**  
Design  
Presentation



**04**  
Construction  
Presentation



**05**  
Architectural  
Posters



**06**  
Construction  
Documentations

# PROJECT QR CODES

|                                              |   |
|----------------------------------------------|---|
| 1.1 Introduction.....                        | 4 |
| 1.2 Types of speech impairments.....         | 5 |
| 1.3 The dichotomy of speech impairments..... | 6 |
| 1.4 Treatment .....                          | 8 |
| 1.5 Conclusion.....                          | 9 |

|                                                         |    |
|---------------------------------------------------------|----|
| 2.1 Introduction.....                                   | 12 |
| 2.2 Various avenues and the essence of the project..... | 13 |
| 2.3 Tenuous melody .....                                | 14 |
| 2.4 Sculptural progression.....                         | 15 |
| 2.5 Touchstone .....                                    | 16 |
| 2.8 Aberration of therapy .....                         | 23 |
| 2.8 Appropriating the subjected.....                    | 24 |
| 2.9 Conclusion .....                                    | 35 |

|                                                                               |    |
|-------------------------------------------------------------------------------|----|
| 3.1 Introduction.....                                                         | 38 |
| 3.2 Hearing voices - Meeting the site as a therapist for the first time ..... | 39 |
| 3.4 Ambitious intention .....                                                 | 45 |
| 3.5 Lenses set in place.....                                                  | 46 |
| 3.6 Patron .....                                                              | 48 |
| 3.7 Program.....                                                              | 50 |
| 3.8 User requirements.....                                                    | 51 |
| 3.9 Economic sustainability .....                                             | 52 |
| 3.10 Site Analysis .....                                                      | 53 |
| 3.11 Macro analysis of the Built fabric.....                                  | 55 |
| 3.12 Terrain Vague .....                                                      | 56 |
| 3.13 Historical access.....                                                   | 56 |
| 3.14 A brief history of Naval Hill.....                                       | 57 |
| 3.16 Heritage strategy .....                                                  | 62 |
| 3.17 Mesoscopic .....                                                         | 65 |
| 3.18 Microscopic.....                                                         | 67 |
| 3.19 Conclusion.....                                                          | 73 |

|                                       |    |
|---------------------------------------|----|
| 4.1 Introduction.....                 | 76 |
| 4.1.1 No right answer .....           | 77 |
| 4.2 The Intangible tension .....      | 79 |
| 4.3 En-route to stimuable speech..... | 83 |
| 4.4 Temporality in edification .....  | 87 |
| 4.5 Conclusion.....                   | 91 |

|                              |     |
|------------------------------|-----|
| 5.1 Introduction.....        | 95  |
| 5.2 Synthesis.....           | 96  |
| 5.3 Design phases.....       | 124 |
| 5.4 Prominent fragility..... | 134 |
| 6.1 Introduction.....        | 144 |

|                              |     |
|------------------------------|-----|
| 6.2 Spatial development..... | 148 |
| 6.3 Reflection.....          | 214 |
| Reflection.....              | 215 |

|                                |     |
|--------------------------------|-----|
| 7.1 Technical resolution ..... | 218 |
|--------------------------------|-----|

|                          |     |
|--------------------------|-----|
| i Bibliography .....     | 218 |
| ii List of Figures ..... | 222 |
| iii Turnitin report..... | 227 |

# 01

## CHAPTER

|                                         |
|-----------------------------------------|
| 1.1 Introduction                        |
| 1.2 Types of speech impairments         |
| 1.3 The dichotomy of speech impairments |
| 1.4 Treatment                           |
| 1.5 Conclusion                          |

# 02

## CHAPTER

|                                                    |
|----------------------------------------------------|
| 2.1 Introduction                                   |
| 2.2 Various avenues and the essence of the project |
| 2.3 Tenuous melody                                 |
| 2.4 Sculptural progression                         |
| 2.5 Touchstone                                     |
| 2.6 Rhythms of phonation                           |
| 2.7 Aberration of therapy                          |
| 2.8 Appropriating the subjected                    |
| 2.9 Conclusion                                     |

# 03

## CHAPTER

|                                                                         |
|-------------------------------------------------------------------------|
| 3.1 Introduction                                                        |
| 3.2 Hearing voices - Meeting the site as a therapist for the first time |
| 3.4 Ambitious intention                                                 |
| 3.5 Lenses set in place                                                 |
| 3.6 Patron                                                              |
| 3.7 Program                                                             |
| 3.8 User requirements                                                   |
| 3.9 Economic sustainability                                             |
| 3.10 Site Analysis                                                      |
| 3.11 Macro analysis of the Built fabric                                 |
| 3.12 Terrain Vague                                                      |
| 3.13 Historical access                                                  |
| 3.14 A brief history of Naval Hill                                      |
| 3.16 Heritage strategy                                                  |
| 3.17 Mesoscopic                                                         |
| 3.18 Microscopic                                                        |
| 3.19 Conclusion                                                         |

# 04

## CHAPTER

|                                  |
|----------------------------------|
| 4.1 Introduction                 |
| 4.2 The Intangible tension       |
| 4.3 En-route to stimuable speech |
| 4.4 Temporality in edification   |
| 4.5 Conclusion                   |

# 05

## CHAPTER

|                         |
|-------------------------|
| 5.1 Introduction        |
| 5.2 Synthesis           |
| 5.3 Design phases       |
| 5.4 Prominent fragility |

# 06

## CHAPTER

|                         |
|-------------------------|
| 6.1 Introduction        |
| 6.2 Spatial development |

# 07

## CHAPTER

|                          |
|--------------------------|
| 7.1 Technical resolution |
|--------------------------|

Many professional health care workers apply themselves to aid groups in need of support in South Africa. For example, speech and occupational therapists have designed and built activity parks for children. Features of these parks are designed according to the human neurological development system. Professional occupational therapist Annamarie van Jaarsveld and her team annually erect low-cost playgrounds. The “Back to Earth ayres sensory parks” greatly improved the children’s cognitive abilities. This Park improved the cognitive abilities of children only by means of neuro stimulations through movement (van Jaarsveld et al., 2021). This dissertation aims to incorporate sensory stimulating elements that would improve speech impairments into the design of the proposed facility. People have long believed that speech therapy is the solution to any speech impairment. Their techniques, skills and experience do have very positive effects. Professional speech therapists also give praise to high success rates. However, therapists have often had trouble uncovering and even incorporating universal therapy techniques. The hard truth is that the best speech pathologists’ techniques are only successful with a dedicated patient. During numerous interviews, with professional speech pathologists Anri Esterhuysen and occupational therapist Annamarie Van Jaarsveld both agree on one aspect. They argue that a pathologist’s effort in treatment is only as effective as the patient’s desire to overcome their impairments. Weekly visits are not enough for a patient to simply overcome a lifelong struggle. Constant and deliberate application of various techniques and daily practice is needed to overcome speech impairments.

As mentioned, Van Jaarsveld is responsible for the annual construction of what she calls the “back to earth low-cost playground”. This playground has been proven to aid in child brain development. The idea is straightforward, by incorporating cleverly designed gimmicks within a play area, during play children are also stimulating certain areas of their brain. This proposal aims to improve the current system of speech impairment treatments and hopes to challenge the perception of the underappreciated community of therapists. These pathologists are constantly acquiring alternative methods, especially focused on the “Do it at home – lifestyle”. The objective is to establish a low-cost therapy facility, focused on major speech therapies. Many pathologists have realized that these are the only form of speech exercise many of their patients are exposed to every week.

Without constant practice and attention to overcome a speech impairment, the effect of any therapy is rendered moot. Therefore, the difficulties lie with finding a balance between professional therapy exposure and personal growth. Acting out speech therapy methods of treatment is still seen as taboo and for many embarrassing such as making awkward sounds and weird noises, especially when committed to the process while not having access to a private space to practice.

This dissertation questions how architecture can mediate speech therapy improving treatments, especially finding ways in which architecture can improve speech. The current speech impartment treatment system depending on the cause and severity mostly revolve around building familiarity of words or physical exercise as defined by Jamie Eske, a health and humanity journalist (Eske, 2019). She explains how professionals has noticed over the years that the human brain is an unpredictable machine. In many cases when a patient is suffering from a speech impairment, it is due to restricted brain function, development, or even stimuli. In layman’s terms, specialists have no specific idea why and how speech impartments develop. Worst of all, they also do not definitively know how to expel a speech impairment.

Therefore, this is a proposal for an alternative speech impairment facility specifically, a design for the two professions of occupational therapy and speech therapy. The aim of the facility is therefore establishing a greater awareness of speech impairments, as well as ensuring that professional treatment is available at affordable rates.



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01

Characteristics of diagnosis

Dissertation introductory information

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## 1.1 Introduction

This chapter identifies and introduces the topic of speech impairments and sound speech disorders, along with familiarizing the terminologies and types of speech impairments. It aims to clarify the possible causes and explain the symptoms of each of the various speech disorders while setting out the parameters associated with the project.

Figure 1.1: Reaching for the unreachable acoustic sense, (Shaabana. N, modified by autho,2021).  
Figure 1.2, 1.3: The variant effects of different speech impairments, (Author, 2021).  
Figure 1.4: A series of interpretive diagrams of each disorder, (Author, 2021).

## 1.2 Types of speech impairments

Speech impairments are easily understood. We all have some form of speech impairment, even the most eloquent (continuous flow of speech) speaker has moments of a broken voice. For most, it is a simple moment of anxiety, for others a lifelong struggle. There are many different treatments and no proven solution, however, there are many approaches that work for specific individuals, and the process of finding a voice becomes a journey. If each individual needs different treatment, perhaps there lies an opportunity to reinterpret methodologies in various applications. Raising the question of, how can architecture promote an innovative and alternative safe space to relieve tension. How can an acoustic sanctuary be a plausible solution?

The basics of speech impairments lie in defining what speech impairments are, who is affected the different types of impairments must be investigated before the possibility of an acoustic sanctuary can be considered. Speech impairments are commonly referred to as speech disorders. Impairments are conditions that affect an individual's ability to speak correctly, or fluently. On the other hand, disorders have very similar difficulties generating comprehensible sounds (Speech Impediment Guide, 2020). 'Speech disorder' is an umbrella term that describes a wide range of symptoms that speech therapists treat (Types of Speech Disorders and Therapy Options, 2019). Symptoms of a speech disorder are often present at birth, while many develop over time, stemming from disabilities, injury, drug use, or in rare cases, it is an issue that occurs as an error of DNA coding, during the time that the neurological functions develop ("Types of Speech Disorders and Therapy Options", 2019). The most common types are:

- **Speech apraxia:** Neurological difficulties in coordinating movement. The brain has difficulty choreographing the complex micro movements associated with speech.
- **Orofacial myofunctional disorders:** Abnormal movement of the face and mouth due to irregular growth and development of facial muscles and bones.
- **Articulation disorders:** Inability to formulate or articulate particular speech sounds.
- **Dysarthria:** An injury to the brain which renders the jaws, tongue, mouth, or lips too weak to formulate words.
- **Autism-related speech disorders:** Individuals with autism may have trouble using and understanding words.
- **Attention Deficit/Hyperactivity Disorders:** ADHD makes it difficult for individuals to pay attention and control their behaviour. Possible symptoms would equate to various communication problems.
- **Resonance disorders:** Having trouble with airflow to the mouth, nose, or throat due to obstructions, thus affecting the vibrations of the voice.
- **Selective mutism:** Inability to speak (Types of Speech Disorders and Therapy Options, 2019).

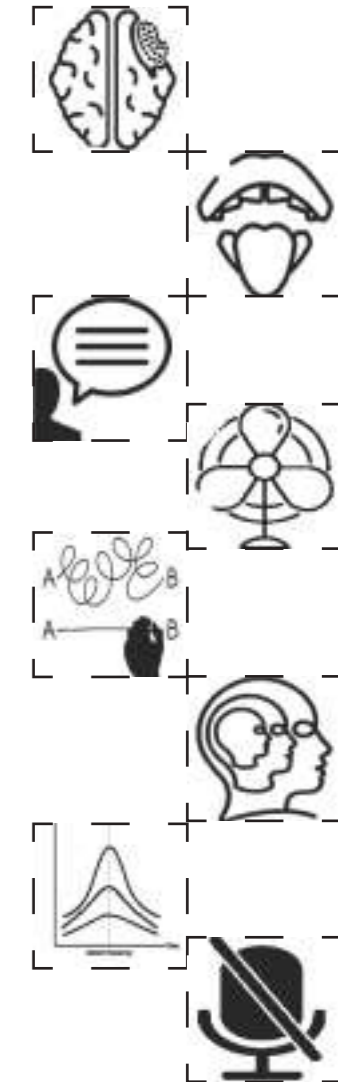


Figure 1.4:



Figure 1.2:



Figure 1.3:

## 1.3 The dichotomy of speech impairments

The most common types of speech impairments all fall under the umbrella term of 'speech sound disorder' (Speech Sound Disorders, 2021). This refers to difficulties in perception and production, including motor production of speech sounds (Speech Sound Disorders, 2021). Speech sound disorder is used as the main heading and branches off into two subsections, namely speech disorders, and speech apraxia, which is the superset of many impairments' symptoms (see Figure 1.5).

Speech disorders affect the sound one creates while trying to formulate words (Speech Disorders, 2017). Most of the time these individuals are aware of what they are trying to say but struggle to articulate their thoughts, and the most common form of speech disorder is stuttering. On the other end of this dichotomy is speech apraxia, a speech problem that originates from motor coordination issues.

Almost every type of speech sound disorder branches off from speech apraxia or speech disorders. These are more frequently found in preschool children (Noel et al., 2018). Speech apraxia only affects a select few, while speech disorders affect most individuals. Everyone has some form of speech disorder, although it may be present in different forms. These speech sound disorders are characterized by the level of difficulty, relating to the production and planning of speech sounds, including the combination of words into sentences (Noel et al., 2018). These difficulties include the following:

- String and forming together of phonemes (distinct units of sounds),
- Omitting sound,
- Substitutions of sounds,
- Or distortion of sounds (fey, Locke., 2018)



Figure 1.5:

### 1.3.1 Statistics

Speech sound disorders, such as stuttering, which is one of the most socially dilapidating catalysts can have devastating effects on people's lives. Usually described as a disruption of the normal flow of speech, this includes pauses, prolongation of sounds, and/or repetitions of words. Everyday situations act as triggers, such as speaking in public, interacting with others, and even eye contact (Mafika, 2008). All these factors can contribute to social tension, making communication more difficult.

Many people suffer from some form of speech sound disorder. A study was done in 2011, which investigated 11 countries in Africa, one of which was South Africa. According to this study, it was found that 1% of the population is affected by speech sound disorders (Nsabimana, 2011). Within South Africa that is a total of five hundred thousand (500 000) (Worldometer, 2021) and within Bloemfontein a total of six thousand (6 000) (Bloemfontein, South Africa Metro Area Population 1950-2021, n.d.).

### 1.3.2 Why

With such a vast number of those influenced, it begs the question: How and why are so many individuals affected? Those who suffer from any form of speech sound disorder is haphazardly determined, meaning that people are affected at random. Researchers are constantly studying the underlying causes that could develop into speech sound disorders. Thus far they have only found two factors that cause a speech disorder or speech apraxia, and namely (Mayo Clinic, 2022.):

- Speech motor control abnormalities: Evidence suggests that the motor coordination mechanism within the brain is subjected to abnormalities of motor control, which influences, for example sensory, motor, and timing coordination (Mayo Clinic, 2022.).
- Genetics: Speech disorders and speech - Apraxia tends to result due to inherited abnormalities (Mayo Clinic, 2022.).

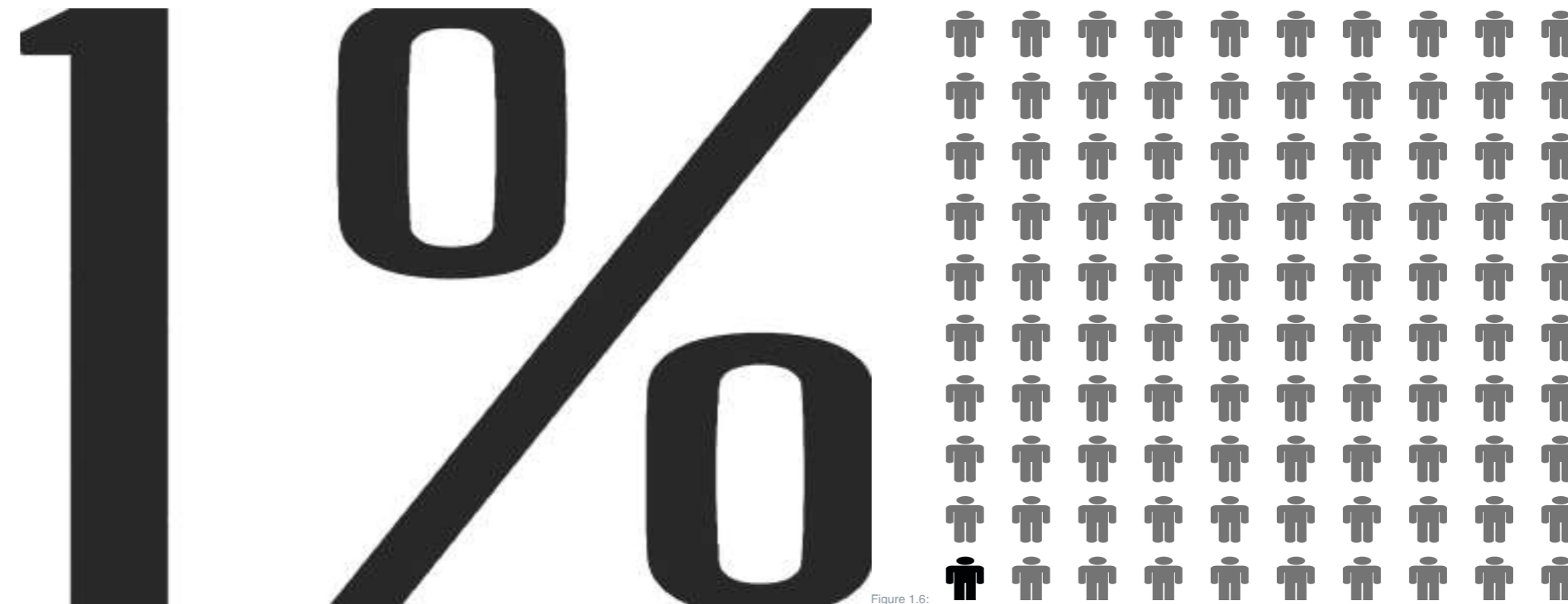


Figure 1.6:

## 1.4 Treatment

From this, it is easy to see how the causation of speech sound disorders is vastly unrestricted. The causes and origins of speech disorders and speech apraxia are open-ended, and the treatment is no different. There is a considerable large number of different treatments for various cases of speech sound disorders. Unfortunately, treatments do not eliminate a speech disorder or speech apraxia, however, they can teach skills to aid in improving speech fluency. There is no right answer when it comes to the treatment of speech sound disorder. Only methods on how to develop or improve communication efficiency that fits the clients best followed by ways to improve participation in activities (Gabbard, 2014). With regard to medication, there are none. No medication has been successful. Regrettably, with many possible treatments, no one is more effective than the next. The most common of these treatments are: (Gabbard, 2014);

- **Speech therapy:** Making use of different techniques and procedures to overcome the issue such as fluency, confidence, and production over time. It is usually in the form of a weekly appointment.
- **Devices:** Several electronic and objective devices are available to enhance stimulability, as these devices would delay auditory feedback or make use of speech mimicry methods. Mimicry methods, mimic the user's speech, alter the sound, and relay the sound back to the user. These alterations could be anything from changing the speed, pitch, or even the tone of the speech.
- **Cognitive-behavioural therapy:** Referring to occupational therapy, which helps to change and identify methods of one's perception of body and space.

Until recently, the best approach to treatment has been to combine these three in different methods. Because each patient is influenced by various treatment methods, each individual's treatment is different from the next. A professional, therefore, needs to introduce many methods so that the patient can determine and optimize their treatment.



Figure 1.7:

8 *Figure 1.7: Photos dramatizing the struggles of speech impairments, (Tran, A, modified by author).  
Figure 1.8: Illustration of the multiple answers that all come together to formulate a whole, (Author, 2021).*

## 1.5 Conclusion

A combination of several fields of study and interests, many branches of research, and the integration of the different disciplines, all to illustrate a single theme, and define a multidisciplinary approach are used. The multi-disciplinary nature of speech disorders and speech apraxia stems from the open-ended cessation, origins, and methods of treatment are discussed and taken into account during the design process. There is no clear answer and therefore the treatment remains multi-disciplinary. This means that there is an infinite number of interpretations, and the design approach should not stray from this. There are many answers and many solutions and therefore the design approach follows along a multi-disciplinary axis. The multi-disciplinary design approach needs to address the methods of treatments and design application. The three above-mentioned treatments each connect to a specific fragment, namely speech therapy, sonic application, and finally, occupational therapy. Drama classes and theatre training may also offer therapeutic support.

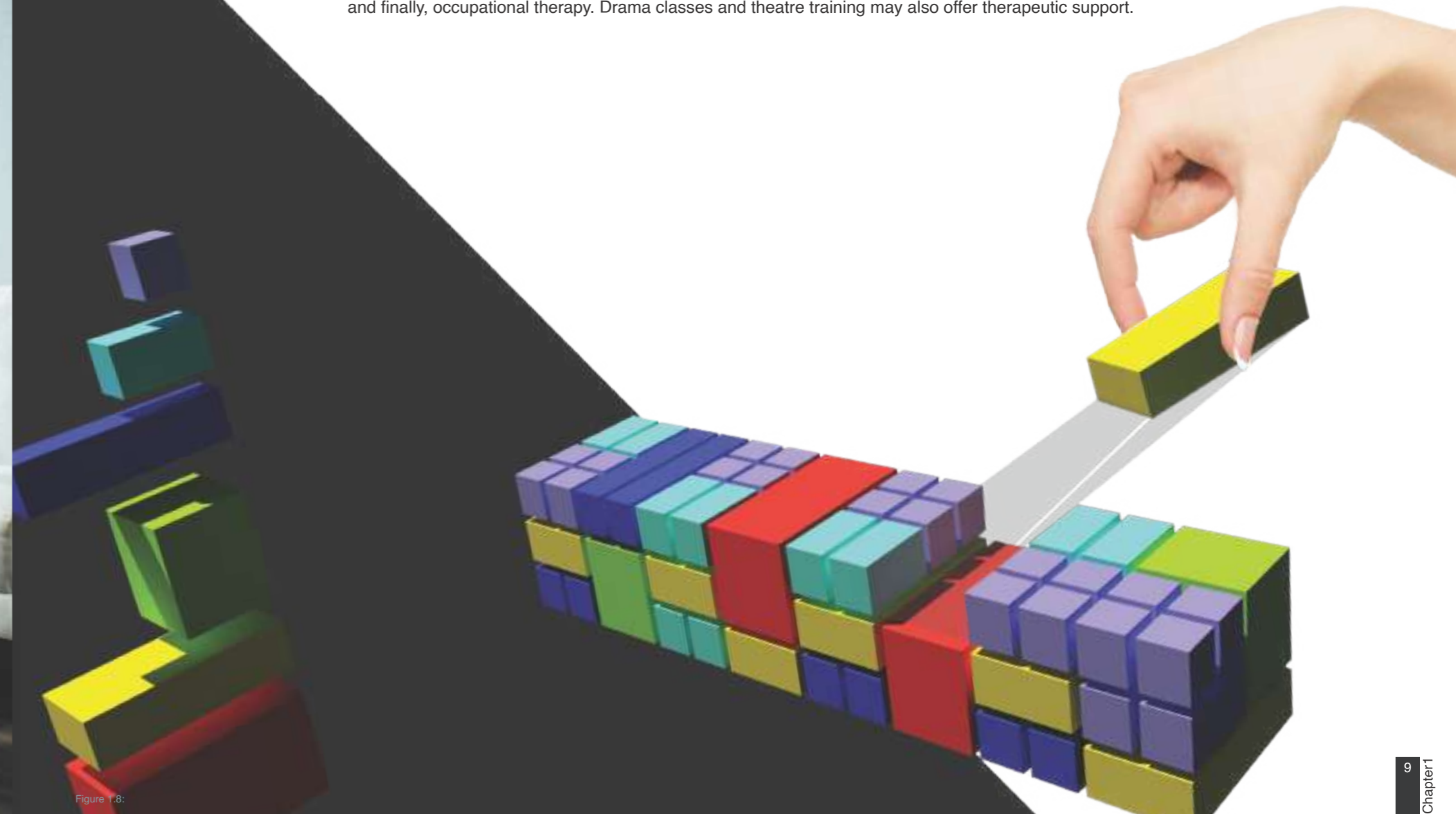


Figure 1.8:

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02

Results of sensory integration

Therapy towards architectural methodology

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## 2.1 Introduction

With so many loose ends, how would this lead to an architectural result that is intrinsic to the treatment of speech sound disorders? Not limiting the research too early provides many benefits and enriches the various avenues that would come from a multidisciplinary approach. This chapter explores the various branches of the research and then ties them back into the theory applicable to an architectural approach.

## 2.2 Various avenues and the essence of the project

Reflecting on the previous chapter, the answers (referring to the many opportunities for treatment) for speech disorders are widespread. There are many solutions, idiopathic origins, and most importantly, if there are so many open-ended interpretations, there must be untested and more successful treatments. Currently, treatments have been forged after years of practice; all aiming to accomplish the same results. The aim is to relieve the tension of social life, providing and empowering voices of broken sounds. This includes actions that strengthen weak vocal muscles, tongue, lips velum, jaw, throat, and vocal chords.

The desired results that each therapist strives for in their treatments are identical to that of the proposed project: striving towards stimulative speech. The essence is to relate individuals suffering from an emotional extreme dilemma to an architectural structure that aids in overcoming a speech impairment, through utilizing architectural sound theory (Wan et al., 2010). The aim is to treat a paradoxical research direction, asking: how sound disorders can be ratified by sound?

This is a study of how architecturally designed sound, and how sound can be used as a building material similar to wood, masonry, and brick? Can this be an approach to a possible healing space, including whether other senses can play a role in the development of speech sound disorders? These questions are the guides to answering the fundamental research question.

*“How can an architectural experience provide a safe space to aid in the development of speech therapy through means of sensory explorations?”*

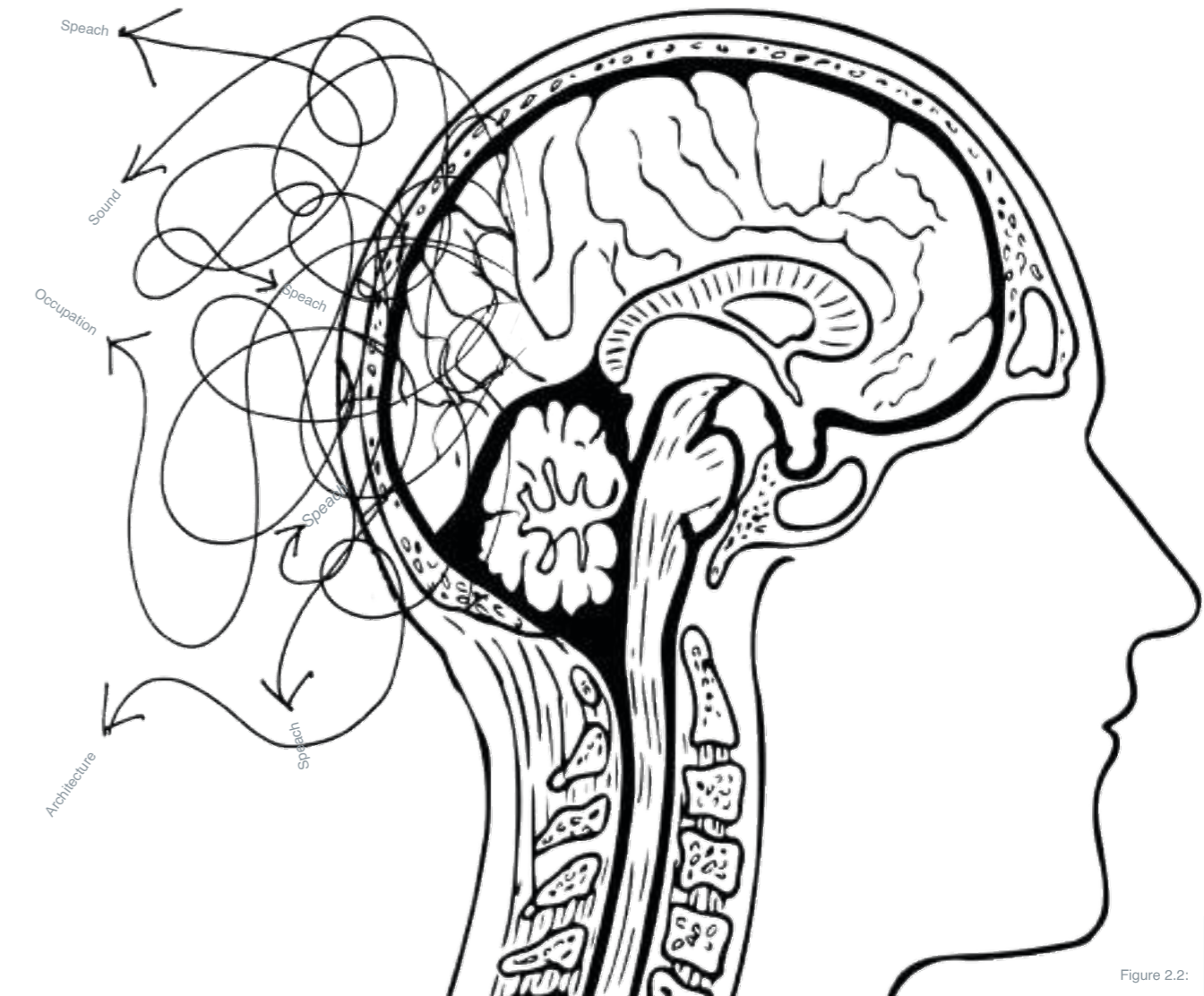


Figure 2.1: A ideological interpretation of melody, (Dziedzic, M, modified by author, 2019).

Figure 2.2: Sketch of a human brain that illustrates the various methods of communicate directly to the brain and that's why there are so many different treatments, (Altmann, G, modified by author, 2020).

## 2.3 Tenuous melody

To embrace a meticulous architectural solution, various hurdles need to be overcome. The main research question is fragmented to establish a methodical direction, which fixates on experience as a catalyst for sensory explorations that are enabled through the built form. Remodelling audio defects are the intended consequence of this catalyst. It's axiomatic to say that the built form would be an impetus of relief for a misfortunate causality. A victim of their very own inherent voice. Subsequently, there is value to the antecedents to this architectural solution that exists in a precursor to such a built form.

Now it's time to explore where these values would lie, peeling back the anticipated result to reveal the very nature of the project. Although the built form stimulates emotional comfort, physical tension such as structural stress is the easiest way to translate and express this within a prototype while looking for direction in designing such a sculptural prototype. Where questions lie for design directions answers are hidden in current interpretations by well-known designers.

According to the research of an architectural master's student from Turkey, Filiz Sönmez, (2006) in her thesis on organic architecture, she states that: "Architecture refers to the relationship between parts forming a unity as a whole. Every part should display its own identity, as well as the amalgam should have a response to the whole" (Sönmez, 2006:). Sönmez briefly directs her framework around the Turkish interpretation of American architect Frank Lloyd Wright (Berkin, Fitoz & Aytar, 2008). Sönmez lists various Turkish designers influenced by Wright who endorsed their own agnate of these design principles. Unity, simplicity and harmony are their own guidelines derived from their own contemporary perception.

Consequently, these principles contribute to a logical translator for the mentioned catalyst. Attempting to embody this essence of "experience" requires experimentation with multiple physical solutions. A chain reaction results in a sculpture that stands in the purity of "experience".

Figure 2.3: Artistic representation of speech tension in architecture, (Author, 2021).

Figure 2.4: Geometric representation of the speech production mechanisms, an oversimplification of the neck and throat, (Author, 2021).

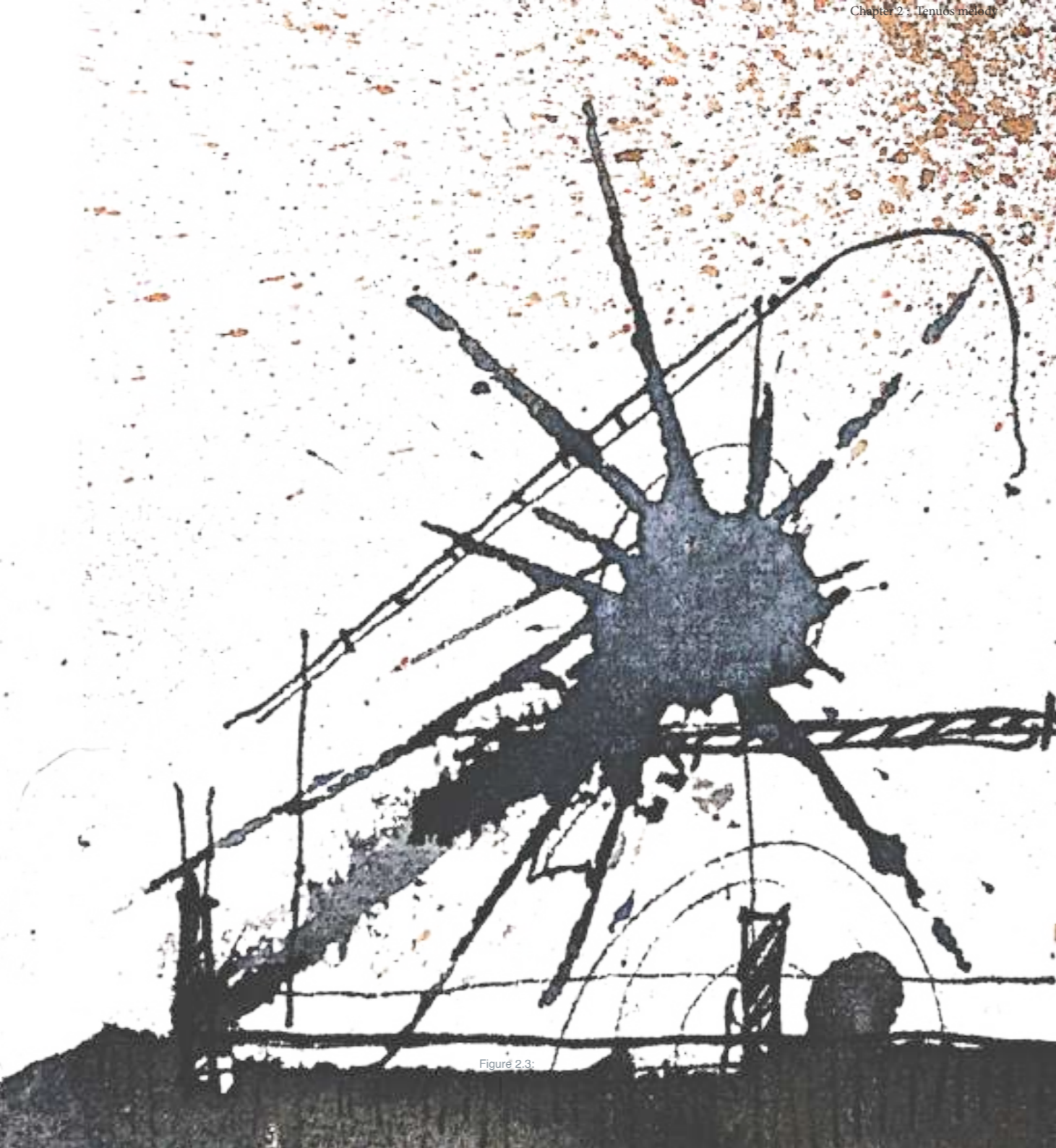


Figure 2.3:

## 2.4 Sculptural progression

Architecture should resonate with the sound of tension, echoing those that suffer from speech sound disorders, mimicking the desire for a functional vocal box. Tenuous Melody, shown in figure 2.4, directly renders this tension in question. Inspired by conceptualizing the production of sound originating from vibrating vocal cords, the catalyst can be translated into a physical form.

### 2.4.1 Simplicity:

Designers inferentially accepted simplicity as readability of form and function. Horizontal and vertical cohesion within the geometric system, a reduction of structure for streamlined form, occupies the functional extracted 'purity of experience. This was a premature attempt to amalgamate the articulatory phonetics with the reappraisal of Frank Lloyd Wright's design principles.

### 2.4.2 Unity:

It's crucial to note that Wright is one of many to use the term 'organic architecture. An organic style in design has manifested itself in a variety of ways. According to Sönmez (2006), Turkish designers understand this guideline as the marriage between parts. In the synthesis of the whole, each part still functions well on its own. Regarding the acoustics of speech, there are three important mechanics at work with every sound made. A source of energy, phonation followed by articulation (Sönmez, 2006:).

### 2.4.3 Harmony:

Harmony can be characterized as the integrity and integration of factors. Considering the various aspects of each part, while paying attention to its amalgamation, construction and form are locked in place and easily traced back to the function. Omitting sound is the desired function and each factor is dematerialised into its most basic form for construction.

Figure 2.5: Dematerializing the three mechanics within the geometric interpretation. Energy can be obtained by strings in tension similar to a bow. Phonation is achieved by an object triggering the vibration of the strings. Lastly, a series of cones can articulate these vibrations producing sound, (Author, 2021).

Figure 2.6: Energy can only be generated through physical integration. These interactions need to trigger a device held in limbo (potential), where kinetic energy is vocalizing. Lastly, the sound must be amplified by speakers producing perceivable audio, (Author, 2021).

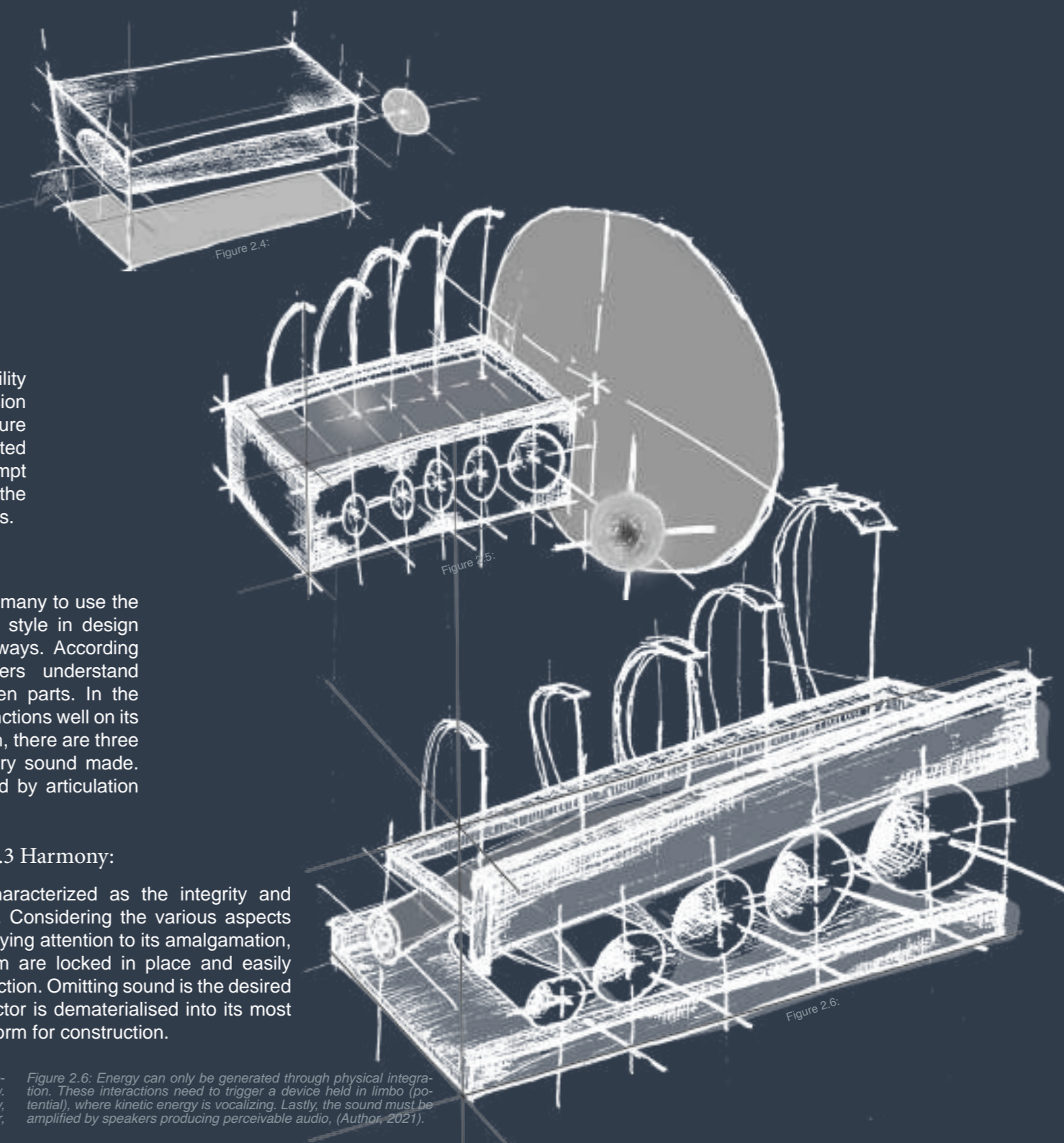


Figure 2.4:

Figure 2.5:

Figure 2.6:

# 2.5 Touchstone

A touchstone is a device that will measure the authenticity of every architectural solution, similar to a benchmark test. Touchstones are a criterion of quality or example used to assess excellence and genuineness (definition, dictionary.com: 2022). Furthermore, this will be used to quantify every design approach.

Simplicity, unity and harmony. These principles paved the way, directing the mechanical tectonics that represents the emotional macrocosm of a halting speaker. An efficacious example to test the substance of any architectural solution. Derived from an unorthodox hypothesis. The ideology of self-improvement results from an architectural experience: Self-development that starts with speech sound disorders. Self-development challenged by social tension, a consistent hurdle en-route to self-reformation.

Speech impairments are deviations of sound. Under observation, it contains innumerable segments within every conversation. The mechanic of speech resembles an abridged version of these sectors. Instead of source, energy and phonation, a typical dialogue involves origin, interaction, and reaction.

The source of sound originates from the conversational opener. Interactions are interrelated energizing the reaction and motivating the phonation of the dialogue. Distorted sounds can abruptly suspend conversations and these sectors become triggers. An instantaneous pressure immobilizes the distorted speaker. Brute force soon follows as the speaker's instinct impulse is to alleviate the abeyance which is a disastrous endeavour that only produces an inaudible vocalization.

In truth, attempts coupled with force only ignite more distortions. Therefore, the aim of this dissertation is to extinguish uncomfortable moments. This essentially becomes a catalyst for the final resolution in providing an individual with methods and techniques to remove these tensions and at last be able to bring forth their integral sound.

The tenuity (slender and thin) of structure translates the fragility of the intended user of the proposed architectural speech sound disorder facility. Individuals rely on the architectural experience. A type of remedial wandering through built form. Their strain is the source of audible impedance. Their participation generates energy through interactions within an architectural setting. Similar to triggers within a conversation that cause pressure, a participant's interactions will trigger devices. Therefore, glass marbles are used to portray users. The marbles would run on dowl rails, interacting with devices while passing through the sculpture and triggering a series of traps. These traps are activated by a lever repressing a gear connected to a drawn bow only activated when a marble knocks the level out of place. This releases the gears to rotate freely and spin due to the pullback of each bow. Transferring mechanical potential energy into rotational kinetic energy, phonation is accomplished through tin cones that amplify sound, articulating the sounds produced by gear teeth impacting these cones.

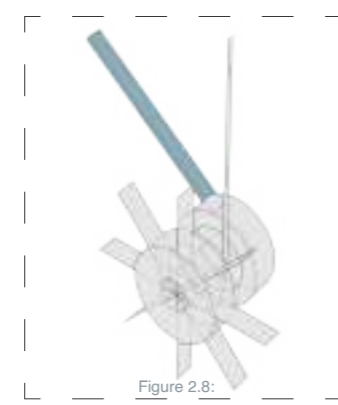


Figure 2.8:

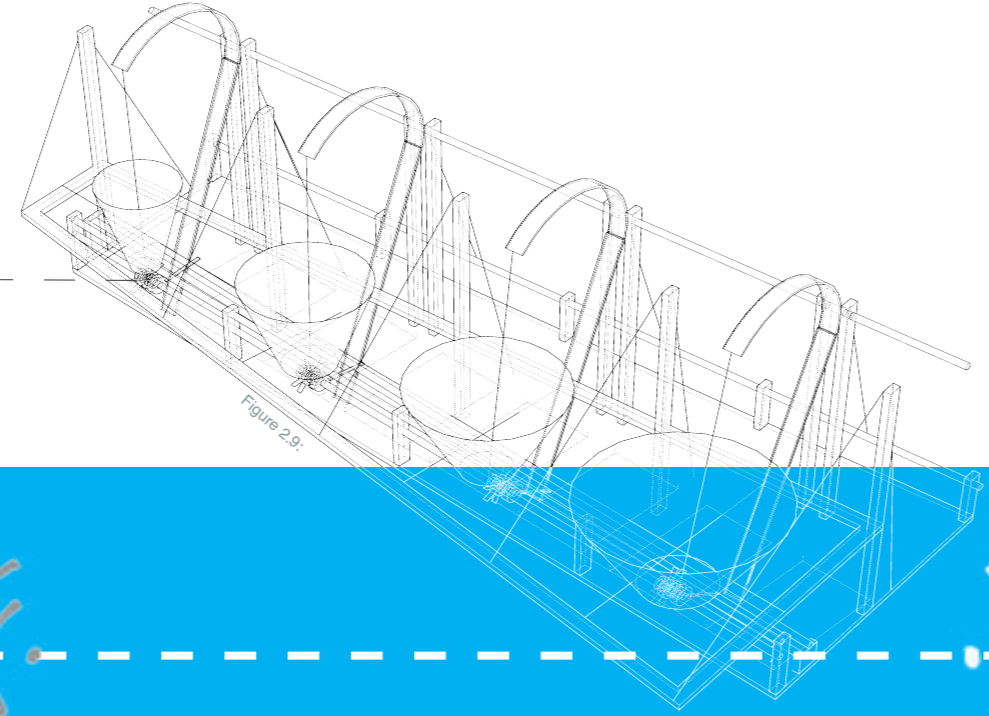
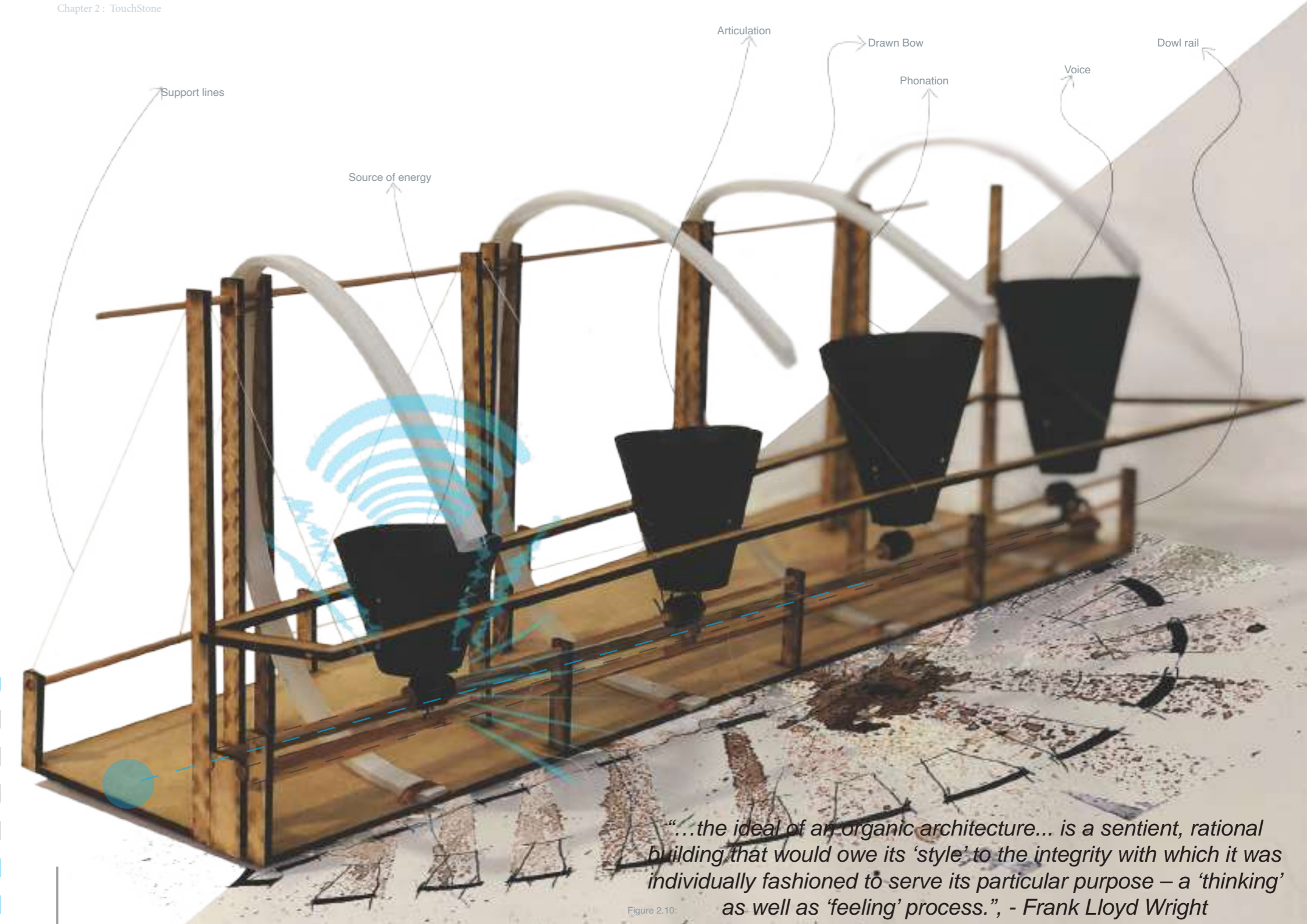


Figure 2.9:



*"...the ideal of an organic architecture... is a sentient, rational building that would owe its 'style' to the integrity with which it was individually fashioned to serve its particular purpose – a 'thinking' as well as 'feeling' process.", - Frank Lloyd Wright*

Figure 2.10:

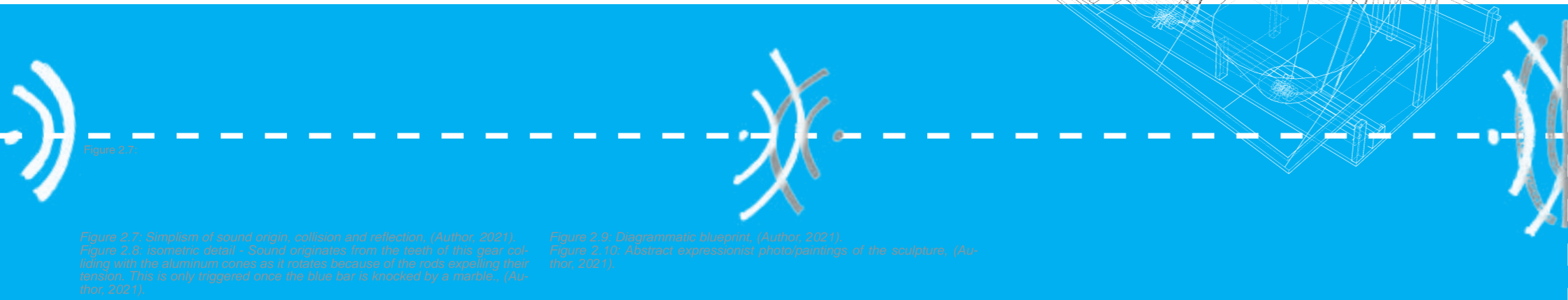


Figure 2.7:

Figure 2.7: Simplism of sound origin, collision and reflection. (Author, 2021).  
Figure 2.8: Isometric detail - Sound originates from the teeth of this gear colliding with the aluminum cones as it rotates because of the rods expelling their tension. This is only triggered once the blue bar is knocked by a marble. (Author, 2021).

Figure 2.9: Diagrammatic blueprint. (Author, 2021).  
Figure 2.10: Abstract expressionist photopainting of the sculpture. (Author, 2021).

## 2.6 Rhythms of phonation

Disparities in treatment are the impetus for heated debates on speech therapy. Social anxiety is undoubtedly a culprit. Unfortunately, speech sound disorders are complex theoretical masses of heterogeneous interpretations layered together. Experienced pathologists venture beyond the social participation of speech, exploring various methods, techniques and devices that invoke stimulability.

Various elementary treatments exist, some of these therapies that expand phonation, include auditory devices and music therapy. These devices will be discussed further on in this chapter. Music therapy has produced significant results (Lightfoot, 2015:). Speech impairments feed an incongruous cacophony of sounds not much different from music, in comparison to the definition according to Dictionary.com (2022), which defines music as:

Subsequently, it is not entirely taboo to view an individual's voice as an instrument of music. Nevertheless, a purely vocal a cappella performance, is astonishing. It is clear that the definition of music does emphasise timing and sound, materialized through only five elements. The two most fundamental elements are melody and rhythm (Lumen Learning, 2022). Melody is a euphonic succession of singular tones systematized with in an aesthetic whole (Merriam-webster.com:2022) while rhythm is the recurring alteration in the flow of sound (Merriam-Webster.com: 2022). Rhythm relates to pattern, while melody refers to the relationship between tones.

Coincidentally, pathologists have recognised these two fundamental elements, present within the two most common types of music therapy. Often using, rhythmic speech cueing and therapeutic singing (Lightfoot, 2015:). Rhythm and melody.

I mitigated my own stutter through music therapy. Speech and music both place emphasis on accents and timing This uncovers the relationship between pragmatics and syntax as they both organize patterns of sound based on rules(Lightfoot, 2015:). Complicities in language and music, share both the importance of communication as well as the communication of time. Therefore, it's not hard to believe that rhythm and melody are heavily dependent on the brain's ability to organize time(Lightfoot, 2015:).

*“An art of sound in time that expresses ideas and emotions in significant forms through the elements of rhythm, melody, harmony, Timbre, Dynamics, texture and form.”*



Figure 2.11 : Illustration of a record players, a symbolic gesture of the most common insult, that entails comparing those who stutter to a broken record player, (Schultz, Ingo, 2018).

It is greatly beneficial not only for speech, but also regarding ameliorate motor difficulties and neurological challenges. Continuous voicing connects words, and syllables and provides more control over the flow of syllables. Consequently, therapeutic singing accelerates the development, initiation and articulation in speech , allowing a speaker to easily combine the rudiments of speech while absorbed by the musical outcome.

Alternatively, rhythmic speech cuing assists in speech initiation by anticipated rhythmic sequences (Howland date: page). A technique that regulates the rate of syllables using auditory rhythm. It makes use of either a metronome or rhythm embedded in music. Optimal benefits in intelligibility ensures a meticulous imitation of a speaker's distinctive cadence. This is accompanied by numerous benefits such as: Improved pronunciation, increases intonation (the variation of the pitch in the voice), phonation duration, as well as expanding memory recall resulting in the familiarity of phrases (Wan et al., 2010). The most successful implementation reflects the patterns and timing of each particular orator. Ensuing optimal benefits in intelligibility imitate a speaker's distinctive cadence. Rhythmic patterns and assonance of a speaker are amassed. This generates a familiarity from a unique speech archetype or a speech profile. Later applied to guide individuals to regulate their patterns and pronunciations.

Recently a study on speech rate modification, confirmed the relationship between music and therapy, revealing promising results. Researchers proposed that dysfluency persists due to the pressure on speech rate. The implications of this study is that signing uses different brain functions than normal speaking (The Stuttering Foundation, 2018:). Communication is deeply rooted within neurological programming. A medical investigation on the therapeutic effects on singing in neurological disorders, mentions how auditory-motor mapping training engages with vastly complex neuron systems. These neurological networks, compared to speaking are aggressively active (www.ncbi.nlm.nih.gov: 2022: online), believed to be the product of memory recollection. When singing, people generally know the words and therefore word retrieval is much easier, compared to searching for words mid-sentence while speaking (Wan et al., 2010:).

Figure 2.12 : Simplified sections of rhythms draw and placed over their related proximity within the park. Prieto De La Fuente draws attention to the cigarette trajectories and lines of traffic, (Prieto De La Fuente & Lunds Universitet, 2018).

Memory, melody, and rhythm are equally entrenched within architecture as it is in communication. French philosopher, Henri Lefebvre, was an advocate of secret rhythms and how rhythms belong to memory. Lefebvre conceptualizes memories as, psychological as well as physiological. Their importance lies within the ability to direct one's attention to things that are not immediately visible (Lefebvre, 2004:). Lefebvre further suggests in his book, Rhythm of Architecture, (2004) that ordinary spaces possess unique rhythms. Hidden within these ordinary sequential patterns lies architectural melodies. Cues that regulate the spatial syllabus. Independent portamento flow is locked in the shift between spaces. Not to say that moving from one location to the next is full of schmaltz. However, a deep timbre is heard within the movement. Lefebvre uses a staircase as an example of this. Stairs and stairways are merely perceived as devices allowing access to a higher or lower floor level. Conversely, the impact of these devices is overlooked. Very often, these devices translate into a seating area, or a social gathering area (Lefebvre, 2004:).

Rhythm is an unnoticed melody within an ordinary space. Rhythms are present in everyday locations, unconsciously followed by the public. Embedded deep within these occupied realms rests the memory of space. Stationary objects yet consume value in movement. Stairs challenge the imagination in everyday use. What Lefebvre (2004) calls the fourth category. Referred to as dominating-dominated rhythm. To clarify, in this context rhythm is 'defined as the secret entity that connects human behaviour to the physical built environment with regards to programme as well as function. This, in short, refers to the dichotomy of how some things are being used, relative to how the intended programme is trying to enforce a predisposed use (Prieto de la Fuente, 2018:). In a nutshell, these secret rhythms are in constant conflux between space been modified to serve the need of a group and the needs of the group that modify the spatial order.



### 2.6.1 Subjected versus appropriated

The rhythmic network bequeaths the sequences of everyday locals. This happens within and around buildings, including mundane objects. Actions bring these locals to life, actions produced by reappearing actors. Entities that take on several acting roles. Paulina Prieto de la Fuente of the Lund University's department of architectures published a paper on architectural rhythms in 2013, titled Architecture on sequential aspects of materialities in urban space. Prieto de la Fuente reports that the built environment will not always turn into something merely because the people say it should. Through her time-lapse study on Värnhemstorget street in Sweden she finds more evidence in support of Lefebvre's theories. She unmasked the rhythmic figures within the urban context, discovering certain objects seemingly dependent on key actors. Her work showed in figures 2.13 deciphers these periodic life cycles. Investigating the roles of actors, juxtaposed over alternative role players within architecture. Targeting tangible rhythms within a public square, Prieto de la Fuente engaged with a series of antitheses of rhythmic figures. This included figures such as newspaper stands, informal food vendors, alcohol and cigarette consumption, seating areas and common public transport waiting areas (Prieto de la Fuente, 2018:).

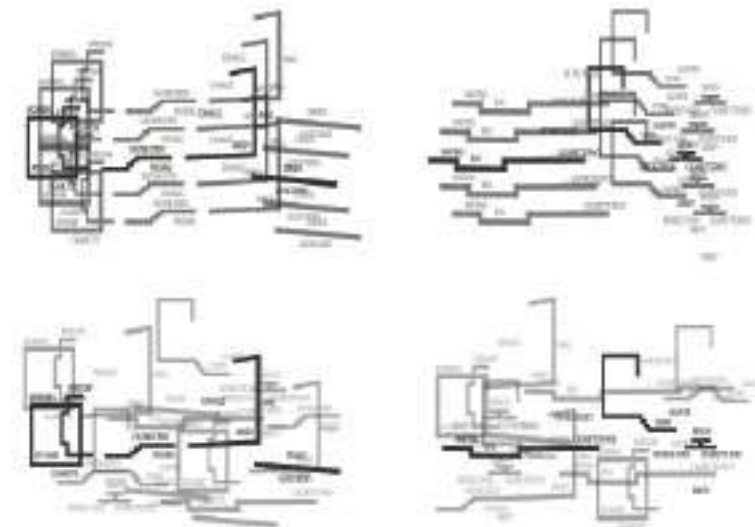


Figure 2.13:

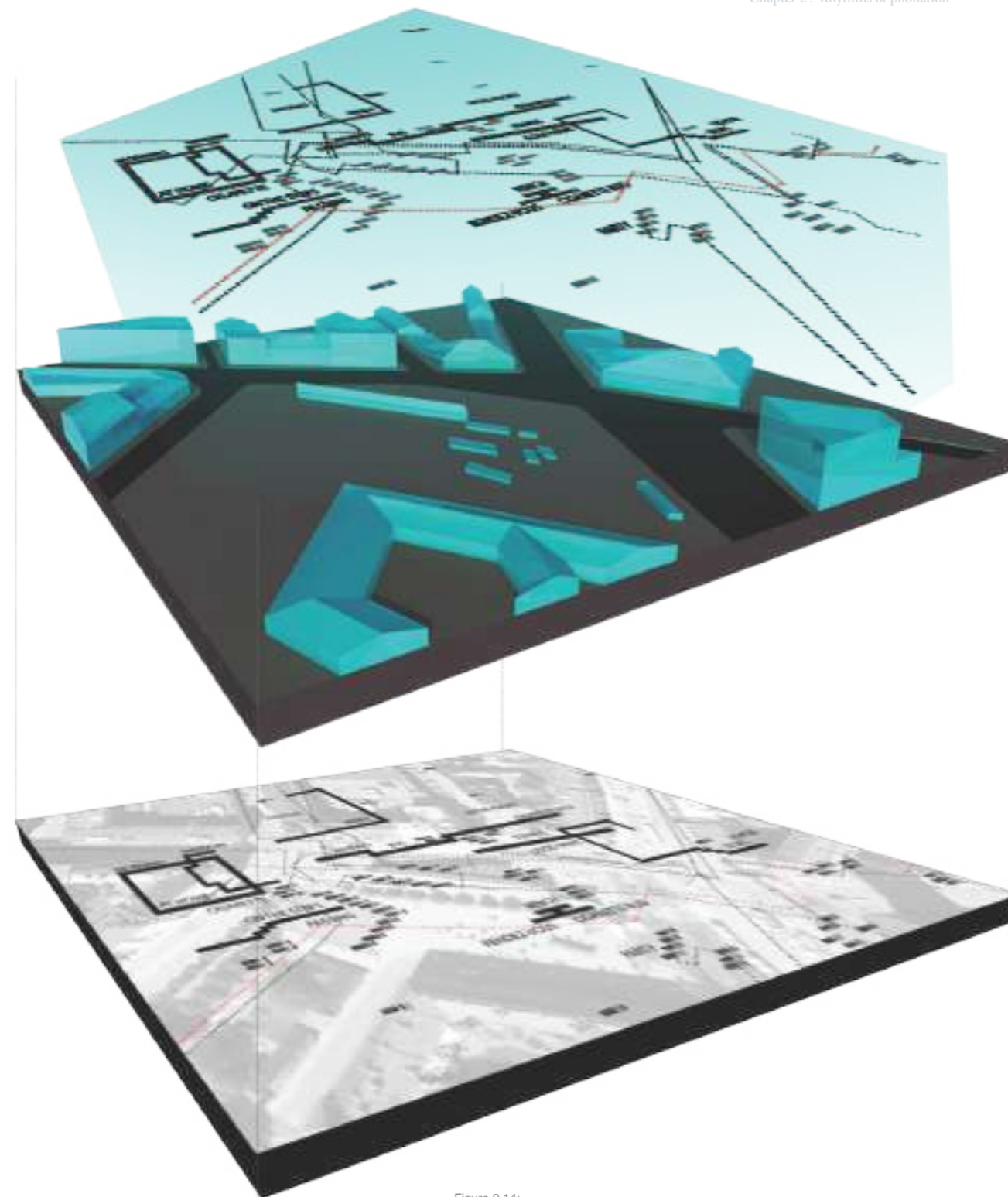


Figure 2.14:

Lefebvre (2004) uses a park bench as an illustration to explain the deference between subjugated and appropriated rhythms, describing the patterns of frequent alcohol consumption throughout the day. Many would occupy a seat while socialising on park benches, often followed by police intervention. Alternatively, violent altercations would break out on occasion. The presence of these groups is predetermined by the recurring rhythm of the city. The bone of contention is not persistent alcohol consumption, nor the tendency to do so in the company of others. This activity is not pre-programmed into a public park; however, it is a result of the contextual programming of the hidden melodies of the urban fabric. Even with counter interventions, this remains a rhythm set in stone, as if this was an involuntary act opposed by the city (Prieto de la Fuente, 2018).

A simple park bench within a specific setting and built environment encourages a subjugated rhythm that is counter-intuitive to the intended appropriated purpose. The built environment is often used as a tool for dominating rhythms to motivate appropriate behaviour such as: "Don't walk here, only sit here, etc." (Prieto de la Fuente, 2018). Often spaces are modified to enforce these behaviours just to be subjugated once again by the spatial orders and rhythms



Figure 2.15: The ritual of a hidden park bench, where sober people rest and turn into drunk animals. Not the absolute ritual of a park bench, but more of a repeating rhythm unintentionally shaped by society, (Hryshyn, H, edited by author, 2021).

## 2.8 Aberration of therapy

Speech therapists translate the isorhythmic and arrhythmia of a patient's speech into a polyrhythmic rhythm, hoping to safeguard patients from constructive and repeating rhythms. Patients govern their speech, by practising certain mellifluous stimulative phrases. This articulation therapy approaches makes use of phrases such as "stick" vs. "tick" (minimal pairs), "sat" vs. "mat" (maximal oppositions) Super Power Speech and Education, 2019:online). It is critical to consider that the use of rhythmic interventions or any form of intercession is fruitless unless it's constantly exercised. Patients need to continuously rehearse their acquired therapy techniques. Interestingly, the current treatments are diversified for each patient, yet, generalized. This means that each remediating vocal pedagogy is designed to be practiced anywhere.

These calculated permutations of treatments are motivated by occupational and speech therapists. Methods of treatments are greatly improved by coherent cooperation between speech and occupational pathologists. These two medical fields complement each other, although they greatly differ in some respects. To understand how opposing treatments are applied to an architectural setting, it is vital to comprehend how these professionals go about treating patients, only then would a phonic gym seem plausible. With this intention in mind, the research deviates into three complex disciplines: speech therapy, occupational therapy, and lastly the perceptible architectural implications of audiotistics. The tectonics of material and form aims to bring forth an acoustic festival of what structure is capable of, regardless of how subtle the effects may be.

Rhythmic techniques or Rhythmic Speech Cueing (RSC) are common within therapy, although many still find it unorthodox (Mainka & Mallien 2014). Not unlike the built environment, where rhythmic applications are undisguisable from general practice. Implemented as a design tool or a form of contextual investigations, also known as a rhythm analysis. This delivers unique opportunities that extend into the urban anthem. Recognizing imperative spatial rhythms subsisted on harmony and melody, connects time and space through elements of repetition. A stutter is an emotional state of being subjugated by social constructs, a moment where time is irrelevant. Every repetition of sound a consequence of emotional turmoil. The broken rhythm of speech is a state of disaster. Architecture can create a space of healing through the adaptation of rhythms.

The above-mentioned disciplines of Speech - and Occupation therapy inhibit the blueprints needed to craft a harmonious melody. That would in turn shape each spoken word felt in rhythm. Therapists abate the utterance of tortured words and within the proposed architecture of this dissertation ought to enable the replication of such therapy. Architectural spaces therefore must relinquish the subjugation of voice.

### 2.6.2 Vocal control

Architecture can appropriate set rules, and the users can unintentionally adhere to subjugated social rules rather than the rules set out in the built environment. This is particularly true for people with speech impairments. People try to dominate over their voices to force words out, but social tension remains the subjugating force. The designers of the built environment try to lead by intentional intervention within society. Nevertheless, the ruling social construct develops unique rhythms. A person with a speech impairment fails by appropriating their voice, in their attempt to regain their intonation. Once the pressure of social interaction erupts, it completely distorts their accentuation. Perhaps the various cadences of rhythms would be a solution, an architectural design catalyst as well as a remedy for speech sound disorders. This could be a plausible remediating approach in combining melodies in conflict. It is important to note that conflicting tunes are still considered a rhythm; classified as arrhythmia. Lefebvre (2004) discusses four alignments of rhythms as it relates to the built environment, but similar rhythms can be noticed in speech. These are:

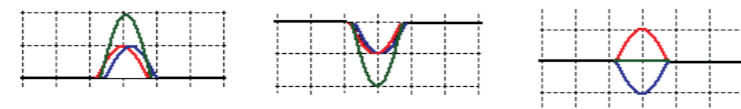
- **Polyrhythmic:** synchronization or coexistence of rhythms.



- **Arrhythmia:** conflicting rhythms.



- **Eurhythmia:** constructive interaction of rhythms,



- **Isorhythmic:** repetition of equivalent rhythms such as frequency.

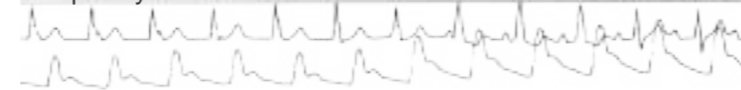
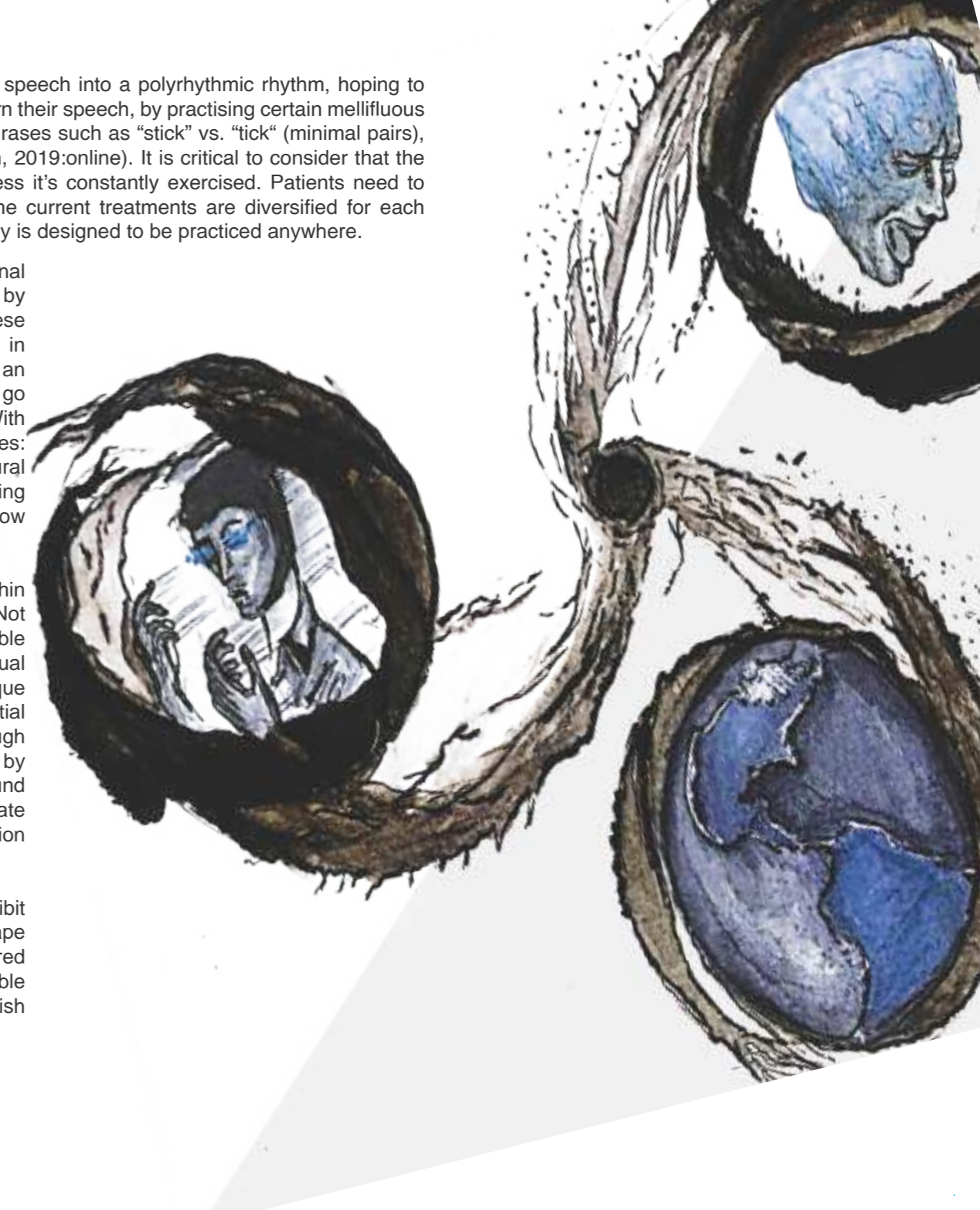


Figure 2.16: The emotional turmoil veld by a speaker dominated by social constructs trying to speak in harmony. Unfortunately, there is only an arrhythmia rhythm to his speech. Never reaching a harmonious point, a polyrhythmic rhythm (Author, 2021).

Figure 2.17: Conceptual interpretation of a patients' rage in speech therapy, awareness in occupational therapy and exploration of the architectural world, (Author, 2021).



## 2.8 Appropriating the subjected

The combination of therapy and architectural form, aspire towards a new archetype. Each deviation of this dichotomy is accompanied by its own intrinsic contribution. This combination then extends a therapy session passively experienced within architecture. Passive healing through space. This nucleus of appropriation is the by-product of each deviation of this unity. These two elements of architectural form and therapy, speech and orbit around speech ramifications.

### 2.8.1 Speech language pathologist

Therapy begins with the aboriginal deviant of therapy, namely speech therapy. Essentially, metaphorizing speech therapy as the theoretical biome. This profession of dialogue corrections daily employs the Van Riper Approach. The following section will encompass these three sequential steps towards comprehensible aphasia, namely, identification, discrimination, and correction. Correction is also sometimes referred to as stimulative behaviour (Dalton, 2018: 94-98).

Identification is the initial step of a typical appointment with a therapist. An individual's speech is relative to their impairment factors, such as problematic sounds and phrases. Notably, physical or occupational aspects are identified separately. These aspects are used to evaluate the patient. A patient's profiles lead to quantified values that are assigned to the following: the vestibular, proprioceptive reflexes and environmental response.

First, the vestibular system controls eye movement and balance, while secondly, proprioception is the body's ability to sense location and movements. This also includes force application. Lastly, the environmental effects, such as sounds (auditory), textures (tactile), and context (sight), among others are considered. Such numeric profiling is the benchmark that aids in identifying key triggers of stress. Triggers of speech sound disorder can relate to attitudes, behaviours, and almost any feelings associated with their impairment ("The Van Riper Approach", n.d.). Obviously Included are the demarcated influences of environmental factors which are explored more in occupational therapy (Teverovsky, Bickel & Feldman, 2009). This explanation is far from absolute and varies dramatically between professionals and patients. The oversimplification of these specialized fields are only to provide a brief and background to the arguments.

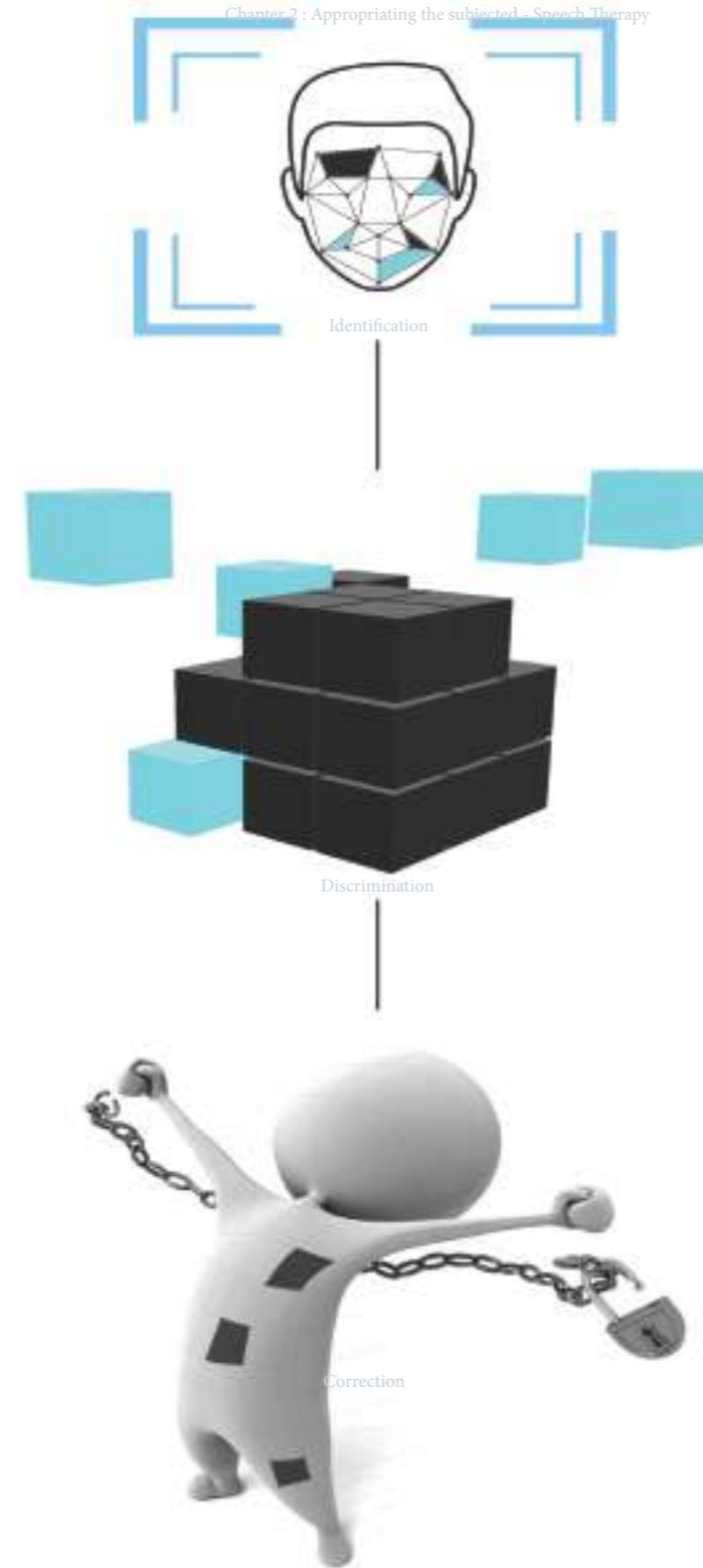
Figure 2.18: Graphic illustration of the Van Riper Approach, (Author,2021).

The second stage is discrimination. Discrimination, as the word implies is to segregate sounds so that audible defects or imperfections are attended to separately. Patients confront their impairments and desensitize themselves to it. This helps to reduce the anxiety, tension, and negative feelings towards their disorder.

Extra:

Speech pathologists provide patients with a list of phrases to try and pronounce. These activities discriminate on sounds and phrases in three steps. It starts with the vertical phase, which involves focusing on specific sounds, phrases, or closely related sounds. Afterwards is the horizontal phase, which broadens out the focus on more problematic phrases and sounds. It attends to other problematic phrases, as well as revealing any other challenges. The last phase is the cyclic approach that functions as a combination of the previous two phases ("Speech Therapy Talk Services, LLC",2022.).

The most fundamental phase, is certainly the last. This where the patients learn modification techniques, of which there are many. For application of this dissertation, only the following three are included. These common techniques are named: Cancellation, Pull-outs, and Preparatory set technique. Cancellation refers to repeating a word directly after the first challenging attempt. Pull-outs simply means to pause. A patient will pause during a challenging word and then try again. Lastly mentioned is the preparatory set technique. During a conversation a speaker would mostly be able to anticipate a difficult word. This method teaches the patient to attempt each sound of that word before slowly attempting to say it ("The Van Riper Approach", n.d.).



Subsequently, The Van Ripper Approach on its own is rather mundane and not that effective in maintaining the production of speech. Its effectiveness lies within continuity. To maintain a stimulative voice, speakers need to constantly follow and apply these techniques. Thus, this new fourth phase can be labelled the Away-From-Therapist phase. Successful speakers are constantly using taught strategies. By using these above techniques, the patient is encouraged to monitor their impairment confidently and independently. Adapting and practising modification techniques are recommended to be practised every day ("Top Exercises to Reduce Stammering in Children", n.d.).

Therapists refer to the term 'generalization' to produce exercises that can function anywhere and within any home. This allows pathologists more time to treat others and helps clients practise on their own time (Esterhuysen, 2021). As mentioned, if a patient only receives treatment in the presence of a pathologist, their treatment would be handicapped, and progress would be extremely slow.

Generalization is to maintain the practice of strategies and skills. For many this is difficult, and pathologists all agree that there is no specific space for people to practise their speech therapy (Janse van Rensburg, 2021). This separate space, that differs from the home or other settings, could be seen as a heterotopian space. These are spaces that contrast with a utopia's spaces while still different from a dystopia. Foucault coins these spaces as heterotopias, they are real and existing locals that reflect a kind of effectively enacted utopia because these places are unlike any similar site that they reflect (Foucault 1984). Seeing a therapist every week is not only expensive but limiting (Esterhuysen, 2021).

A private space of vocal sanctuary is supported by many local specialists in both the fields of speech and occupational therapy. Numerous research articles, support the idea of a private space to encourage the application of generalized exercises (Tosh, Arnott & Scarinci 2017; Mostafa 2014; Giddens, Coleman & Corey 2010). This is where the dissertation anchors itself, and this proposed park would be a new heterotopian space, separate from typical therapeutic spaces, or from the home (van Jaarsveld et al., 2021). This means having a space where an individual can practice their therapy in their own time, at their own pace, thus in layman's terms 'phonic gym'. An area where the theoretical biome of speech therapy generates a physical and applicable therapeutic environment. A generalized speech therapy facility that addresses the issue of a safe space for individuals to practice. Where the therapists can make use of architecture to guide patients and where patients become rhythm analysts (rhythmic analysts), in reference to Henri Lefebvre.

Such a phonic sanctuary would need to reach out to each sense. Architectural triggers that relate to external sounds and echoes, tactile environments, proprioception, and vestibular factors. Undeniably, this is an unorthodox method to guide speakers in their pursuit of vocal control. Architecture on its own is required to trigger senses, however, a phonic gym uses therapeutic research to manipulate neurological functions. Inspired by the modern-day understanding of speech control and present methods of treatment, this can be done through activities and expected human behaviours. As Paulina Prieto de la Fuente, author of "Rhythm Architecture" explains, the relationship between people and objects is simplified for the purpose to elude the sense of control (Prieto de la Fuente, 2018:). Human behaviour cannot be controlled rather their memory of special order can be rearranged. Lefebvre's rhymes belong to memory: the physiological and psychological rhythms, represented in memory as the "said" and "non-said" or memorable spatial representations of "walk here" and "don't walk" there.

As mentioned, this is a harsh oversimplification of what speech therapists do. Therefore, with the first professional field understood the physical applications will next be discussed. The next section explains actual therapy applications and an architectural precedent.

“More sensitive to times than to spaces, to moods than to images, to the atmosphere that to particular events, he is strictly speaking neither psychologist, nor sociologist, nor anthropologist, nor economist: however, he borders on each of these fields in turn and can draw on the instruments that the specialists use” - (Lefebvre, 2004)”

### 2.8.1.1 The perceptible architectural implications of acoustics

The proposed acoustic sanctuary would manipulate sounds and echoes, including other senses to stimulate the necessary neurological pathways. To comprehend such a statement, it's important to study the utilities used by therapists. All pathologists have a set of tools that help them in practice, such as sound and echo devices. Echo strategies are relatively simple to grasp, but, even though it is simple to grasp, sound tactics are relatively vague. One method that does stand out from the rest is the music rhythmic technique and how it has been applied into a previous explored architectural application.

Within speech therapy, pathologists make use of sonic applications to improve a patient's stimulability. This targets problematic sounds and phrases, through devices that provide auditory feedback or a vocal mirror that mimics speech. Auditory feedback devices are anything that provides the patient with an almost immediate echo. This is successfully executed through either expensive technology, free software, or even something as simple as a PVC pipe as shown in figure 2.19 (Esterhuysen, 2021). Vocal mirrors are any devices that changes the tone or pitch of a voice and replays it back in almost perfect synchrony. These methods are used to transform an arrhythmic (conflicting) rhythm into a polyrhythmic (synchronized) rhythm (Lefebvre, 2004).

Music therapy is a powerful tool to achieve stimulability, according to Dr Barry Guiter of the University of Vermont: "understanding what dramatically reduces stuttering during singing may eventually help us understand stuttering better (in Heilman 2008)". He further explains how the body mechanics that formulate words, all work in synchrony to sing. He theorizes that the reasons are the lack of communication pressure and regulated breathing. Also noting that words are not created anew, but rather retrieved. In practice this could improve overall word recollection and production.

When noting down music on a page, a composer will indicate pitch, chords, and note duration, although they will not necessarily provide clues to the player on how to sound these notes. Notes could be played in a continuous isothymian (continuous repetition) rhythm or be broken up into shorter arrhythmic (chopped up or conflicting) rhythms (Master Class 2022: online). In music, these two styles of playing are referred to as legato and staccato. Much like language, if a spoken phrase is broken or detached, it is described to be a staccato style in music. Whereas a continuous, consistent, and smooth phrase in music is called legato. The combination of these opposing factors, if applied correctly, can achieve beautiful symphonies. Both factors are fixed in their specific rhythmic cohesion. The fixed cohesion of legato and the de-cohesion of staccato, when applied coherently, can conceive satisfying ballads.

Extra:

Staccato is Italian for disconnected or detached sounds; in music, this refers to a playing technique where each note sounds brisk. Staccato is indicated in music with dots over notes and the sounds are described as detached, short notes with accents, discordant or dissonant (Master Class 2022: online). Where staccato signifies shortened duration or detached notes, opposite to legato, Italian for bounded together Music: Practice & Theory Stack Exchange", 2022.). Legato indicates notes played in smooth, coherent, and connected musical notes. Within the performance and notation of music, legato produces continuous and fluid motion between notes (Master Class 2022:online) A musician makes a gradual transition between notes without intervening silence. The techniques of staccato and legato are complementary contrasting factors.

