



# FAMILIARIZING...

# THE ALIEN

+++ Designing working nodes that reveal the opportunity of invasive alien plants as a resource in the Theewaterskloof catchment area.

Exploring the design potential of mountain catchment services through hybrid interactions between infrastructure, ecology and society as a tool for a responsive mountain catchment landscape.

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# FAMILIARIZING\_THE\_ALIEN

## **Designing working nodes that reveal the opportunity of invasive alien plants as a resource in the Theewaterskloof catchment area.**

How can freshwater landscapes in the Cape become more responsive through hybrid interactions between our social, infrastructural and natural environment?

A landscape architectural response to diminishing water resources and dropping dam levels leading to a near day Zero in 2018, which resulted in the water sensitivity measures that are in place today.

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Exploring the design potential of mountain catchment services through hybrid interactions between infrastructure, ecology and society as a tool for a responsive mountain catchment landscape.

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Submitted in partial fulfillment of the Master of  
Landscape Architecture Degree

Under supervision of Marcel Henry

120 Credits

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Department of Architecture, Planning and Geomatics  
University of Cape Town

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## I. PROJECT\_SUMMARY

### **Familiarizing the Alien - Designing working nodes that reveal the opportunity of invasive alien plants as a resource in the Theewaterskloof catchment area.**

How can freshwater landscapes in the Cape become more responsive through hybrid interactions between our social, infrastructural and natural environment?

A landscape architectural response to diminishing water resources and dropping dam levels leading to a near day Zero in 2018, which resulted in the water sensitivity measures that are in place today.

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Exploring the design potential of mountain catchment services through hybrid interactions between infrastructure, ecology and society as a tool for an responsive mountain catchment landscape.

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Besides using a quantitative and scientific approach to try formulate a response, a phenomenological approach will be used to find problems and generate new insights. This last approach will also address the complex socio-environmental interactions in a contextual way, which can lead to new or enhanced hybrid interactions.

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### **Equilibrium is the overarching exploration theme in this thesis. To investigate this, the notions of stasis & flow, storage & release and tension & relaxation become critical to explore in the design and study area of the Theewaterskloof Dam sub-catchments.**

The notion of stasis & flow is a strong characteristic of water, as part of the process of dammed river flows, the flow of water coming in and out gradually, as well as alien plant invasion / eradication processes. More poetically this notion refers to moments in time of unconsciousness, when time flows like water, and occurrences of stasis through social awareness and comprehension. Stasis also means an equilibrium or perfect balance of elements and not particularly stagnation. How can the mountain catchments find that balance, while its resources seem to decrease?

Another important notion to be considered in this thesis specifically is storage & release, which comes forth from the vast-ness and scarcity of certain resources in the mountain landscape, where surface, volume, yield and memory of various mountain resources constantly change due to landscape process and exploitation shifts. Keeping, holding, withdrawing and removing are words associated with storage as well as stasis and flow.

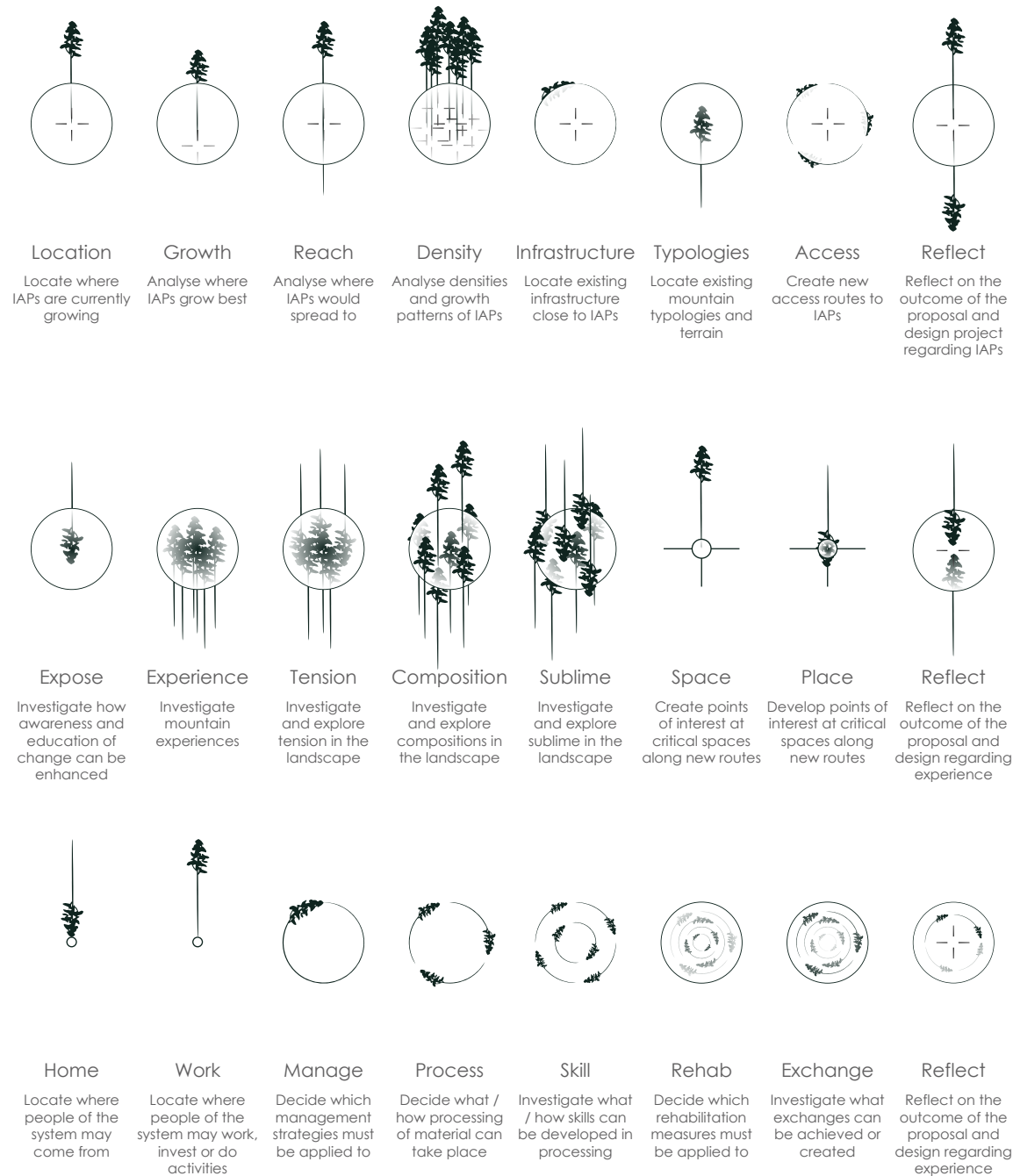
The last notion to be captured in the design and process is the notion of tension & relaxation. The landscape of the study area is one of tension. This is created by opposites, differences and compositions of both satisfaction and / or unease. While tension is usually formed by relations and interactions, it can exist physically as well. In the exploration of the notion one must also consider tension to be strengthened, released, broken, discovered, suspended and (re-)created.

'Familiarizing the Alien' speaks about the progressing amount and impact of invasive alien plants and respective tensions in a landscape that is a very much ruled and loved by these species - 'Landscape of the Alien'. It refers to the developing transformation of alienation in the landscape into a sense belonging by building new / re-established relations and engagements between people and something perceived as alien, unknown and harmful. In addition, this title reflects on my personal subsequential paradigm shift during the project on dealing with invasive alien plants and rediscovering their role in the landscape, while looking ahead to a water scarce future.

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## II. PROJECT\_METHODODOLOGY

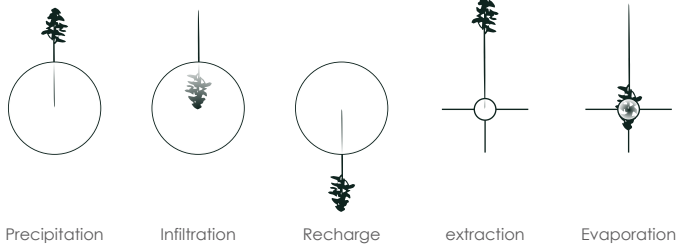
The following steps are taken in the process of the design research. Each row indicates a particular aspect in the project. The first row speaks about the strategies related to the invasive alien plant spread and how we deal with this. It is necessary to start with this aspect since it is the biggest environmental disaster that South Africa faces currently. This aspect will form the framework of the project in which points of intervention can be found. Following this, the aspect of experience and exposure of alienation in the landscape of tension is to be explored and investigated for design of space, form and materiality. The last row explores and creates potential, desired and necessary systems to make sure the 'Landscape of the Alien' becomes elevated and functions in a responsible way. All aspects need to be reflected on to ensure a favorable outcome for both people and the landscape components.



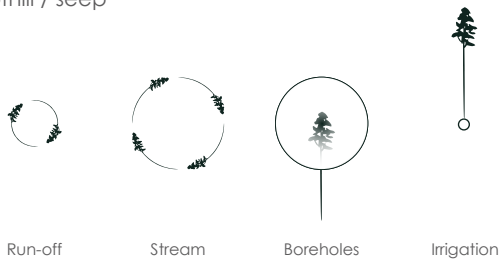
## >> WATER\_FLOW >

By looking at the flow of water in the montane region of the Overberg one can visualize where issues and potentials lie. This diagram has assisted in the development of the thesis in which it was found that both alien components of dams and invasive alien plants have negative effects and impacts on water flow + supply and their immediate context in the landscape. While invasive alien plants (IAPs) are already in the 'naughty book', dams are not considered bad by most people. Yet, their impacts are vast, mostly harmful and efficiency falls short as we've entered climate change and exceeding water demands. The combination of both dam and IAPs in the same spot creates a lethal tea-coloured cocktail, quenching thirst in an instant on a hot baking day. What is left is an empty, dusty bowl with temperatures similar to Africa Burn.

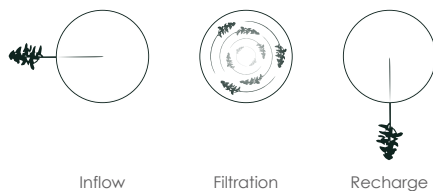
### Mountain



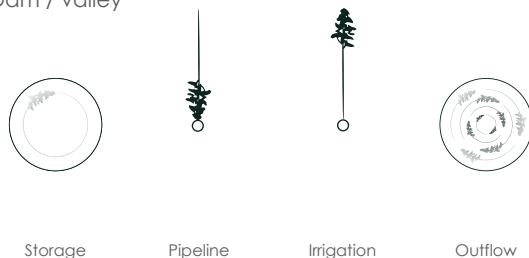
### Foothill / seep



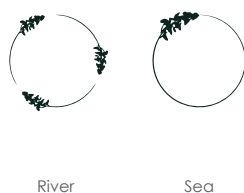
### Wetland / marsh



### Dam / valley



### Floodplain





# RESEARCH

How can freshwater landscapes in the Cape become more adaptive through hybrid interactions between our social, infrastructural and natural environment?

### III. RESEARCH\_PROPOSAL - ABSTRACT

The mountain catchment areas have always been an important foundation of resources and development progress, providing value and opportunity, as well as a sense of modesty, sublime and strong interaction. Supply of water in these areas to dams and aquifers is a critical service, which is extremely valued in this water sensitive country. Other catchment resources include the accumulation of sediment and rich species biodiversity. (Town, 2018)

Environmental change and increasing demands are heavily affecting our mountain catchment areas. Rapid alien plant invasion diminishes vast quantities of water which leads to dropping dam levels, compositional changes of fynbos vegetation and siltation, resulting in the 'submergence' of entire landscapes and communities. Instead of recharging these freshwater landscapes, we start to exploit other sources in manners that limit our physical interaction and with fresh water supply. (Jack, Wolski, Steynor, & Lennard, 2016)

In dire moments of drought and water delivery failure, we have built intense relationships with our freshwater landscapes in which gradually transforming damscapes as hydrological ruins have become icons to our concern around freshwater. As we develop to an anthropogenic mountain landscape, bioremediation and cyborg methods could recharge the flow and create hybrid interactions between freshwater landscapes, society and new ecology in an adaptive and sensitive manifestation. (Slingsby & Botha, 2018)

A responsive adjustment of our attitude to how we treat and engage with our mountain resources is vital in relation to a water sensitive approach. An adaptive and performing mountain catchment landscape can evade/endure/resist/utilize these extortions through hybridity in interaction.

# RESEARCH\_QUESTION

How can freshwater landscapes in the Cape can become more responsive through hybrid interactions between our social, infrastructural and natural environment?

## Sub-questions:

1. How can freshwater landscapes respond to the challenging precarious behavior of environmental change and destruction by various factors?
2. How can freshwater landscapes be re-imagined as productive and activated cultural landscapes for the future?
3. How can freshwater landscapes become functional spaces that reveal and improve the value, quality and awareness of its potential?
4. How can freshwater landscapes as hydrological ruins be represented as recordings of our rather distant relationships to water storage and supply?



# LITERATURE\_REVIEW

## Cyborg in the landscape:

Cyborg landscapes (performance, adaptation and resilience) (Lokman, 2017) (Aragón, 2017) (Rudy, 2005) (Sidler, 2004) (Cuthbert & Tyler, 2017) (Service, 2016) (Hirsh, 2014) (Exploring eco-aesthetics for urban green infrastructure development and building resilient cities: A theoretical overview, 2018) (Ascensão, 2015) (Loffie-Eaton & Neary, 2014) (Gandy, 2005)

*"The implementation of infrastructures such as dams and roads, has also led to landscape changes that range from small-scale land-use transformations to the emergence of wholly new environments at regional scales."* (Lokman 2016)

*"As such, infrastructure can be understood as 'life supports' fully embedded in our environment, channeling 'water, energy, information, people, goods, and waste to and from the objects supported.'" (Neuman, 2006)*

*"An imaginative response to the unknowability of the city" by producing a "landscape exhibiting different forms of integration between body, technology and social practices"* (Gandy, 2005)

**Landscape ecology:** (Davies, Day, & Douie, 1998) (Ecology, 1987) (Forman & Godron, 1986)

- Ecosophy (ecophilosophy) (Næss & Rothenberg, 1989)
- Post-industrial rehabilitation and bioremediation (Baldin, 2017)

## Art and the landscape:

- Phenomenology (Swaffield & Garcia, 2009) (Tilley, 2010)
- Ruin landscapes (sublime & poetry) (Smith & Schiele, 1890-1918) (Lentjes, 2015)

## Landscape heritage:

- Cultural water and heritage (Johnston, 2012) (Olmo & Munoz, 2010) (Chen & Han, 2018) (Heynen, Kaika, & Swyngedouw, 2006)
- "Memory in Architecture and Landscape; (Treib, 2009) (Lavoie, 1997)
  - I. Rivers, meanders, and memory (Karamanea & Karamanea, 2015)
  - II. Displacements: canals, rivers, and flows
  - III. Remembering ruins, ruins remembering"

## METHODS / METHODOLOGY

### Theory:

- Critical interrogation with theory on cyborg landscape and bioremediation techniques.
- Critical interrogation with theory on ruin landscape, memory landscapes and cultural water.