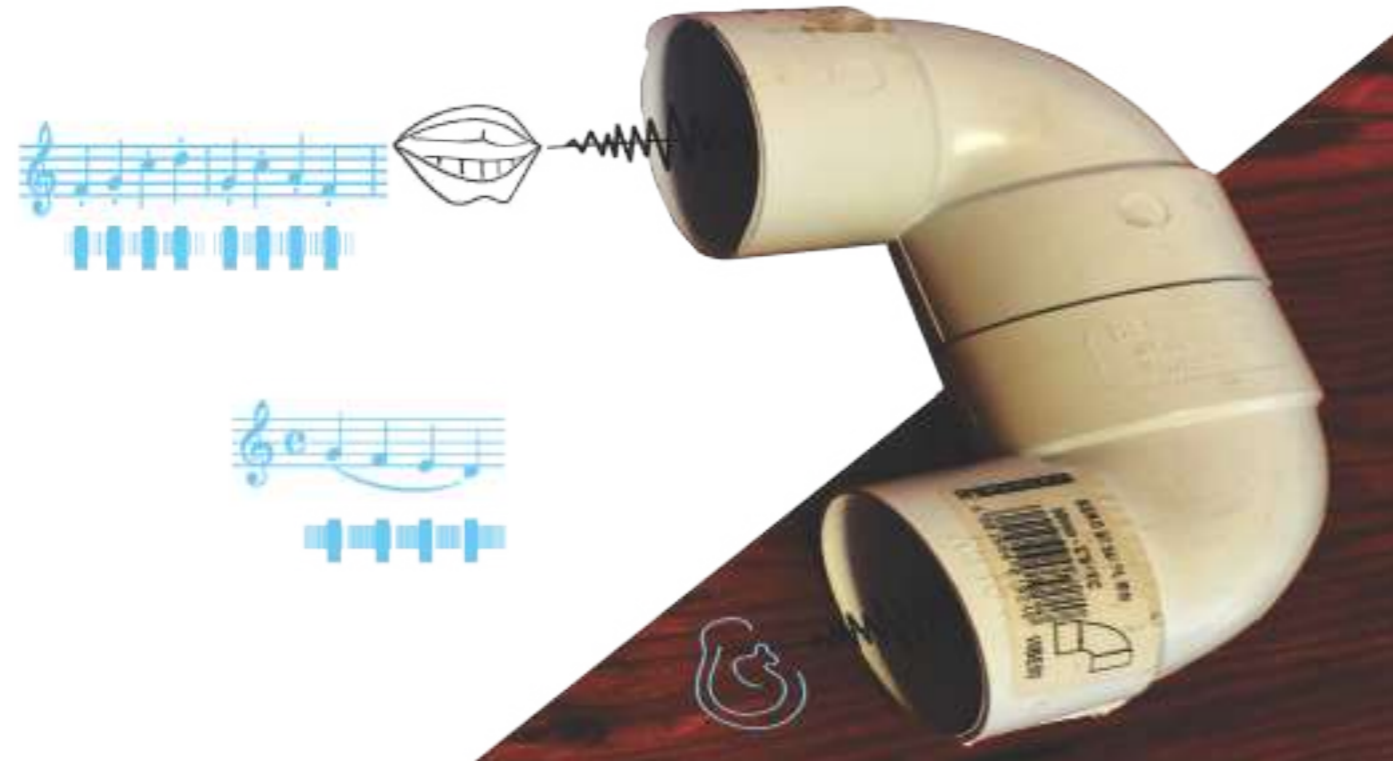
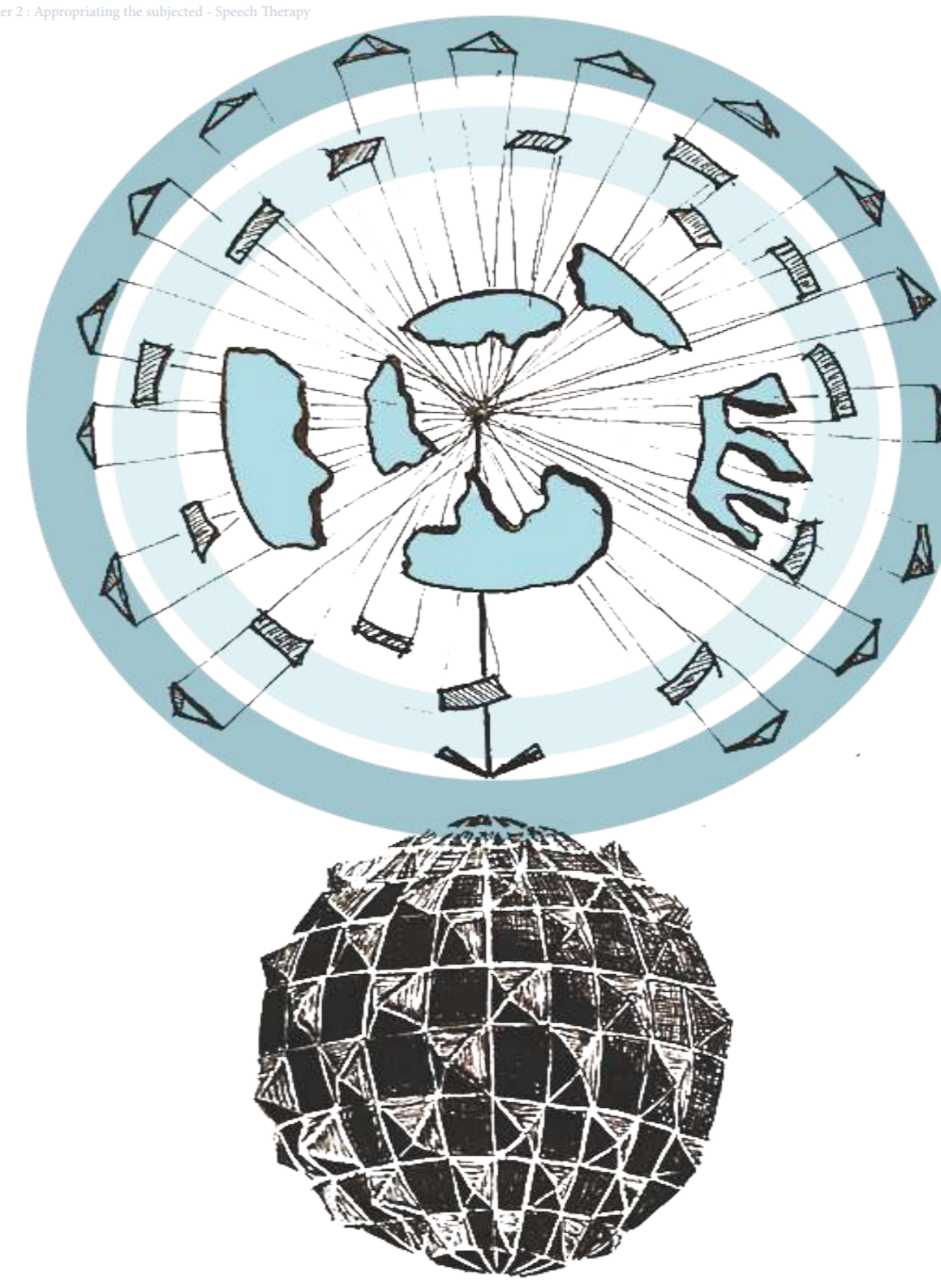


Figure 2.19: An example of an auditory relay device that is actually used in speech therapy, (Author, 2021).  
Figure 2.20: Visual explanation of Legato and Staccato, (Author, 2021).



### 2.8.1.2 Responsive cohesion

In "A Theory of General Ethics: Human relationships, nature, and the built environment (2006) Australian philosopher, Warwick Fox, describes a thing (building) or process (design) that displays mutual beneficial cooperation between multiple complex layers as being responsively coherent. Fox explains that to design a complete responsive cohesion, the context must coincide with the internal response, along with the internal space, coexisting within the context (symbiotically). Overviewing various aspects of Fox's theory, the most notable and applicable concepts are cohesion versus de-cohesion. This distinguishes the relationship between anarchic and cooperative systems that align in the built environment (Fox, 2006: page).

Extra:

Much like staccato and legato apply to music, the responsive cohesion between legato and staccato within music can cohere with architecture via the theory of general ethics. Cross-examining the elements or according to Fox (2006:) the "salient features" that constitute the "something" or "process". These features constitute the ambiguous in-between, they are cooperative just as much as they are anarchic. By introducing these elements within an architectural "thing" (internal cohesion), the contexts become more relevant to the boundaries that define it (external cohesion). Cohesion is not a theory of context, but rather a means to establish a connection between the cohesive items (sub-context) or "salient features" within the encapsulating context (Fox, 2006:). This entails the internal versus the contextual, the sub-contexts versus the encapsulated context, and the liminal spaces between becoming the focal sphere. Situationally speaking, these spheres refer to the pumpstation and reservoir versus the encapsulated site boundaries and the competing high-rise buildings and the Naval Hill context. The cohesive impetus lies within the overlapping areas of these spheres.

This is all compelling; however, it is not convincing if not explained through a practical precedent. An example of such cohesion of salient features is best understood through the following architectural precedents. Although this example is only theoretical, the designer's process is very real. Figure 2.23 shows the cohesion conceptualized through the symbiotic intervention of music and the built environment, where various keys of music are interpreted in architectural form, and further distilled in musical rhythm. This was done by musician and professional architect, Michelle M. Morimoto, using music as a catalyst for architectural design. Responsively cohering to the framework and the implementation of musical principles into the conceptual design process, she explores three contrasting fields of research: research on historical music, building representation, and proposition of compositional tools (Morimoto, 2019). Morimoto successfully interprets her contrasting research fields. Notice how the rhythms of musical elements reflects with in the architectural morphology. Columns, ceilings, and walls all sing together. Her method ensures that various salient features cohere into one architectural execution.

Morimoto's musical approach is innovative, referring to Figure 2.22 and 2.23. She merges physical form within architecture with audible form. She creates coherence between the external elements of architectural morphology and musical principles. The structural elevation coheres to a musical pitch (Figure 2.21) and rhythm responses to a three-dimensional effect (Figure 2.25). The rhythmic implications are directly taken from musical note durations by merging each half note, full note, and quarter note into one three-dimensional space. Note the silent features demarcated in red and blue, where these notes are translated into walls and ceilings. These are evident of how music can directly influence the architectural interior or internal cohesion shown in Figure 2.24.



Figure 2.22:



Figure 2.23:

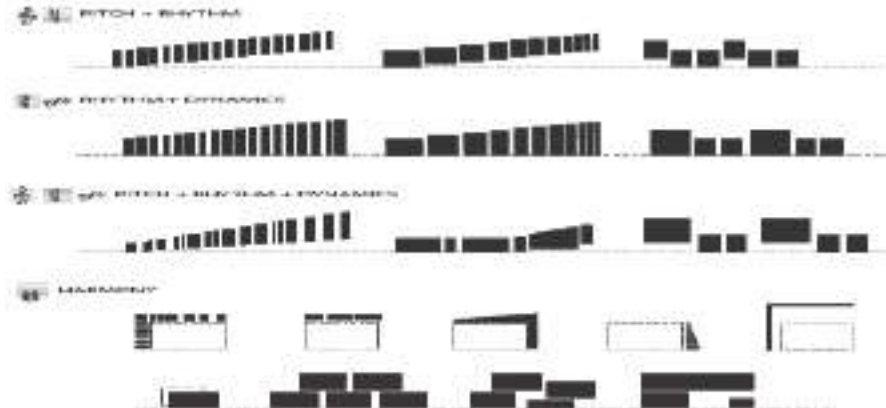


Figure 2.21:

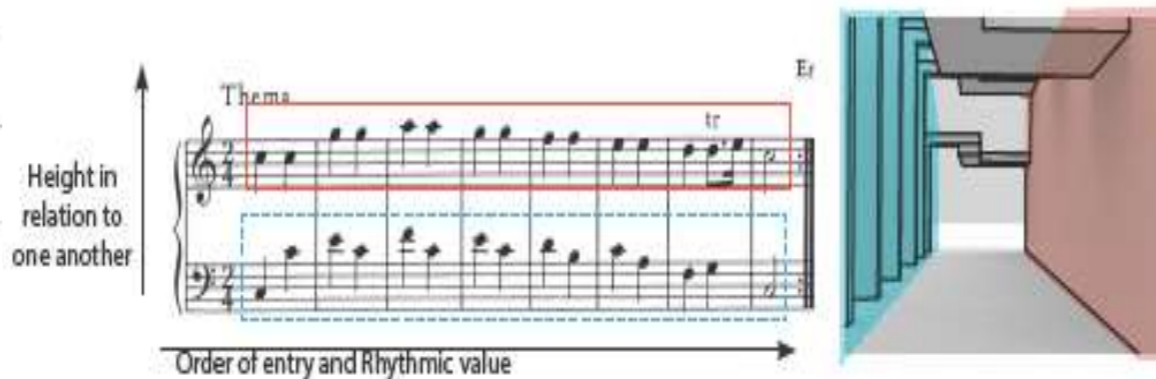


Figure 2.24:

Figure 2.21, 2.22, 2.23, 2.24: The compositions of variables are reflected in space as musical interpretations, (Morimoto, 2017).

Figure 2.25, 2.26, 2.27, 2.28: Executing various arrangements of voices and notes in Thematic Module of architecture, (Morimoto, 2017).



Figure 2.25:



Figure 2.26:



Figure 2.27:



Figure 2.28:

## 2.8.2 Occupational therapy

Building up on what was discussed in chapter 1, with regards to speech sound disorders affecting motor response, control, and reflexes, this section focuses on occupational Therapy as a supporting therapeutic discipline. Occupational therapists directly apply treatments associated with motor control disorders into treating speech sound disorders (Teverovsky, et al. 2009). Therefore, this section focuses on a popular occupational therapy process and treatment. A simplistic overview of their daily procedures and how they would profile a patient is provided, followed by a plausible architectural precedent.

One notable disorder to understand in relation to this proposed design, is Speech Apraxia. It is relevant to both speech and occupational therapy. This speech impairment causes major motor control deficiencies. Interestingly, treatments for this speech impairment are shared with other speech-specific impairments. The American speech-language-hearing association, (ASHA) (2007) shares many similarities to the SASLHA (South African Speech-Language-Hearing Association). These associations define apraxia of speech as a neurological paediatric speech sound disorder. This disorder impairs the neuromuscular system that controls the precision movements for speech (Noel, 2018). Patients with speech apraxia commonly exhibit generalized difficulties with other motor programming difficulties, termed as “developmental dyspraxia” (Ayres & Mailloux, 1981). Speech Apraxia confirms the associated difficulties between motor and vocal control and difficulties within oral-motor imitation and abnormalities in fine-motor functions (Noel, 2018). Apraxia or dyspraxia affects many systems of the human body and each effect is categorized by its damaging factors (Newmeyer et al., 2010).

During consultations, patients diagnosed with speech apraxia explore the relationship between their sensory processing and sound production systems. Any miscommunication between these two systems can be mended by the coherent efforts of both speech and occupational therapy, with a focus on the occupational therapy side. Therapists use sensory integration, an undeniably successful method, that modifies a patient’s ability to adapt to their environment, improving skill development, and most importantly communication (Ayres & Mailloux, 1981; Noel, 2018). The International Classification of Functions, (ICF), is based on an explicit conceptual framework. In this framework, an individual’s health impacts three major domains of function, namely the bodily functions and structures, activities, and participation (Teverovsky, et al, 2009). The integrity of body function is dependent on the ability to perform activities that associated with daily living and any difficulty in daily activities may have a disastrous effect on participation levels. Each one of these three aspects perpetually catalyses the next. Any distress that causes the body to disrupt the balance between these domain’s functions can drastically reduce social participation which in turn, increases environmental influences (Teverovsky, et al, 2009). This set of coded information that operates an individual’s functioning system is considered a comprehensive profile (Teverovsky, et al, 2009).

Extra:

There are far more prevailing problems, apart from the communication casualty of speech apraxia. Other problems include challenges with attention, vestibular function, temperament, hand coordination, literature interpretation, and many more. The above-mentioned factors account for 23% of the variance in functional problems (Teverovsky, Bickel & Feldman, 2009) and they are grouped into four factors (Newmeyer et al., 2010). These four factors are Cognitive and learning problems, social communication difficulties, social communication difficulties, behavioural dysregulation, and oral motor problems. Pathologists systematically approach each factor. With cognitive and learning problems, it’s best to focus on body functions and applications that stimulate brain development. Communication difficulties mean that the pathologist would have to avoid social distress and focus on neurological processes that do not overwhelm the patient. Internal conflicts such as behavioural dysregulation would lead to radical behaviours, temperament, and emotional vulnerability. Therefore, it is best to focus on environmental factors that influence behaviour. The last factor of oral-motor control would be reinforced by language development and simple motor applications (Teverovsky, Bickel & Feldman, 2009). These four factors make it easy to see how communication disorders are highly likely to impact children’s lives and development, far beyond the boundaries of speech and languages (Teverovsky, Bickel & Feldman, 2009).



Figure 2.29: Examples of tactile sensory devices, different weights, textures and shapes all stimulate brain development. (Author, 2021).

Figure 2.30: Drawing of the vestibular sense of ballance. (Author, 2021).

### Comprehensive profile

Comprehensive profiling consists of two components, complimentary to medical and developmental diagnoses. These components are the activities and participation components (Teverovsky, et al., 2009). Activities components are the physical and interactive elements. Lefebvre terms this the dominating rhythm in the built environment (Lefebvre, 2004). The participation components are elements that make provision for social interaction, or they can be described as the dominant rhythms of urban fabric (Lefebvre, 2004; Teverovsky, et al, 2009). The activities component is particularly useful for designing interventions in habitation and education spaces for independent learning. The participation component is useful for designing interventions that promote social integration and community life.

Comprehensive profiling was a steppingstone to the integration of sensory treatments within occupational therapy. Architects, such as, Finish architect Juhani Pallasmaa, Swiss architect Peter Zumthor, or Polish-American architect Daniel Libeskind, and countless more have been manipulating and theorizing sensory experiences since Imhotep, the very first architect of ancient Egyptian times in 2630 BC (Worthington” 2013: online). However, the occupational therapy profession hypothesized that aspects of language development are dependent on maturation (maturity development), somatosensory processing (conscious perception of touch), as well as vestibular (system that controls eye movement and balance) input (Ayres & Mailloux, 1981). This was later proven to be correct. Language development does in fact rely heavily on sensory integration (Van Jaarsveld et al., 2021) thus, the architectural concern with senses is also brought to attention in occupation therapy.

American occupational therapist, Anna Jean Ayres, established what is today known as the Ayres sensory integration (van Jaarsveld et al., 2021). Sensory integration has become one of the most trusted methods of occupational therapy treatments, also showing a constant increase in language development. Ayres’ method improved the overall communication and comprehension of patients (Janse van Rensburg, 2021), along with an increase in acquisition of language comprehension and verbal expression. Therefore, this method is also applied in speech therapy. In speech therapy, the Ayres sensory integration method takes the comprehensive profile of a patient and applies specific exercises, according to the patient’s profile. It merely entrenched itself within the role of identification whereafter client-specific exercises are developed. Exercises that target the maturation, somatosensory, proprioceptive, and vestibular systems greatly improve neurological and bodily communication.

Psychologist, James J Gibson, regards the senses as an aggressively seeking mechanism rather than a mere passive set of receivers (Gibson, 1969). Instead of categorizing the senses into five basic sensory systems, he combines them with the haptic system (known as the kinaesthetic communication or three-dimensional perception); the more appropriate category would be to adopt the haptic system along with a revised or modified Ayres sensory integration. Sensory integration is the process by which people register, modulate, and discriminate sensations. Producing purposeful and adaptive behaviours in response to the environment (Ayres and Robbins 2005). This may be compared to Pallasmaa’s (2005) views on the value of senses in architectural space, in his book of “The eyes of the skin” he refers to architecture as more than any simple form of art. Not a pleasant picture that is isolated to only be appreciated by the retinas, far from it, he expresses that architecture is a fully integrated experience of material, spatial embodiment and the medium to experience a spiritual essence (Pallasmaa 2005).



Architectural influence

Sensory integrated architecture is often thought to be common practice. Regrettably, somatosensory architectural examples are scarce. Most notable examples are the Fort Worth, water gardens, and The Ira Keller Fountain Park in Portland however, perfectly engaged in the somatosensory and the vestibular systems(Archdaily 2016)“ (The Cultural Landscape Foundation 2022)“ 2016; Hirsch 2014). The Ira Keller Fountain, is a product of urban renewal and inspires active participation. It was commissioned by modernist landscape architect, Angela Danadjieva from Lawrence Halprin and Associates and conceptually drawn from the Cascades of the Columbian River Gorge (Hirsch 2006). Danadjieva evoked a metaphorical watershed, with emphasis on a holistic experience ( The Cultural Landscape Foundation n.d.). The park is morphologically inspired by the geometric cityscapes abstracted by nature. Locals refer to the park as “the city within a city” due to this geometry. Danadjieva ignores human scale and places an emphasis on sensory experience. Resulting in outpouring pools that encourage interactive kinaesthetic experiences (Refer to Figure 2.32).

These cascading fountains were not part of the original design because many thought that this piece of real-estate would have been used for commercial purposes or a simple greenspace. In fact, the immediate surroundings have always been popular social nodes. Interdisciplinary landscape architect Lawrence Halprin was convinced it would be criminal to ignore a city’s natural Motion and Ecoscore (John Alder 2014; Prudence 2012). Similar to Henri Lefebvre’s hidden melodies within the urban fabric (Refer back to page 36), Halprin had his own theory of rhythmic analysis. By observing features within the natural environment, he used these features to generate a score, termed Ecoscore. This rating system was the precursor to his theory of motion. Movements through space and time can be represented with in a diagrammatic framework by means of musical scoring. Halprin’s ‘Motations’ are rhythmic studies of intended motion of people while scoring the actual movement of architecture (Prudence 2012). Danadjieva and Halprin successfully interpreted the natural appropriated rhythms of context. In a sense, Halprin unintentionally cross-examined the fixed cohesion of rhythms of the built environment and successfully integrated these sub-contextual salient features into an appropriate responsive cohesion.



Figure 2.31:



Figure 2.33, 2.34, 2.35:

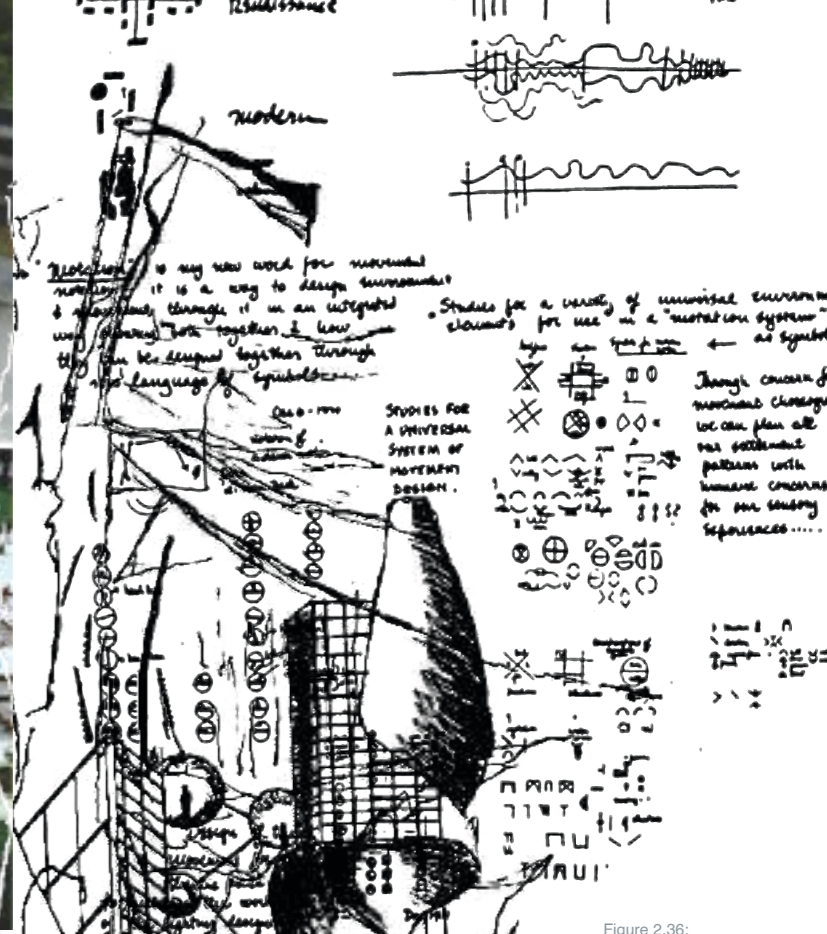


Figure 2.36:



Figure 2.32:



Figure 2.37:

Figure 2.35: Aerial view of fountain park, (“Ira Keller Fountain | The Cultural Landscape Foundation”, 2016).  
 Figure 2.37: Motation Drawing of Lawrence Halprin, (Hirsch, 2014).  
 Figure 2.38: Photos of fountain park, (“Ira Keller Fountain | The Cultural Landscape Foundation”, adapted by author, 2021).

Figure 2.31: Three-dimensional illustration of the landscape development, (“by Author, 2022).  
 Figure 2.32, 2.33, 2.34, 2.37: Photo of the fountain parks beauty (“The Landscape Architecture of Lawrence Halprin”, 2016).



## Chapter 2 : Conclusion 2.9 Conclusion

The previous chapter concluded with more questions rather than answers, as this chapter explored the intrinsic effect of various open-ended interpretations within speech therapy. This chapter merged speech and occupational therapy by expanding on the two professions. At this point the collaboration between these two fields is obvious. Throughout the various avenues of professional practice and architectural theories, this section is an investigation of the possibility of a subconscious healing space or an architectural veil of sensory stimuli; considering that this dissertation explores the possibility of a space that would aid in speech therapy with minimal pathologist interventions. The human sensorial network is undeniably complex and accompanied by with the limited knowledge available, pathologist can improve movement and vocalization. Architects have studied manipulation for decades finding new ways to alter sensory perception to improve spatial quality, Turkish architect Ahmet Vefik Alp(1948-2021) sets out various elements of what he believes are the hierarchy of psychological dimensions of architecture (Alp 1993). Only two decades later Charles Spence, experimental psychologist at the University of Oxford perused the work of hundreds of professional architects works, and writings, in research of his article titled: Senses of place: Architectural design for the multisensory mind (2022). Spence was possibly unaware of Ahmet Vefik Alp's work and yet their theories align with in the following architectural senses of Spence's work; Sound, touch, proprioception, kinesthesia, vestibular, and smell (Rethinking the Future 2022; Spence 2020; Alp 1993: 1993). Many similar books and articles have been written to guide other architects through the effects architecture has on the multisensory mind. Unintentionally, therapy and architecture meet with in the playground of rhythmic analysis and musical conflict.

Up until this point the research was focused solely on understanding the theoretical context. Subsequently, the next chapter focuses on the physical context, by evaluating the site, surrounding structures and the urban fabric. The consideration and application of sensory integration now become the analytical criteria for location examination. Halprin's (1968) Ecoscore combined with Lefebvre's rhythms accumulate into a metaphorical spy glass with interchangeable lenses (Herrington 2016). Each lens is derived from of speech therapy, architectural implications, and occupational therapy. These lenses are set in place to focus on various aspects of the project. The project's morphology, typology and topology are influenced by these lenses. Therefore, the next step is to use these lenses and focus on the intended site for the project, at Naval Hill in Bloemfontein

*“The authenticity of architectural experience is grounded in the tectonic language of building and the comprehensibility of the act of construction to the senses, we behold, touch, listen and measure the world with our bodily existence, and the experiential world becomes organized and articulated around the center of the body, our domicile is the refuge or our body, memory, and identity... “*

*- Juhani Pallasmaa (Pallasmaa, 2005:)*

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03

Scene investigation for the *Acoustic sanctuary*

The project aims and site analysis

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### 3.1 Introduction

Each lens, as mentioned in Chapter 2, represents a different theoretical approach towards a final design. This dissertation is supported by a tripod. Each leg represents a different component, namely: programme, theory, and site. Chapters 1 and 2 provided an overview of the theoretical conversation. This chapter not only covers the site but also the functional programme for the proposed design. Initially this chapter focuses on programmatic topics such as general background, followed by the client, users, and economic factors, and then directly leads into the urban landscape, theoretical implications, and the heritage assessment that all form part of the site analysis.

Before starting with the programme, it must be mentioned that this facility challenges standard typologies. Especially within therapy, occupational and speech pathologists, pride themselves on standardization. This is based on established research protocols and experience. This also implies that few optimized facilities exist, but an abundance of standardized facilities from repurposed office spaces are available. In general, for repurposed or adapted office buildings to become a sensory integrated facility for speech impairments is a scarce typology, especially in South Africa, is difficult. Notably, I attempt, through the chosen site, to re-use the historical structure of the pumpstation. To adaptively reuse means to appreciate the tales of a dilapidated and forgotten building and to reinterpret it, and providing a new way of speaking for the site.

### 3.2 Hearing voices - Meeting the site as a therapist for the first time

Isolated and barricaded, doors welded shut, and person bars on every window, is the current image of the site. Fortified to keep people out. That is all that remains of the pumpstation and water reservoirs. Most likely it will remain the same for many more years to come. Located within Bloemfontein, adjoined to the Naval Hill entrance, rests a grieving structure. Historically famed, this industrial shed-like structure housed the state-of-the-art water pump systems of 1898. Continuously pouring water into concrete catacombs. Large reservoirs were intentionally elevated to minimize distribution efforts while maximizing efficiency and encompasses the structure, simply to allow gravity to disperse water to surrounding infrastructure.

Historical structures are tangible links to the past, serving as physical, and phenomenological windows, such as memory recollection, like how music can find forgotten appellations. Heritage structures bring forth the reminiscence of memory to a society. Over time this site progressed into a liminal space, mediating between unities of past and present. At the same time touching the Bloemfontein central business district, while submerged within a peri-urban residential area, yet in conflict against natural landscapes. Liminality mediates in-between

spheres, a watershed threshold amongst the urban fabric while opposing the natural environment. Resting on the most northern point of Bloemfontein's business district, this building lies at the foot of Naval Hill and the Franklin Nature Reserve. Home to many wild animals, including giraffe, blue wildebeest, zebra, springbok, and eland (Franklin Nature Reserve 2022), this nature reserve is encapsulated by urban development and a historic building hidden between different features of the built environment.

Through years of urban development, this hydraulic shed's location evolved into foreign land, as the context around it changed. The building became voiceless and rejected, excluded from the urban fabric and omitted from the natural environment. Reminiscing silence of abandonment has only attracted exploring displaced individuals. Evacuated individuals can relate to the social injustice equal to that of the abandoned outbuilding. It is currently a space where the voiceless decay. Remnants of an industrial typology, of the late nineteenth century, this serves as one of the last industrial architectural examples of early Bloemfontein. Dwellers on-site embody this sense of place as they seem untested by visitors. Visitors experience extensions of forgotten appellations, detested people.

They may be seen as soulless zombies lingering in the decay of social injustice (Seithati, 2019). Any facility that aims to provide a voice can also be an enforcer of silence. As not to worsen their situation a portion of the erf is proposed to be allocated to these settlers in solidarity with Bloem Shelter, and the vacant backpackers building could be used as a temporary emergency shelter, thus clearing the ground on which the alternative speech therapy facility would be built. Home of the relinquished, where architecture is hidden. This is the location where those who stutter are the voiceless who will be heard and where the historic can be reappreciated, engaging in various layers of cohesions that stem from the pumpstation and underground water reservoir.

I aim to innovate through the proposed design, by engaging with various layers of cohesion that can stem from the use of the historic pumpstation and underground reservoir.



Figure 3.1:



Figure 3.2:



Figure 3.3:



Figure 3.4:

Figure 3.1: Photo to symbolize the different lenses of the dissertation (Moranville, 2019).  
Figure 3.2: Conceptual sketch of the human periphery, (Author, 2021).  
Figure 3.3, 3.4, 3.5: industrial detailing on site, (Author, 2021).



Figure 3.5:



Figure 3.6: Photo of site entrance closest to Naval Hill entrance, (Author, 2021).



Figure 3.7: Photo of the city view from the site, standing directly on top of the underground water reservoir, (Author, 2021).



Figure 3.8: Standing in the ruins of the water reservoir entrances looking towards the pump station (Author, 2021).

Figure 3.9: The majesty of the pump station, (Author, 2021).

### 3.4 Ambitious intention

My intention as designer is to provide a space where almost any number of speech sound disorders may be addressed in a single facility where therapists evaluate and determine the most applicable treatment for patients, profiling each patient to set up an activities plan. Most often these generalized exercises are perfect to practice at home. Unfortunately, many patients do not have the privacy at home, nor do they have the necessary support to do so. Therein lies the foundation upon which an alternative speech therapy facility will be constructed, namely improving lives through spatial experience developed by extensive research. The aim is to clear the schedules of therapists to treat a larger variety of patients. In most cases, the bookings with a therapist will regularly be filled with one-time appointments. This is expensive for patients. Thus, by cutting down on patient expenses and allowing them a space to practice, they can commence on a journey of self-empowerment. More sessions are advised for performance evaluation. However, self-evaluations should suffice depending on the therapist's evaluation. Intended users within this proposed building are regularly referred to as socially displaced souls. The South African Ayres Sensory Facility aims to design a facility that can house the future of speech and occupational therapy, and where architecture is designed to embody sensory therapy and experimental therapy can adaptively reuse existing infrastructure by applying the fundamental concepts. These concepts are explained in the following section.



Figure 3.10: Highlighting the sand stone detailing in the historical pump station, (Author, 2021).

Figure 3.11: Sketch of the dilapidating soul that generates the sense of place, (Author, 2021).

## 3.5 Lenses set in place

### 3.5.1 Dominated versus dominating

The opposing elements of the dominated and dominating, are defined within urban rhythms and social constructs. This concept refers to the continuous conflict between forcefully imposed ideals and the lived reality of public spaces. Architectural authority is often mistaken for architectural empathy, simply a dichotomy of antithetical standards. Intentional spatial morals are not in any way similar to those that are socially developed. Publicly accessible areas are scrutinized by this societal process. Streets, parks, shops, etc. are part of daily rhythms. Contextual evolution is expected.

Both Lefebvre and Halprin understand melodious implications of spatial rhythm relative to context and time. Therefore, the third design lens, or conceptual approach, combines their methodologies. This design experiments with social construct. Just as the pumpstation is currently derelict, the proposed publicly accessible South African Ayres Sensory Facility may just as easily suffer the same fate, if it fails to collaborate within the surrounding cadence of its context. Essentially, this lens is an abstract method of study and site profiling. Perhaps this is an architectural pathologist's approach to curing a dilapidated structure. The chosen site bears a strong resemblance to the proposed project programme. It is concealed from public eyes while protecting voiceless vagrants.

Speech sound disorders are identical to spatial conflict. Struggling speakers force their words out in an attempt to dominate over their own voice in frustration, while in reality, other underlying conditions are dominating. The goal is to achieve social behaviour that would still enhance the speech of a user and relieve their social stress. The existing rhythms of the site can complement the proposed South African Ayres Sensory Facility.

### 3.5.2 Sensory integrations

Referring to the dichotomous centre between occupational and speech therapy. Treatments in sensory experiences target specific triggers situated throughout the human body. Sensory experience constitutes physical form (Pallasmaa 2005). From head to toe, a patient will constantly interact with any given environment, picking up on any communication between the world and the interoceptive. Any outward boundary conditions are announced to the internal state of the body, with complex abilities to understand and identify patterns of internal signals (Morrow & Gamal Abdelmonem, 2013). I aim to explore the pathological sensory condition within architecture.

### 3.5.3 Unconstrained articulation

Rendering the emotional field of speech sound distorted transparent, in order to observe the destructive nature of the constraints within social tension. This conceptual lens directs principal design decisions throughout morphological development. Thoughts of tension stand behind every decision, where suspension is the overwhelming design decision.

### 3.5.4 Responsive cohesion

The final lens of cohesion is understood as the beneficial cooperation amongst the salient features of a thing (like a building) and its context. It is a juggling of information between architecture and the immediate surrounding; an exchange of objectives between fields, the process of asking for sub-contextual elements to coordinate architectural translations. Michelle Morimoto designed a conceptual modernist house in Aina Haina, in Honolulu, Hawaii, using complex synchronization of rhythms of history, music, and architecture (Morimoto, 2017). The South African Ayres Sensory Facility proposes to do the same with the use of tension, music, rhythms, and sensory integrations.



Figure 3.12:

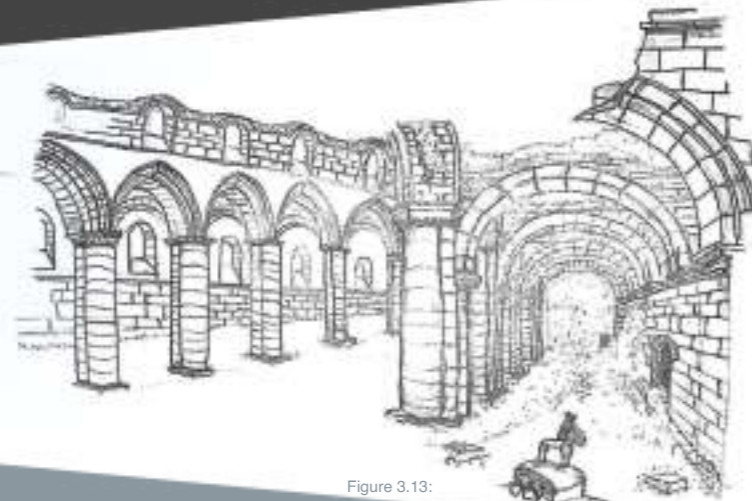


Figure 3.13:



Figure 3.14:

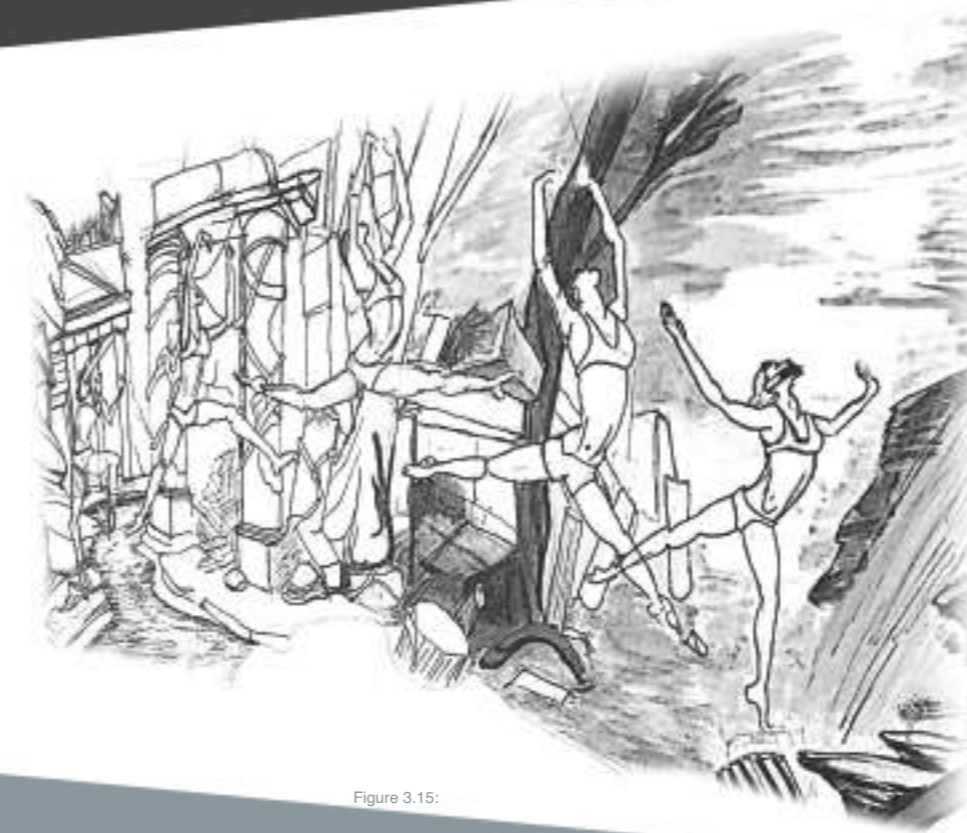


Figure 3.15:

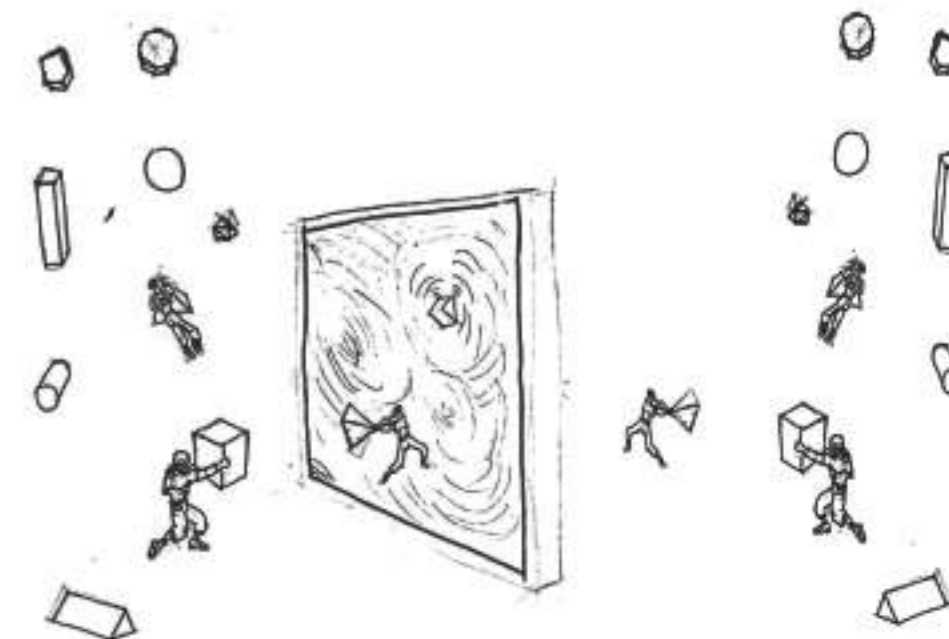


Figure 3.16:

### 3.5.5 Musical rhythms

Vocally flowing, a melody encourages stimulative speech. Continuous beauty in language is achieved through merely following pitches and troughs. Arrhythmias or the sounds produced by impaired speech are compared to the segregated music of staccato and the polyrhythmic sounds to the continuous play of legato. Although opposing elements, these two are inseparable. This lens looks at the topographical features of the site. Where order seems lost, musical rhythms place each piece intentionally to create a harmony.

## 3.6 Patron

Speech therapy and occupational therapy professional practices each have their own governing association, namely SASLHA and OTASA. Within this project these two administrative associations collaborate against speech sound disorders, with the aim to reshape the future of both professional fields within a singular facility. Combining specialized fields into one location aims to deliver the best treatment.

### 3.6.1 Client Brief

OTASA and SASLHA have been on the frontline of research and development in terms of speech and occupational therapy in South Africa. These two associations envision a sensory park that will function as an open-source and genericized therapeutic experience for all to admire and use. The focus is on patients in need of a space to practise and make use of sensory applications in their speech therapy. The space should be equipped for all classes of society, as to open the door of speech development for everyone and offer a unique spatial experience.

These two associations requested that the SA-AS facility should be designed and developed. The proposed South African Ayres Sensory Facility, is named after American occupational therapist, Anna Jean Ayres. This facility includes various architectural and therapeutic garden structures situated throughout the landscaping. This guides users in establishing a system that works best for them. The proposed programme includes traditional therapy rooms, exercise-specific areas, a multi-functional auditorium, an administration block, and supporting spaces.

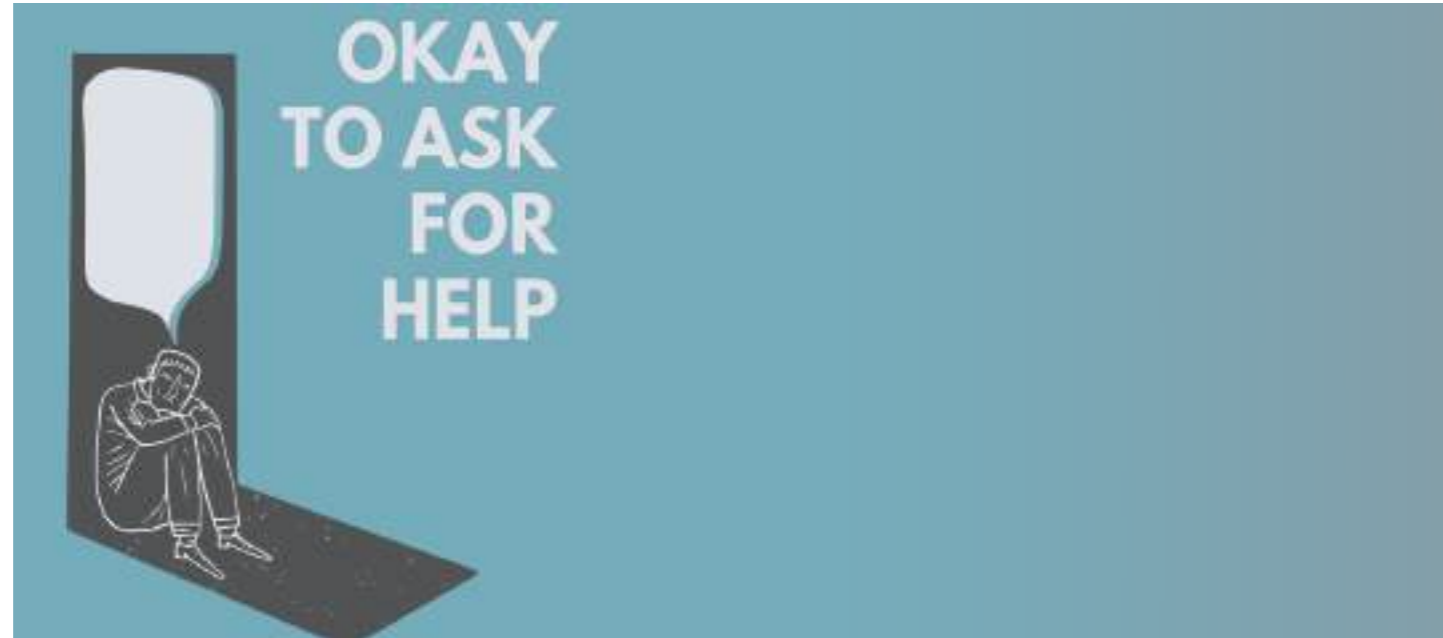


Figure 3.17:



Figure 3.19:

SASLHA is the South African Speech-Language-Hearing Association. They promote the profession and members interests, through all spheres of work performance, as well as opportunities to improve competence and performance of each professional. SASLHA encourages professional innovation, while aspiring to new heights and better standards throughout South Africa (SASLHA, 2022). They embody their vision of being the voice of the voiceless. Speech-language therapists and audiologists all register at SASLHA, sharing a similar vision to SASLHA is OTASA, the administrative body of occupational therapy.



Figure 3.18:



Figure 3.20:

The Occupational Therapy Association of South Africa (OTASA), like SASLHA, aims to improve the field of occupational therapy. They take pride in representing all professionals in occupational therapy as a fundamental part of health care. They promote, support, and engage in innovation. They strive towards quality service for all its members, including constantly refining their service to clients through quality, professionalism, and personal engagement (Williams, 2022).

These two associations are dedicated to the growth of their respective fields in therapy. They support advancements in technology that improve techniques of treatment and consumer services (Williams, 2022; SASLHA, 2022).

## 3.7 Program

This proposed SA-AS or South African Ayres Sensory Facility will consist out of numerous experiential spatial structures designed according to specific sensory requirements. Strictly planned according to therapy requirements, these structures integrate various sensory methodologies that stimulate a combination of senses. Focusing on a revised Ayres sensory integrated system, namely the vestibular (acknowledging your body in space), proprioceptive (body applying force to an external object), tactile (textures) and acoustic (echoes and sounds) senses, the program is ordered in line with these elements.

This is practically implemented by dividing the project into two core aspects, namely a functional therapy centre and a sensory park. Both aspects are inseparable components of the SA-AS. Therefore, the sensory park and therapy facility cannot function as separate entities, as their functions run in tandem. A stand-alone sensory park would be redundant, and a stand-alone facility would be disregarded and undistinguished from any other facility and render this proposed project fruitless. However, the accommodation properties differ in both the sensory park and therapy facility. Each space is affected by the accommodation requirements of the end user. To incorporate end-user diversity while staying true to traditional therapy the programme of this facility would be as follows:

### 3.7.1 Traditional therapy facility

Professional pathologists require functional spaces to consult patients. Many are accustomed to generalized practices, where their consultations could be done anywhere. This, however, hinders pathologists from providing consistently beneficial consultations. Like any speech or occupational practice, this alternative facility would include reception area, waiting area, offices, boardrooms, various storage areas, restrooms, and therapy rooms.

During interviews, many pathologists would mention how incomplete this accommodation list is. They recommend including additional items, such as: patient assessment rooms, parental observation rooms, and family rooms. Assessment rooms simplify symptom diagnostics and profiling, while observation rooms allow for active parenting. Guardians often neglect the importance of continuous therapy, especially home therapy. Within the proposed facility, guardians are included within each appointment without distracting patients. Family rooms are for family groups but also research and educational spaces. These spaces would improve their understanding of how to help and mediate their children, loved ones, or friends through their therapy. It can also serve as an educational space for patients to learn about their own disorders. What makes the SA-AS unique from any other facility would obviously be the sensory park. Patients would be provided with a training routine suited to their unique impairments. The unorthodox spaces of this dissertation are covered in Chapter 4.

### 3.7.2 Sensory integrated architectural follies/garden structures

Sensory integrated architectural follies refer to isolated, yet integrated structures. Each folly is designed to activate preselected senses of human experience. Within this project the follies will be seamlessly integrated throughout the landscape. These garden interventions are designed according to speech and occupational therapy. According to Jeane Kolbe (2021), Johannesburg occupational therapist, there are eight senses, although most believe there to be only five: sight, sound, taste, smell, and touch. However, occupational professionals, such as Kolbe include three more to the list: tactile, proprioceptive and interoceptive (internal state of the human body) (Kolbe, 2021). All sensorial structures subconsciously enchant every sense. This entails a coherently laid out landscape, designed for both patients with under-stimulated and overstimulated neurological systems. This means that patients sensitive to overstimulation will find comfort, but also patients that are prone to under-stimulation.



Figure 3.21:

## 3.8 User requirements

### 3.8.1 Daily visitors

Daily patients would be able to explore every sensory structure. Improving their speech through acoustic or spatial awareness exercises. Using echo chambers, sound absorption spheres, vestibular walkways, proprioceptive spaces, and other complex components within the park boundaries. Furthermore, their progress would be frequently evaluated by professionals guiding patients through optimal treatment. They require fully equipped consultation spaces with plenty of natural light, large open and comfortable waiting areas within sight of the consultation rooms, access to information technology such as a computer lab with low noise levels and is artificially lit or gets indirect sunlight—importantly they need easy access to each folly.

### 3.8.3 Outdoor enthusiasts

Cyclists, hikers, runners, and rock climbers often visit Naval Hill. It is well known for its recreational use and recurring events, such as CityRuns every Saturday and many running events throughout the year. Daily visitors are expected at the proposed centre and may move past the site as they enter the Franklin Nature Reserve. Subsequently, the curiosity of these visitors may encourage them to explore the SA-AS sensory park. Expeditions, meeting points, and quick passage to and from Naval Hill, are only a few expected scenarios on how many more people would make use of the sensory park. As a result of these visitors, the sensory park would integrate with Naval Hill's cross-country trails and a sensory inspired passage through the site while still avoiding the private areas of this facility.

### 3.8.5 Administration

Support staff members and facilities for administrative purposes are included, such as a reception area, boardroom, general storage, important documents storage, storage for miscellaneous items, head office, and cafeteria areas. These members include office administrator, assistant manager, accountant, receptionist, IT professional, occupational therapy assistants and speech-language pathology assistant. A staff component of about twenty staff members in total, including five administrative positions, five professional pathology roles along with ten speech and occupational pathology assistants is proposed.



Figure 3.22:

### 3.8.2 Local visitors

Local visitors could be expected in terms of people that stay in the surrounding areas, who may visit to experience the park for social activities, such as picnics, walking, or simply enjoying the green spaces. Existing green spaces, such as the green space surrounding the Orchid House are already popular with locals, especially during public holidays.

### 3.8.4 Staff

Staff members of the proposed facility would be the fundamental users needed to keep the facility afloat. Any professional service provider would be included in the list, such as speech therapists, audiologists, and occupational therapists. A small number of professional therapists are estimated for the first few years. Therapists would be permanently employed and provided with their own office spaces. However, therapy rooms are rentable spaces to be used by any registered therapists. The wide variety of equipment in each therapy room would provide a suitable space for any speech or occupational therapist.

### 3.9 Economic sustainability

The main economic challenge is to make therapy more affordable. I propose to do this by implementing a free-to-use sensory park. Subsequently, such a facility would need to sustain itself within the Bloemfontein economy. Three primary forms of income are identified to ensure a future for the SA-AS facility.

Weekly recurring clients would be minimized because of the SA-AS facility providing self-evaluating therapy. Regular patients are a more stable solution. However, each appointment would be a new patient. Those with impairments only need to schedule a single appointment. Once a profile has been established, patients would be introduced and educated on each sensory application of the facility. If only one appointment is necessary, more people would be interested, making therapy more affordable to everyone. Decreasing professional therapy costs would mean an increase in interest.

Due to possible interaction with numerous patients daily, the facility would potentially be filled by a whole new set of patients each week. Only one professional session is recommended to all newcomers. The aim is that this would allow more people to afford the treatment. One percent of the South African population suffer from a speech sound disorder, according to studies mentioned in Chapter one (Nsabimana, 2011). Bloemfontein's population was estimated at 578 000 in 2020 (Bloemfontein, South Africa Metro Area Population 1950-2021, n.d.). This leads to a general estimate that 5 780 people in Bloemfontein may have a speech sound disorder.

The second means of proposed income would be from sales and rentable assets. Rentable assets include, but are not limited to, the renting of therapy rooms, delayed auditory feedback devices, and many other approved therapy devices. Other professionals can rent therapy rooms designed for a larger variety of treatments. Sales of therapeutic devices, such as AAC devices (Augmentee and Alternative Communication) can also garner an income. Devices such as these are extremely expensive and could easily be rented out for a smaller passive income. Lastly, sponsorships and support from other associations and donations towards the facility are still possible to ensure the survival of the SA-AS facility.



Figure 3.23:

Figure 3.23: Photo of the potential growth of the facility while still being affordable, (Michelle, 2020).

Figure 3.24: Service roof and reservoir primary entrance, the closest structure to the existing pump station, (Author, 2021).

Figure 3.25: Combination of various sources to produce an exploded explanatory view of the site location, (Online, 2021).

### 3.10 Site Analysis

Within the centre of South Africa lies a city with an estimated population 578 000 named Bloemfontein. The proposed site for the SA-AS facility rests on the periphery of the Franklin Nature Reserve on Naval Hill and the Bloemfontein central business district. The old pumpstation and underground water reservoir are the only structures present on the reposed site.

The tension between nature and urban is present on site. This project is focused on the threshold between various elements while still finding connections between them. As mentioned before, it is not surprising that the chosen site would do the same. The urban space and the natural environment each has their own unique rhythmic identity. Methodically dictated structures are commonplace within the urban fabric, while standing in strong contrast against the tension of the freedom that nature provides. Therefore, it is crucial to investigate the site through mapping, photographs, diagrams, sketches, and through terrain vague investigations (Solà-Morales Rubió, 1996).



Figure 3.24:

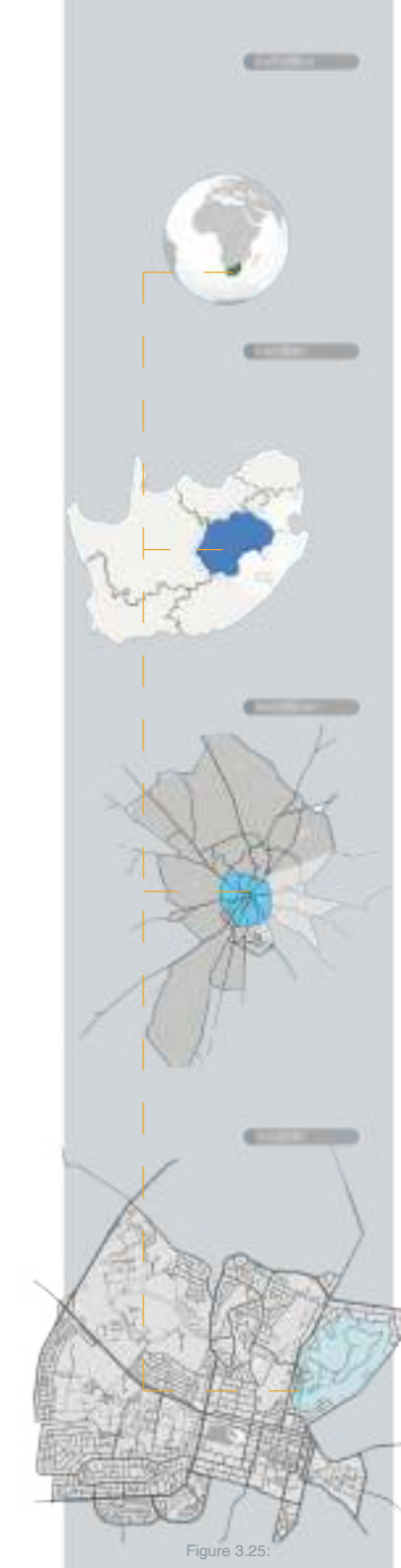


Figure 3.25:

### 3.11 Macro analysis of the Built fabric

#### 3.10.1 Urban landscapes

The intersection between the urban context and the nature reserve of Naval Hill is shown in Figure 3.27. Figure 3.28 indicates how Naval Hill (in green) is surrounded by the built environment. It is flanked by the Bloemfontein central business district (CBD) (highlighted in grey) to the south. To the east lies the industrial and mixed-use area of Hilton, indicated in brown. Lastly, residential infrastructure of Waverley, Arboretum and Noordhoek lies to the north and west.

Because of its strategic position, Naval Hill played a major role in the development of Bloemfontein. Therefore, the South African Ayres Sensory Facility becomes the conciliator of present technology within a historical catalyst. The aspects of this mediation between the built environment and the natural environment will be analysed and considered before being translated into conceptual architecture.



Figure 3.27:

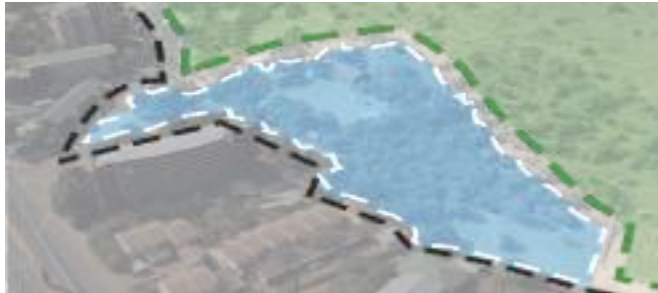


Figure 3.26:



Figure 3.28:

Figure 3.26: The peripheral space between nature/ Naval Hill and the concrete landscape, (Adapted by author, Online, 2021).  
 Figure 3.27: Google earth images illustrating various city zones, (Adapted by author, Online, 2021).

Figure 3.28: Two extreme depictions of city perspective in contrast to nature, (Adapted by author, Online, 2021).  
 Figure 3.29: Noll diagram showing how the city clusters around hills and valleys, (Snazzy Maps, 2021).

Figure 3.30: Example on the city's original urban plan had to be abandoned, a road the size of any other main roads. Hardly any vehicles use this road and it leads straight into the side of a hill, (Google earth image adapted by author, Online, 2021).

#### 3.11.1 The fabric of the built environment

Figure 3.30 indicates the dichotomy between the urban in conjunction with the natural. To better understand the city, one must appreciate the combination of these two aspects. Figure 3.32 and 3.33 illustrates this relationship between the urban fabric and the natural landscapes. It shows how fragmented the natural ecosystem has become. Bloemfontein is bounded by the natural landscape. It is simply not feasible for any development equal to Bloemfontein's economy to make huge landscape changes. Originally during the development of Bloemfontein, rudimentary urban developers had ambitious ideas. Developers wanted to impose a strict cartesian grid onto the virgin terrain (Auret, 2016; Van der Westhuizen, 2001). Fortunately, these attempts in overthrowing the natural landscape were unsuccessful and nature proved to be more resilient.

#### 3.11.2 Transportation activity

The transportation grid of the city reveals attempts to reappropriate the natural environment, similar the conception of the Pretoria city (1978), located within Gauteng, South Africa. Elizabeth Yolanda van der Vyver wrote her PhD on the "Critical interpretation of the temporal impact of landscape", where she explains that the Pretorian Hippodamian city layout started with the placement of the capital, (Church Square Van der Vyver, 2018). Growing in-between hills and valleys, the cartesian grid of Pretoria had to adapt to its environmental restrictions. Figure 3.34 depicts this according to work by urban designer, G.J. Jordaan (Jordaan, 1989) . Referring to Bloemfontein, Figure 3.31 shows an example these environmental restrictions. The way in which these roads react around voids, such as hills and valleys where roads could not be built, should be noticed. The cartesian grid started within the CBD of Bloemfontein and was phased out as the roads diverted out (see Figure 3.30). These streets seamlessly spread through the terrain, twisting, and turning around hills and valleys. However, many seem to stop awkwardly pointing directly at a hill or valley. As seen in Figure 3.31, where a four-lane Rayger Street comes to a dead end. It seems that the original city layout of Bloemfontein overlooked these hills and valleys (Van der Vyver, 2018). Figures 3.32 and 3.33 show the current conflict between the natural terrain being challenged and the urban fabric. All the remaining green spaces are fenced off and deserted veld areas, most being declared animal sanctuaries. While the city continues to develop, these veld areas are consumed.

#### 3.11.3 Environmental Conditions

Bloemfontein is situated 1 398 m above sea level and receives an annual rainfall of 545 mm with an average temperature of 17.1°C ("Climate Bloemfontein", 2021). The graphs below are based on 30 years of hourly recordings done by Meteoblue. It is essential information to keep in mind while designing within the Bloemfontein climate. To combat the desert-like heat in summer and antarctic weather in winter, this information is used in combination with 10400 XA Edition 2 standards (South Africa Metro Area Population, 2021).

Figure 3.31: Indication of the most prevailing roads in Bloemfontein, note how the CBD is completely square while the rest of the roads are more freely laid out, (Adapted by author, Snazzy Maps, 2021).  
 Figure 3.32: Shows where nature has not yet been destroyed, (Adapted by author, Snazzy Maps, 2021).

Figure 3.33: Pretoria had to adapt to its environmental, (G.J. Jordaan, 1989).  
 Figure 3.34: Data charts of Bloemfontein annual weather, (Data, 2020).

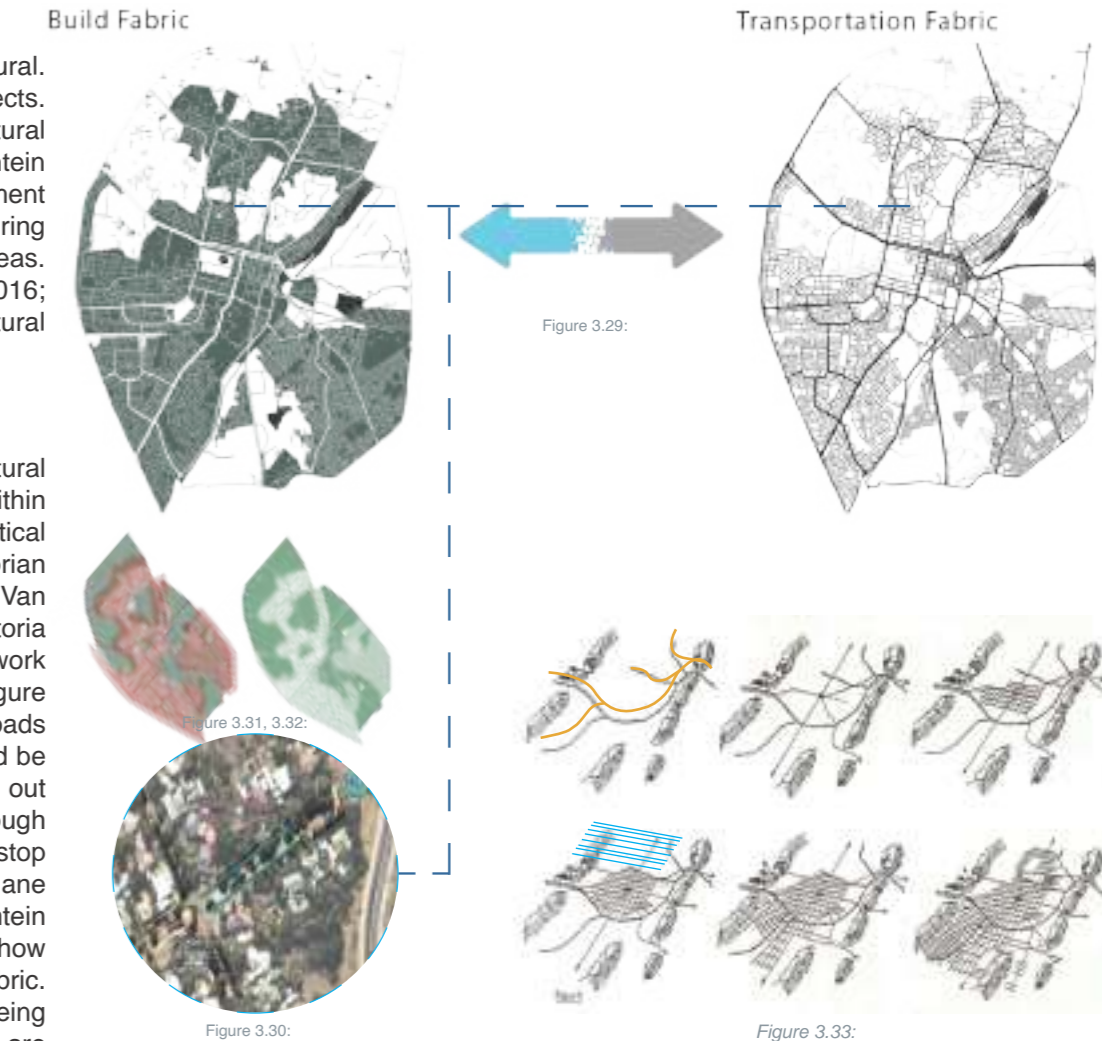


Figure 3.30:

Figure 3.33:

Figure 3.34:

### 3.12 Terrain Vague

Accurate interpretations and predictions of city development can be generated from a macro analysis. However, a macro analysis fails to provide an empathetic understanding of urban life and its development. Therefore, the terrain vague method is used to understand the city experience along with the relationship between urban development on virgin land (Mariani & Barron, 2014).

Terrain Vague is an alternative method of urban analysis. Conceptualized in the 1990s by Ignasi de Sola-Morales. A detailed explanation is found in the pages of Terrain Vague: Interstices at the edge of the pale. by Manuela Mariani and Patrick Barron (2014). This compilation of essays identifies Terrain Vague as a subversive form of Henri Lefebvre's theory on secret rhythms. Mariani explains how all forms of Lefebvre's social rhythms are implicit within the Terrain Vague method. Lefebvre examines spatial shortcomings by comparing the original intent of a design to the present use of that space by the public. Lefebvre's shortcomings are the consequence of overlooked social behaviours that always dominate over intended spatial design. This method focuses on the continuity of the metropolis' character without violating the dynamics and complexities, by accumulating information on systemic transformation to reincorporate spaces into the productive logic of a city (Solà-Morales Rubió, 1996).

This form of analysis is far from scientific and provides no concrete evidence. However, this method does generate intellectual arguments. This method reveals the silent features of any city, and this is accomplished by evaluating various city transformations. Many of these evolutionary moments are visible within the city layout. Notice the strict cartesian grid within the very centre of Bloemfontein, where all main roads intersect (Figure 3.36). Historically, Bloemfontein roads were intended to only run "North to South" and "East to West" (Figure 3.37). Bloemfontein's grid-like development was the result of two fundamental axes (Auret, 2016). As indicated in Figure 3.39, these axes are the catalysts of Bloemfontein's origin story. The first axis was intended for Military shelter and the second for economic development. This demarcates the starting point that motivated Bloemfontein's layout and future growth. The first axis strategically shelters the city by using surrounding hills as a lookout points. More specifically, the British military made use of Naval Hill and Fort Hill. Roads to and from these two prominent hills were prioritized due to their tactical significance. Only many years later did the second axis start to develop, referred to as the transportation axis. It articulated the economic impact of the train station, built in 1890, that resulted in more efficient transportation systems for both pedestrians and goods (Auret, 2016). It was within this historic context that the pumpstation on the proposed site was also built.

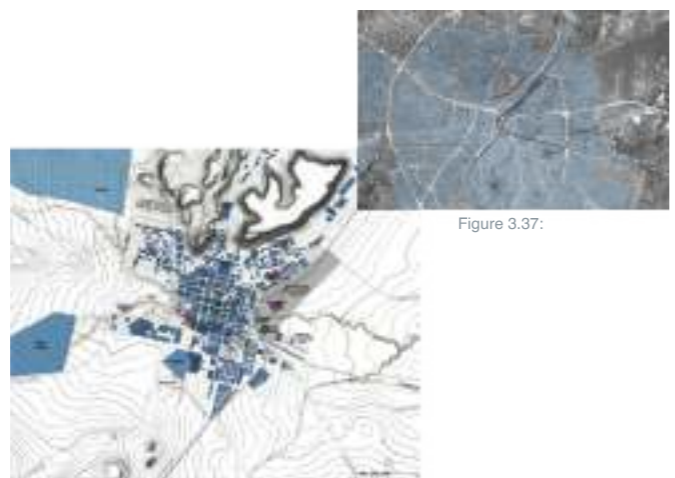


Figure 3.35: Geographic mapping of Bloemfontein from 1846, 1860 and till 1940, (Auret, 2016).  
 Figure 3.36: 1904 map of Bloemfontein, (Auret, 2016).  
 Figure 3.37: Extracted layering of the distant context, (Author, 2020).

### 3.13 Historical access

The urban and spatial history of Bloemfontein has been mapped by Hendrik Auret and Diaan van der Westhuizen who in their work "Colonial conception and space on the evolution of the city (Bloemfontein)". Figure 3.38 by Auret (2016) shows how these two axes, mentioned above, influenced Bloemfontein's development, while Figure 3.39 superimposes this development into the current city layout. These two major axes link the historical and defensive significance of the city. Figure 3.39 expands on the significance of these two axes. The economic axis (indicated in yellow) connects the train station to the main building of the University of the Free State. Auret refers to the institutional axis (indicated with a blue line) that connects Naval Hill to Fort Hill. The Twin-Spired church (Dutch Reformed Bloemfontein –now Towers of Hope), Arthur Nathan swimming pool, and the Nelson Mandela statue are all placed directly on this line. Just offset to the west of this line lies the proposed site for the South African Ayres Sensory Facility.



Figure 3.38: Google earth map, indicating city development in 2021, (Adapted by Author, Online, 2021).  
 Figure 3.39: Expression of the combined idiosyncrasies of the site on a simpler 2-dimensional plane, (Author, 2020).  
 Figure 3.40: Photo of the Wiltshire Remount Regiment, after laying out the white horse, ("Bloemfontein's White Horse on the slope of Naval Hill", 2019).  
 Figure 3.41: Photo of the current planetarium, (UFS, 2020).  
 Figure 3.42: Photo of Naval Hill wildlife, (Heerden, 2019).

### 3.14 A brief history of Naval Hill

The proposed site is attached directly to one of Bloemfontein's original anchors. Therefore, it is appropriate to cross-examine the significance of this entity. Naval Hill has three significant attributes linked to its history: conflict, conservation, and science. In the days of conflict, during the South African War (1899-1902), Naval Hill provided good tactical oversight. Naval Hill even accommodated the British colony military governor and his garrison stationed in Tempe and Naval Hill (Warden, 1989). This is also where the name originated as the hill was named after the British Naval Brigade (National Museum, 2019).

Naval Hill's importance to science was initially started in 1928, when the University of Michigan opened the Lamont Hussy Observatory. After some renovation, this observatory functioned as a theatre in the 1970s before it was converted into a planetarium (Snyder 2013; South African History Online, 2011). The final environmental conservation attribute of Naval Hill is still a very important aspect to this day, namely the Franklin Nature Reserve, named after John Stuart Franklin, the 1920 mayor of Bloemfontein (Franklin Nature Reserve, 2022). Not many cities can boast a 250-hectare nature reserve located within its centre, making this nature reserve unique (Franklin Game Reserve, 2022; Mangaung Metropolitan Municipality, 2022). On the edge of the reserve rests the proposed site. It consists of two prominent structures: the pumpstation, and the underground water reservoirs. Subsequently, the contextual focus shifts to analysing the anatomy of each of these structures.

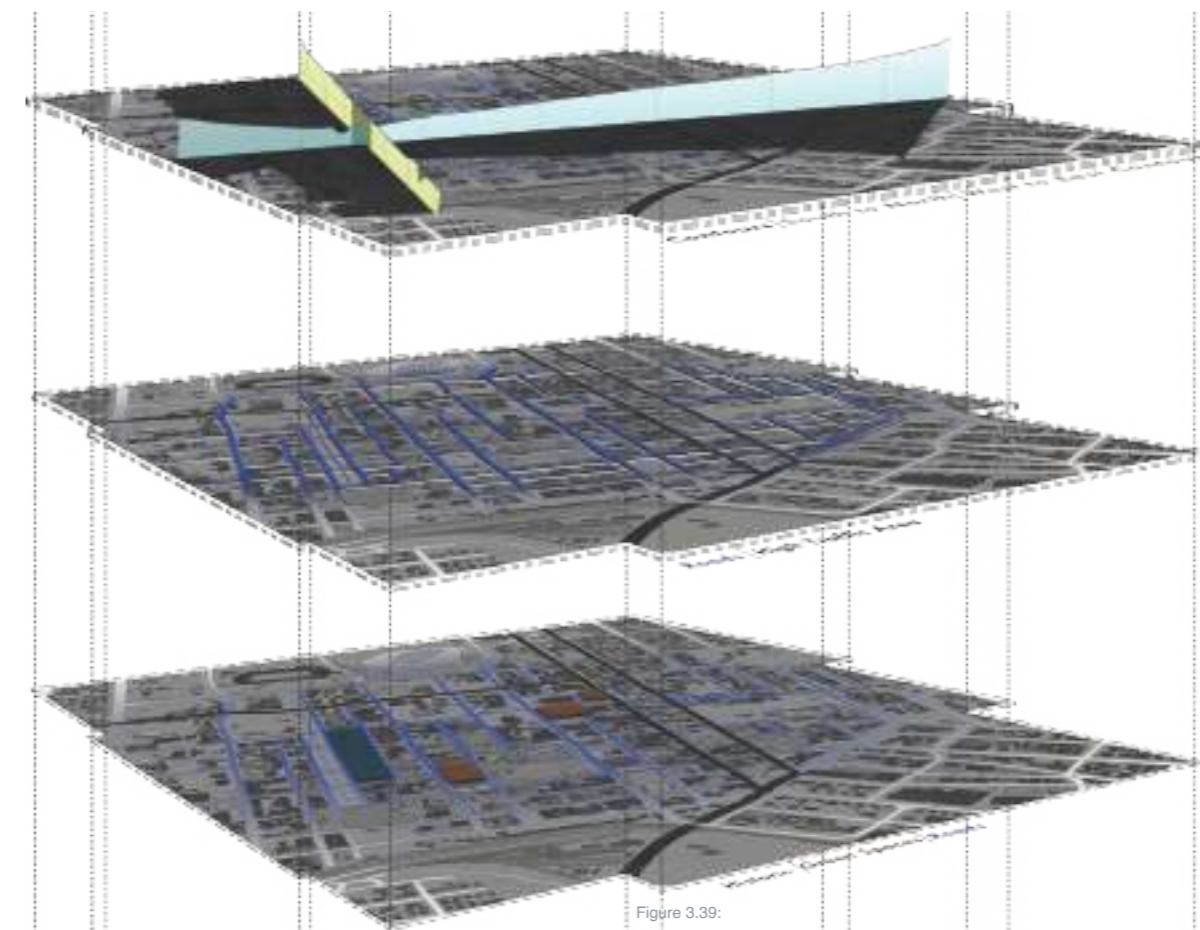


Figure 3.39: Expression of the combined idiosyncrasies of the site on a simpler 2-dimensional plane, (Author, 2020).



Figure 3.40: Photo of the Wiltshire Remount Regiment, after laying out the white horse, ("Bloemfontein's White Horse on the slope of Naval Hill", 2019).

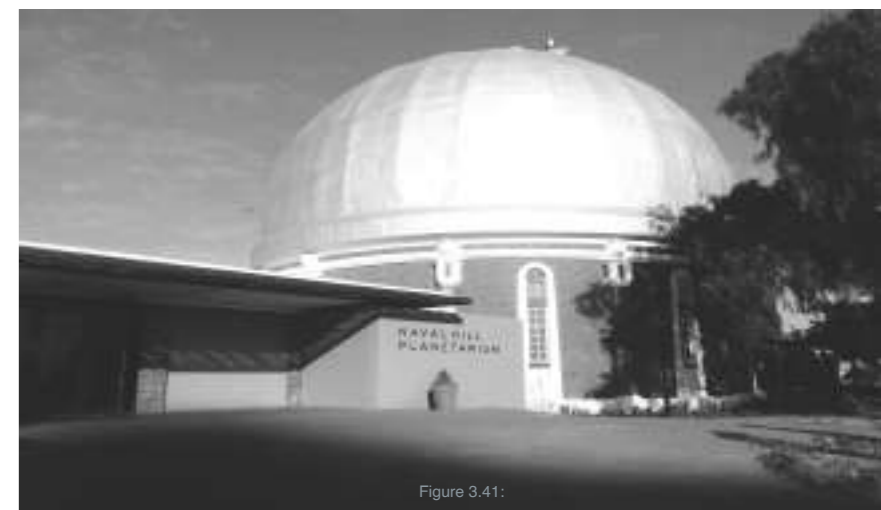


Figure 3.41: Photo of the current planetarium, (UFS, 2020).



Figure 3.42: Photo of Naval Hill wildlife, (Heerden, 2019).

### 3.14.1 The pump stations

- Area: 235m<sup>2</sup>
- Construction date: 1898
- Year completed:1899

The pumpstation is protected by the National Heritage Council of South Africa because of the heritage criteria set out in section 3 of the National Heritage Resources act (No.25 of 1999), most specifically section 3.2 (c): historical settlements of townscapes. This legal protection does not hold up against the constant maltreatment and neglect that is slowly accelerating the deterioration. Unfortunately, the social exclusion of this site has turned the structure into prime real estate for the displaced. This industrial barn quickly become the home of many displaced. This caught the attention of the local communities. Due to their complaints about safety, the pumpstation was barricaded and sheltered from everyone. Currently, there is no way to enter the pumpstation because every entrance remains welded shut with square steel tubing. Danny Bester (2015) used the same site for his dissertation. His photography has supported this study, as it shows interior views of this structure and provides a glimpse of how the site looked before the doors were barricaded.

Currently the street view is overgrown and almost safari-like, evoking a romantic wildlife or nature reserve atmosphere (See Figure: 3.43). This appeal is quickly faded by the sounds of strangers hiding in the distance. Visitors can expect to find litter everywhere, temporary structures, and people simply trying to survive. Bester (2015) describes the interior design of the pumpstation as nothing more than practical. This double-volumed space was designed and built for only its intended purpose. Three major materials are prominent within the pumpstation: metal, sandstone, and brickwork. (Refer to Figure 3.44).1 Standard bricks are laid in an English bond and rest on a 1000mm x 400mm ironstone plinth, articulated with two sandstone rings, one on top of the other (Bester, 2015:42-98). One sandstone ring

is rectangular and just above it, the second sandstone ring is finished with a tapered edge. Every solid element is articulated with sandstone (See Figure 3.44). Sandstone is also used as the windowsill for the clerestory and further articulated with a sandstone lintel.

The steel construction is more detailed than I anticipated. Apart from the standard corrugated iron bolted to standard purlins, the complexity lies within the steel roof truss supporting these purlins. It incorporates tension rods to anchor the composite steel trusses, creating a thin profile for the roof structure, while the ceiling, according to Bester (2015), has its charm as, tongue and groove timber planks are fixed to the truss (See Figures 3.45-3.47). He further explains the tensile properties of the trusses consisting of 40mm x 40mm steel angle irons along with 10mm steel rods kept in tension while spaced every 2 meters (Bester, 2015:42-98). Figure 3.51 reveals how simple this structure is, with its footprint of 23 500mm x 8 200mm. A symmetrically designed structure with gables on the North and South. The only key differences are the large wooden doors on either end. The southern door is centred compared to the northern door which is offset from the central axis. Lastly, the pumpstation obscures an estimated three-meter-deep void, the original housing of the mechanical water pump.

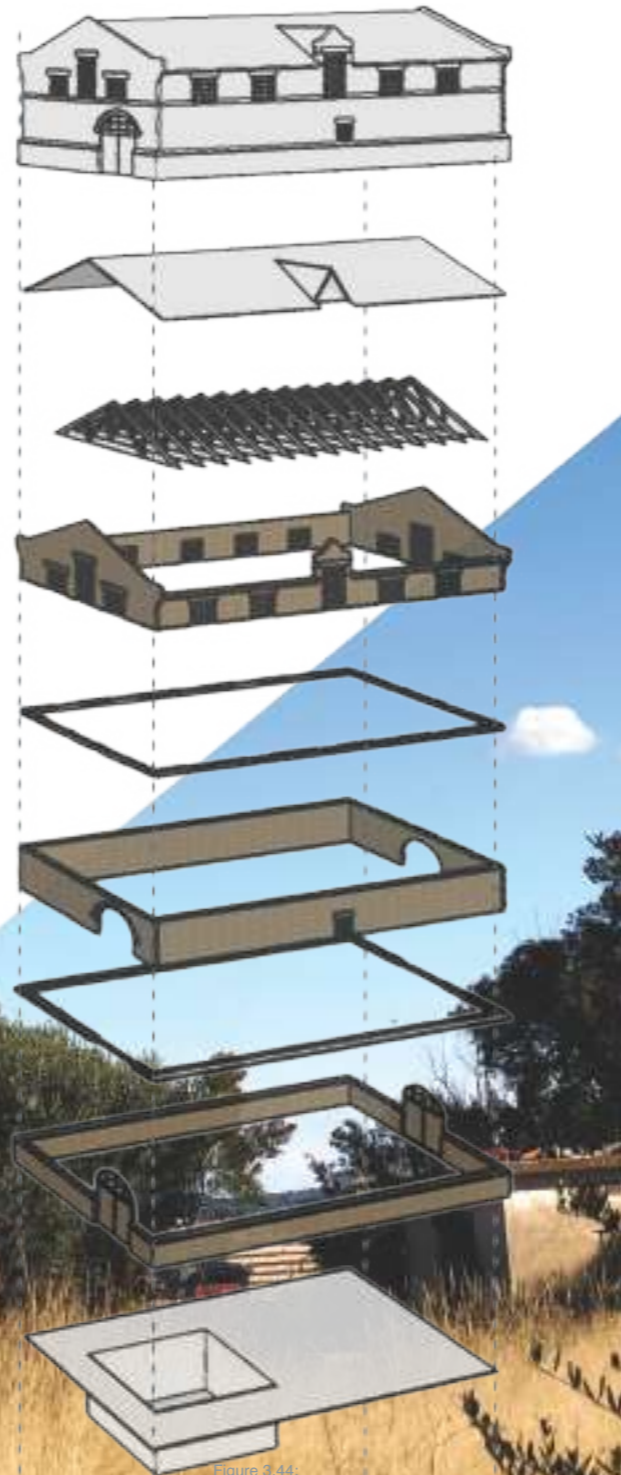


Figure 3.44:



Figure 3.43:



Figure 3.45:



Figure 3.46:



Figure 3.47:

Figure 3.45: Steel fittings inside the pump station, (Bester, 2015).  
 Figure 3.46: View from the mezzanine floor windows, (Bester, 2015).  
 Figure 3.47: Steel fittings inside the pump station, (Bester, 2015).

### 3.14.2 Water reservoir

Beneath the ground lies four water reservoirs, large enough to hold almost 6 million litres of water. The size of each reservoir is 8 meters wide, 8 meters high, and 45 meters long. It is built with rough aggregated concrete floors, concrete block walls and brick vaulted ceilings with a layer of concrete cast over. This giant water infrastructure is believed to have been decommissioned at the end of the 19th century due to its insufficient elevation (Botes, 2021). Strategically located on Naval Hill, where the natural topography would allow the use of gravity to lead water to nearby residences. It was, however, unsuccessful as it was unfortunately not built high enough. At the time Bloemfontein did not have the infrastructure to pump water any higher. To ensure clean water was supplied to the young and developing city, more water reservoirs were built. New lower-level service reservoirs were constructed on Signal Hill and Naval Hill, while highland reservoirs were constructed on Grant Hill. These larger reservoirs, built within relative proximity to each other, provided effective water supply to the nearby developing areas. Even unused, the historical ambience of these submerged vaults sparks the imagination. The subterranean structures built to hold a large body of water now stand empty, yet full of potential. The atmosphere within this reservoir is breath-taking while possessing qualities that entice the imagination (See Figure 3.50). Any underground structure of the past possesses an astonishing aura, for example the Basilica Cistern in Istanbul, built in the year 532, has absolutely breath-taking symmetry and grandeur (Lonely Planet, 2022). This can be compared to the Oliewenhuis Art Museum's renovated reservoir seen in Figure 3.48 and 3.49. Financed by the National Department of Art and Culture, this project started in 1996 and was completed in November of 2002 (National Museum, 2022).

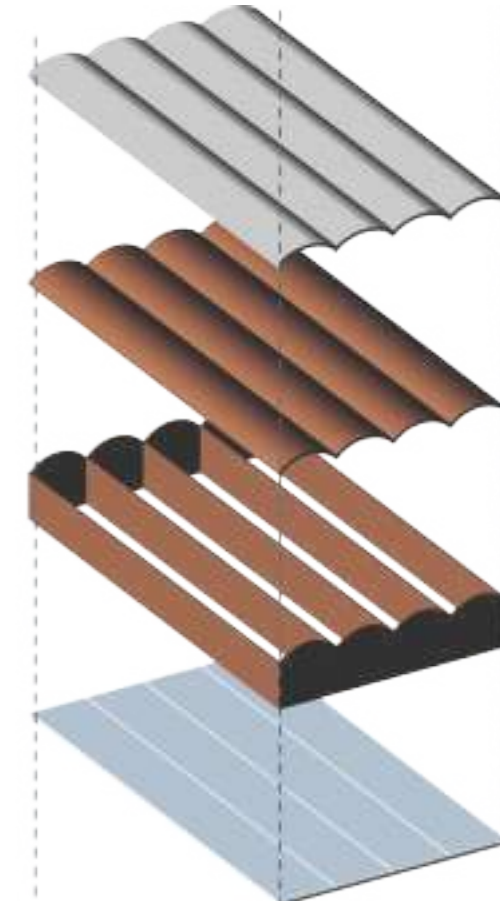


Figure 3.51:



Figure 3.48:

Figure 3.48, 3.49: Oliewenhuis Art Museum renovated reservoir before and after, (nasmus, 2022).  
 Figure 3.50: Expressionist sketch of the inside of the reservoirs, (Author, 2021).



Figure 3.49:

Figure 3.51: Exploded isometric of the underground water reservoirs, (Author, 2021).