### Analyses and information:

- Examine and investigate freshwater landscapes and their relations (to people): what do they mean? Their significance (tangible/intangible)? Distant relationship?
- Research on different freshwater landscapes in the Cape.
- Gather historic, cultural and ecological information about specific freshwater landscapes.
- Investigate the current-day issues revolved around the efficiency and behavior of freshwater landscapes and their impacts on the surroundings.
- Critical interrogation into the unique qualities of specific freshwater landscapes and their differences around the Cape.

### Site exploration:

- Visit specific freshwater landscapes and observe, map, draw, dig, scrape and plot the feeling of the sites.
- Interview local people with a relation to specific freshwater landscapes.

### Design studies:

- Study complex impacts on freshwater flow in the landscape.
- Study landscape patterns (pre- and post-freshwater infrastructure implementation, empty and full, above and below).
- Study context materiality and how this can work in the advantage of the landscape.
- Study notions of tension, stasis and flow in the landscape.

### Program determination:

- Look into the different programs the chosen freshwater landscape could provide in the context of the site (scenarios).
- Look into the different programs the chosen freshwater landscape could provide to allow adaptability and / or transformation.
- Look into the different programs the chosen freshwater landscape could provide to solve current-day issues that affect the relation of these places with people.

### During the design process:

- Discover ways of representing the notions of tension, stasis and flow / fill and empty in the landscape through the above investigations.
- Discover ways of representing ruin landscapes / memory in the landscape.
- Experience the transforming landscape through poetry, artistic expressions and crazy mapping.

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### Design and detail:

1. Zoom in to an area, find a site (strong relation to people, critical contextual issue, provocative scenario/site/story, need for change, response and / or adaptability, etc.)
2. Start a design composition that allows for transformation, responsiveness, performance, adaptation and / or resilience through hybrid exchange between freshwater landscapes, society and ecology in the Cape.

## RELEVANCE\_OF\_TOPIC

The relevance of the topic almost speaks for itself. Water scarcity is a serious issue in a drought sensitive country. Man-made freshwater landscapes lack a sense of climate adaptability as seen in the last three years when water levels in dams and other freshwater infrastructures dropped to critical levels. Desalination and groundwater extraction are expensive and relatively drastic measures in which environmental implications are not yet understood thoroughly to solely rely on a main water sources. Environmental and social issues start to rise as freshwater landscapes are more frequently running dry and water delivery demands keep growing. Their efficiency can be questioned, yet it is part of an integrated hydrological infrastructure which has much potential still and shaped the country as it is today. An increase of local and distant interaction and relation with these artificial freshwater landscapes is desired while a need for ecologically and socially sensitive freshwater landscapes has become of great importance.

## NARRATIVE\_AND\_THEORY

Embracing hybridity, composition and transformation for a responsive approach is the narrative of this thesis in which hybrid not only means hybridity between human and natural systems (cyborg), but also hybrid ecologies (alien + natural).

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The content of this topic is strongly related to themes in theory about systems logic, predominantly touching base on Cybernetics in the landscape, infrastructure and diagramming. Natural systems in catchment landscapes would include mountain resource flows such as the rapid alien plant invasion, sediment accumulation and above all the complex water systems. Human systems are methods of agriculture, infrastructure and settlement, as well as forms of recreational interactions. Both natural and human are linked in this mountain landscape and could create strong hybrid interactions for a responsive mountain catchment in the broader scheme of water sensitivity.

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In the theory of cybernetics and diagramming however most often spatial practices are lacking, resulting in an absence of memory and human scale, which is essential to make sure cybernetics as an approach into the topic will be valued or recognized. In language theory, the aspect of typology might become another flaw of cybernetics, since this is a theme that suggests relatively generic results to systems. Context and experience play a huge role in this topic to generate a memorable place through rich narrative and story representation. Changing attitudes and beliefs is a strong part of the landscape, therefore the use of theories with themes of spatial practices is crucial to develop a common understanding in the design. By creating a sense of slowness through space creation along the systems one can reflect, experience and understand the processes that are in place, the historic values and stories of mountain resources, as well as a realization, appreciation and goal of the project for the future of water sensitivity.

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Three words that I have strategically chosen that will guide the process of interaction and experience of this project are Expose, Activate and Recharge. These come forth from the essential drivers of water sensitivity approaches and will challenge current system logics.



#### IV. DESIGN\_STUDY - INTRODUCTION

The design study focuses on the field of study of Invasion Science in a landscape of tension. Invasion Science is a study that looks at the 'workings' of alien invasive species. In this project the focus lies in four invasive alien plants (IAP) that predominantly occur in the study area of the Du Toits sub-catchment and their relations, interactions, functioning and appearances in the landscape. The study area contains a critical and inspiring zone (highlighted as square frame on maps) with historic elements, unique landscape qualities and story. The study includes activities such as clearing and socio-economic factors. The IAPs that have been sighted are: *Pinus pinaster* (Maritime Pine / Cluster Pine), *Acacia mearnsii* (Black Wattle), *Eucalyptus camaldulensis* (Red River Gum) and *Hakea sericea* (Silky Hakea). Interviews to Invasion biologists, Invasive alien plant specialists, water specialists, botanists, Environmental program officers and individuals doing extreme clearing in the mountains have been done as well.

The design study is necessary to inform what must and can be done with / to the invasive alien plants and what factors need to be considered in this complex system. The conclusions of the design study are used to find and encourage movement space in the landscape for clearing or management systems. Besides that, the study will help to develop further design investigations on discovering a variety of landscape experiences, new insights on relevant / desired systems, more awareness & education revolving IAPs and change of the landscape into a rather resourceful one. These investigations and explorations will primarily be done through a water sensitive and resource lens. A sense of rehabilitation, performance, experience and adaptation will be explored in the development of the design process.

## DESIGN\_STUDY – SUMMARY

The design study is composed out of six layers related to the in-depth understanding of the four predominant alien invasive plant species. Each of these six layers will inform a specific detail of the IAPs, creating better knowledge, comprehension and is intended to evoke emotions on these plant species, whether admiration, anger, fear, beauty, discomfort, imagination or inspiration. Tension is the key aspect in the representation of this design study.

1. The first component is necessary information on growth, water consumption, spread and status. This will put the IAPs into a political and scientific corner that speaks strongly about the severity of the impacts of the plants in the landscape and its future.

2. As a second layer a time line of the Du Toits sub-catchment on the movements through the landscape regarding IAPs and human influences has been created. This time line is critical since the historic Franschoek Pass is situated in the study area as a form of infrastructure with notions of clearing.

3. Thirdly, a visual composition of the relations and elements related to the IAPs has been made to create a better understanding to these plants. Questions such as: 'What makes these plants invasive?', 'What is currently being done?' and 'How can we move forward?' are themes that are presented. As part of this visual representation a profile picture has been added. This shows the plant, including its children (seeds) on their own, highlighting the life, energy and intelligence (in terms of adaptiveness). Here, the plant can finally tell their side of the story, allowing to reveal a sense of character and humanity.

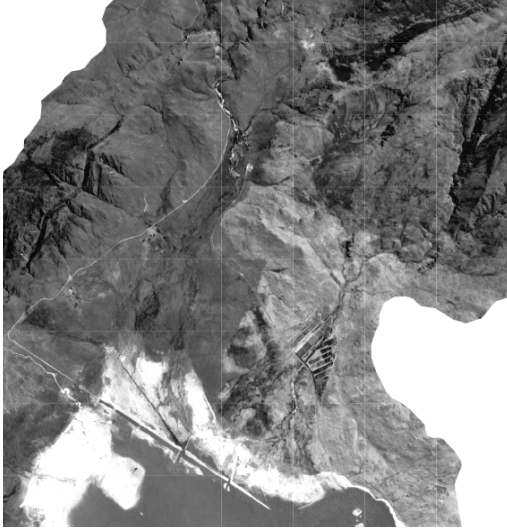
4. Following, analyses maps have been made focusing on the various unique interactions and systems that play a role in the invasiveness of the four specific IAPs. Soils, water, slope, infrastructure and fire are such categories that have been mapped in the study area.

5. From these maps a conclusion has been drawn on what the ideal conditions of the four species are in the area. It also reveals and predicts where the IAPs would generally grow, which areas they would invade and where / when condensed invasive alien plants stands would appear due to ideal site conditions. This also indicates certain mountain typologies and places that are critical in IAP presence or absence.

6. The sixth layer is a visual representation of the current tensions in the landscape in which the invasive alien plant species have landed. This installation, *Recomposing the Decomposing*, is a stasis form of alien woody material, suspended and imprisoned in the landscape and not desired to move, transform or touch. The condensed object starts to reveal a new form for the IAPs in and out of the landscape.

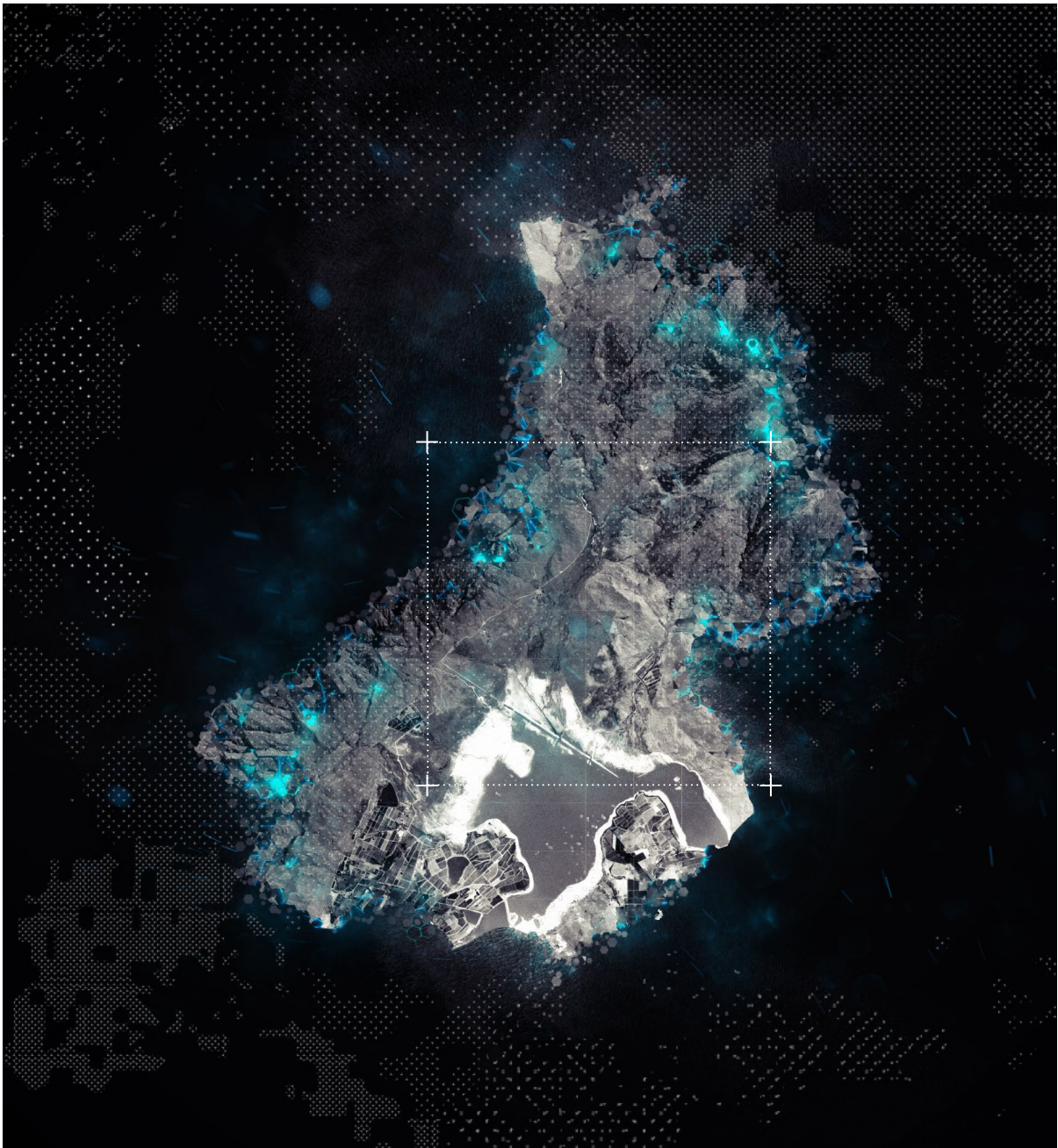


The three entry themes of this design project into the study area of Theewaterskloof Dam and the Hottentots-Holland Mountain range.



## +++ THE\_LANDSCAPE\_OF\_THE\_ALIEN

The current water loss in the WCWSS due to invasive alien plants exceeds 100 million liters of water a day. In the Du Toits sub-catchment there is a total of 95% coverage by alien invasive plants, of which a condensed alien invasive plant coverage of 33%, resulting in  $\pm 14.500$  ha and  $\pm 5000$  ha respectively. This currently causes  $\pm 10.000$  liters of water yield reduction per hectare per year in the area. Without invasive clearing and rehabilitation programs this figure will double within 30 years, and triple within 50 years. Not only the Theewaterskloof Dam suffers from this daunting situation, the Cape Flats and Table Mountain aquifers are impacted as well; most of this ancient water comes from seepage into the sandstone mountains, which is exactly where current water losses take place.



Du Toits sub-catchment including Theewaterskloof Dam, Hottentots-Holland mountains and the Franschhoek Pass

## << RAW\_DATA\_&\_INFORMATION

To understand the severity of invasive alien plants, and especially in the mountain catchment areas, the following information provides an insight into the issues revolving around this topic regarding water consumption, biodiversity loss, management, costs and rehabilitation.

### **Invasive alien plants are the greatest threat Cape Town's water security**

1. "Invasive alien plants are possibly the greatest threat to Cape Town's water security and climate resilience." (Slingsby & Botha, 2018)
2. "The worst-case climate change scenarios predict about a 10% decline in Cape Town's water supply by 2050. But we're already losing this much to invasive alien plants in our mountain catchments." (Slingsby & Botha, 2018)
3. "The current loss of water supplied by the Western Cape Water Supply System (WCWSS) because of alien plants is more than 100 million liters per day (MLD) - nearly 20% of what Capetonians are currently using daily. These losses are expected to triple by 2050 if not addressed." (Slingsby & Botha, 2018)
4. "Restoring and maintaining our catchments in a healthy state is essential for water security and climate resilience for the city of Cape Town and the surrounding region. The threat of invasive species to water security will not go away and will only become a greater problem the longer it is not properly addressed." (Slingsby & Botha, 2018)
5. "Clearing invasive alien trees is a cheaper, less risky water augmentation option for Cape Town. We simply cannot afford to lose the equivalent of the Wemmershoek dam every year and watch as the situation deteriorates, leaving us more vulnerable to erratic rainfall." (Slingsby & Botha, 2018)
6. "Catchment restoration has long been recognized as a priority for water security, and alien clearing programs have existed for decades, but underfunding and inefficiencies mean this cause needs all the help it can get." (Slingsby & Botha, 2018)
7. "Mountain catchment restoration often requires expert teams with high altitude training and specialized equipment, raising the person-day costs and making these bids uncompetitive, regardless of their water returns." (Slingsby & Botha, 2018)
8. "Large portions of the Steenbras, Berg and Theewaterskloof catchments have been used for plantation forestry for decades, under the control of the Department of Agriculture, Forestry and Fisheries. - ... - These 'forestry exit lands' are covered in low density invasions of alien species that will rapidly swamp the catchments if left unmanaged." (Slingsby & Botha, 2018)

### **Destructive impact of invasive alien plants on dam catchment**

9. "The dynamics of alien invasive plants are such that repeated follow-up clearing is required to counter the regeneration of the plants," explains Le Maitre, adding that a follow-up fire within two years of the initial clearing can kill all the seedlings and limit the need for further treatments." (Arnoldi, 2019)
10. "Building a dam without a plan to clear its catchments of invasive alien plants is tantamount to fruitless expenditure." (Arnoldi, 2019)
11. "A study assumed the worst case scenario, where the average tree is 20 years, and the invasion would increase from 3% to between 49% and 99% of the invadable area in the catchment area. The result would be that river flows into the dam would be reduced by up to 50%, with significant implications for Cape Town and irrigation schemes that depend on water from the dam. To clear the invasion at this point, would cost around 3 000% more." (Arnoldi, 2019)

### **Theewaterskloof sub-catchments: The Greater Cape Town Water Fund Business Case**

12. "Seven of the twenty-four sub-catchments were identified as priorities for invasive alien plant removal. They comprise a total of 54,300 hectares and are the sub-catchments for Wemmershoek, Theewaterskloof, and Berg River dams." (Conservancy, 2018)
13. "Results show that investing R372 million here (\$25.5 million USD; present value) will generate expected annual water gains of 100 billion liters (100 Mm<sup>3</sup>) within thirty years compared to the business as usual scenario. Importantly, invasive alien plant removal would already yield up to an additional 50 billion liters (50 Mm<sup>3</sup>) within five years. Approximately 350 job opportunities will be created in the first five years of implementation, as removing alien plant invasions is very labour intensive." (Conservancy, 2018)
14. "The results of catchment restoration programs will be evident rapidly, with improved supply showing as soon as the first winter rains. Furthermore, catchment restoration produces water yield gains into perpetuity if areas cleared of invasive alien plants are maintained." (Conservancy, 2018)
15. "The Water Fund will stimulate funding and implementation of catchment restoration efforts and, in the process, create jobs and momentum to protect globally important biodiversity and build more resilient communities in the face of climate change." (Conservancy, 2018)
16. "Mostly pristine veld and wetlands high in the protected areas are currently being targeted for borehole implementation." (Slingsby & Botha, 2018)
17. "Clearing IAPs is also an opportunity to employ some of the 30,000 or so farm workers sitting without work due to the drought, and an opportunity to invest in restoring our environment. (Slingsby & Botha, 2018)
18. "Clearing, containing and rehabilitating would reduce the risk of extreme wildfires, reduce erosion and improve dry-season flows, while protecting our unique biodiversity (and tourism), and securing the many benefits that nature has to offer." (Slingsby & Botha, 2018)

## < PARADIGM\_REVIEW: PLANT\_INVASION

Adaptability is strong in invasive alien plants (IAP), so strong that they can handle multiple forms of habitation and reproduction strategies. Adaptive strategies in habitation and reproduction aspects of alien invasive plants are responsive methods to sustain its life.

As humans, we also desire to reach a sustainable life, and preferably livelihood. Constantly changing and adapting are environments and habits (not just habitats), including our mind-sets are methods to sustain our lives and livelihoods.

Freshwater is crucial to sustain our lives, no matter how you turn it..

Acceptance of alien (/) invasive plants can be considered, but in what state, until what point and under which circumstances? What sacrifices are we able to make and which consequences are we able to take? And who are we to decide on who / what must live and what must die?

It is common and reasonable to have alien invasive plants to be eradicated or kept under certain conditions, but it is how we deal with them in the landscape which poses the question and issue. How can a handful of people confront a force that is larger than 3 million hectares? Is what we currently do the most effective practice, or must we think about other solutions and new insights? The goal from the past was to eradicate. Nowadays, the goal has changed to contain, and limit the spread into unaffected areas. Can we rethink the battle strategy to achieve a more positive outcome? Perhaps for both us and the IAPs even?

Part of me wants to say; let the invasive alien plants be/come in these catchments, we will find another way to supply water from a different source. However, running away from and doing nothing to the alien plant invasion in the landscape is not necessarily adaptive, nor responsive. In addition, letting alien plant invasion take over these specific areas (mountain catchments) would not only result in the losses of water, but also the loss of fynbos vegetation, its biodiversity & habitats, extreme soil degradation, erosion and increased fire risks, which will result in the loss of our livelihoods (socially and economically). We should rather engage with the alien plant invasion to tackle the issue by creating our own adaptation strategies using new (and in this thesis; hybrid) techniques (as nature responds to change as well) that will result in a sustainable life and livelihoods.

*"But isn't that how evolution works? You ask. The survival of the fittest? Trees would just shake their heads—or rather their crowns. Their well-being depends on their community, and when the supposedly feeble trees disappear, the others lose as well."* (Wohlleben, 2016)

Currently we are fighting the alien plant invasion in the catchments by clearing and eradication. This is a responsive and perhaps adaptive strategy which has only started developing in the last few decades, with the recent procedures being most evident in the landscape of our catchments. The intensity of work that needs to be done is much and performance issues (including investment and politics which allows for greater performance) are numerous. Vast areas require various clearing techniques and regular check-ups. Most of these areas are currently relatively to highly inaccessible due to difficult terrain and a lack of infrastructure. Other areas require transport and processing of alien invasive plants that have been removed. The time frame in this clearing process reaches from now to between 50 or 100+ years. Thus management and facilitation are key factors to make this engagement perform well in which currently most practices and strategies are lacking. Another important factor is process, awareness, education and experience to help develop an responsive mountain catchment landscape. (Lister, 2016)

## > TENSION <

*“When the logs in the fireplace crackle merrily, the corpse of a beech or oak is going up in flames. The paper in the book you are holding in your hands right now is made from the shavings of spruce, and birches were expressly felled (that is to say, killed) for this purpose. Does that sound over the top? I don't think so. For if we keep in mind all we have learned in the previous chapters, parallels can definitely be drawn to pigs and pork. Not to put too fine a point on it, we use living things killed for our purposes. Does that make our behavior reprehensible? Not necessarily. After all, we are also part of Nature, and we are made in such a way that we can survive only with the help of organic substances from other species. We share this necessity with all other animals. The real question is whether we help ourselves only to what we need from the forest ecosystem, and-analogous to our treatment of animals - whether we spare the trees unnecessary suffering when we do this.*

*That means it is okay to use wood as long as trees are allowed to live in a way that is appropriate to their species. And that means that they should be allowed to fulfill their social needs, to grow in a true forest environment on undisturbed ground, and to pass their knowledge on to the next generation. And at least some of them should be allowed to grow old with dignity and finally die a natural death.” (Wohlleben, 2016)*

-

*“My simple explanation of why we human beings, the most advanced species on earth, cannot find happiness, is this: as we evolve up the ladder of being, we find three things: the first, that the tension between the range of opposites in our lives and society widens dramatically and often painfully as we evolve; the second, that the better informed and more intelligent we are, the more humble we have to become about our ability to live meaningful lives and to change anything, even ourselves; and consequently, thirdly, that the cost of gaining the simplicity the other side of complexity can rise very steeply if we do not align ourselves and our lives well.” (Lincoln Wood, 2014)*

-

*“Life as a forester became exciting once again. Every day in the forest was a day of discovery. This led me to unusual ways of managing the forest. When you know that trees experience pain and have memories and that tree parents live together with their children, then you can no longer just chop them down and disrupt their lives with large machines. Machines have been banned from the forest for a couple of decades now, and if a few individual trees need to be harvested from time to time, the work is done with care by foresters using horses instead. A healthier—perhaps you could even say happier—forest is considerably more productive, and that means it is also more profitable.” (Wohlleben, 2016)*



# Pinus pinaster > (Maritime / Cluster Pine)



**Status:** CARA 2002 – Category 2 NEMBA; – a. 2 for plantations and wind-rows, b. 1b elsewhere, c. National Heritage Trees or National Monument Trees are not listed

**Invasiveness:** extremely invasive

**Coverage in SA:** 2.9 million ha (excl. plantations: 660.000 ha)

**Water consumption:** ± 50 L / day

**Reduced average run-off:** 55%

**Preferred growing conditions:** mountains and lowland fynbos areas, temperate climate

**Seed dispersal:** 2 - 3 years until cone opens, high intensity fires accelerate opening and release of seeds

**Reproduction time:** 5 - 7 years

**Roots:** < 8 meters

**Original purpose:** timber

**Implications:** extreme fire risks (adaptation to high intensity fires), winged dispersal ability, soil erosion

**Dependence:** timber, charcoal and firewood

**Current clearing:** cutting, felling, pulling and burning

## >> BACKGROUND

The information on the following two pages will become the foundation for most of the design study and this project.

Sources include the following: Invasives.org.za, SANBI, Department of Environmental Affairs, Department of Forestry, The Mountain Club of South Africa, The Agricultural Research Council, Working for Water, Future Water, The Invasive Species Compendium, Plants for a Future, Capetowninvasives.org.za, Cape Nature, the Academy of Science of South Africa (ASSAf) and the Centre of Excellence for Invasion Biology (CIB)



# Acacia mearnsii > (Black Wattle)

**Status:** CARA 2002 – Category 2 NEMBA – Category 2

**Invasiveness:** highly invasive

**Coverage in SA:** 2.5 million ha (excl. plantations: 106.700 ha)

**Water consumption:** ± 35 L / day

**Reduced average run-off:** 45%

**Preferred growing conditions:** grassland, lowland fynbos and riparian zones, temperate climate

**Seed dispersal:** mid-August / September (flower) to December (seed)

**Reproduction time:** ± 2 years

**Roots:** > 4 meters

**Original purpose:** dune stabilizer and fire breaks

**Implications:** destabilizing river banks and soil erosion

**Dependence:** firewood, tannery & weaving industry, charcoal and timber

**Current clearing:** cutting, pulling, ring-barking, coating of herbicide and biological control

## >> BACKGROUND

The information on the following two pages will become the foundation for most of the design study and this project.

Sources include the following: Invasives.org.za, SANBI, Department of Environmental Affairs, Department of Forestry, The Mountain Club of South Africa, The Agricultural Research Council, Working for Water, Future Water, The Invasive Species Compendium, Plants for a Future, Capetowninvasives.org.za, Cape Nature, the Academy of Science of South Africa (ASSAf) and the Centre of Excellence for Invasion Biology (CIB)



# Eucalyptus camaldulensis > (Red River Gum)

**Status:** CARA 2002 – Category 2 NEMBA - a. Category 1b within riparian areas, protected areas or, listed ecosystems for conservation and Fynbos biomes, b. category 2 for plantations, woodlots, bee-forage areas, wind-rows and the lining of avenues.

**Invasiveness:** relatively invasive

**Coverage in SA:** ± 200.000 ha

**Water consumption:** 30 - 90 L / day

**Reduced average run-off:** 90%

**Preferred growing conditions:** water courses and riparian zones, arid to temperate climate

**Seed dispersal:** mid-September / January (flower) to June (seed)

**Reproduction time:** ± 3 years

**Roots:** > 10 meters

**Original purpose:** ornamental and shelter

**Implications:** water repellent and soil erosion (climate adaptable)

**Dependence:** windbreaks, bee-foraging sources, timber and firewood

**Current clearing:** cutting, pulling, felling, ring-barking and coating herbicides

## >> BACKGROUND

The information on the following two pages will become the foundation for most of the design study and this project.

Sources include the following: Invasives.org.za, SANBI, Department of Environmental Affairs, Department of Forestry, The Mountain Club of South Africa, The Agricultural Research Council, Working for Water, Future Water, The Invasive Species Compendium, Plants for a Future, Capetowninvasives.org.za, Cape Nature, the Academy of Science of South Africa (ASSAf) and the Centre of Excellence for Invasion Biology (CIB)



# Hakea sericea > (Silky Hakea)

**Status:** CARA 2002 – Category 1 NEMBA – Category 1b

**Invasiveness:** extremely invasive

**Coverage in SA:** 360.000 ha

**Water consumption:** ± 10 L / day

**Reduced average run-off:** 25%

**Preferred growing conditions:** mountain and fynbos areas, arid to temperate climate

**Seed dispersal:** mid-June / September (flower) to December (seed), fires and felling allow opening process and release of seeds

**Reproduction time:** ± 2 years, death of plant after fire

**Roots:** < 4 meters

**Original purpose:** hedging

**Implications:** increase fuel load and decrease leaf retention & seed percentage set in native Proteaceae

**Dependence:** firewood and ornamental

**Current clearing:** cutting, pulling, slash & burn, and biological control (shooting & applying)

## >> BACKGROUND

The information on the following two pages will become the foundation for most of the design study and this project.

Sources include the following: Invasives.org.za, SANBI, Department of Environmental Affairs, Department of Forestry, The Mountain Club of South Africa, The Agricultural Research Council, Working for Water, Future Water, The Invasive Species Compendium, Plants for a Future, Capetowninvasives.org.za, Cape Nature, the Academy of Science of South Africa (ASSAf) and the Centre of Excellence for Invasion Biology (CIB)







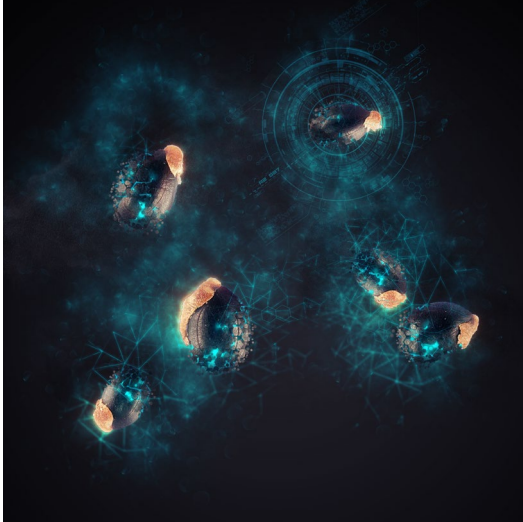


## < THE\_RUNAWAY

'One day I asked my mum: 'why can't we go play outside the plantation? I'm bored in here and I want to explore the mountains; the views must be amazing and it's only a stone-throw away. Besides, no other trees are there anyways..' My mum said we were not supposed to go beyond the boundary and I mustn't ask again. I got really mad, so my friends and I decided to sneak out the one season and it's the best decision we ever made; there is so much space, light and water out here!' - Pinus pinaster





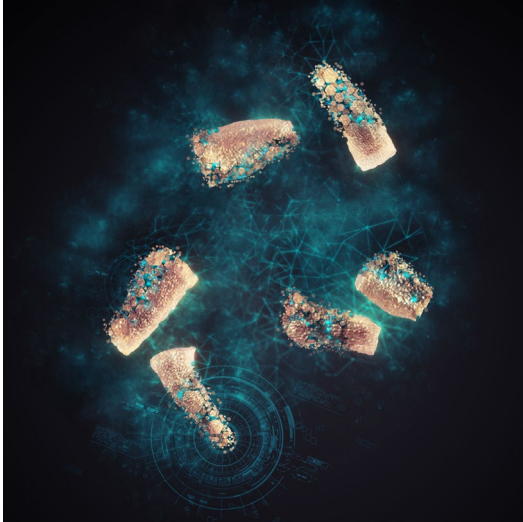


## < THE\_WANDERER

'I had been working hard to stabilize the dunes, making overtime, predominantly in Summer. Every day I got sandblasted while baking in the sun. It's super crowded out there with little water. I managed to gradually get away from the crowds and started my own business, further up the stream near the mountains. The work here is much easier and resources are abundant. The locals seem somewhat bothered with me though, but I don't want to go back and work in those conditions' - Black Wattle