Figure 3.50:

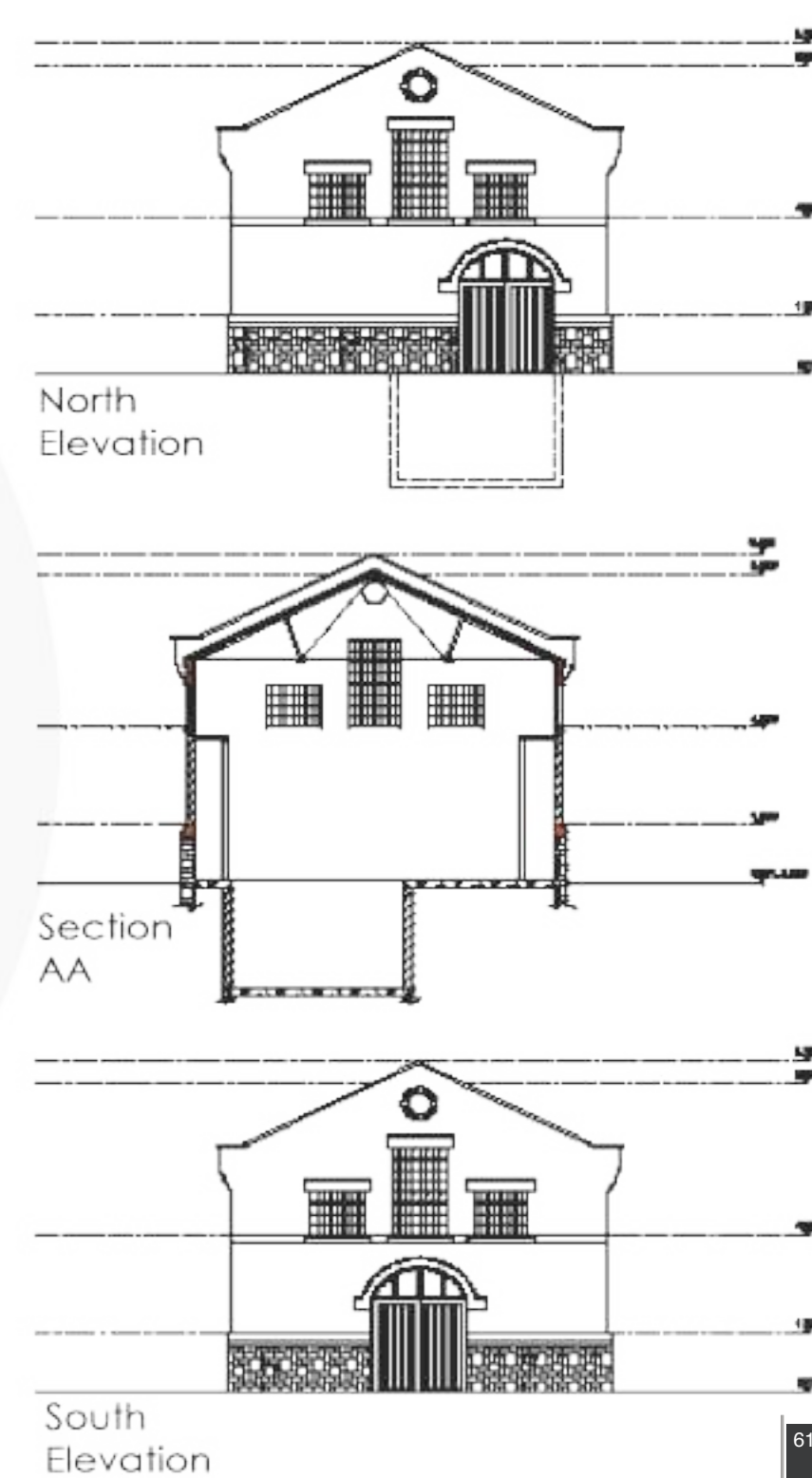
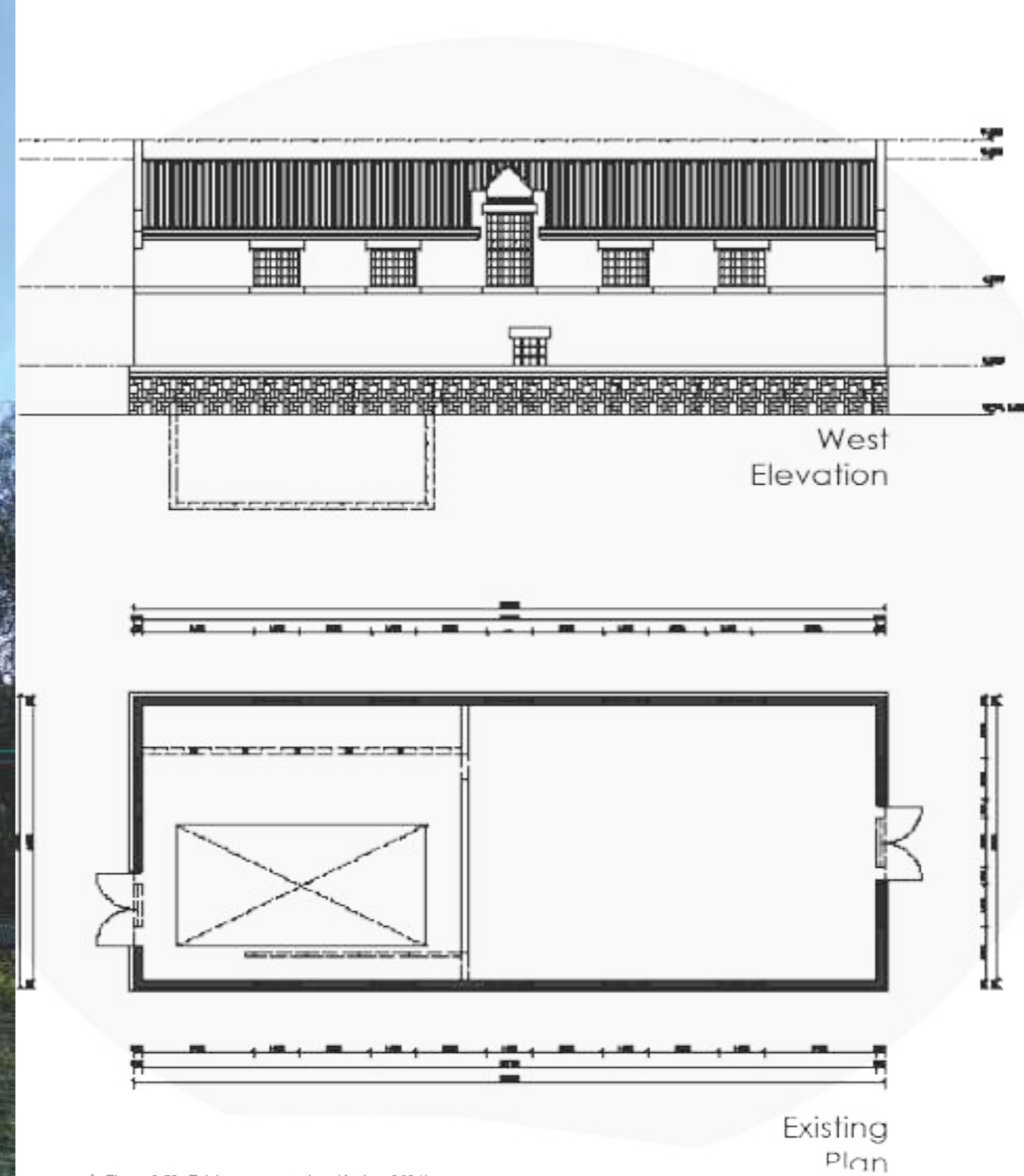


Figure 3.52: Existing pump station, (Author, 2021).  
 Figure 3.53: Redrawn documentation of the existing, (Bester, 2015).

### 3.16 Heritage strategy

Forgotten narratives are all that remain of historical buildings as their stories fade with time. As those that embodied the space pass away, so do their memories. Daily rituals of the original occupants are hard to deduce. Unfortunately, the pumpstation has outlived its functional purpose while leaving behind limited historical documentation. This structure has not quite dilapidated into ruins, and it still embodies a sense of nostalgia and decay. Any new architectural intervention would be required to respect the historical remnants. Historical structures must be respected and understood for their previous significance, whether it is monetary or historical value.

This project aims to reveal the hidden structures while bringing the submerged structures to the surface. Before the SA-AS facility can propose a reappropriation of heritage structures, it is fundamental that the cultural significance be quantified. Currently, the buildings' value is being overlooked which in turn leads to further neglect and disarray. The Burra Charter (Australia ICOMOS, 2013) is generally used to evaluate and calculate historical value. Also, this charter is used to understand what the consequences on the community would be if a heritage building is demolished. The Burra Charter consists of ten steps divided into three core aspects that evaluate conservation (Australia ICOMOS 2013.). These three aspects are heritage consideration, implementation of protective policies, and the management of these policies. Designers' guidelines are generated from these policies that shape the historical matrix of sensitive architecture (Walker & Marquis-Kyle, 2004).



#### The Burra Charter Process

Sequence of investigations, decisions and actions

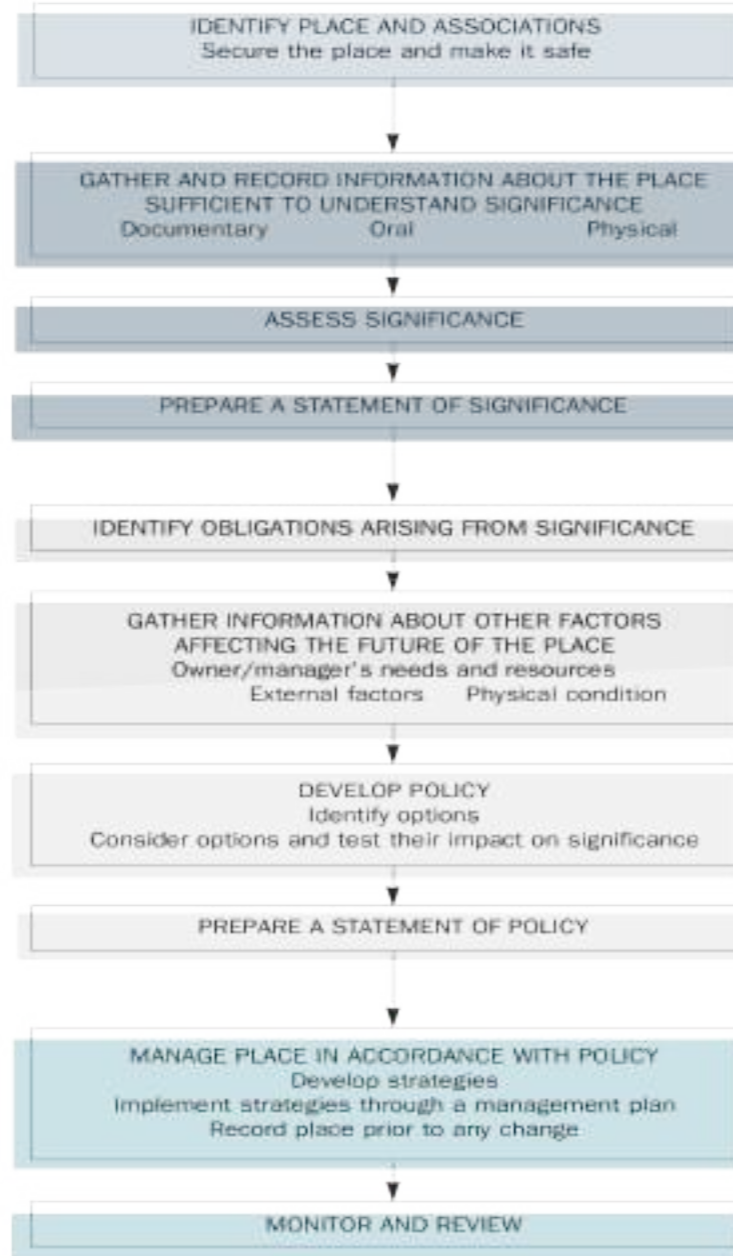


Figure 3.55

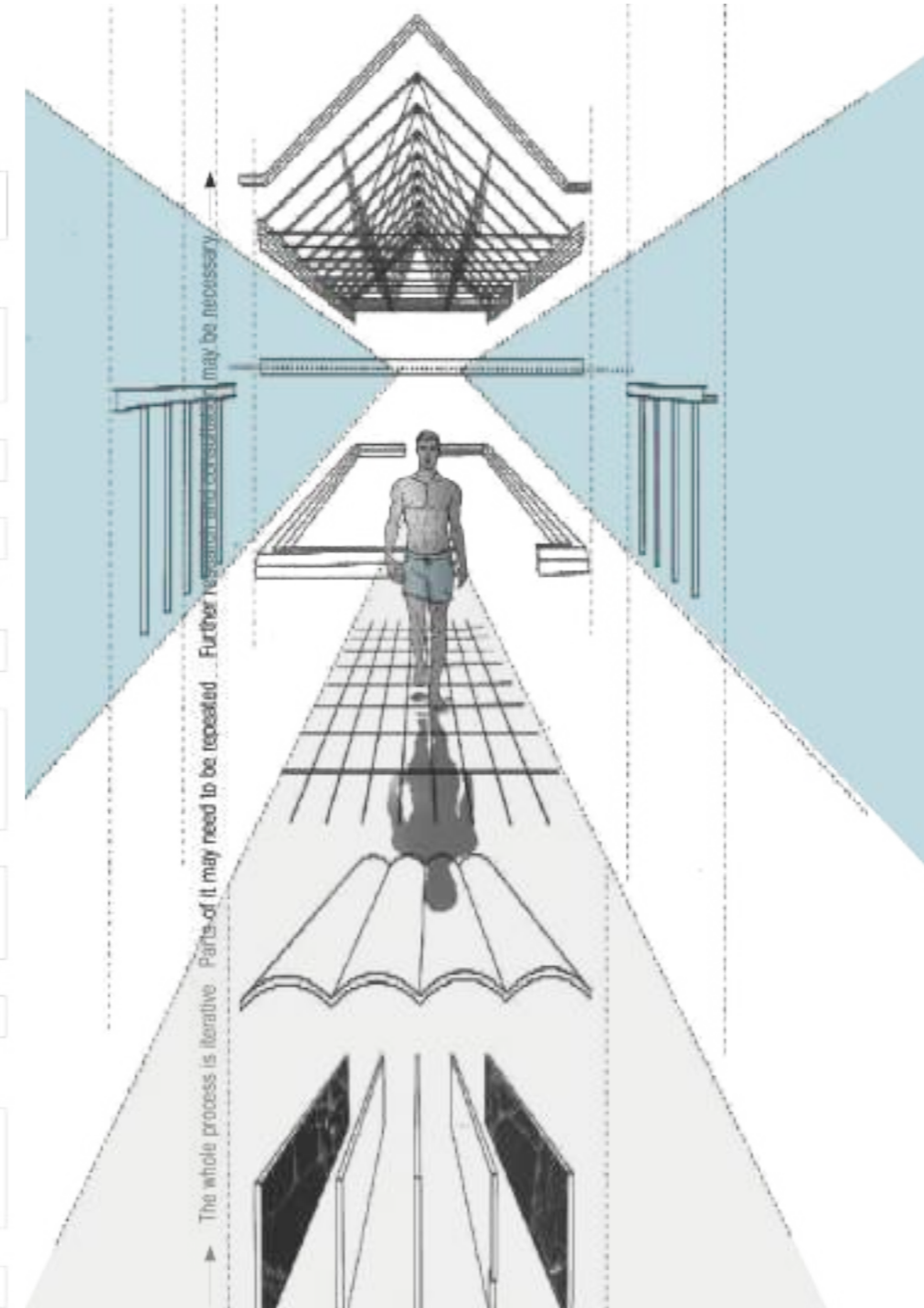


Figure 3.56

#### 3.16.1 Heritage consideration

The pumpstation was built by the Bloemfontein waterworks in 1898. It was designed to only house the mechanical infrastructure to pump large quantities of water. Once filled, gravity would push water out from these large reservoirs to the nearest community. Functionally this structure seems valuable, however, the Burra Charter (2013) quantifies cultural details over functionality. The Burra Charter highlights the importance of investigating significance within structure and details. One such an important detail is the west-facing gable. This gable contains the mark of King George VII (Schoeman, 1980). Bester (2015) theorizes that this gable was built later and was inspired by King Eduard's sister, princess Christian van Sleswijk-Holstein. She spent an entire day exploring the military outpost on Naval Hill (Schoeman, 1980; Bester, 2015). However, no official documents support that this gable was indeed the result of the princess' visit. The only supporting factors are that this gable was not part of the original construction, was installed sometime after princess Christian van Sleswijk-Holstein's visit and contains the mark of King George VII (Schoeman, 1980).

Places of historical and cultural significates enrich people's lives, spaces that inspire communities while improving the lived experience (Walker & Marquis-Kyle, 2004). At first glance the pumpstation lacks cultural significance. Its pragmatic industrial architecture and detailing indicate a purely functional rather than cultural importance. Although, this is not to say there are no cultural significance to the pumpstation, due to its topological rarity and documented sacristy of similar structure the cultural value can be derived from its representation of unrecorded voices of the historical development of the Bloemfontein city. That's why most of the structure must be left untouched. This specific context asks for more than only the preservation of a moment in time. This historical structure and water reservoir require an innovative palimpsest that would preserve most of its existence. The proposed design can then reveal that which is hidden, similar to how the facility exposes individuals who are afraid to be heard and allows the unheard to be heard and the unseen to be seen.

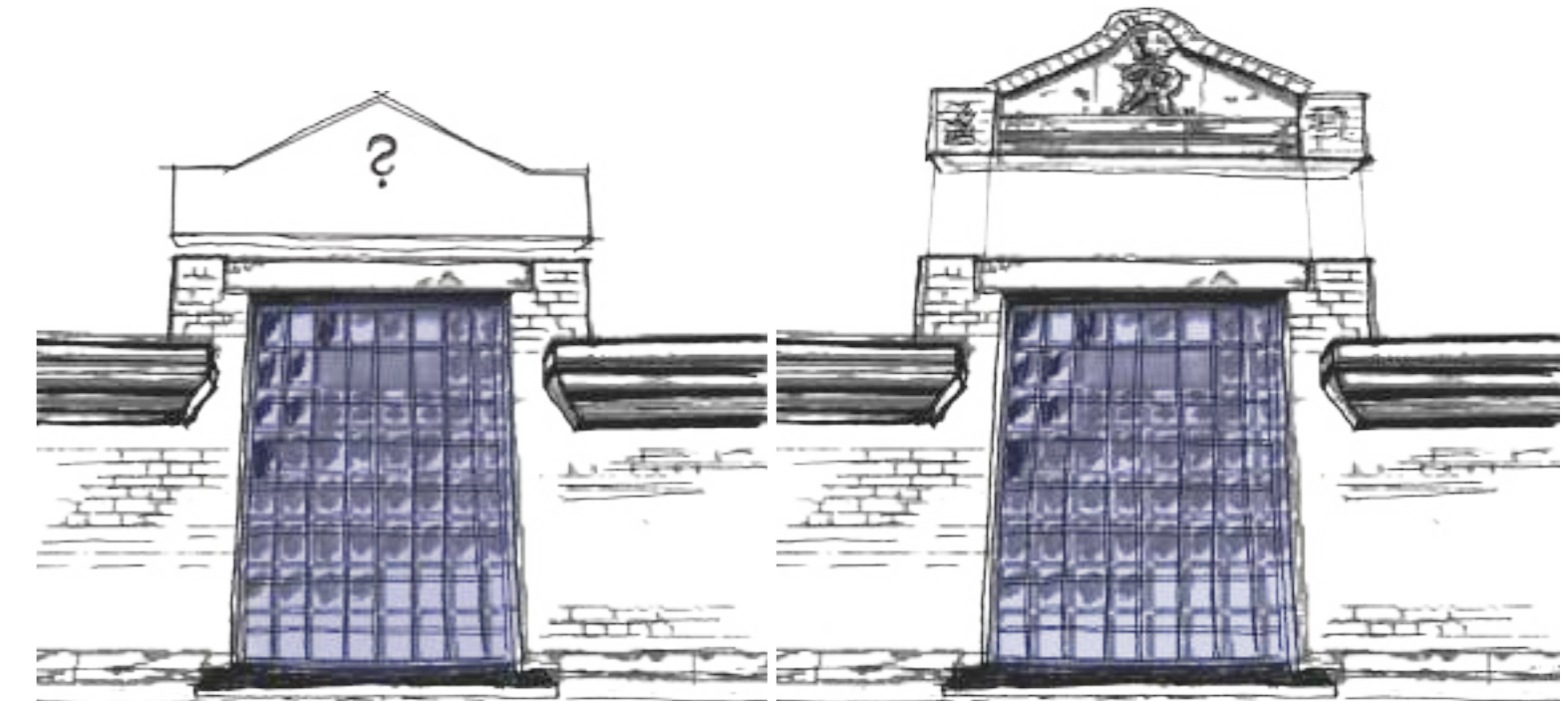


Figure 3.57: Water used as frozen moments in time, presented as a palimpsest over a typical Cape-Dutch gable style facade, (Author, 2022).  
Figure 3.55: The Burra Charter, (Walker, 1999).  
Figure 3.56: Walking through the structural fundamentals of the historical, (Author, 2021).

Figure 3.58: Sketch of the West-facing gable, showing how the gable changed as well as giving clues as to where the theory came from, (Author, 2021).

Conservation is grounded in respecting the existing fabric of history. The Burra Charter revolves around changing as much as necessary while changing as little as possible (Walker & Marquis-Kyle, 2004), meaning that the least interfering approach is often the best approach to adaptive reuse. This places emphasis on detailing the dialogue between new and existing. Accentuating the conversation between history and present, while accommodating new functions and giving new life and exploring lines of flight. What came before takes precedence while aiming to retain and amplify spatial experiences. While the pumpstation and water reservoirs lack obvious cultural importance, they gain value because they were the catalyst to cultural growth. Subsequently, the following list of policies adheres to the Burra Charter principles. These principles preserve continuity.

- The existing pumpstation's longitudinal axis is orientated North to South (See Figure 3.60). Provisions will be made to allow natural sunlight to spread throughout the interior. A possible solution would be slim openings or slits cut into the facades for sunlight to penetrate. A more sensitive approach would be to design an open floor area offset from the exterior walls, allowing light to circulate throughout the interior (See Figure 3.61).
- The water reservoir poses a certain mystical sense of place. This spatial intimacy must be enriched and made public. Therefore, the architecture lies on the edge of the historical mystic, whilst subjected to the historical (See Figure 3.61).
- Any new intervention must remain subject to the existing, meaning that new structures should not be higher than the old. This is in conjunction with the Burra Charter that describes the importance of consideration to scale, form, and character (Walker & Marquis-Kyle, 2004).
- Reacting on the existing materiality of rusted iron, sandstone, cut sandstone, and brick, the new structure should contrast the existing morphology, while trying not to be overpowering. According to the Burra Charter (Australia ICOMOS 2013), any new work should respect the significance of the historical place. This is accomplished through careful consideration of materiality. New work should not be overwhelmingly bulky. Textures that imitate existing materials must be avoided (Walker & Marquis-Kyle, 2004). These principles limit aesthetic competition and encourage designs that would complement the existing structure. Architectural delicacy can contradict the bulky brick and stonework of the existing structure.



Figure 3.59:

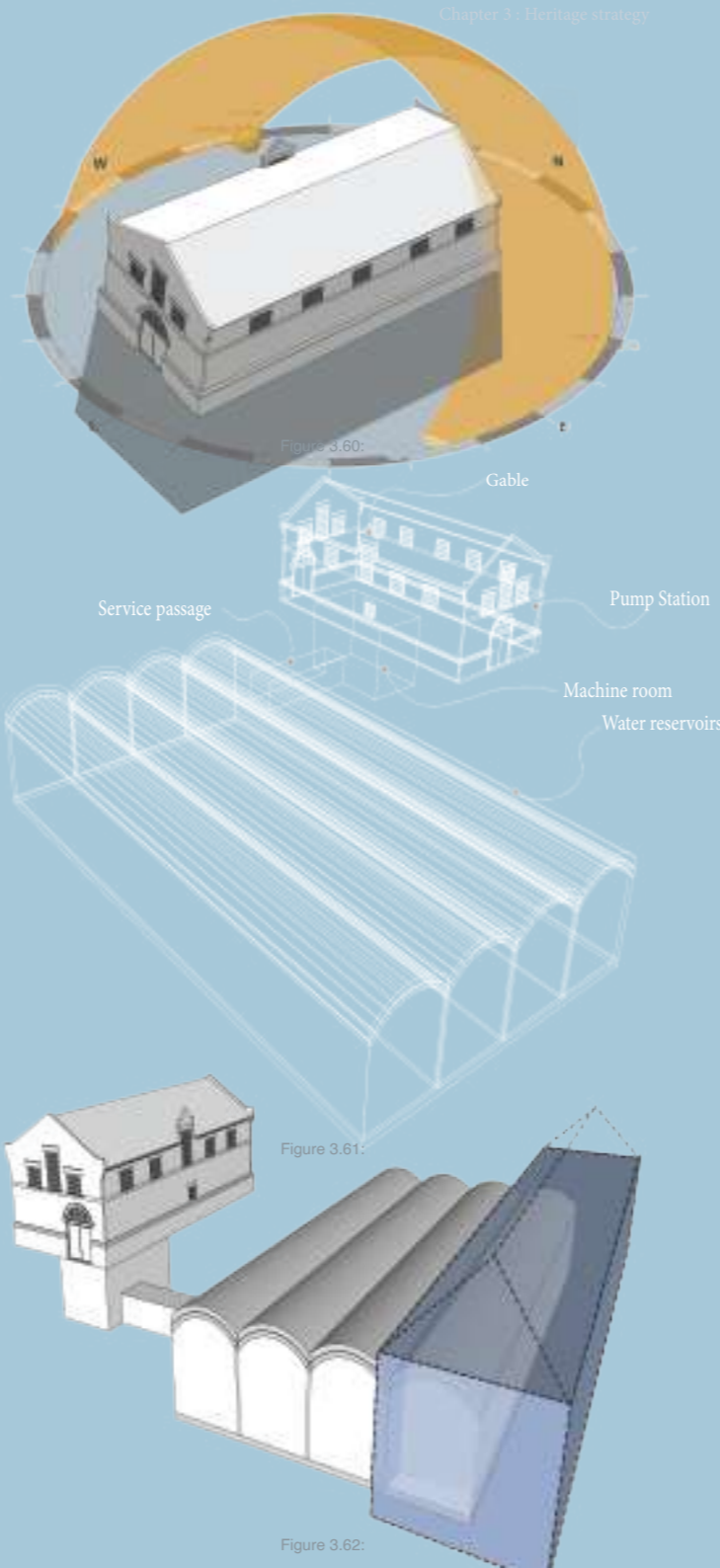


Figure 3.60:

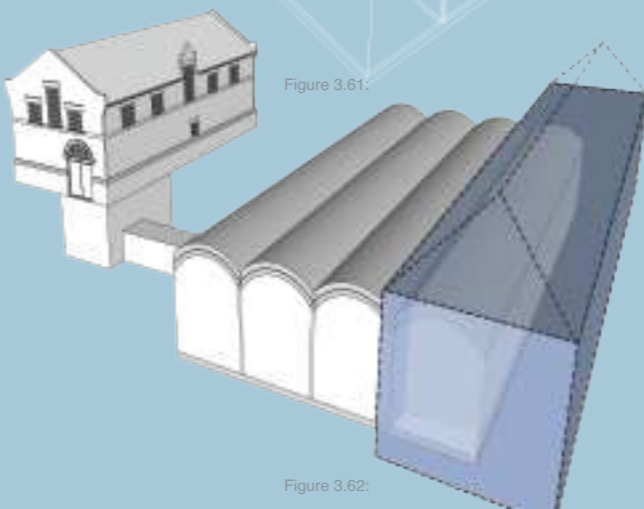


Figure 3.61:

## 3.17 Mesoscopic

This section aims to draw a clear image and provide deeper understanding of the site through a mesoscopic view. Six relevant aspects need to be mentioned, namely surrounding masses, height restrictions, routes and access, vantage points, contextual heritage, and lastly a few general zoning restrictions.

### 3.17.1 Surrounding masses

Figures 3.63 and 3.64 focus on the surrounding masses, comparing the solid to void, as well as indicating the municipal zoning. The blue spaces indicate residential areas. These large buildings are spaced fairly far from each other to optimise surface area for parking spaces. The green zones are public park areas and are most often used for social gatherings. Unfortunately, these spaces have become notoriously dangerous. The red zone is, according to municipal documents, demarcated as nature preservation. The proposed site is indicated in blue, showing that the pumpstation is part of the Franklin Nature Reserve.

### 3.17.2 Height restrictions

Taking into consideration the heights of neighbouring buildings, it is surprising that only one building is visible from the site, situated to the west, a stone's throw away. It has nine storeys and dwarfs the surrounding average



Figure 3.59: Nollie diagram of access routes, (adapted by M. Winkler, 2020).  
 Figure 3.60: Even considering the vast interior space equipped with only a light story, a lot of light floods the interior. Perhaps it is not necessary for more windows but only for a clever design solution, (Bester, 2015).

structures of no more than three storeys. The closest, as well as the tallest, building is the La Triomphe Apartments. Fortunately, this leaves the rest of Bloemfontein open to admiration from afar. One can easily view the city while only standing on top of the water reservoirs.

### 3.17.3 Routes and access

Currently, the entrance closest to Naval Hill is the only available route of access due to dense foliage and rough terrain and the presence of protected nature reserve property. The site is accessible by vehicle to the north and partially accessible on foot from the southern entrances. Reaching the pumpstation from the south is difficult on foot and vehicles will only get as far as 20 meters into the site. This route is regularly challenged by runners, daring to overcome the steep elevation and forest-like overgrown vegetation. This extreme thoroughfare is often used as a shortcut to access Naval Hill. These routes marked out in Figure 3.65 are the only possible means of passage.

### 3.17.4 Vantage points

These are romantic spots where dense trees give way and reveal contextual beauty of unique panoramas of the urban landscape, unmatched by any other site in Bloemfontein. Here one can appreciate just how elevated the water reservoirs are.



Figure 3.61: Blueprint anatomy of the existing pump station and reservoirs, (Author, 2021).  
 Figure 3.62: Blue outlines a reflection of the existing, placed on the edge of the underground reservoir, (Author, 2021).  
 Figure 3.63: Nollie diagram of surrounding massing, (Author, 2021).

### 3.17.5 Contextual Heritage

Figure 3.68 maps out the historical structures nearby, demarcating the Olliewenhuis Art Museum, Arthur Nathan Swimming Pool, the Orchid House, and Freshford House Museum. Each of these has its history and made its impact on the story of Bloemfontein. This diagram aims to provide an intrinsic overview of structures of similar ages, visualizing the timeline applicable to this study.

### 3.17.6 General Restrictions

According to the Mangaung Metro Municipality zoning regulations the current site is reserved for a private nature reserve, therefore rezoning to a general business zone is required. The erf would have to adhere to the local building regulations and restrictions and municipal by-laws such as those found within the Mangaung Metropolitan Municipality land use scheme, that places restrictions on general business zones of Gymnasia outside of the Central Business District to a height restriction of 3 storeys, 75 % coverage and 1.5 bulk factor (Mangaung Metropolitan Municipality, 2021). These most basic restrictions for general business use are shown in Figure 3.67.

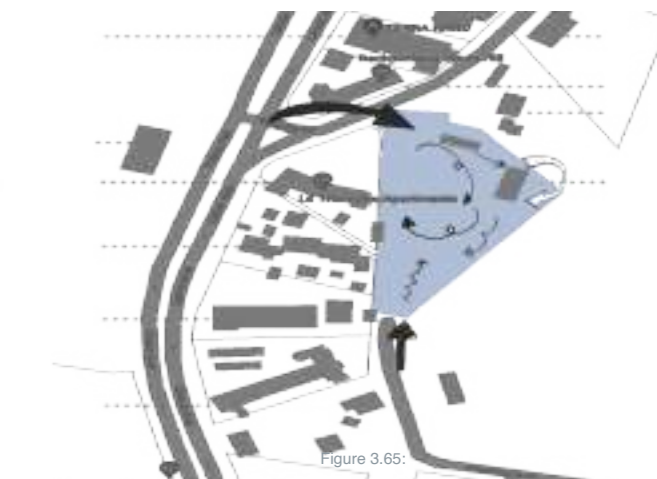


Figure 3.64: Nollie diagram indicating building heights, (Author, 2021).  
 Figure 3.65: Nollie diagram of access routes, (Author, 2021).

### 3.18 Microscopic

The study is now limited to the site boundaries to search for physical and phenomenological clues toward an architectural synthesis. A micro-analysis is a simple overview of location as indicated in Figure 3.69. This three-dimensional representation of the site cuts away all factors beyond its boundaries, exploring the natural influences directly on site. This typical site investigation covers basic information such as wind direction, topography and solar path. However, this site does encapsulate many unique elements apart from the steep contours. It includes a 6-meter-high cliff (indicated in jagged black) and a romantic canopy greeted by tall slender trees (shown in green). The structures are of course vacant while gravitating closer and closer to devastation. Bordering the urban fabric these structures are not part of the city, at least not on SG diagrams or cadastral data. However, the topology of Naval hill indicates otherwise.

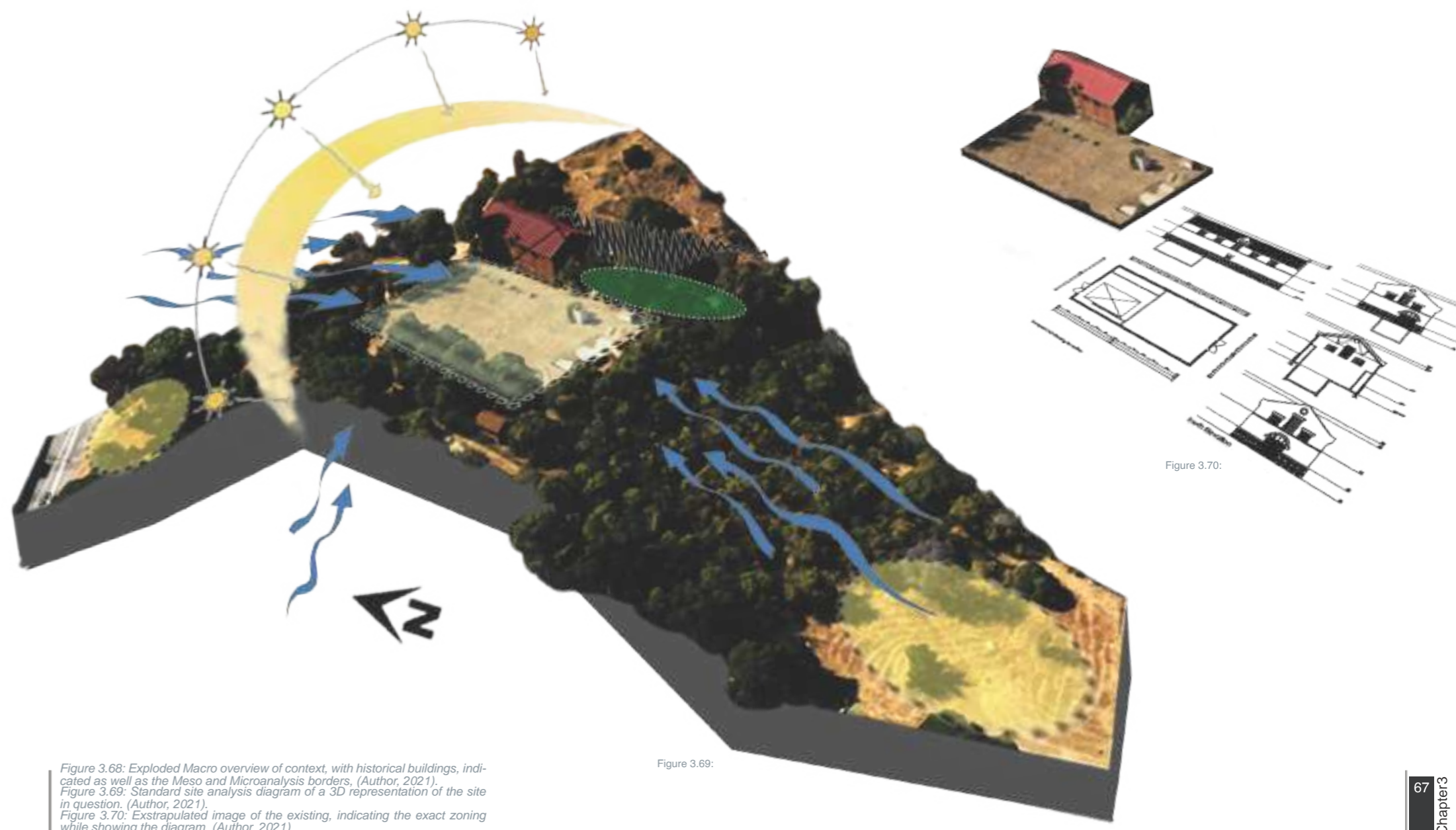
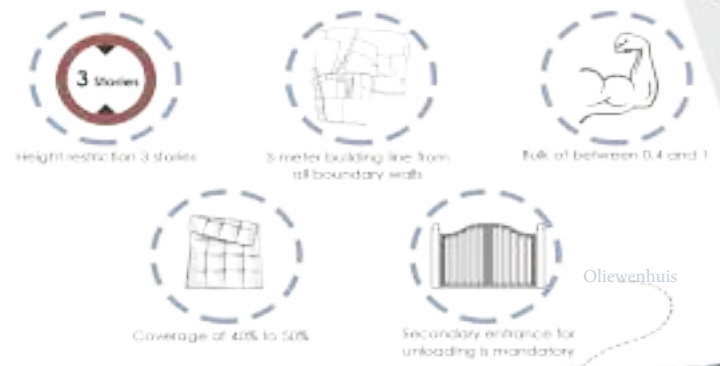
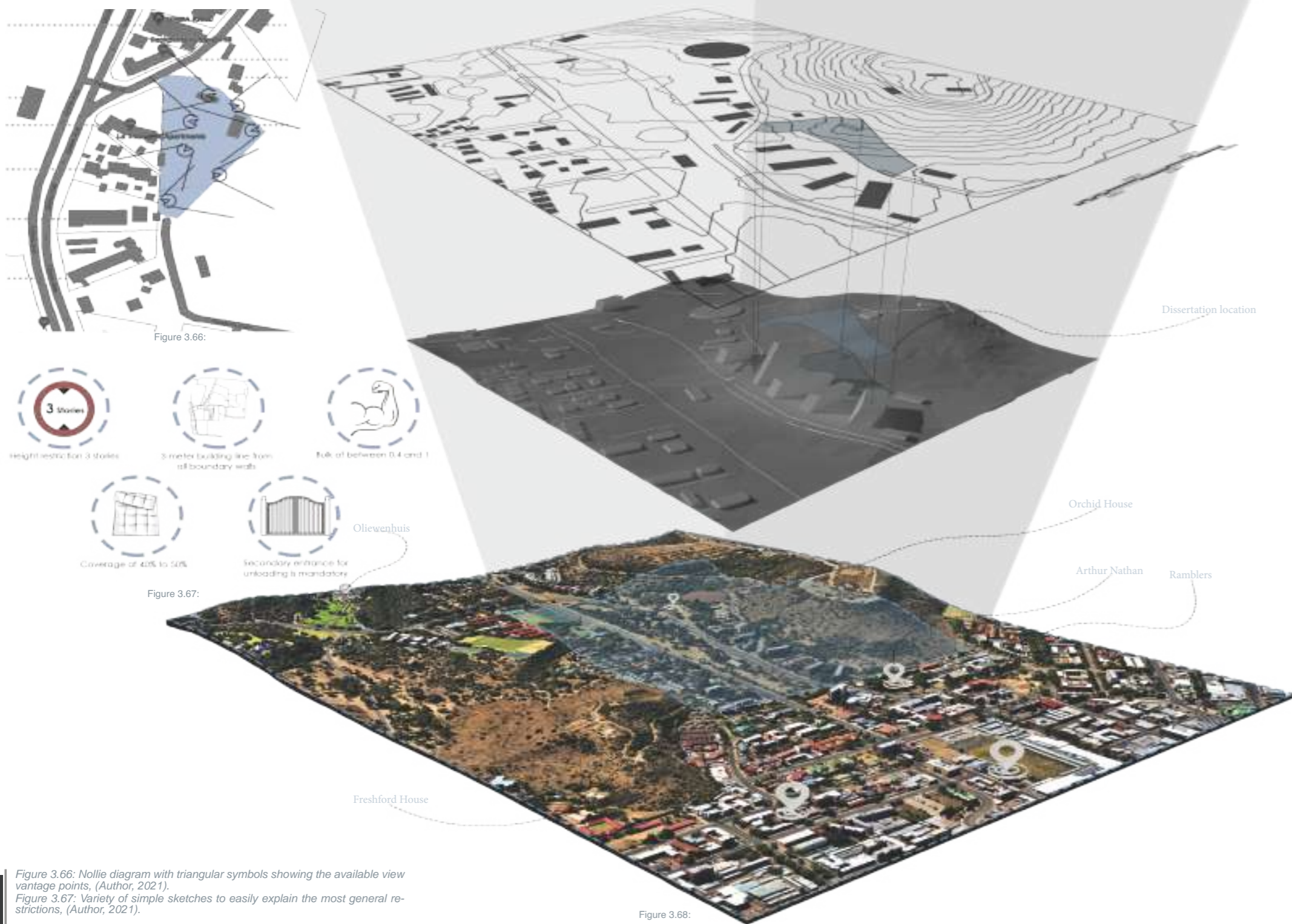


Figure 3.66: Nollie diagram with triangular symbols showing the available view vantage points, (Author, 2021).  
Figure 3.67: Variety of simple sketches to easily explain the most general restrictions, (Author, 2021).

Figure 3.68:

Figure 3.68: Exploded Macro overview of context, with historical buildings, indicated as well as the Meso and Microanalysis borders, (Author, 2021).  
Figure 3.69: Standard site analysis diagram of a 3D representation of the site in question, (Author, 2021).  
Figure 3.70: Extrapolated image of the existing, indicating the exact zoning while showing the diagram, (Author, 2021).

Figure 3.69:

## 3.18.1 Scale

Figure 3.71 expresses the scale and magnitude of the site, an estimated 12 000 square meter (m<sup>2</sup>). The elevation change in height from street level is 18 meters equivalent to 6 storeys.

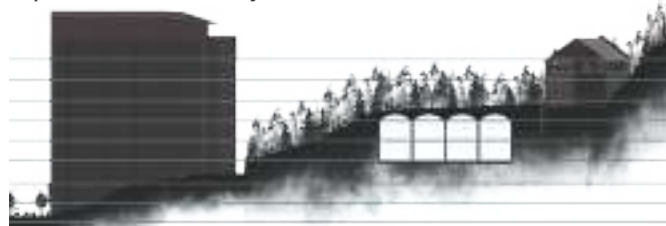


Figure 3.71:

## 3.18.2 Scale of existing

Figures 3.72, 3.73, and 3.74 are scale representations of the existing pumpstation and water reservoir. As explained earlier each reservoir is 8 meters wide, 8 meters high, and 45 meters long. These figures present the magnitude of scale within this space. I included human and vehicle silhouettes to make the absolute scale of these spaces apparent. The almost 10 meter high existing pumpstation is presented to scale. Note how human figures are dwarfed by such a large interior volume.

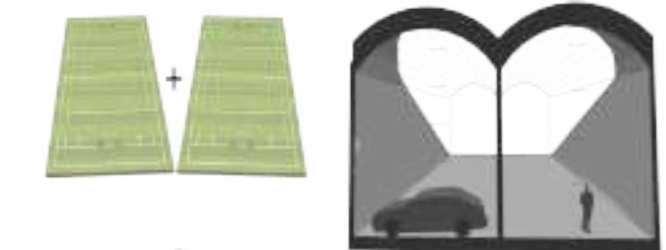


Figure 3.72:



Figure 3.73:



Figure 3.74:

## 3.18.3 Wind, Water

Wind and water are two opposing and complementary elements of beauty and destruction in nature. These two elements can be disastrous if ignored. Water rushes down from Naval Hill during the rainy seasons. The average precipitation of 113.00 mm is in February, known for being Bloemfontein's wettest month (Weather&Climate.co.za, 2022) Without a deliberately detailed solution, this would cause severe problems with stormwater (Figure X). Well-placed water channels will resolve most drainage issues as well as improve the overall sense of place, this will later be explained in detail within the technical report section of this dissertation.

Wind on the other hand, may also be a challenging factor in some circumstances. Because of the elevation, the pumpstation is exposed to uncomfortable winds. Figure X indicates the average wind on site. This wind rose diagram superimposed on site, shows the average wind direction during every hour of the year. According to ClimateBloemfontein.com, the most dominant wind direction is from south-west to north-east with a total of 1-000 hours a year at a maximum speed of 38 km/h (Climate Bloemfontein.com, 2022). South-western winds affect the proposed site more than the North-eastern due to the large mass of Naval Hill sheltering the site from wind coming in from the North-East. The technical section will discuss how the South-Western wind is used to naturally ventilate the facility by opening the Southern face and including smaller courtyards on the North.

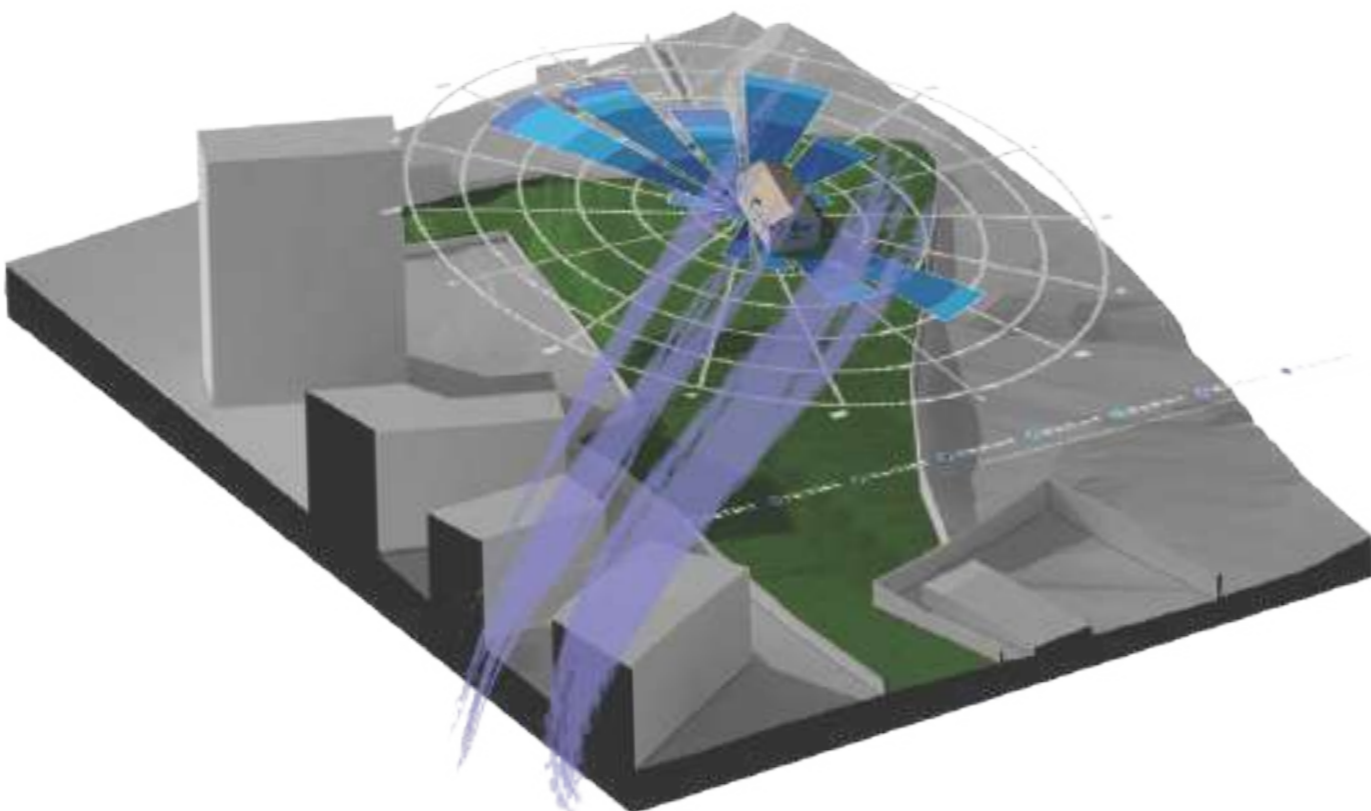


Figure 3.75:

Figure 3.74: CAD-Drawing detailed section of the existing pump station to show scale, (Author, 2021).

Figure 3.75: Monochrome render indicating wind and water effect, (Author, 2021).

Figure 3.76: Sectional sketch of 1850, (Author, 2021).

Figure 3.77: Sectional sketch of 1898, (Author, 2021).

Figure 3.78: Sectional sketch of 1900, (Author, 2021).

Figure 3.79: Sectional sketch of 2021, (Author, 2021).

Figure 3.80: Contextual plan indicating the location of the excessive excavation, (Author, 2021).

Figure 3.71: CAD section drawing in proportion to show the elevation from street level, (Author, 2021).

Figure 3.72: 3D monochrome rendering of the site, showcasing scale, (Author, 2021).

Figure 3.73: CAD-Drawing section of the existing reservoir, to indicate scale, (Author, 2021).



Figure 3.76:

Figure 3.77:

Figure 3.78:

Figure 3.79:

## 3.18.4 Earth domination

The pumpstation dominates natural water supplies to siphon water to nearby residences, just like the construction process of the pumpstation dominated the landscape to build a large structure against the side of a hill. Figures 3.76, 3.77, 3.78, and 3.79 show the progression of landfilling and excavation needed to bury the water reservoirs and pump. This completely altered the landscape topography.

Figure 3.77 indicates the extent of this excavation. Just north of the pumpstation lies a hidden, smaller excavation site: a roughly 6-meter deep crater. The original contractors of this pumpstation had to level a large area. Even though they cut deep into Naval Hill and ended up cutting out a 6-meter-high cliff, they still did not have enough soil to cover and secure a compacted soil bedding for the reservoirs. These actions that left a crater and the unnatural cliff edge just beside the pumpstation are examples of how the play of dominance over dominated continues.

Please note, that this is not an argument in favour of landfill and landscape devastation, merely a theoretical argument, linking the tension in domination between the impaired and the speaker, the architect and architecture, new against old, and infrastructure versus nature.

## 3.19.5 Noise

Surrounding noise pollution is negligible. Only during events and extreme circumstances can the surrounding areas be heard on site. Figure 3.80 indicates where noise will generally originate from. These areas include popular social gatherings and sporting events that occur around the Nelson Mandela statue. Another major noise contributor is passing traffic. Fortunately, the site is set back into Naval Hill and is most often a very serene and quiet area.

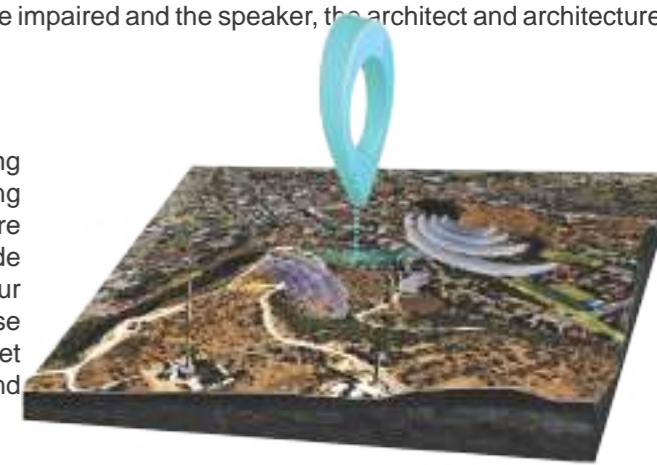


Figure 3.80:

## 3.19.6 Materiality mood board

These accumulative materials shown in Figure 3.81 to 3.87 present the site ambience: a combination of different materiality, all advertising the silent features embedded within the sense of place. The Burra Charter recommends that designers should use elements that complement or contradict the historical mood board. As with any new intervention, materiality must be distinguishable from the old (Walker & Marquis-Kyle, 2004).

Danny Besters' photos of the pumpstation, site and reservoirs are captivating windows to the year 2015. It is remarkable how dramatically the erf changed in six years. Currently it is impossible to gain access to the barricaded pumpstation and dangerous to throw oneself into the underground reservoirs. Bester's (2015) site visit shows more complete images, as since then any remnants of metal have been stripped. The following images compare the variation in time, conveying the overall change in atmosphere. These photos demonstrate the materiality and the shift in genius loci (spirit of place) (Norberg-Schulz, 1980).



Figure 3.81:



Figure 3.82:

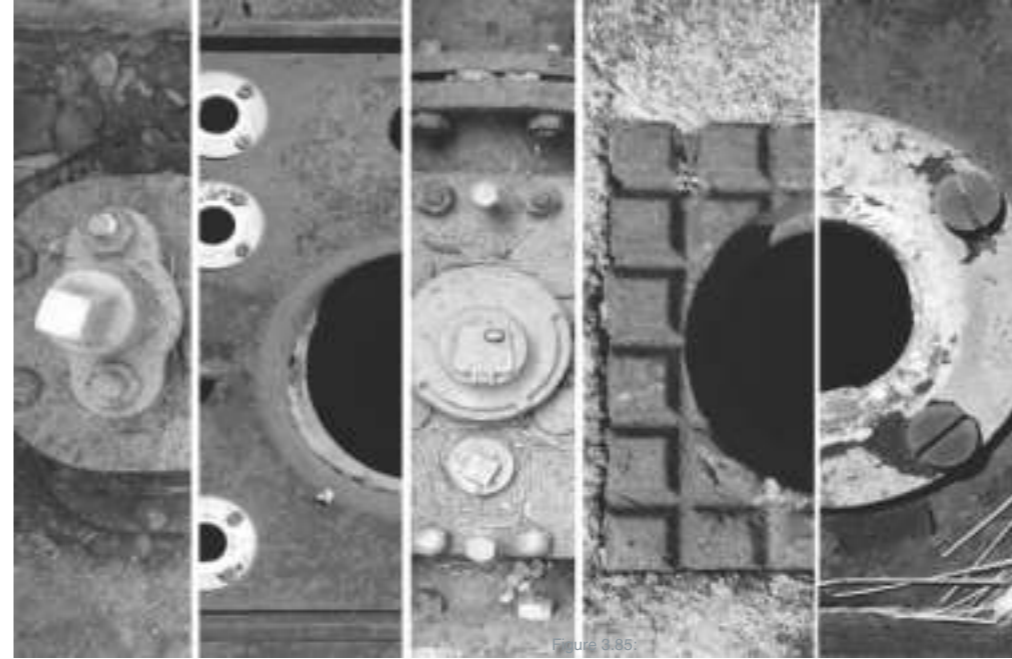


Figure 3.85:



Figure 3.86:



Figure 3.83:



Figure 3.84:



Figure 3.87:

70  
 Figure 3.81: Service entrance to water reservoirs in 2017, (Bester, 2017).  
 Figure 3.82: This is the present state of the service entrance to water reservoirs, (Author, 2021).  
 Figure 3.83: These photos were taken from inside the water reservoirs in 2017, (Bester, 2017).

Figure 3.84: Currently the only entrance to the underground water reservoirs, occupied by a displaced individual. At the time of this dissertation the reservoirs only had one entrance and one exit, going down there is looking for trouble, (Author, 2021).

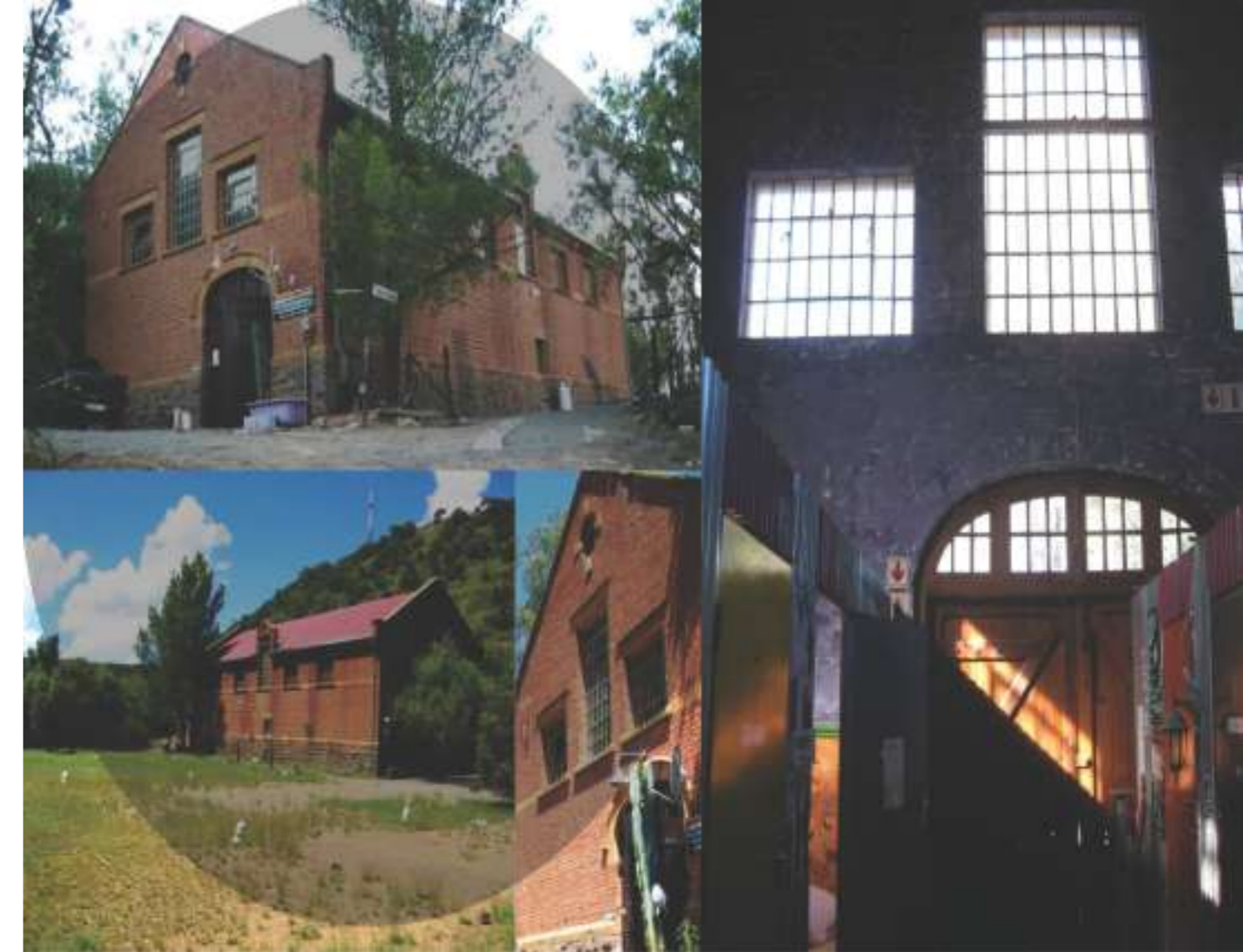
Figure 3.85: Detailed metal fittings, photo taken in 2017, (Bester, 2017).  
 Figure 3.86: This is the only metal detail still present on site. The rest have been removed due to vandalism, (Author, 2021).  
 Figure 3.87: The only neighboring building visible from the site, (Author, 2021).



### Chapter 3 : Conclusion 3.19 Conclusion

The pumpstation and water reservoirs have opened intangible windows into the past. Phenomenological and physical recollections shape our understanding of past influences. Undeniably, these will also affect the design decisions going forward, similar to how the design lenses govern the trajectory of this dissertation. Many other preliminary aspects were covered in this chapter, apart from the heritage assessment, such as the client introduction, economical strategies, user profiling and site analysis. The largest part of this chapter is the analytical study of the site by narrowing down the field of study from a macro analysis to a study on materiality found on site.

Thus far information on the topic, discourse, and the site has been provided. Morphological experimentation is the only remaining investigation for this study. The following chapter will tie together all the saturated ideas and research into architecture.



“Our bodies and movements are in constant interaction with the environment; the world and the self-inform and redefine each other constantly. The percept of the body and the image of the world turn into one single continuous existential experience; there is no body separate from its domicile in space, and there is no space unrelated to the unconscious image of the perceiving self.” - Juhani Pallasmaa (Pallasmaa & Holl, 2005: 40-41)

Figure 3.88: The displaced were not fond of their picture being taken. They only allowed me to take a photo of their make-shift campsite. (Author, 2021).  
Figure 3.89: These are a combination of photos taken by Danny Bester and assembled by Jaco Oliver, UFS architecture lectures. Notes how different the over hole ambiance was in 2017. (Bester, Olivier, 2021).

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# 04

Fabrication of research and Results of sensory integration

The Agglomeration of conception approaches

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## 4.1 Introduction

Now that all the background music is playing, the architectural symphony can take over. This chapter aims to translate the information of the previous chapters into architecture. Chapter one sets the scene while chapters two and three, explain project details such as theoretical discourse, limitations, and program specifics. These chapters set out a combination of goals and milestones.

Within the early phases of this dissertation, a multidisciplinary research approach was necessary. Referring to the research technique in which tools of diverse disciplines are used to explain the study complexities. This study uses various tools to find a coherent typology for three separate disciplines. From these avenues a series of design tools were developed that would aid in the architectural development.

This dissertation relies on the successful integration of the application of three intermediate careers, two of which already run in tandem, while the last has mostly been overlooked. Due to the career freedom that speech pathologists have in terms of office requirements, new architectural developments may not be a very popular topic of discussion among pathologists (Bradley, 2022; Brick, 2008). Combined with the various articles recommending easy steps on how pathologists can start their own practices at home, the reason for such freedom is because of how generalized the practice aims to be. Therapists all aspire towards affordable and generalized care, so that therapists could in theory provide care for anyone, anywhere. A very impressive accomplishment, although this is also their downfall. Anri Esterhuysen (2021), a professional speech therapist practising in Bloemfontein, confirmed that pathologists struggle to optimize their facilities.

A pathologist can treat a patient in any space. However, there are no precedents of a space that can treat a patient. Architecture can fit alongside occupational and speech therapy through passive therapy spaces. This chapter details each avenue while conceptualizing the physical manifestations of each.

### 4.1.1 No right answer

Occupational and speech therapists promote out-of-the-box thinking to cure their patients. Cure might not be the right word, as they only teach how to live with the struggle while providing techniques to maintain a stimulative speech. For something such as a stutter, the unfortunate truth is that it never truly goes away. A stutter is only embalmed and kept hidden. Not to dismiss therapy, on the contrary, therapists are indispensable, helping many to break free from their stutter. However, to triumph over a stutter, individuals need to constantly and deliberately implement techniques that have been optimized for their specific circumstances.

Speech pathologists mitigate speech impairment symptoms in numerous ways. Many focus on the rhythms of speech, theorizing that a patient will find it easier to pronounce words if he/she attempts to speak in a slow rhythmic tempo (preferably not a constant tapping beat) in other words a staccato rhythm. Looking beyond the act of speech, pathologists also observe the effects of social interactions. Evaluating the levels of comfort in various social interactions while minimizing the tension or stress that comes from communicating.

Communication anxiety goes unnoticed by most. Intangible stress makes communication difficult, destroys self-confidence as well as prohibits and restricts normal life. Tension reflects in almost every aspect of speech therapy, as a kind of golden thread. The process of translating speech therapy into an architectural concept is thus motivated by tension.

## 4.2 The Intangible tension

The day-to-day life of a person who stutters is constantly in a state of tension. To defuse such a state in a sensual space can only be done through a series of moments of experiences. Speech impairments in and of itself consist of a series of moments. A seemingly timeless moment of struggle, a moment where a single word seems to take minutes to form. Such a voiceless individual has the constant thought of escaping conversations. With every interaction, there are thoughts of absconding the tension. A sensual experience can create or relieve tension (Pallasmaa, 2005). Intangible tension fragments the soul, discourages social interaction, and encourages solitude, where these souls drift away on open water. This concept of "intangible tension" is drawn from speech therapy. The suffering of tension is metaphorically expressed as a sailing vessel lost at sea, while also metaphorically comparing the structural essentials of a ship to therapy. These two comparisons share intrinsic similarities.

Sound cannot exist without direction and interfering waves. Arrhythmic sound produced by a rhetorician would instantaneously cause tension. Consequently, the Tensegrity sculpture was conceptualized. Developed through a series of experimental watercolour paintings shown in Figures 4.1 to 4.8. A fragile sculpture best represents this concept and the emotional fragility of patients. Strings keep the structure floating while tied to an inconsequential foundation (Figure 4.7). This conceptual tensegrity sculpture uses tension for stability, exposing fragility of tension that contributes to difficulties in self-expression. The intangible experience of tension is what drives the conceptual form. Figure 4.3 shows the true majesty of what the intangible must present while the individual's self-confidence reads within each line in tension.

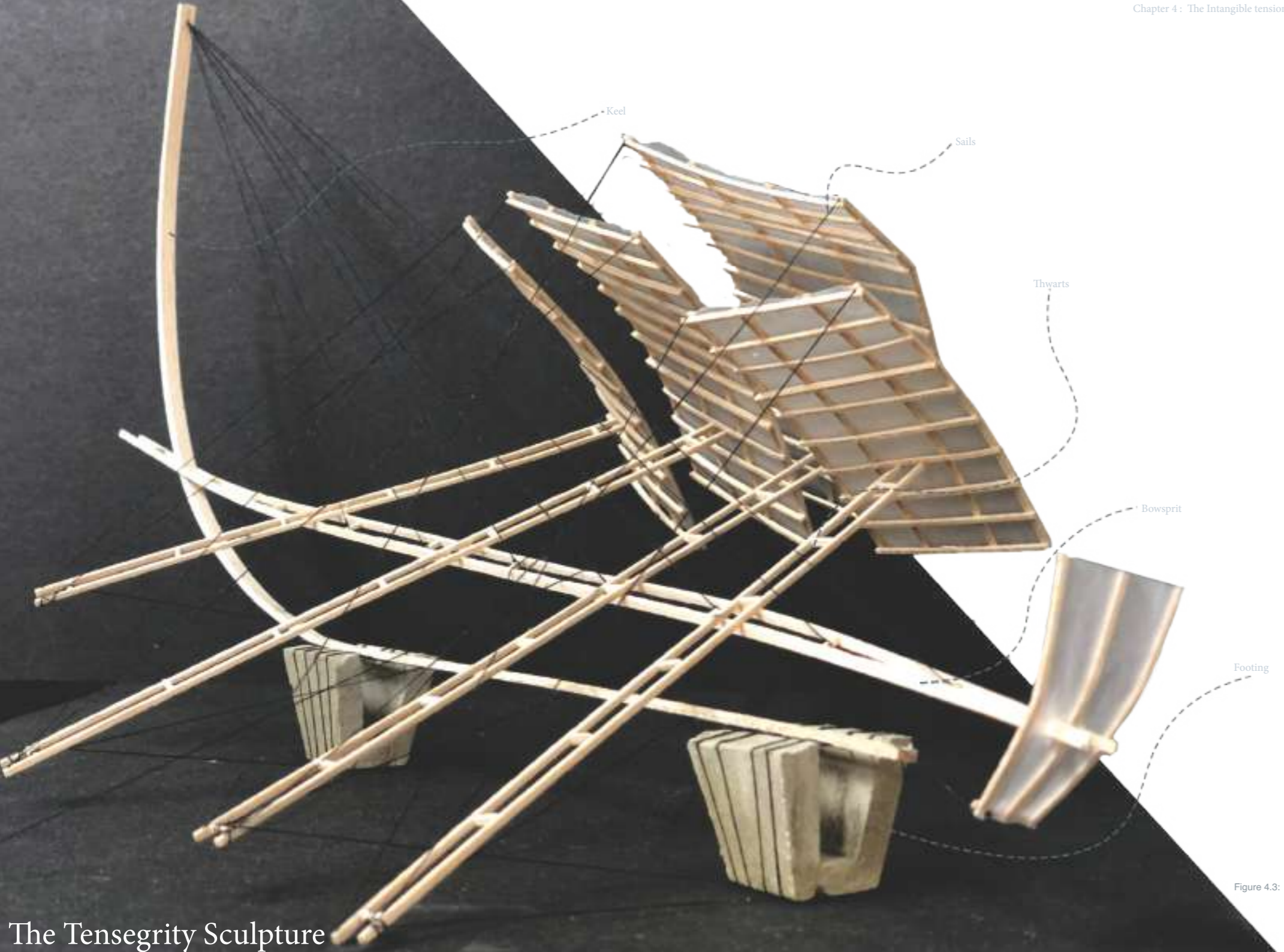


Figure 4.3:

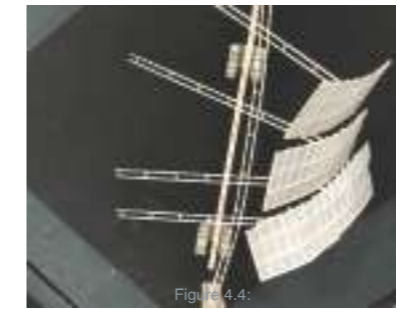


Figure 4.4:



Figure 4.5:

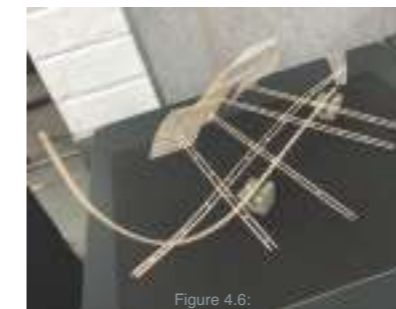


Figure 4.6:

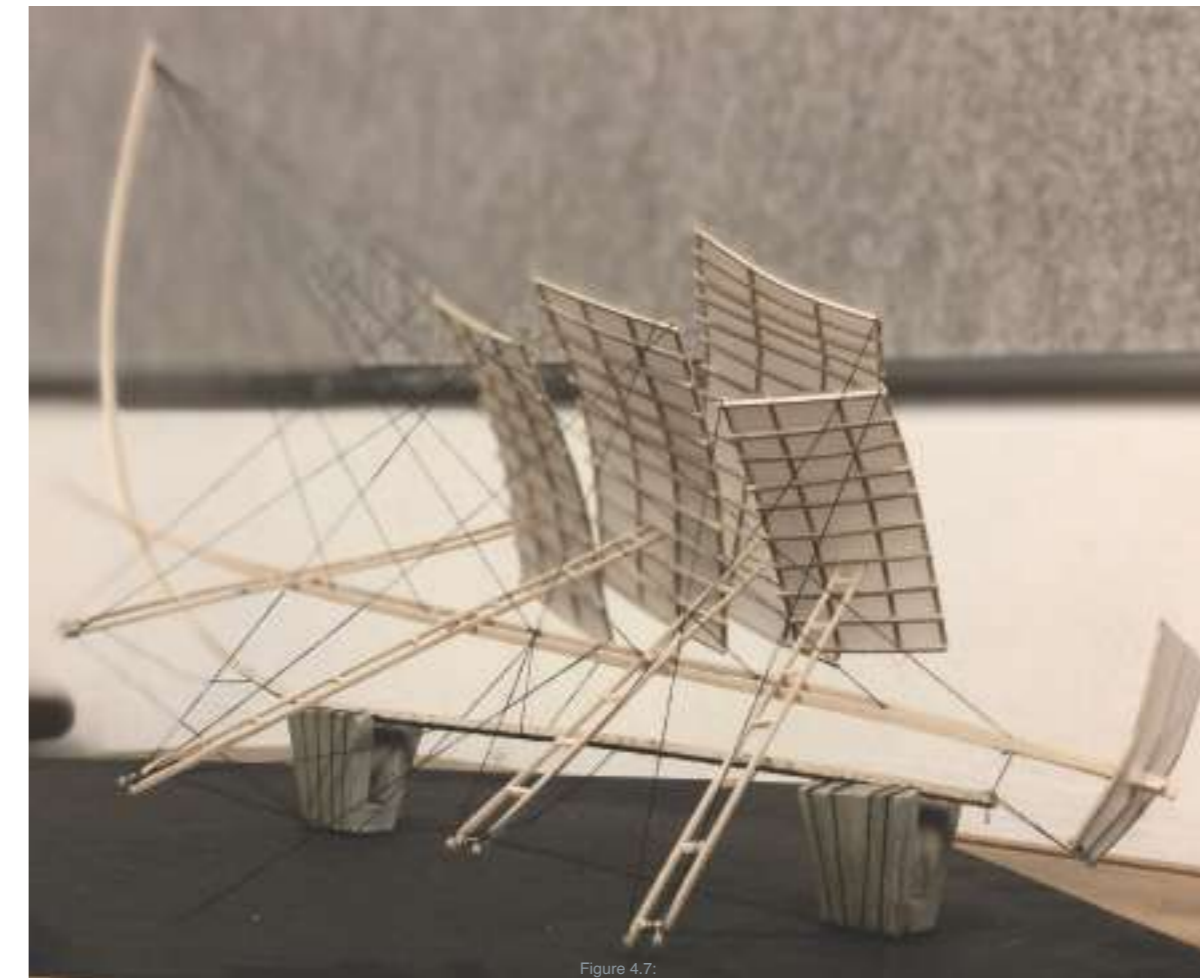


Figure 4.7:

Figure 4.3: The Tensegrity Sculpture and its parts, (Author, 2021).  
 Figure 4.4: Top view of the sculpture, (Author, 2021).  
 Figure 4.5: Perspective view, (Author, 2021).  
 Figure 4.6: Perspective of the sculpture, (Author, 2021).  
 Figure 4.7: Perfectly Picturesque, (Author, 2021).

### 4.2.1 Apprehensive tension

The physical manifestation of social tension and moments of beauty in tension is shown in Figures 4.4 to 4.6. Deliberately brittle concrete footings provide just enough support to hoist the entire structure off the ground. Surprisingly, the keel or main structure, is completely stable. On the one end, the keel bends up and is over-held in place via cotton thread spanning between the keel and the bowsprit. The bowsprit floats parallel to the keel and only intersects once the keel reaches the sky. Lying across the bowsprit are the thwarts. These thwarts lay radially crossed over the bowsprit and are attached to the sails (see Figure 4.5). Notice the intersection in Figure 4.4. Thwarts are the conversational outreach, the attempts to start a conversation. Architectural synthesis progresses from theory into a concept, and from a concept into a built form. Four design principles were obtained from this morphological study.



Figure 4.8:



Figure 4.9:

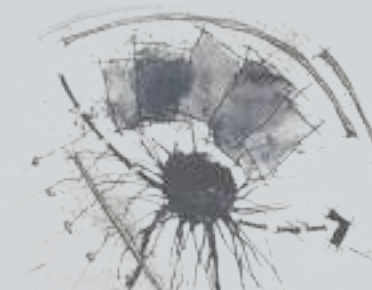
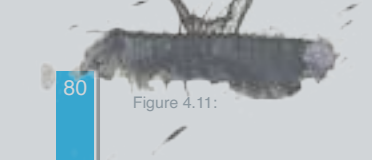


Figure 4.10:



Figure 4.11:



#### 4.2.1.1 Thwarts few points

Shown in Figure 4.15 is the thwarts application on site: walkways that reach out of the existing underground water reservoir. If suspended, the motion of every step will activate the vestibular system, engaging the sense of balance. Therefore, the simple process of walking becomes therapeutic by simply simulating the rocking board shown in Figure 4.12. Sails are attached to the end of each thwart, therefore the walkways projecting out of the structure would also include curved elements. Sound is manipulated by curved structures. Users will quickly notice this manipulation of sound when standing on the end of these thwarts. This structure would amplify the contextual sounds or echo the voice of the user. An echo with the slightest of delays would be beneficial. While the city sounds would be greatly amplified, much like a passive aircraft detection device of World War II (Figure 4.13).



Figure 4.12:

#### 4.2.1.2 Reservoir Keel

Symbolizing the spine of this facility that connects everything to a central and linear line (Figure: 4.17), a spinal passage will connect functions by latching spaces onto a central route. This design principle also lends itself to the context, by setting out routes for patients to follow throughout the sensory park. This will also provide a passage for explorers and daily runners to experience the facility on their way to run the trails of Naval Hill.

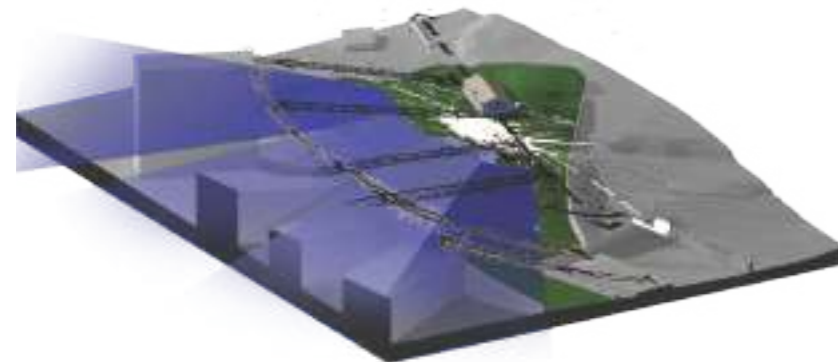


Figure 4.14:



Figure 4.13:

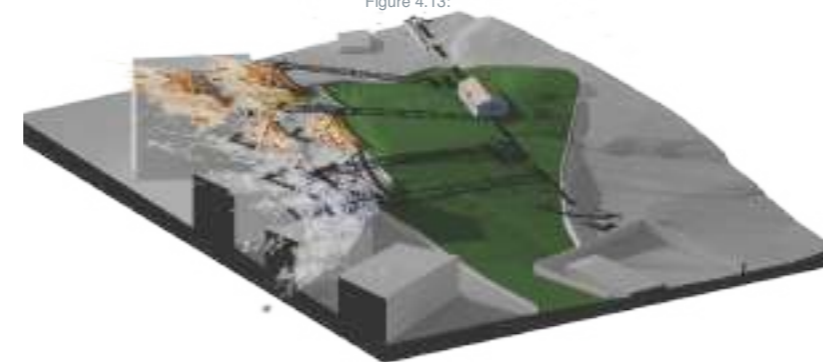


Figure 4.15:

Figure 4.8: Tension, (Author, 2021).  
 Figure 4.9: Overlay, (Author, 2021).  
 Figure 4.10: Wave, (Author, 2021).  
 Figure 4.11: Transition, (Author, 2021).  
 Figure 4.12: Sketch of a tumble form vestibular board, (Author, 2021).

Figure 4.13: Aircraft detection before radar, 1917-1940, ("Aircraft detection before radar, 1917-1940 - Rare Historical Photos", 2016).  
 Figure 4.14: Three dimensional illustration of the conceptual approach, (Author, 2021).  
 Figure 4.15: Three dimensional illustration of The Tensegrity Sculpture, (Author, 2021).

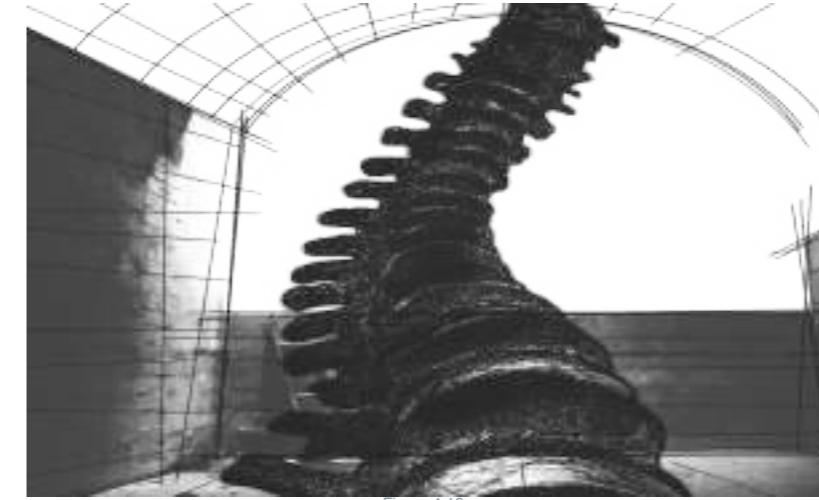


Figure 4.16:



Figure 4.17:

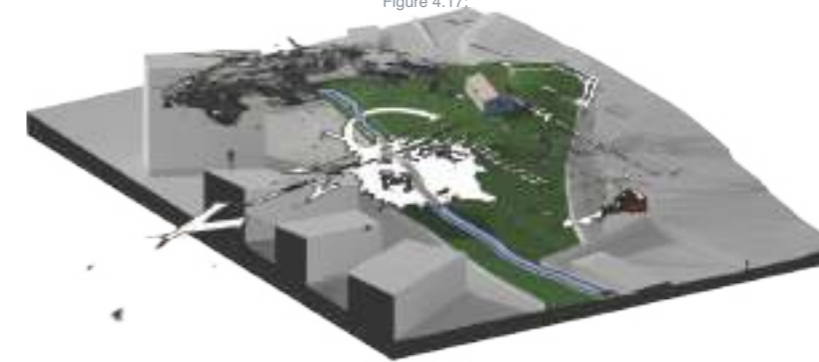


Figure 4.18:

Figure 4.16: Visual representation of the conceptual implementation of a spine through the existing water reservoirs, (Author, 2021).  
 Figure 4.17: Conceptual illustration of the walkway stretching through the existing reservoir, (Author, 2021).  
 Figure 4.18: Three dimensional illustration, showing more context indicating own this site is used as a shortcut, (Author, 2021).  
 Figure 4.19: Conceptual model negotiating a moment within the final design, (Author, 2021).

#### 4.2.1.3 Suspension sails through the design

Curved elements or sail-like structures will rhythmically repeat throughout the final design. The expected application of this is presented in Figure 4.16. A conceptual model represents the sails of a vessel. Visitors will experience beauty in tectonics. This structure would also be implemented within the thwart at a few points. As explained earlier, these structures would greatly manipulate sound. Any sound would be amplified and echoed. While the users walk toward these structures their footsteps would become louder and louder. On the other hand, if this curve was to be inverted the effect would be as reverted well.

#### 4.2.1.4 Bowsprit suspension bridge

Few dwellers from the surrounding area use this site as a shortcut from the east to reach the entrance of Naval Hill, (See Figure 4.18). People actively visit Naval Hill and many visit this site as well. Keeping this in mind, a public garden area does seem plausible. The SA-AS facility would greatly benefit from the anticipated traffic. Therefore, passers-by can experience some aspects of what the sensory park has to offer. The first thing that comes to mind is a suspension bridge, placed on the farthest most western edge of the reservoirs. Such a route would allow users to appreciate the architecture and natural landscapes. Figure 4.19 captures a singular moment of the final design, looking towards the edge of the reservoir, where the rhythmic curved façade of the design looks onto the conceptual suspension bridge. Inspired by the bowsprit suspension supporting the keel within the Tensegrity sculpture.

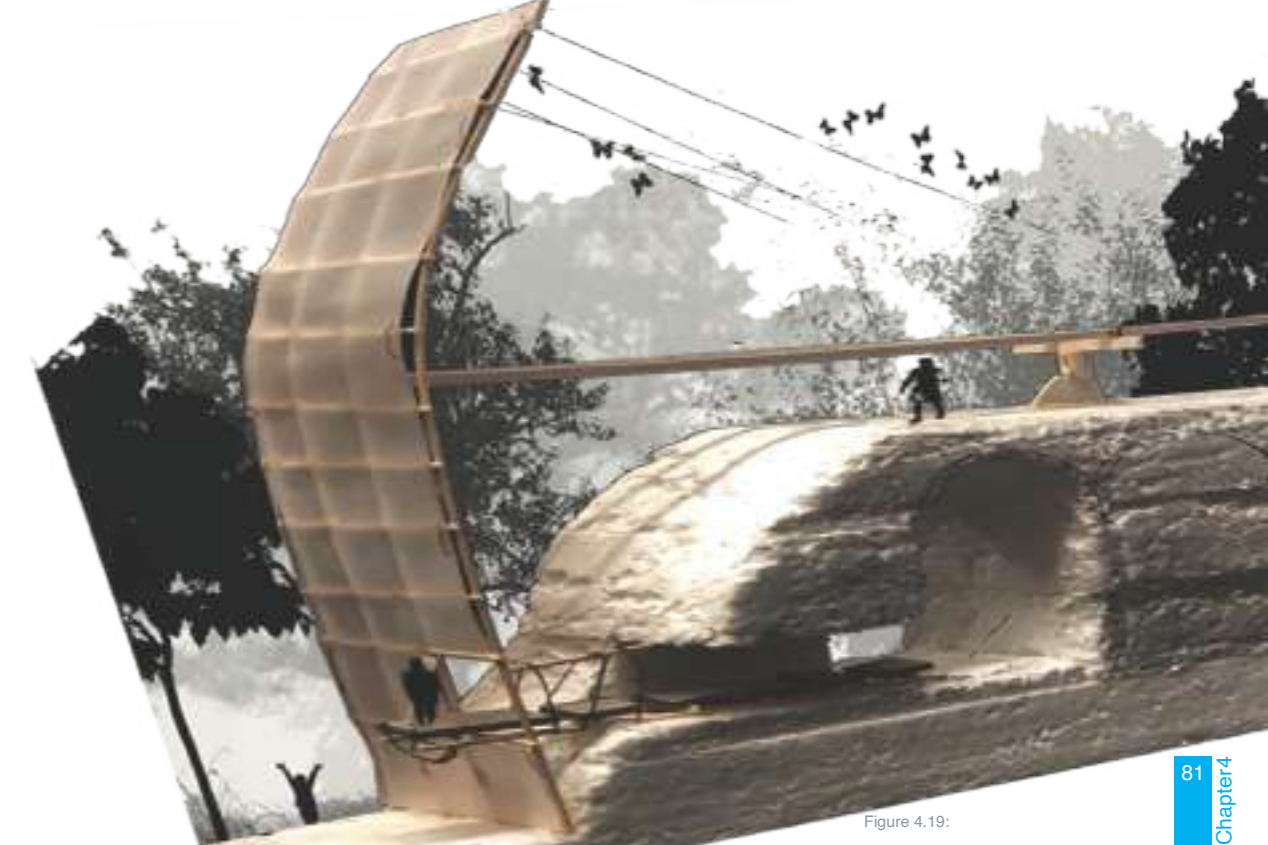


Figure 4.19:

## 4.3 En-route to stimuable speech

A patient's ability to immediately imitate a phrase or sound absent from any deviations or trouble with any sounds, is referred to as stimulability (Miccio, Elbert & Forrest, 1999) or the ability to speak flawlessly. A gradual transition of pronunciations in speech is to speak stimuable and the gradual transition between architectural elements is termed articulation. An architectural entity goes through a process of criticism and development to reach a timeless articulated design. Similarly, a patient with a speech impairment experiences a process of therapy. Each patient must go through a similar critical process to be able to flawlessly pronounce words.

This process is for many a journey of pain. Traditionally speaking, the current methods of speech impairments have been very successful. This success does not limit speech therapists and occupational therapists from seeking out new techniques. The Colloquy sculpture shown in Figure 4.20 was inspired by the exploration of new possibilities. It symbolises the manifestation of traditional and new methods of therapy, where sound is represented in white canvases tied to timber posts. Colloquy means a formal conversation.