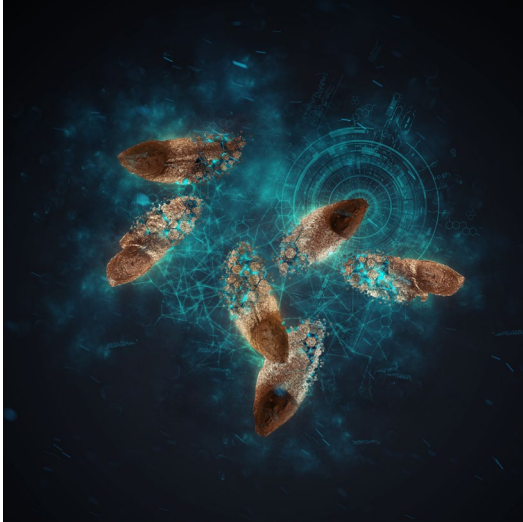


## < THE\_LONE\_WOLF

'I'd been taken away shortly after I was born and raised on a farm up in the mountains. I don't know my family and was placed in a land unknown. I have managed to grow, which has been surprisingly easy after I found a source of water 100m away. Sometimes, when I look over the locals, I feel sad and lonely again; I explode out of anger and fear, but I survive. Now that I'm older I can make seeds, and hopefully start a family of my own. I'm sure the farmer wouldn't mind..' - *Eucalyptus camaldulensis*







## < THE\_SOLDIER

'A 150 years ago we pulled out: 'Alpha, this is Beta, are you there? It's time, over.' In the heat of the moment, when the time was ripe we took off, out of Baron C.T.H. von Ludwig's garden as pretty guards, to march into new territory. Me and my comrade took the lead and soon we established a great force high up in the mountains, camouflaged as locals. The conditions here are harsh, but they suit us. In any case, we are very adaptable. Today we face a new threat, but we shall not fail.'

- Hakea Sericea

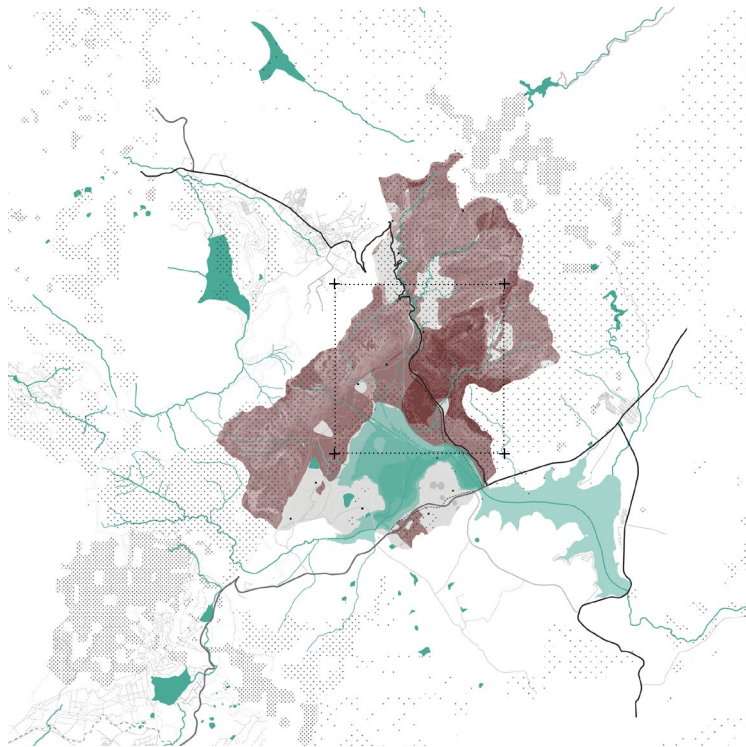






## + Pinus pinaster

Pine currently covers more than 50% of the area in the Du Toits sub-catchment. The predicted movement and location of this IAP centers mostly around the North facing mountainous areas of the sub-catchment, from gentle slopes, to steep cliffs, gorges and even mountain peaks. This species will compete with other trees and replaces fynbos.

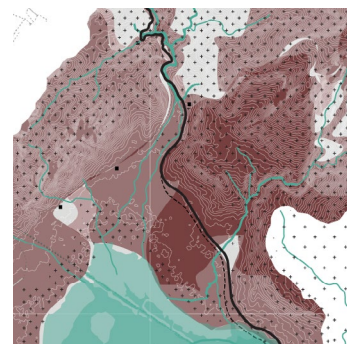


Veld fire events between 2008 and 2018

Veld fires can kill the trees but allow cones to open much faster and seeds to be dispersed



1. Multiple veld fire recordings within the last 10 years
2. A single veld fire recorded within the last 10 years
3. A single veld fire recorded before 2008

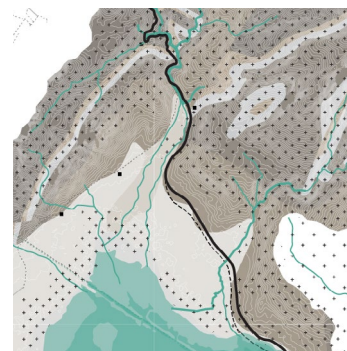


Geology; sandstone, shale & mudrock

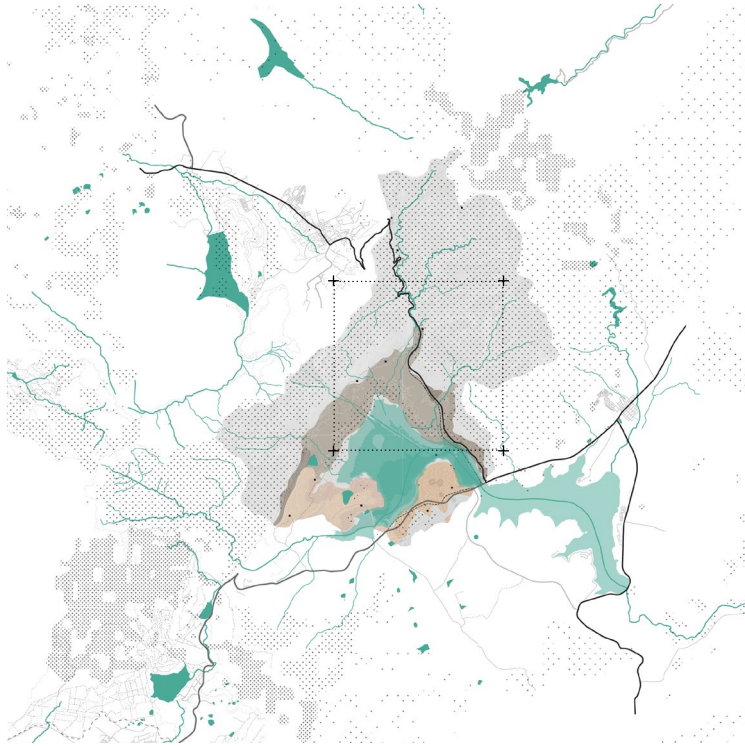
Geology plays a role in the ease of pine establishment, with sandstone and shale as preferred base layer



1. Sandstone
2. Quartzitic sandstone
3. Feldspathic sandstone
4. Mudstone
5. Mudrock
6. Shale
7. Granite
8. Scree / Alluvium
9. Brackish - calcareous soil



## > Pinus pinaster

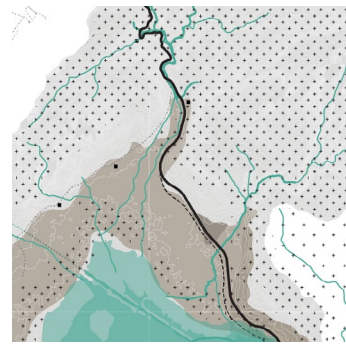


Soil; well-drained, dry to moist

The soil determines whether pine will grow well and survive, mostly because it prefers well-drained soil



1. Acid podzolic sand
2. Shallow phase of 1.
3. Clayish wet poorly drained alluvial soils
4. Mixed wet poorly drained alluvial soils
5. Red eutrophic / calcareous soils
6. Stony soils
7. Yellow-brown apedal soils
8. Dry sandy soil
9. Shallow soils

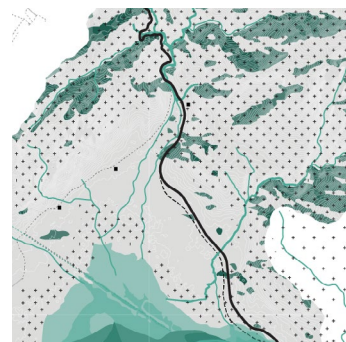


Aspect; North, NW & NE

Aspect in combination with climate will create optimal growth. North-facing areas are best suited

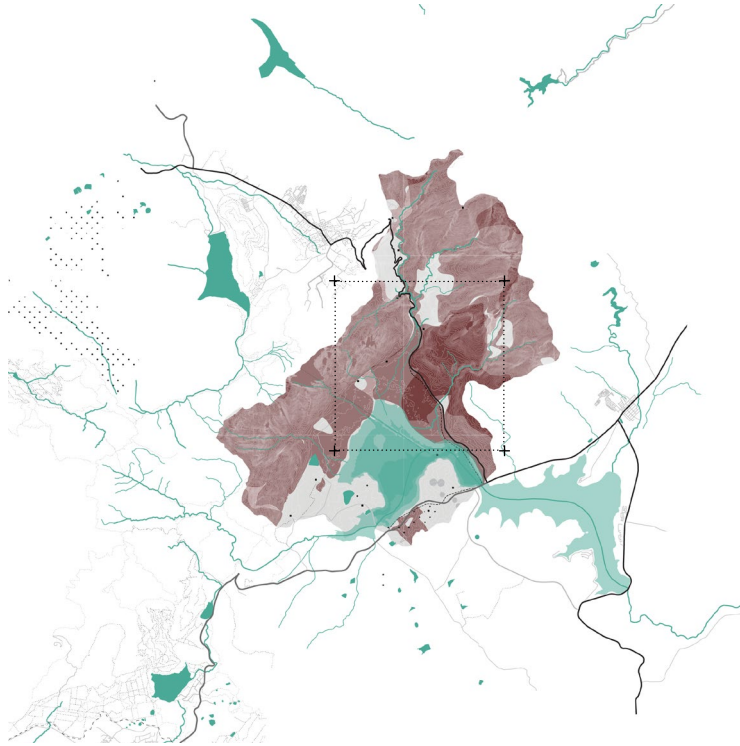


1. North
2. North-East & North-West
3. East & West



## + *Acacia mearnsii*

Wattle currently covers about 10% of the area in the Du Toits sub-catchment, although the spread could be much more and not monitored well. The predicted movement and location of this IAP centers mostly around the North facing areas of the sub-catchment, surrounding water courses and relatively gentle slopes, as well as sandy shore-like aspects of the dam and rivers. This species will compete with fynbos. Wattle can stay dormant for several years until a fire event happens, allowing it to overtake large areas quickly due to rapid growth.

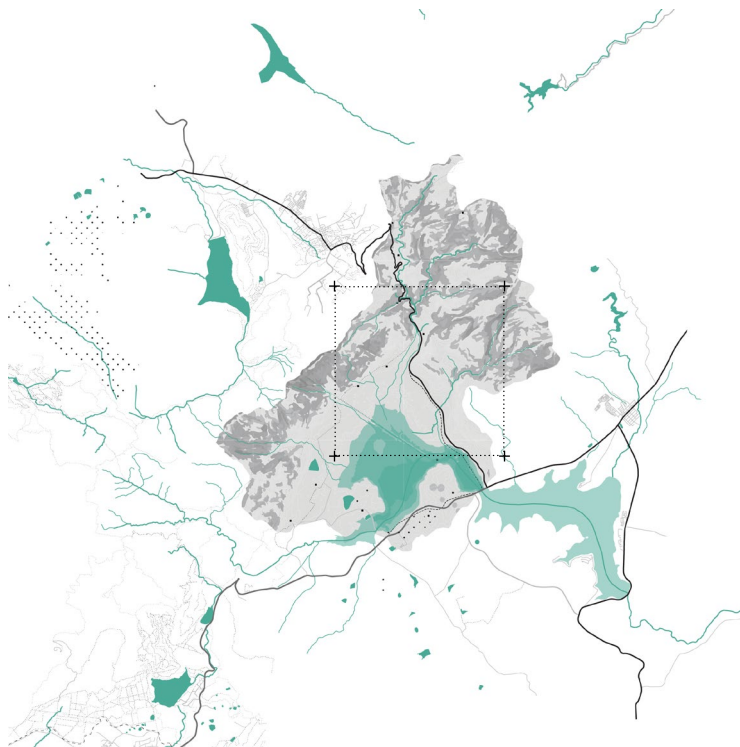
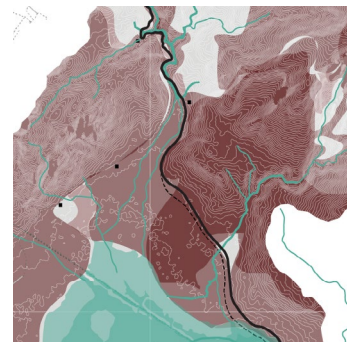


Veld fire events between 2008 and 2018

Veld fires allow seeds that have stayed dormant in the ground to sprout and seed pods to open



1. Multiple veld fire recordings within the last 10 years
2. A single veld fire recorded within the last 10 years
3. A single veld fire recorded before 2008

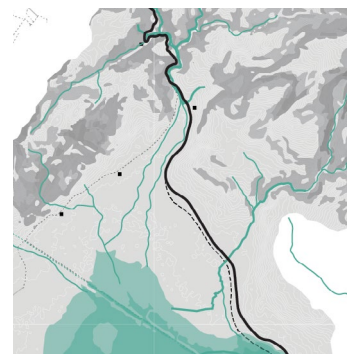


Slope percentage; 0 - 30%

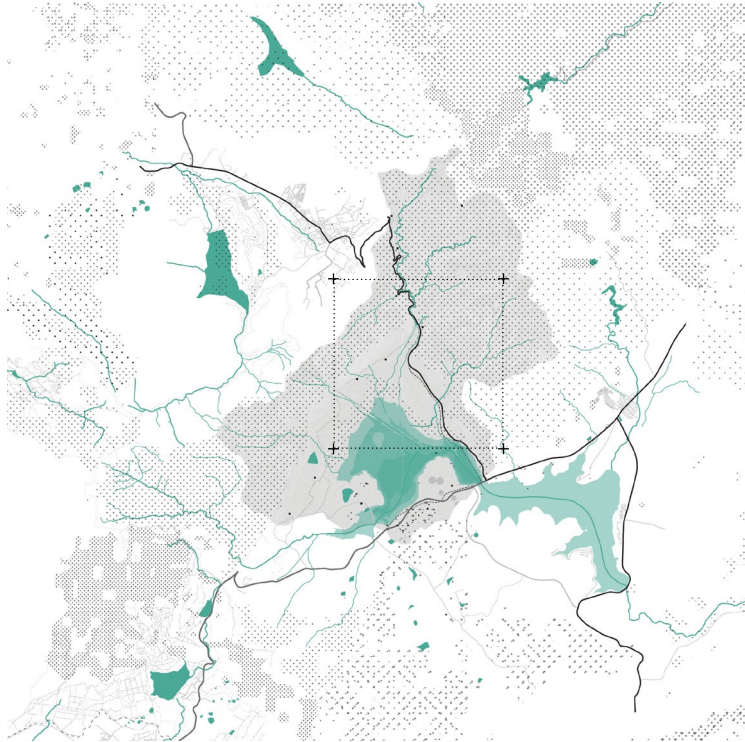
*Acacia mearnsii* prefers gentle slopes & plains and can't establish well on steep slopes (> 30%)



Slope % between 30 and 70 %

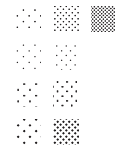


# > *Acacia mearnsii*

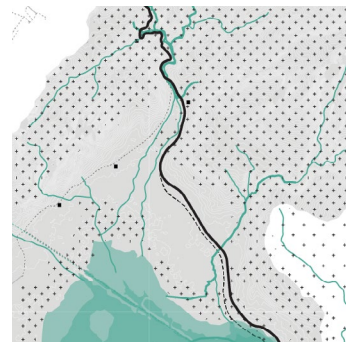


Alien invasive spread; alien removal

After bulk invasive alien plant removals and clearings, black wattle can sprout and grow quickly



1. *Pinus pinaster*
2. *Acacia mearnsii*
3. *Eucalyptus camaldulensis*
4. *Hakea sericea*

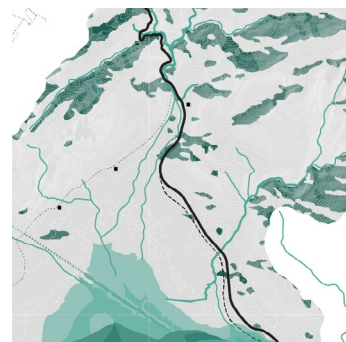


Aspect; North, NW & NE

Aspect in combination with climate will create optimal growth. North-facing areas are best suited

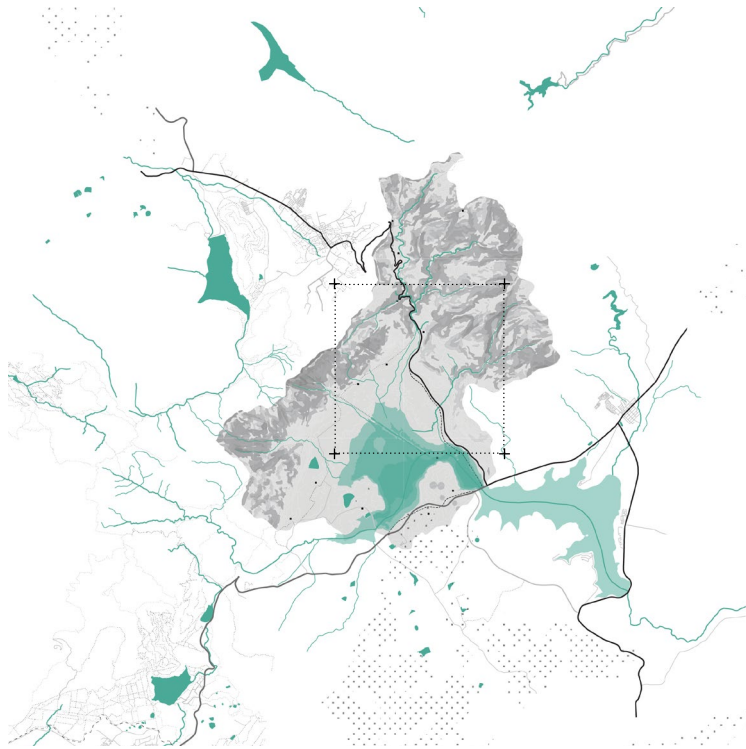


1. North
2. North-East & North-West
3. East & West



## + Eucalyptus camaldulensis

Eucalyptus currently covers relatively 10% of the area in the Du Toits sub-catchment, of which half has been established on or near farms. The predicted movement and location of this IAP centers mostly around the North facing, flat to foothill areas of the sub-catchment. Especially river courses and riparian zones would be affected. This species will compete with other trees and replaces fynbos. This species can even change soil conditions to suit only itself.



Slope percentage; 0 - 20 %

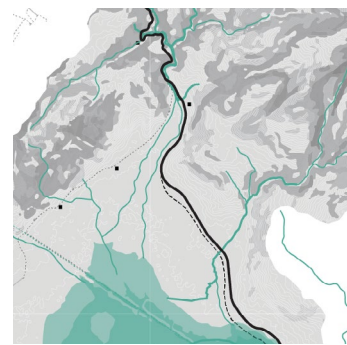
Acacia mearnsii prefers gentle slopes & plains and can't establish well on steep slopes (> 30%)



Slope % between 30 and 70 %



Slope % between 20 and 30 %



Geology; shale & alluvium

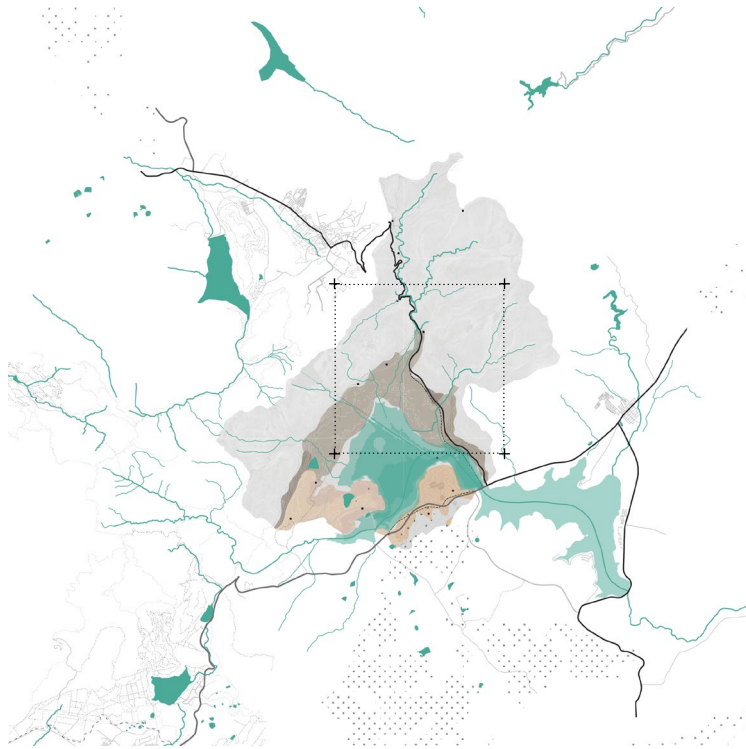
Geology plays a role in the ease of Eucalyptus establishment, with shale as preferred base layer



1. Sandstone
2. Quartzitic sandstone
3. Feldspathic sandstone
4. Mudstone
5. Mudrock
6. Shale
7. Granite
8. Scree / Alluvium
9. Brackish - calcareous soil



## > Eucalyptus camaldulensis



Soils; well-drained, deep to shallow, dry to wet soil

The soil determines if Eucalyptus will grow, mostly because it prefers deeper well-drained sandy soil



1. Acid podzolic sand
2. Shallow phase of 1.
3. Clayish wet poorly drained alluvial soils
4. Mixed wet poorly drained alluvial soils
5. Red eutrophic / calcareous soils
6. Stony soils
7. Yellow-brown apedal soils
8. Dry sandy soil
9. Shallow soils

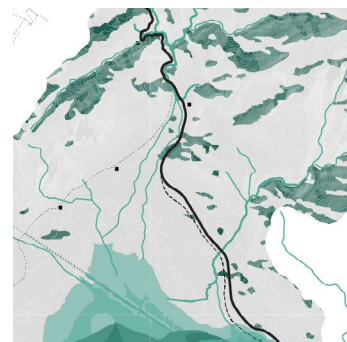


Aspect; North, NW & NE

Aspect in combination with climate will create optimal growth. North-facing areas are best suited

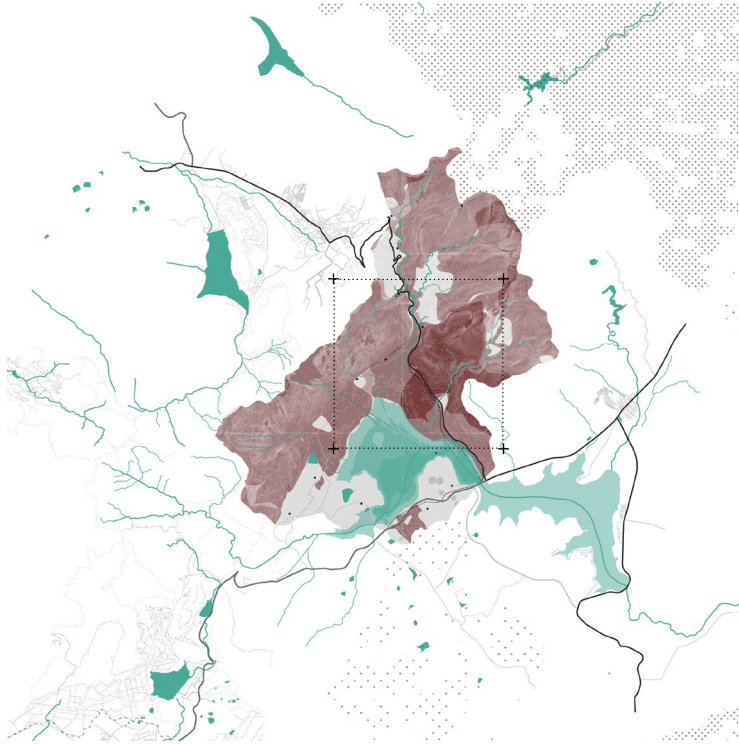


1. North
2. North-East & North-West
3. East & West



## + Hakea sericea

Hakea currently covers less than 10% of the area in the Du Toits sub-catchment, although the spread could be much more and not monitored well. The predicted movement and location of this IAP centers mostly around the North facing areas of the sub-catchment, seeking arid to moist areas, predominantly high up in the mountains. This species will compete with fynbos by using the same germination techniques as proteas using fire. A dense section of Hakeas has established north of the sub-catchment, right on the watershed boundary, which creates an immense potential threat once crossing this intangible boundary.

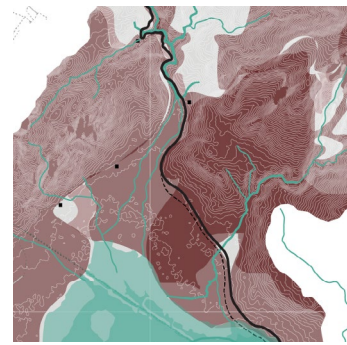


Veld fire events between 2008 and 2018

Veld fires kill the trees but allow cones to open and seeds to sprout and disperse, similar to proteas



1. Multiple veld fire recordings within the last 10 years
2. A single veld fire recorded within the last 10 years
3. A single veld fire recorded before 2008



Geology plays a role in the ease of Hakea growth, with sandstone and shale as preferred base layer



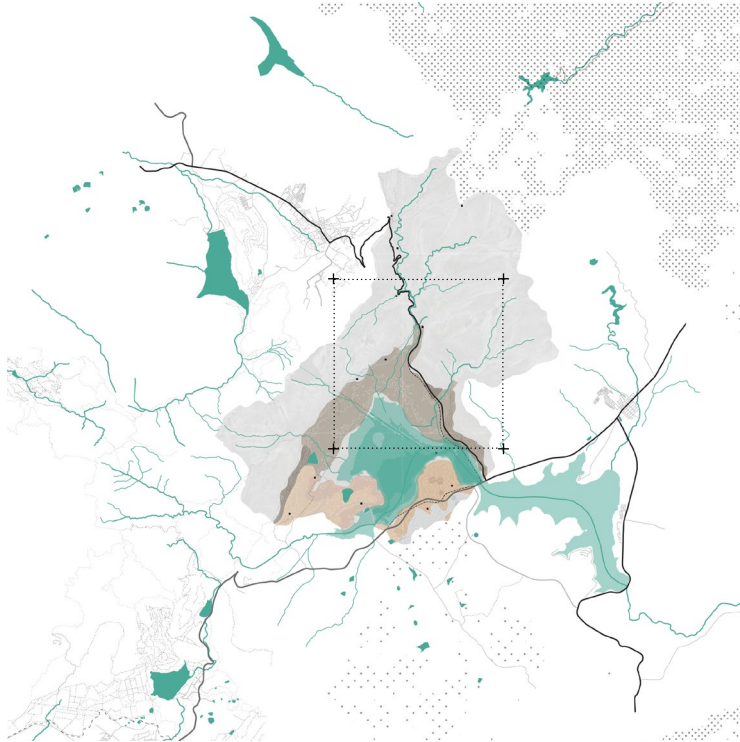
1. Sandstone
2. Quartzitic sandstone
3. Feldspathic sandstone
4. Mudstone
5. Mudrock
6. Shale
7. Granite
8. Scree / Alluvium
9. Brackish - calcareous soil



Geology; sandstone, shale & mudrock



## > Hakea sericea

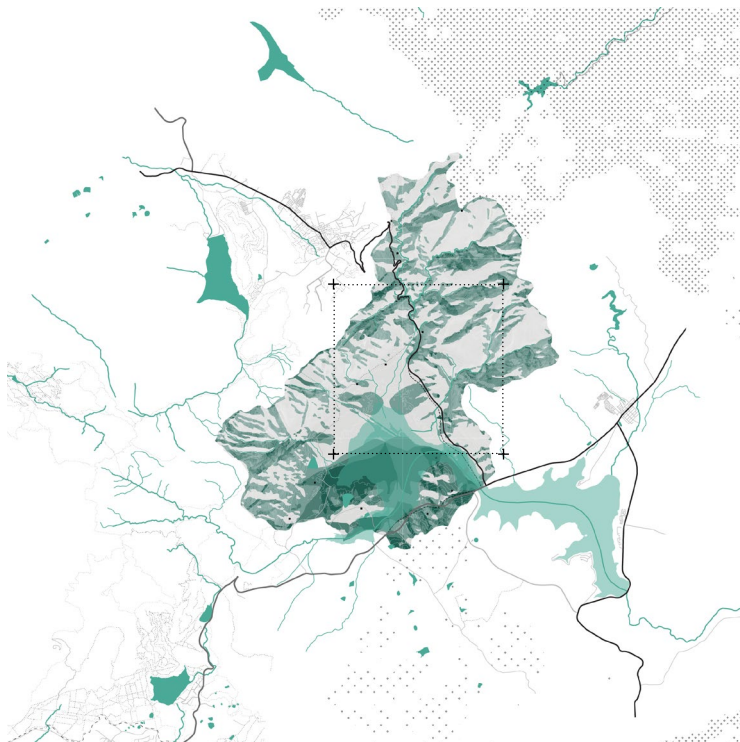


Soils; well-drained, shallow, dry to moist soil

The soil determines if Hakea will grow, mostly because it prefers shallow well-drained sandy soil