This sculpture aims to evoke thoughts of progression. Canvases are spread throughout the edges of the concrete base. Note how the continuity is broken, almost creating the expectation that these canvases should be in each port (spaces between wooden supports). It mimics the staccato of a patient voice. Figure 4.30 shows how the concrete base floats. However, the circular shape allows it to simply rest on timber posts. Chapter two explains the three important mechanics needed to produce sound. These mechanics help shape the Colloquy sculpture. Sounds can only be produced from an energy source. A voice can only flourish if a phonated energy source is articulated. The energy source can be seen in Figure 4.26 and 4.27: where sound intercepts, the concrete base starts to defragment. This produces a scattering echo that further dematerializes into a tactile timber frame.

### 4.3.1 Detailing in elicitation

Collision, balance, and stability are the oversimplification of the vestibular and proprioceptive systems. Almost every occupational therapy exercise contains one or more of these three attributes. Applying the same method in transforming theory into a physical structure, these attributes are conceptualized and transferred onto paper via watercolour (See Figure 4.21 – 4.24). The following two design principles are used within the articular conversation and have been extracted from the Colloquy sculpture:

“Sight isolates, where sound incorporates; vision is directional, where’s sound is omnidirectional. The sense of sight implies exteriority, but sound creates an experience of integrity. I regard an object, but sound approaches me; the eye reaches, but the ear receives. Buildings do not react to our gaze, but they do return our sound back to our ears.” - Juhani Pallasmaa (Pallasmaa & Holl, 2005)

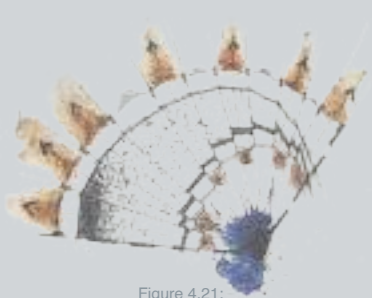


Figure 4.21:

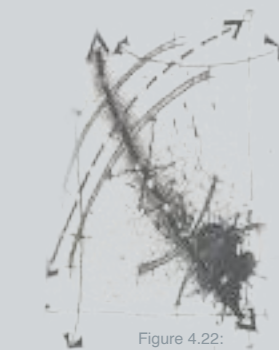


Figure 4.22:



Figure 4.23:

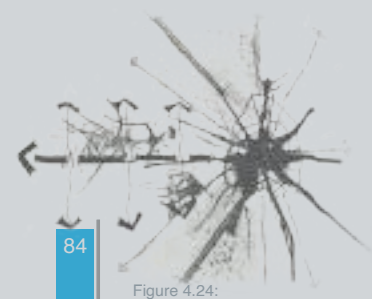


Figure 4.24:

#### 4.3.1.1 Echo silos

Echo plays a large role in sound therapy and within occupational therapy spatial awareness is fundamental for cognitive development. Spatial awareness has many concepts such as; spatial -skills, -abilities, -intelligence, -perception, -temporal reasoning, -sense and body awareness;(Van Jaarsveld et al., 2021; Mostafa, 2014). An echo silo is a space where speech can resonate, echo, and be mirrored while confusing the viewer's spatial perception. During the later design stages, four echo chambers are designed, equal to the number of water reservoirs. Each echo chamber differs from the next in terms of size and shape. It is just large enough for the brain to register an echo without the individual noticing. Shape and size directly determine the ambient-, altered-, or delayed auditory feedback, all common tools within therapy, as discussed in chapter two. An example of this is shown in the first echo chamber in Figure 4.25, a conceptual sketch of what this space might entail.

#### 4.3.1.2 Façade transformation

Morphological changes in the concrete bed simulate the progressive transformation of sound in space (Figure 4.29). An applied example of this design principle is shown in Figure 4.26. It is derived from conceptualized screams of the reservoirs. Patients want to be heard and heritage wants to be admired. The final design elevation would be largely affected by this design principle.

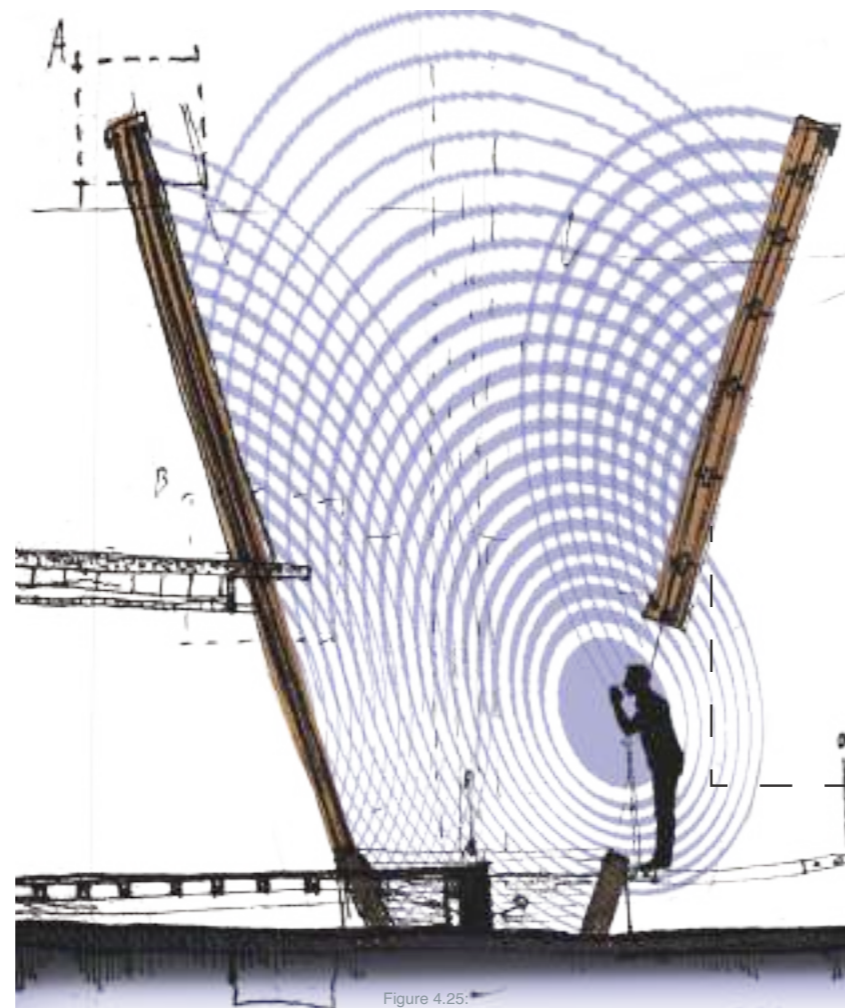


Figure 4.25:

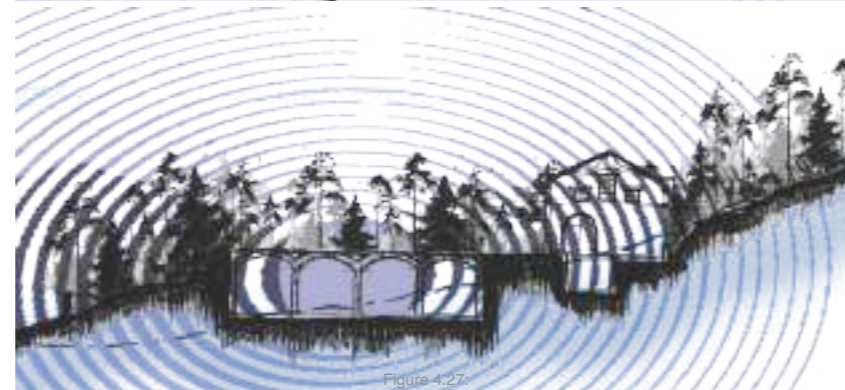


Figure 4.27:

Figure 4.26: This is a pen sketch of the pump station drawn in section, to show how the design needs to unfold inside. The basic idea of this sketch is to show the outer shell is untouched, (Author, 2021).  
Figure 4.27: Conceptual overlay, this explains how the drawings translated into the sculpture, (Author, 2021).



Figure 4.28:



Figure 4.29:

Figure 4.28: Conceptual sketch of the mystic space with is the smallest detail, your voice is amplified by the reservoir, (Author, 2021).  
Figure 4.29: The top view of the model With a graphical elaboration on the sound, (Author, 2021).  
Figure 4.30: Sketch of the existing reservoir making sound and the outside skin catching the waves, (Author, 2021).



Figure 4.26:

Figure 4.21: Resonate, (Aurhor, 2021).  
Figure 4.22: Stabality, (Author, 2021).  
Figure 4.23: Adaptation, (Author, 2021).  
Figure 4.24: Collision, (Author, 2021).  
Figure 4.25: A detailed photo of the Colloquy sculpture resting on thin timber posts, (Author, 2021).

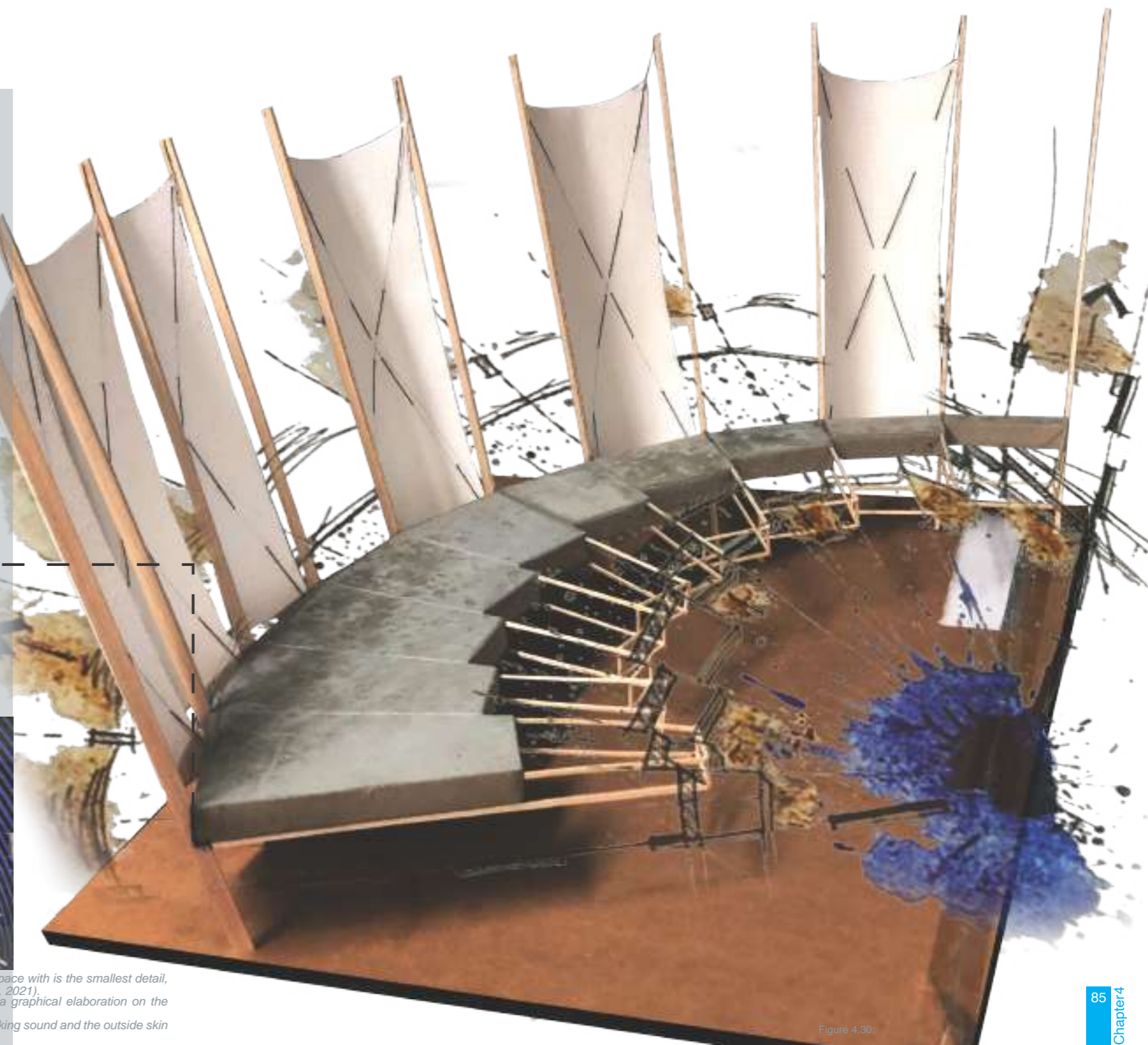


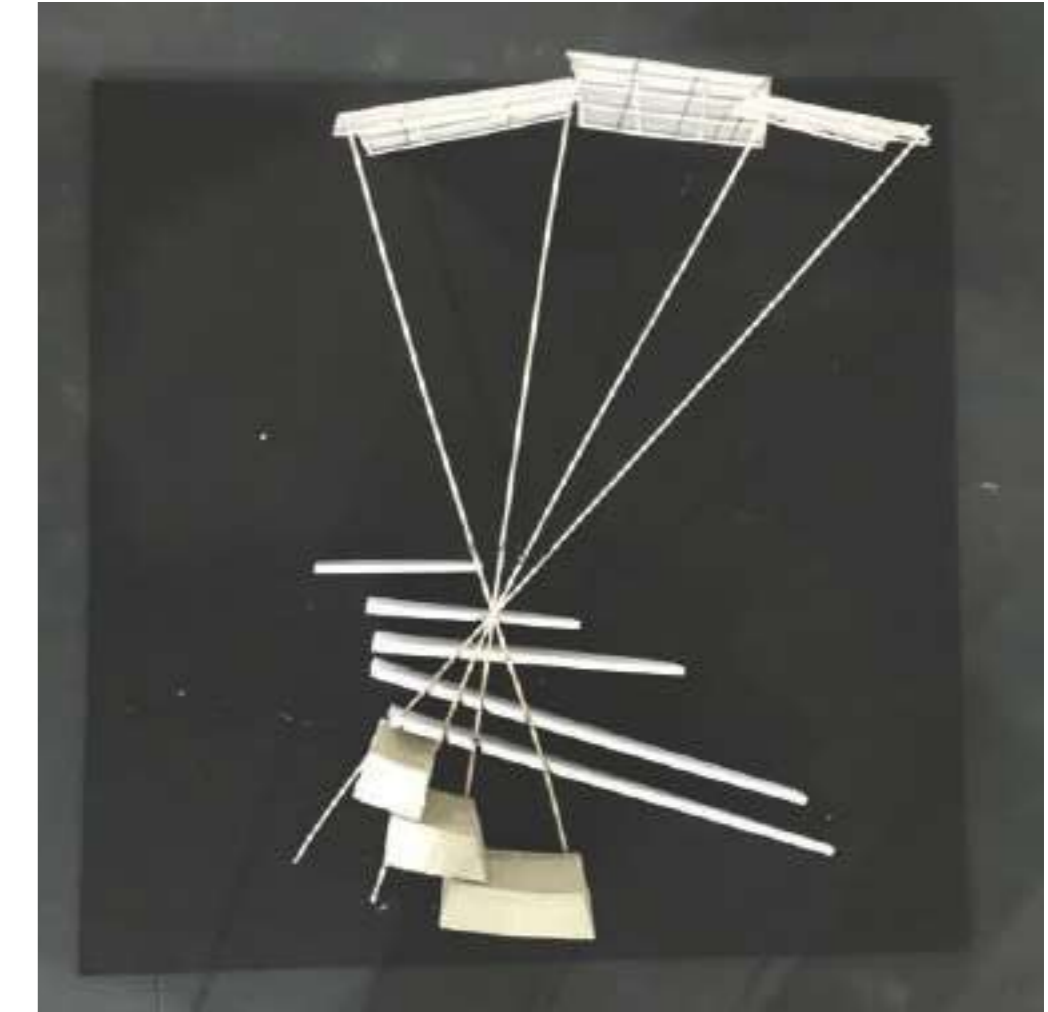
Figure 4.30:

## 4.4 Temporality in edification

The temporality in edification refers to the tedious process necessary for self-improvement. More specifically, the time and effort needed for a patient to speak without issue. This process is therefore translated and applied to the architectural process of exposing hidden historical structures. Furthermore, the edifying sculpture embraces the spiritual experience of progression in physical form. It is a symbolic expression of support that patients would review from the SA-As facility and is comparable to the historical foundation on which this facility would rely.

The SA-AS facility would be the much-needed helping hand for many and the first step toward fluid speech. It would be similar to the first sculpture, curved elements represent sound waves, and they are hoisted up in solidarity. However, instead of using tension to support these curves, this sculpture makes use of concrete blocks as leverage, symbolizing the needed support for those with a speech impairment and conceptualising that the architectural synthesis will radiate out from the old in support of the new.

Anticipating that the SA-AS facility would motivate people in their speech journey, inspiring commitment through the inevitable struggles of progression. These struggles are represented with white slits supporting the foundation of the user. To edify means to uplift and the following design tool aims to do exactly that: empowering the facility, through intelligent design principles.



“The most essential auditory experience created by architecture is tranquility. Architecture presents the drama of construction silenced into matter, space and light. Ultimately, architecture is the art of petrified silence.”- Juhani Pallasmaa (Pallasmaa & Holl, 2005: 41-45)

Figure 4.30: The elegance of The Edifying sculpture, (Author, 2021).  
Figure 4.31: Plan view of The Edifying sculpture, (Author, 2021).

#### 4.4.1 Connection in cohesion

Collaboration and cohesion of many various complex systems of architecture, speech therapy and occupation therapy are combined into a compressive system of site and heritage. Finding cohesion between old and new, the sculpture of edification symbolizes the old and the new as one singular concrete entity divided into various parts, thus representing the discrete, appropriate, and ethical response to heritage. The application of this would dematerialise the subterranean structure, starting from the existing pumpstation and flowing outward till the final reservoir is completely defragmented.

#### 4.4.2 Spatial Development Framework

Music therapy dramatically reduces stuttering, according to Barry Guitar (2016) (The Stuttering Foundation, 2018; Susanibar et al. 2016; Heilman, 2008). Music aids in the bodily mechanics that guide the formulation of words in a process of synchronized rhythms. In other words, music therapy guides the formulation of rhythms, directing people with a speech impairment to follow a rhythm and speak without issue while recollecting lyrics that are trapped in memory. This memory of lyrics allows patients to speak fluently. The architectural implication of this is to use music as a layering tool to structure, position, and combine architecture and organize the park's spatial development framework, including the location and application of therapeutic garden structures or follies.

Therefore, I engaged with covering the site with the Für Elise tablatures. Figure 4.36 shows how the most notable section of the music is superimposed over the site. First, the tablature is stretched to an appropriate scale relative to the existing water reservoirs. The water reservoir already has five horizontal lines or in musical terms five staves (Staff). Five extruding horizontal lines are drawn from each, and from there the tablature is drawn. Figure 4.37 is the first attempt to give form to music on site which later transformed into the final layout of the sensory structures on site.

#### 4.4.3 Rhythm in Architecture

As mentioned, Mornito made use of music as a catalyst to kick-start her architectural design dissertation (refer to chapter 2). Figure 4.38 shows how Mornito used of musical rhythms as a design tool. Consequently, this method is applied to the rhythmic spaces within the South African Ayr's Sensory facility. Figure 4.39 shows an example of how this design principle is applied. Musical rhythms are extracted from The Für Elise and transformed according to a revised Mornito method.

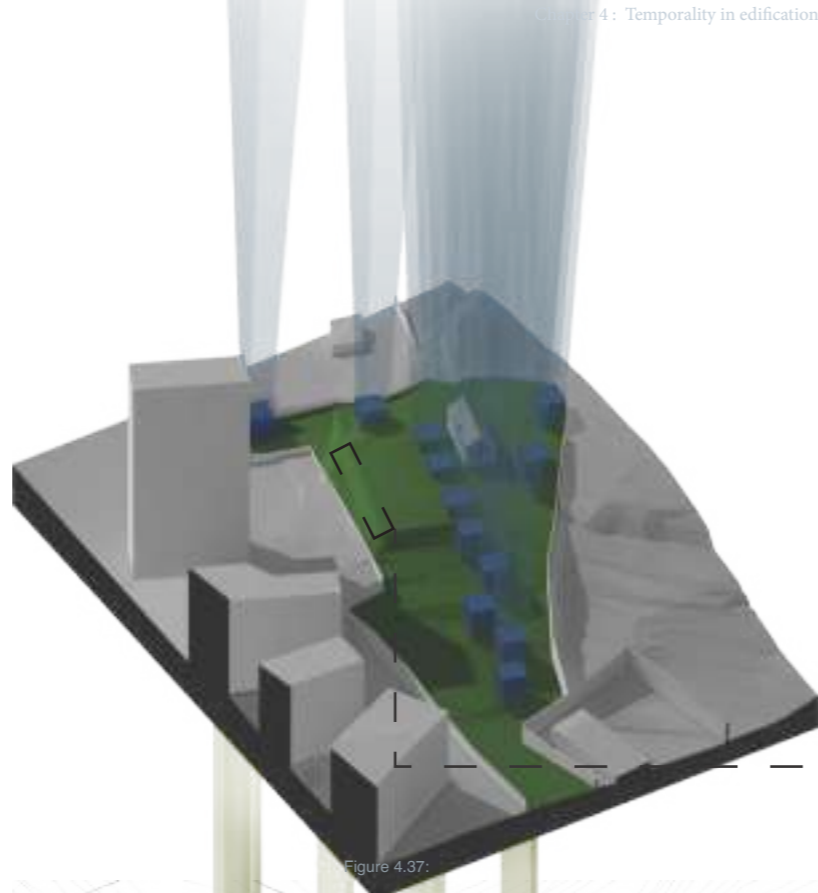


Figure 4.37:

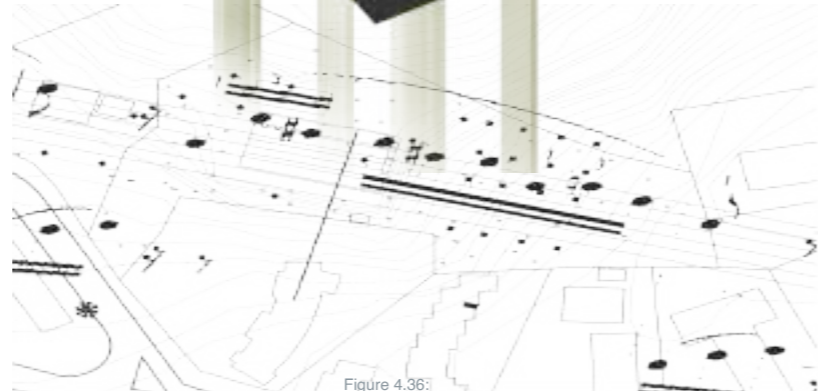


Figure 4.36:

A personal note from the author

"Personally, speaking music therapy has played a major role in overcoming my speech impairment. As the designer of a speech impairment facility and sensory park, one of the greatest challenges is the layout. Designing a spatial development framework for this facility is challenging and to overcome this I made use of music. It is a composition that I used to overcome my speech impairment and it gave me a rhythm to speak with more confidence. The Für Elise by Beethoven."

Figure 4.32: Edification, (Author, 2021).  
Figure 4.33: Dominance, (Author, 2021).  
Figure 4.34: Upliftment, (Author, 2021).  
Figure 4.35: Movement, (Author, 2021).

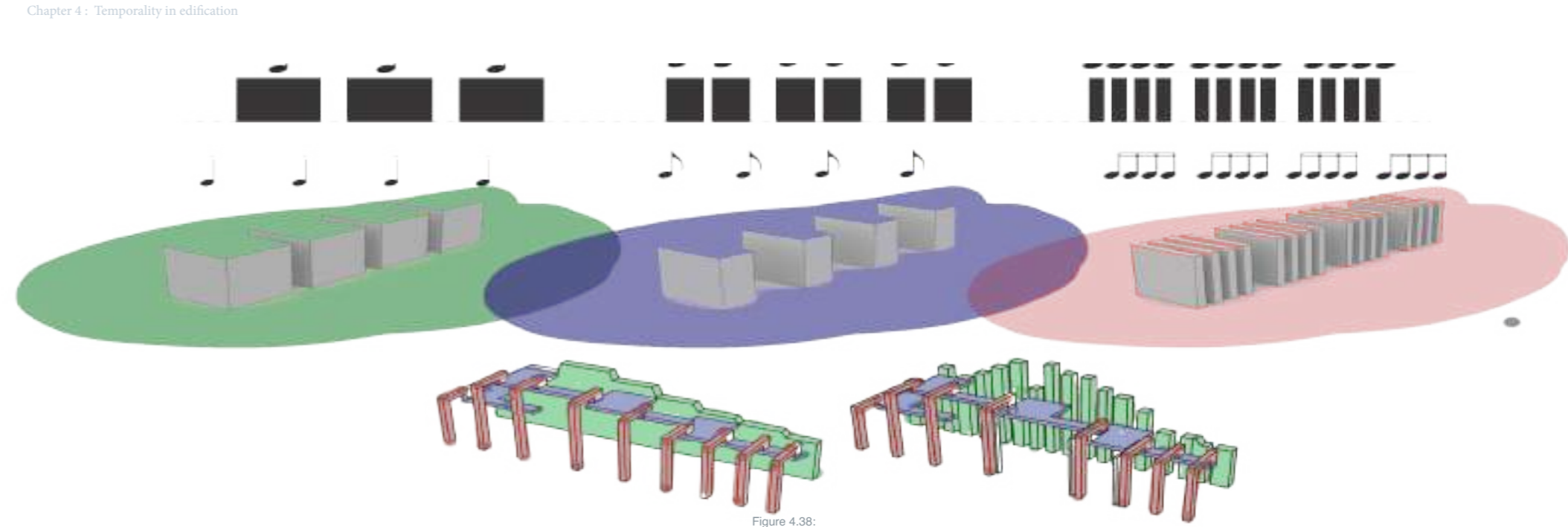


Figure 4.38:

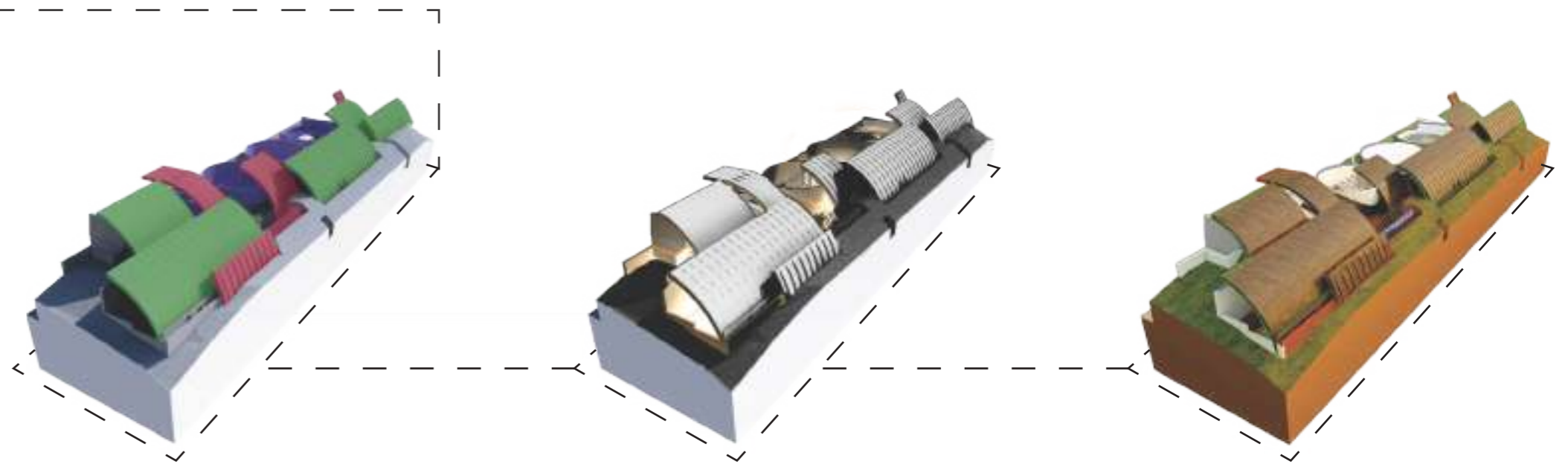


Figure 4.39:

Figure 4.36: Detailed three dimensional model of the site and the water reservoir were lines become the staves for the musical notes, including structures, (Author, 2021).  
Figure 4.37: Site plan and the Fur Elise notes are laid over, (Author, 2021).

Figure 4.38: Musical design according to Morimoto design method of music interpretation, (Morimoto, 2017).

Figure 4.39: Authors interpretation of Morimoto design method applied to reservoir edge, (Author, 2017).

## 4.5 Conclusion

This chapter covered the theoretical discourse while providing a conceptual interpretation of each. It provides a three-dimensional manifestation of each concept, reasons for each and possible design applications. It is important to mention the extensive research done with the utmost respect for these three professional fields. This dissertation barely scratches the surface of their complexities. It lends itself as a device that links many clusters of thought into an extraordinary system of literature. The outcomes of this dissertation, including the programme expectations and the therapy rationale, are supported by professionals in both speech and occupational therapy.

The next chapter follows the design process, starting with the spatial development framework, also known as the project layout on site. It is then followed by the various design phases. The ideas of this chapter are what drove every idea, decision, and thought of this dissertation. Each phase in the design process constantly refers to these three sculptures.



Figure 4.40: Beautiful photo of the of The Edifying sculpture, (Author, 2021).

Figure 4.41: Stock photo of a sheet of music, (Masalar, 2017).



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# 05

## Design Development

From the spatial development frame word till the end of the design

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## 5.1 Introduction

In this section the final architectural synthesis is approached by using every design strategy and tool crafted throughout this dissertation. Chapter 4 provided an overview of the strategies applied to the spatial development framework, design methodology and theoretical application. This chapter explains how these strategies apply to the development of landscape, follies, and functionality. It includes the various iterations that stem from the amalgamation of these developments.

This chapter elaborates on the necessary architectural steps that materialised the SA-AS Facility. This process trifurcates different levels of the design procedure, namely the landscape design, garden interventions and the pragmatic facility. The required steps within each level of the design process remain constant. These steps start with a precedent study, then experimentation of precedent rationale, followed by the re-engineering of the precedent methodology.

Ultimately, these levels unify the design method of the SA-AS facility, resulting in a three-phase architectural development process. Phases one and two suffered greatly as a result of a fixed and unyielding approach to architectural design burdened by desperation, frustration, and impatience. This designer's aggression increasingly drove the process towards a breaking point. Fortunately, deep into the design process and after many mistakes the design finally glimmers with success. Phase three marks the turning point. It succeeds in every aspect where phases one and two fell short. Many mistakes were made, and lessons were learned during the design development.

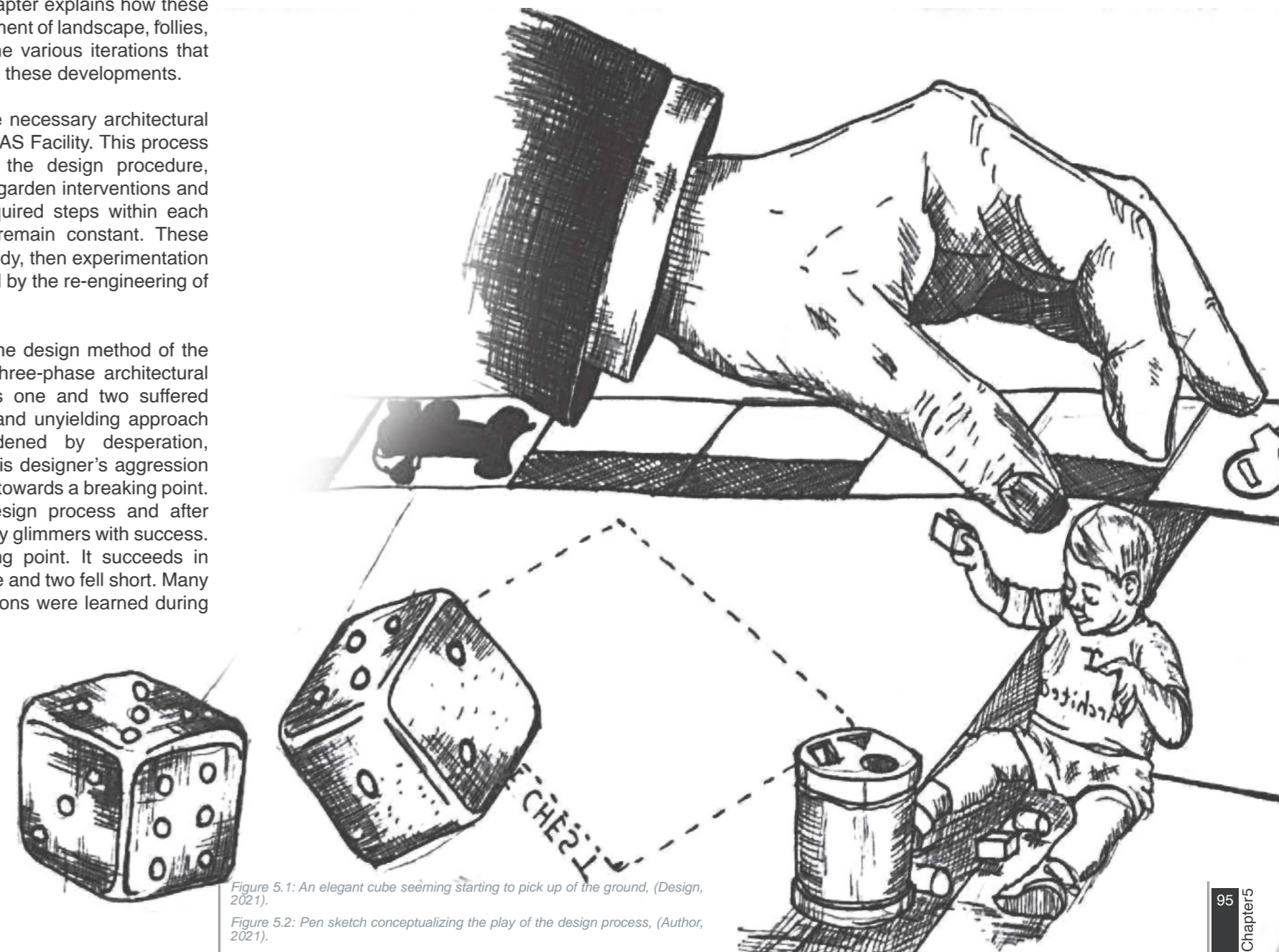
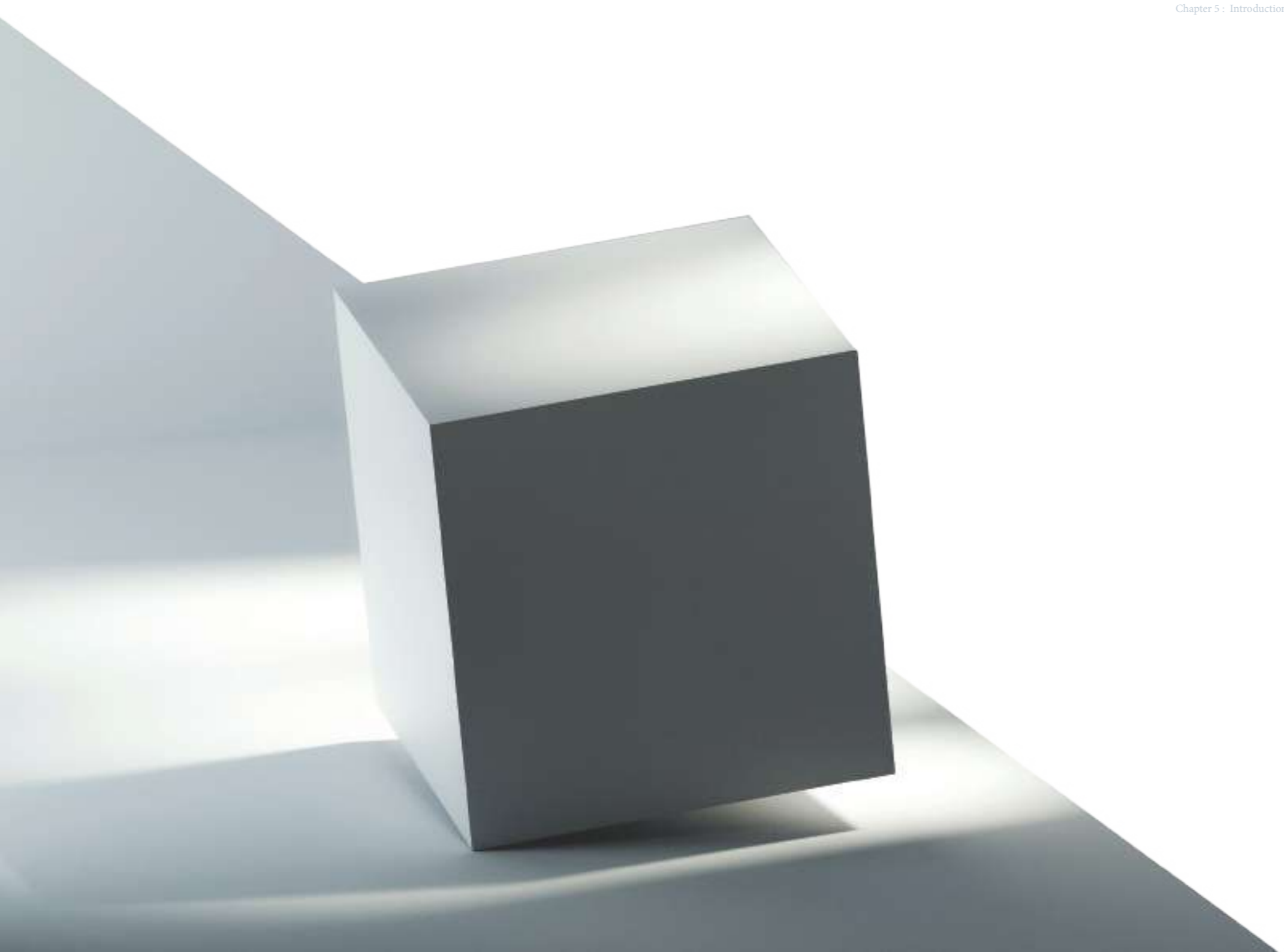


Figure 5.1: An elegant cube seeming starting to pick up of the ground, (Design, 2021).

Figure 5.2: Pen sketch conceptualizing the play of the design process, (Author, 2021).

## 5.2 Synthesis

### 5.2.1 Site development

Once started with the site the design, ideas are activated and the utilization of design tools from previous chapters are seen. As discussed during the site analysis, this area is situated on Delville Drive, 100 meters from the entrance to Naval Hill. Currently, conditions on site are haunting. Clustered and overgrown vegetation provides an ominous atmosphere to the entrance. This concealed entrance adds mystery to the experience. The pumpstation becomes visible only after traversing the steep gravel driveway. It is recommended that sceptical explorers travel on foot because vehicular access remains restricted and borderline impractical (See Figure 5.10). Vehicles are only able to reach the front door of the pumpstation. During this approach, the first impressions are misled by secrecy. This false impression is only broken once you have entered the structure. You' will notice the unorthodox scale, machine-like proportions, and an underground chamber hidden behind brick walls.



Figure 5.3:

#### 5.2.1.1 Access

Figure 5.3 dissects the accessibility of this site. Within this site, there are two plausible entrances. The more noticeable and frequently used northern entrance is currently the only available entrance., while on the other hand, a more private and secluded and disused southern entrance is also present. It was most likely used for service during the pumpstation's years of operation. These two entrances are both necessary. They are suitable for both daily professionals and services. A second entrance is required according to the local municipality restrictions and the disused southern entrance fortunately serves this purpose.



Figure 5.4:

#### 5.2.1.2 Foliage

Dense foliage conceals the ground surface increasing the difficulty to roam around freely around the site. Thick brush and closely knit trees are not uncommon for a veldt-like environment. However, any architectural intervention would have to adapt and minimize environmental damage to the natural landscape. Unfortunately, large excavations and backfill within this context are essential for site and programme cohesion that would be remedied after construction through additional vegetation and landscape design. Figure 5.4 is an attempt to illustrate the foliage presented along with the existing demarcated landscape and routes laid out, indicating the easiest ways to travel.



Figure 5.5:

#### 5.2.1.3 Hiking Trails

There are trails present on site, and these wildlife trails and hiking routes run sporadically through the site, often used by weekly runners and city explorers. These paths have been forged by the passing of time. Footpaths meander around trees, therefore they remain relevant design influencers that cannot be ignored. Figure 5.5 shows how these routes split the site. These paths can perhaps be revitalised to remain functional.

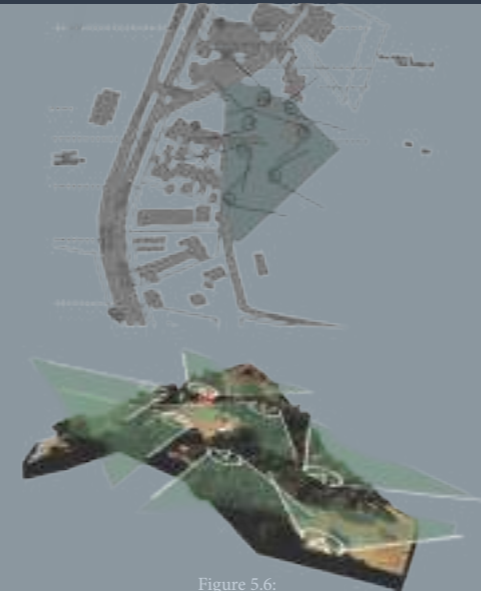


Figure 5.6:

#### 5.2.1.4 Views

Various lookout points are tucked away around the proposed site. These viewpoints are unique to Naval Hill. It would be an absolute shame if these romantic spheres are left unappreciated. Figure 5.6 shows where the most fundamental views lie.



Figure 5.7:

#### 5.2.1.5 Important spaces on site

Exciting moments are already present on site. Figure 5.7 indicates their locations while Figures 5.8-5.13 elaborate on the ambient experience through expressive sketches. These expressions attempt to imitate the spatial quality of each unique moment, through a series of quick travel sketches.

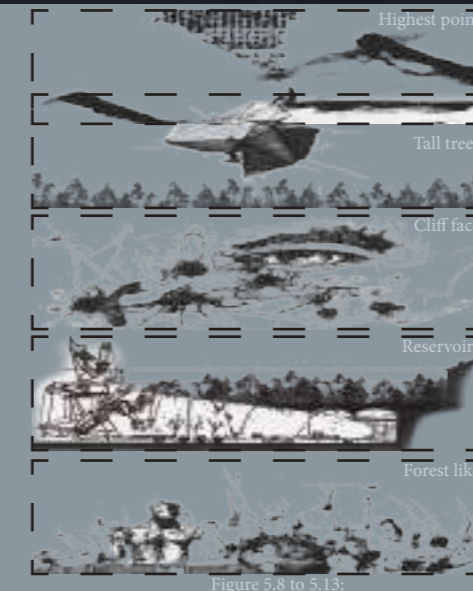


Figure 5.8 to 5.13:

#### 5.2.1.6 Resurface

Hypogeal spaces on site, buried and hidden, are significantly more dramatic than any epigeal structures close to or on the surface. It is important to reminisce about the essence of this dissertation, which is to "give a voice to the voiceless". Architecturally speaking, this equates to "revealing the invisible". Whispers from mystical space are silently screaming out of desperation. These spectacular spaces of the reservoir are victims of urban speech impairments. Impatiently, these moments wait for the day that their voices are treasured and revealed. Architects are the pathologists of past infrastructure, equally committed to eliciting a melodious voice. Architecture that scruffles in the shadows appreciate light, while impaired patients are relieved from agony by auditory harmony.

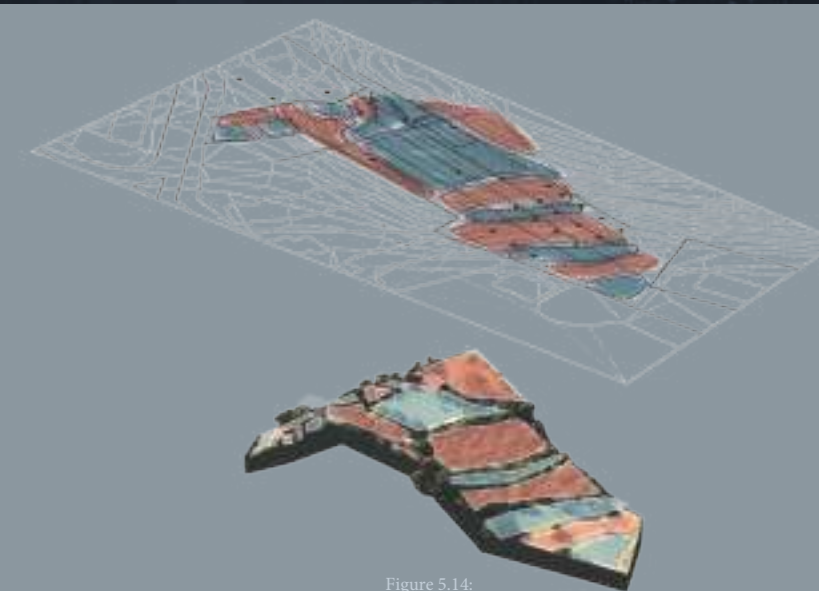
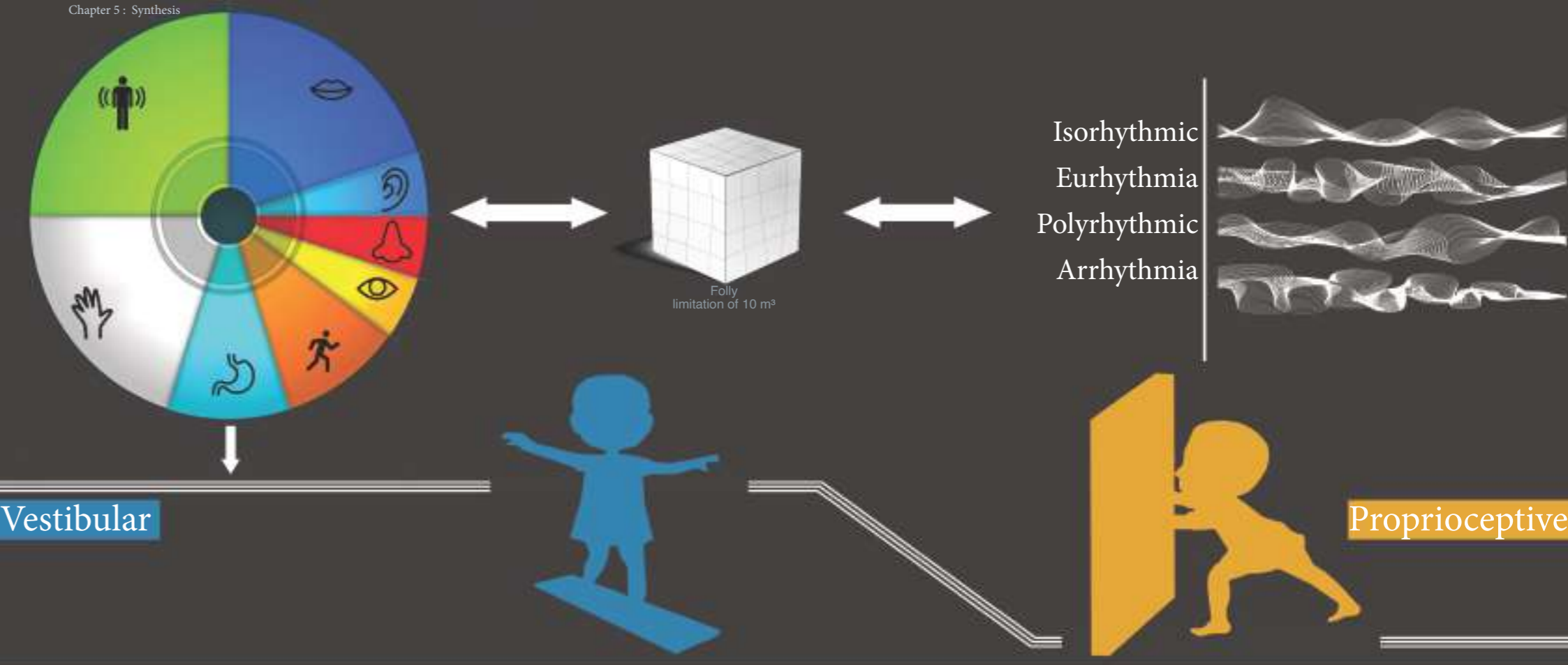


Figure 5.14:

#### 5.2.1.7 Ayres sensory application

Occupational therapists use tactile, proprioceptive, and vestibular exercises to aid in the development of speech. Therefore, the site is subdivided by the properties of these exercises. The vestibular system is easily understood as the body's perception of position and movement (Merriam-Webster, 1828), while the proprioceptive system is the body's response to outside forces that affect its position and movement, such as heaviness, applied resistance, sitting, or standing (Proske & Gandevia, 2012). Finally, the tactile system recognises differences in textures. These systems are applied on site, where the topography aligns with the definitions of each system. Subsequently Figure 5.14 highlights these areas in two distinct colours. Illustrated in red are the proprioceptive areas: these areas require more effort to navigate through the thick brush and steep inclines. The vestibular zones are indicated in blue. These areas are mostly level and easier to navigate through due to minimum resistance from vegetation. Tactile systems were discriminated against during this study to elucidate the overwhelming number of textures already present.

There are follies located at seemingly random locations throughout the site, each with a different therapeutic purpose. Ideally these follies would be interactive structural elements within a park similar to Parc De La Villette in France (Figure: 5.21). The proposed follies are designed and inspired by therapy. One of the biggest challenges was to develop a meticulous strategy to organize each within a landscape. Many attempts in developing a layout fell short due to site restrictions, useability concerns, and overall challenges with cohesion. A logically aesthetic solution was derived from subdividing the site and follies into a multi-layered integration of sensory peripheries. Every individual folly differs from the next because of the specific set of sensory applications-built into the structure. With the large number of human senses and ways to manipulate or activate each sense, it only makes sense to design every folly according to a small group of senses. This means that each therapeutically applicable sensory exercise will be incorporated into the network of follies. The physical location of each folly will also be chosen according to their intended therapeutic application and the occupational profiling of the site (Figure 5.14). These follies represent the architectural form of sensory utilitarianism, subjected to a readaptation of the Ayres-based sensory integration. These garden follies will assist in the development of visual perception, spatial awareness, auditory perception, and socio-emotional development (See Table 5.1). The landscaping design and folly layout were tedious and time-consuming processes where the perfect solution seemed to be impossible to find; however, after many different approaches the best solution was found.



Vestibular **VS** Proprioceptive

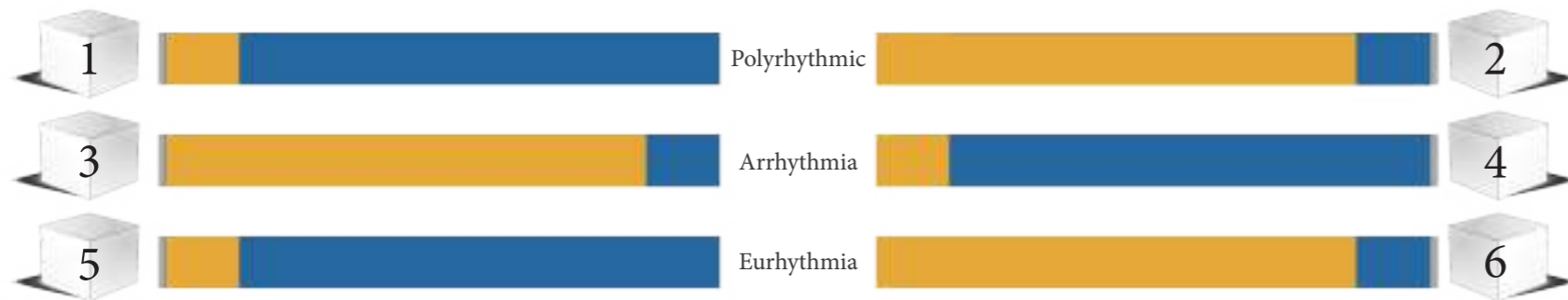
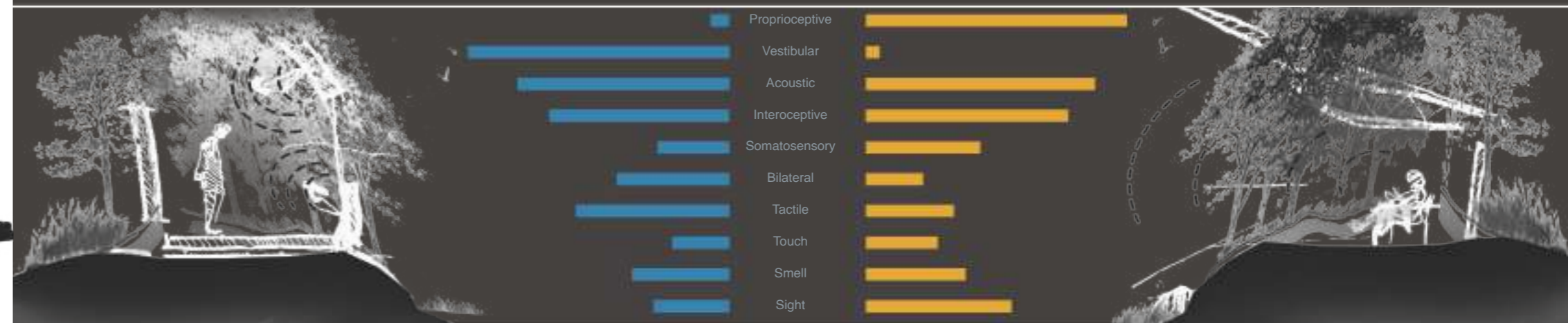
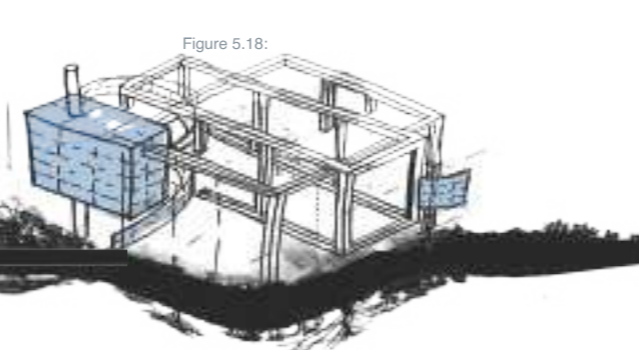
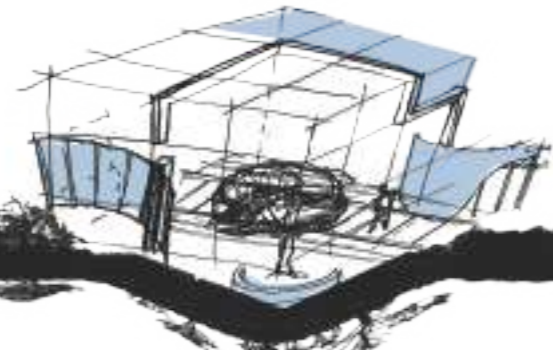
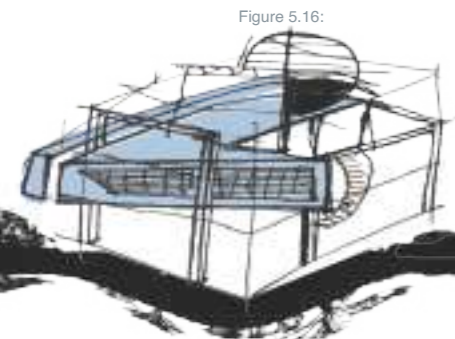


Table 5.1

Figure 5.17:

Figure 5.18:



## 5.2.2.1 Precedent study

In the early 1980s, Paris set out to redevelop the city as part of their urban beautification plan. Part of this strategy was to improve tourism. The urban beautification was particularly focused on a large vacant plot that was previously used for slaughterhouses.

Thus, Paris launched a huge design competition, with over 470 proposals submitted. Designers were tasked to imagine a 21st century urban park, the 135-acre site split by the Canal de L'Ourcq river, the largest park in Paris. Parc de la Villette was designed by Bernard Tschumi. He envisioned this large open expanse to be a space for exploration, instead of a picturesque Victorian park. Opting for a space that encourages dwellers to be present in a space of freedom (Souza, 2011: online). Parc de la Villette developed from three principles. Tschumi defined these principles as: surfaces, lines, and points. The 135 acres surface is overlaid by a contextual contrasting grid. Thirty-five points are derived from the intersecting grid lines (See Figure 5.22). These principles draw the attention of architecture away from the picturesque form and towards a design that evokes a deeper sense of contextual meaning. Traditional parks lack functional programme, where Parc De La Villette provides intimate spaces for Parisians. Parc De La Villette orientates the user through immersive areas and architectural follies. Twenty-seven morphologically unique spaces that are open to be reprogram. Yet, they all remain restricted to a size of 10 x 10 x 10 meters (Souza, 2011: online).

Originally planned for informal programming, these follies have become fundamental to the park's success. Parc de la Villette is a critical manifestation of social activity and urban life converging into one large area. Kush Upendra Patel (2016) who wrote his PhD thesis on Realizing: Henri Lefebvre, explains in detail how Lefebvre's concepts of "Spaces as moments" apply to Parc de la Villette. Lefebvre uses notions of moments to amplify the relationship between everyday life and space, emphasising the fluidity and continuity of space (Patel, 2016).



Figure 5.20:

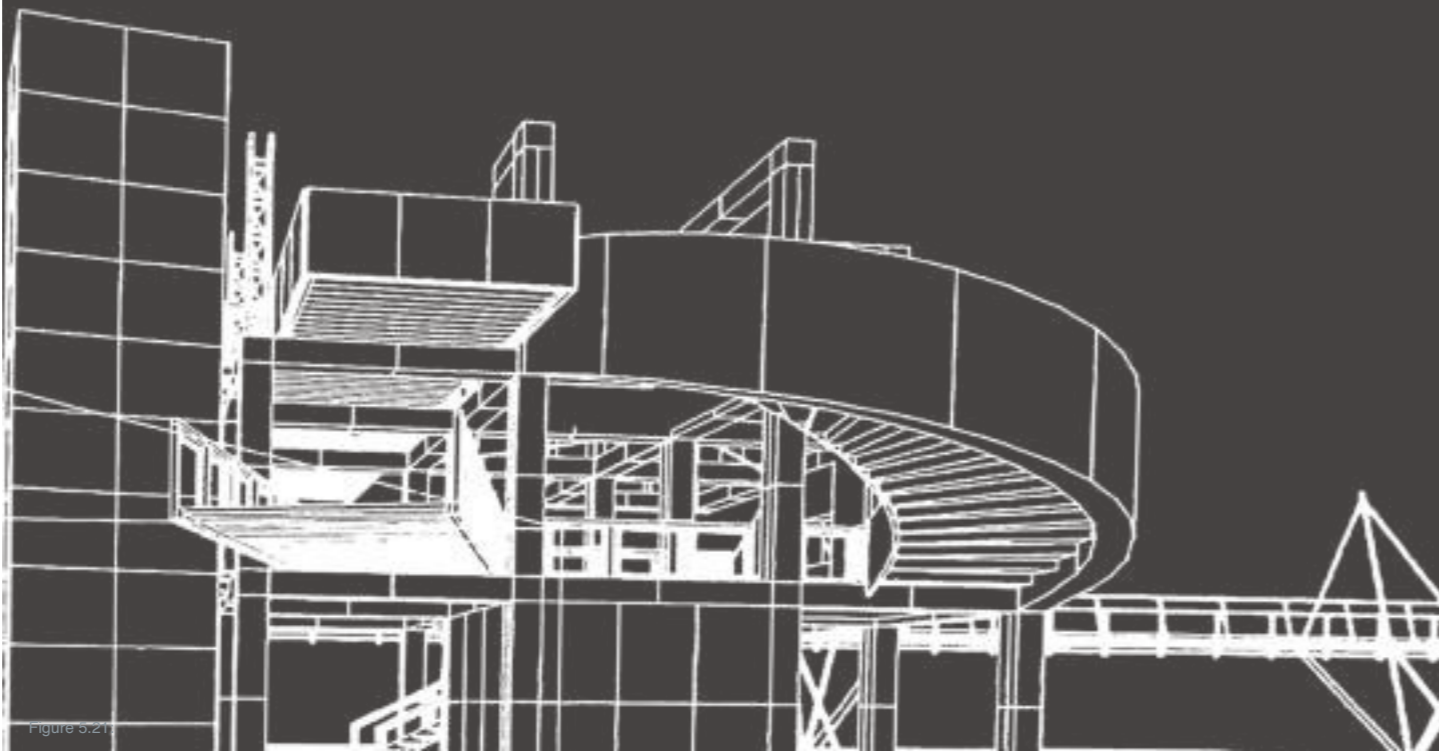
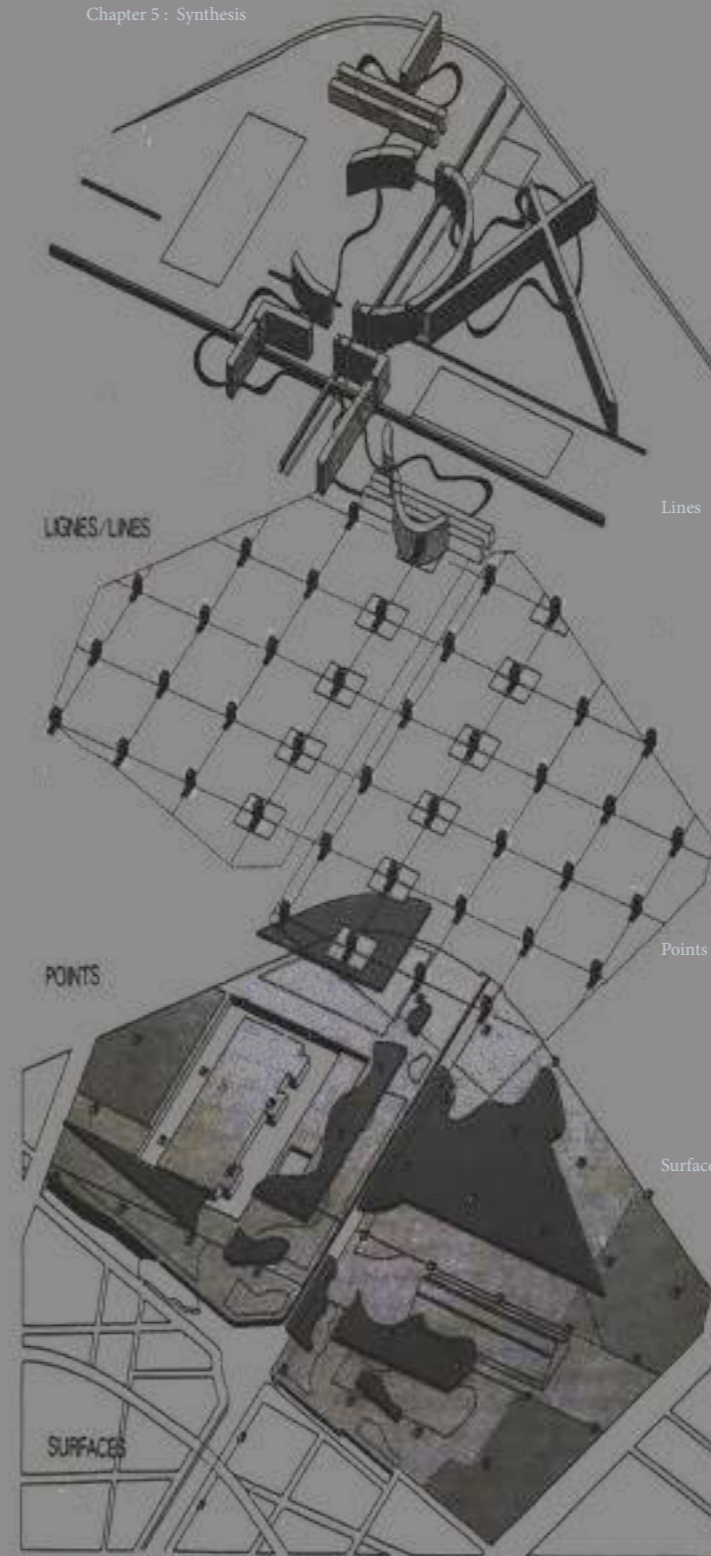


Figure 5.21:



Patel argues that architects too often rely on the representations of space (such as plans and section) rather than the lived moment of space. Tschumi makes use of Lefebvrian principles. These principles, according to Patel, evaluate the spatial field as a process of spatial rhythms, meaning that daily rituals and spatial perceptions provoke the rhythmic momentum of life within architecture. Tschumi's approach to architecture runs parallel to Lefebvre's theory of spatial rhythms. Both have independently developed systems similar to Halprin's Ecoscore. Their diagrammatic study of contextual momentum is reinterpreted and applied to the spatial development framework of the SA-AS facility. Parc de la Villette successfully plots functional garden structures, each designed according to their locational significance without disrupting the architectural motivations.



Figure 5.23:



Figure 5.24:



Figure 5.25:



Figure 5.26:

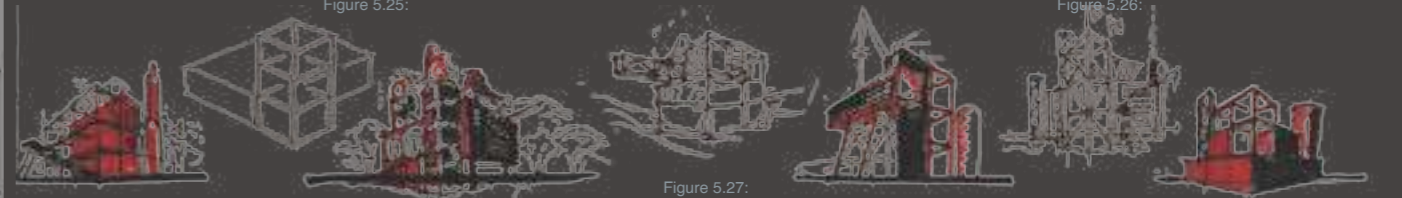


Figure 5.27:

Figure 5.20: White globe showing the location of France, (IMGBIN, 2021).  
 Figure 5.21: Digital outline of a folly, (Author, 2021).  
 Figure 5.22: The layers of organization, (Tschumi, 1983).  
 Figure 5.23: Folly located mid park, (Lochner, 2011).

Figure 5.24: Aerial overview of park, (Lochner, 2011).  
 Figure 5.25: Line of follies, (Lochner, 2011).  
 Figure 5.26: Photo of a folly located beside the stream, (Lochner, 2011).  
 Figure 5.27: Original conceptual sketches of Parc de la Villette, (Tschumi, 1983).

5.2.2.2 Folly rationale  
Each architectural folly explores specific therapeutic sensory applications. The sensory stimuli are derived from the Ayres sensory integration combined with Lefebvre's rhythms. These two ingredients generate six unique follies. This section gives an explanation of the rationale behind the garden structures.

The first ingredient is the Ayres sensory integration, and as previously stated the Ayres sensory integration method of therapy targets the tactile, vestibular, and proprioceptive senses. Therefore, these follies will target these specific sensory systems. Tactile integration is negligible, as it would be impossible to avoid the various textures on site. However, the vestibular and proprioceptive sensory systems can be manipulated through architecture. Lefebvre's rhythms that relate to music therapy are the second ingredient. Table 5.1 shows the combinations of ingredients that christens each folly with a unique impetus. Not only does this folly profile predetermine the functionality of each folly, but also predetermines the location on site.

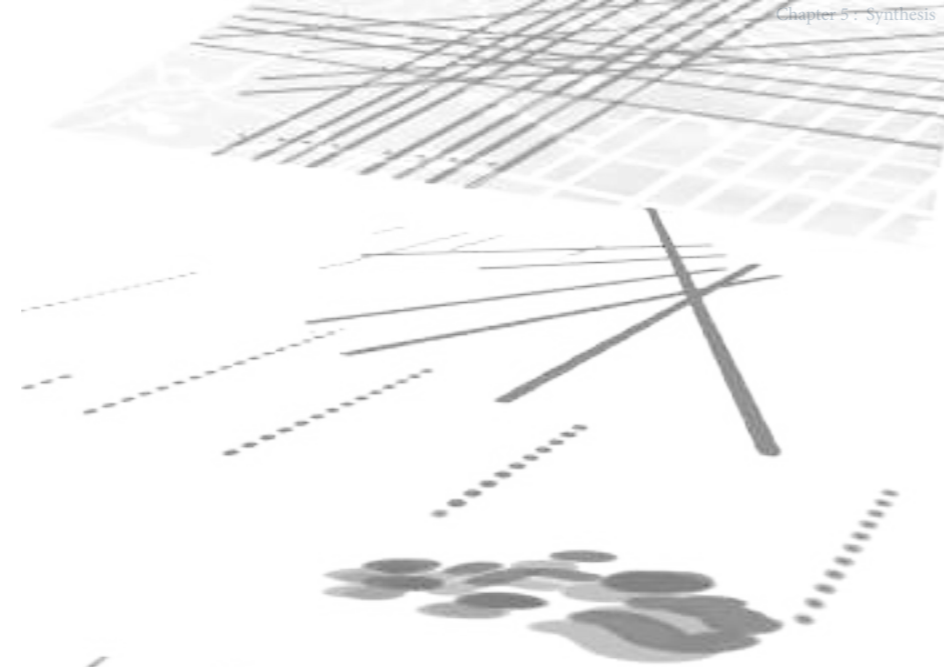
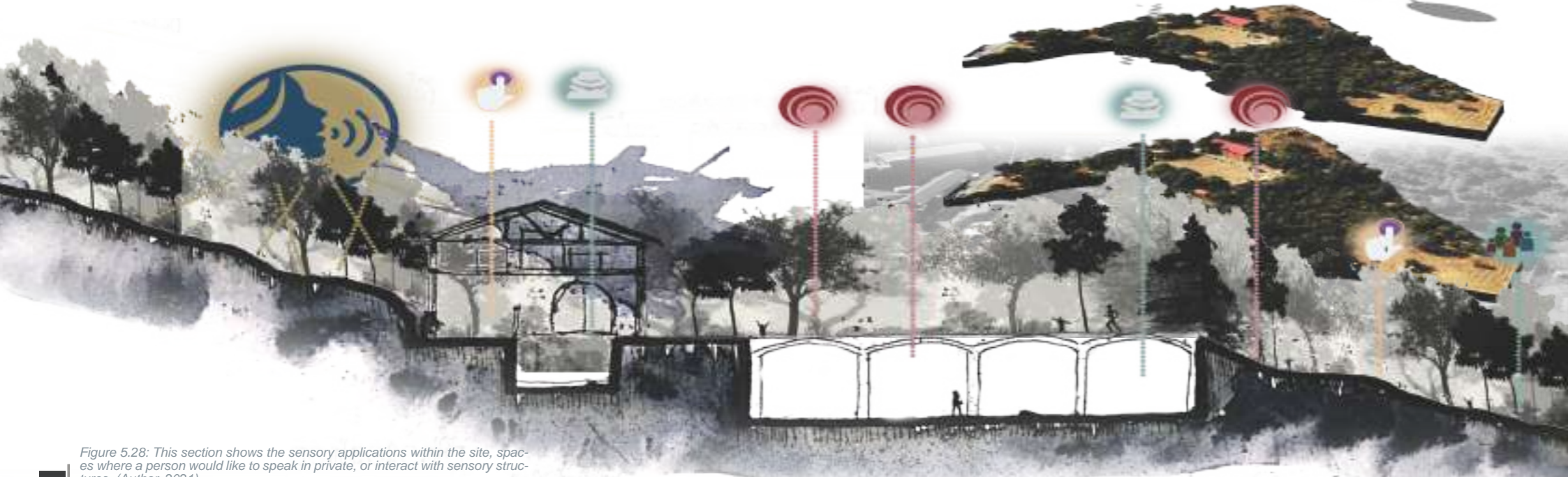


Figure 5.29:

The Bernard Tschumi approach

Environment control is embodied in human nature, even though nature's resilience remains uncontested. Naval Hill made it impossible for the original settlers of Bloemfontein to superimpose a strict cartesian grid across the landscape, confirming that any grid imposed by humans is challenged by nature. Figure 5.29 shows how the city grid is altered because of nature's triumph. Green and red lines show the intended city grid, where the blue lines rotate around Naval Hill. Figure 5.30 experiments with the contextual and lines in opposition to context on site, similar to Tschumi's organizational system.

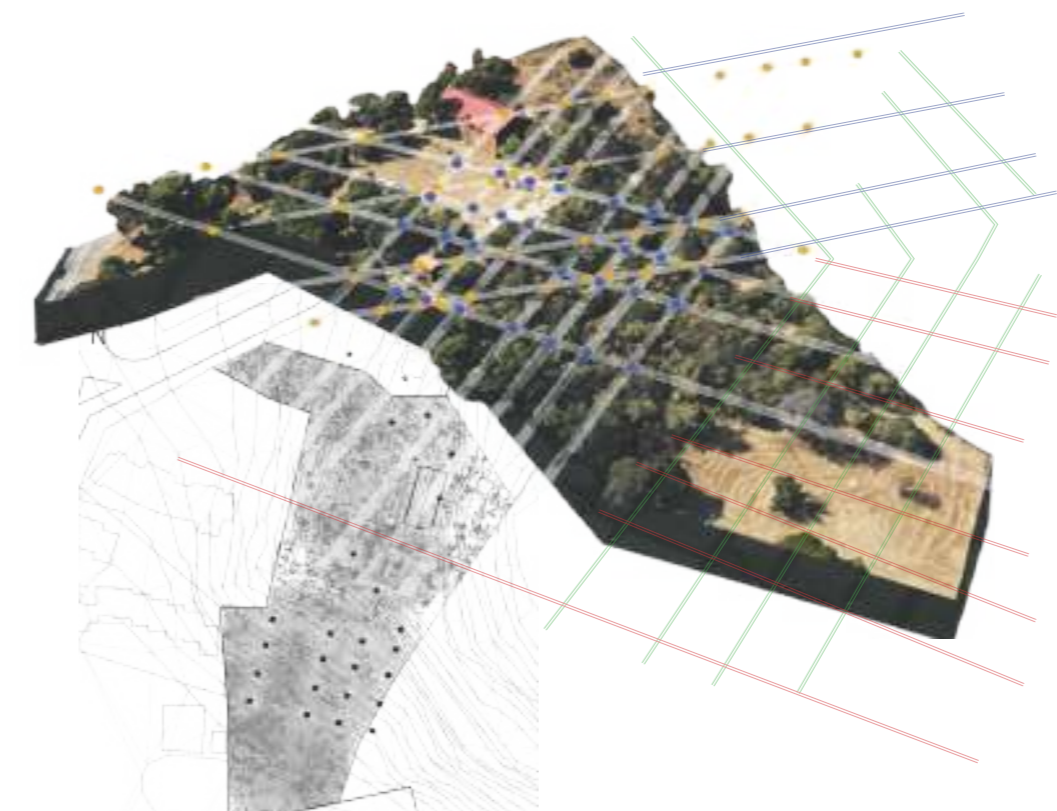


Figure 5.30:

The Für Elise approach

In speech therapy, music is used to rhythmically aid in word recollection. The second ingredient makes use of my own personal experience with music therapy to amplify the historical whispers produced by structures on site. Most importantly, the voiceless songs from the underground reservoirs are waiting to be heard. Four connecting chambers resemble musical sheets when observed on plan. Each line can be interpreted as a staff on a tablature. Laying a grid over the site for music notes, Für Elise' tablature is spread over the site. A folly is placed where each clef falls (See Figure 5.31), resulting in a more inspiring spatial development framework.

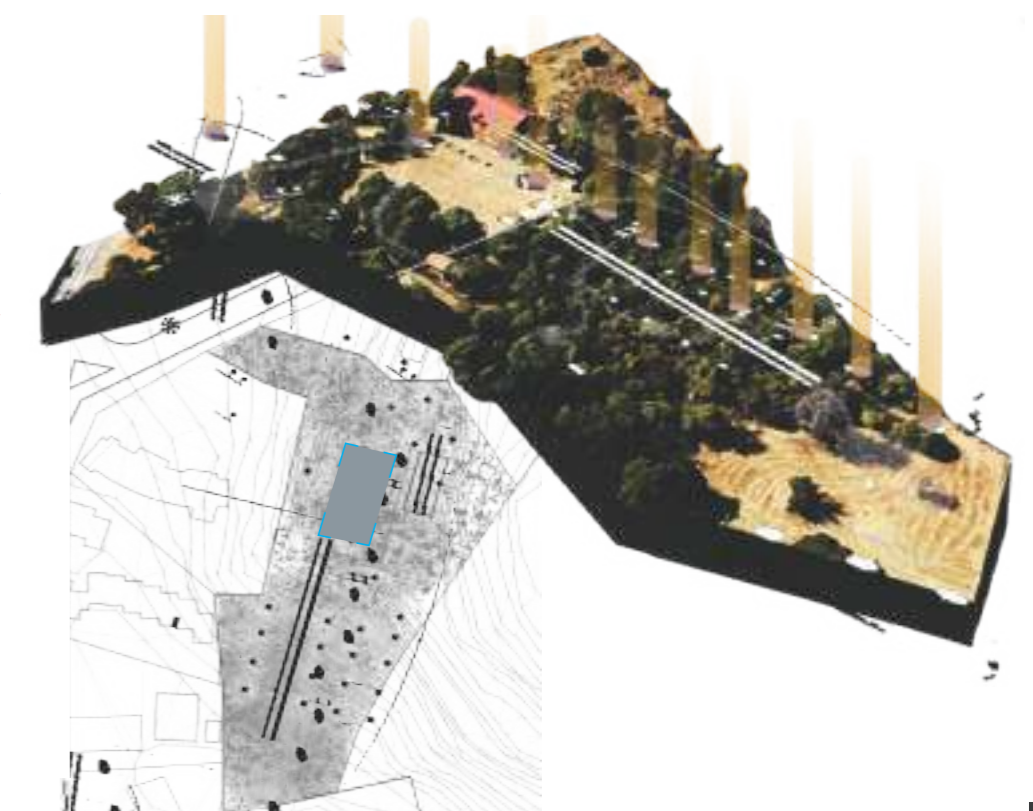


Figure 5.31:

102  
Figure 5.28: This section shows the sensory applications within the site, spaces where a person would like to speak in private, or interact with sensory structures, (Author, 2021).  
Figure 5.29: Layering of spatial development, (Author, 2021).  
Figure 5.30: The Bernard Tschumi approach, (Author, 2021).  
Figure 5.31: The Für Elise approach, (Author, 2021).

Figure 5.28:

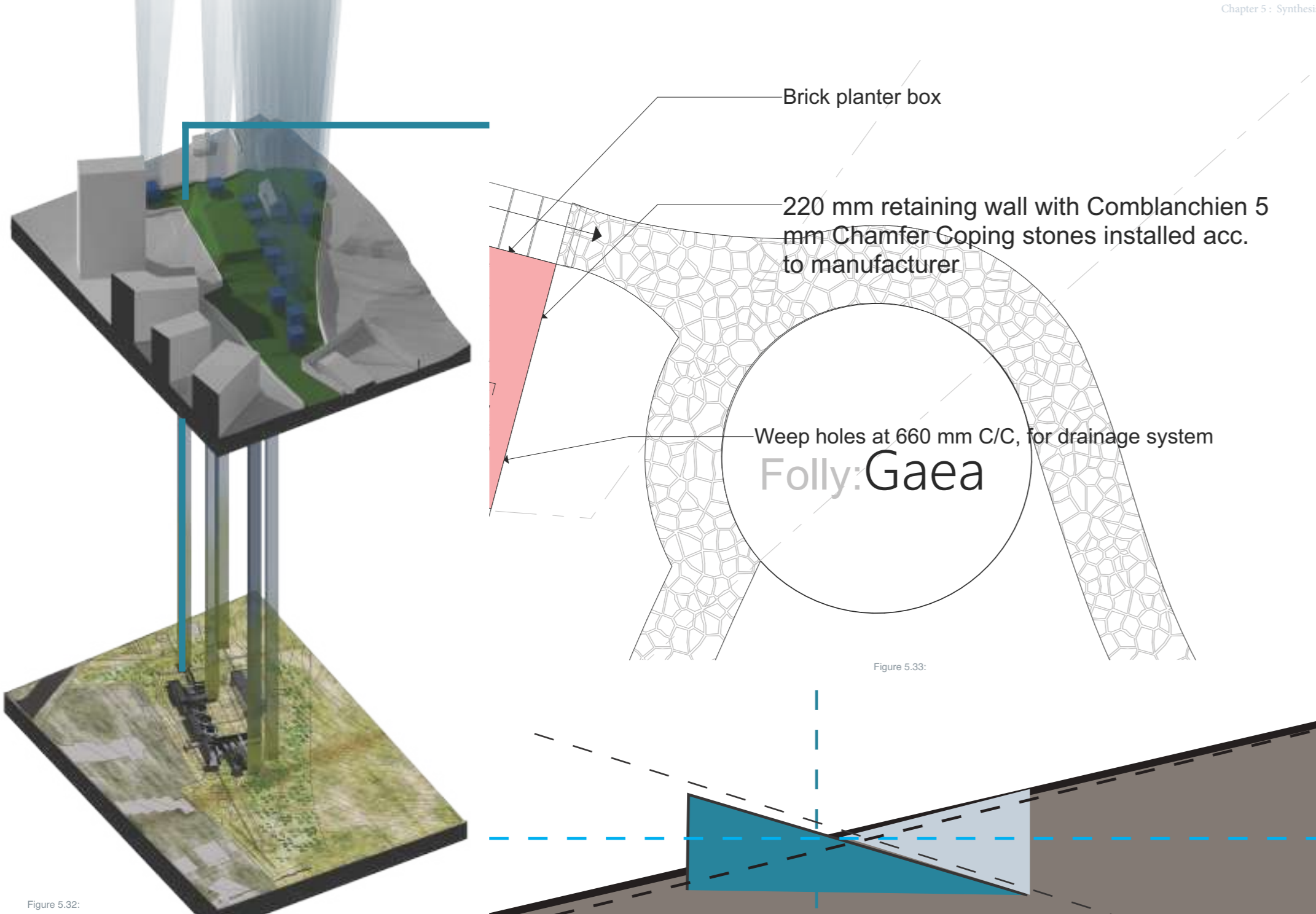


Figure 5.33:

Figure 5.34:

As previously discussed, the site folly locations are motivated by their therapy application and the occupational profiling of the site. Vestibular orientated follies will therefore be built with in a vestibular zone on site and vice versa. Furthermore, each folly is limited to a size of  $10 \text{ m}^3$  as with the follies in Parc De La Villette. The following are the six follies on site, each named for an ancient Greek/Roman/Egyptian god, serving to best reflect the function and purpose of each folly with a generalized and globalized allegory.

It is designed according to the concept of conflicting halos. A halo is defined as a form of light, usually a circle that surrounds an object or person (Merriam-Webster, 1828). Usually, this term refers to a spiritual sphere or aura that provokes an emotional and spiritual response. This folly evokes a response from the neurological systems, most notably it conflicts with the proprioceptive sense. The surface where a user stands is sloped in the opposite direction to the natural slope. As mentioned earlier, the proprioceptive sense is key in coordinating movements, controlling body posture, and the maintenance of balance through anatomic coordination. Therefore, the proprioceptive system is challenged by manoeuvring between two dramatically opposing surface slopes.



Figure 5.35:



Figure 5.36:



Figure 5.37:

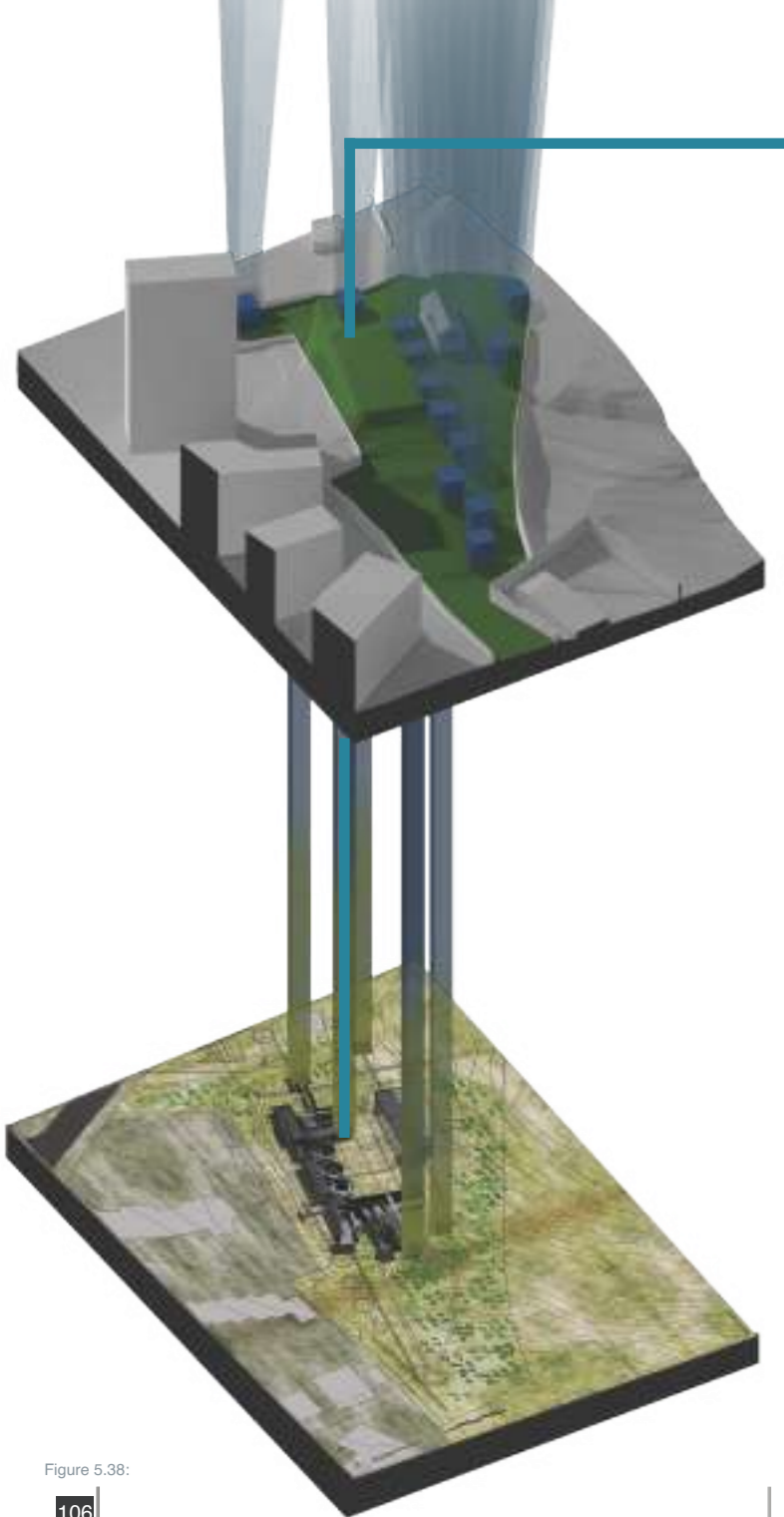


Figure 5.38:



Figure 5.39:

Inspired by the ancient Egyptian word 'tekhen', a hieroglyphic polysemous word for obelisk, that also means musician (Imhotep, 2019:online) Experts believe that ancient Egyptians often associate the 'tekhen' or obelisk with the sun god Ra (Konstantinovskiy, 2020: online). These monuments prompt the vestibular sense by drawing the viewer's gaze to the sky. Vestibular and visual systems work in tandem, which is known as the vestibular-ocular reflex. This "ear-to-eye" connection is critical for gaze stability. A common strategy to improve these connections requires patients to perambulate around a large object. Patients are asked to focus on a huge object situated a short distance away, while walking back and forth. These vestibular exercises improve balance by reducing head motion through mitigating gait and gaze instability (Schubert, Ciuffreda & Cohen, 2022).