1. Acid podzolic sand
2. Shallow phase of 1.
3. Clayish wet poorly drained alluvial soils
4. Mixed wet poorly drained alluvial soils
5. Red eutrophic / calcareous soils
6. Stony soils
7. Yellow-brown apedal soils
8. Dry sandy soil
9. Shallow soils

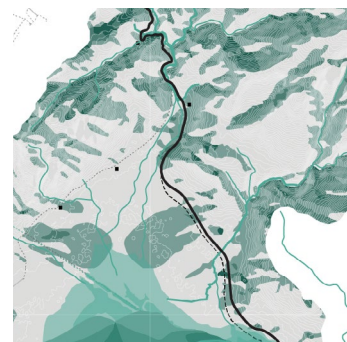


Aspect; North, NW, NE, West & East

Aspect in combination with climate will create optimal growth. North, East and West facing areas are best suited



1. North
2. North-East & North-West
3. East & West

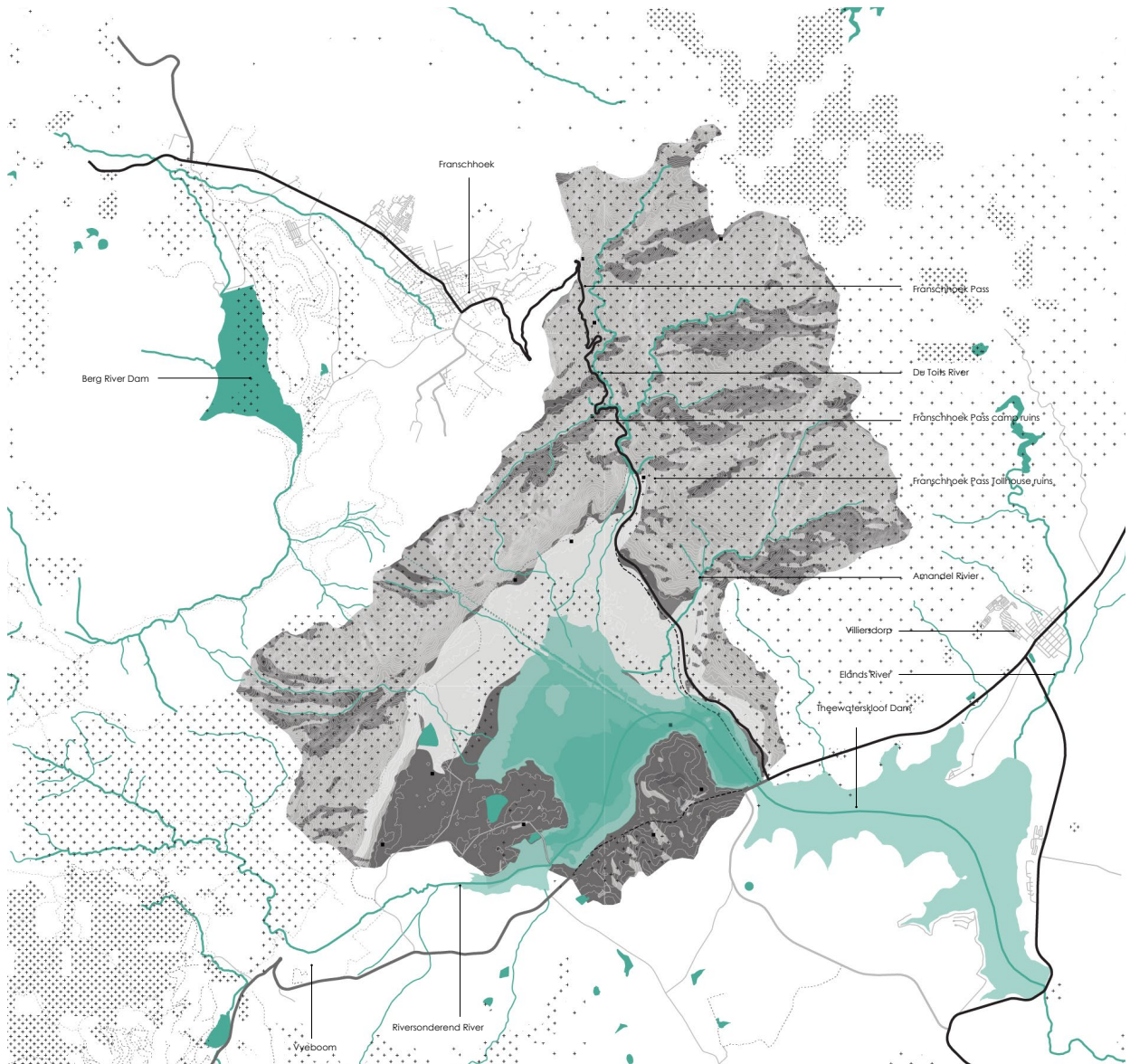


## + MOVEMENT\_SYNTHESIS

By analyzing maps related to the movement of the studied invasive alien plants, one can relatively and theoretically predict which areas would need to be controlled more effectively than others. It reveals what places, typologies and conditions of the mountainous region are most preferable to the species and will most likely become overrun by this IAP in a condensed form. These models indicate their 'movement'.



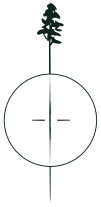
## >> Pinus pinaster



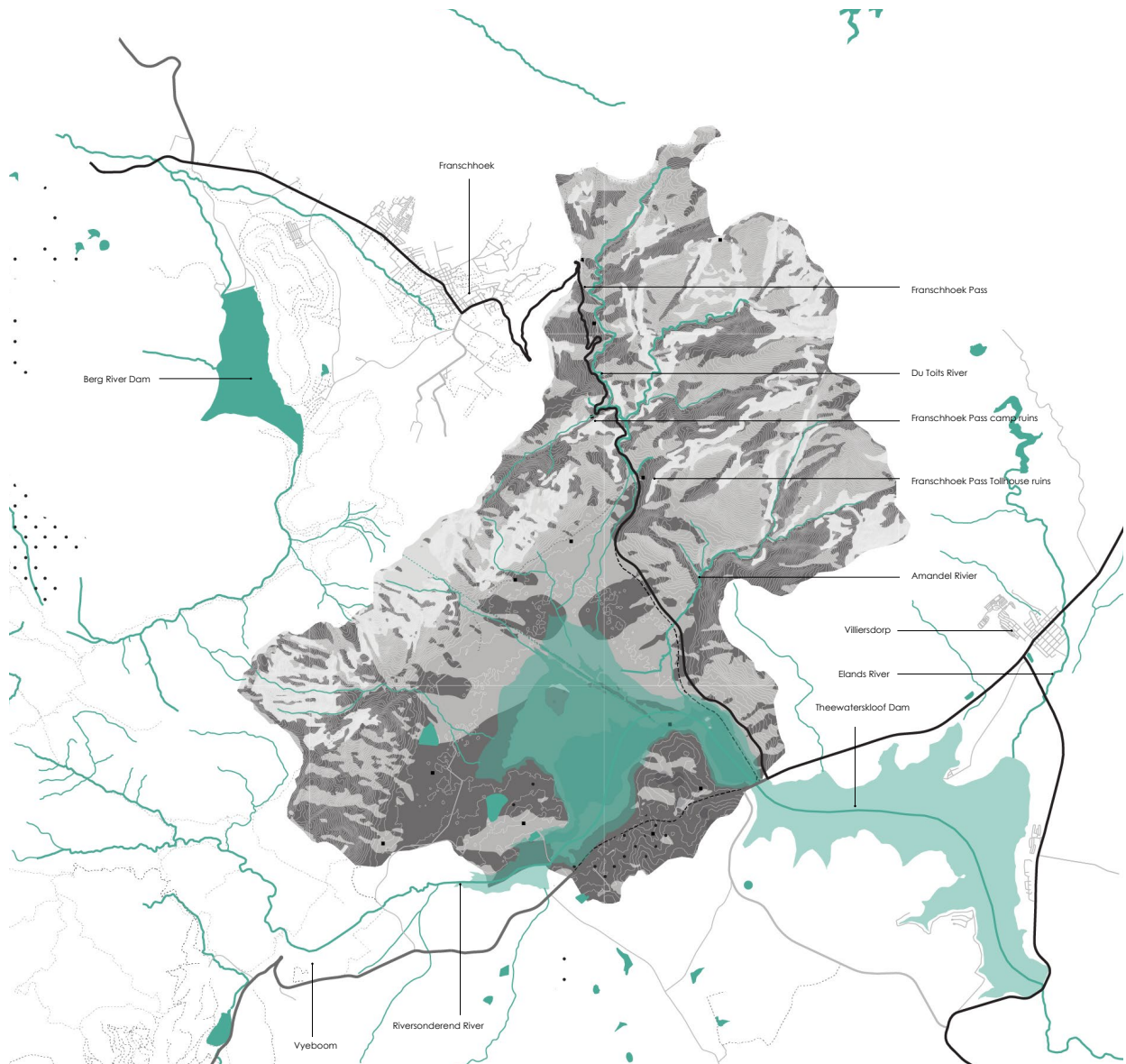
*Pinus pinaster* is the most invasive plant in the sub-catchment currently. The species prefers mountain landscapes and can handle both gentle and steep slopes. It thrives in sunny and well-drained conditions and grows rapidly in grass and shrubland.

- > Basic conditions
- >> Ideal conditions





## >> *Acacia mearnsii*



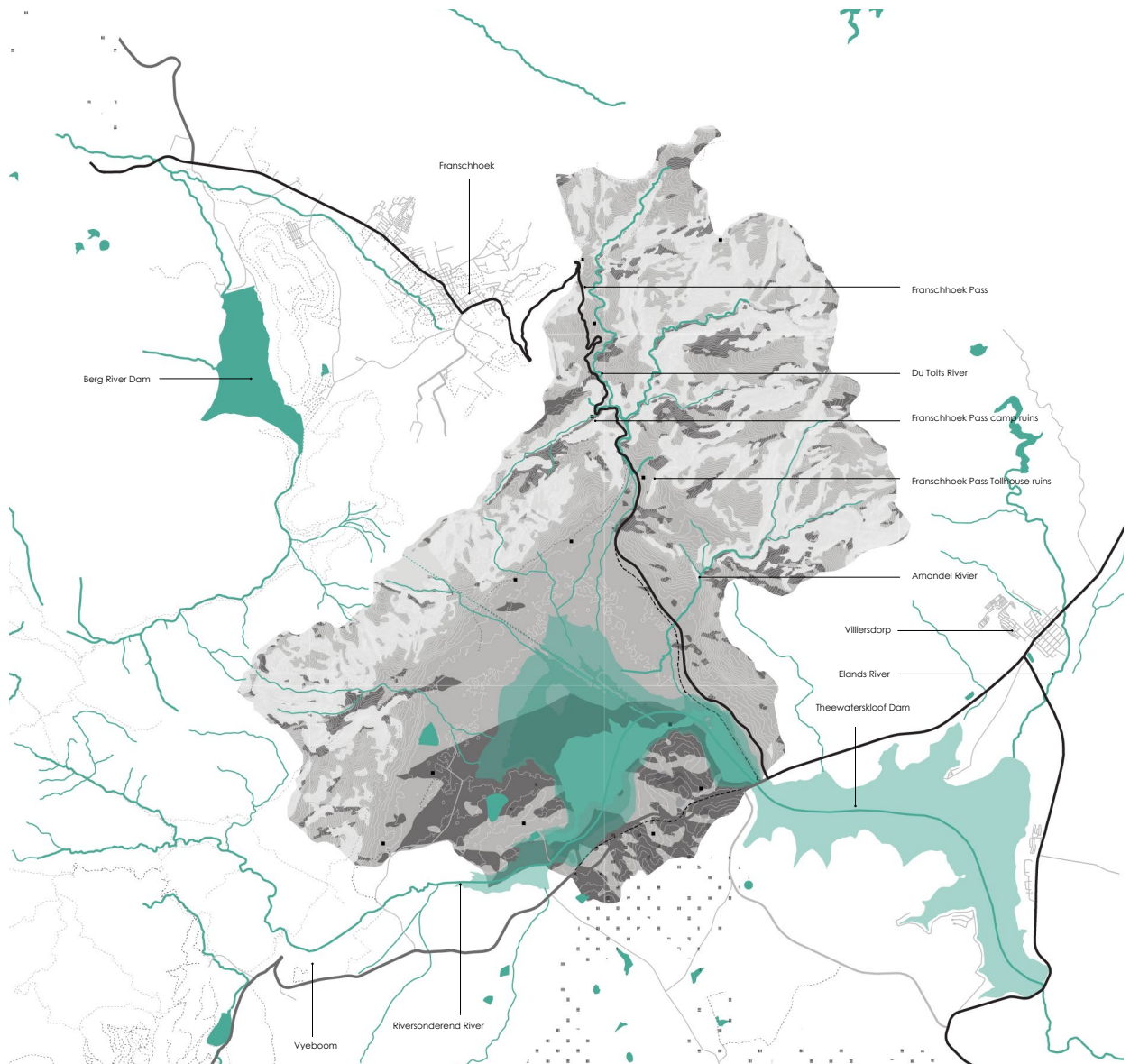
*Acacia mearnsii* has a potential to become widespread in the study area. Since the plant prefers to establish on relatively gentle slopes its reach stays low. However, as soon as other IAPs are removed or fire events happen, this plant thrives.