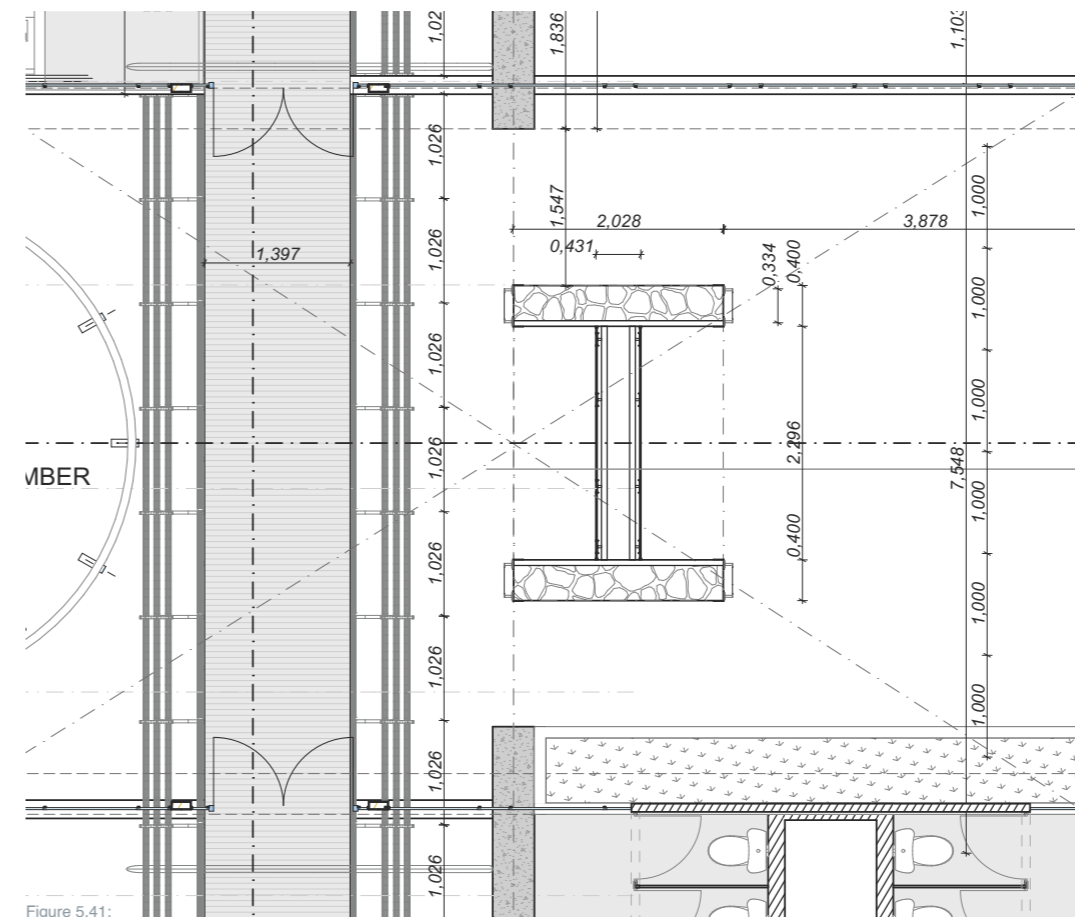


Figure 5.41:

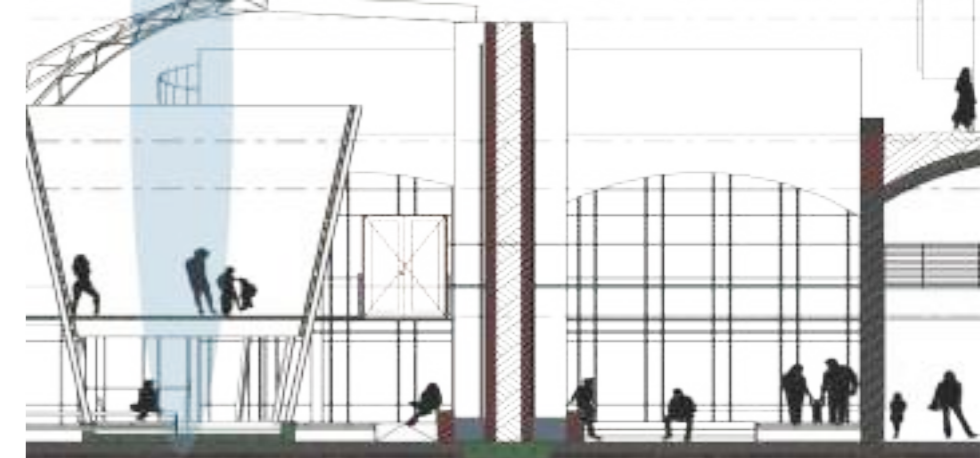


Figure 5.40:



Figure 5.42:



Figure 5.43:

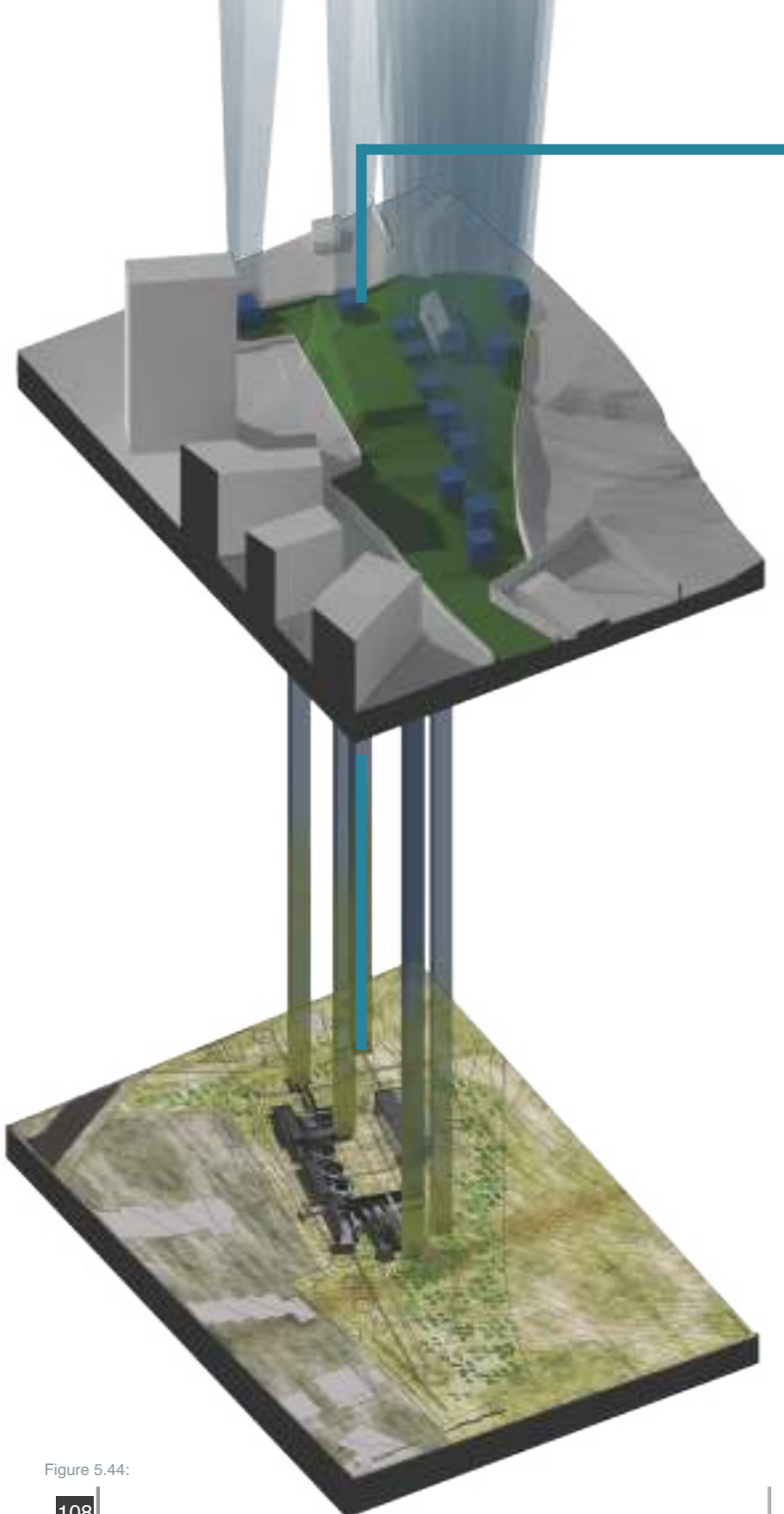


Figure 5.45:

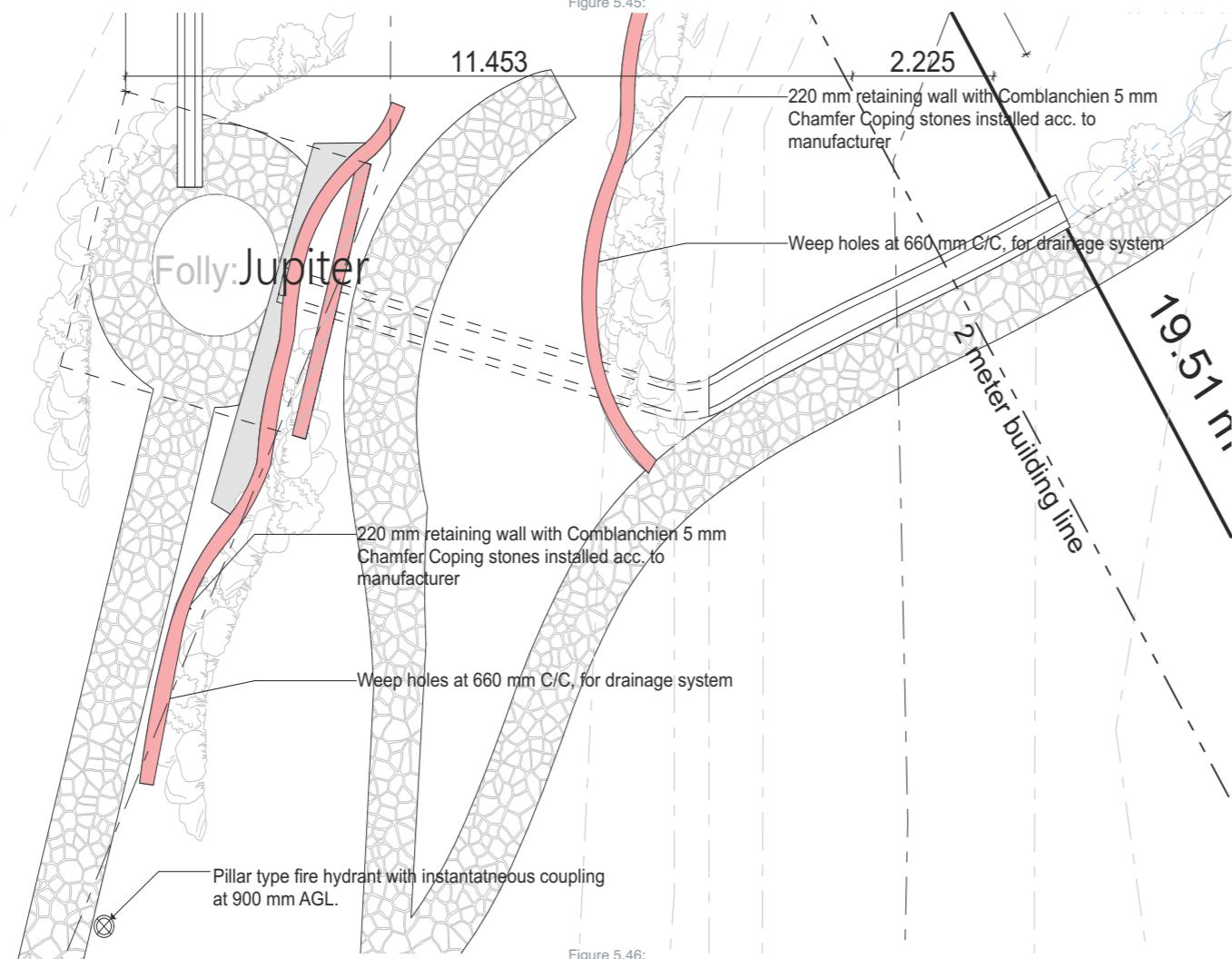


Figure 5.46:

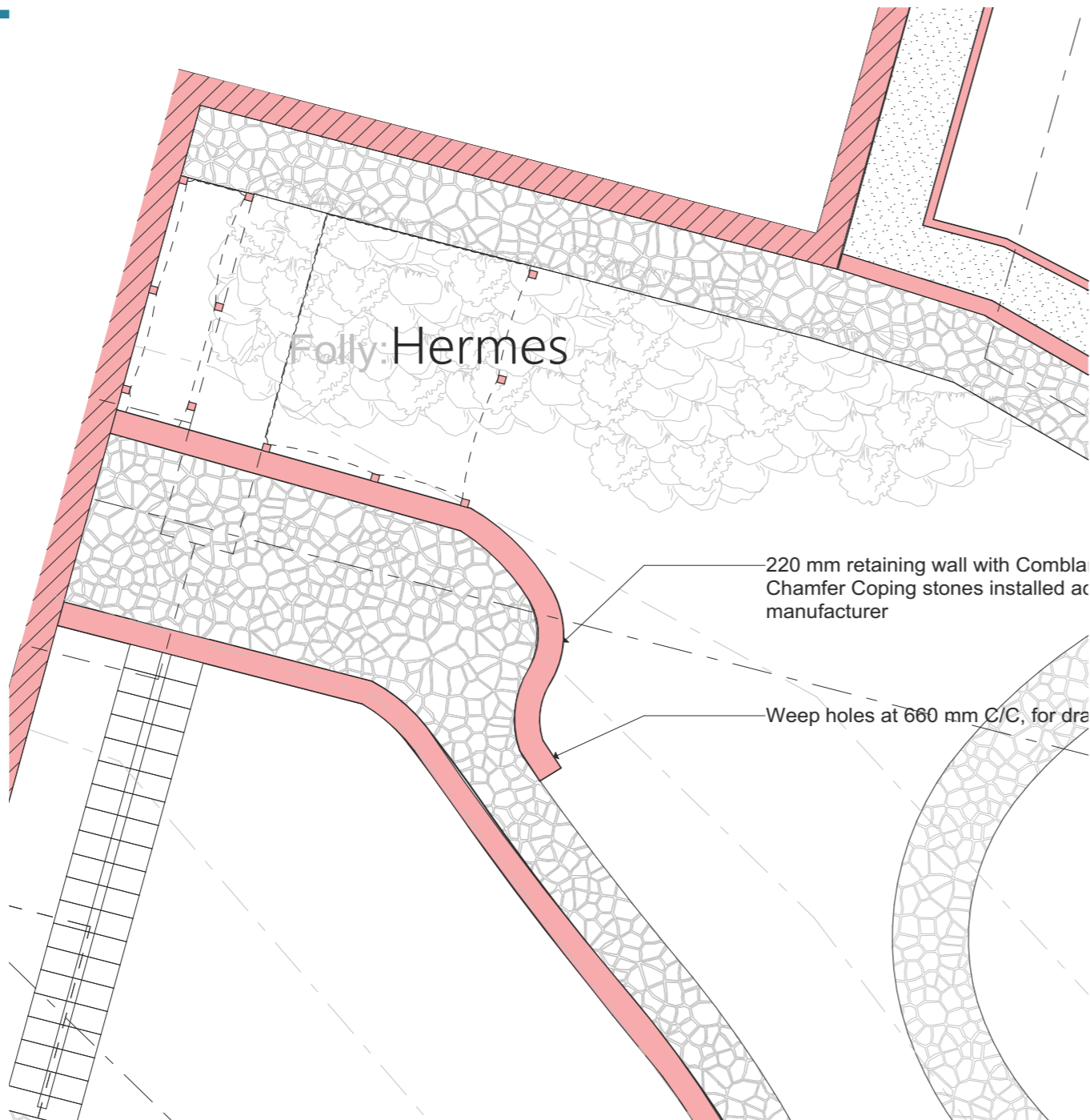
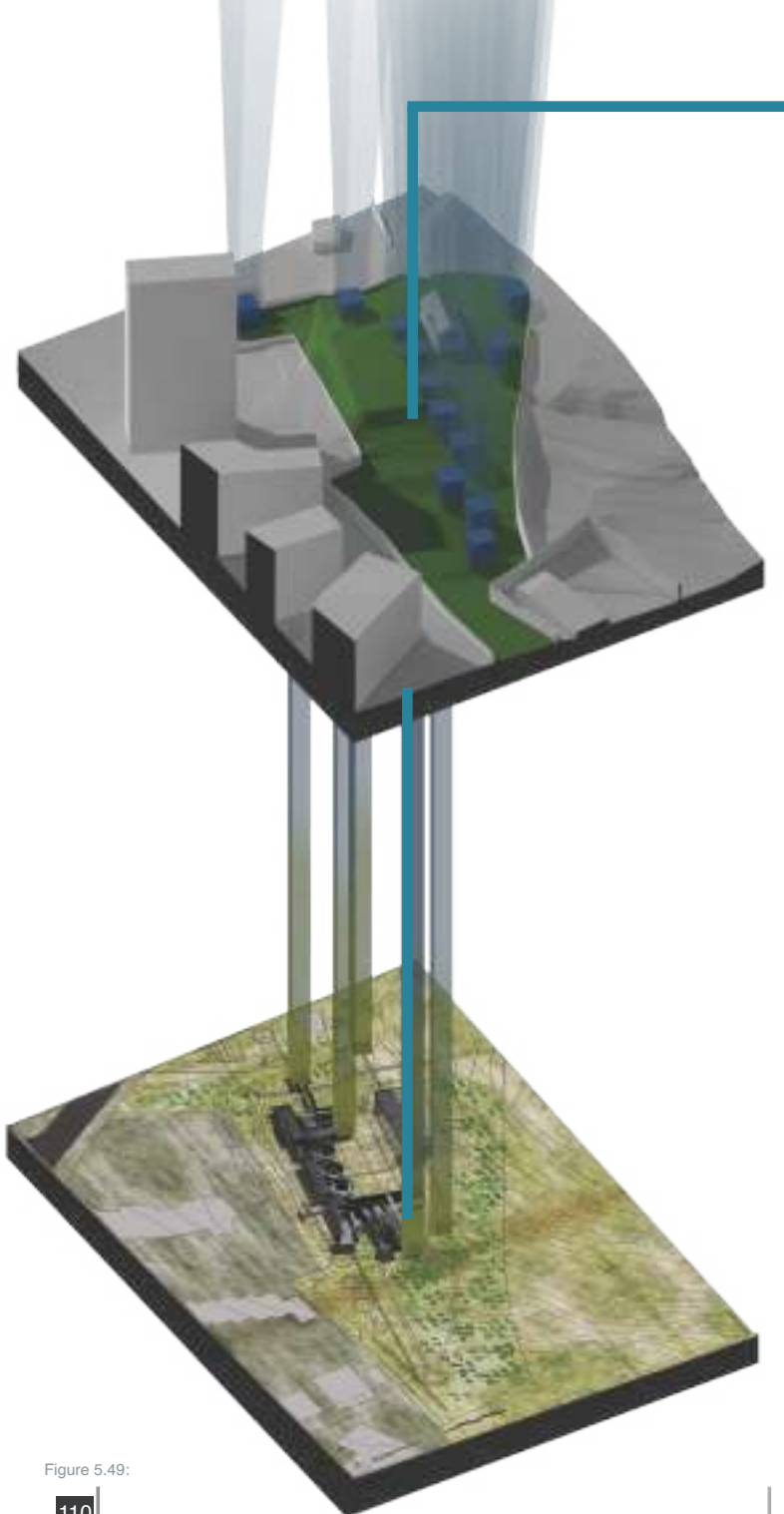


Figure 5.47:

Sounds can appear to be manipulated by simply walking around a speaker. The observer's orientation and posture relative to a speaker contest the vestibular sense. At its most basic form, this folly is a garden canopy where water cascades down from the ceiling. It is named after the Greek god Zeus because of its correlation to weather, for this folly simulates a gentle drizzle (Krishnan, 2018). Water trickles down from the centre of the canopy, splashing into a small pond. The sound of each splash is amplified by the acoustic focal point of the curved ceiling. Many won't be accustomed to the intensified sounds of water droplets. Such an unexpected augmentation of an everyday sound obscures the vestibular memory. Streaming water will subsequently lead to visitor's idle curiosity, where visitors unintentionally allow their gaze to follow a running channel.



Figure 5.48:



Hermes was the Greek god of boundaries and transitions, He came to be known for his wits and ability to transverse freely between the divine world and the mortal world (Hermes, 2014:online), therefore this folly represents the liminality between the divine world and the mortal world, the sky and the earth, existing in the liminality between the two. The human brain can determine exactly where the body is positioned in space. This intrinsic system of autonomous geolocation is only achieved through sensory feedback from joints and muscles. Manoeuvring, rolling, and bouncing are a great sources of proprioceptive stimuli (Harding, 2021:online). Crawling around a suspended net effectively locates each appendix, the anti-gravity nature of being suspended mid-air coupled with the difficulty in manoeuvring can easily overwhelm the proprioceptive system and achieve the therapeutic result necessary for healing.



Figure 5.49:

Figure 5.49: An isometric view indicating folly location, (Author, 2022).  
 Figure 5.50: Documented plan view of garden intervention, (Author, 2022).  
 Figure 5.51: Final perspective render of garden intervention, (Author, 2022).

Figure 5.50:

Figure 5.51:

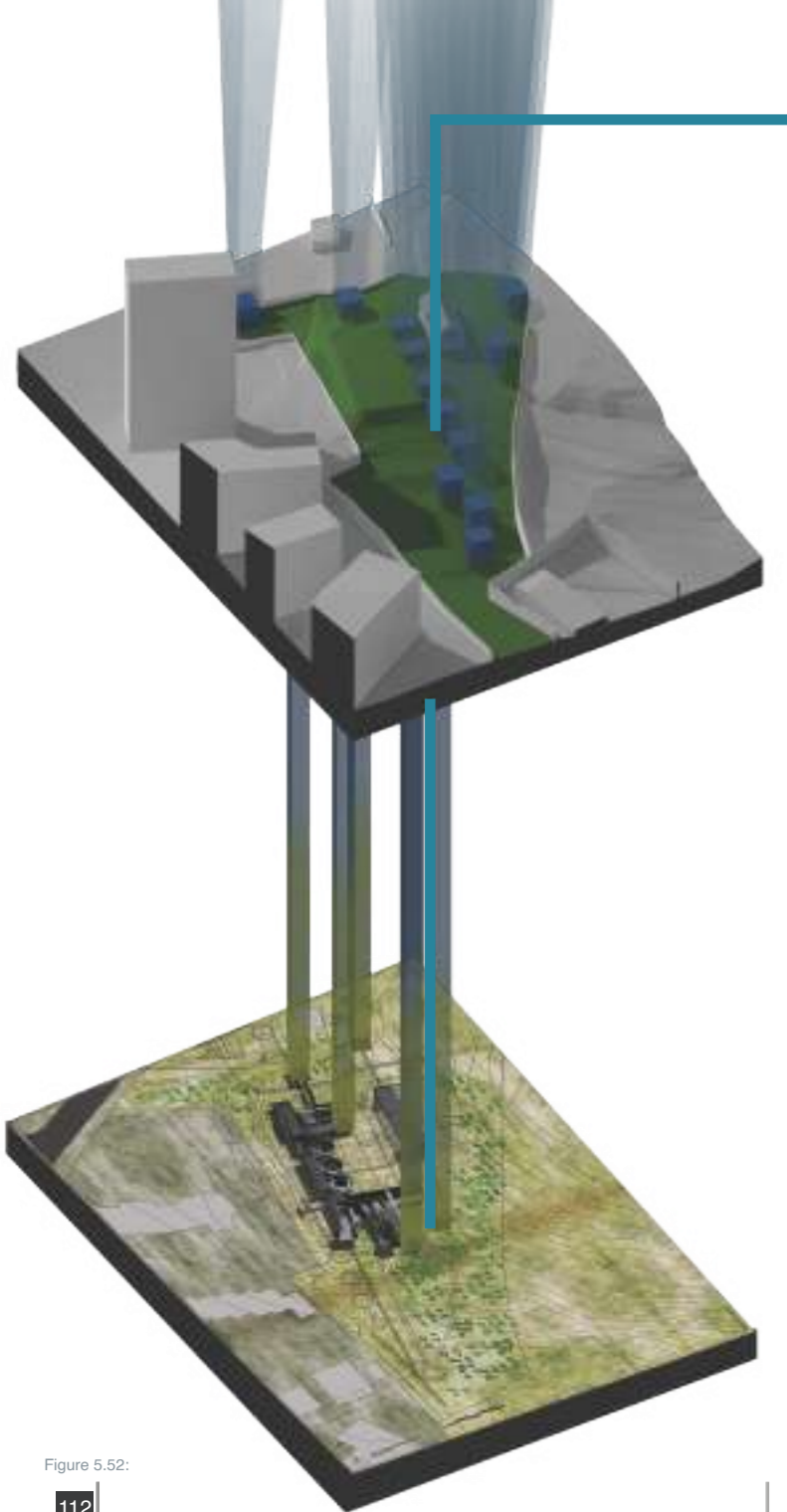


Figure 5.52:

112

Figure 5.52: An isometric view indicating folly location, (Author, 2022).  
 Figure 5.53: Documented plan view of garden intervention, (Author, 2022).  
 Figure 5.54: Final prototype of garden structure, (Author, 2022).

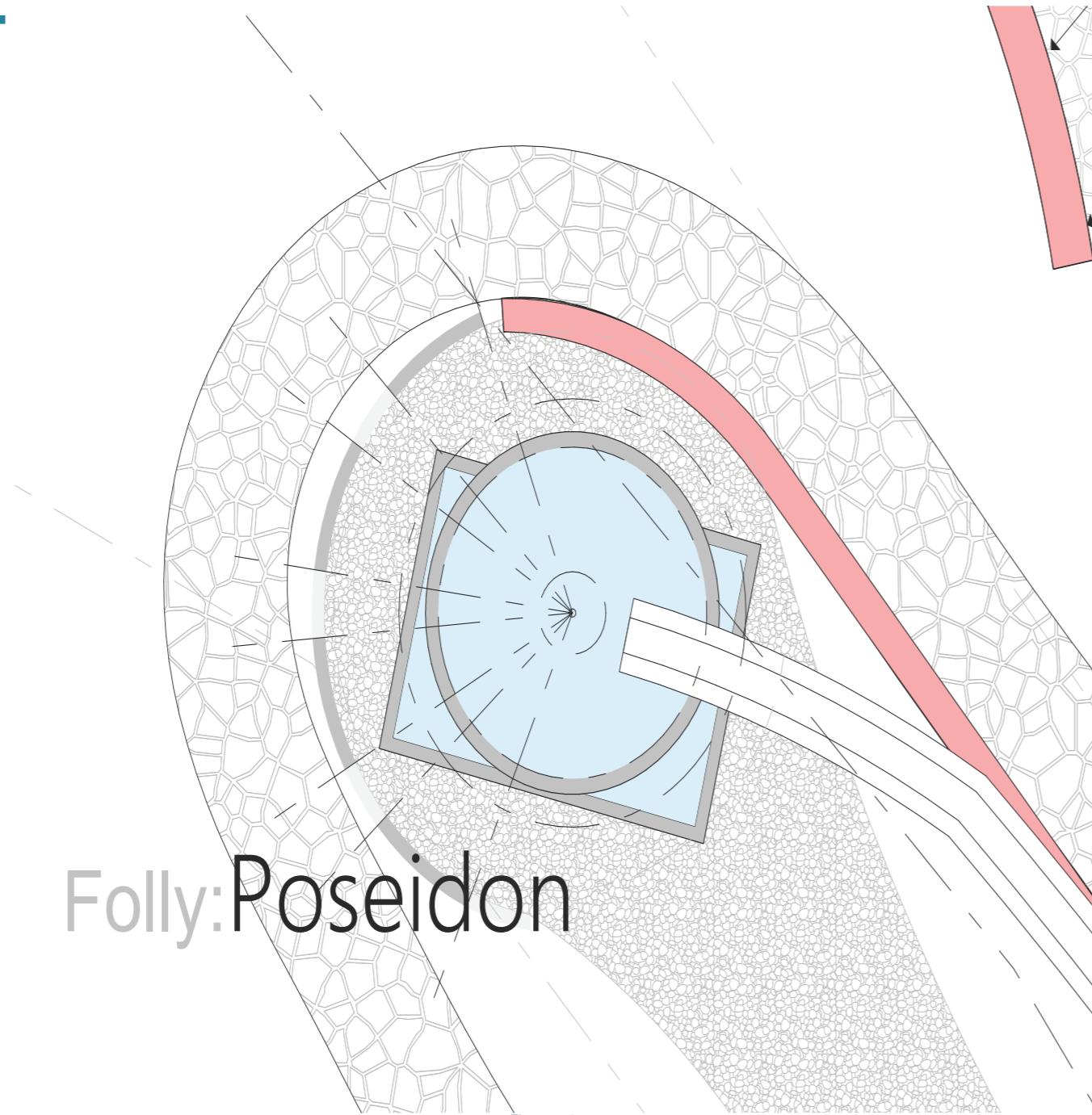


Figure 5.53:

# Folly: Poseidon

Poseidon is the god of the ocean, most notable for his association with water, and earthquakes (Hephaestus, 2014:online). This folly combines many sensory systems while keeping the vestibular at its core. It was conceptualized through a process of prototyping. As seen in Figure X, water flows form a suspended channel and splashes into an elevated pond. Built into this pond is a set of pullies connected to a single crank. A user can rotate it either way, similar to the mechanics of a traditional water well. Rotation of this crank causes curved canvases to tilt back and forth, either pulling them closer to, or further away from the user. They are intentionally positioned around the pond so that users can manipulate the sound produced by the splashing water, by the simple action of a rotating lever. Various colours are incorporated into the cables and patients would naturally try and follow these colours as they move back and forth, and in doing so, constantly draw the users' gaze between the pullies, further stimulating the vestibular.

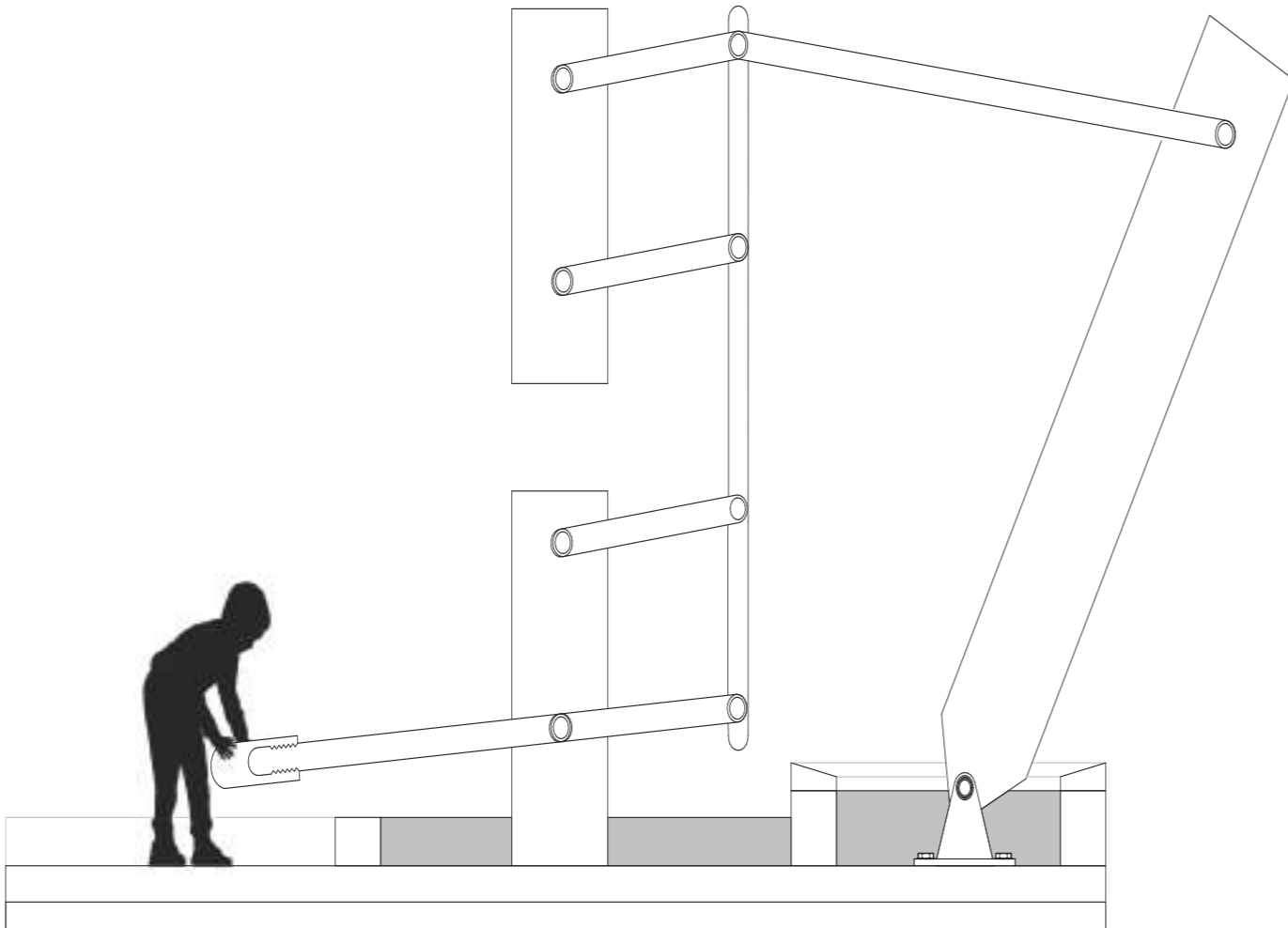
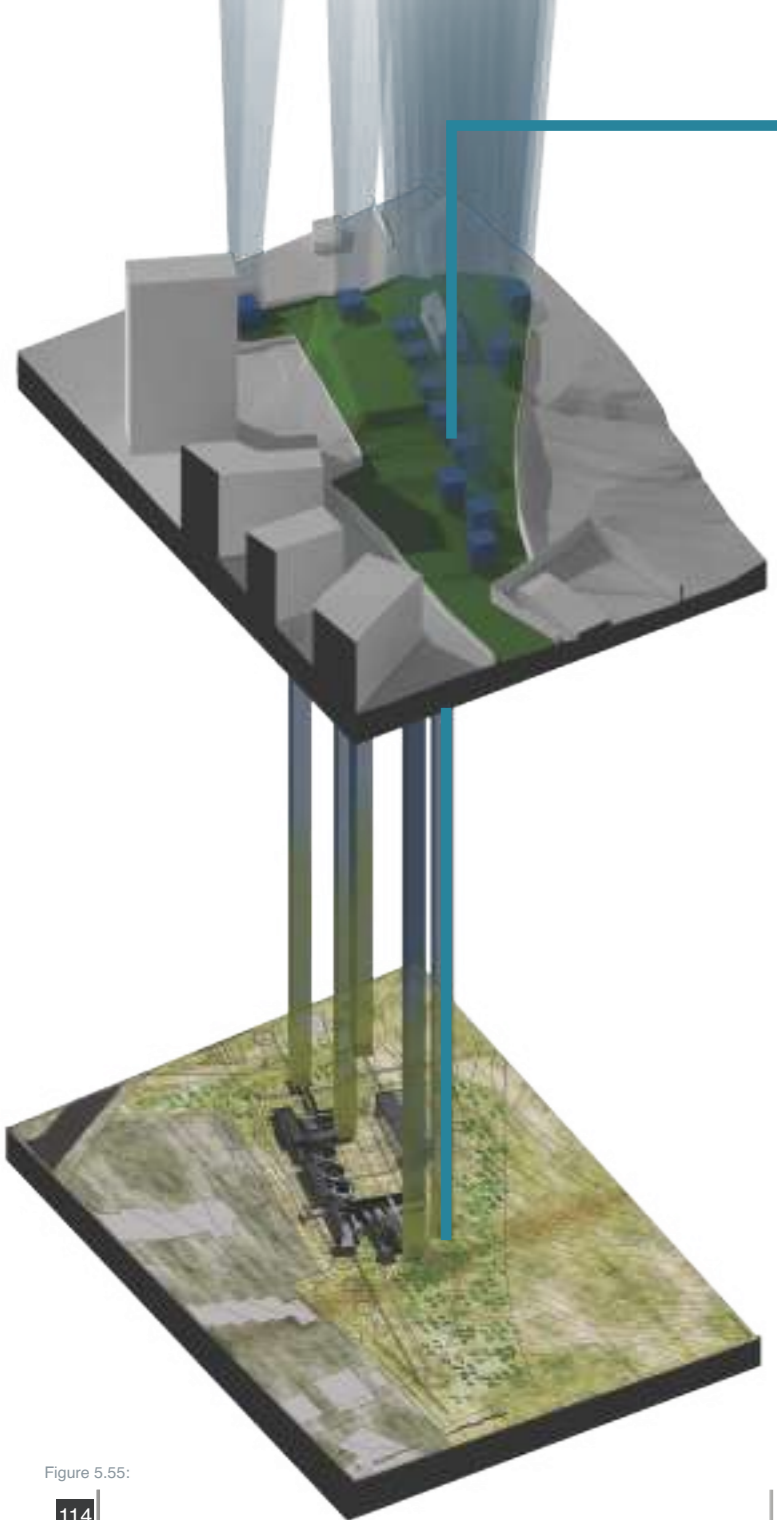


Figure 5.54:

113

Chapter 5

Hephaestus is the god of innovation, most notable for his stone masonry, metal work, sculpting, and his mechanical creations (Hephaestus, 2014:online). Designed to confuse the perceptive sense through a cleverly designed mechanical system that will both confuse the somatosensory and proprioceptive systems. The shape can only be described as an industrial obelisk cut horizontally. The bottom half remains stationary, while the top can easily move up and down through mechanical leverage, thus creating a visual illusion that would trigger the somatosensory system that consists of a network of neurons that help the human body generate appropriate sensory-motor feedback through object recollection.



This helps one recognize objects, distinguish between various textures, etc. (Madzime et al., 2022; NICCI, 2022). Most importantly this folly focusses on the proprioceptive sense, prompting specific nerve endings that inform the brain about the body's position. Locating muscles and joints through a network of nerve endings (Han et al., 2016). A common proprioceptive exercise is moving an object with resistance such as shovelling dirt, pulling, pushing, etc. These resistance activities are often referred to as "heavy work" (Drobnjak, 2017:online). The somatosensory and proprioceptive systems are forced into a state of ambiguity, the moment a patients' neurological understanding of objects is challenged by an insurmountable heavy object that is easily lifted by applying pressure to a lever.

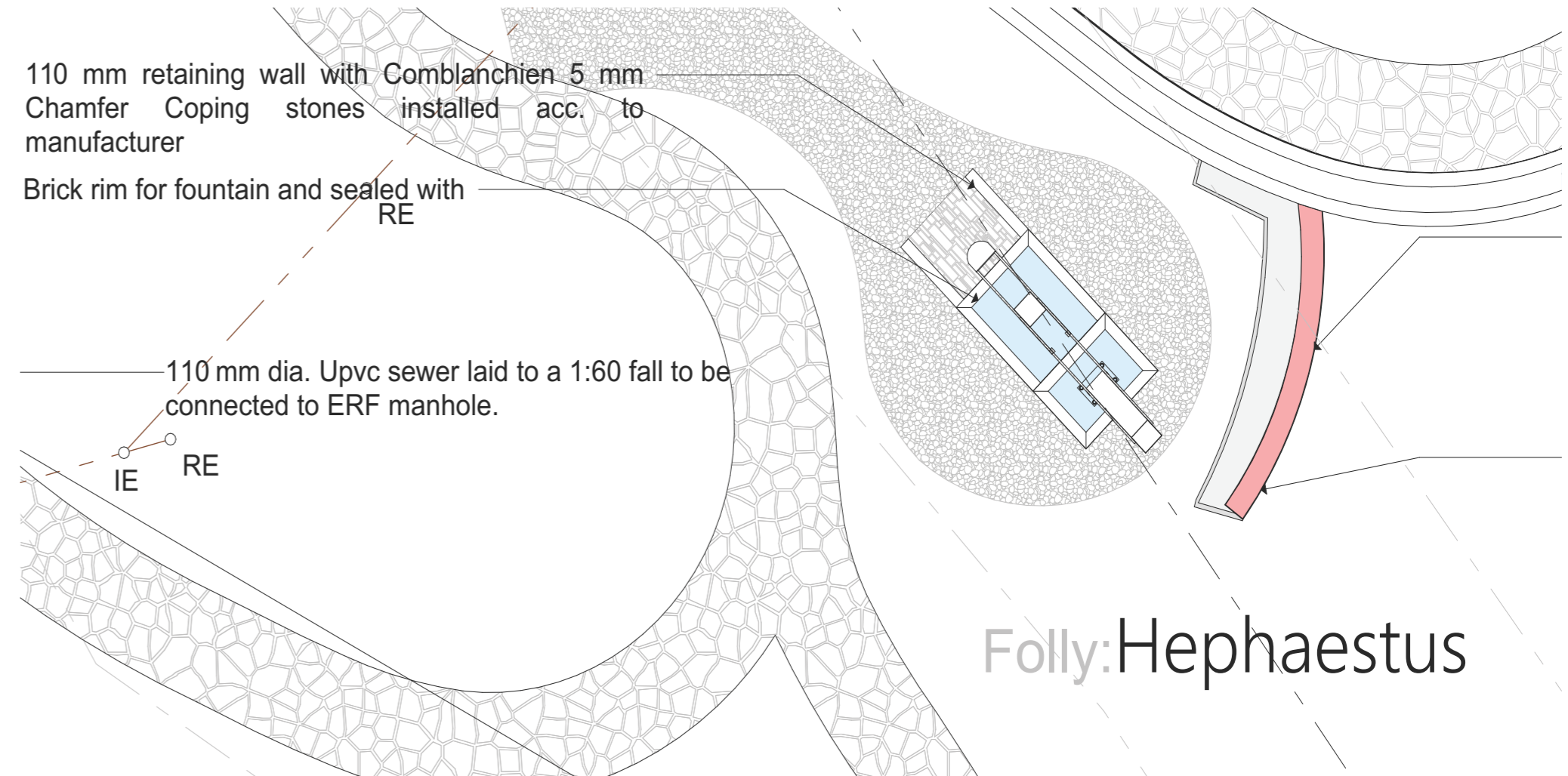


Figure 5.55:

Figure 5.56:

Figure 5.57:

Eventually, the SA-AS facility will function as a speech therapy facility. As mentioned before, pathologists carefully plan each therapy exercise. Not only for therapeutic intent but also focused on the development of generalised exercises. This means that these exercises can be done anywhere without the need for specialized equipment. This allows pathologists to operate wherever space is available while encouraging patients to practice anywhere at any time, inequitably enabling pathologists to renovate any office space into a functional therapy facility.

This section targets the specific needs and requirements that would only apply to the office space for speech and occupational therapy, thus aiming to design a structure that would be functional for only the use of speech or occupational therapy. It is therefore crucial to study how a purposefully designed facility would differ from the example of reappropriated office spaces.

*“One Kids Place Children’s Treatment Centre is a not-for-profit corporation providing regional rehabilitation and related support services. The new Children’s Treatment Centre in North Bay, Ontario Canada serves children and youth with communication, developmental and physical needs including, with a range of integrated services, which include occupational therapy, physiotherapy, speech language pathology, social work, therapeutic recreation and specialized medical clinics.”*  
 – Paul Mitchell (Archdaily.com, 2010)



Figure 5.58:

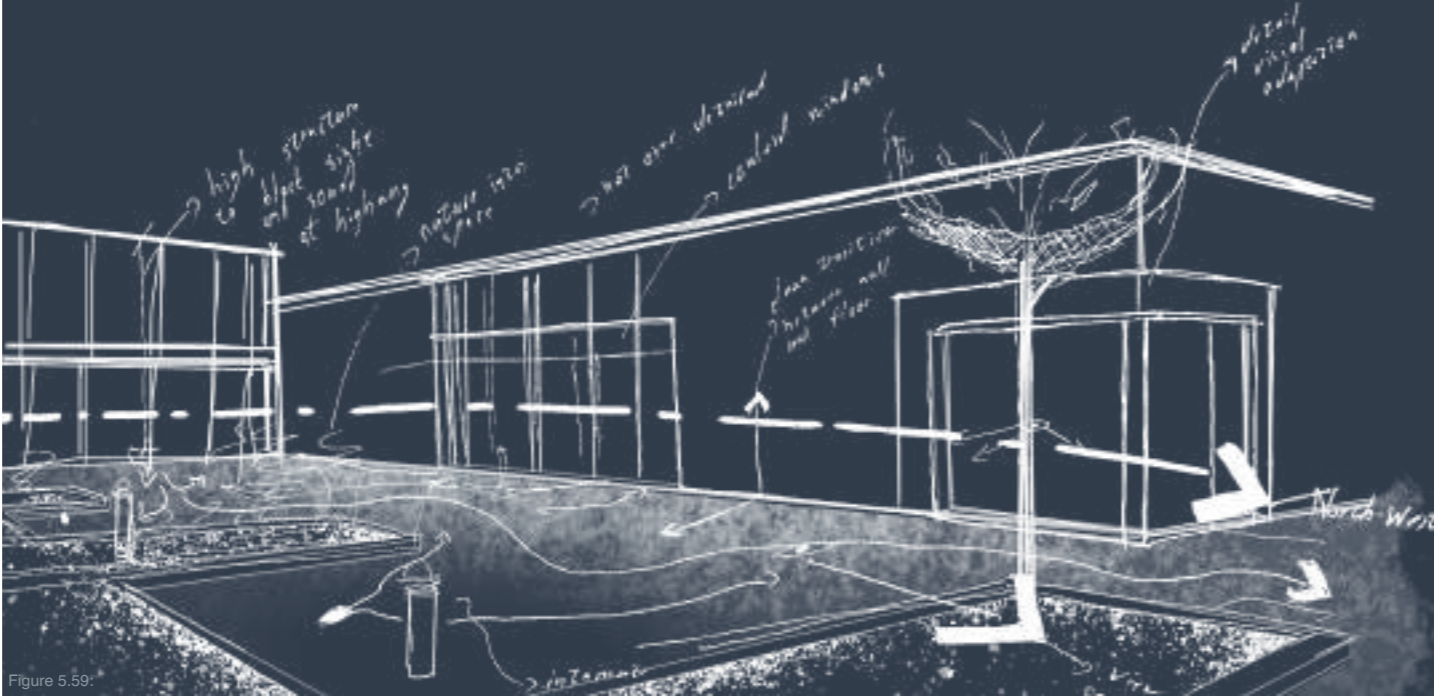


Figure 5.59:

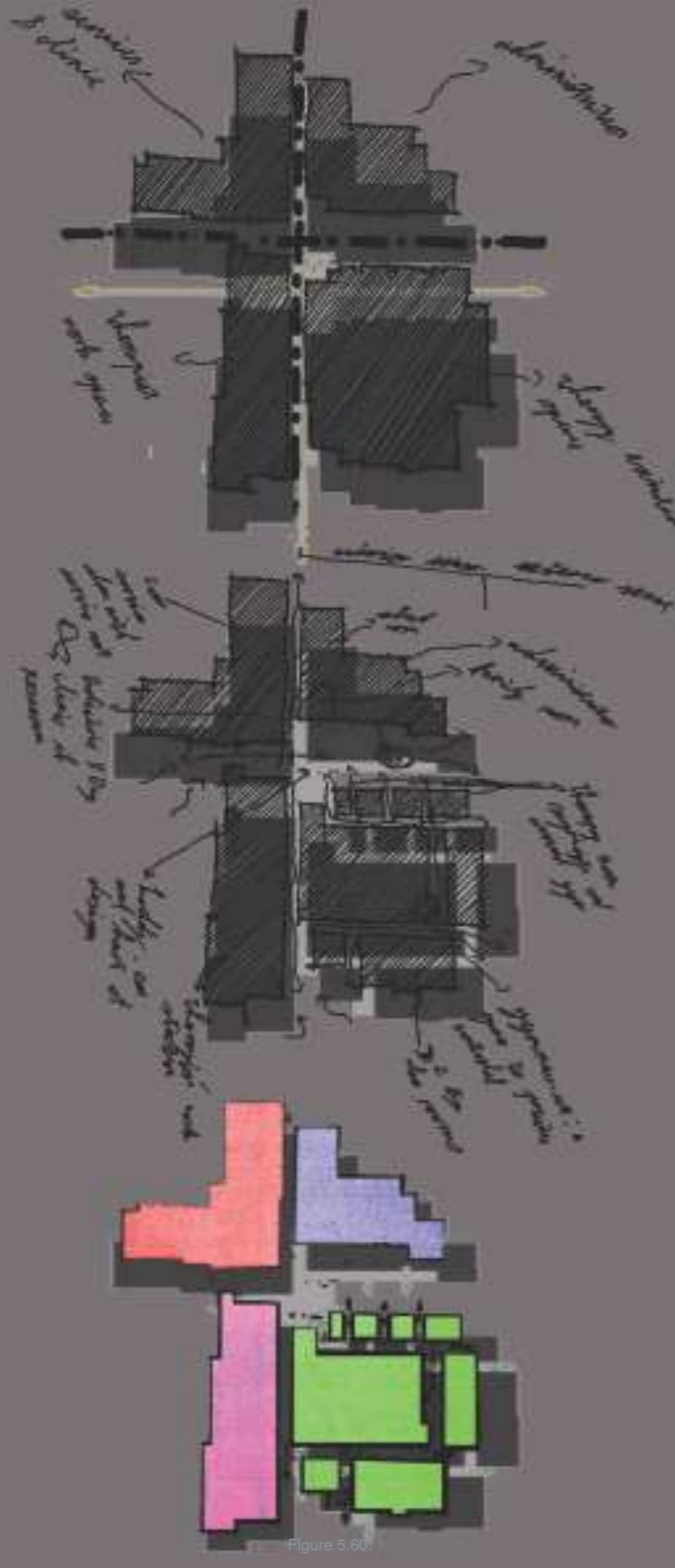


Figure 5.60:

The following project was completed by a Canadian architectural firm, Mitchell Jensen Architects, in 2009. They designed an award winning children treatment centre in North Bay, Canada. Paul Mitchel was the lead architect and project manager. He was responsible for many aspects of this project, including selection of the location. He settled on a previously undeveloped 5,9 acre (23 876,5 m²) site, intentionally close to the North Bay General Hospital (One Kids Place, 2022). The One Kids Place has been an absolute blessing for many kids, adults and parents. It is primarily orientated around occupational and speech therapy. However, this facility has recently added autism spectrum disorder treatments to its arsenal (One Kids Place, 2022.). One Kids place is an excellent example of how architecture can optimize a generalized programme.

This section cross-examines the One Kids Place to achieve a similar level of success within the SA-AS facility, while questioning the concepts that inspired The One Kids Place, followed by an investigation into the location and functionality before the final amelioration of the programme.



Figure 5.61:



Figure 5.62:



Figure 5.63:



Figure 5.64:

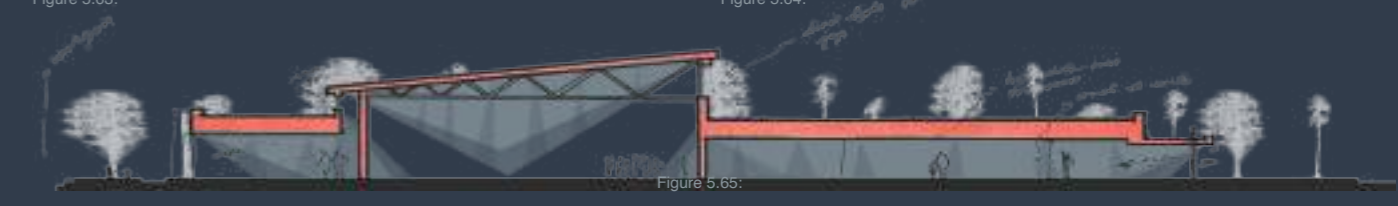


Figure 5.65:

Figure 5.58: Indication of precedent location, Canada, (Archdaily.com, 2010: online).  
 Figure 5.59: Sketch of courtyard directly adjacent to entrance foyer, (Author, 2022).  
 Figure 5.60: Diagram of One kids place pragmatic exploration, (Author, 2022).  
 Figure 5.61 - 5.64: Photos of One Kids place few years after completion, (Archdaily.com, 2010: online).  
 Figure 5.65: Sectional sketch through gymnasium, (Author, 2022).

### 5.2.3.1.1 Site

The One Kids Place design does not aim to overload the sensory field nor do they apply childish ornamentation. This might not seem relevant; however, it does help to explain why this facility is different from other therapeutic environments and landscaping. The staff are focussed on improving the quality of services and applications to both parents and children. Mitchell eloquently embodies his clients' professionalism into a structure that instils confidence in its application. Designing a unique spatial character through selective materials further enables therapists by including tactile stimuli to their array of neurological stimulating activities. Within a singular environment, Mitchell caters for everyone's needs and abilities. Unfortunately, the site was located against a constantly populated freeway, which complicated the circulation and noise control within the facility. Mitchell therefore addressed noise levels by means of landscaping and vegetations by planting dense brush on the site boundary and orientating the functions of the facility for internal circulations. Vehicle circulation was made easier by increasing the driveway distance from the site entrance to the nearest parking area. This accommodates more vehicles to wait in line for leaving or entering the facility.

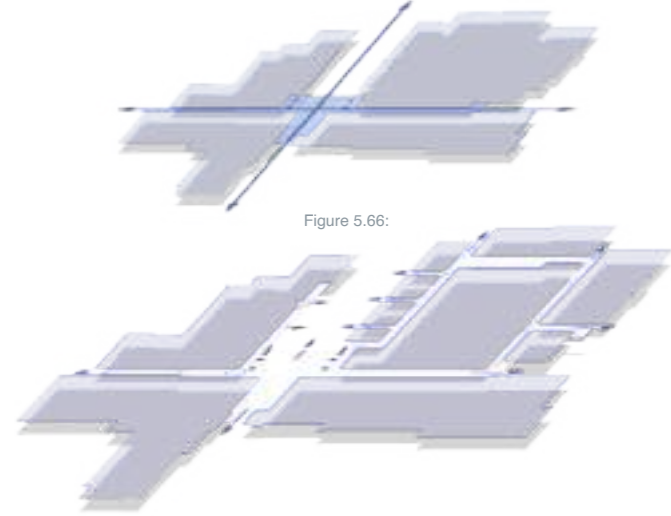


Figure 5.66:



Figure 5.67:

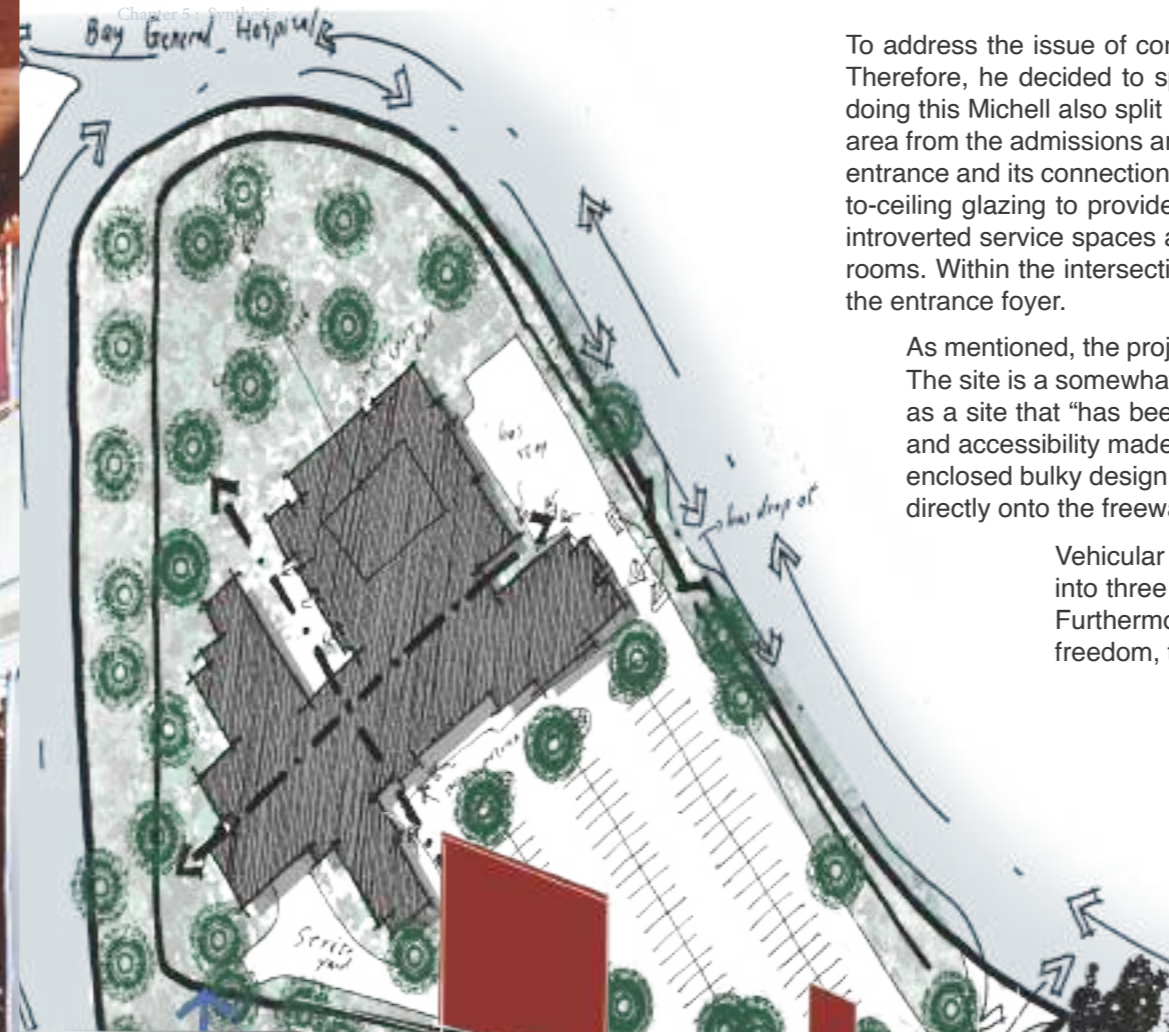


Figure 5.68:



Figure 5.69:

To address the issue of contextual noise levels, Mitchell knew that he would have to design an inward-facing facility. Therefore, he decided to split the facility into four different functional sections, as seen in Figure 5.60 and 5.66. By doing this Mitchell also split the facility along two axes, drawing a line from east to west, segregating the administration area from the admissions area. It is demarcated as the patron axis that extends from the overhang articulating the main entrance and its connection to the sensory park. It furthermore engages the entrance foyer and courtyard through floor-to-ceiling glazing to provides colourful natural light for the most public spaces. The perpendicular axis separates the introverted service spaces and therapist's private office spaces from the more extroverted service spaces and therapy rooms. Within the intersection of these two axes lies the heart of the facility, which refers to the large open volume of the entrance foyer.

As mentioned, the project is located in North Bay, Ontario, Canada on a 5,9 acre or 23 876,5 m<sup>2</sup> undeveloped site. The site is a somewhat enclosed stretch of land surrounded by municipal highways and described by the architect as a site that "has been left orphaned". Its orientation, size, proximity to North Bay General Hospital to the west, and accessibility made this particular site an obvious choice. Due to freeway noise pollution, Mitchell designed an enclosed bulky design. Keeping the existing environmental aspects in mind, he decided to minimize views looking directly onto the freeway and decided to rather frame the surrounding landscapes (One Kids Place, 2022.).

Vehicular accessibility is limited only at the southern entrance. Upon entering, the driveway splits into three sections: a service yard, public parking, and a bus drop-off point. (One Kids Place, 2022). Furthermore, Mitchell proposed a single-storey facility. Convinced that this facility should only inspire freedom, this includes freedom of movement for the physically challenged.

Two intimate courtyards filter the contextual infrastructure through vegetation and breakaway spaces. In order to make it appear more transparent, Mitchell placed the most prominent courtyard directly facing the main entrance. This creates a space that leads daily visitors through the patron axis and towards a conceptual sensory park (One Kids Place, 2022). Organized intimate spaces surrounding this courtyard further shelters dwellers from traffic sound. A few common sensory exercises are available on site. However, the full vision Mitchell had for the sensory park never materialized. Instead, a carpet of lawn was laid over the site with only a few traditional playground elements added (One Kids Place, 2022).

Figure 5.66: Diagram of the final amalgamation of the One Kids Place program, (Author, 2022).

Figure 5.67: Interior elements with trigger various sense within the entrance foyer, (Archdaily.com, 2010: online – readapted by Author).

Figure 5.68: One Kids Place site plan, (Author, 2022).

Figure 5.69: Exterior elements with trigger various sense within the courtyard adjacent to the entrance foyer, (Archdaily.com, 2010: online – readapted by Author).

### 5.2.3.1.2 Designers' intent

Mitchell's intentions evolved during the course of this project and he later started to pursue a more welcoming interior environment. Apart from his original goals of easily accessible facilities, framed views of the landscape, and contextually isolation, Mitchell turned his gaze to the therapeutically stimulating experience that architecture can provide. He managed to accomplish this through meaningful materials found on site. This vernacular design combines wood and stone in such a way that visitors can indulge the warm and comforting atmosphere. Impressively, Mitchell uses bio-filtering systems to regulate the interior air quality separately from controlled heating through passive elements such as overhangs, clerestories, and aluminium louvers (One Kids Place, 2022).



Figure 5.70:



Figure 5.71:



Figure 5.73:



Figure 5.74:



Figure 5.75:



Figure 5.76:

Figure 5.77:

### Spatial enhancements

Material diversity amplifies the interior qualities of the spaces. Apart from the already mentioned wood and stone, Mitchell stimulates the tactile system through the creative amalgamation of exposed clay bricks, glue-laminated timber, maple, fragrant timber such as cedar, slate tiles, and limestone (masonry, polished sills, and tiles). The entrance foyer is shown in Figure 5.67. Note how discreet these materials are incorporated. Natural light effortlessly illuminates the heart of the design, penetrating through two glass pyramid skylights, while filtering through a colourful and unusual chandelier.

Each skylight is situated above an important tactile element. In Figure 5.70, the skylight is situated directly above a large green wall. Apart from the beneficial hydrophilic growth that improves air quality, this large green wall is arguably the closes feature that resembles a therapeutic folly. It stimulates the tactile and vestibular systems. Surprisingly, this facility incorporates a handful of built-in stimulating activities that are similar in concept to the garden structures or follies proposed by the SA-AS facility. Figure 5.73 shows a built-in proprioceptive exercise, with various timber objects that patients are able to shift, rotate and move around. Elements such as these are spread throughout the One Kids Place. Therapeutic activities such as water play, reflections that play on perception, tactile stimuli, including vestibular and proprioceptive installations, are incorporated. The design even includes a large saltwater fish tank to calm patients and visitors waiting in the entrance foyer.



Figure 5.72:

Figure 5.70 & 5.71: Photos of One kids Place interior, (Archdaily.com, 2010: online).  
 Figure 5.72: Elements witch trigger various sense within the exterior façade, as seen from the parking lot, (Archdaily.com, 2010: online-readapted by Author).  
 Figure 5.73-5.76: Conceptual indicating how the sensory exploration starts with in the entrance foyer, from within the heart of the large green wall, (Archdaily.com, 2010: online - readapted by Author).  
 Figure 5.77: Section through One Kids Place, running through the entrance foyer, (Archdaily.com, 2010: online).



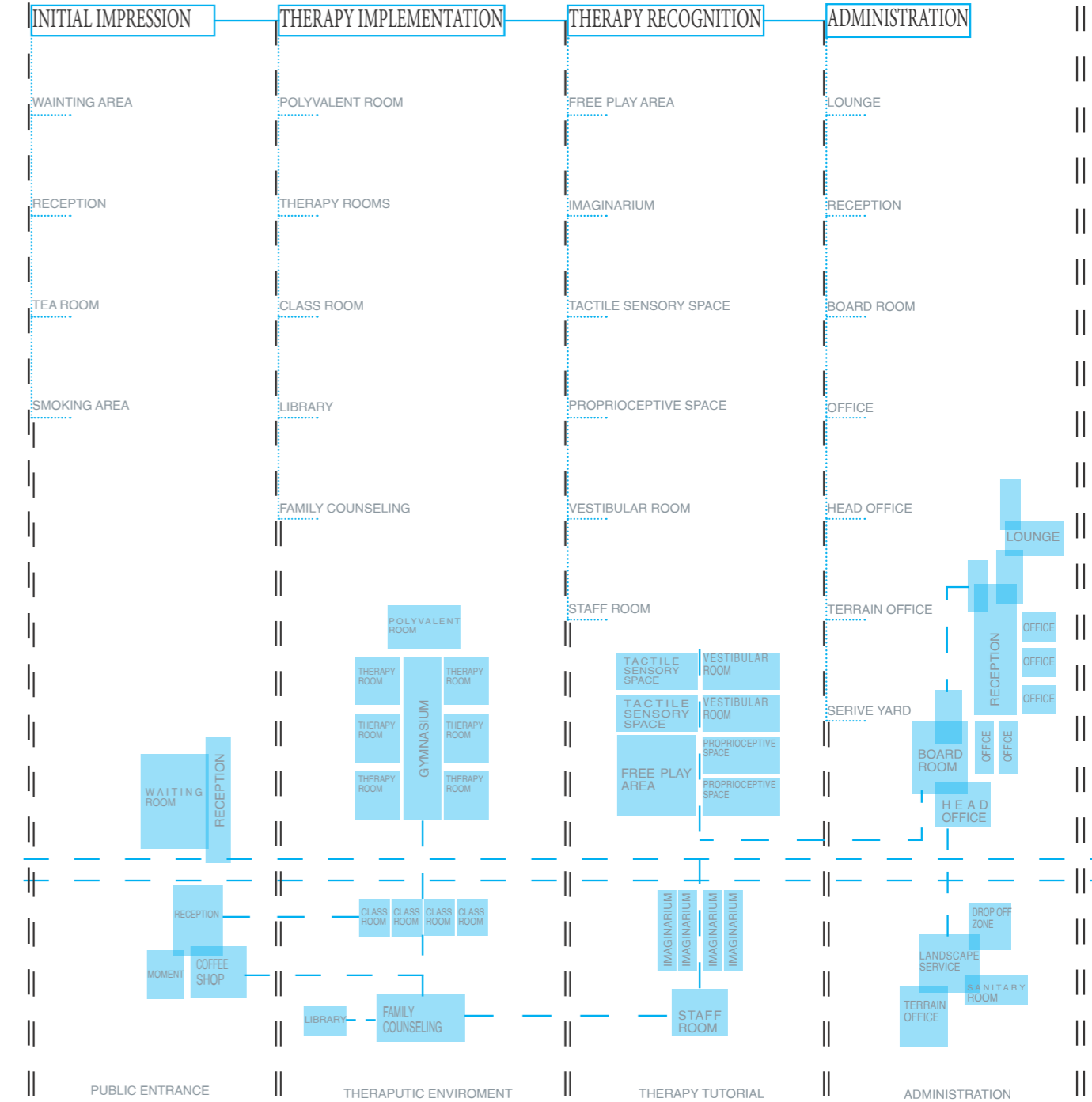
### 5.2.3.1.3 Program

The One Kids Place is able to address a broad range of impairments. The facility is constantly expanding and adding more to the list of treatments. This ever-expanding accommodation list includes autism treatment facilities and an in-house clinic for paediatric care, thanks to their partnership with the North Bay General Hospital (One Kids Place, 2022). Besides the expected therapy rooms and other common programmes, this facility makes use of architectural installations to manipulate and trigger sensory systems, not unlike the SA-AS facility that explores and experiments with the therapeutic implications of architecture. The One Kids Place facilitates the professional practice of therapy treatment for children and young adults (One Kids, 2022). It is distinguishable from the SA-AS facility where architecture does not only house therapy but is a crucial part of it.

To conclude the precedent study, the following diagram shows the final amalgamated accommodation list of the One Kids Place along with the pragmatic links between each element. Only a few changes will be made to this accommodation diagram.

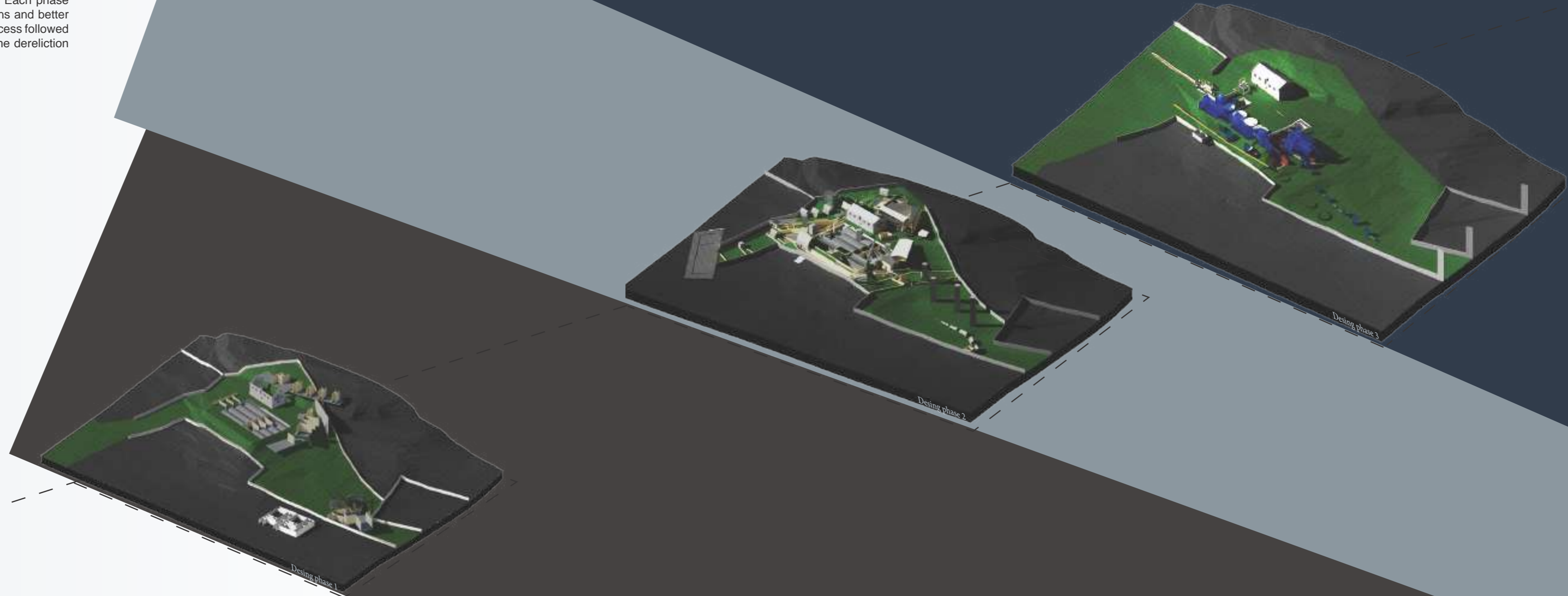


Figure 5.78: Conceptual expression of various parts combining into one piece of moldable clay. (Miguel, B, 2018:online- readapted by Author).  
 Figure 5.79: One Kids Place plan, (Author, 2022).



## 5.3 Design phases

Looking back at the many attempts and iterations of this project, it became apparent that this dissertation's development can be broken up into three phases. Each phase represents critical turning points that paved the way for further explorations and better understanding of the architectural synthesis. By closely scrutinizing the process followed with in the inception phases, the final design development sprung from the dereliction of the first two phases.



### 5.3.1 Phase one

During this phase of conception, it was difficult not to feel overwhelmed by various ideas and theories. This was ultimately the downfall of phase one as it quickly unravelled by incorrectly interpreting the fundamental purpose of this proposal. This led to a rushed architectural solution, with the therapeutic facility buildings scattered on the site, fragmenting the programme in order to design a sensory park where therapy spaces are spread throughout the landscape. Landscape design and functional therapy facilities were merged into one coherent garden layout. The sketches in Figures 5.84-5.94, investigate how therapeutic installation can be incorporated within a functional space. Inspired by the work of Paul Mitchell, these installations are the paradigm of subtle sensory application within the final design.

This phase scattered fragments of the facility's programme throughout the site. The result of this was inoperative. Detached therapeutic applications caused this prototype to collapse and the most basic requirements tore up almost every aspect of this design approach. Not only were these functional spaces inadequately located, the scale and slope of the proposed site was underestimated.



Figure 5.82:



Figure 5.83:

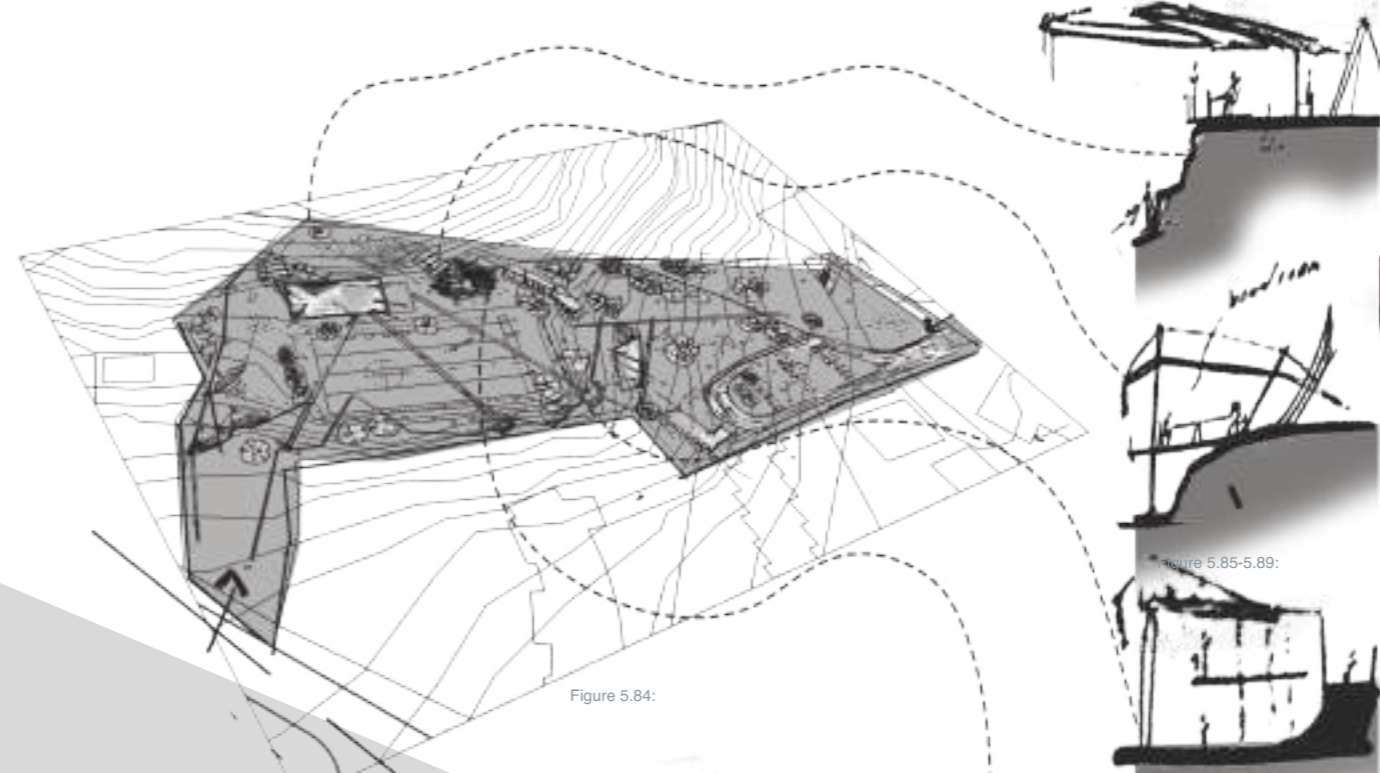


Figure 5.84:

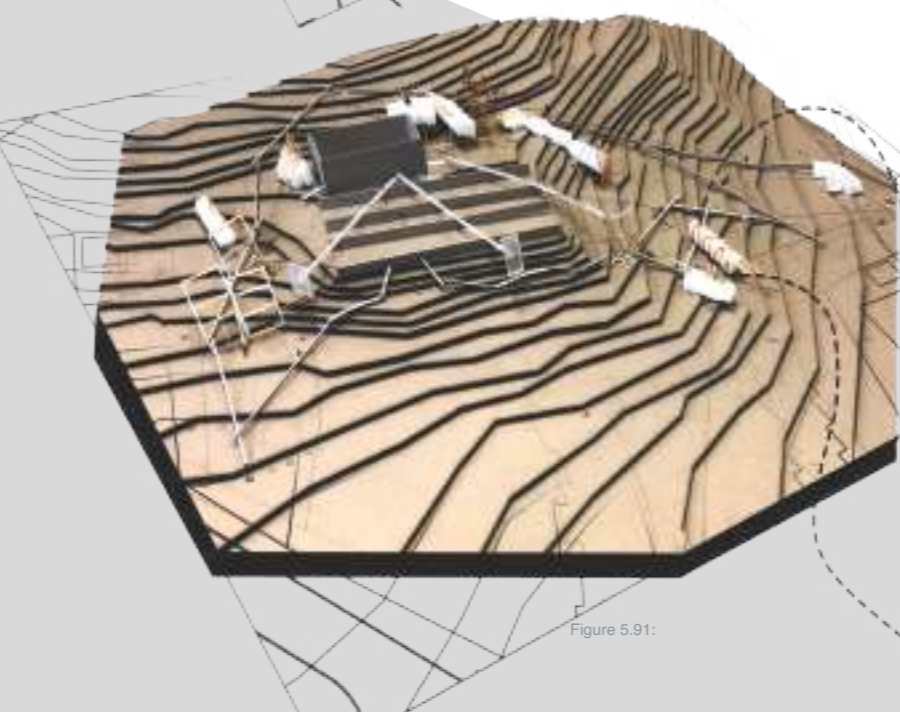


Figure 5.91:



Figure 5.85-5.89:

Figure 5.92 & 5.93:



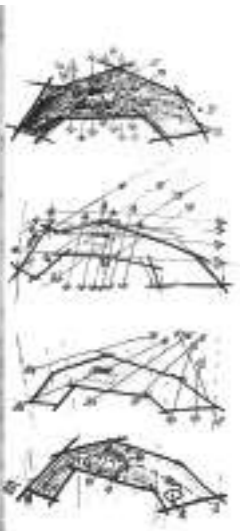
Figure 5.90:



Figure 5.94:



Figure 5.81:



### 5.3.2 Phase two

Expecting to improve on every aspect of the first phase and pouring in every possible ingredient into the designer's potion, this second attempt ultimately exploded in a spectacular fashion. Butchering every idea while blending it all into one resulted in complete chaos. Even though this design was sporadic, unpractical, and historically insensitive, it still cultivated many positive features. Through the exploration of more options, the facility programme was refined and successfully incorporated the underground reservoir and pumpstation into a centralized development. All the administrative facilities were also combined into one space, even though placing above the pumpstation was uncomfortable. The therapy spaces were also awkwardly placed. Without justification these spaces are buried just the east of the reservoirs. Nevertheless, this phase kickstarted the investigation into using the submerged reservoir as a phonic gymnasium.



Figure 5.95:



Figure 5.96:



Figure 5.97:

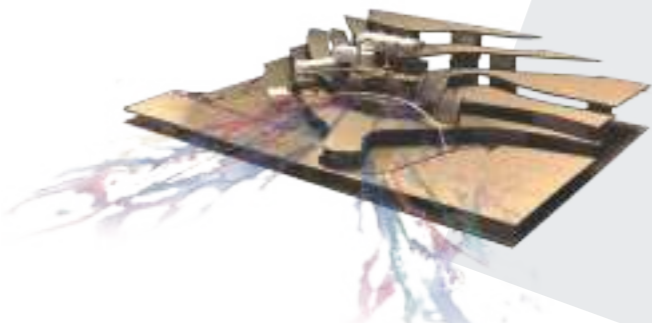


Figure 5.98:



Figure 5.99:



Figure 5.100:

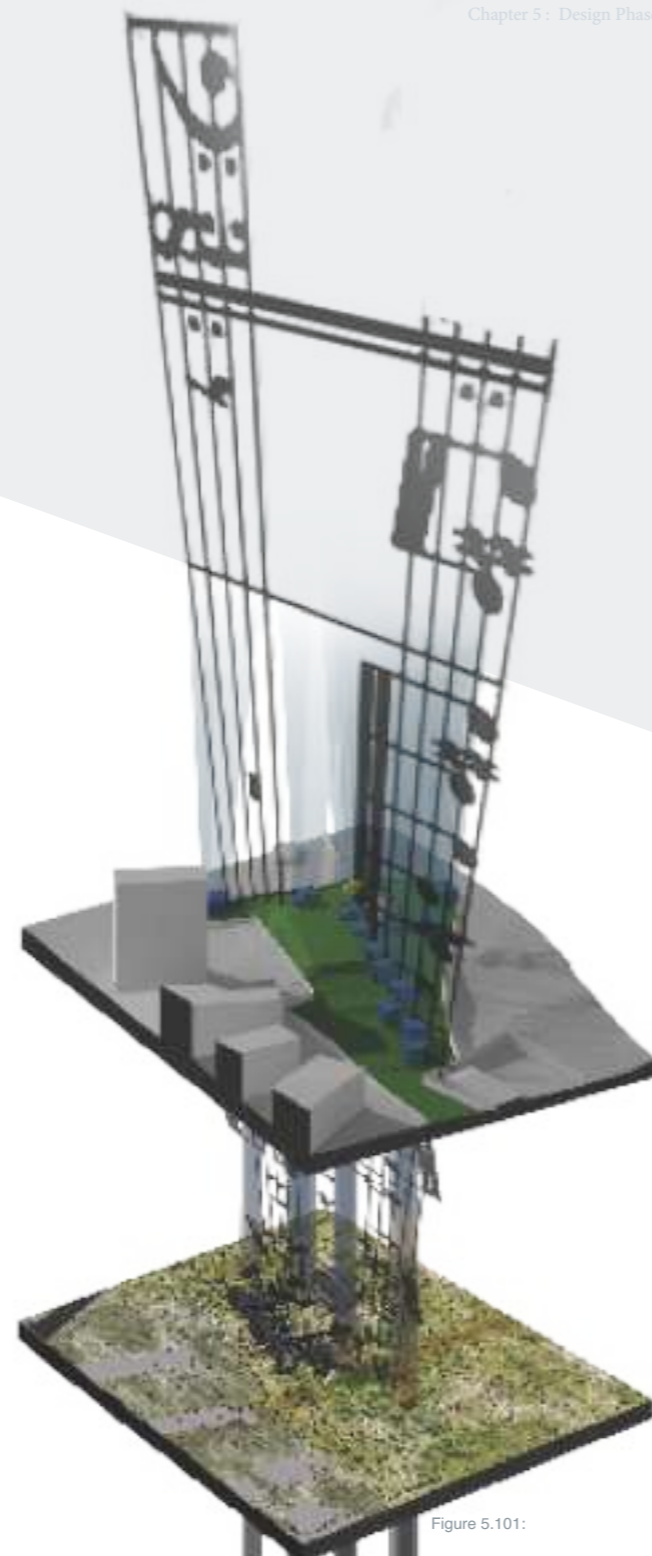


Figure 5.101:



Figure 5.102:



Figure 5.103:



Figure 5.104:



Figure 5.105:



Figure 5.106:



Figure 5.107:



Figure 5.108:



Figure 5.109:



Figure 5.109:



Figure 5.110:



Figure 5.111:



Figure 5.112:

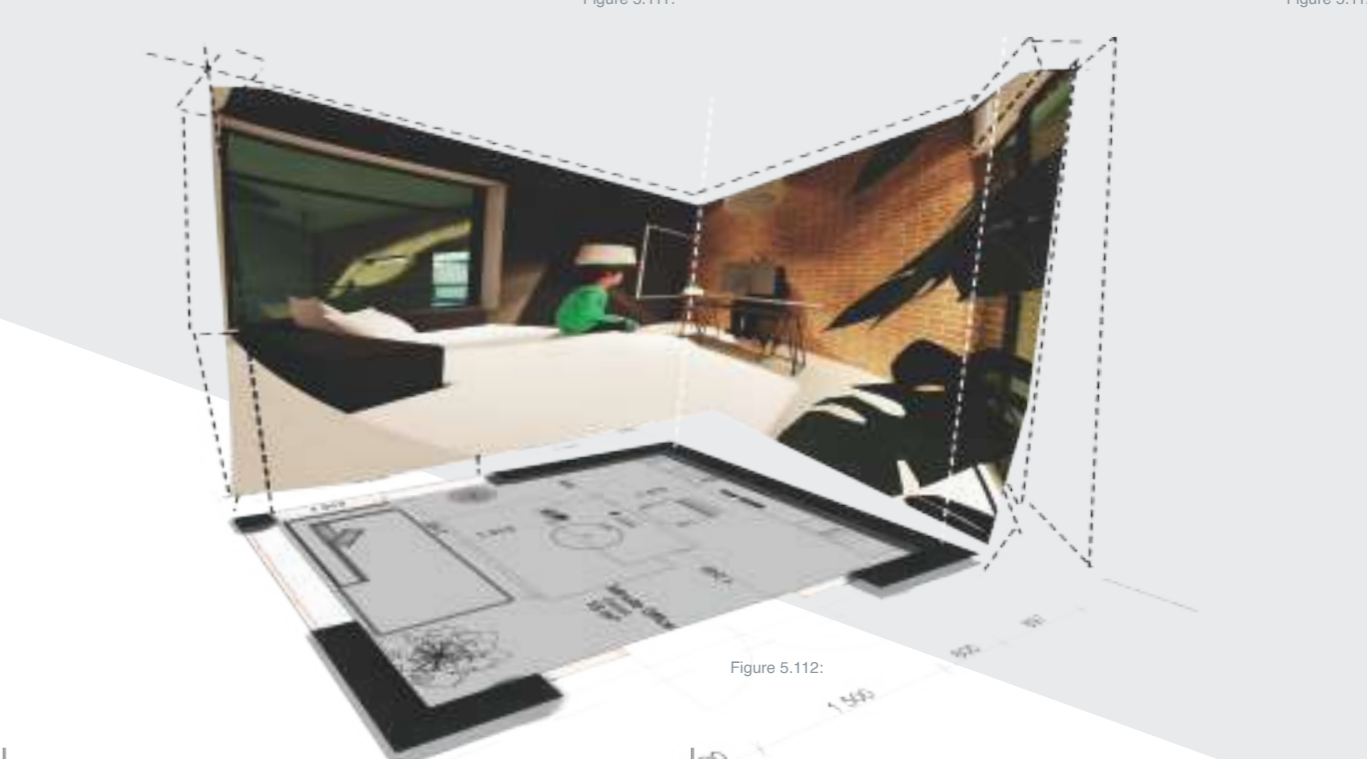


Figure 5.112:

Figure 5.108: Rough sectional draft of phase two. (Author, 2022).  
 Figure 5.109 - 5.112: Within the concluding stages of phase two, these renders were presented to the final examiner. (Author, 2022).