- > Basic conditions
- >> Ideal conditions





## >> Eucalyptus camaldulensis



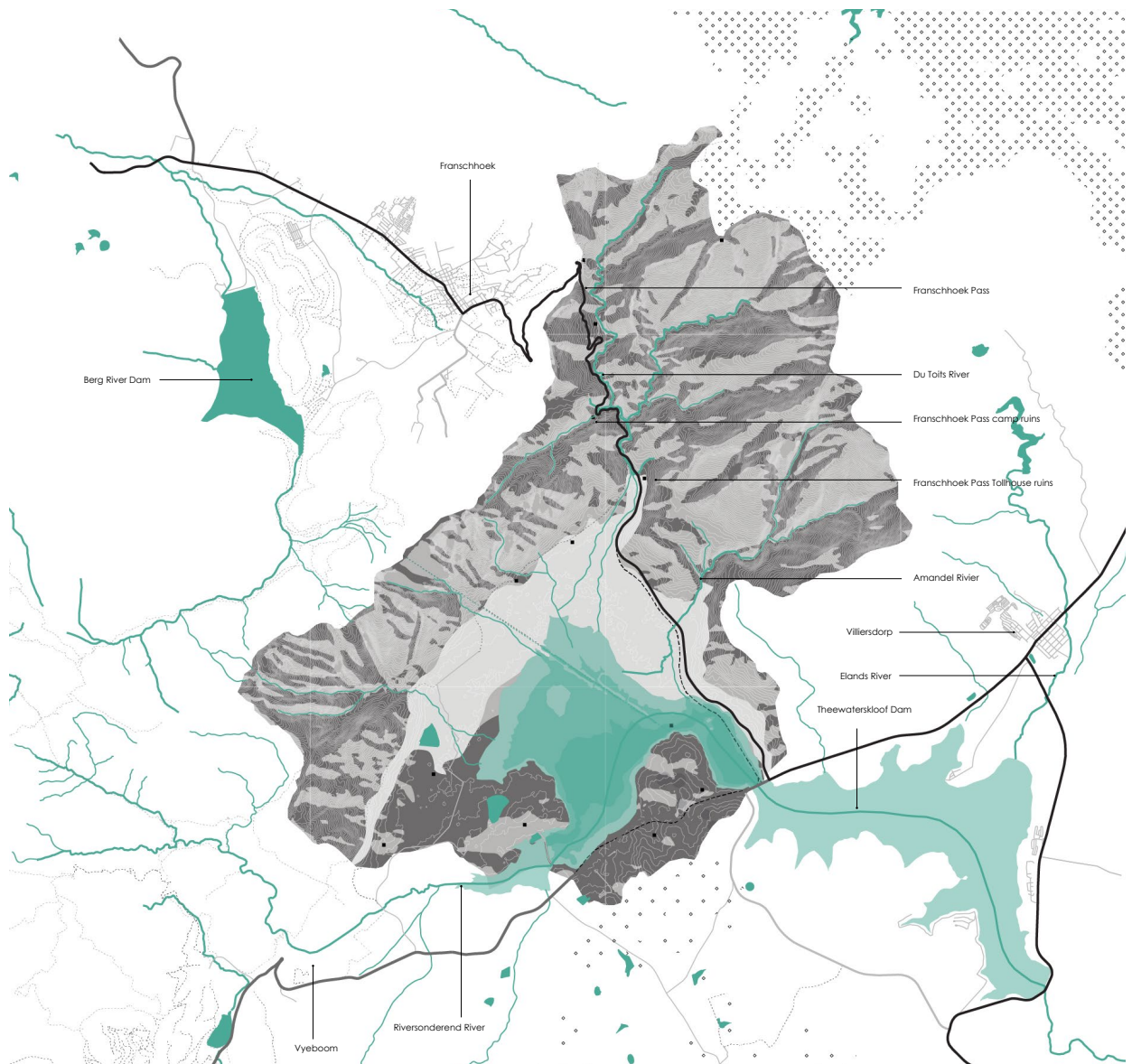
Eucalyptus camaldulensis prefers gentle slopes and full sun conditions, especially around water courses. The study area does not have many of these areas due to the mountains. The current spread is therefore also limited to farms and the dam.

- > Basic conditions
- >> Ideal conditions





## >> Hakea sericea



Hakea sericea has a wide range of sites it can establish in this sub-catchment. The species can handle the rough mountainous areas, both dry and moist conditions as well as places that are in shade. Fires kill the plant but allow seeds to be spread.

- > Basic conditions
- >> Ideal conditions

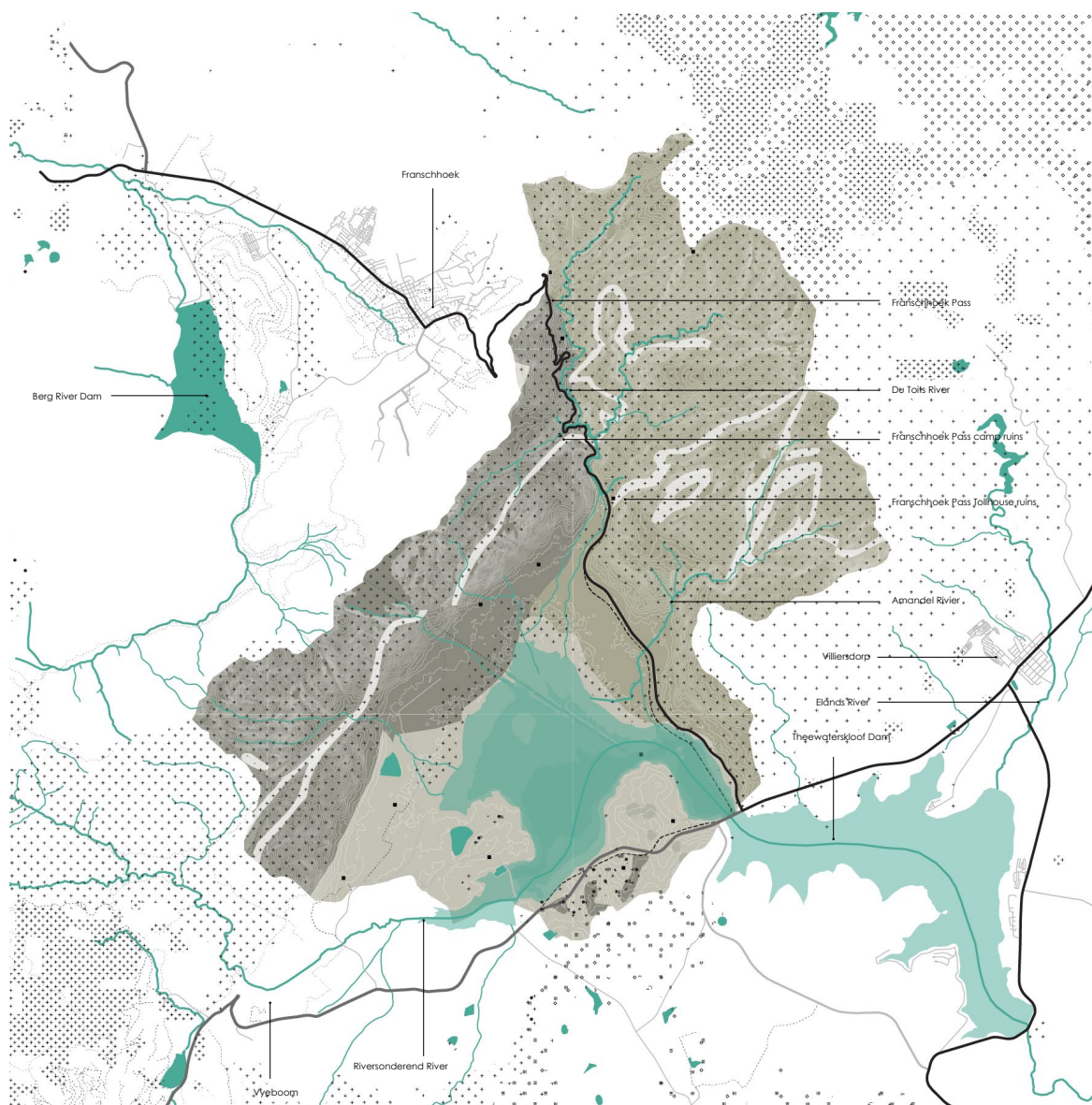




## >> TENSION <<

The installation on the following page features a representation of the current landscape. The landscape is one of tension. There are two sides of the coin, thus a duality in the landscape. There is a tension between the indigenous and IAP ecologies - questioning what is 'natural'. There is tension in what sustainability is or feels like; whether the management approach is a way forward or a hopeless act of resistance. Tension is positioned between the functioning of the system and the life-cycle of the IAP's, in which both are processes. Even on molecular level tension exists here; whether water or oxygen is more critical, respectively the choice of having trees or fynbos shrubbery..

In the long run, the IAPs will stay present most likely for a very long time due to its incredible adaptability, making the practice of clearing sound almost unsustainable (even though it currently is the best way to develop into). This theory must be taken into account for future decisions on permanent implications and interventions related to clearing. A design intervention that is safe-to-fail, becomes more resilient and responsive to change.



If clearing practices continue to lack resources, good management and skills, and future improvements and developments falls behind, then by 2100 most, if not all, of the 'natural' vegetation on this map will be covered by invasive alien plants, starting with the most critically endangered (CE).



1. Kogelberg Sandstone Fynbos (LT)
2. Hawequas Sandstone Fynbos (LT)
3. Boland Granite Fynbos (E)
4. Elgin Shale Fynbos (CE)
5. Western Ruens Shale Renosterveld (CE)
6. Western Coastal Shale Band Vegetation (LT)



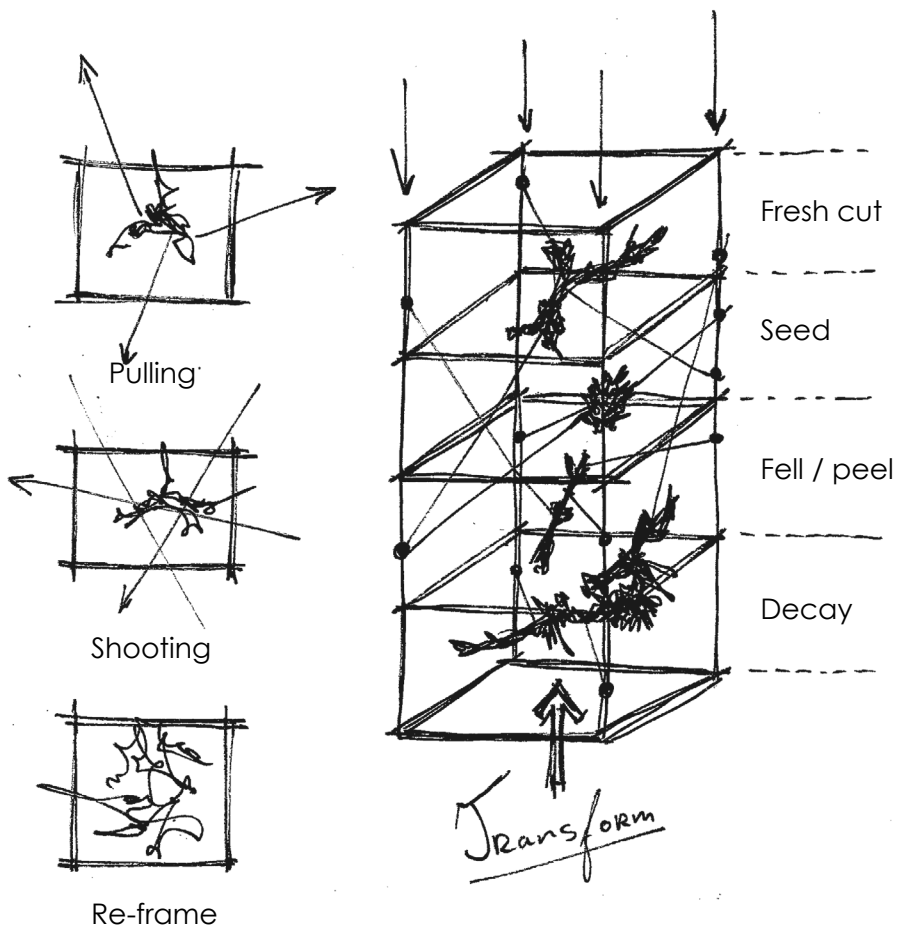
## + RECOMPOSING\_THE\_DECOMPOSING

The four verticals of the installation represent key elements that have an impact on the landscape. People, animals, vegetation and the earthly elements of fire, water, wind and earth become the main drivers of the tensions. Each of these verticals pull onto invasive alien wood. While the alien has landed in the landscape and made it its home, it has been imprisoned, left to rot. This stasis is forced onto by the elements of the landscape, wishing for it to be stuck in time and unable to move. The alien is not able to grow, transform, move or become something more than it is now.

Meanwhile the wood, a suspended component of the space, is creating an increased counter-tension. The relation of the wood with the landscape, affecting water flow above all, allows it to undergo various metamorphosis, becoming something new over time.



The wood found on site comes in six different forms: Alive / fresh cut, recently cut and left behind, seed cones / pods / husks, peeled bark, rotting / decaying wood, burnt / charred wood



## < THE\_SUSPENDED / THE\_RELEASED >

The alien invasive can shape the landscape. The recomposition by pulling, dragging, draping, suspending, cutting, felling, storing and combining the wood of the alien forms spaces, patterns, depths, layers and newly composed woody material. New insights and enhanced viewpoints are the results of Recomposing the Decomposing. Clues can be found in the making of the installation, such as finding space without allowance of touch and movement; looking for the tension and isolation of the invasive alien (wood).





## > LIVING\_THE\_SUBLIME

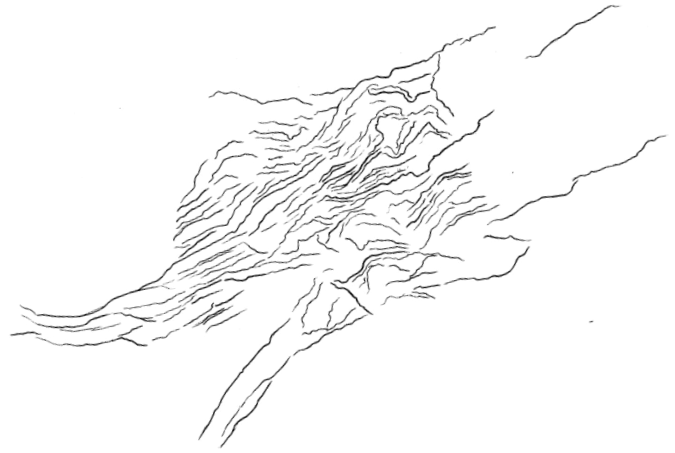
The installation speaks about the darkness that has been shed on the alien invasive plant species. Yet, in darkness there is excitement and awe. Given the right circumstances or conditions, the object or space can give off a level of unease and satisfaction simultaneously.

This piece of alien wood was brought in from the Theewaterskloof dam and is part of what is called the 'Ghost Vineyards'; expropriated land, submerged and exposed by dam water level fluctuations.