Figure 5.112: This isometric blueprint of a therapist office space, symbolizes my first attempt at a detailed spatial design. (Author, 2022).

### 5.3.3 Phase three

While looking at the initial design concepts of the intangible tension, the road to stimulative speech, and the temporality of edification, an architectural implication for each surfaced. This inspired a series of conceptual models. These models paved the road to a coherent architectural synthesis. Each of these adaptations depict a step in the right direction, towards a place of phonation.



Figure 5.117:



Figure 5.113:

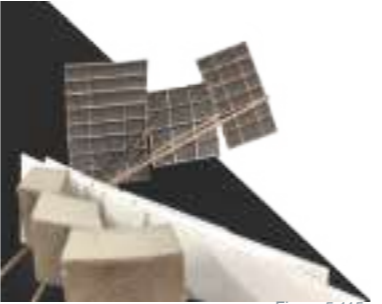


Figure 5.114:

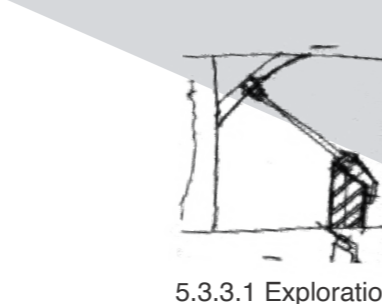


Figure 5.115:

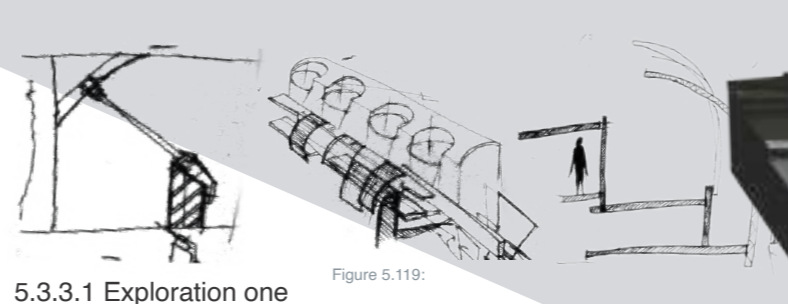


Figure 5.119:

#### 5.3.3.1 Exploration one

Interpreting the first concepts of the intangible tension, the model absorbed the multitude of apprehensive tension design tools set out in chapter four. The design was placed directly on top of the existing reservoir while embodying the concepts in a very literal sense, by simply injecting the concept on site allowed the design spine to run through the reservoir, challenging the visibility of the submerged. However, the results of following the guidelines of the Burra Charter lead to the gentle placement of the facility on the edge of the last reservoir. The main entrance cuts through the site to accommodate an entrance straight into the water reservoir. This was done to avoid an exhausting climb to the main entrance of the pumpstation.

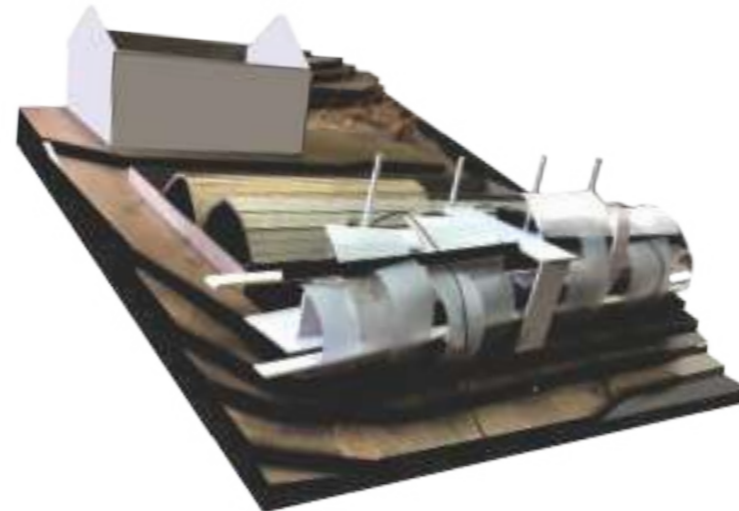


Figure 5.120:

#### 5.3.3.3 Exploration three

During this phase, the facility is shifted further from the pumpstation while the scale is also brought down. This provides a more appreciative perspective of the existing, without competing with the historical. The orientation is admittedly compromising. Therefore, the facility is narrowed as it stretches over the reservoir in order to overcome this orientation dilemma. Through the previous explorations the pumpstation was ignored and not appropriately integrated. The additions are focused on cutting into the reservoir to ensure optimal living conditions within an underground structure. On the other hand, the pumpstation requires a less invasive solution. Little effort was dedicated to the ergonomics of the pumpstation during the original planning as it was initially designed only according to the functional requirements. The architectural solution is to offset the interior spaces for more natural light while including a mezzanine floor to increase usable floor area. Lastly, this exploration shifts the main entrance closer to the parking lot with in return minimized excavation, while also removing the need to slop the walkway leading up to the main entrance from the parking.

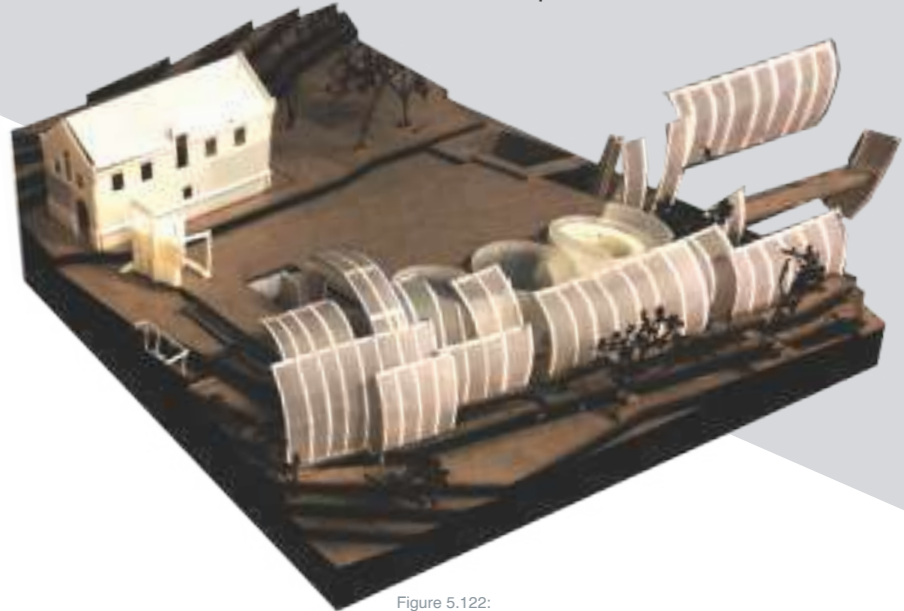


Figure 5.122:

#### 5.3.3.2 Exploration two

The scale of the existing structure was difficult to negotiate, therefore the second exploration attempts to adaptively reuse the existing structure. Subsequently this led to a less intimidating interior and a more adventurous site layout. Now visitors are able to experience both the site and the exterior facades of the pumpstation without being distracted by the SA-SA facility. This adaptation incorporates the design tool derived from 'Detailing in elicitation', further questioning the orientation of the facility which is limiting the natural light and programmatic flow of the facility. Due to the western orientation, natural light cannot penetrate the functional spaces.



Figure 5.116:



Figure 5.118:

## 5.4 Prominent fragility

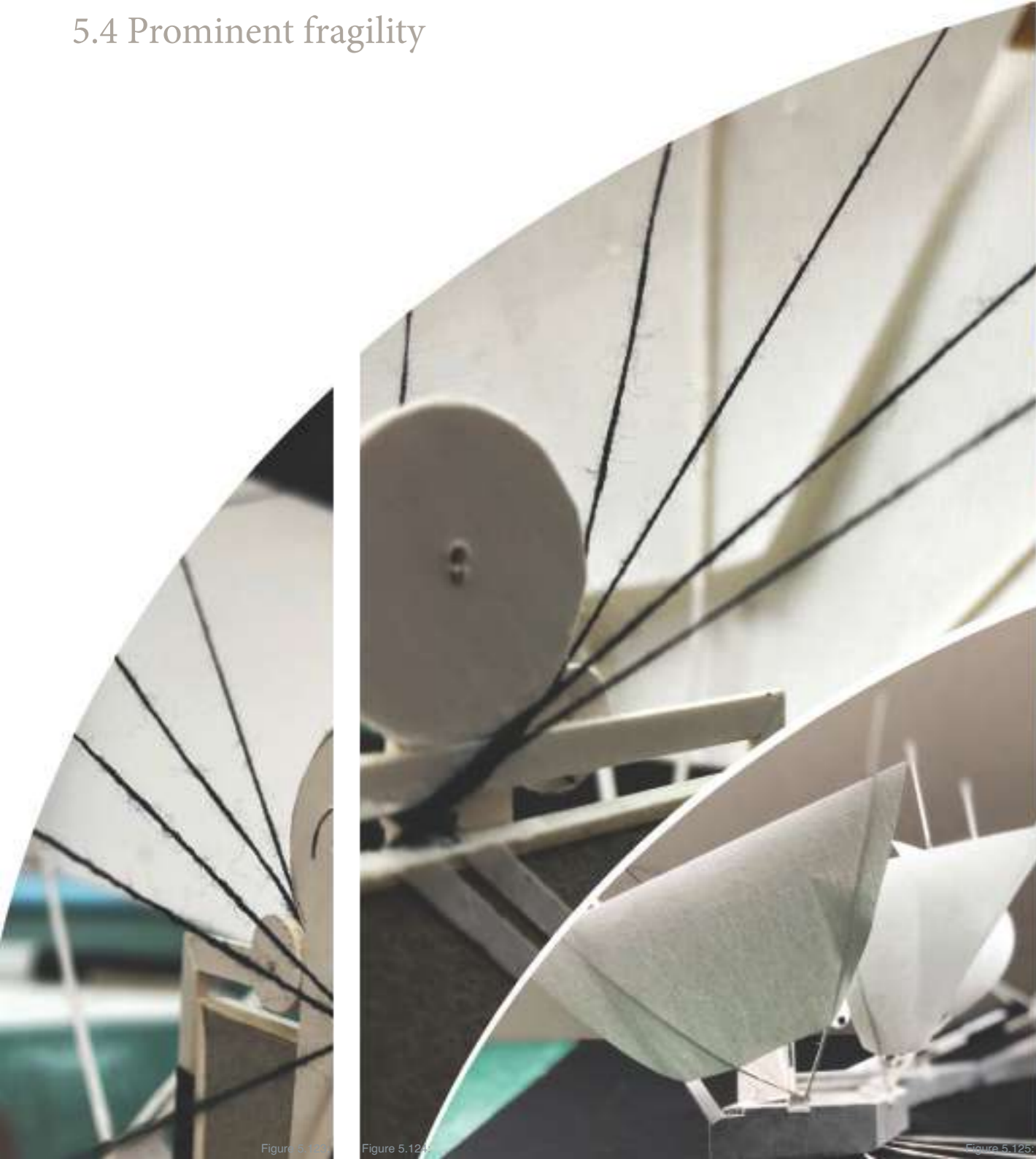


Figure 5.123



Figure 5.124



Figure 5.127



Figure 5.125



Figure 5.126

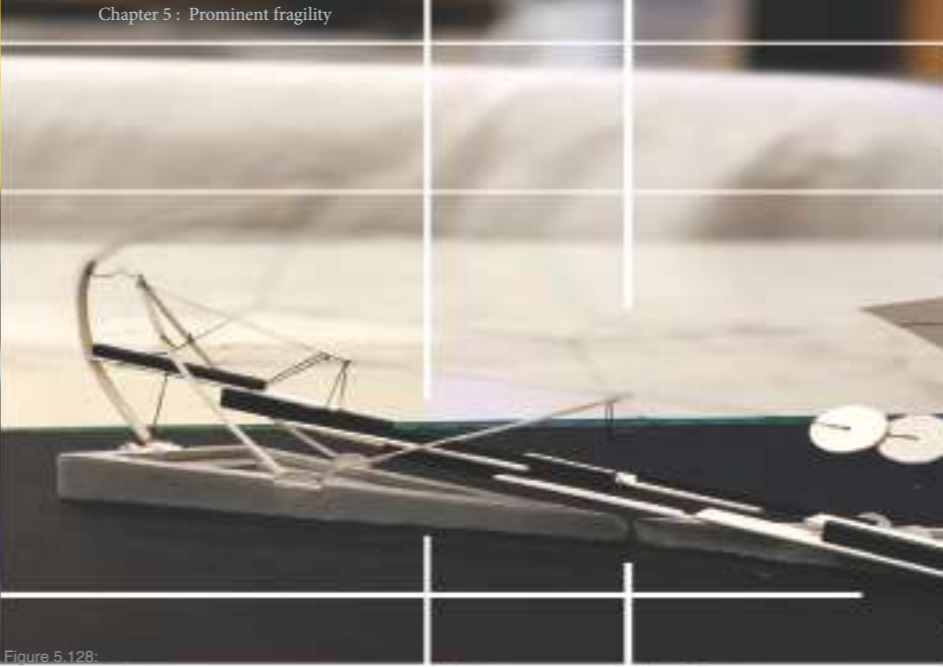


Figure 5.128

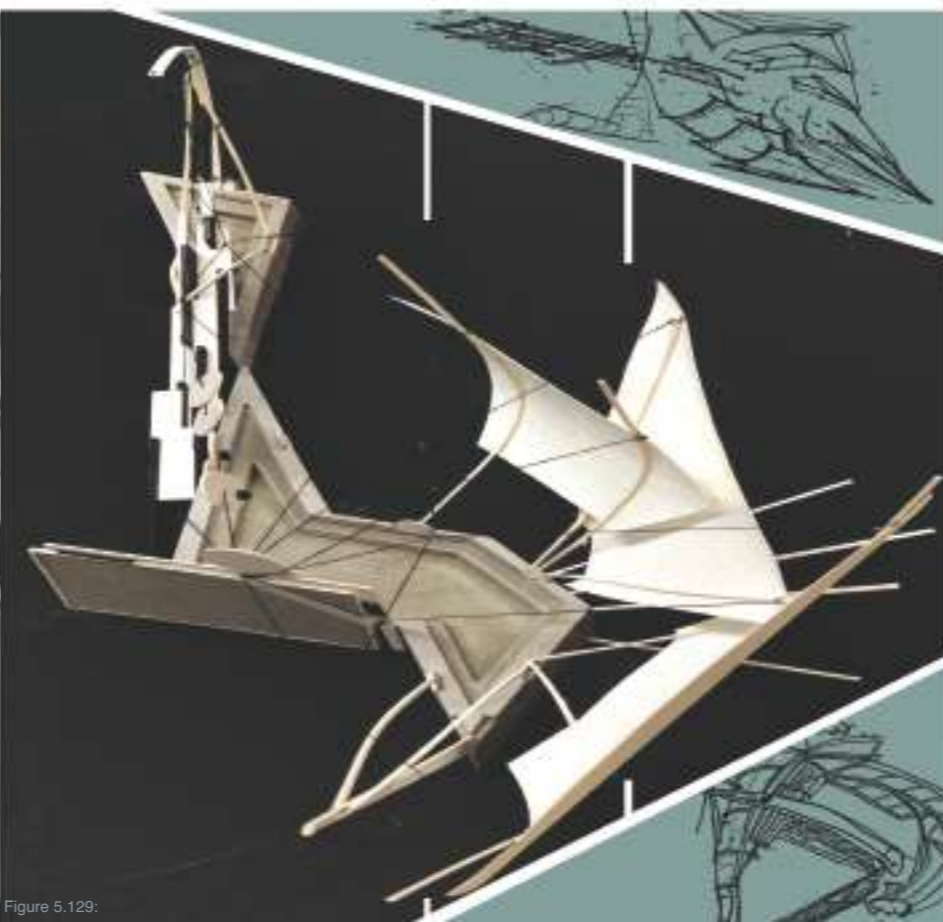
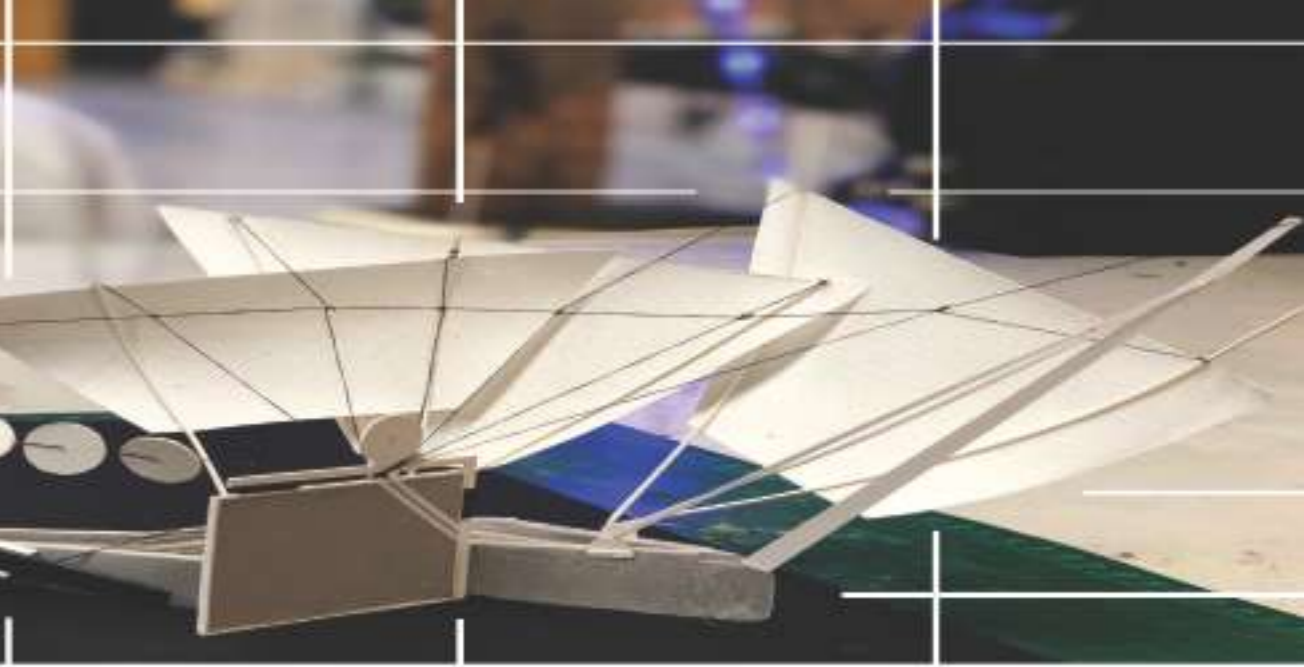


Figure 5.129



The programme aspires to integrate traditional and alternative speech therapy methods into a sensory park in conjunction with a professional facility. The sensory park will pull the professional therapy from the facility into the public sector and reintegrate urban development tactics. The construction methodology must integrate the fragile social and emotional tension of people who struggle each and every day with speech impairments. These individuals are constantly held back and unable to express themselves, causing many to be emotionally fragile. This section explores how architecture can inspire confidence, consequently asking if an architectural form can impersonate the goals and struggles of an intended user.

Figure 5.128 shows the first attempt at a constructed anthropomorphism. This sculpture tries to mimic construction detailing rather than building materiality. For example, a general user of this SA-AS facility, would feel underappreciated in their daily life. Speaking to someone close to you about your emotions are challenging enough, combine that with a physical restriction and it is easy for these individuals to underestimate the strength of the support system available to them. That being said, the sculpture embodies this perception of a brittle foundation. By designing a bulky concrete base but having the majority of the inner mass removed, creates a perception of a solid footing from outside the sculpture, while it is actually unstable.

This sculpture anticipates the physical construction limitations. Limitations of curved elements, which consists of tall steel members able to support large sail-like devices even in the event of rough winds. Therefore, curved structures are supported through suspension lines while resting on a delicate detail attached to the foundation. Perhaps the answer lies in proud and prominent forms that don't require complex mechanical systems. Previous sculptures and prototypes incorporated curved canvases that portray the physical manifestation of sound. Within a real-world application, these details just aren't feasible, therefore the curved members must be able to support more than their own weight without the need for messy suspension lines on site.

Figure 5.123 - 5.28: Photos of the anthropomorphic imitation of construction detailing. (Author, 2022).

### 5.4.1 Plan and Section development

The plan and section develops from the surreptitious ambiance concealed with in the reservoirs, theoretically referring to this beauty as a trapped voice that solidifies during a vocalized outburst. The subterranean voice breaks through its physical restrictions and pauses directly after it's explosion of frustration. At this critical point, where fragments of words and sounds erupt, they remain frozen in space. The particles are webbed together and formulate the morphology of the SA-AS facility. Here the reservoirs remain silenced and disappointed by its failure to communicate. Mercifully, the reservoir stands tall, for its efforts were not in vain.

Similar to The One kid's Place where the administration is separated from the functional spaces, the SA-AS facility reiterates this segregation; however, the threshold between the two spheres is occupied by the alternative method of therapy. Traditional therapy rooms are located on the edge of the reservoir and the rest of the space hosts all the therapeutic facilities that guide patients to phonate and alleviate their frustration. The facility is operated and maintained by the administration in the historic pumpstation.

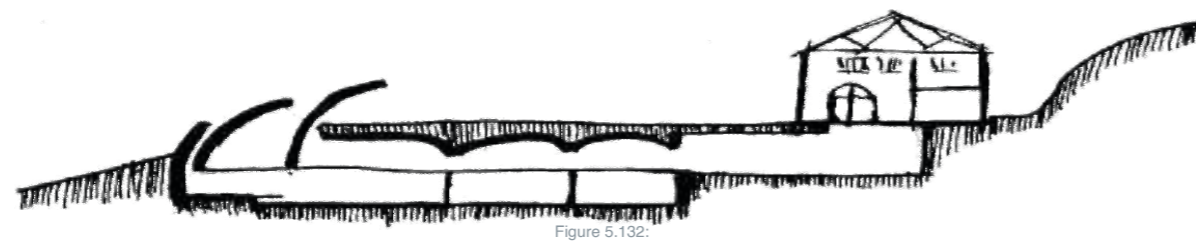


Figure 5.132:

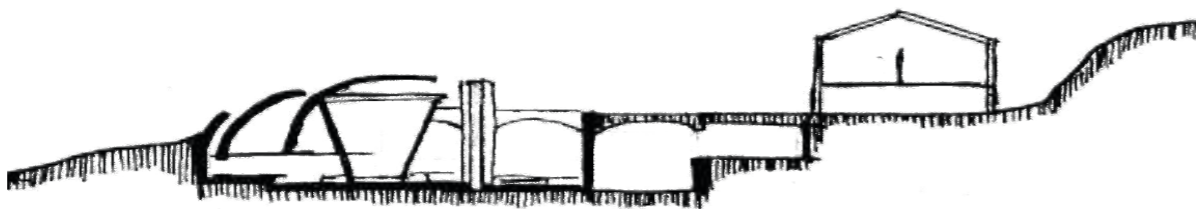


Figure 5.133:

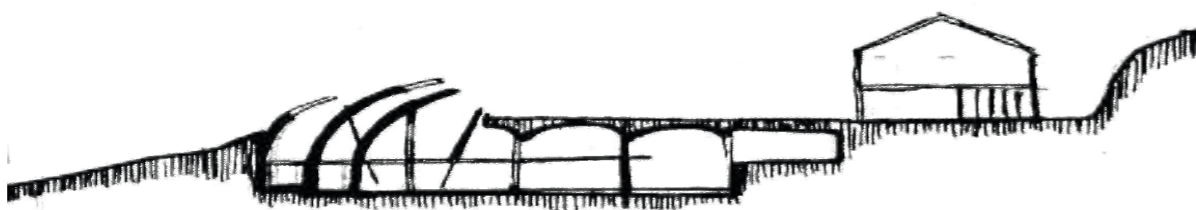


Figure 5.134:

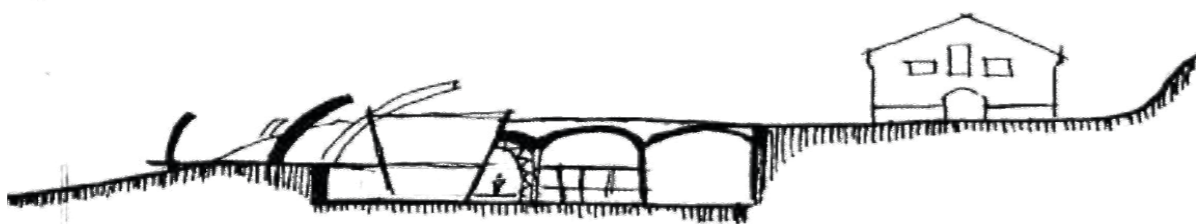


Figure 5.135:

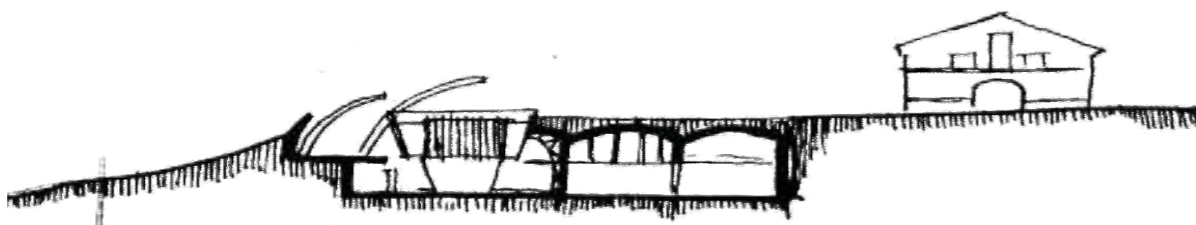


Figure 5.136:



Figure 5.137:



Figure 5.138:

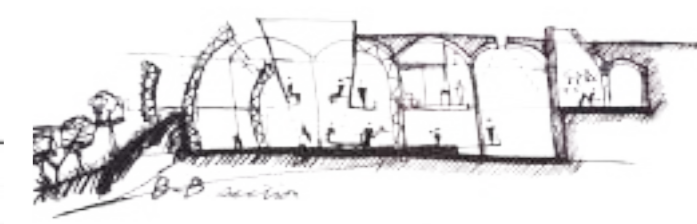


Figure 5.139:

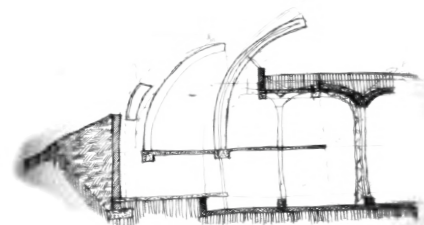
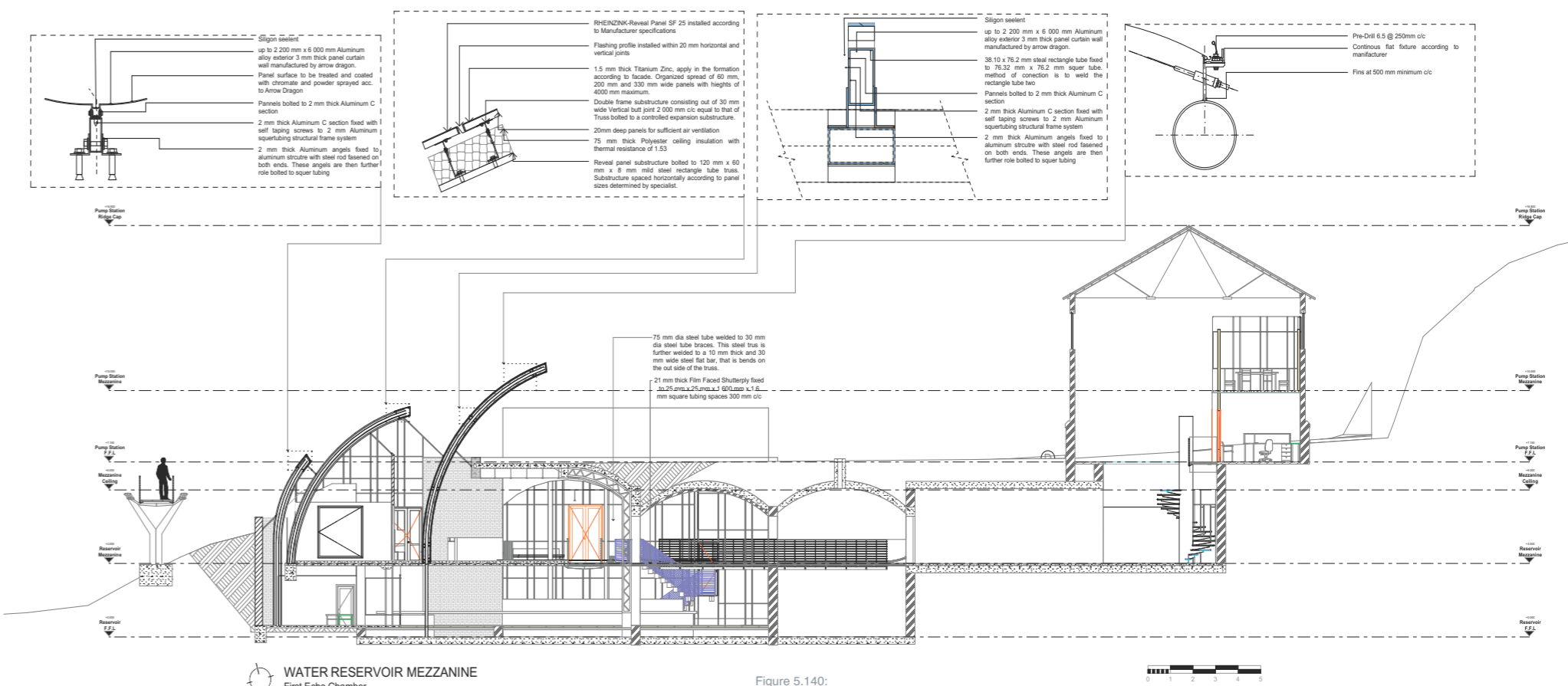


Figure 5.130:

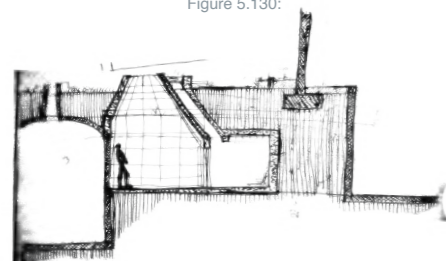


Figure 5.131:

Figure 5.137 - 5.139: These three sectional development diagrams represent the three polar opposite iterations of phase three. (Author, 2022).  
Figure 5.140: The complete documental section through the final SA-AS Facility. (Author, 2022).



Figure 5.141:

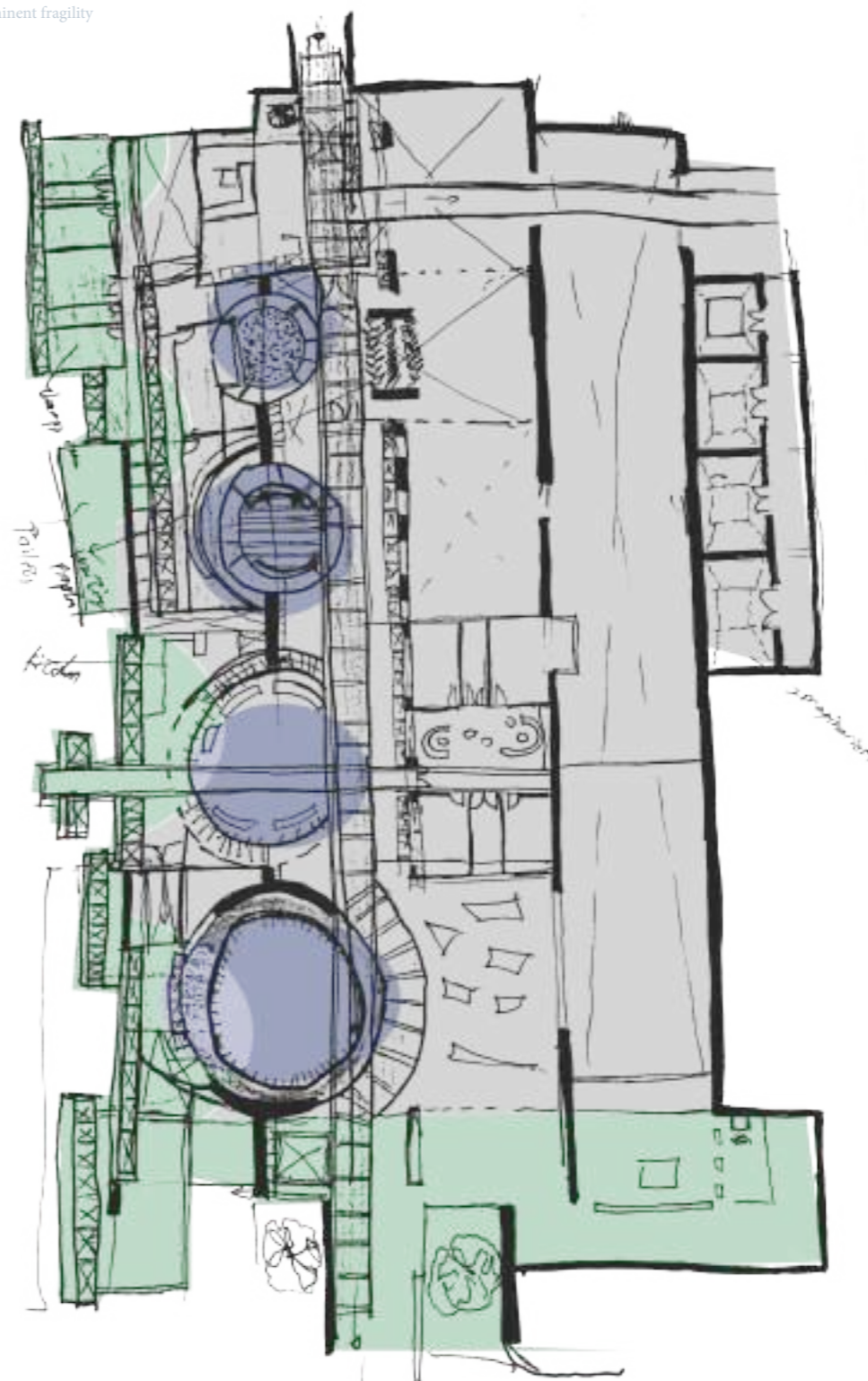


Figure 5.142:

#### 5.4.1.1 First and second plans

As is the case with every first attempt, complications plague the break of day; the start is complex, and many ideas need to be considered. This is evident in the initial plan for the proposed design, where the facility seems lost within the immense site. The plan exasperatedly squeezed functional spaces into an impractical structure, resulting in a compacted linear design.

By spreading out the facility the interior spaces became more accommodating. The first plan incorporated basic functional spaces for a speech therapy facility, such as office space, reception, storage, etc., followed by the second plan that further incorporated, ground keeping facilities, gymnasiums, and family rooms. Although these developments were spatially prominent, the actual facility became separated from the pumpstation. Even though these structures enriched the architecture, the existing structure was not incorporated.

Figure 5.141: The inception of design phase three, brought to light the first of many draft plans, (Author, 2022).  
Figure 5.142: This program iteration soon followed after the first plan, with address various issues found within the first attempt, (Author, 2022).

## 5.4.1.2 Third plan

The third plan is a development and amalgamation of ideas from previous attempts. This specific approach entangles the landscape, introducing new routes and demarcating space on site for parking. It also shifts the main entrance from the centre of the reservoir to the edge of the reservoir, placing more emphasis on the extension and making it easier to access the facility. This alteration incorporates the four acoustic coils into the facility programme, two of which are allocated as social spaces or conversational courtyards, where the other two are used for isolated therapy spaces. A few other notable changes include glazing improvements, extensive excavation, and the additional functional spaces such as the multifunctional hall and imaginariums.

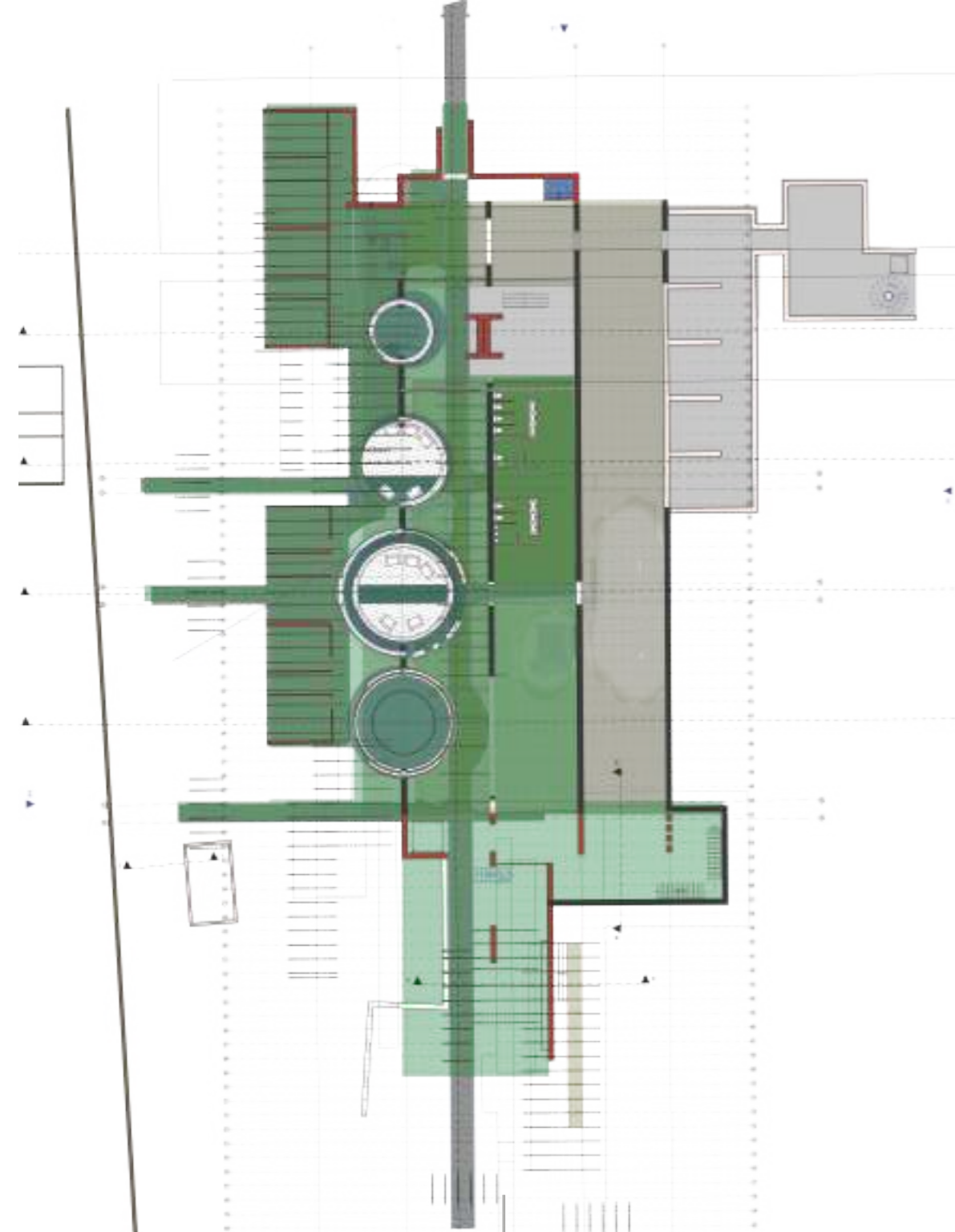


Figure 5.143:

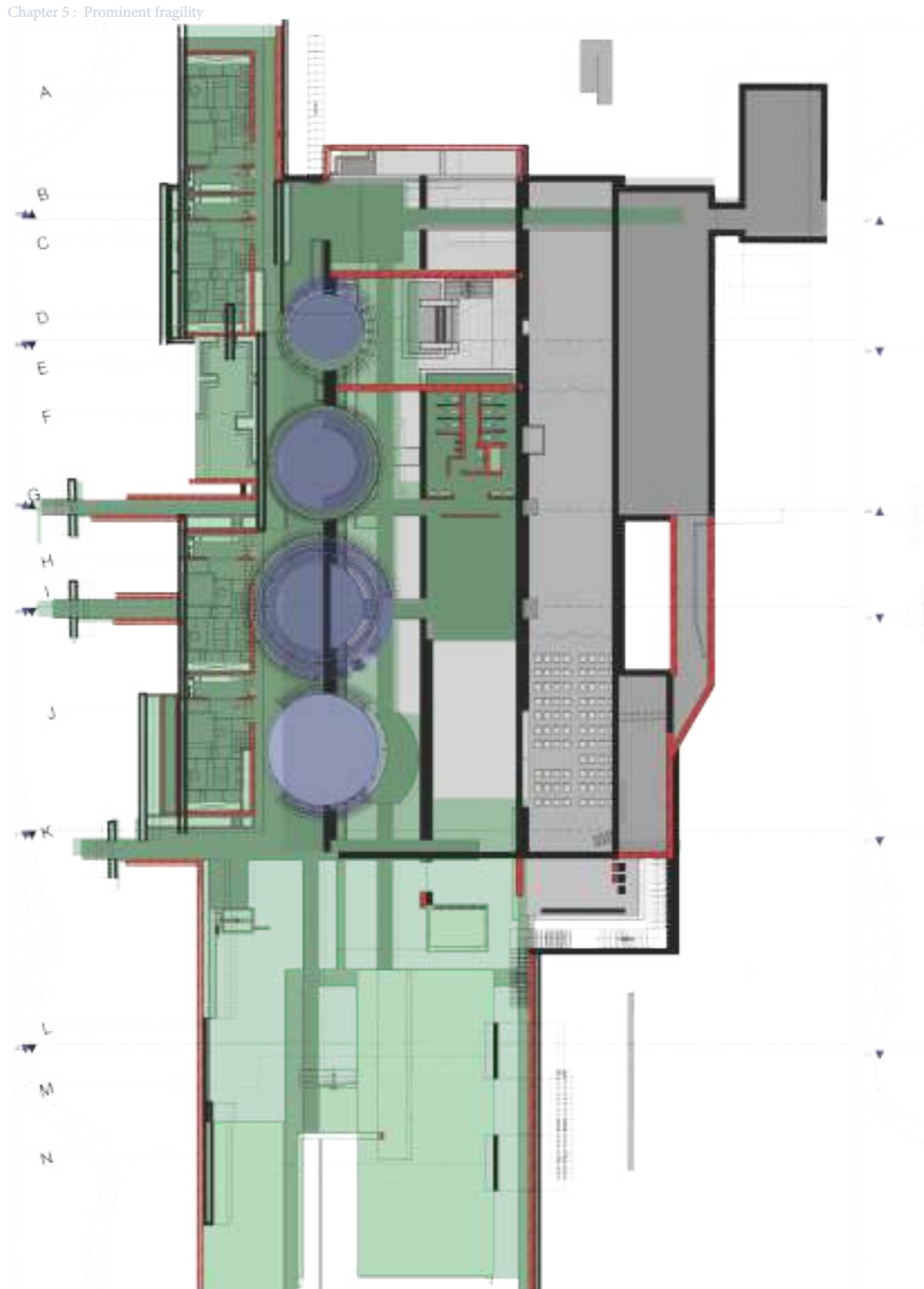


Figure 5.144:

## 5.4.1.3 Fourth plan

With sound manipulation playing such an important role in this design, the acoustic implications had to be addressed. Spatial volumes were altered, a few curved structures had to have more arched designs and other curved elements removed. The four silos were redesigned, altering the circulation and application of these acoustic spheres. This version of the design also includes the readapted southern atrium, now capable of hosting large events. Apart of these upgrades there are also an events kitchen, bulk storage area, a closet for cleaning utilities, and a security office.

Finally, the follies are introduced and placed within their locations. With minimum obstruction and generalized design, these follies easily slotted into place, followed by a brief allowance of garden and landscape provocation. The garden and landscaping involved meticulously interventions to improve movement and existing routes.

Figure 5.143: This approach lends its self-more towards the landscape and introduces new routes while improving on interior spaces as the third iteration of the SA-AS Facility, (Author, 2022).  
Figure 5.144: The fourth hand final altered plan of the SA-AS Facility redesigns the circulation and improves application of the acoustic spheres, (Author, 2022).

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06

South African Ayres Sensory Facility

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Final design walkthrough

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## 6.1 Introduction

The intangible links provided by the existing historical pump station and water reservoirs do indeed open phenomenological and physical widows of memory that lead to the recollection of the past that will influence the current design decisions of the proposed facility. Further investigation of various cohesions led by the design lenses established by previous chapters guides the project to its final ambition intentions to meet the needs of the clients. The project had to be fully understood from the client to the economic strategy, and most importantly the physical site. Diving deeper into the site to fully comprehend what lies within the set boundaries the analysis made use of the Burra Charter to process the importance of the existing heritage. This was followed by a meso-level analysis and microanalysis that gave a clear understanding of exactly what lies on-site and the overall atmosphere on site.

### 6.1.1 First half of plan

The first half of the plan looks back at the pathologist procurement, where patients are first profiled, followed by a timely process that would equip them with affective tool on a weekly schedule. However, within the notion of sound as a therapeutic device, the vocalizational aspects had to somehow integrate more within the architecture. The therapy process had to form part of the functional ritual and to a certain extent avoid patients simply becoming a product of the facility. The therapy rooms are grouped and separate from the central point of the facility. It made sense to provide the owners of this facility the ability of renting out these purposefully-made spaces. Moving on to the rest of facility, its functions extend far beyond the pragmatic spaces. The entire architectural housing of this facility is capable of passive healing experiences.

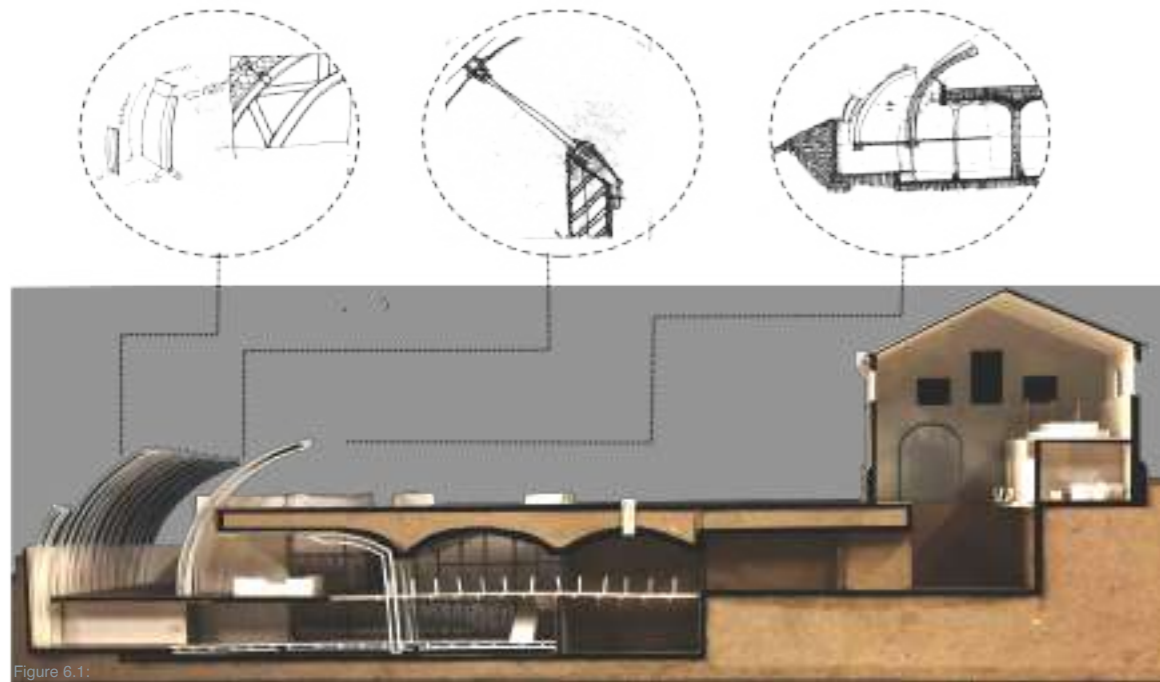


Figure 6.1: Sectional model through the SA-AS Facility, (Author, 2022).



Figure 6.2:



Figure 6.3:



Figure 6.4:

### 6.1.2 Second half of plan

The second half of the plan is linked to the process of reflection in design and therapy. After reflecting on the process that occupational and speech pathologists follow, the inoperable layout of this proposed facility was apparent. Both pathologists require effortless flow between critical facilities. These are the profiling facilities, gymnasiums, and private counselling rooms. They also need to be able to occupy any space without affecting the operations of another pathologist, therefore these spaces were further integrated and spatially extended for easy passage.

This section of the floor plan reveals the circulation between these critical spaces that are noticeably segregated from the atrium. This subtle threshold represents the end of the therapy facility and the start of the additional functional spaces. The courtyard connects the multi-functional hall, large storage, kitchen, elevator, and security room. Pathologists and staff members would use this southern approach to gain access to the facility, as would as some of the regular clientele. The reason for this is the congested road leading up to the Naval Hill entrance is during peak hours. Because this entrance is so well-known and convenient, it is safe to say that new arrivals will most likely use this route. Even though the therapy rooms are situated some distance away from the southern entrance and the parking even further, it does not result in any conflict of interests. The reason is that this facility focuses on the sensory experience and not the traditional therapy application. Arguably, patients might not want to engage with the sensory park or commit to using any of the follies, which is expected. Through the course of this study, it became apparent that one of the most common rules in many studies is: Those who are positively motivated and desperate to overcome their stammer, most often will. The effectiveness of this facility relies not only on the pathologist, nor the garden structure but on the dedication of its visitors. The entirety of the SA-AS facility's function extends far beyond the pragmatic spaces. This means that the physical architecture is therapeutic and not only reliant on the professionals who occupy it.

Figure 6.5:

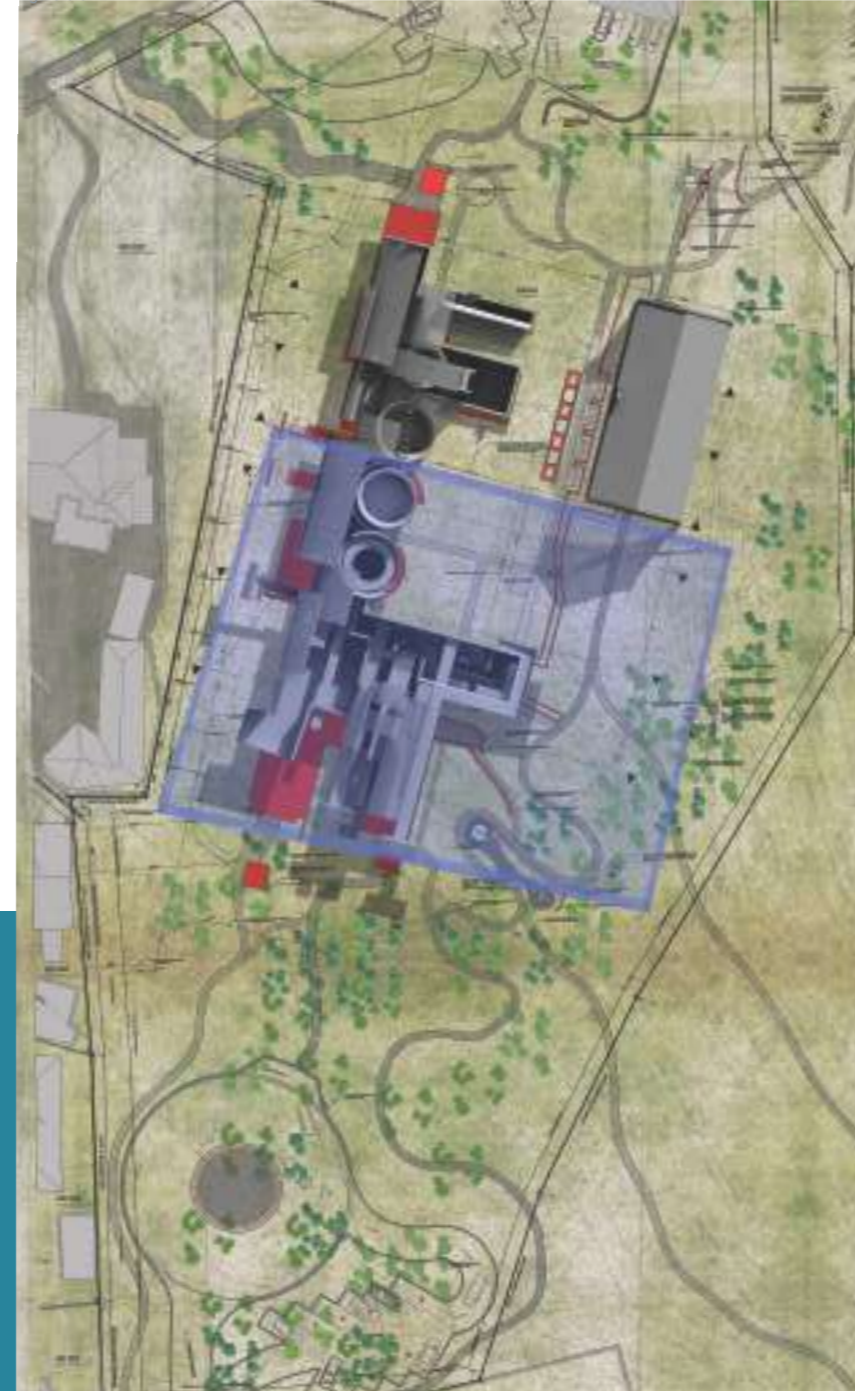


Figure 6.6:



*“You have not opened your eyes, you are still following common rules. You have not suffered enough. Go home and suffer some more.” - Ram Dass*

## 6.2 Spatial development

### 6.2.1 Reservoir

#### 6.2.1.1 Mezzanine Floor

##### Reception

On approaching the facility, the patient would embark on either a traditional or alternative therapeutic journey. Looking at the traditional and revised therapy methods, the treatment splits into two spheres. The traditional therapy is situated on the mezzanine floor while the revised therapy includes the reservoir ground floor and the sensory park.

The reception space includes a waiting area and western facing front desk looking straight onto the front door. A curved screen separates the outer passage that leads to the main entrance. This screen disperses light throughout the interior. Just above the reception desk is a skylight that directs light onto the reception desk. This screen represents a musical note from the Für Elise, the sound wave that originates from inside the reservoir.

Figure 6.7:



Figure 6.8:

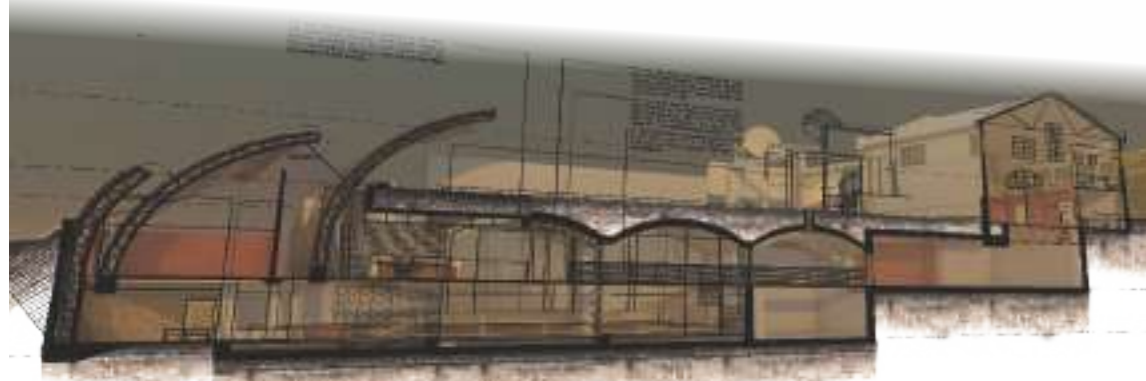


Figure 6.7 - 6.8: From the physically build section model, these two computer-generated render where derived, (Author, 2022).

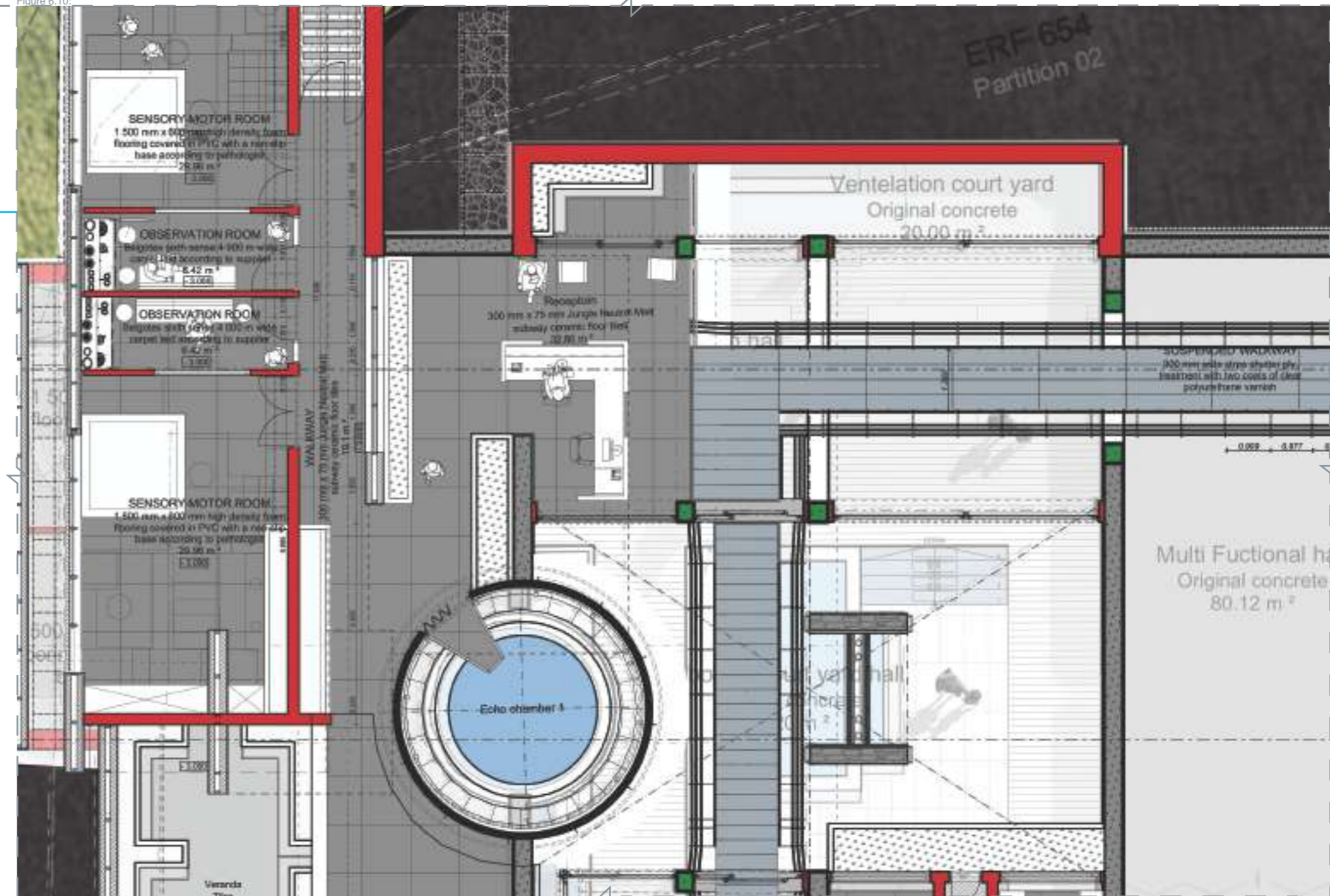
Figure 6.9: Indicating the reception on a topographically drawn site plan, (Author, 2022).

Figure 6.10: Sectional drawing extracted from the final documentation showcasing the reception, (Author, 2022).



Figure 6.9:

Figure 6.10:



Reservoir Mezzanine Floor  
Reception

Figure 6.11:

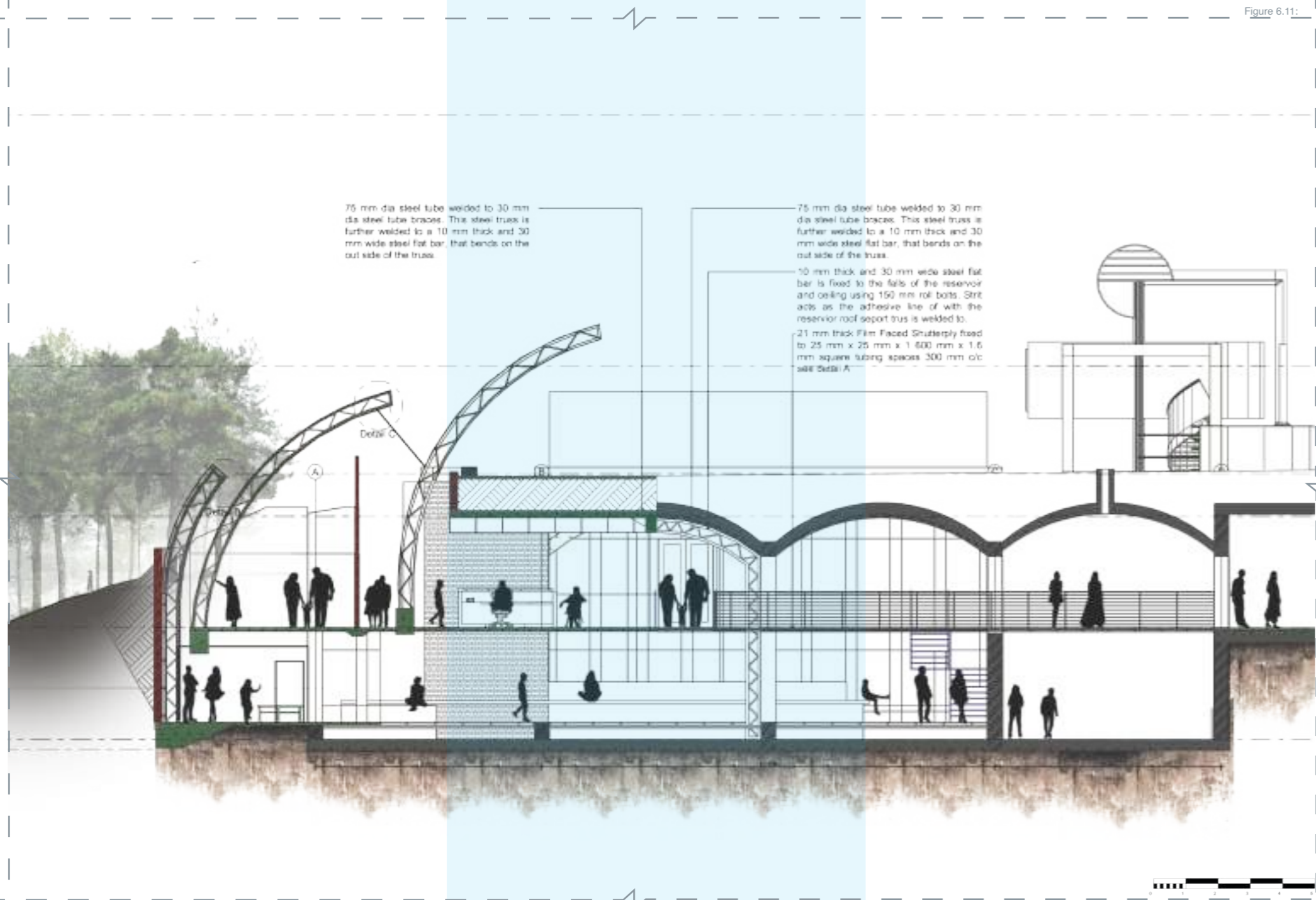


Figure 6.11: Partial section extracted from the final documentation showcasing the reception area, (Author, 2022).  
 Figure 6.12: Partial section extracted from the final documentation investigating the suspended ceiling system, (Author, 2022).  
 Figure 6.13 - 6.16: Series of final renders of the SA-AS Facility, (Author, 2022).

Figure 6.12:

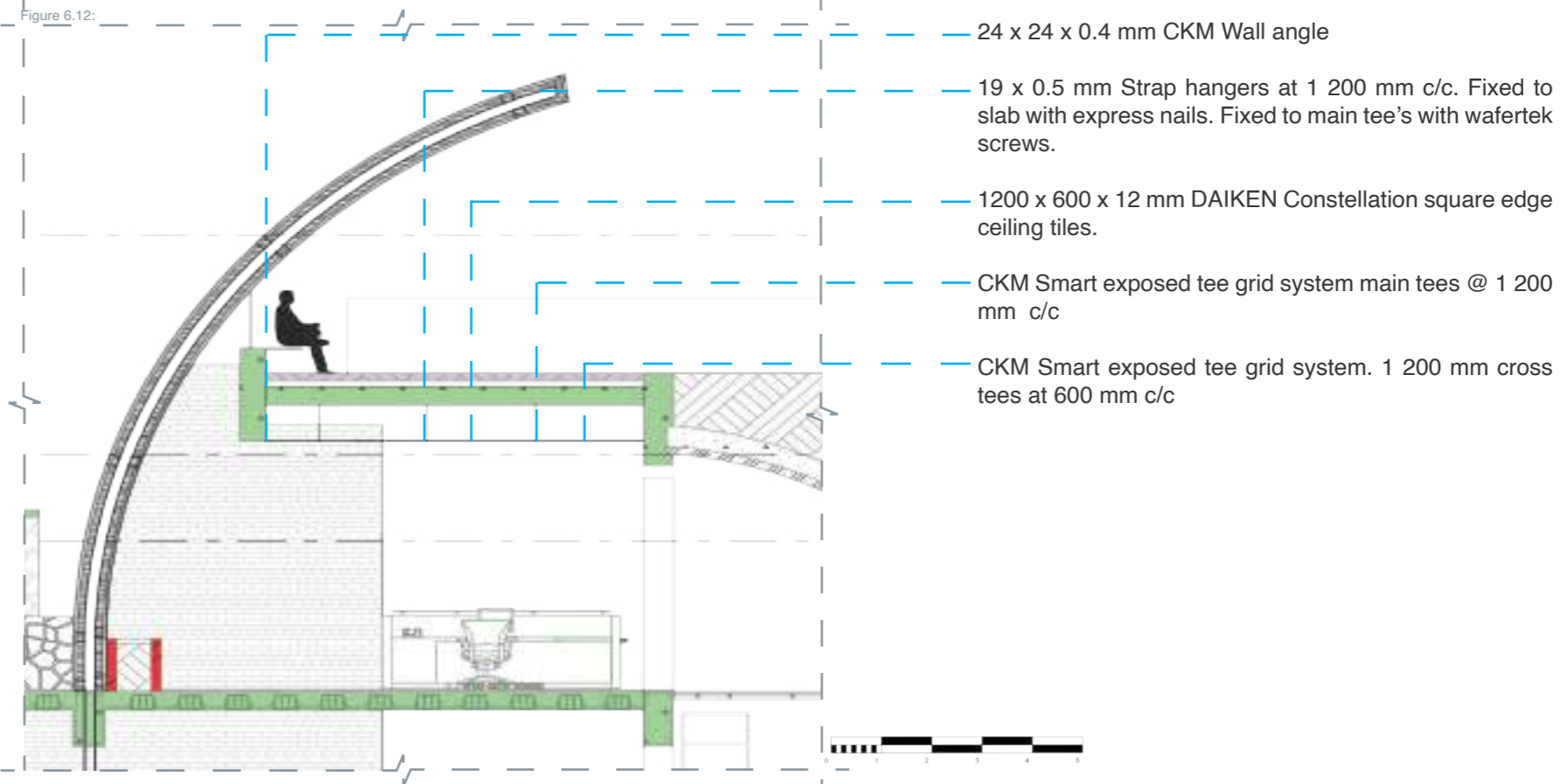


Figure 6.13:



Figure 6.14:



Figure 6.15:



Therapy rooms

Following along the same floor level, the therapy rooms are situated on the mezzanine floor while the therapeutic exercise spaces are on the basement ground level. These spaces are intimate environments for optimized traditional therapy. The spaces are purposefully designed for one-on-one therapy sessions. Next to every therapy room is a private evaluation or visitors room, this allows professionals and visitors or guardians to oversee the therapy session. Taking notes, enjoying a beverage and most importantly observing the therapeutic information. This ensures that the therapy stays with the patient and is not only limited to the exercise room.

The spaces are located on the western edge of the site and orientated in such a way that a surplus of western sun penetrates the therapy space. Is not ideal, while there are skylights that allow for eastern and northern sunlight to penetrate during the course of the day, it is important to ensure that the space is illuminated, and a comfortable atmosphere is maintained. Temperatures are mediated through the section qualities such as insulated cavities. The later afternoon sunlight is mitigated through louvers, and along with the thermal properties of the glazing ensures a comfortable temperature and light quality.



Figure 6.17:

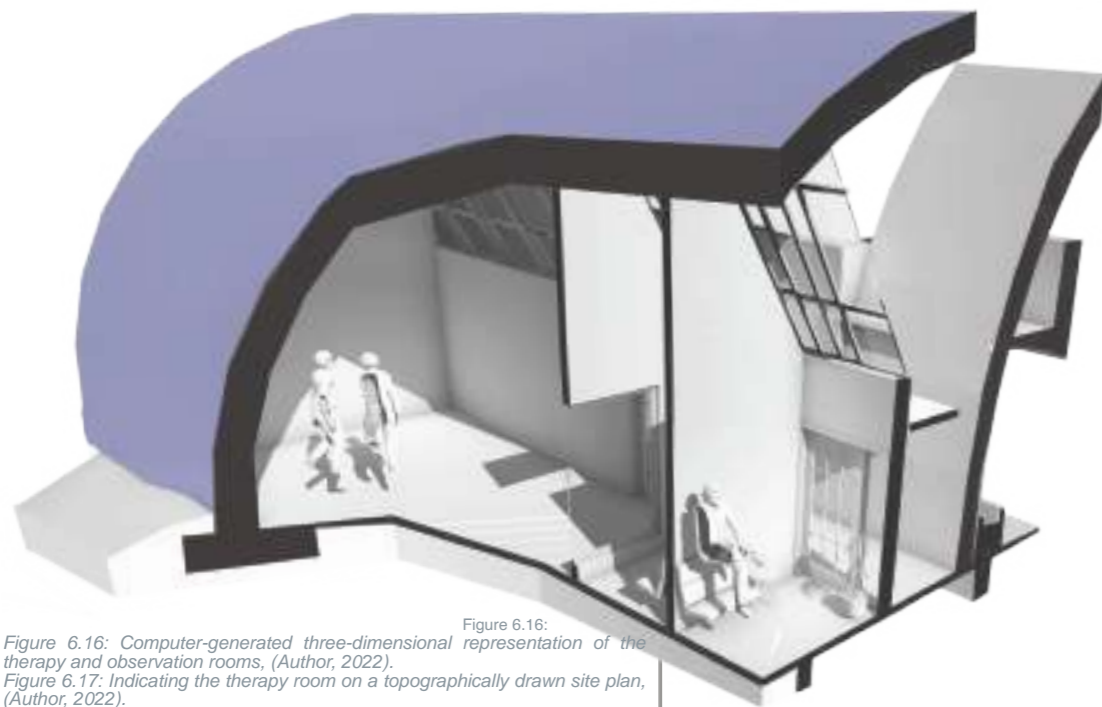
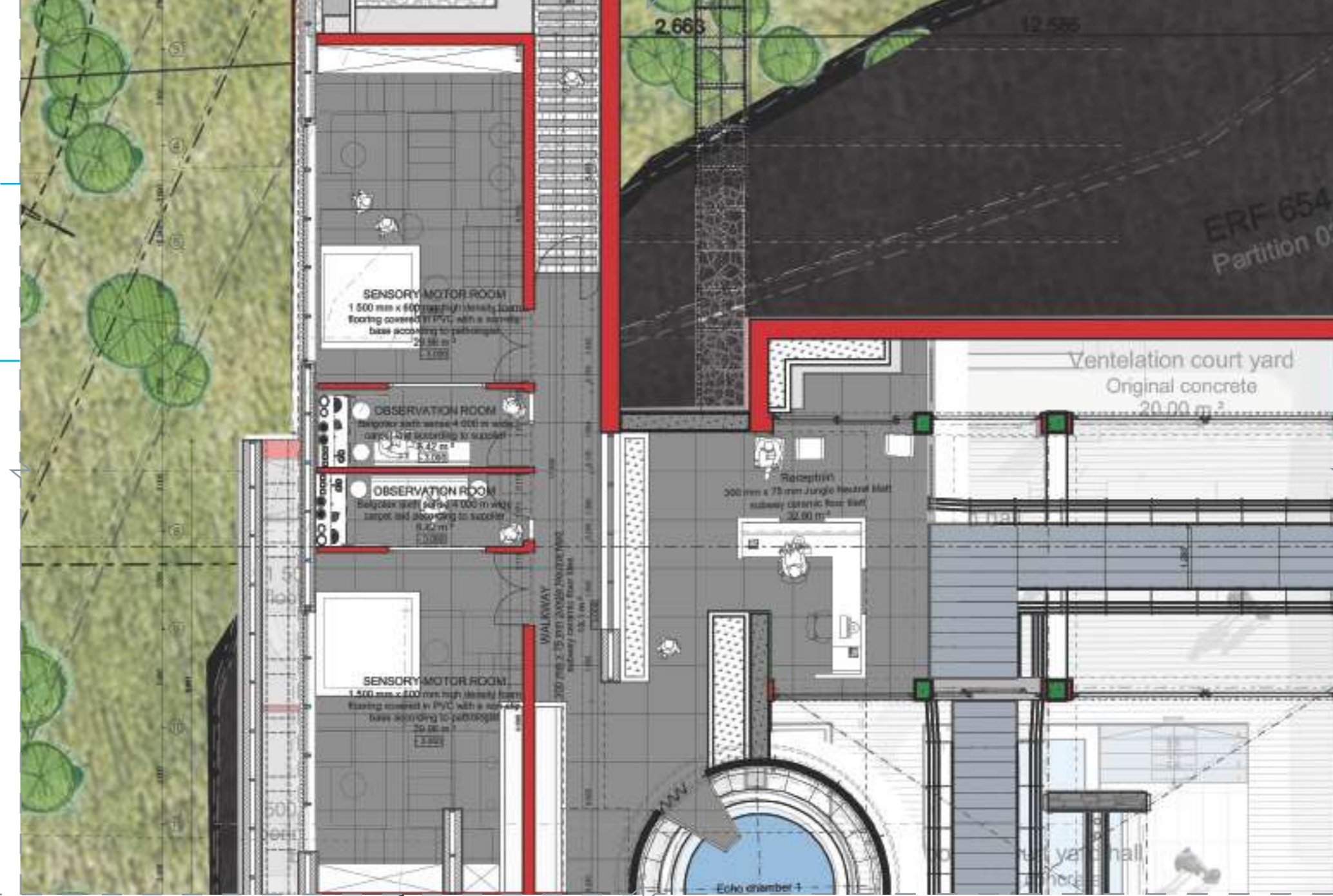


Figure 6.16:

Figure 6.16: Computer-generated three-dimensional representation of the therapy and observation rooms, (Author, 2022).  
 Figure 6.17: Indicating the therapy room on a topographically drawn site plan, (Author, 2022).  
 Figure 6.18: Sectional drawing extracted from the final documentation showcasing a therapy room, (Author, 2022).

Figure 6.18:



Reservoir Mezzanine Floor  
 Therapy Rooms

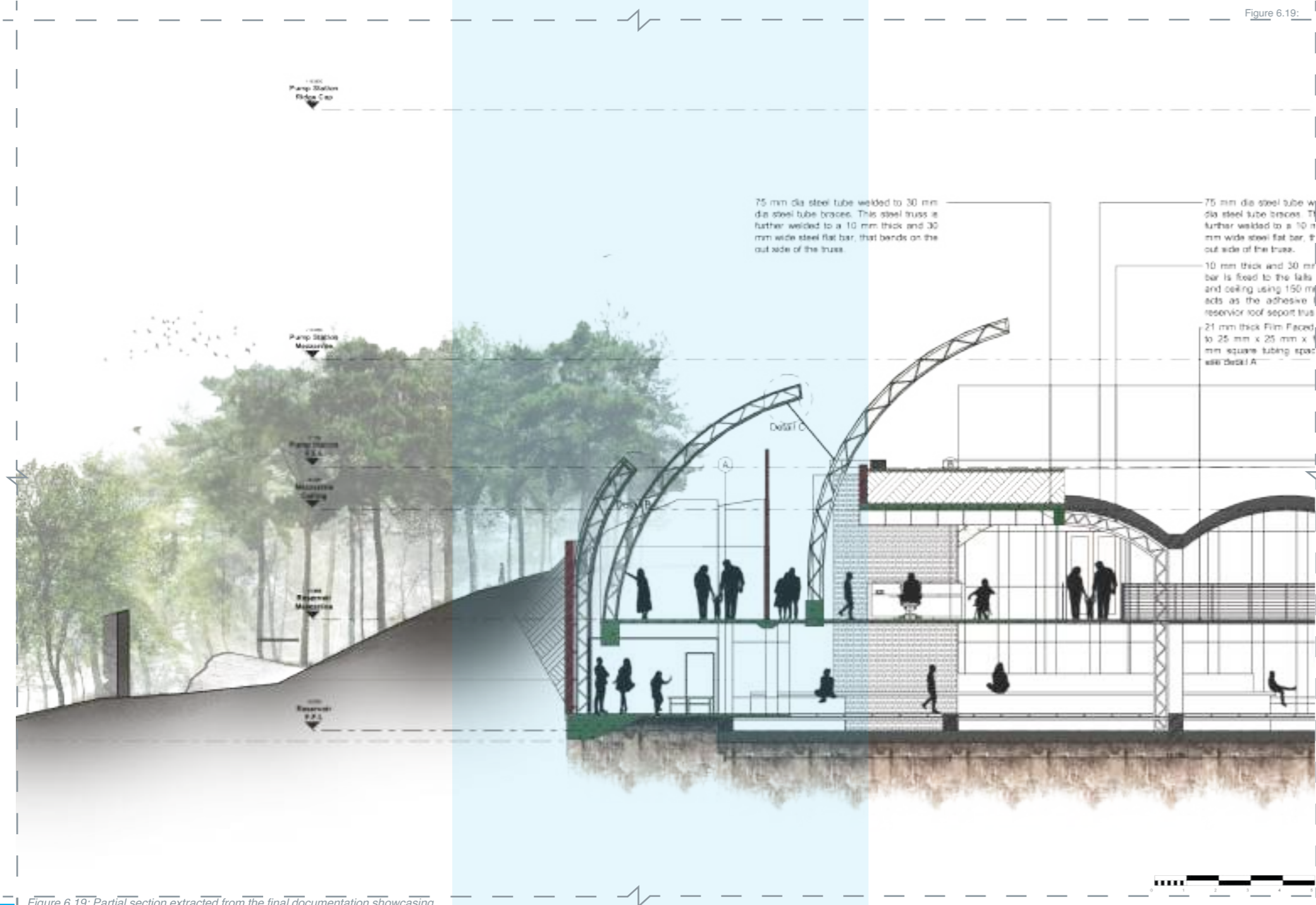
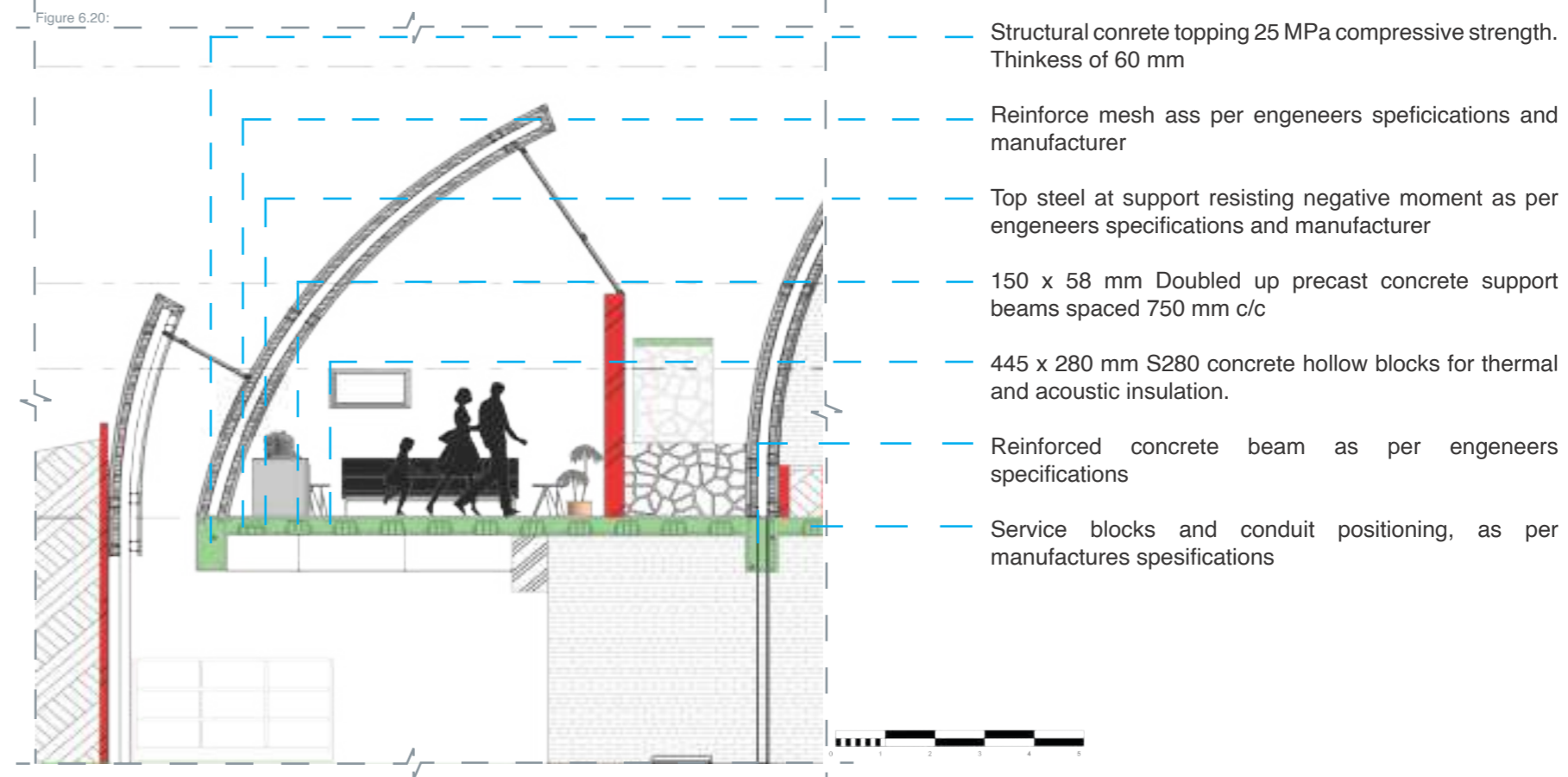


Figure 6.19: Partial section extracted from the final documentation showcasing a therapy room. (Author, 2022).



Family Room

During therapy sessions guardians, friends, or family would most often either linger in a waiting area, sit in their cars or simply drive off. By looking at this current process, it is no wonder that therapy is mostly contained within the confines of therapy rooms. That is why the revised method is also directed towards therapy awareness. Educating and motivating loved ones to stay behind and learn more about the specific disorder at hand may make a significant difference.

The family rooms include computers, an architectural model of the facility, tea area, bathrooms, and comfortable seating. The space also allows visitors to admire the interior of what used to be a water reservoir. It is located deep within the water reservoir that analogically represents the voiceless moment within sound production. Sound originates from far within the reservoir. This space is situated in the centre of the sound production. Lingering in the moment of tenos speech, implying that loved ones are architecturally, physically, and educationally involved in the therapy.

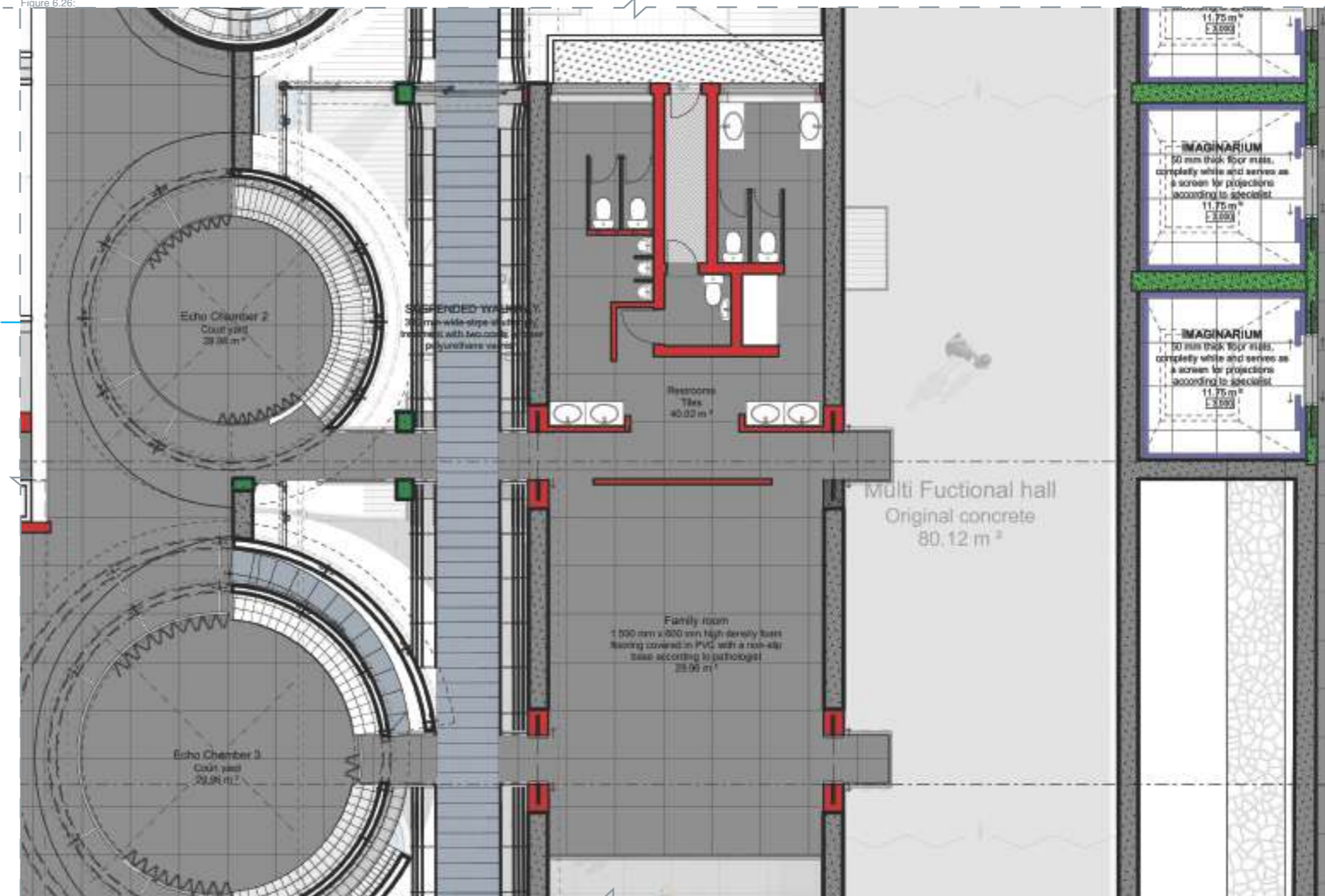


Figure 6.24:



Figure 6.25:

Figure 6.26:



Reservoir Mezzanine Floor  
Therapy Rooms

Figure 6.24: Final renders of the SA-AS Facility, (Author, 2022).  
Figure 6.25: Indicating the family room on a topographically drawn site plan, (Author, 2022).  
Figure 6.26: Sectional drawing extracted from the final documentation showcasing the family room, (Author, 2022).



### Imaginariums

A large tunnel connects the reservoirs and the pumpstation, more specifically the machine room that is 5 meters deep that results in a 7 x 7 meter hole in the ground floor of the pumpstation. This space is used in the design. From the reception desk the vestibular walkway leads the visitors through the water reservoir chambers and directly below the pumpstation. Peepholes on the surface of the reservoir terrain that are located midway between the reservoirs and pumpstation indicate hidden mechanic facilities underground that include pipe systems for maintenance, training, and emergency connection lines. In architectural terms this means that there is a void in between the pumpstation and reservoir.

Therefore, the Imaginariums were slotted in between the two heritage structures. Derived from the word imagination, these rooms provide a four-dimensional experience. An imaginarium is a sensory deprivation and satiation chamber, with walls clad with soft white sponge and a pyramid ceiling. The peepholes are repurposed skylights. While these chambers are intimate and excluded from the rest of the facility, they are technologically advanced therapy spaces. Projectors map out a landscape onto the white canvassed walls, and speakers emit patterns in a virtual atmosphere. For example, all these systems including climate control would convince the sensory systems and patients to immerse themselves in an environment such as a rainforest.

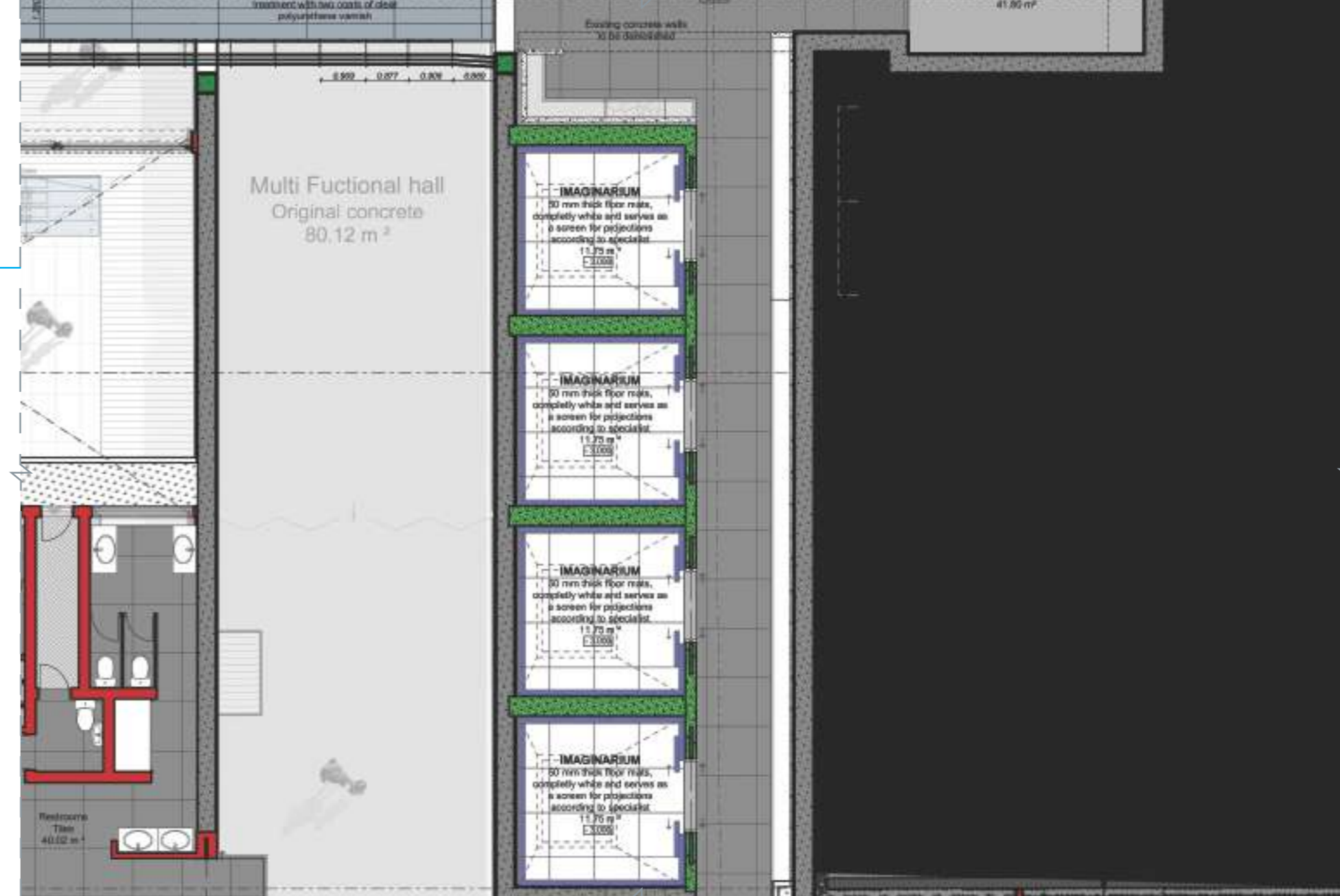


Figure 6.29:



Figure 6.30:

Figure 6.31:



### Reservoir Mezzanine Floor Therapy Rooms

Figure 6.27: Aerial perspective of the western entrance, (Author, 2022).  
Figure 6.28: Elevated view of the service entrance located to the west of the SA-AS Facility, (Author, 2022).  
Figure 6.29: Final renders of the SA-AS Facility, (Author, 2022)

Figure 6.30: Indicating the imaginariums on a topographically drawn site plan, (Author, 2022).  
Figure 6.31: Sectional drawing extracted from the final documentation showcasing the imaginariums, (Author, 2022).



### 5.5.1.2 Reservoir Ground

#### Vestibular and Tactile studios

Patients are often exposed to sensory specific stimuli. The studios focus on the vestibular and the tactile system. To activate these systems patients are asked to balance on boards, engage their vision, play with water, experience various texture, and other sensory tasks.

Situated directly below the reception area is the vestibular and tactile studio foyer. A seating area connects to the exhibition room. The exhibition room contains a large assortment of devices and equipment for every therapy application. Dividing the obelisk's courtyard and the vestibular studio is the first echo chamber. Note the various floor levels, they are no more than two steps apart in height. The highest platform is the sandbox games room. Probably the most effect tactile driven activity, patients essentially play in a large sandpit on top of a table. Patients need to build a new world in this sand table while explaining what they are doing. This inspires creativity through a vital and fun therapy.

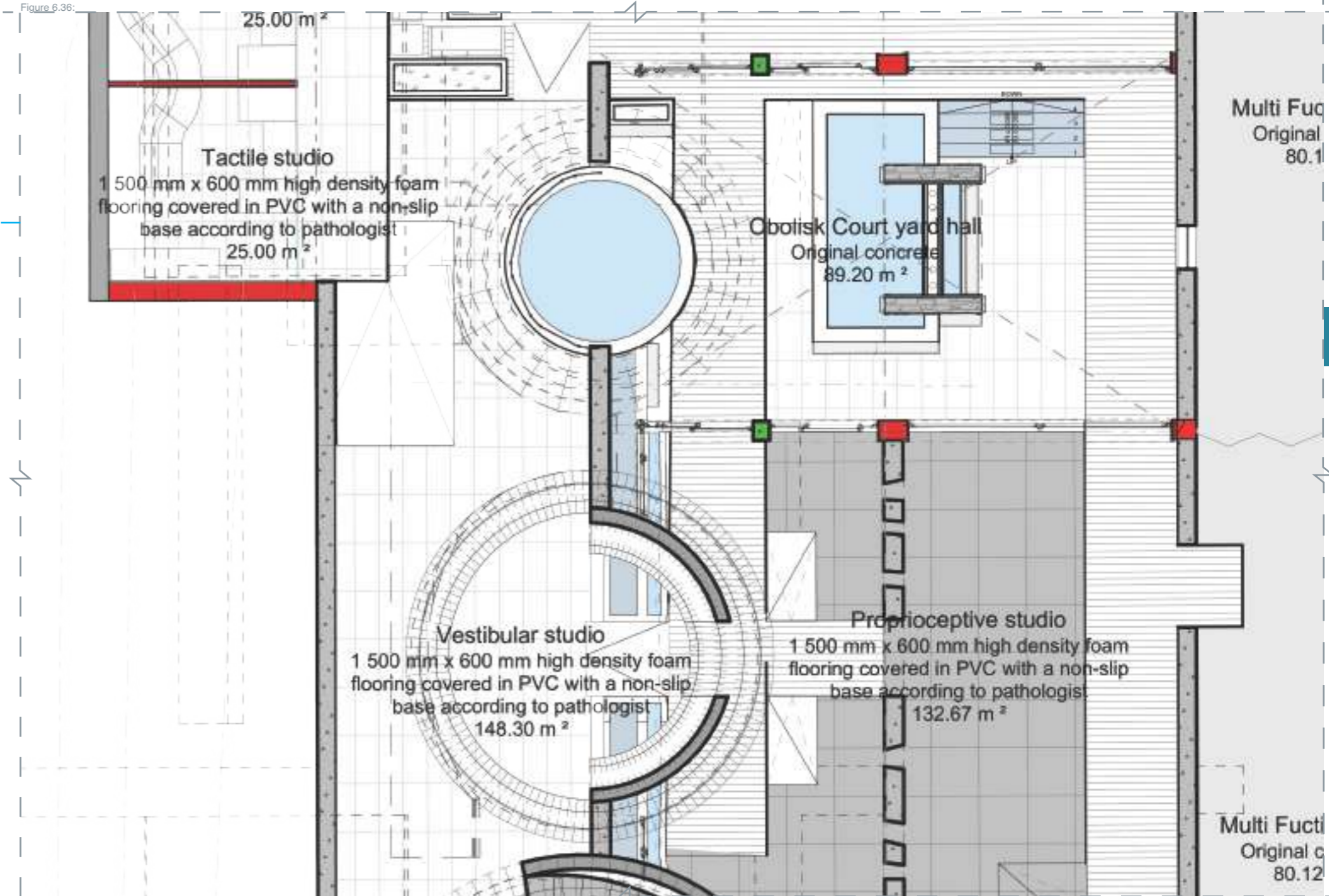


Figure 6.34:



Figure 6.35:

Figure 6.36:



Reservoir Mezzanine Floor  
Vestibular and Tactile studios

Figure 6.32: Worms eye perspective of the wester courtyard, (Author, 2022).  
Figure 6.33: Standing on the edge of the Hermes garden intervention looking down onto the western court yard, peeking into the multi-functional space, (Author, 2022).  
Figure 6.34: Final renders of the SA-AS Facility, (Author, 2022)

Figure 6.35: Indicating the vestibular and tactile studios on a topographically drawn site plan, (Author, 2022).  
Figure 6.36: Sectional drawing extracted from the final documentation showcasing the vestibular and tactile studios, (Author, 2022).



### Exhibition Room

Converting an underground structure that was designed and detailed to keep water sealed, caused a lot of problems. The most important issues were ventilation. Simply opening a few walls in a submerged infrastructure does not mean moisture would be able to escape. Courtyards, drainage, and industrial ventilation systems were needed.

The facility also requires a space to store and exhibit examples of therapy devices along with their DIY counterparts. The exhibition space connects the various studios and courtyards. This double volume space may convert the reservoirs into some sort of wind-tunnel. Reflecting on the most anticipated winds on site as mentioned in the site analysis, wind will come in through the southern excavation, heat up and leave through the north. Just to the north of the exhibition room are a series of industrial ventilation systems, that can pump air into the facility or push air up creating a draught through the reservoir, allowing fresh air to circulate.

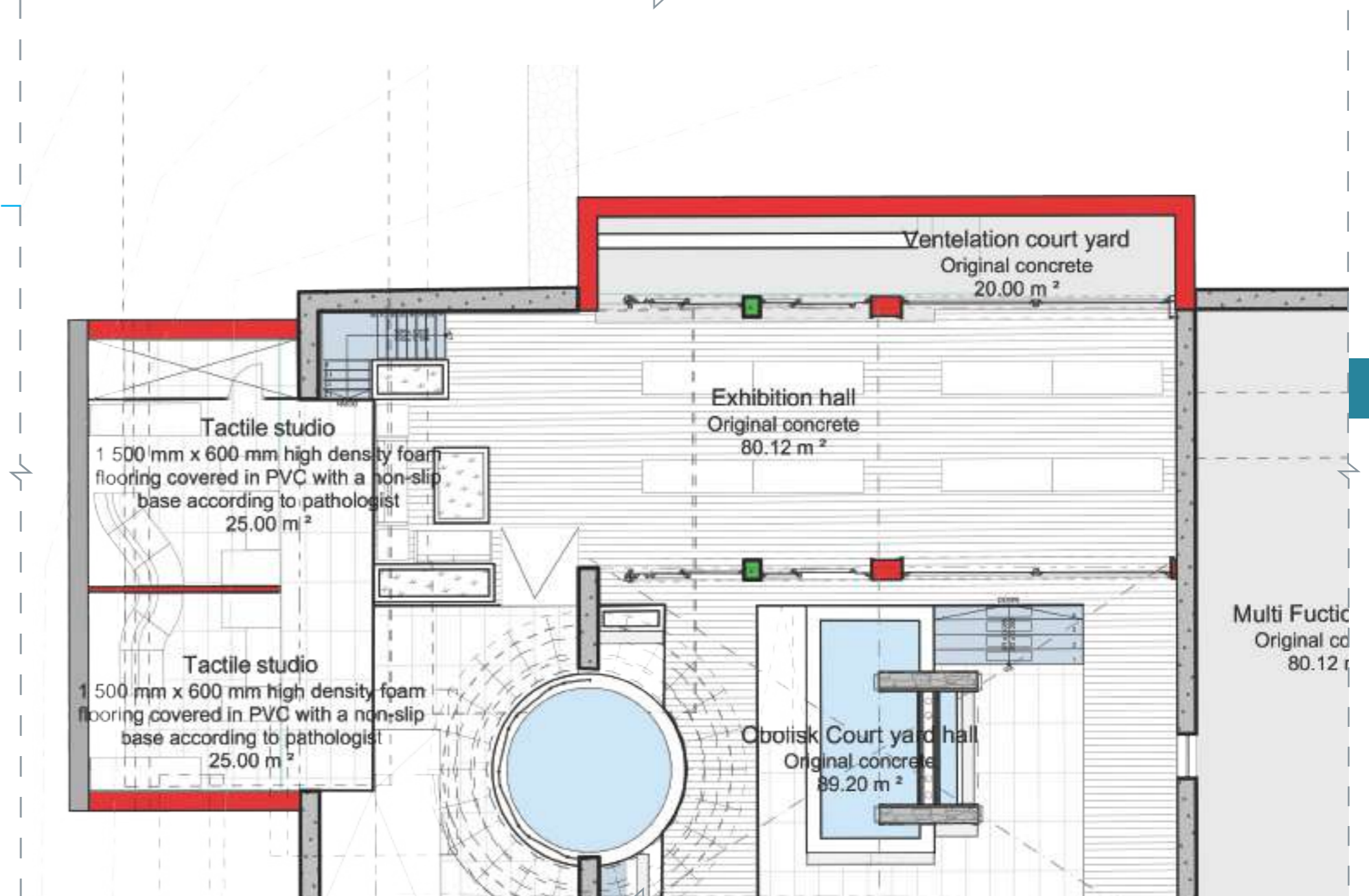


Figure 6.39:



Figure 6.40:

Figure 6.41:



Reservoir Mezzanine Floor  
Exhibition Room

Figure 6.37: Interior render looking towards the exhibition room from within the vestibular studio, (Author, 2022).  
Figure 6.38: Computer generated perspective within the third echo silo, (Author, 2022).  
Figure 6.39: Final renders of the SA-AS Facility, (Author, 2022)

Figure 6.40: Indicating the exhibition room on a topographically drawn site plan, (Author, 2022).  
Figure 6.41: Sectional drawing extracted from the final documentation showcasing the exhibition room, (Author, 2022).



**Obelisk Courtyard**

The obelisk is one of the vestibular orientated follies. It is situated deep within the reservoir, in the centre of a courtyard. It allows natural light to funnel into the submerged spaces and provides a sense of how large the reservoir vaults are. The obelisk protrudes from the reservoir, measuring at a height of 13 meters. It is an enormous monolith forcefully placed in the middle of a tiny courtyard. From outside the obelisk seems like an insignificant object on site, but it is contrasted by the intimidating feeling by standing right beside it and looking up to the heavens. This obelisk is directly aligned with the first silo and squeezed in between the exhibition space and the proprioceptive studio.

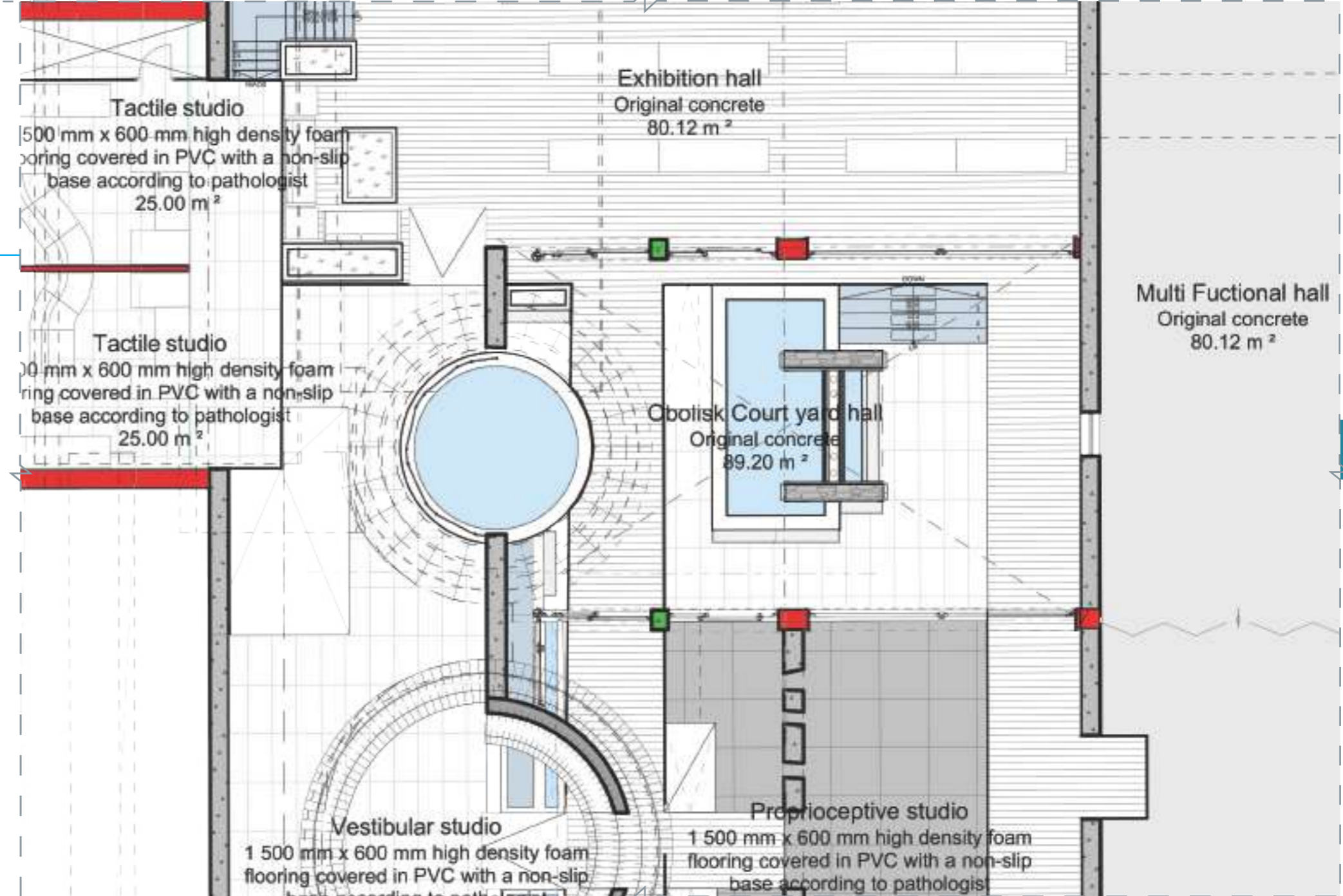


Figure 6.44:



Figure 6.45:

Figure 6.46:



**Reservoir Mezzanine Floor**  
Obelisk Courtyard

Figure 6.42: Final render from within the kitchen which serves out into the wester courtyard, (Author, 2022).  
Figure 6.43: When standing on top of the existing underground water reservoir you will see this computer-generated perspective when looking down onto the wester courtyard, (Author, 2022).

Figure 6.44: Final renders of the SA-AS Facility, (Author, 2022).  
Figure 6.45: Indicating the obelisk courtyard on a topographically drawn site plan, (Author, 2022).  
Figure 6.46: Sectional drawing extracted from the final documentation showcasing the obelisk courtyard, (Author, 2022).



**Multi-functional hall**

The transformation of the reservoirs into a functional facility was restricted due to the Burra Charter (Australia ICOMOS, 2013) guidelines. According to these guidelines, a percentage of the historical must be left untouched. Therefore, the four chambers of the reservoir, closest to the pumpstation are converted into a multifunctional space able to facilitate three lectures in one space.

This multifunctional space is placed within the existing reservoirs with only the most necessary alterations. These include installing lights, air-conditioning, sound systems, and other building services. Directly opposite the eastern wall is a large storage space and service elevator, to allow easy access to cleaning utilities or expensive and specialized devices such as a traction halo.

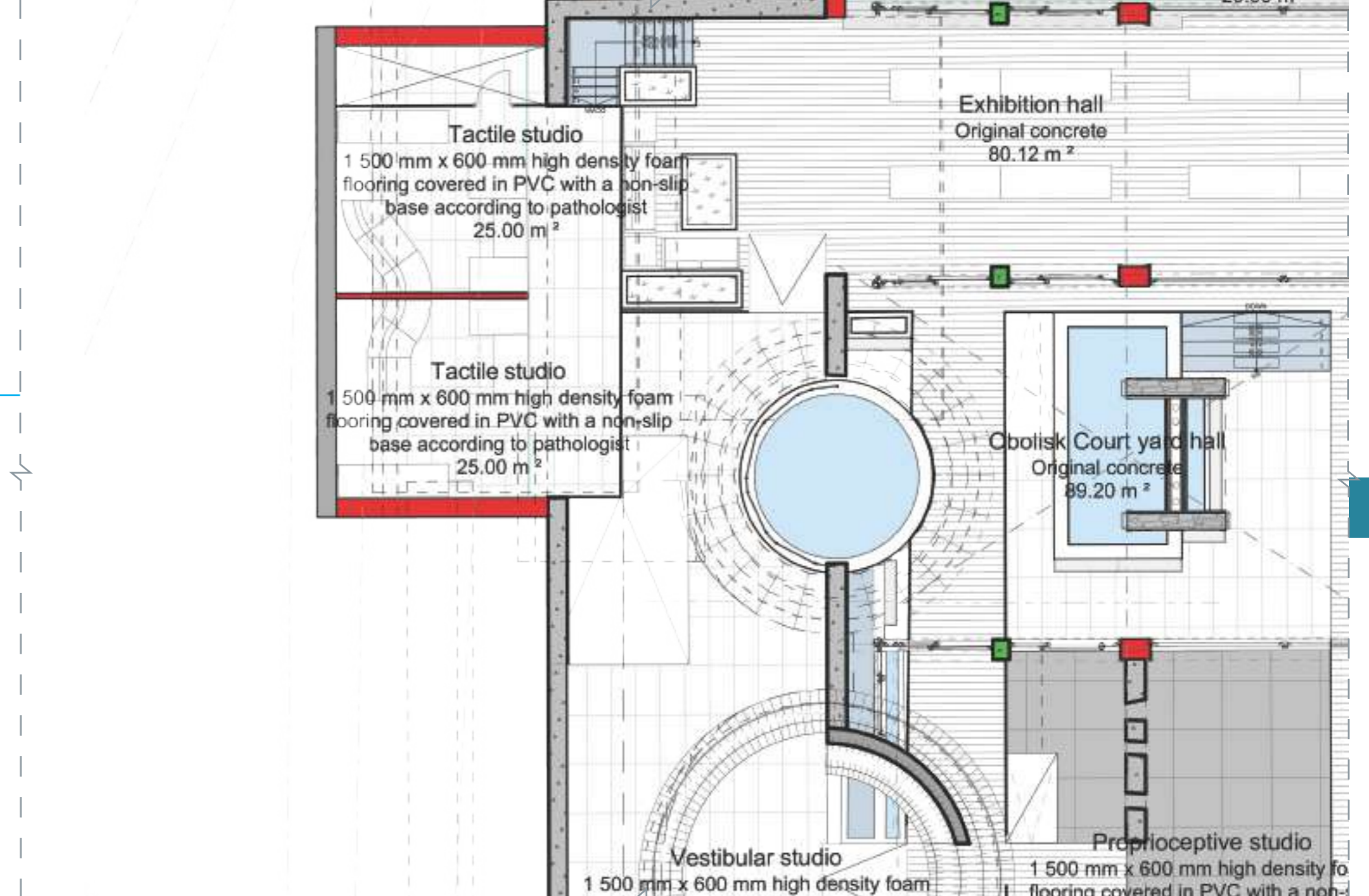
When standing inside the multi-functional hall and looking out one would notice the reflection pond. It has been meticulously placed to catch and redirect storm water pouring in from Naval Hill. While improving the aesthetic appeal of a borrowed ruin, this reflection pond reflects the light into the space, casting patterns onto the vaulted ceiling.

Figure 6.49:



Figure 6.50:

Figure 6.51:



**Reservoir Mezzanine Floor**  
Therapy Rooms

Figure 6.47: Looking up onto the silhouette Naval Hill, while standing on top of the Western courtyard events kitchen, (Author, 2022).  
Figure 6.48: Within the western courtyard, one will notice the depths of the excavated ground while passing the security office and looking up to the mezzanine floor, (Author, 2022).

Figure 6.49: Final renders of the SA-AS Facility, (Author, 2022).  
Figure 6.50: Indicating the multi-functional hall on a topographically drawn site plan, (Author, 2022).  
Figure 6.51: Sectional drawing extracted from the final documentation showcasing the multi-functional hall, (Author, 2022).



## 6.2.2 Pumpstation

### 6.2.2.1 Machine pit

A multitude of pumps and various machines were imported from Scotland during the initial construction of the pumpstation, between 1898 and 1899. During this time pipelines were laid to nearby residences in preparation of “Die Modderrivier-waterskema” (Modder River water scheme). Up until this point water was transported via pipeline from Sannaspos, 31,5 km away and stored with in the water reservoir at the foot of Naval Hill (Botes, 2021). Only a year later the pump and machines from Scotland were installed and water could be pumped from the Modder River into nearby residences.

As mentioned, currently a large void remains within the present pumpstation, this pit is large enough to encompass two office spaces with ample ceiling space. This 49m<sup>2</sup> mechanical pit now generates a triple volume and a perfect location for vertical circulation. This circulation core is a symbolic gesture, where water once circulated between the reservoir and pumpstation, is now the circulation point between the administration and gymnasium.



Figure 6.54:



Figure 6.55:

Figure 6.56:

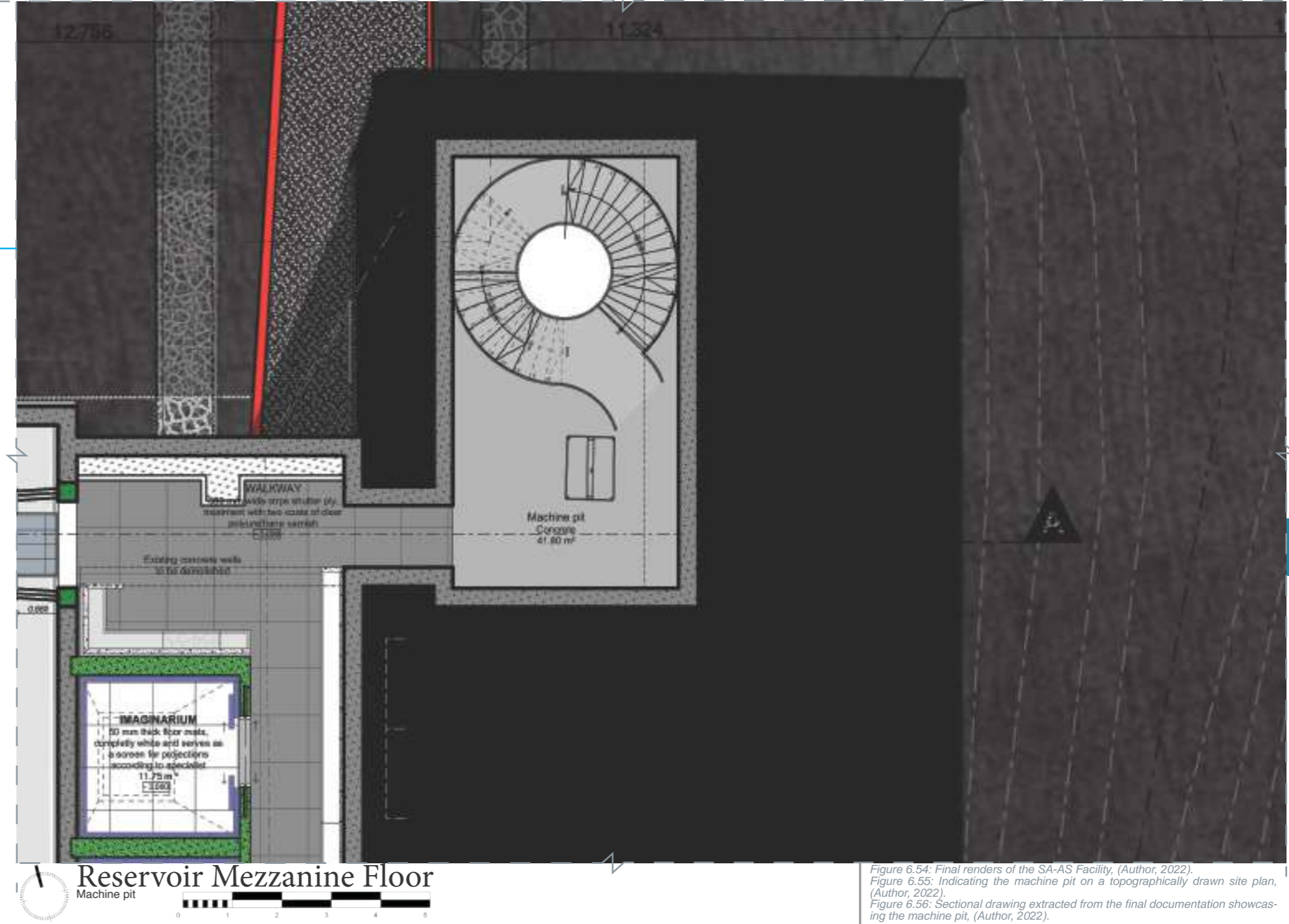


Figure 6.54: Final renders of the SA-AS Facility, (Author, 2022).  
 Figure 6.55: Indicating the machine pit on a topographically drawn site plan, (Author, 2022).  
 Figure 6.56: Sectional drawing extracted from the final documentation showcasing the machine pit, (Author, 2022).

6.2.2.2 Pumpstation Ground Floor

The vertical circulation is the transition from therapy facility to administration. Separating administration from therapy allows pathologists to maintain a comfortable office that would not need to be rearranged to suit each patient. Therefore, the existing pumpstation is only used to regulate and maintain the business side of occupational and speech therapy.

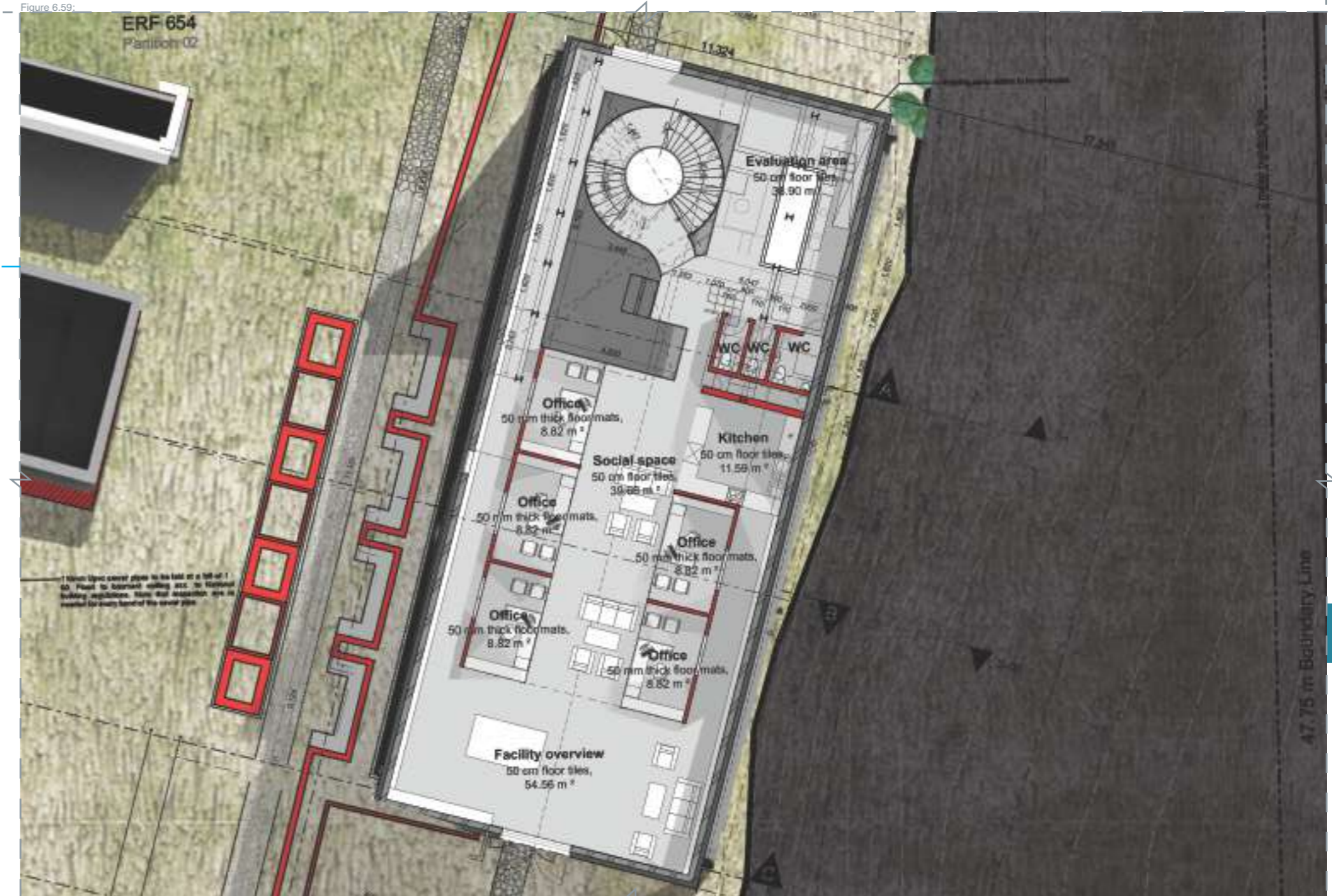
The ground floor of the pumpstation encompasses evaluation rooms, therapy offices, bathrooms, and a staff lounge. Most people in this industry are notably more social than most other professional fields. Therefore, the therapy offices surround a staff lounge to encourage communication while providing a private office space. The interior aesthetics are subjected to the existing structure, with functional and administrative spaces designed as plexiglass boxes, allowing natural light to flow and spread throughout the space. There is also a sense of privacy provided within a social space. In essence the administrative space represents the larynx or the vocal box, that sits within the head of the facility.



Figure 6.57:



Figure 6.58:



Reservoir Mezzanine Floor  
Pumpstation Ground Floor

Figure 6.57: Final renders of the SA-AS Facility, (Author, 2022).  
Figure 6.58: Indicating the pumpstation ground floor on a topographically drawn site plan, (Author, 2022).  
Figure 6.59: Sectional drawing extracted from the final documentation showcasing the pumpstation ground floor, (Author, 2022).

### 6.2.2.3 Pumpstation Mezzanine Floor

At its most basic, the mezzanine floor is a lightweight steel structure with glass infill. Ideal for light dispersion, opposed to using drywalling in terms of office partitions due to its density, and transparency. The mezzanine floor is attached to the existing support structure that was used to house heavy machinery in the pumpstation. Also, the functional floor area is offset from the pumpstation walls, respecting its heritage.

The head office, therapist offices, accountant, documentation storage, server room and boardroom are on the list of functional space allocated to this mezzanine floor. It is designed to impress rather than overwhelm. Some patients are easily overwhelmed by their sensory stimuli and in opposition to this the social nature of speech and occupational therapists would not want to spend their day inside an introverted office. Therefore, a lightweight structure minimizes the overpowering ambiance the interior space will have.

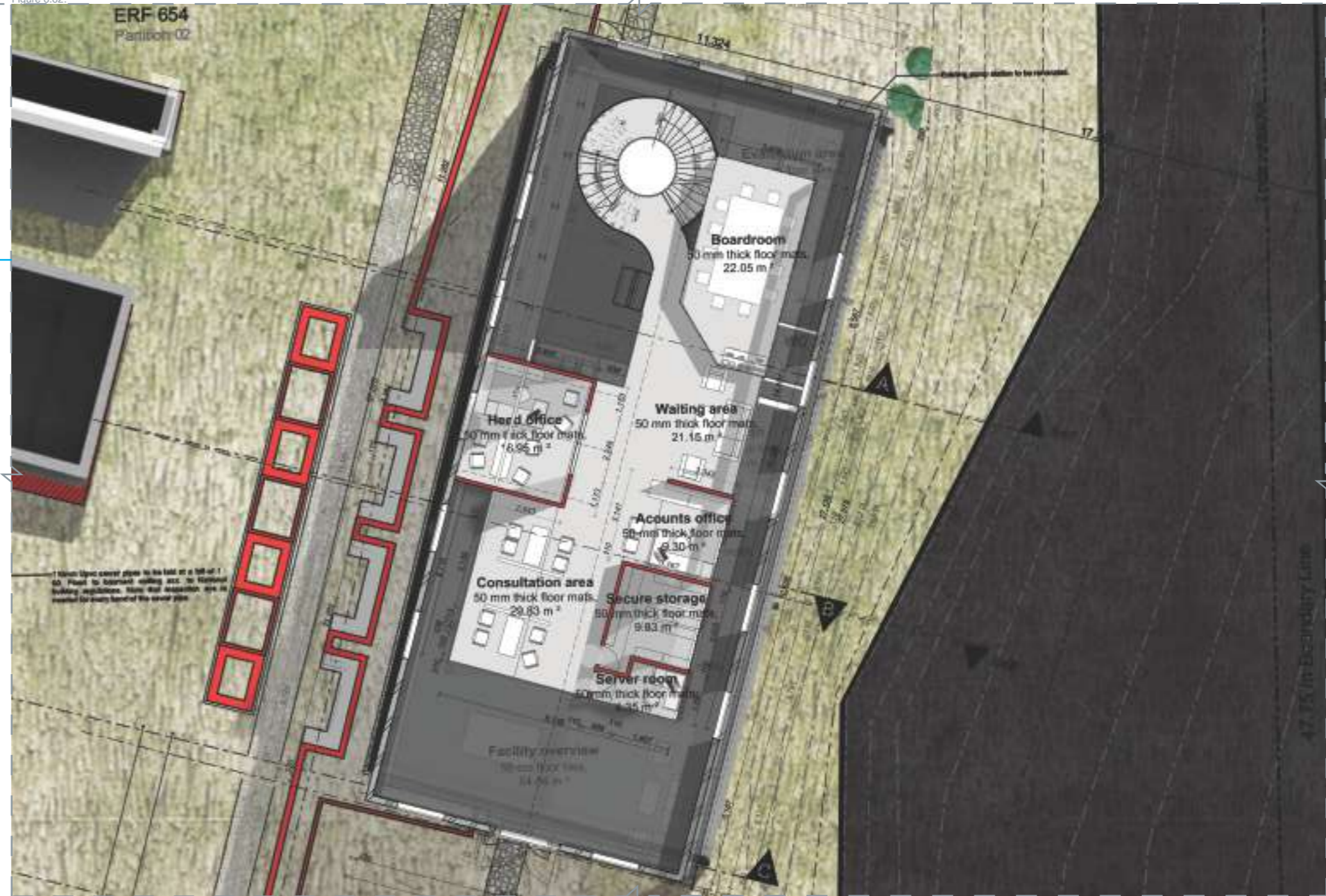


Figure 6.60:



Figure 6.61:

Figure 6.62:



**Reservoir Mezzanine Floor**  
Pumpstation Mezzanine Floor

Figure 6.60: Final renders of the SA-AS Facility, (Author, 2022).  
Figure 6.61: Indicating pumpstation mezzanine floor on a topographically drawn site plan, (Author, 2022).  
Figure 6.62: Sectional drawing extracted from the final documentation showcasing the pumpstation mezzanine floor, (Author, 2022).



Phonic spaces morphed by mathematically derived dimensions are never used to its fullest within therapy. The most important and notable feature of this facility is undoubtedly the four silos, because these silos are able to echo, reflect, and mimic sounds due to their choice of material and shape. It is only appropriate to dedicate a section on how these spaces use sound to mediate speech. These ruins are transcended into a phonic recreational space, acting as an incubator for vocal amplification. These silos embody the vocal cords of the site.

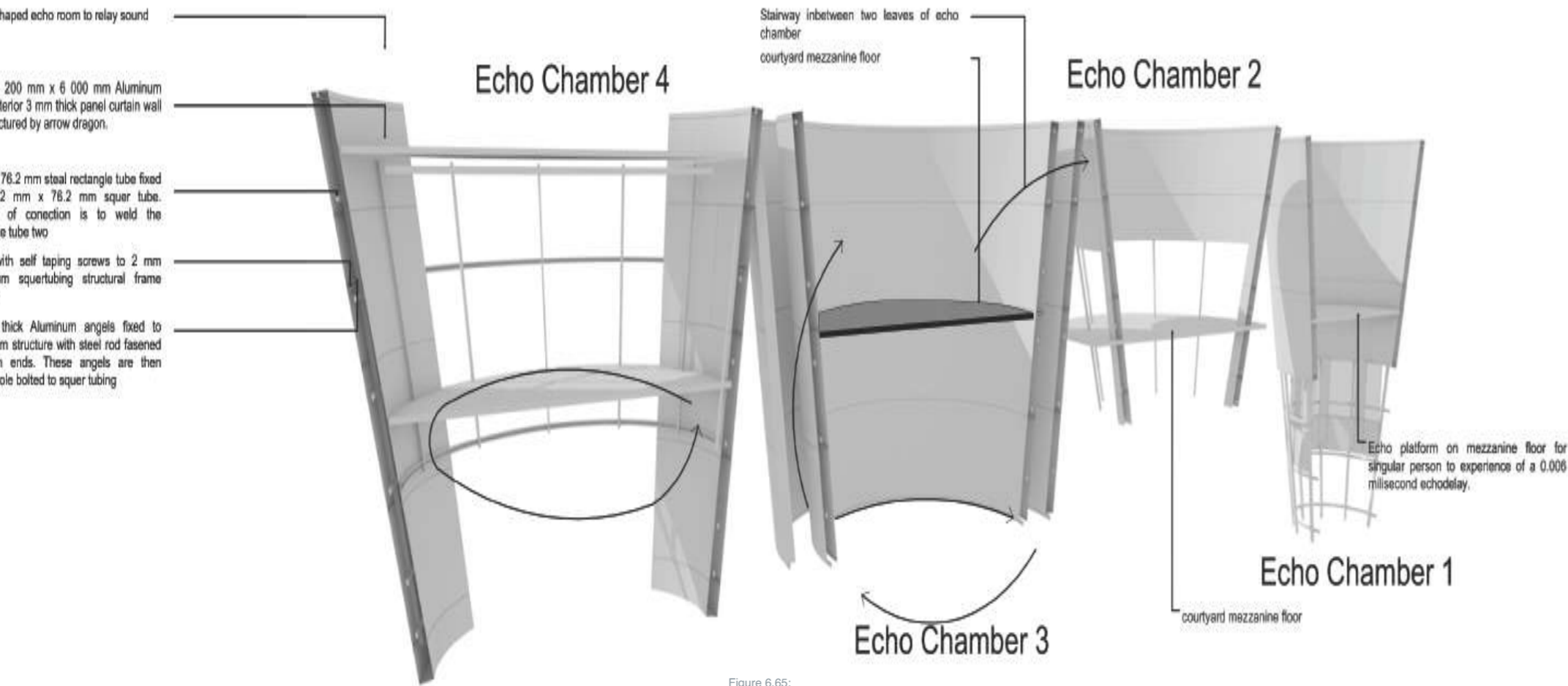
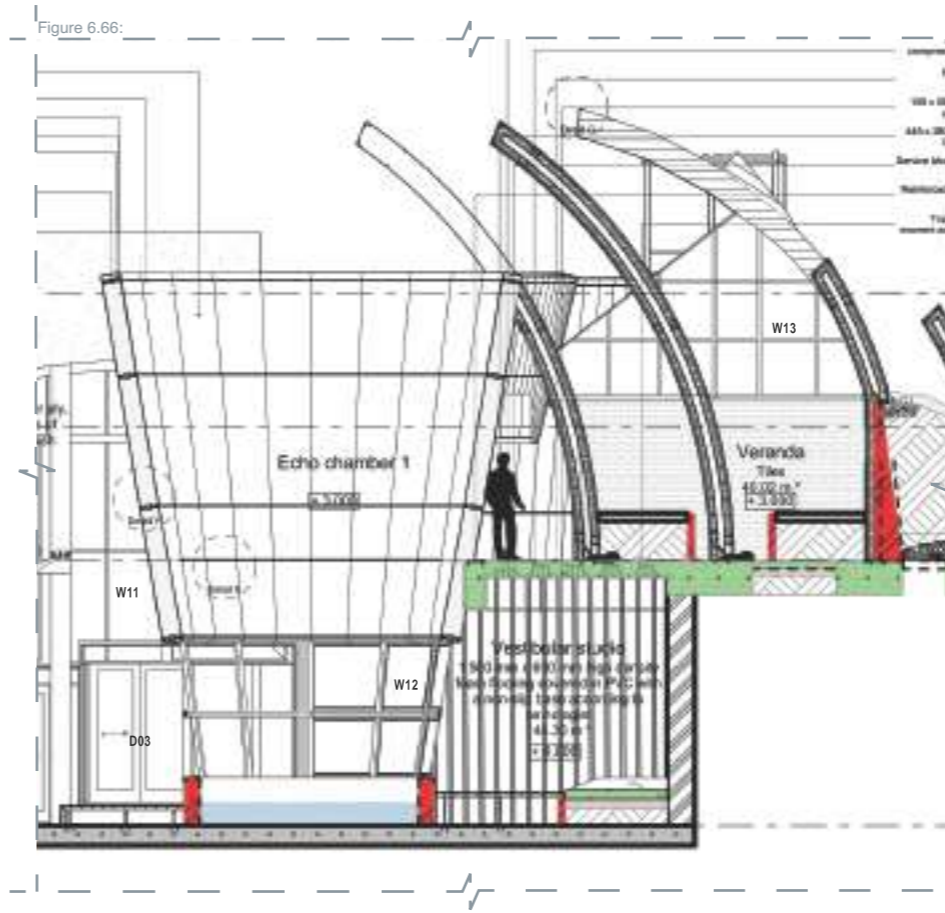


Figure 6.65:

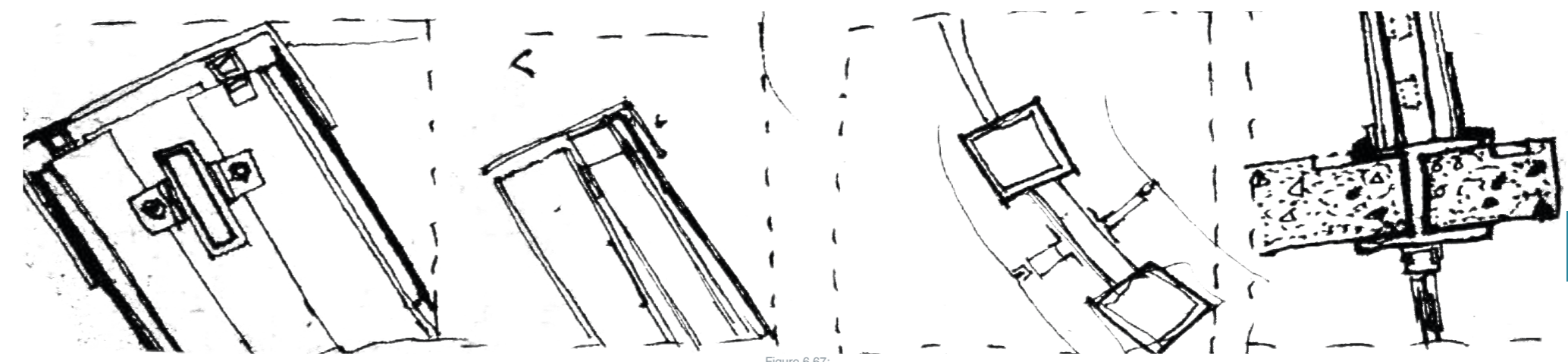


6.2.3.1 Effect of sunlight

Looking at the future intended use of the existing structure, it is evident that there won't be adequate natural light penetrating the interior volumes. The scale of these structures, along with the vaulted roof structures, was identified as the two of the biggest issues to address.

Firstly, the cylinders are punched into the vaults for their therapeutic function. To allow the maximum amount of sunlight into the space during the day, these cylinders had to be stretched into cones, each at different angles. By doing this the scale and ambience are dramatically affected. Cone shapes amplify sound waves and direct them upward as well as emphasizing the sounds coming in. The angles at which these silo walls lean is determined by the solar path to ensure maximum light quality and they are adjusted according to the specific sonic applications.

The vaulted roof structures are sensitive to any alteration, which makes them extremely brittle against and modifications due to the structural properties of an arch. These vaults cannot simply be cut. The vaulted structures affected by the silos are removed and replaced with a less dense steel structure. These structures latch onto and push against the existing reservoir walls to distribute the structural load.



188  
 Figure 6.63: Perspective render of main entrance from the vehicular route leaving the site, (Author, 2022).  
 Figure 6.64: This render shows how the curved screens can be flipped to curve in the opposite direction allowing the sounds from the site to be amplified within a singular location, (Author, 2022).  
 Figure 6.65: Exploded isometric detailing of all four echo silos, (Author, 2022).

Figure 6.66: Partial section from final documented section of an echo silo, (Author, 2022).  
 Figure 6.67: Only a handful of hand drawn sketch investigating possible structural technical resolutions, (Author, 2022).

## Echo Chamber 1

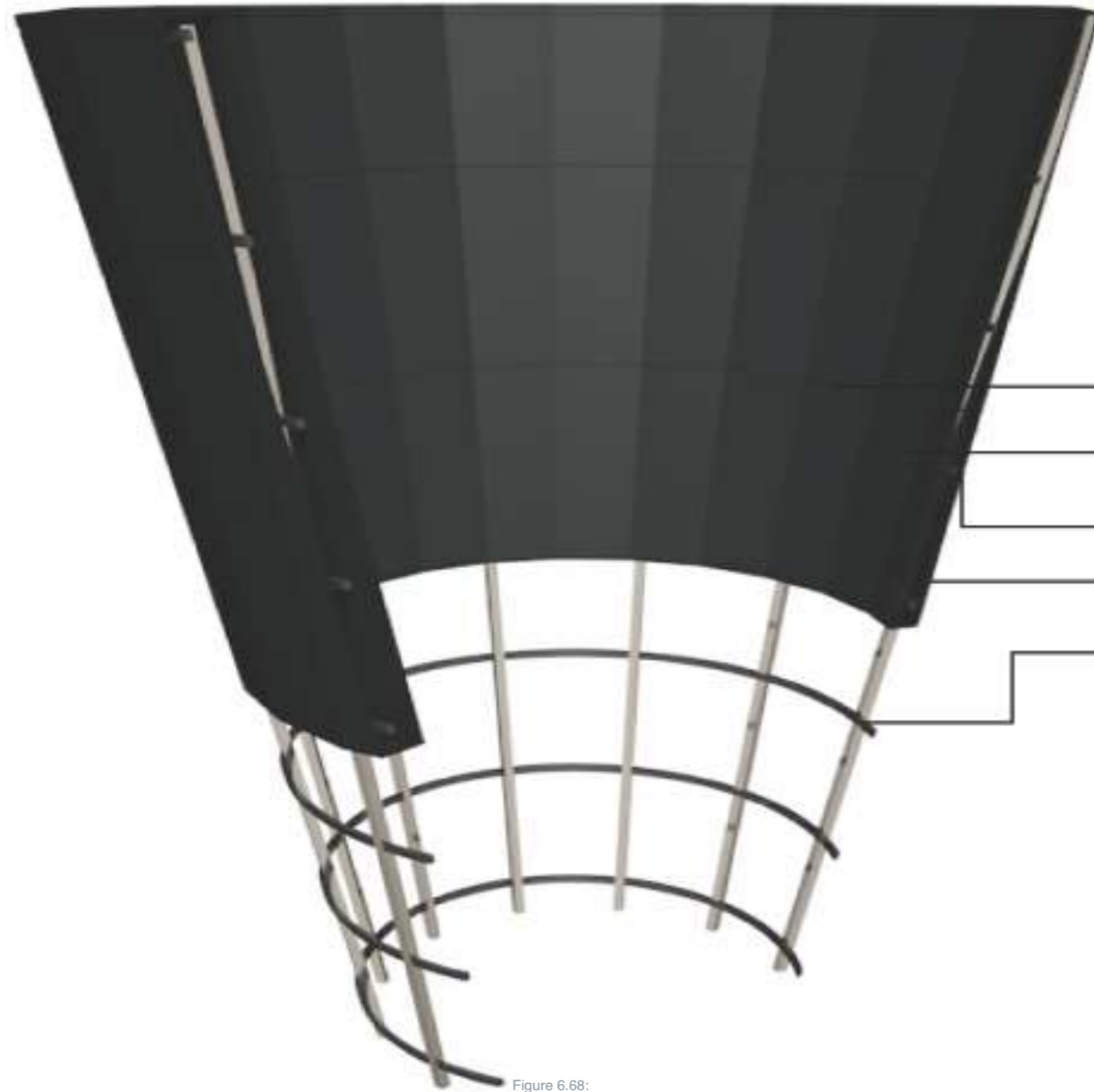


Figure 6.68:

Figure 6.68: Detailed isometric diagram of the first echo silo, (Author, 2022).  
 Figure 6.69: All four echo silo exploded into its most basic functional aspects, (Author, 2022).  
 Figure 6.70: Exploded isometric, describing each structural component of the SA-AS Facility, (Author, 2022).



Figure 6.67:

- up to 2 200 mm x 6 000 mm Aluminum alloy exterior 3 mm thick panel curtain wall manufactured by arrow dragon.
- Panel surface to be treated and coated with chromate and powder sprayed acc. to Arrow Dragon
- Pannels bolted to 2 mm thick Aluminum C section
- 2 mm thick Aluminum C section fixed with self taping screws to 2 mm Aluminum squertubing structural frame system
- 2 mm thick Aluminum angels fixed to aluminum strcutre with steel rod fasened on both ends. These angels are then further role bolted to squer tubing

### 6.2.3.2 Silo Explication

During therapy sessions, patients would experience these silos from either the suspended mezzanine floor or on basement level. Patients will stand in the centre of the silos repeating selected phrases or executing required activities. After the patient has built up their confidence they will move on to the sensory park. This is where they can explore and linger in the stimulating spaces. Patients will be educated on the simplicity of these complex applications and have the choice to either continue using the sensory park or to purchase electronic and static devices of similar purpose. Apart of their therapy, patients and guardians are taught how to build various of these devices for themselves at home.

The silos' construction consists of two properties, namely frame and cladding. Aluminium frames are used due to their lightweight properties and noise reduction coefficient values. These frames are then cladded with Arrow dragon Aluminium alloy panels that are designed to propagate sound waves. This results in an elegantly designed curved structure with a high thermal resistance value that greatly improves sound insulation. More importantly these materials increase sound vibration and acoustic diffraction.

This material diffracts sound and improves the echo quality, while weaker sounds or noises are eliminated through material absorption. The effect sound has on the brain endures for more than a fraction of a second, meaning that the human brain keeps any sound stored in memory for up to 0.1 second. If a reflected sound reaches the ear within 0.1 seconds, the sound is preserved to be prolonged.

These silos minimize multiple reverberations, so that only particular sounds are prolonged. Sound waves at room temperature travel at a speed of 300 m/sec and to achieve an echo of 0.1 seconds the sound would need to bounce of an object 17 meters way (Physics Classroom, 2022). Pathologists make use of a PVC telephone, as discussed earlier, with an approximate sound wave travel distance of 15cm. This provides an echo of 0.00044 seconds. This travel time is used for the echo constant for each silo structure. The silos will in future become beacons of hope for stimulative speech (Physics Classroom, 2022).

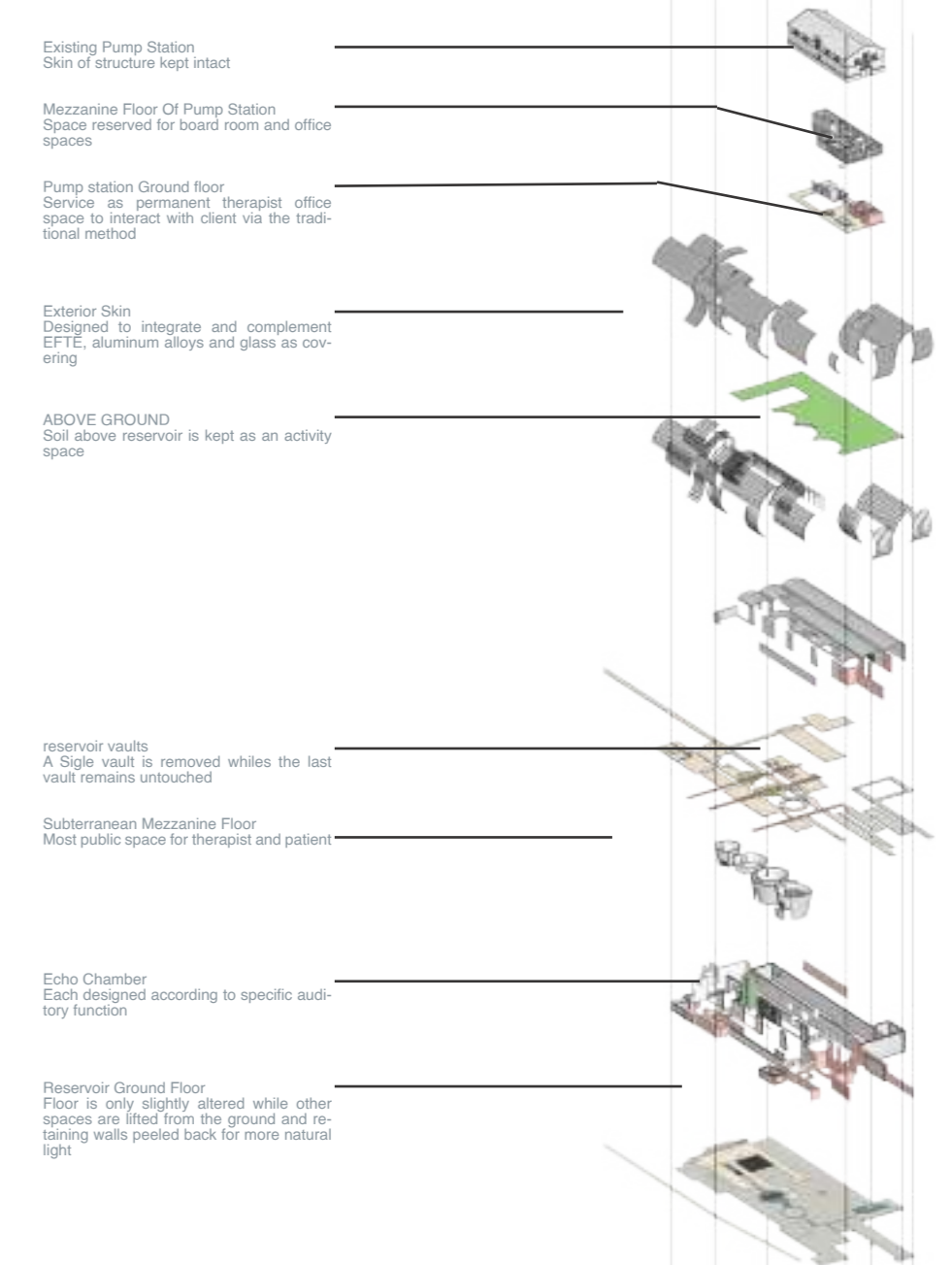


Figure 6.69:





1. Multi-functional Storage
2. Cold Storage
3. Storage
4. Admin office
5. Records office
6. IT/ Security office
7. Events kitchen
8. Multi-functional hall
9. Venue Atrium
10. Venue restrooms
11. Proprioceptive studio
12. Ventilation courtyard
13. Exhibition hall
14. Vestibular Studio
15. Tactile studio

Figure 6.71:



Figure 6.72:



Figure 6.73:



Figure 6.74:



Figure 6.70: Floor plan of the water reservoir of the SA-AS Facility and descriptive legend, (Author, 2022).  
 Figure 6.71 - 6.74: A series of final renders of the SA-AS Facility, (Author, 2022).

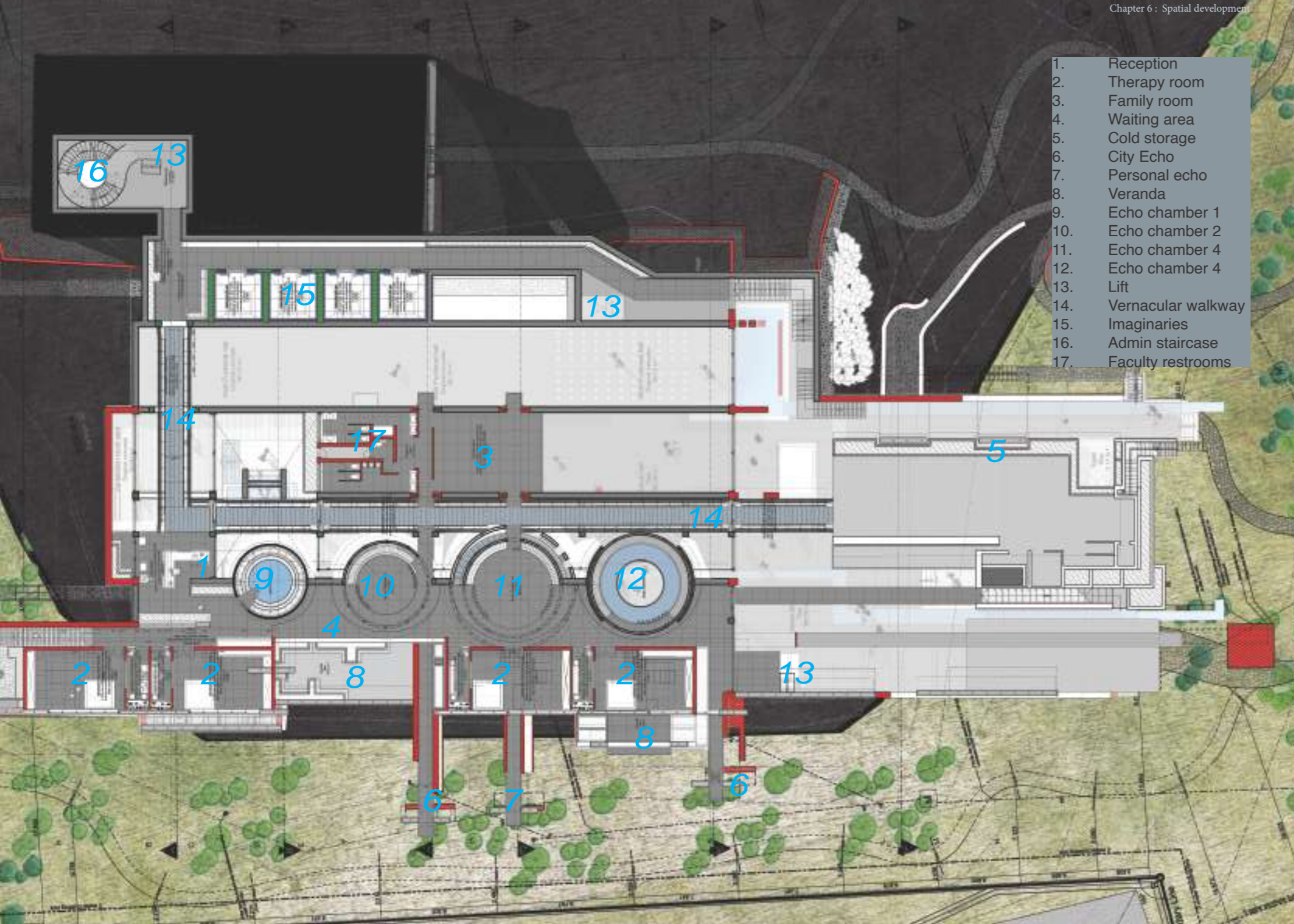


Figure 6.76:



Figure 6.78:



Figure 6.77:



Figure 6.79:



Figure 6.75: Floor plan of the pump house of the SA-AS Facility and descriptive legend, (Author, 2022).  
Figure 6.76 - 6.79: A series of final renders of the SA-AS Facility, (Author, 2022).



Figure 6.80 & 6.81: Computer generated photographical render of the final SA-AS facility design and its nearest context, (Author, 2022).

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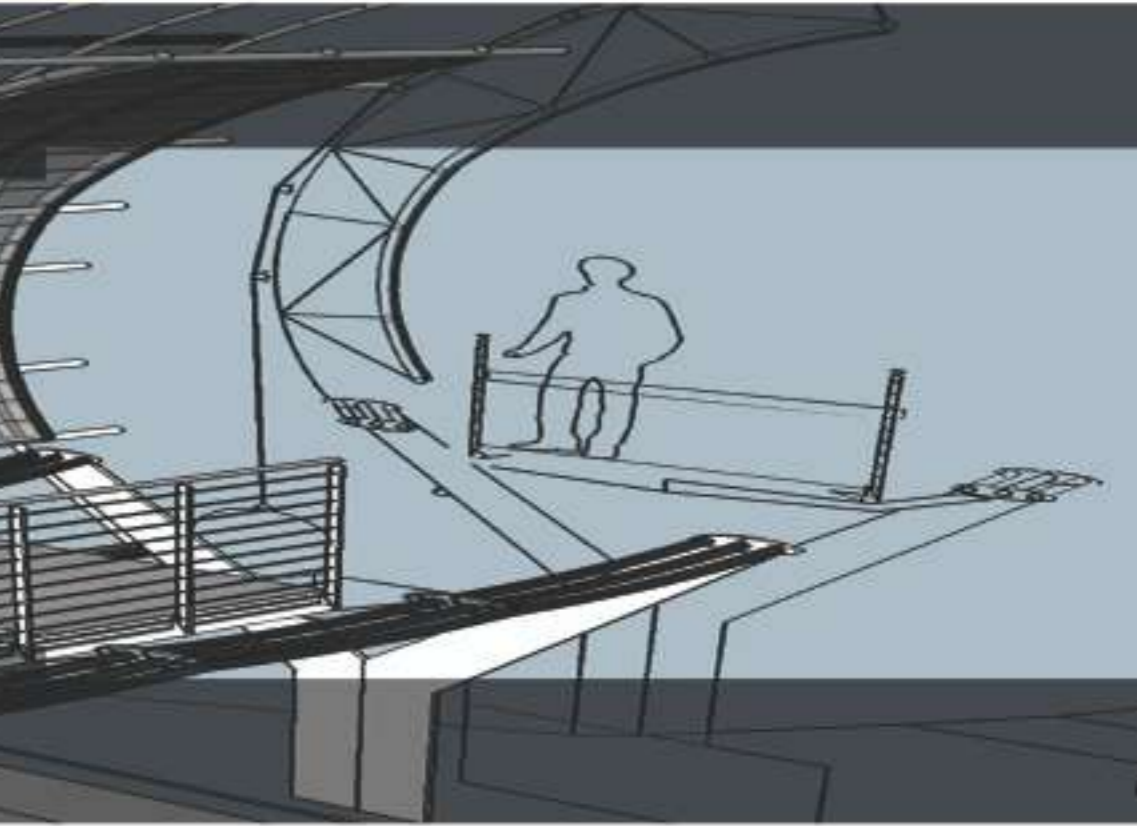
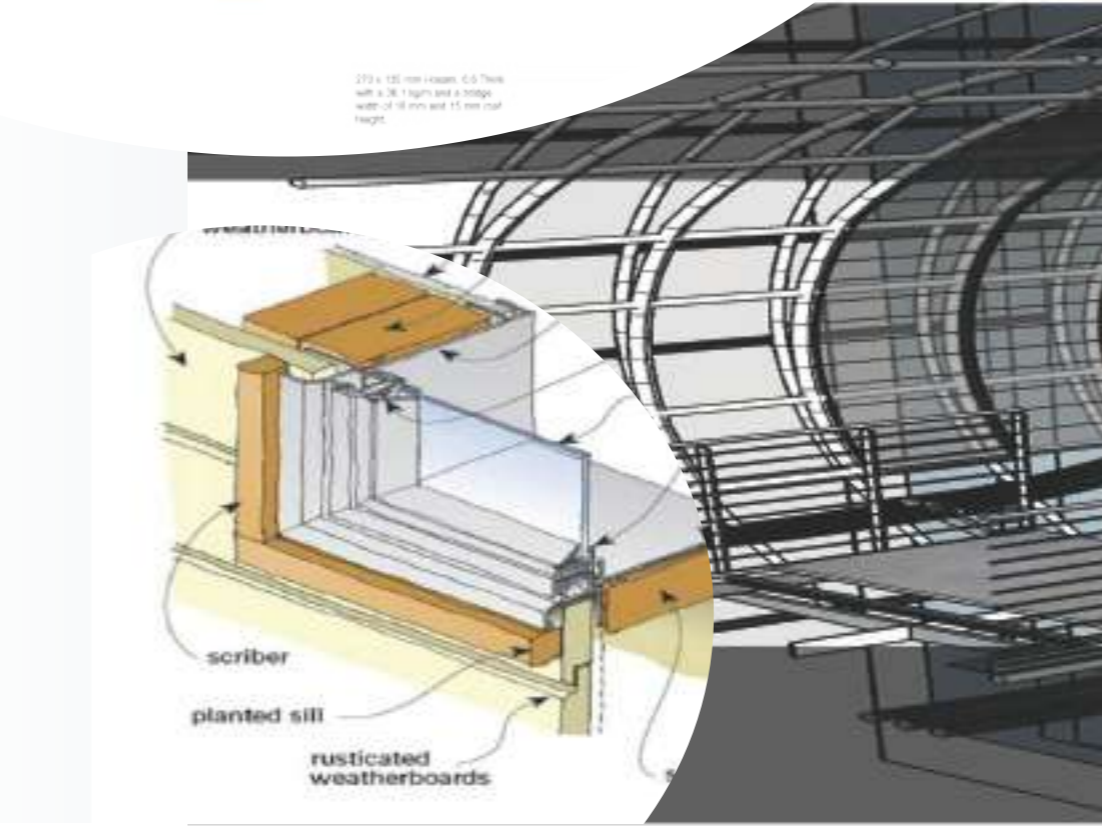
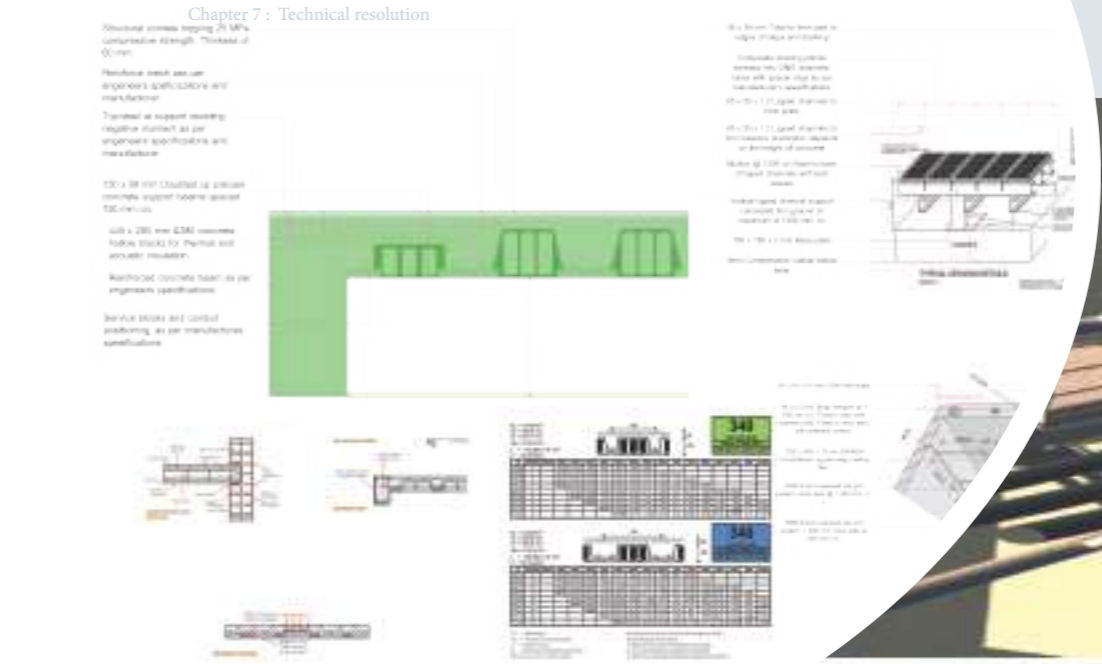
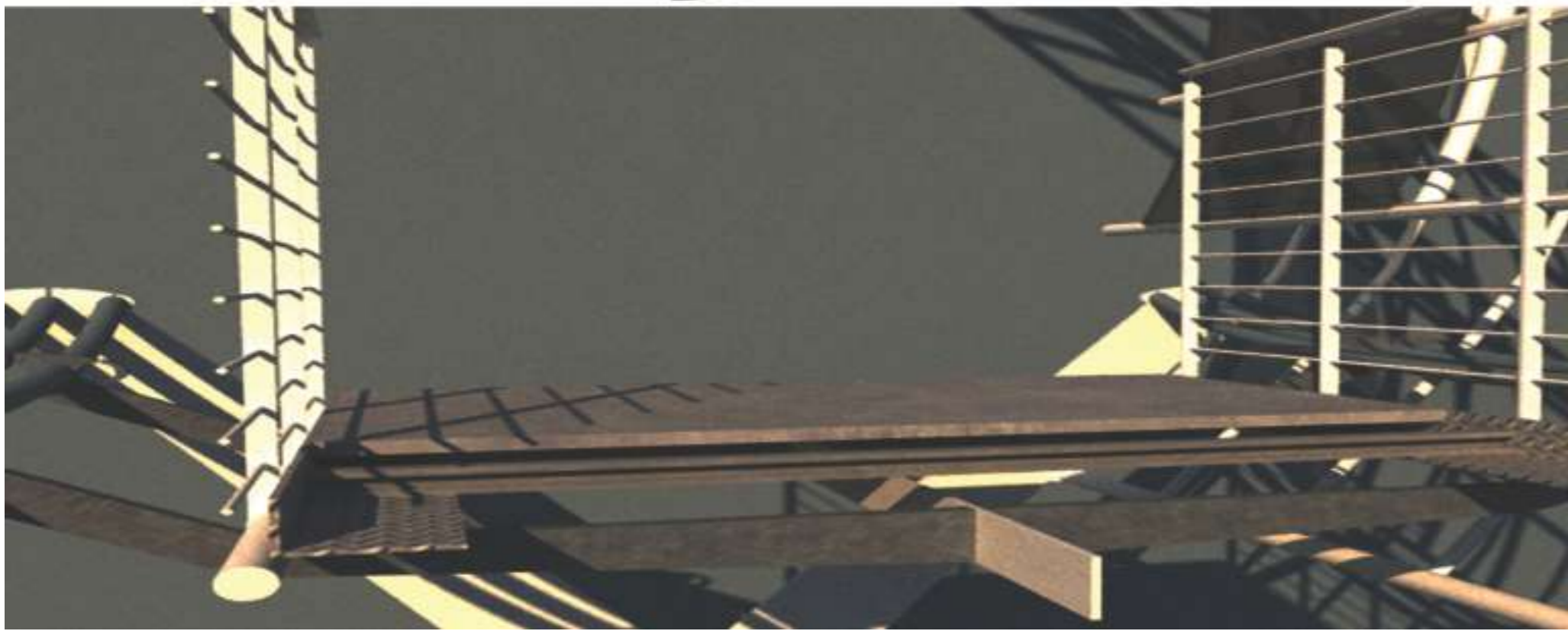
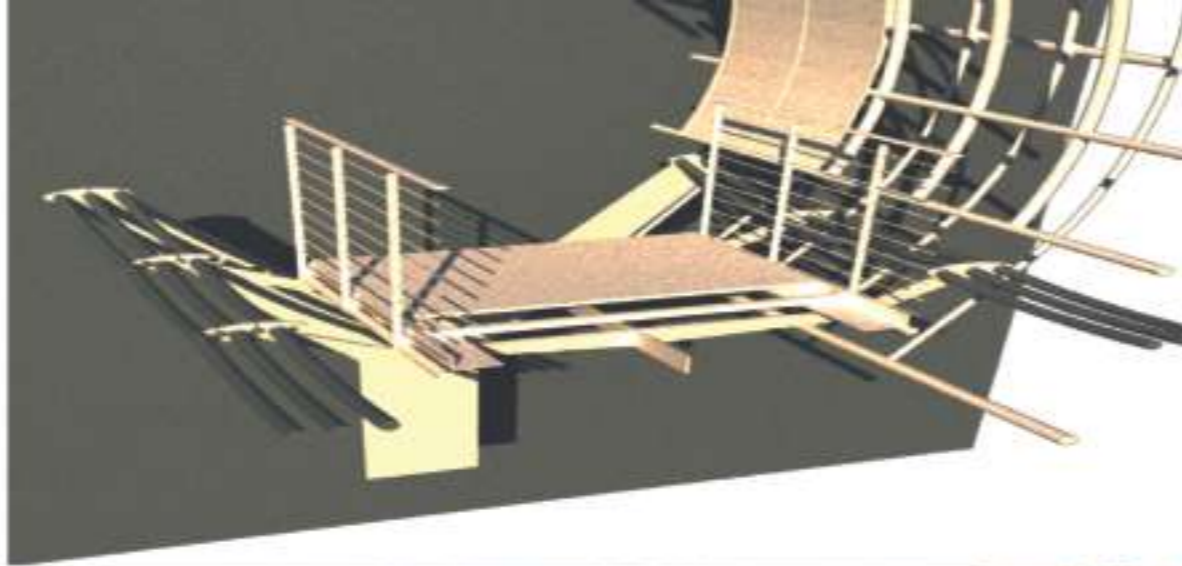
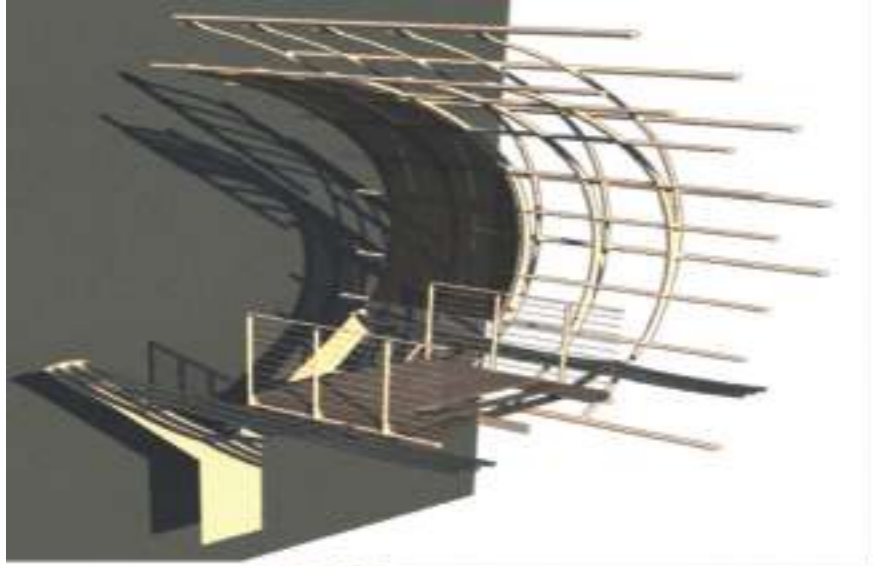
Technical resolution

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Final design analysis

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Handover steel work engineer's specifications and manufacturer

Trapped at support meeting negative moment as per engineer's specifications and manufacturer

230 x 90 mm Channel as shown concrete support beams spaced 1200 mm

100 x 200 mm G30 concrete table slabs for Platform and screen structure

Rusticated concrete hand as per engineer's specifications

Service ducts and control ductwork as per manufacturer's specifications

272 x 120 mm screen, G.D. Term with a 30° slope and a bridge water of 18 mm and 15 mm rail height.

230 x 90 mm Channel as shown concrete support beams spaced 1200 mm

100 x 200 mm G30 concrete table slabs for Platform and screen structure

Rusticated concrete hand as per engineer's specifications

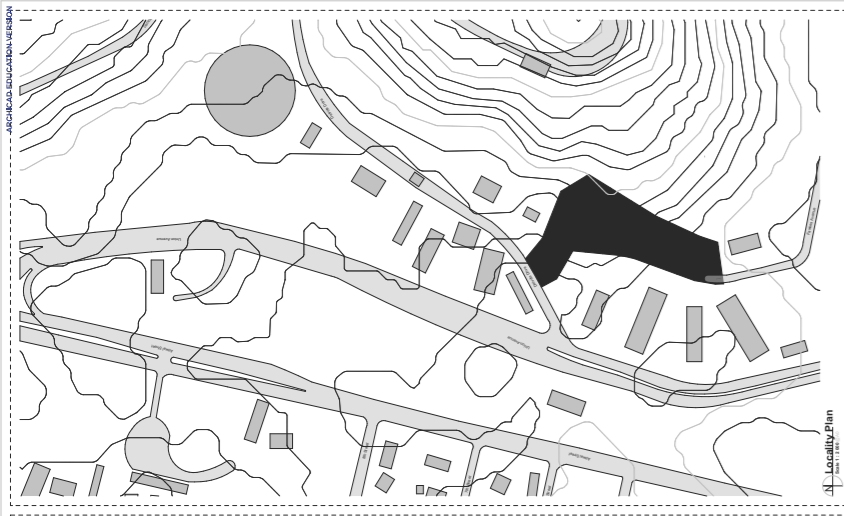
Service ducts and control ductwork as per manufacturer's specifications

272 x 120 mm screen, G.D. Term with a 30° slope and a bridge water of 18 mm and 15 mm rail height.

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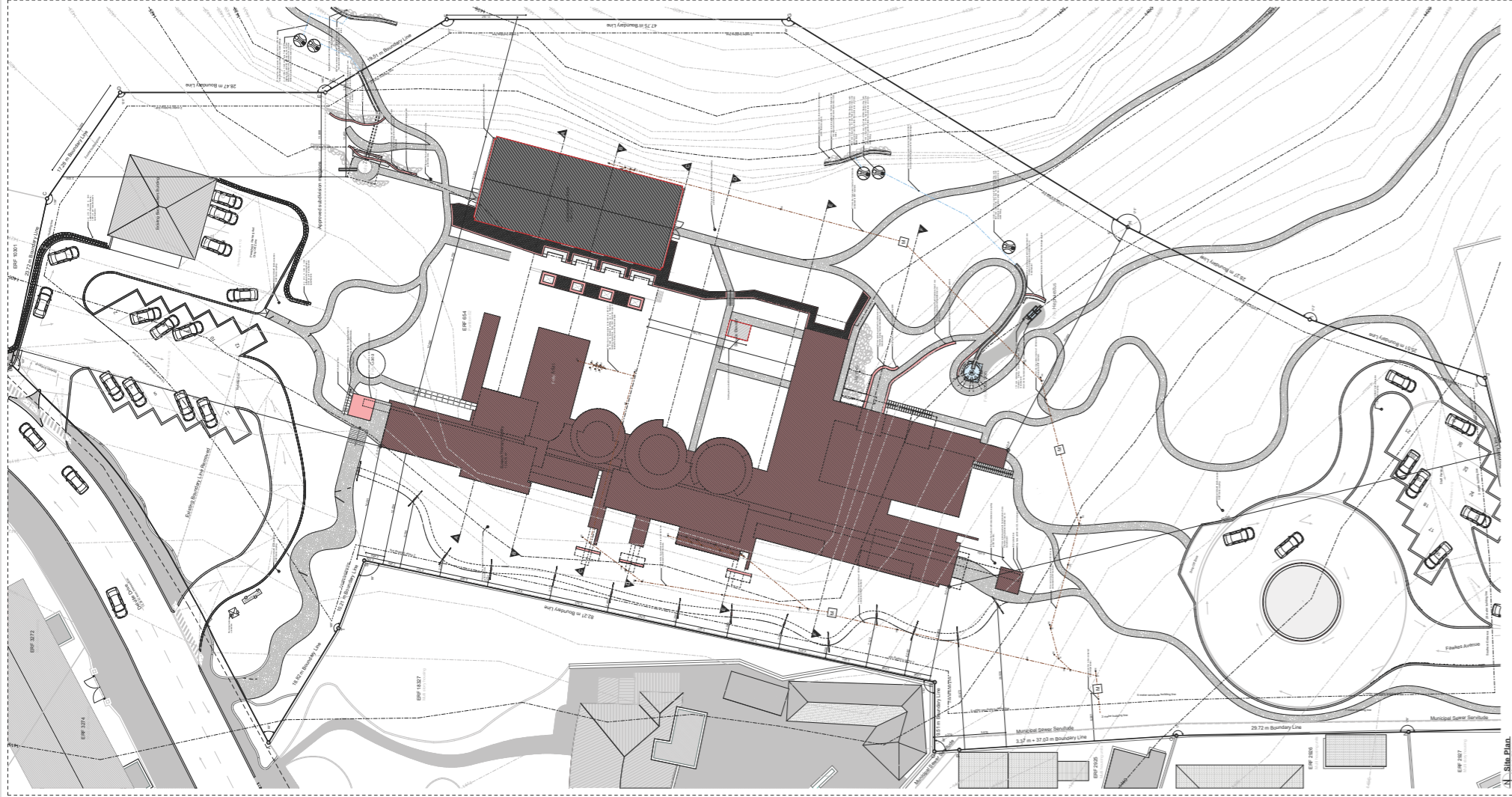
planted sill

rusticated weatherboards



Chapter 7- Technical resolution

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| 2  | 1   | ISSUED FOR PERMIT | 10/20/2021 |
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Chapter 7- Technical resolution

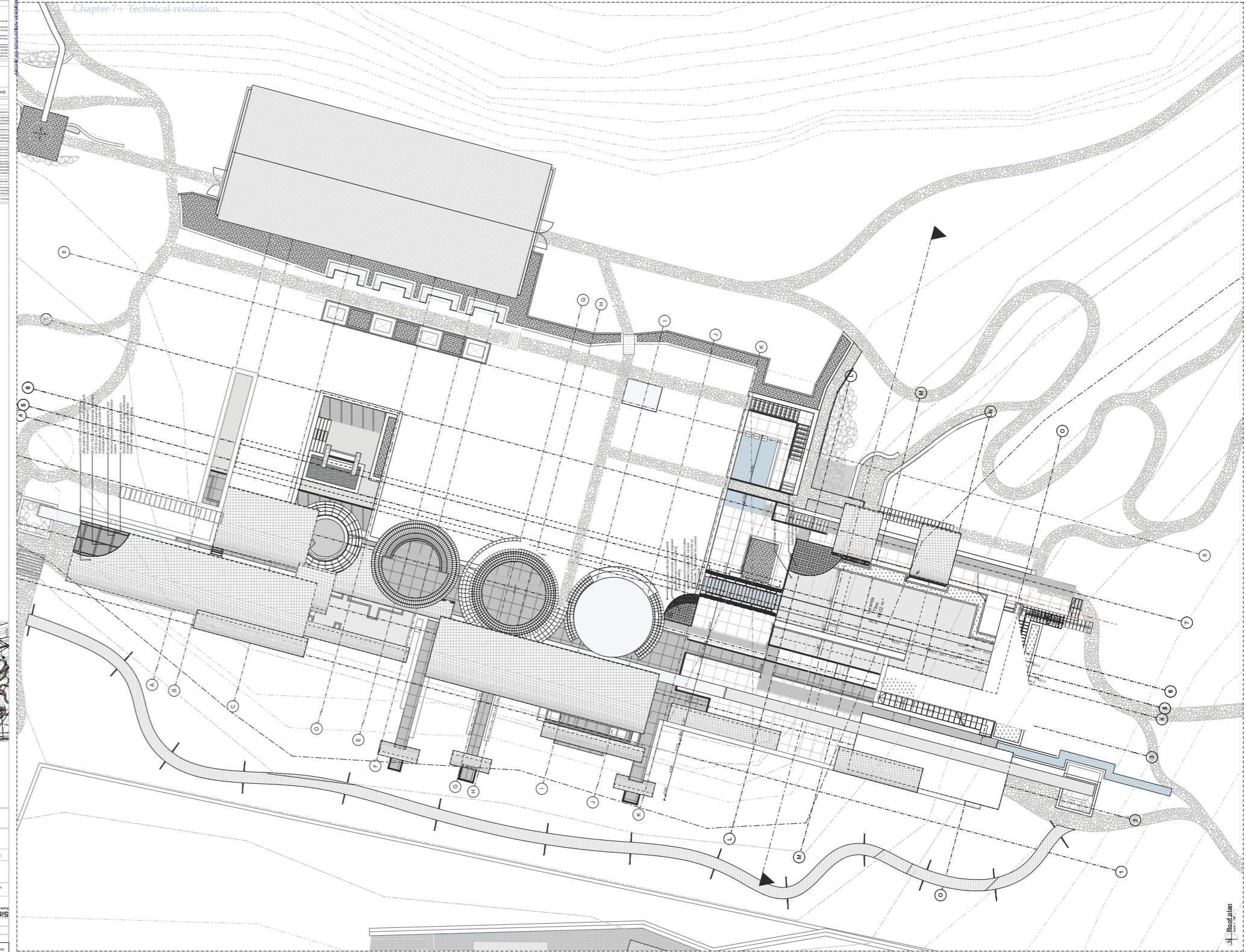
PHONIC GYMNASIUM

Proposed new development at DeWitt Drive, Miami 33143, Florida

Architect: UFS-UV

Site Plan

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Chapter 7- Technical resolution

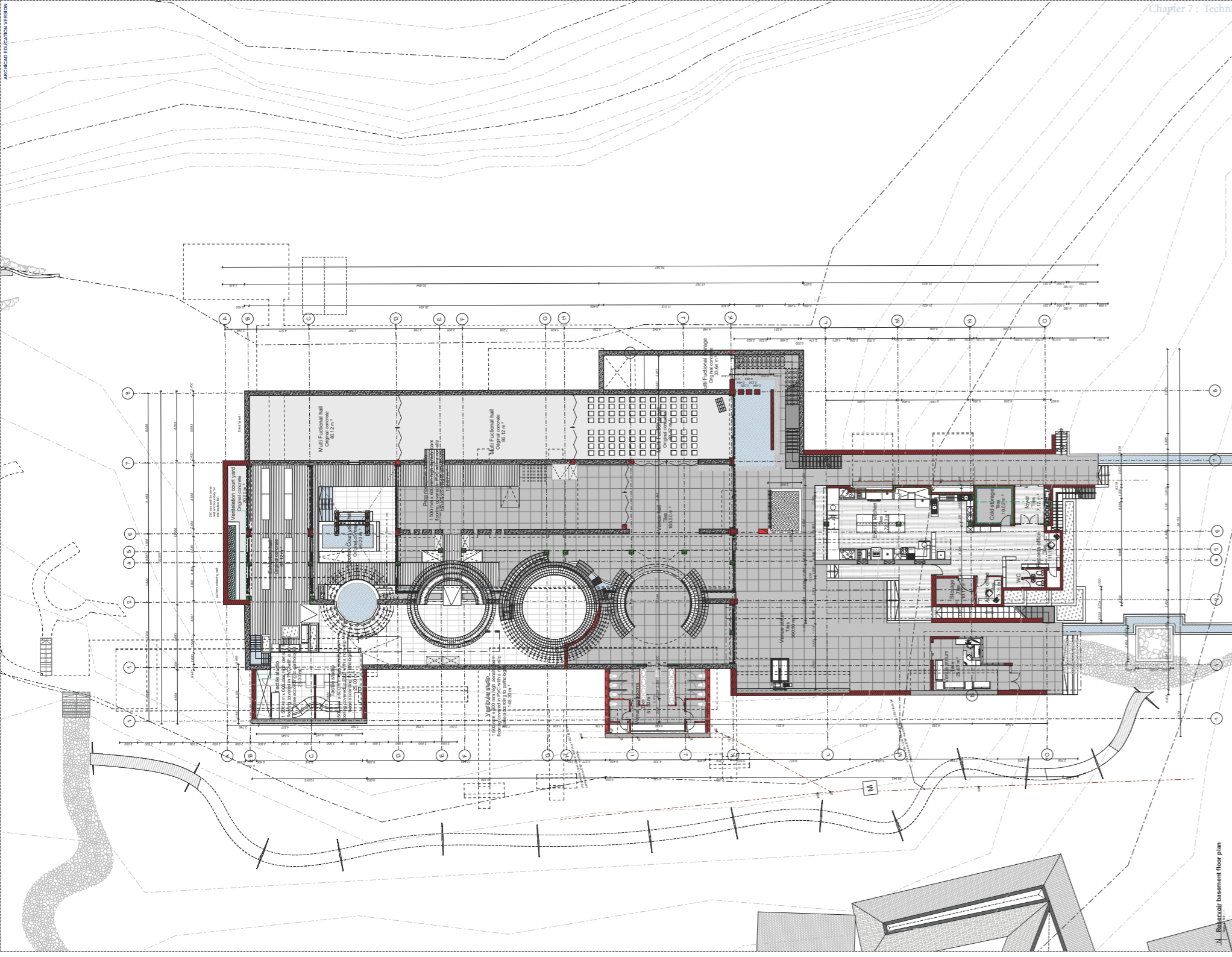
PHONIC GYMNASIUM

Proposed new development at DeWitt Drive, Miami 33143, Florida

Architect: UFS-UV

Architectural

| NO | REV | DESCRIPTION       | DATE       |
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Reservoir basement floor plan

UFS-UV  
UNIVERSITÄT  
DUISBURG  
ESSEN  
UNIVERSITY OF APPLIED SCIENCES

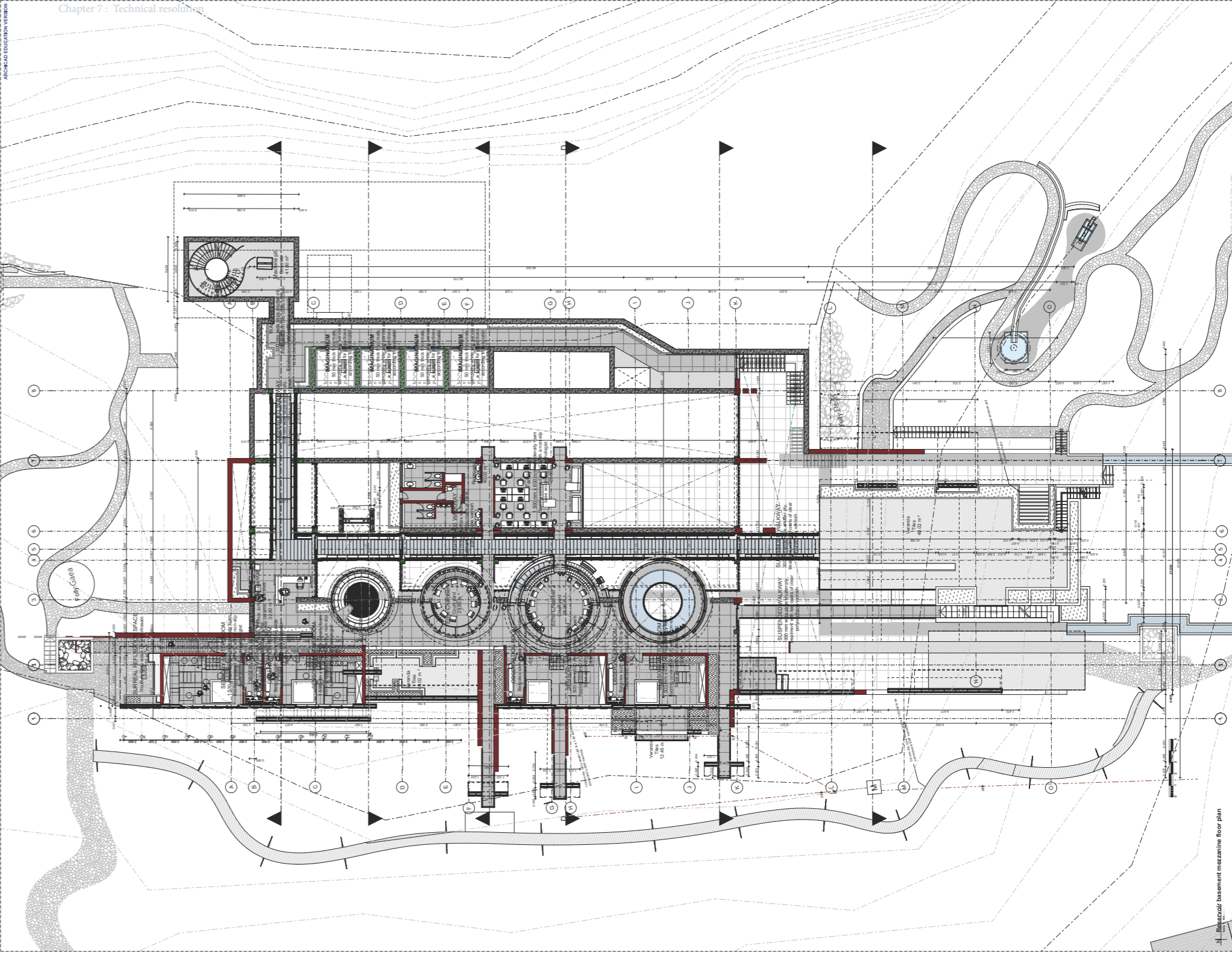
PHONG GYMNASIUM  
Speech language pathology and audiology

Construction  
Phong Gymnasium, First floor, 2023, Stuttgart  
Prepared and developed in close collaboration with the client

Reservoir basement floor plan  
Scale: 1:100  
Date: 14. November 2023  
Author: T.L. Bannmann, Ph.D., M.A.  
Client: UFS-UV

Chapter 7: Technical resolution

ARCHITECT EDUCATION REVIEW



Reservoir basement mezzanine floor plan

UFS-UV  
UNIVERSITÄT  
DUISBURG  
ESSEN  
UNIVERSITY OF APPLIED SCIENCES

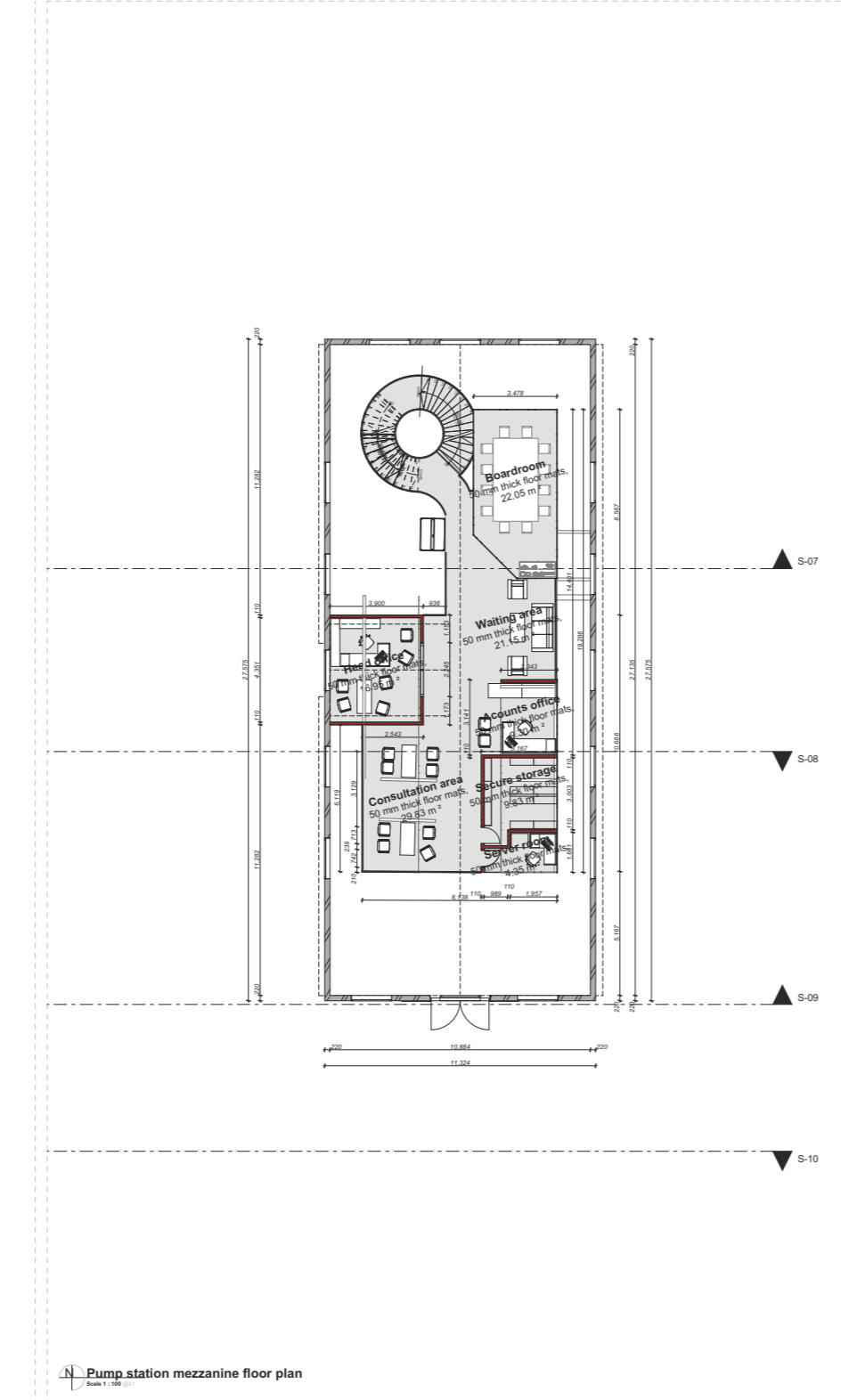
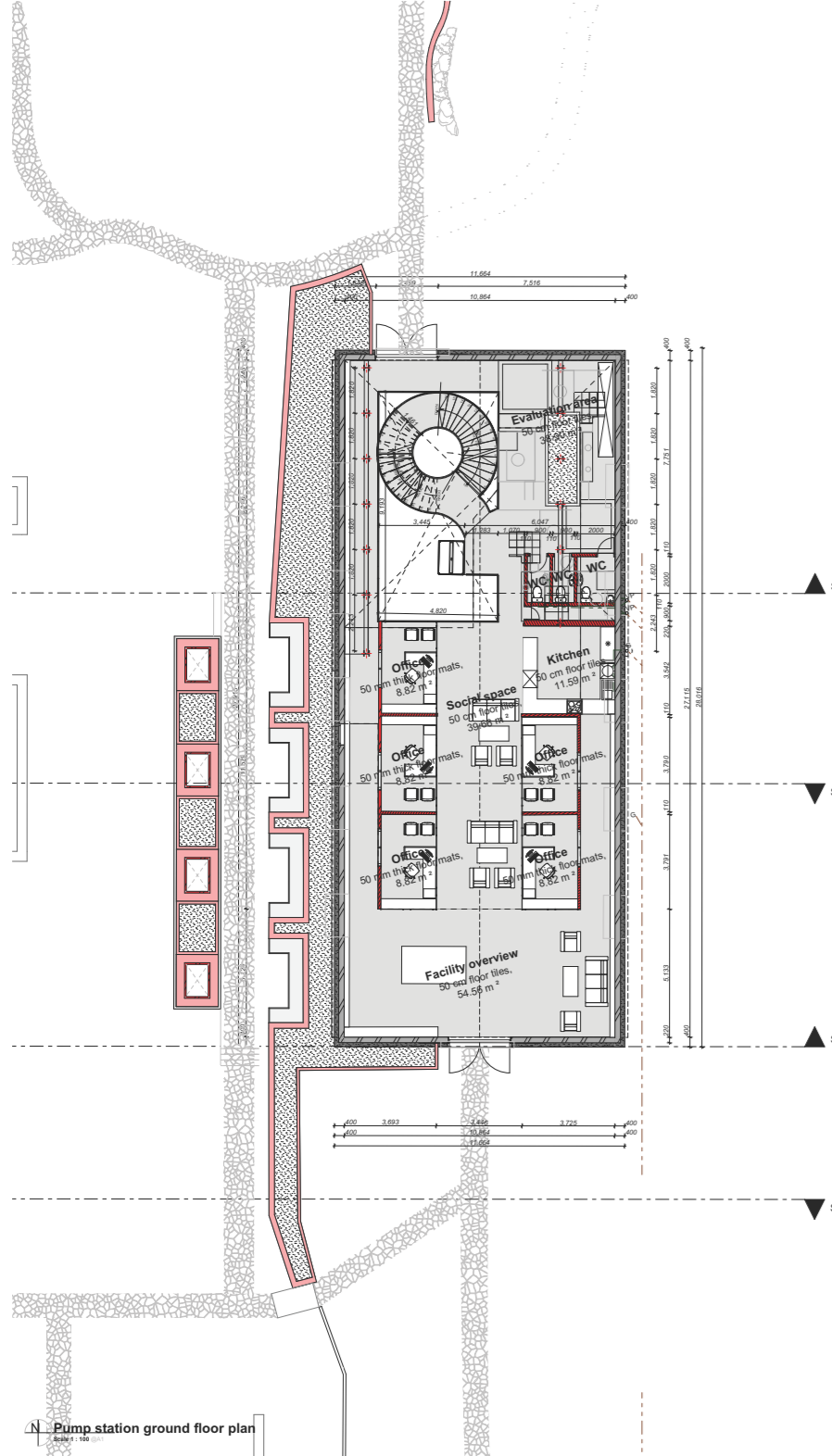
PHONG GYMNASIUM  
Speech language pathology and audiology

Construction  
Phong Gymnasium, First floor, 2023, Stuttgart  
Prepared and developed in close collaboration with the client

Reservoir basement mezzanine floor plan  
Scale: 1:100  
Date: 14. November 2023  
Author: T.L. Bannmann, Ph.D., M.A.  
Client: UFS-UV

Chapter 7: Technical resolution

ARCHITECT EDUCATION REVIEW



**PHONIC GYMNASIUM**  
Speech language Pathology and audiology

Proposed new development at DeWille Drive, Naval Hill, Bloemfontein, Free State, 9301, South Africa

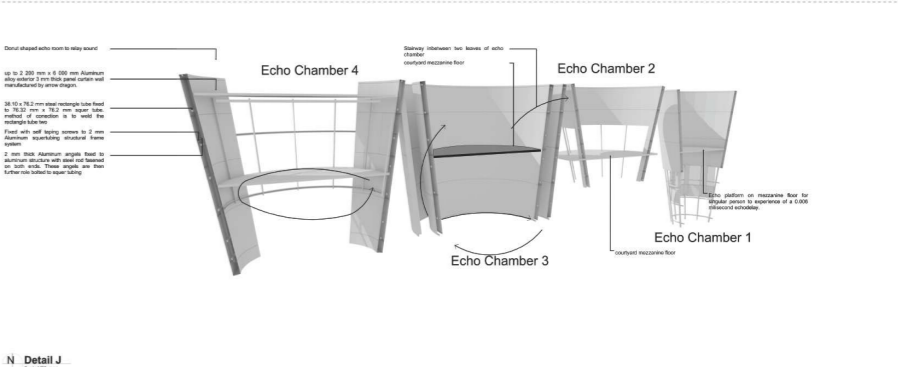
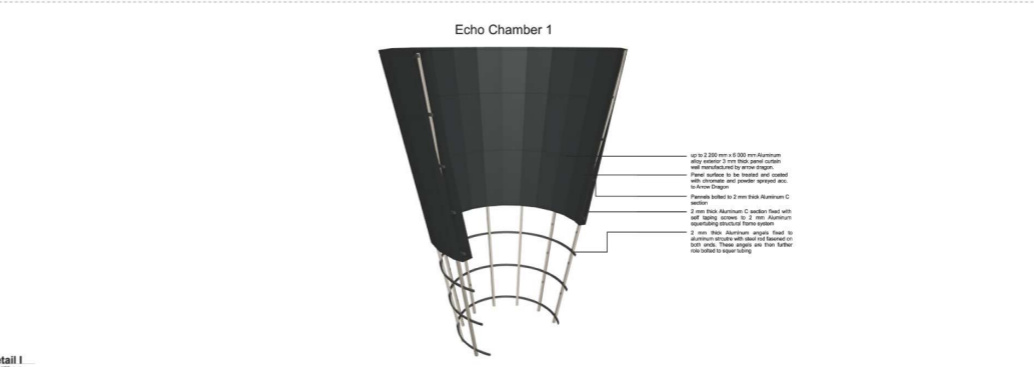
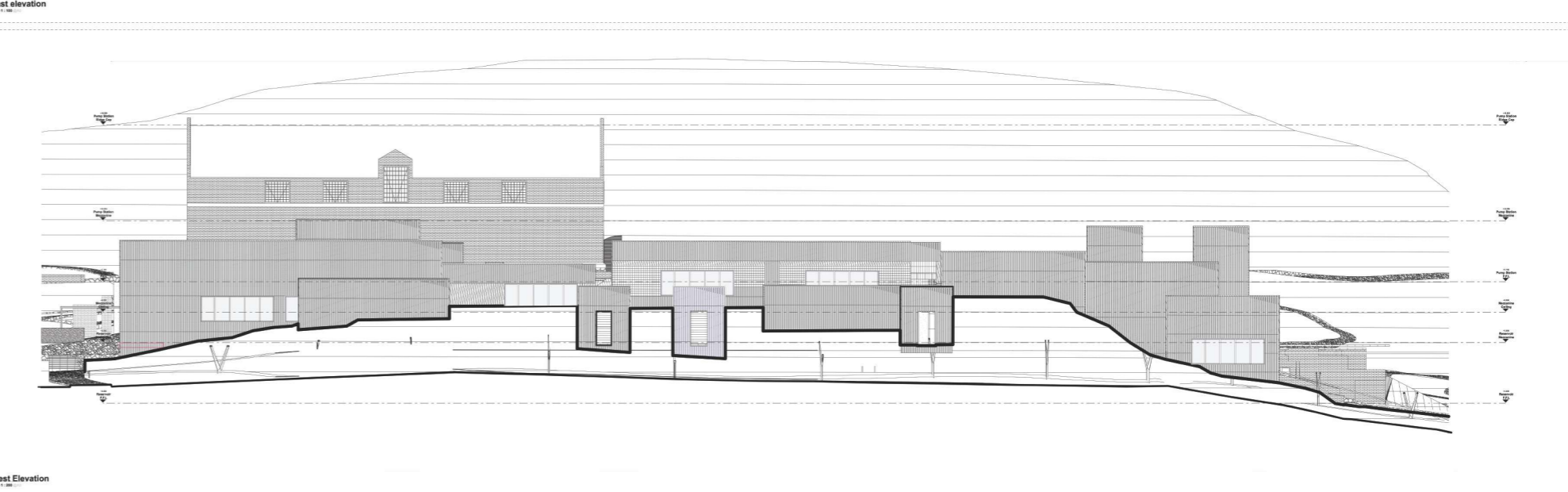
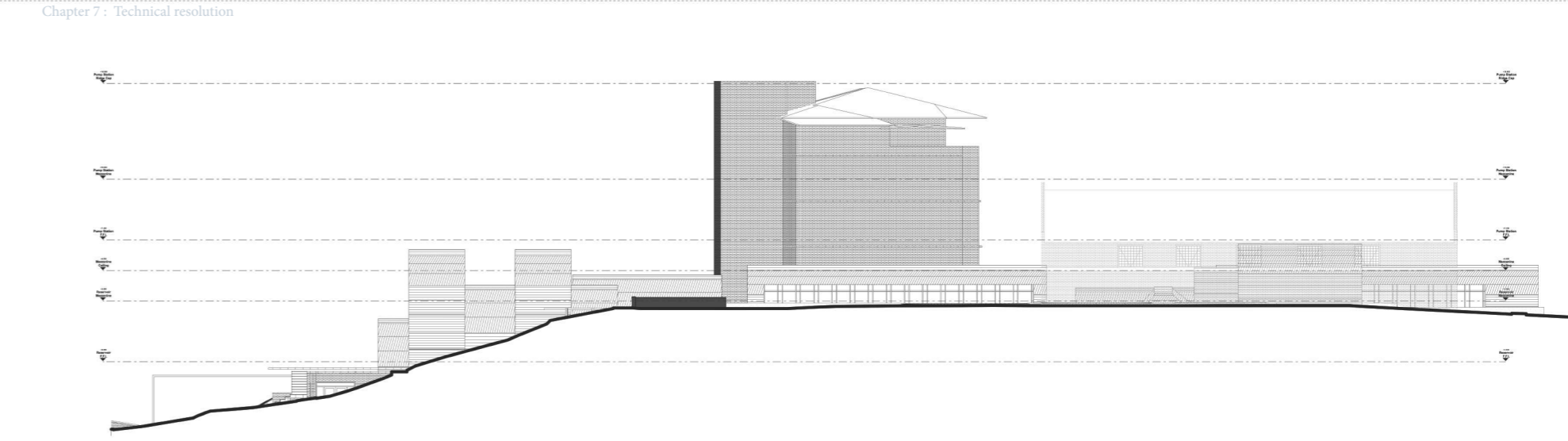
Building number: M Water reservoir

**Construction**

Building number: M

**Pump station ground + mezzanine floor plan**  
Scale 1:100

|            |                                  |                |               |
|------------|----------------------------------|----------------|---------------|
| ref number | 2014037457                       | drawn          | H.R. Coetzee  |
| scale      | 1:100 - A0                       | student number | Henry Coetzee |
| date       | 14 November 2022                 | checked        | Max BMP_01_A0 |
| drawn by   | TH_Jr_Basement_Mez_Plan_1-100_A0 | checked by     | Max BMP_01_A0 |



**UFS-UV**  
UNIVERSITY OF THE FREE STATE

**PHONIC GYMNASIUM**  
Speech language Pathology and audiology

Proposed new development at DeWille Drive, Naval Hill, Bloemfontein, Free State, 9301, South Africa

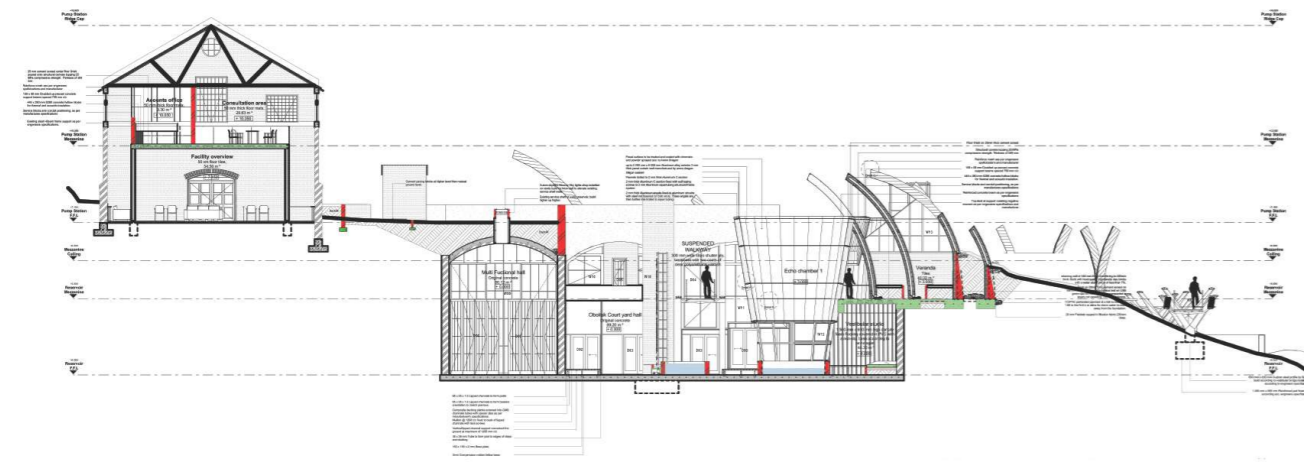
**Architectural**

Author: H.R. Coetzee

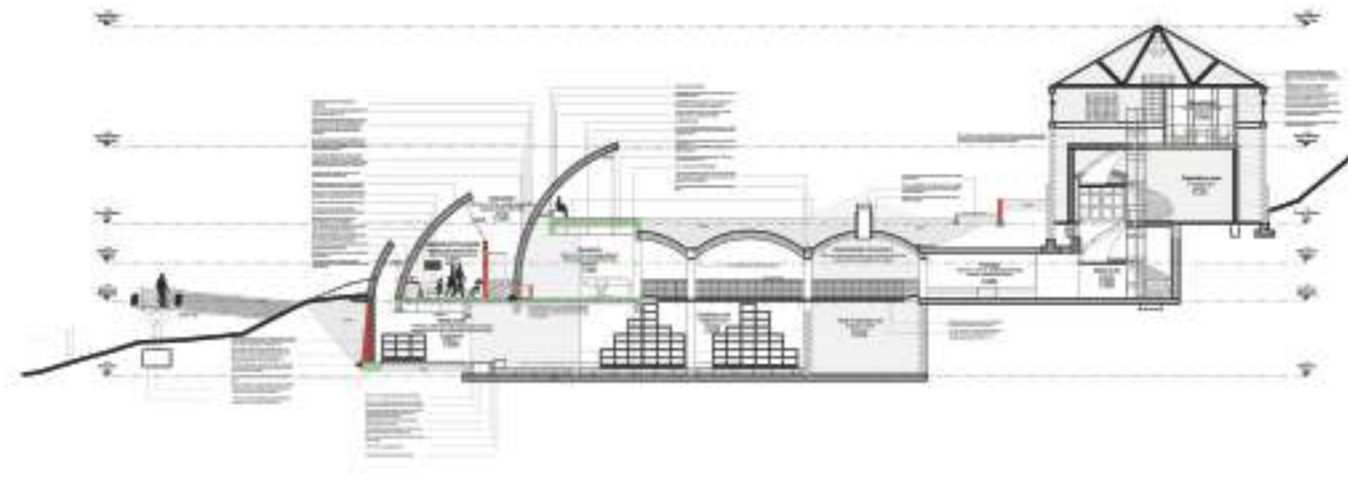
Checked: Max BMP\_01\_A0

Date: 14 November 2022

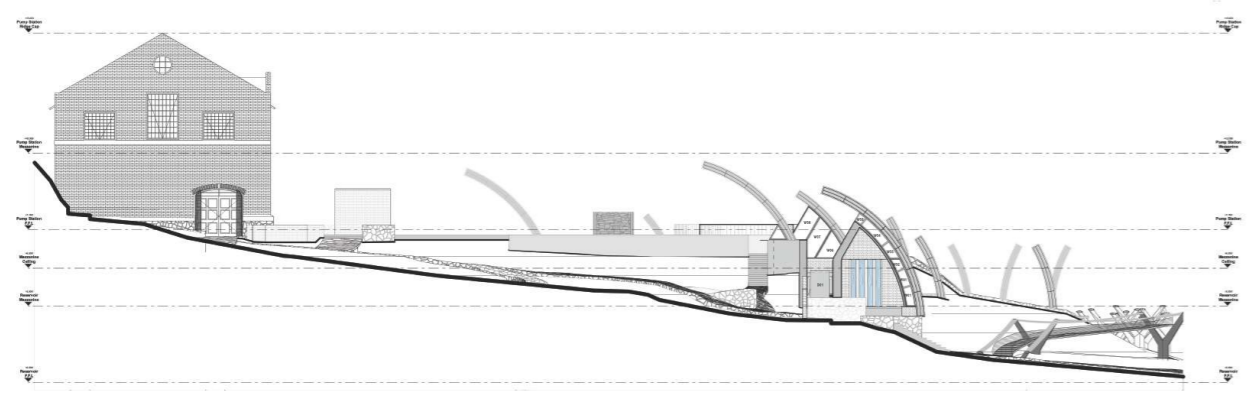
Scale: 1:100



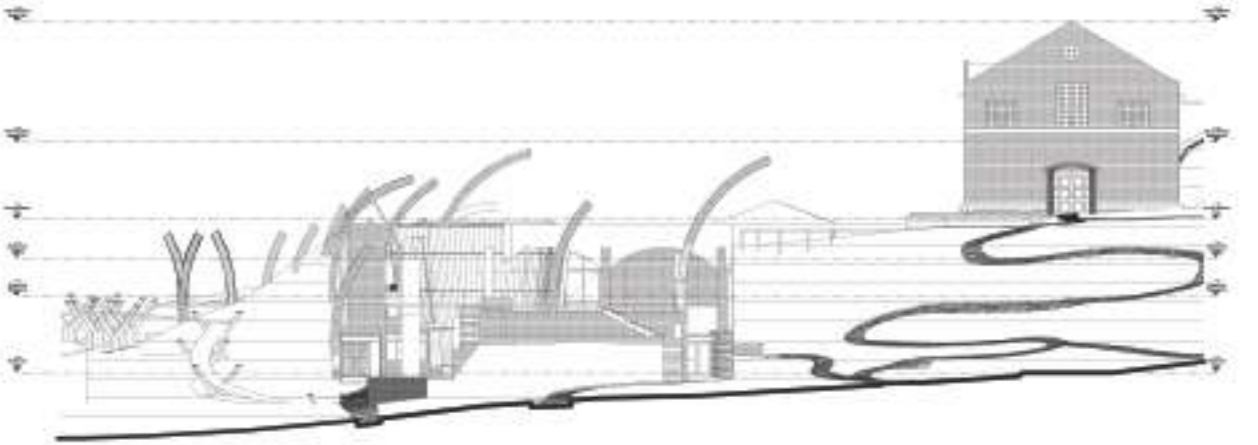
N Section B-B



N Section A-A



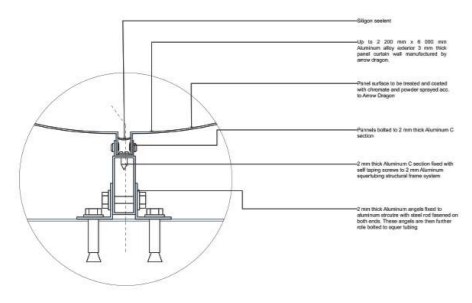
N North Elevation



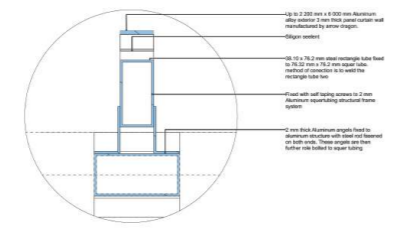
N South Elevation



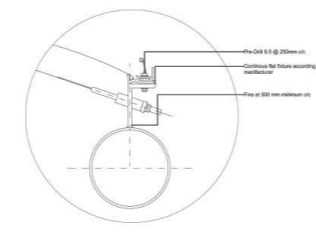

  
**PHONIC GYMNASIUM**  
 Speech language Pathology and audiology  
 Proposed new development at DeWitt Drive, Napaal Hill,  
 Broomfield, Five Star, 3301, South Africa  
 Architectural  
 Author: Henry R Coertz  
 Date: 10/27/2022  
 Project: 2014037457  
 Drawing: BP11/01-SBB-D



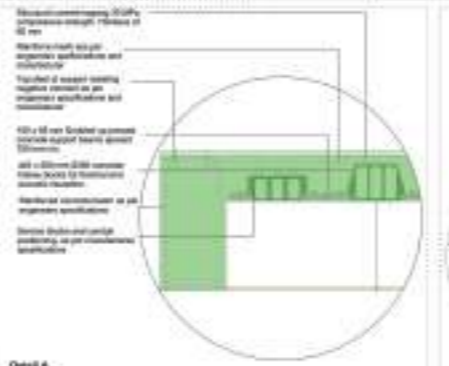
Detail E



Detail F



Detail G



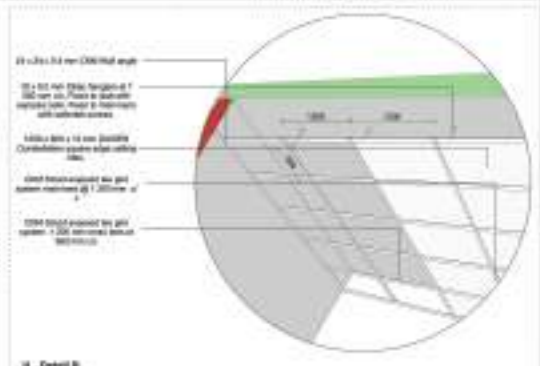
Detail A



Detail B



Detail C



Detail D




  
**PHONIC GYMNASIUM**  
 Speech language Pathology and audiology  
 Proposed new development at DeWitt Drive, Napaal Hill,  
 Broomfield, Five Star, 3301, South Africa  
 Architectural  
 Author: Henry R Coertz  
 Date: 10/27/2022  
 Project: 2014037457  
 Drawing: BP11/01-SAA-D

## 6.3 Reflection

Reflecting on the design progress thus far and glimpses of the outcome, the method of execution and how this new typology is taking on its own identity within the context. The very experimental nature of this dissertation contributes to the success of the scheme and serves the purpose of integrating speech impairments as an everyday factor of personal growth. By taking on this challenge of reinterpreting professional therapy quickly unfolded into an unanticipated complex system. Even though the design is not completely resolved at this point in time, the final product would be just as obligated to lead itself to be developed more. This topic of personal growth and professional growth ties in with the notion of future development. Experimentation and professional expansion are part of the continuity of this dissertation.

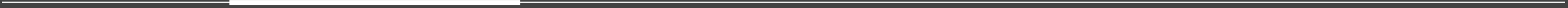
Just as occupational and speech therapy is constantly in the process of development, so too is this facility never truly complete and will always be progressing in hopes of establishing a facility with a higher success rate. So, to do patients share the hardship of progress.

If there is one thing that I would take from this year, it is the significant impact just a little bit of patience can have. Personally, I have learned much during this year, constantly battling with a speech impairment myself. We are all human and enjoy taking part in the simple rituals of life. Constant concerns of acceptance and appreciation in social interventions steal our precious time. We all have experienced the torment of communication, although it might have only been a brief stutter trying to impress the in-laws. It is part of life, the best thing forward is to be appreciative, being able to communicate.

It is difficult: difficult to accept that you are struggling, knowing that you might not ever be able to effectively communicate and thinking that you have no place in society. Many people are not given the time to speak, even at home. Ideas and emotions are exhausting to deal with and become a labyrinth when trying to share with the people you love. If it is that difficult to comprehend your own emotions, and tortuous to communicate, just try to imagine how excruciating this process becomes when the fundamental tool of communication becomes unbearable.



Figure 6.82: Panoramic view of site from the tallest neighboring building, (Author, 2022).  
Figure 6.83: The most spectacular photographic render of the SA-As Facility, (Author, 2022).



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# List of Figures

## List of Figures

|                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                              |    |                                                                                                                                               |    |                                                                                                                                                                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1: Aggression and frustration consumes those who suffer from speech impairments, (Author, 2021). .....                                                                                                                                                                                                                       | vi  | energy is vocalizing. Lastly, the sound must be amplified by speakers producing perceivable audio, (Author, 2021).....                                                                                                                                                                                                                                                                       | 15 | Figure 2.29: Examples of tactile sensory devices, different weights, textures and shapes all stimulate brain development, (Author, 2021)..... | 30 | Figure 3.21: Experiancail sketch of the three other human senses that Jeane Kolbe speaks of, (Author. 2021). .....                                                                                                                                                | 50 |
| Figure 2: Showing the combination of sensory integrated feeling superimposed over mechanical objects, (Author, 2021). .....                                                                                                                                                                                                         | vi  | Figure 2.7: Simplism of sound origin, collision and reflection, (Author, 2021). ....                                                                                                                                                                                                                                                                                                         | 16 | Figure 2.30: Drawing of the vestibular sense of ballance, (Author, 2021). .....                                                               | 30 | Figure 3.22: Graphic representation of the expected users, (Author, 2021). .....                                                                                                                                                                                  | 50 |
| Figure 3: Photo taken on site of the existing pump facilities, (Author, 2021).....                                                                                                                                                                                                                                                  | x   | Figure 2.8: isometric detail - Sound originates from the teeth of this gear colliding with the aluminum cones as it rotates because of the rods expelling their tension. This is only triggered once the blue bar is knocked by a marble., (Author, 2021). 16                                                                                                                                |    | Figure 2.31: Three-dimensional illustration of the landscape development, (“by Author, 2022). .....                                           | 32 | Figure 3.23: Photo of the potential growth of the facility while still being affordable, (Micheile, 2020). .....                                                                                                                                                  | 52 |
| Figure 4: Imaginative image of what Emotional expression this project strives for within a park, (A Spratt, adapted by author, 2021). .....                                                                                                                                                                                         | x   | Figure 2.9: Diagrammatic blueprint, (Author, 2021). .....                                                                                                                                                                                                                                                                                                                                    | 16 | Figure 2.32, 2.33, 2.34, 2.37: Photo of the fountain parks beauty (“The Landscape Architecture of Lawrence Halprin”, 2016). .....             | 32 | Figure 3.24: Service roof and reservoir primary entrance, the closest structure to the existing pump station, (Author, 2021). .....                                                                                                                               | 52 |
| Figure 5: First impression of the magnificent sandstone and brick facade, (Author, 2021). .....                                                                                                                                                                                                                                     | xvi | Figure 2.10: Abstract expressionist photo/paintings of the sculpture, (Author, 2021). .....                                                                                                                                                                                                                                                                                                  | 16 | Figure 2.35: Aerial view of fountain park, (“Ira Keller Fountain I The Cultural Landscape Foundation”, 2016).....                             | 33 | Figure 3.25: Combination of various sources to produce a exploded explanatory view of the site location, (Online, 2021).....                                                                                                                                      | 52 |
| Figure 1.1: Reaching for the untouchable acoustic sense, (Shaabana. N, modified by autho,2021).....                                                                                                                                                                                                                                 | 4   | Figure 2.11 : Illustration of a record players, a symbolic gesture of the most common insult, that entails comparing those who stutter to a broken record player, (Schultz, Ingo, 2018).....                                                                                                                                                                                                 | 18 | Figure 2.37: Motation Drawing of Lawrence Halprin, (Hirsch, 2014).....                                                                        | 33 | Figure 3.26: The peripheral space between nature/ Naval Hill and the concrete landscape, (Adapted by author, Online, 2021). .....                                                                                                                                 | 54 |
| Figure 1.2, 1.3: The variant effects of different speech impairments, (Author, 2021). .....                                                                                                                                                                                                                                         | 4   | Figure 2.12 : Simplified sections of rhythms draw and placed over their related proximity within the park. Prieto De La Fuente draws attention to the cigarette trajectories and lines of traffic, (Prieto De La Fuente & Lunds Universitet, 2018). 19                                                                                                                                       |    | Figure 2.38: Photos of fountain park, (“Ira Keller Fountain I The Cultural Landscape Foundation”, adapted by author, 2021).....               | 33 | Figure 3.27: Google earth images illustrating various city zones, (Adapted by author, Online, 2021). .....                                                                                                                                                        | 54 |
| Figure 1.4: A series of interpretive diagrams of each disorder, (Author, 2021).....                                                                                                                                                                                                                                                 | 4   | Figure 2.13, 2.14: Show the step-by-step development of how these abstract sections are taken out of their geographical setting. The last two images superimpose these urban rituals randomly. This was done to explore rhymes and repetitions. As well as experimenting on the various social implications of mixing these rhythms up, (Prieto De La Fuente & Lunds Universitet, 2018)..... | 20 | Figure 36:Drawing of lady meditating whiles being mindful of her haptic sensory system, (Author, 2021). .....                                 | 33 | Figure 3.28: Two extreme depictions of city perspective in contrast to nature, (Adapted by author, Online ,2021,).....                                                                                                                                            | 54 |
| Figure 1.5: Diagram of the Speech sound disorder structure, (Author,2021).....                                                                                                                                                                                                                                                      | 6   | Figure 2.15: The ritual of a hidden park bench, where sober people rest and turn into drunk animals. Not the absolute ritual of a park bench, but more of a repeating rhythm unintentionally shaped by society, (Hryshyn. H, edited by author, 2021). .....                                                                                                                                  | 21 | Figure 3.1: Photo to symbolize the different lenses of the dissertation (Moranville, 2019). .....                                             | 39 | Figure 3.29: Nolli diagram showing how the city clusters around hills and valleys, (Snazzy Maps, 2021).....                                                                                                                                                       | 54 |
| Figure 1.6: Illustration of the 1 percent population that suffer from speech disorders, (Author, 2021). .....                                                                                                                                                                                                                       | 6   | Figure 2.16: The emotional turmoil veld by a speaker dominated by social constructs trying to speak in harmony. Unfortunately, there is only an arrhythmia rhythm to his speech. Never reaching a harmonious point, a polyrhythmic rhythm (Author, 2021).....                                                                                                                                | 22 | Figure 3.2: Conceptual sketch of the human periphery, (Author, 2021). .....                                                                   | 39 | Figure 3.30: Example on the city’s original urban plan had to be abandoned, a road the size of any other main roads. Hardly any vehicles use this road and it leads straight into the side of a hill, (Google earth image adapted by author, Online, 2021). ..... | 54 |
| Figure 1.7: Photos dramatizing the struggles of speech impairments, (Tran. A, modified by author).....                                                                                                                                                                                                                              | 8   | Figure 2.17: Conceptual interpretation of a patients’ rage in speech therapy, awareness in occupational therapy and exploration of the architectural world, (Author, 2021).....                                                                                                                                                                                                              | 23 | Figure 3.3, 3.4, 3.5: industrial detailing on site, (Author, 2021). .....                                                                     | 39 | Figure 3.31: Indication of the most prevailing roads in Bloemfontein, note how the CDB is completely square while the rest of the roads are more freely laid out, (Adapted by author, Snazzy Maps, 2021). .....                                                   | 55 |
| Figure 1.8: Illustration of the multiple answers that all come together to formulate a whole, (Author, 2021). .....                                                                                                                                                                                                                 | 8   | Figure 2.18: Graphic illustration of the Van Riper Approach, (Author,2021).....                                                                                                                                                                                                                                                                                                              | 24 | Figure 3.6: Photo of site entrance closest to Naval Hill entrance, (Author, 2021). 41                                                         |    | Figure 3.32: Shows where nature has not yet been destroyed, (Adapted by author, Snazzy Maps, 2021).....                                                                                                                                                           | 55 |
| Figure 2.1: A ideological interpretation of melody, (Dziedzic. M, modified by author, 2019). .....                                                                                                                                                                                                                                  | 13  | Figure 2.19: An example of an auditory relay device that is actually used in speech therapy, (Author, 2021). .....                                                                                                                                                                                                                                                                           | 26 | Figure 3.7: Photo of the city view from the site, standing directly on top of the underground water reservoir, (Author, 2021).....            | 41 | Figure 3.33: Pretoria had to adapt to its environmental, (G.J. Jordaan, 1989). ....                                                                                                                                                                               | 55 |
| Figure 2.2: Sketch of a human brain that illustrates the various methods of communicate directly to the brain and that’s why there are so many different treatments, (Altmann. G, modified by author, 2020).....                                                                                                                    | 13  | Figure 2.20: Visual explanation of Legato and Staccato, (Author, 2021). .....                                                                                                                                                                                                                                                                                                                | 26 | Figure 3.8: Standing in the ruins of the water reservoir entrances looking towards the pump station (Author, 2021). .....                     | 43 | Figure 3.34: Data charts of Bloemfontein annul weather, (Data, 2020). .....                                                                                                                                                                                       | 55 |
| Speach .....                                                                                                                                                                                                                                                                                                                        | 13  | Figure 2.21, 2.22, 2.23, 2.24: The compositions of variables are reflected in space as musical interpretations, (Morimoto, 2017).....                                                                                                                                                                                                                                                        | 28 | Figure 3.9: The majesty of the pump station, (Author, 2021). .....                                                                            | 43 | Figure 3.35: Geographic mapping of Bloemfontein from 1846, 1860 and till 1940, (Auret, 2016).....                                                                                                                                                                 | 56 |
| Figure 2.3: Artistic representation of speech tension in architecture, (Author, 2021). .....                                                                                                                                                                                                                                        | 14  | Figure 2.25, 2.26, 2.27, 2.28: Executing various arrangements of voices and notes in Thematic Module of architecture, (Morimoto, 2017). .....                                                                                                                                                                                                                                                | 28 | Figure 3.10: Highlighting the sand stone detailing in the historical pump station, (Author, 2021).....                                        | 45 | Figure 3.36: 1904 map of Bloemfontein, (Auret, 2016). .....                                                                                                                                                                                                       | 56 |
| Figure 2.4: Geometric representation of the speech production mechanisms, an oversimplification of the neck and throat, (Author, 2021). .....                                                                                                                                                                                       | 14  |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.11: Sketch of the dilapidating soul that generates the sense of place, (Author, 2021).....                                           | 45 | Figure 3.37: Extracted layering of the distant context, (Author, 2020). .....                                                                                                                                                                                     | 56 |
| Figure 2.5: DemaDematerializing the three mechanics within the geometric reinterpretation. Energy can be obtained by strings in tension similar to a bow. Phonation is achieved by an object triggering the vibration of the strings. Lastly, a series of cones can articulate these vibrations producing sound, (Author, 2021). 15 |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.12: Release of tension, (Author, 2021).....                                                                                          | 46 | Figure 3.38: Google earth map, indicating city development in 2021, (Adapted by Author, Online, 2021).....                                                                                                                                                        | 56 |
| Figure 2.6: Energy can only be generated through physical integration. These interactions need to trigger a device held in limbo (potential), where kinetic                                                                                                                                                                         |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.13: Musical rhythms in architecture, (Author, 2021).....                                                                             | 46 | Figure 3.39: Expression of the combined idiosyncrasies of the site on a simpler 2-dimensional plane, (Author, 2020).....                                                                                                                                          | 56 |
|                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.14: Dominated versus dominating, (Author, 2021).....                                                                                 | 46 |                                                                                                                                                                                                                                                                   |    |
|                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.15: Sensory integrations, (Author, 2021).....                                                                                        | 47 |                                                                                                                                                                                                                                                                   |    |
|                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.16: Responsive cohesion, (Author, 2021). .....                                                                                       | 47 |                                                                                                                                                                                                                                                                   |    |
|                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.18: Facebook post of SASLHA, (SASLHA, 2021).....                                                                                     | 48 |                                                                                                                                                                                                                                                                   |    |
|                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.19: Goals of the SASLHA comunnity, (SASLHA, 2021). .....                                                                             | 48 |                                                                                                                                                                                                                                                                   |    |
|                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                              |    | Figure 3.20: Facebook post by OTASA, (OTASA, 2020).....                                                                                       | 48 |                                                                                                                                                                                                                                                                   |    |

|                                                                                                                                                                                                                                     |    |                                                                                                                                                                                                                                                                    |    |                                                                                                                                                                                                                      |    |                                                                                                                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 3.40: Photo of the Wiltshire Remount Regiment, after laying out the white horse, (“Bloemfontein’s White Horse on the slope of Naval Hill”, 2019).....                                                                        | 56 | Figure 3.66: Nollie diagram with triangular symbols showing the available view vantage points, (Author, 2021). .....                                                                                                                                               | 66 | removed due to vandalism, (Author, 2021).....                                                                                                                                                                        | 70 | Figure 4.22: Stability, (Author, 2021).....                                                                                                                                                                       | 84 |
| Figure 3.41: Photo of the current planetarium, (UFS, 2020). .....                                                                                                                                                                   | 56 | Figure 3.67: Variety of simple sketches to easily explain the most general restrictions, (Author, 2021). .....                                                                                                                                                     | 66 | Figure 3.87: The only neighboring building visible from the site, (Author, 2021)...                                                                                                                                  | 70 | Figure 4.23: Adaptation, (Author, 2021).....                                                                                                                                                                      | 84 |
| Figure 3.42: Photo of Naval Hill wildlife, (Heerden, 2019).....                                                                                                                                                                     | 56 | Figure 3.68: Exploded Macro overview of context, with historical buildings, indicated as well as the Meso and Microanalysis borders, (Author, 2021).....                                                                                                           | 67 | Figure 3.88: The displaced were not fond of their picture being taken. They only allowed me to take a photo of their make-shift campsite, (Author, 2021).....                                                        | 73 | Figure 4.24: Collision, (Author, 2021).....                                                                                                                                                                       | 84 |
| Figure 3.43: Photo of what the site looks like upon entering from the street, (Author, 2021).....                                                                                                                                   | 58 | Figure 3.69: Standard site analysis diagram of a 3D representation of the site in question. (Author, 2021). .....                                                                                                                                                  | 67 | Figure 3.89: These are a combination of photos taken by Danny Bester and assembled by Jaco Oliver, UFS architecture lectures. Notes how different the over hole ambiance was in 2017, (Bester, Olivier, 2021). ..... | 73 | Figure 4.25: A detailed photo of the Colloquy sculpture resting on thin timber posts, (Author, 2021). .....                                                                                                       | 84 |
| Figure 3.44: Exploded isometric model of the existing ump station, (Author,2021).....                                                                                                                                               | 58 | Figure 3.70: Exstrapulated image of the existing, indicating the exact zoning while showing the diagram, (Author, 2021). .....                                                                                                                                     | 67 | Figure 4.1: Burning city life with the landscape, (Shishikin, 2020). .....                                                                                                                                           | 77 | Figure 4.26: This is a pen sketch of the pump station drawn in section, to show how the design needs to unfold inside. The basic idea of this sketch is to show the outer shell is untouched, (Author, 2021)..... | 84 |
| Figure 3.45: Steel fittings inside the pump station, (Bester, 2015). .....                                                                                                                                                          | 59 | Figure 3.71: CAD section drawing in proportion to show the elevation from street level, (Author, 2021). .....                                                                                                                                                      | 68 | Figure 4.2: Cable pulley mechanism, the reflection of social stress, (Theodore, 2019). .....                                                                                                                         | 77 | Figure 4.27: Conceptual overlay, this explains how the drawings translated into the sculpture, (Author 2021).....                                                                                                 | 84 |
| Figure 3.46: View from the mezzanine floor windows, (Bester, 2015).....                                                                                                                                                             | 59 | Figure 3.72: 3D monochrome rendering of the site, showcasing scale, (Author, 2021). .....                                                                                                                                                                          | 68 | Figure 4.3: The Tensegrity Sculpture and its parts, (Author, 2021). .....                                                                                                                                            | 79 | Figure 4.28: Conceptual sketch of the mystic space with is the smallest detail, your voice is amplified by the reservoir, (Author, 2021).....                                                                     | 85 |
| Figure 3.47: Steel fittings inside the pump station, (Bester, 2015). .....                                                                                                                                                          | 59 | Figure 3.73: CAD-Drawing section of the existing reservoir, to indicate scale, (Author, 2021). .....                                                                                                                                                               | 68 | Figure 4.4: Top view of the sculpture, (Author, 2021).....                                                                                                                                                           | 79 | Figure 4.29: The top view of the model With a graphical elaboration on the sound, (Author, 2021).....                                                                                                             | 85 |
| Figure 3.48, 3.49: Oliewenhuis Art Museum renovated reservoir before and after, (nasmus, 2022).....                                                                                                                                 | 59 | Figure 3.74: CAD-Drawing detailed section of the existing pump station to show scale, (Author, 2021). .....                                                                                                                                                        | 68 | Figure 4.5: Perspective view, (Author, 2021).....                                                                                                                                                                    | 79 | Figure 4.30: Sketch of the existing reservoir making sound and the outside skin catching the waves, (Author, 2021). .....                                                                                         | 85 |
| Figure 3.50: Expressionist sketch of the inside of the reservoirs, (Author, 2021). ..                                                                                                                                               | 59 | Figure 3.75: Monochrome render indicating wind and water effect, (Author, 2021). .....                                                                                                                                                                             | 68 | Figure 4.6: Perspective of the sculpture, (Author, 2021). .....                                                                                                                                                      | 79 | Figure 4.30: The elegance of The Edifying sculpture, (Author, 2021). .....                                                                                                                                        | 87 |
| Figure 3.51: Exploded isometric of the underground water reservoirs, (Author, 2021). .....                                                                                                                                          | 59 | Figure 3.76: Sectional sketch of 1850, (Author, 2021). .....                                                                                                                                                                                                       | 68 | Figure 4.7: Perfectly Picturesque, (Author, 2021).....                                                                                                                                                               | 79 | Figure 4.31: Plan view of The Edifying sculpture, (Author, 2021).....                                                                                                                                             | 87 |
| Figure 3.52: Exisitng pump station, (Author, 2021). .....                                                                                                                                                                           | 61 | Figure 3.77: Sectional sketch of 1898, (Author, 2021). .....                                                                                                                                                                                                       | 68 | Figure 4.8: Tension, (Author, 2021). .....                                                                                                                                                                           | 80 | Figure 4.32: Edification, (Author, 2021). .....                                                                                                                                                                   | 88 |
| Figure 3.53: Redrawn documentation of the existing, (Bester, 2015). .....                                                                                                                                                           | 61 | Figure 3.78: Sectional sketch of 1900, (Author, 2021). .....                                                                                                                                                                                                       | 68 | Figure 4.9: Overlay, (Author, 2021). .....                                                                                                                                                                           | 80 | Figure 4.33: Dominance, (Author, 2021). .....                                                                                                                                                                     | 88 |
| Figure 3.54: Water used as frozen moments in time, presented as a palimpsest over a typical Cape-Dutch gable style facade, (Author, 2022). .....                                                                                    | 63 | Figure 3.79: Sectional sketch of 2021, (Author, 2021). .....                                                                                                                                                                                                       | 68 | Figure 4.10: Wave, (Author, 2021). .....                                                                                                                                                                             | 80 | Figure 4.34: Upliftment, (Author, 2021). .....                                                                                                                                                                    | 88 |
| Figure 3.55: The Burra Charter, (Walker, 1999). .....                                                                                                                                                                               | 63 | Figure 3.80: Contextual plan indicating the location of the excessive excavation, (Author, 2021).....                                                                                                                                                              | 68 | Figure 4.11: Transition, (Author, 2021). .....                                                                                                                                                                       | 80 | Figure 4.35: Movement, (Author, 2021).....                                                                                                                                                                        | 88 |
| Figure 3.56: Walking through the structural fundamentals of the historical, (Author, 2021).....                                                                                                                                     | 63 | Figure 3.81: Service entrance to water reservoirs in 2017, (Bester, 2017). .....                                                                                                                                                                                   | 70 | Figure 4.12: Sketch of a tumble form vestibular board, (Authort, 2021).....                                                                                                                                          | 80 | Figure 4.36: Detailed three dimensional model of the site and the water reservoir were lines become the staves for the musical notes, including structures, (Author, 2021). .....                                 | 89 |
| Figure 3.57, 3.58: Sketch of the West-facing gable, showing how the gable changed as well as giving clues as to where the theory came from, (Author, 2021). .....                                                                   | 63 | Figure 3.82: This is the present state of the service entrance to water reservoirs, (Author, 2021).....                                                                                                                                                            | 70 | Figure 4.13: Aircraft detection before radar, 1917-1940, (“Aircraft detection before radar, 1917-1940 - Rare Historical Photos”, 2016).....                                                                          | 80 | Figure 4.37: Site plan and the Fur Elise notes are laid over, (Author, 2021). .....                                                                                                                               | 89 |
| Figure 3.59: Nollie diagram of access routes, (adapted by M.Winkler, 2020). .....                                                                                                                                                   | 65 | Figure 3.83: These photos were taken from inside the water reservoirs in 2017, (Bester, 2017).....                                                                                                                                                                 | 70 | Figure 4.14: Three dimensional illustration of the conceptual approach, (Author, 2021). .....                                                                                                                        | 80 | Figure 4.38: Musical design according to Morimoto design method of music interpretation, (Morimoto, 2017). .....                                                                                                  | 89 |
| Figure 3.60: Even considering the vast interior space equipped with only a light story, a lot of light floods the interior. Perhaps it is not necessary for more windows but only for a clever design solution, (Bester, 2015)..... | 65 | Figure 3.84: Currently the only entrance to the underground water reservoirs, occupied by a displaced individual. At the time of this dissertation the reservoirs only had one entrance and one exit, going down there is looking for trouble, (Author, 2021)..... | 70 | Figure 4.15: Three dimensional illustration of The Tensegrity Sculpture, (Author, 2021). .....                                                                                                                       | 80 | Figure 4.39: Authors interpretation of Morimoto design method applied to reservoir edge, (Author, 2017).....                                                                                                      | 89 |
| Figure 3.61: Blueprint anatomy of the existing pump station and reservoirs, (Author, 2021).....                                                                                                                                     | 65 | Figure 3.85: Detailed metal fittings, photo taken in 2017, (Bester, 2017).....                                                                                                                                                                                     | 70 | Figure 4.16: Visual representation of the conceptual implementation of a spine through the existing water reservoirs, (Author, 2021).....                                                                            | 81 | Figure 4.40: Beautiful photo of the of The Edifying sculpture, (Author, 2021). .....                                                                                                                              | 90 |
| Figure 3.62: Blue outlines a reflection of the existing, placed on the edge of the underground reservoir, (Author, 2021).....                                                                                                       | 65 | Figure 3.86: This is the only metal detail still present on site. The rest have been                                                                                                                                                                               |    | Figure 4.17: Conceptual illustration of the walkway stretching through the existing reservoir, (Author, 2021).....                                                                                                   | 81 | Figure 4.41: Stock photo of a sheet of music, (Masalar, 2017). .....                                                                                                                                              | 90 |
| Figure 3.63: Nollie diagram of surrounding massing, (Author, 2021). .....                                                                                                                                                           | 65 |                                                                                                                                                                                                                                                                    |    | Figure 4.18: Three dimensional illustration, showing more context indicating own this site is used as a shortcut, (Author, 2021).....                                                                                | 81 | Figure 5.1: An elegant cube seeming starting to pick up of the ground, (Design, 2021). .....                                                                                                                      | 95 |
| Figure 3.64: Nollie diagram indicating building heights, (Author, 2021). .....                                                                                                                                                      | 65 |                                                                                                                                                                                                                                                                    |    | Figure 4.19: Conceptual model negotiating a moment within the final design, (Author, 2021).....                                                                                                                      | 81 | Figure 5.2: Pen sketch conceptualizing the play of the design process, (Author, 2021). .....                                                                                                                      | 95 |
| Figure 3.65: Nollie diagram of access routes, (Author, 2021). .....                                                                                                                                                                 | 65 |                                                                                                                                                                                                                                                                    |    | Figure 4.20: The Colloquy sculpture and its parts, (Author, 2021). .....                                                                                                                                             | 82 |                                                                                                                                                                                                                   |    |
|                                                                                                                                                                                                                                     |    |                                                                                                                                                                                                                                                                    |    | Figure 4.21: Resonate, (Aurhor, 2021).....                                                                                                                                                                           | 84 |                                                                                                                                                                                                                   |    |

|                                                                                                                                                                                                                                                                                                 |     |                                                                                                          |     |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 5.3: Illustration of prominent entrance and locations of parking, services, daily professional, visitors. Conceptionally mediation of routs through site and how this can shape the design (Author, 2021). .....                                                                         | 96  | Figure 5.33: Documented plan view of garden intervention, (Author, 2022). .....                          | 104 | (Archdaily.com, 2010: online). .....                                                                                                                                                                             | 116 | Figure 5.103 - 5.107: Within the concluding stages of phase two, these renders were presented two the final examiner, (Author, 2022). .....                                                            | 128 |
| Figure 5.4: Showing the dense foliage on site, (Author, 2021). .....                                                                                                                                                                                                                            | 96  | Figure 5.34: Over simplified section of garden intervention, (Author, 2022). .....                       | 104 | Figure 5.65: Sectional sketch through gymnasium, (Author, 2022). .....                                                                                                                                           | 116 | Figure 5.108: Rough sectional draft of phase two, (Author, 2022). .....                                                                                                                                | 131 |
| Figure 5.5: Illustrating marking plotting out the routs through the site, (Author, 2021). .....                                                                                                                                                                                                 | 96  | Figure 5.35: Perspective view from parking lot, (Author, 2022). .....                                    | 104 | Figure 5.66: Diagram of the final amalgamation of the One Kids Place program, (Author, 2022). .....                                                                                                              | 118 | Figure 5.109 - 5.112: Within the concluding stages of phase two, these renders were presented two the final examiner, (Author, 2022). .....                                                            | 131 |
| Figure 5.6: Indicating the various viewpoints on site, (Author, 2021). .....                                                                                                                                                                                                                    | 96  | Figure 5.36: Overhead perspective of garden intervention located by main entrance, (Author, 2022). ..... | 104 | Figure 5.67: Interior elements witch trigger various sense within the entrance foyer, (Archdaily.com, 2010: online – readapted by Author). .....                                                                 | 118 | Figure 5.112: This isometric blueprint of a therapist office space, symbolizes my first attempt at a detailed spatial design, (Author, 2022). .....                                                    | 131 |
| Figure 5.7: This site plan, labels these awesome moments and draws a section, quick to explain what is happening, and perhaps provide a sense of atmosphere, (Author, 2021). .....                                                                                                              | 96  | Figure 5.37: View from on top of the water reservoir looking towards the parking, (Author, 2022). .....  | 104 | Figure 5.68: One Kids Place site plan, (Author, 2022). .....                                                                                                                                                     | 118 | Figure 5.113 - 5.115: Graphically altered photos of the three conceptual sculptures, (Author, 2022). .....                                                                                             | 132 |
| Figure 5.8: Each sketch a theoretical interpretation of each moment on site, the first sketch is of a person exploring while producing sound waves, these wave corelates to the reservoirs, these sounds are echoed and the last reservoir explodes at the sound escapes, (Author, 2021). ..... | 97  | Figure 5.38: An isometric view indicating folly location, (Author, 2022). .....                          | 106 | Figure 5.69: Exterior elements witch trigger various sense within the courtyard adjacent to the entrance foyer, (Archdaily.com, 2010: online – readapted by Author). .....                                       | 118 | Figure 5.116 - 5.118: These are the first three steps in the right directions, each of these models where build following the design principles laid out within this document, (Author, 2022). .....   | 132 |
| Figure 5.9: This site plan indicating different colours marked out to represent the theory, differences in peripheries, (Author, 2021). .....                                                                                                                                                   | 97  | Figure 5.39: Sectional perspective of obelisk structure, (Author, 2022). .....                           | 106 | Figure 5.70 & 5.71: Photos of One kids Place interior, (Archdaily.com, 2010: online). .....                                                                                                                      | 121 | Figure 5.119: A few of many explorations sketching that later developed into the final construction detailing, (Author, 2022). .....                                                                   | 132 |
| Figure 5.16, 5.17, 5.18: First attempt to design garden structures, (Author, 2021). .....                                                                                                                                                                                                       | 98  | Figure 5.40: Over simplified section of garden intervention, (Author, 2022). .....                       | 106 | Figure 5.72: Elements witch trigger various sense within the exterior façade, as seen from the parking lot, (Archdaily.com, 2010: online–readapted by Author). .....                                             | 121 | Figure 5.120 - 5.122: Closer view of the three physical models that represent the impetus of the SA-AS Facility, (Author, 2022). .....                                                                 | 132 |
| Figure 5.19: an analytical chart of the vestibular and proprioceptive system, (Author, 2021). .....                                                                                                                                                                                             | 98  | Figure 5.41: Documented plan of garden structure, (Author, 2022). .....                                  | 106 | Figure 5.73-5.76: Conceptual indicating how the sensory exploration starts with in the entrance foyer, from within the heart of the large green wall, (Archdaily.com, 2010: online – readapted by Author). ..... | 121 | Figure 5.123 - 5.28: Photos of the anthropomorphic imitation of construction detailing, (Author, 2022). .....                                                                                          | 135 |
| Figure 5.20: .....                                                                                                                                                                                                                                                                              | 100 | Figure 5.42: Early conceptual render of courtyard, (Author, 2022). .....                                 | 106 | Figure 5.77: Section through One Kids Place, running through the entrance foyer, (Archdaily.com, 2010: online). .....                                                                                            | 121 | Figure 5.130 - 5.131: A few of many explorations sketching that later developed into the final construction detailing, (Author, 2022). .....                                                           | 136 |
| Figure 5.20: White globe showing the location of France, (IMGBIN, 2021). .....                                                                                                                                                                                                                  | 101 | Figure 5.43: Final render of sensory courtyard, (Author, 2022). .....                                    | 106 | Figure 5.78: Conceptual expression of various parts combining into one piece of moldable clay, (Miguel. B, 2018:online– readapted by Author). .....                                                              | 123 | Figure 5.132 - 5.136: Sectional development, (Author, 2022). .....                                                                                                                                     | 136 |
| Figure 5.21: Digital outline of a folly, (Author, 2021). .....                                                                                                                                                                                                                                  | 101 | Figure 5.44: An isometric view indicating folly location, (Author, 2022). .....                          | 108 | Figure 5.79: One Kids Place plan, (Author, 2022). .....                                                                                                                                                          | 123 | Figure 5.137 - 5.139: These three sectional development diagrams represent the three polar opposite iterations of phase three, (Author, 2022). .....                                                   | 136 |
| Figure 5.22: The layers of organization, (Tschumi, 1983). .....                                                                                                                                                                                                                                 | 101 | Figure 5.45: A child’s perspective of this garden intervention, (Author, 2022). .....                    | 108 | Figure 5.80: Isometric rendering of all three phases of the design development, (Author, 2022). .....                                                                                                            | 124 | Figure 5.140: The complete documentational section through the final SA-AS Facility, (Author, 2022). .....                                                                                             | 136 |
| Figure 5.23: Folly located mid park, (Lochner, 2011). .....                                                                                                                                                                                                                                     | 101 | Figure 5.46: Documented plan view of garden intervention, (Author, 2022). .....                          | 108 | Figure 5.81: Design application of augmented rhythms found on and around site, (Author, 2022). .....                                                                                                             | 126 | Figure 5.141: The inception of design phase three, brought to light the first of many draft plans, (Author, 2022). .....                                                                               | 139 |
| Figure 5.24: Arial overview of park, (Lochner, 2011). .....                                                                                                                                                                                                                                     | 101 | Figure 5.47: Interior render of folly indicating water flow and water build up, (Author, 2022). .....    | 108 | Figure 5.82 & 5.83: First two conceptual models, (Author, 2022). .....                                                                                                                                           | 126 | Figure 5.142: This program iteration soon followed after the first plan, witch address various issues found within the first attempt, (Author, 2022). .....                                            | 139 |
| Figure 5.25: line of follies, (Lochner, 2011). .....                                                                                                                                                                                                                                            | 101 | Figure 5.48: View of facility from within this garden structure, (Author, 2022). .....                   | 108 | Figure 5.84-5.94: The investigation on therapeutic installations incorporated within functional spaces, (Author, 2022). .....                                                                                    | 126 | Figure 5.143: This approach lends its self-more towards the landscape and introduces new routes while improving on interior spaces as the third iteration of the SA-AS Facility, (Author, 2022). ..... | 141 |
| Figure 5.26: Photo of a folly located beside the stream, (Lochner, 2011). .....                                                                                                                                                                                                                 | 101 | Figure 5.49: An isometric view indicating folly location, (Author, 2022). .....                          | 110 | Figure 5.95 - 5.97: Sketches of early design development within phase two , (Author, 2022). .....                                                                                                                | 128 | Figure 5.144: The fourth hand final altered plan of the SA-AS Facility redesigns the circulation and improves application of the acoustic spheres, (Author, 2022). .....                               | 141 |
| Figure 5.27: Original conceptual sketches of Parc de la Villette, (Tschumi, 1983). .....                                                                                                                                                                                                        | 101 | Figure 5.50: Documented plan view of garden intervention, (Author, 2022). .....                          | 110 | Figure 5.98 - 5.100: Professional stages from physical prototyping into virtual architectural application on site (Author, 2022). .....                                                                          | 128 | Figure 6.1: Sectional model through the SA-AS Facility, (Author, 2022). .....                                                                                                                          | 144 |
| Figure 5.28: This section shows the sensory applications within the site, spaces where a person would like to speak in private, or interact with sensory structures, (Author, 2021). .....                                                                                                      | 102 | Figure 5.51: Final perspective render of garden intervention, (Author, 2022). .....                      | 110 | Figure 5.101: Conceptual expression of rhythmic ideas imploding onto the final design, (Author, 2022). .....                                                                                                     | 128 | Figure 6.2: Spatial development framework, the second to last iteration, of which the northern half is highlighted, (Author, 2022). .....                                                              | 144 |
| Figure 5.29: Layering of spatial development, (Author, 2021). .....                                                                                                                                                                                                                             | 102 | Figure 5.52: An isometric view indicating folly location, (Author, 2022). .....                          | 112 | Figure 5.102: Rough draft of phase two’s spatial development framework, (Author, 2022). .....                                                                                                                    | 128 | Figure 6.3 & 6.4: Quick photoshopped renders of google earth with the SA-AS                                                                                                                            |     |
| Figure 5.30: The Bernard Tschumi approach, (Author, 2021). .....                                                                                                                                                                                                                                | 102 | Figure 5.53: Documented plan view of garden intervention, (Author, 2022). .....                          | 112 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
| Figure 5.31: The Für Elise approach, (Author, 2021). .....                                                                                                                                                                                                                                      | 102 | Figure 5.54: Final prototype of garden structure, (Author, 2022). .....                                  | 112 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
| Figure 5.32: An isometric view indicating folly location, (Author, 2022). .....                                                                                                                                                                                                                 | 104 | Figure 5.55: An isometric view indicating folly location, (Author, 2022). .....                          | 114 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
|                                                                                                                                                                                                                                                                                                 |     | Figure 5.56: Sectional draught of conceptual mechanical function, (Author, 2022). .....                  | 114 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
|                                                                                                                                                                                                                                                                                                 |     | Figure 5.57: Documented plan view of garden intervention, (Author, 2022). .....                          | 114 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
|                                                                                                                                                                                                                                                                                                 |     | Figure 5.58: Indication of precedent location, Canada, (Archdaily.com, 2010: online). .....              | 116 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
|                                                                                                                                                                                                                                                                                                 |     | Figure 5.59: Sketch of courtyard directly adjacent to entrance foyer, (Author, 2022). .....              | 116 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
|                                                                                                                                                                                                                                                                                                 |     | Figure 5.60: Diagram of One kids place pragmatic exploration, (Author, 2022). .....                      | 116 |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |
|                                                                                                                                                                                                                                                                                                 |     | Figure 5.61 - 5.64: Photos of One Kids place few years after completion,                                 |     |                                                                                                                                                                                                                  |     |                                                                                                                                                                                                        |     |

|                                                                                                                                                     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| facility concept model juxtaposed over the existing site, (Author, 2021). .....                                                                     | 144 |
| Figure 6.5: Spatial development framework, where the western half is highlighted, (Author, 2022). .....                                             | 146 |
| Figure 6.6: Birds eye view of a conceptualized image from google earth where the physical concept model is graphically added, (Author, 2022). ..... | 146 |
| Figure 6.7 - 6.8: From the physically build section model, these two computer generated render where derived, (Author, 2022). .....                 | 148 |
| Figure 6.9: Indicating the reception on a topographically drawn site plan, (Author, 2022). .....                                                    | 148 |
| Figure 6.10: Sectional drawing extracted from the final documentation showcasing the reception, (Author, 2022). .....                               | 148 |
| Figure 6.11: Partial section extracted from the final documentation showcasing the reception area, (Author, 2022). .....                            | 150 |
| Figure 6.12: Partial section extracted from the final documentation investigating the suspended ceiling system, (Author, 2022). .....               | 150 |
| Figure 6.13 - 6.16: Series of final renders of the SA-AS Facility, (Author, 2022). .....                                                            | 150 |
| Figure 6.16: Computer-generated three-dimensional representation of the therapy and observation rooms, (Author, 2022). .....                        | 152 |
| Figure 6.17: Indicating the therapy room on a topographically drawn site plan, (Author, 2022). .....                                                | 152 |
| Figure 6.18: Sectional drawing extracted from the final documentation showcasing a therapy room, (Author, 2022). .....                              | 152 |
| Figure 6.19: Partial section extracted from the final documentation showcasing a therapy room, (Author, 2022). .....                                | 154 |
| Figure 6.20: Precast concrete rib and block floor slab, (Author, 2022). .....                                                                       | 154 |
| Figure 6.21 - 6.23: Series of final renders of the SA-AS Facility, (Author, 2022). .....                                                            | 154 |
| Figure 6.24: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                             | 157 |
| Figure 6.25: Indicating the family room on a topographically drawn site plan, (Author, 2022). .....                                                 | 157 |
| Figure 6.26: Sectional drawing extracted from the final documentation showcasing the family room, (Author, 2022). .....                             | 157 |
| Figure 6.27: Aerial perspective of the western entrance, (Author, 2022). .....                                                                      | 161 |
| Figure 6.28: Elevated view of the service entrance located to the west of the SA-AS Facility, (Author, 2022). .....                                 | 161 |
| Figure 6.29: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                             | 161 |
| Figure 6.30: Indicating the imaginariums on a topographically drawn site plan, (Author, 2022). .....                                                | 161 |

|                                                                                                                                                                                                   |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 6.31: Sectional drawing extracted from the final documentation showcasing the imaginariums, (Author, 2022). .....                                                                          | 161 |
| Figure 6.32: Worms eye perspective of the wester courtyard, (Author, 2022). ...                                                                                                                   | 165 |
| Figure 6.33: Standing on the edge of the Hermes garden intervention looking down onto the western court yard, peeking into the multi-functional space, (Author, 2022). .....                      | 165 |
| Figure 6.34: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                                                                           | 165 |
| Figure 6.35: Indicating the vestibular and tactile studios on a topographically drawn site plan, (Author, 2022). .....                                                                            | 165 |
| Figure 6.36: Sectional drawing extracted from the final documentation showcasing the vestibular and tactile studios, (Author, 2022). .....                                                        | 165 |
| Figure 6.37: Interior render looking towards the exhibition room from within the vestibular studio, (Author, 2022). .....                                                                         | 169 |
| Figure 6.38: Computer generated perspective within the third echo silo, (Author, 2022). .....                                                                                                     | 169 |
| Figure 6.39: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                                                                           | 169 |
| Figure 6.40: Indicating the exhibition room on a topographically drawn site plan, (Author, 2022). .....                                                                                           | 169 |
| Figure 6.41: Sectional drawing extracted from the final documentation showcasing the exhibition room, (Author, 2022). .....                                                                       | 169 |
| Figure 6.42: Final render from within the kitchen which serves out into the wester courtyard, (Author, 2022). .....                                                                               | 173 |
| Figure 6.43: When standing on top of the existing underground water reservoir you will see this computer-generated perspective when looking down onto the wester courtyard, (Author, 2022). ..... | 173 |
| Figure 6.44: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                                                                           | 173 |
| Figure 6.45: Indicating the obelisk courtyard on a topographically drawn site plan, (Author, 2022). .....                                                                                         | 173 |
| Figure 6.46: Sectional drawing extracted from the final documentation showcasing the obelisk courtyard, (Author, 2022). .....                                                                     | 173 |
| Figure 6.47: Looking up onto the silhouette Navel Hill, while standing on top of the Western courtyard events kitchen, (Author, 2022). .....                                                      | 177 |
| Figure 6.48: Within the western courtyard, one will notice the depts of the excavated ground while passing the security office and looking up to the mezzanine floor, (Author, 2022). .....       | 177 |
| Figure 6.49: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                                                                           | 177 |
| Figure 6.50: Indicating the multi-functional hall on a topographically drawn site plan, (Author, 2022). .....                                                                                     | 177 |

|                                                                                                                                                                                                             |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 6.51: Sectional drawing extracted from the final documentation showcasing the multi-functional hall, (Author, 2022). .....                                                                           | 177 |
| Figure 6.54: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                                                                                     | 181 |
| Figure 6.55: Indicating the machine pit on a topographically drawn site plan, (Author, 2022). .....                                                                                                         | 181 |
| Figure 6.56: Sectional drawing extracted from the final documentation showcasing the machine pit, (Author, 2022). .....                                                                                     | 181 |
| Figure 6.57: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                                                                                     | 183 |
| Figure 6.58: Indicating the pumpstation ground floor on a topographically drawn site plan, (Author, 2022). .....                                                                                            | 183 |
| Figure 6.59: Sectional drawing extracted from the final documentation showcasing the pumpstation ground floor, (Author, 2022). .....                                                                        | 183 |
| Figure 6.60: Final renders of the SA-AS Facility, (Author, 2022). .....                                                                                                                                     | 185 |
| Figure 6.61: Indicating pumpstation mezzanine floor on a topographically drawn site plan, (Author, 2022). .....                                                                                             | 185 |
| Figure 6.62: Sectional drawing extracted from the final documentation showcasing the pumpstation mezzanine floor, (Author, 2022). .....                                                                     | 185 |
| Figure 6.63: Perspective render of main entrance from the vehicular route leaving the site, (Author, 2022). .....                                                                                           | 188 |
| Figure 6.64: This render shows how the curved screens can be flipped to curve in the opposite direction allowing the sounds from the site to be amplified within a singular location, (Author, 2022). ..... | 188 |
| Figure 6.65: Exploded isometric detailing of all four echo silos, (Author, 2022). ..                                                                                                                        | 188 |
| Figure 6.66: Partial section from final documented section of an echo silo, (Author, 2022). .....                                                                                                           | 188 |
| Figure 6.67: Only a handful of hand drawn sketch investigating possible structural technical resolutions, (Author, 2022). .....                                                                             | 188 |
| Figure 6.68: Detailed isometric diagram of the first echo silo, (Author, 2022). ...                                                                                                                         | 190 |
| Figure 6.69: All four echo silo exploded into it's most basic functional aspects, (Author, 2022). .....                                                                                                     | 190 |
| Figure 6.70: Exploded isometric, describing each structural component of the SA-AS Facility, (Author, 2022). .....                                                                                          | 190 |
| Figure 6.70: Floor plan of the water reservoir of the SA-AS Facility and descriptive legend, (Author, 2022). .....                                                                                          | 193 |
| Figure 6.71 - 6.74: A series of final renders of the SA-AS Facility, (Author, 2022). ..                                                                                                                     | 193 |
| Figure 6.75: Floor plan of the pump house of the SA-AS Facility and descriptive legend, (Author, 2022). .....                                                                                               | 195 |

|                                                                                                                                              |     |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 6.76 - 6.79: A series of final renders of the SA-AS Facility, (Author, 2022). .....                                                   | 195 |
| Figure 6.80 & 6.81: Computer generated photographic render of the final SA-AS facility design and its nearest context, (Author, 2022). ..... | 197 |
| Figure 6.82: Panoramic view of site from the tallest neighboring building, (Author, 2022). .....                                             | 211 |
| Figure 6.83: The most spectacular photographic render of the SA-As Facility, (Author, 2022). .....                                           | 211 |
| Figure X: Photo of the author reflecting on the city, (Author, 2021). .....                                                                  | 229 |



Figure X:

# Turnitin report

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# *“How can an architectural experience provide a safe space to aid in the development of speech therapy through means of sensory explorations?”*

This project is an alternative speech therapy center, that repurposes a historical water reservoir and pumpstation located on the foot of Naval Hill, Bloemfontein. Where architecture plays a critical role in speech therapy equal to that of any professional pathologist. Apart from a reimagined speech pathologist office, the South African – Ares Sensory facility (SA-AS Facility) also incorporates a sensory park. The impetus of this project is the sensory park and the freedom of therapy that it represents. Freedom to mend a speech disorder at the tempo of the patient, through neurologically stimulating garden structures. Similar to gymnasium equipment, these follies allow patients to exercise their neurological network of senses that all contribute to speech disorder, hence the phonic gymnasium description of this SA-AS facility.

This dissertation covers complex therapeutic and theoretical topics, and the information from each chapter contains the chronologically necessary information to understand the chapters that follow. Chapter one dives straight into what is known about speech sound disorders. Chapter two starts with the reinterpretation of Frank Lloyd Wright's concepts of organic architecture in order to establish a physical form of the essence of this dissertation. From here, the discourse starts to question the communication process at an anatomical level and therefore translates the auditory defect of speech impairments to that of musical melodies and architectural rhythm. These phonic applications are then explored within architectural precedents, while being related back into sound correction (Speech therapy) and mobility (Occupational therapy). Chapter 3 clarifies and analysis the project goals and location within these mentioned ideals. Whereas chapter 4 refines all the information so far into three conceptual models. These physical manifestations investigate the architectural application of scientist research and therapeutical discourse. The final chapters explain the design development and folly rational before leading into the final design.

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