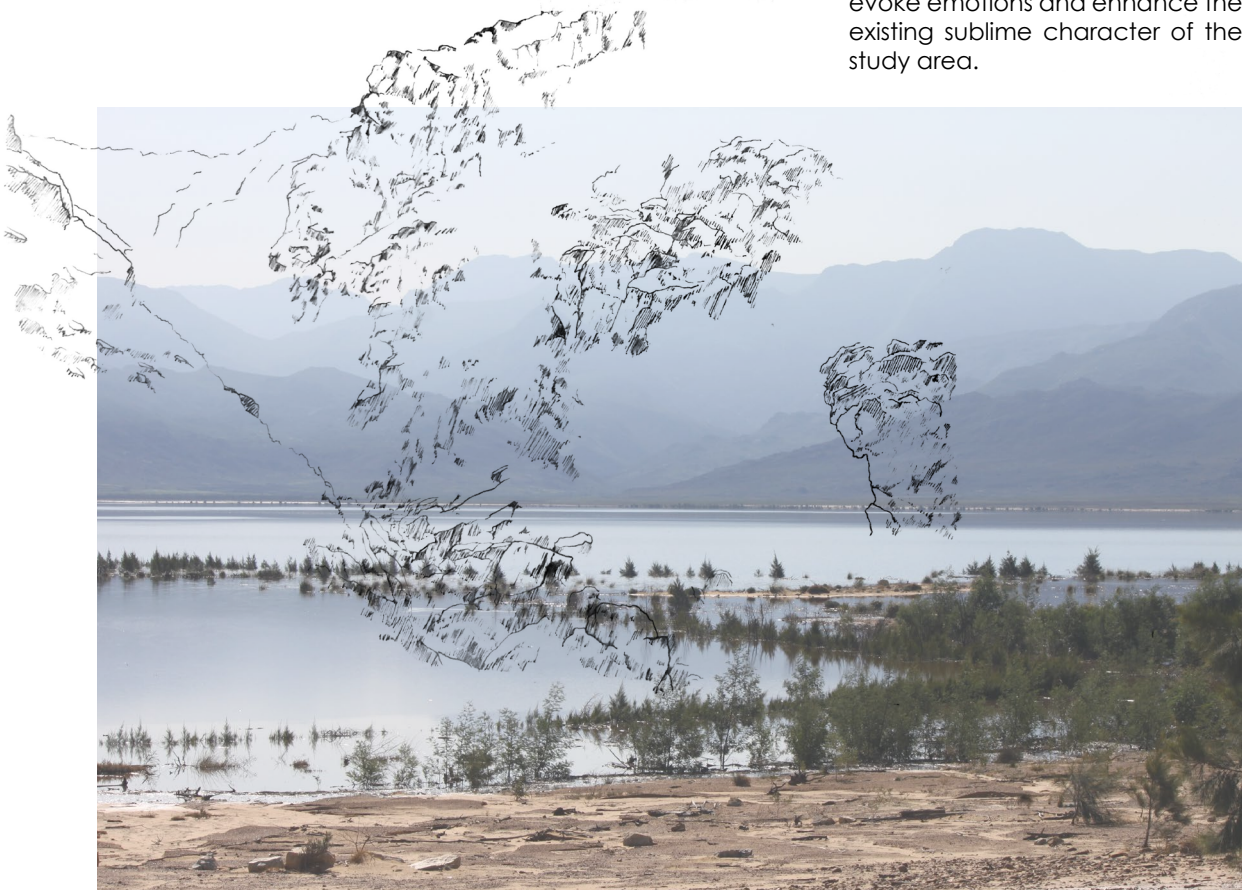


## DARKNESS

The invasive alien plant species prefer to stand in full sun, just as fynbos does. However, ironically most IAPs create vast amounts of deep shade, in comparison with the limited amount of shade fynbos vegetation creates. This competition over sun is one of the key issues to the loss of fynbos vegetation due to its slower and lower growth patterns. Darkness is embedded in the IAPs growth & patterns and creates, in combination and transition with fynbos vegetation, varieties of openness / exposure and obscurity, depth, enclosure / concealed impact with levels of transparency. The drawing of the exposed wood of the 'Ghost Vineyards' starts to speak in a similar way to some of these visually sublime qualities when held into the light.



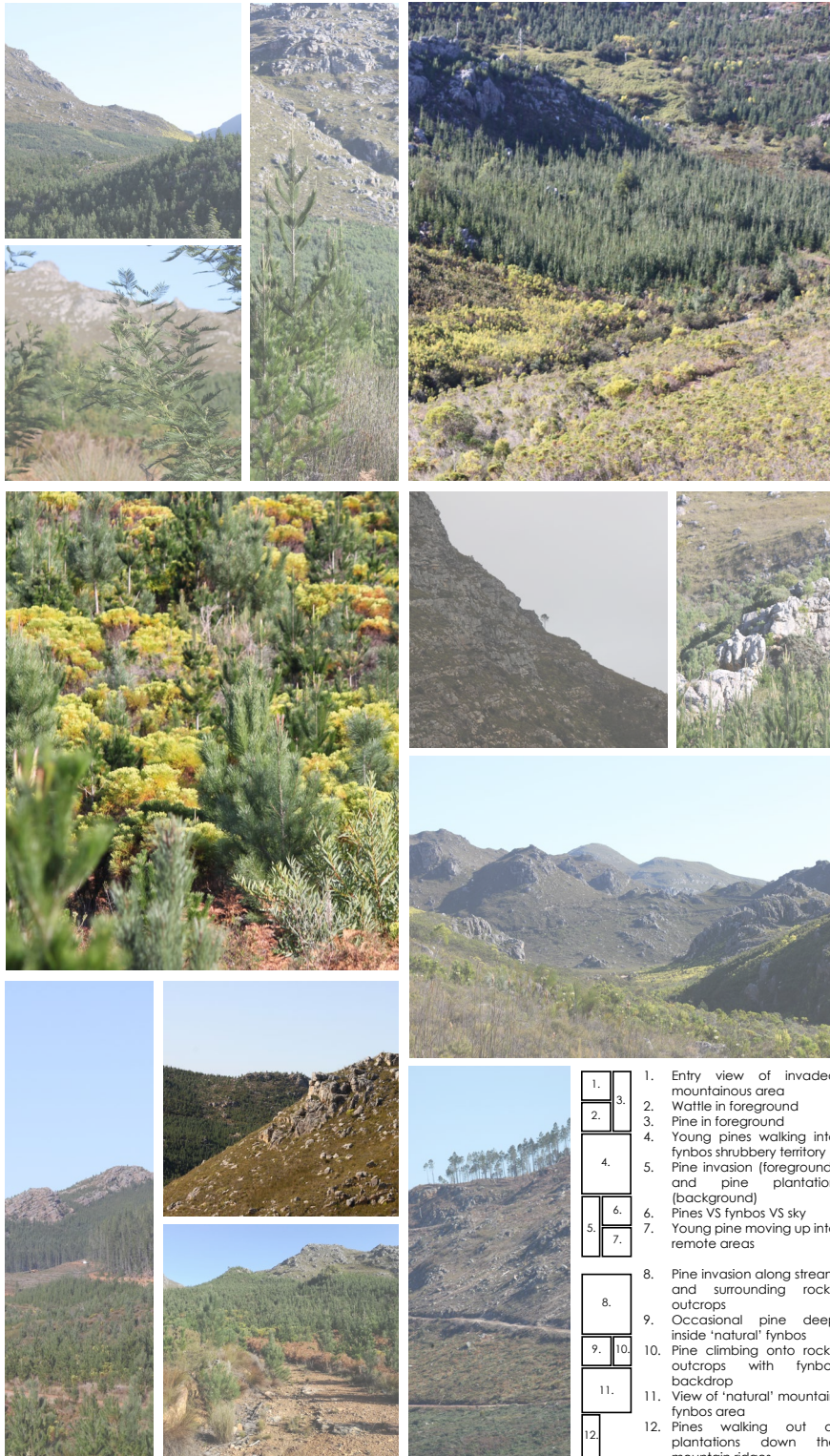
Patterns and expressions of darkness are formed through light. Finding this darkness in an object or image can inform certain experiences that are desired to be amplified and spatialized into a design of a space. Darkness in complex natural processes such as invasiveness and emergence can be abstracted to a human scale to create deep form. One can think of canopy / shade structures, enclosures, clearings and a slippage inbetween to evoke emotions and enhance the existing sublime character of the study area.





## > ALIEN + INDIGENOUS <

Alien invasive plant vegetation in the study area is strongly affected by change. Much of the change comes forth from clearing and growth patterns. This change of the plant species also creates a transformation of the visual landscape and indigenous vegetation patterns and compositions. Materiality now starts to speak about the combination of both the alien and indigenous vegetations, as well as the tension, transition and transformation of both components through interaction and integration with each other.



- |     |    |  |
|-----|----|--|
| 1.  | 3. | 1. Entry view of invaded mountainous area                      |
| 2.  |    |  |
| 4.  |    | 2. Wattle in foreground  |
| 5.  |    | 3. Pine in foreground  |
| 6.  |    | 4. Young pines walking into fynbos shrubby territory           |
| 7.  |    | 5. Pine invasion (foreground) and pine plantation (background) |
| 8.  |    | 6. Pines VS fynbos VS sky                                      |
| 9.  |    | 7. Young pine moving up into remote areas                      |
| 10. |    | 8. Pine invasion along stream and surrounding rocky outcrops   |
| 11. |    | 9. Occasional pine deep inside 'natural' fynbos                |
| 12. |    | 10. Pine climbing onto rocky outcrops with fynbos backdrop     |
|     |    | 11. View of 'natural' mountain fynbos area                     |
|     |    | 12. Pines walking out of plantations down the mountain ridges  |

## + FORM

### **Finding form through function, process and composition in the Landscape of the Alien.**

Ecological landscape planning and performance is a strong informant to design interventions within the Overberg region, and more specifically the mountain catchment areas of the Theewaterskloof dam district. The uncertain future of the study area requires any system that is introduced to be flexible, responsive and have the ability to adapt over time. Successful interventions must consider ecology, ecosystem services, the cultural landscape and the complex socio-economic conditions, relations and interactions. Besides that, the thesis and design research exploration outcome and process must develop a sense of admiration to the invasive alien plant species, that are so remarkably adaptive, a legacy of the past, a valuable resource and potential asset for an uncertain future. This concept can be used to influence form, experience and a better understanding. (Steiner, 2016) (Lister, 2016)

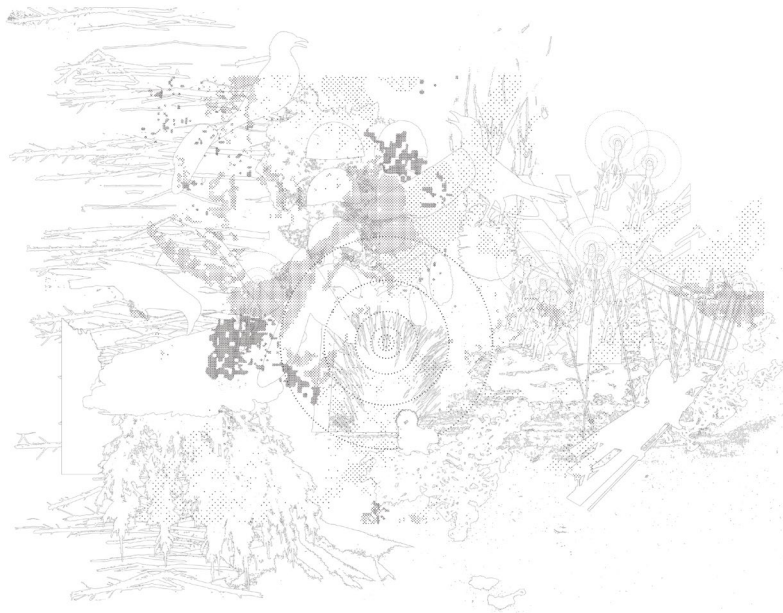
Hybridity, ecological thinking and an existing duality of context between practice, aesthetics and meaning are concepts that will be applied to the design exploration. The study area has a strong sense of place that can harness great potential in terms of representation through composition, story and systems. The theme of forming will predominantly come forth by looking at interactions of existing and potential features and processes in the landscape to design a new system, which primarily enables freshwater. Therefore, form generation will be manifested through function and process, creating an operative landscape which is also revelatory.



The landscape is one of tension and duality. There is a tension between the indigenous and IAP ecologies<sup>1</sup> - questioning what is 'natural'. There is tension in what sustainability is or feels like; whether the management approach is a way forward or a hopeless act of resistance. Tension is positioned between the functioning of the system and the life-cycle of the IAPs, in which both are processes. This tension of processes happening in the landscape, one of them the process of water flow, the other the spread and growth of the IAP's, suggests that process as a way of generating form is a very suitable way of finding form. The theory of forming is an approach and strong aspect of IAP clearing techniques to sculpt the land in order to gain a productive outcome in the mountain catchment landscapes in terms of resources, experience and engagement. Process driven actions related to this tense landscape include cutting, clearing, chopping, sawing, pulling, scraping, scratching, brushing, spraying, slashing, girdling, burning, digging, dragging and 'sjouwen'.<sup>2</sup>

The study area requires a responsive landscape approach in which representation of the above mentioned tension plays a large role in the IAPs and how we deal with them

physically. A design study on Invasion Science, with detailed thorough understanding, visualization and representation on various IAPs, will assist the generation of forming into a designed dynamic system through pattern, story and composition. Hybrid photomontage, mapping and drawing of the (dys-)composition of existing and potential elements, objects, aspects, interactions, relations and systems related to certain plant species can challenge the designer in creative ways of form making such as how to re-use material, allow for movement through the landscape, improve site conditions and see opportunities for an responsive mountain landscape that may breath both novelty and familiarity. New hybrid pathway construction technologies, acupuncture points of intervention, landscape rehabilitation modifications and tools or methods in management techniques and citizen science as processing & monitoring are aspects of the desired design outcome that will be influenced by form- making, generated through processes, systems, stories, phenomena and materiality of IAP's in the mountain catchment areas affected (the where goes what, how and why questions). (Serra, 2001)



Furthermore, the study area is identified as a popular recreation destination and seen as a 'natural' landscape, wherein the form generating process must make use of hybridity and representation techniques to allow both the system of IAP clearing and visitors experience that can subtly play on the dramatics of the surrounding environmental features / systems that are in place, to enhance access, engagement and expression in the landscape. By utilizing the aspects of the sublime and picturesque in the forming process as notions in the creation of access and intervention, this mountain catchment landscape can be seen as a place to become 'landscape', rather than mere land. This may lead to a sequence of encounters with a set of composed scenes, while always changing due to IAP spread, clearing, growth and decay. Management, as a process-based activity and system, can generate form to create a responsive landscape, which will include both visitors and people at work, can apply the Dutch recreation network concept of 'knooppunten' (nodes) as precedent in the rational formation of new routes and relevant points of intervention in the landscape. (Palma, 2016)

Ultimately, representation is the base of forming a designed hybrid and responsive system, in which imagination, emotion, effect and experience through composition are key aspects of the physical design, form making process and the desired outcome. One specific exploration on the 'workings' of the IAP species and its accompanied tension to find inspiration and respond to the landscape that would address the pressing issues regarding enabling freshwater, will extrapolate greatly on the methods of representation to find form, function and intervention in the process of ecological landscape planning and design.

# ACTIVATE

THEWATERSKLOOF\_DAM

## V. PROPOSED DESIGN - INTRODUCTION

The design proposal comes forth through the design study of 'The Landscape of the Alien'. Through analyses of the study area and doing research on current clearing technology, landscape ecology, forestry & agroforestry, cultural landscape & history, a shift in paradigm and search for solutions has been developed to solve not only a very pressing and complex issue, but also to find and reveal value in invasive alien plants as a resource and potential asset for the future. Additionally, emotions of conflict, tensions and reflections on alienation and belonging are tested through semiotics and semantics in concept designs, diagrams and photomontages to reveal the connotations associated with IAPs, while bringing a sense of personification and paradigm shift to the table. Theories of Cyborg landscapes, infrastructure, ecology, and history & memory have been used during the process of the project. The final design is set in a framework consisting of a network of trails to encourage access, with the Old Tol House Village site as key design intervention. The site of the Old Tol House Village is situated along the Franschoek Pass and at the confluence of mountain, river and wetland (going directly into Theewaterskloof Dam). This site is currently abandoned, overrun by IAPs and filled with traces related to human and natural disturbance. Methods of trace and pattern have been used as central informants to the design concept. The site hosts a set of functions such as entry to the mountain and wetlands for IAP clearing, monitoring and resource extraction, a resource depot and process site of (woody) plant material, wood craft and skills development centre, rest-stop and recreational space for outdoor activities such as mountain biking, hiking, bouldering, birding, etc. The design will focus on engagement and reflection of the above mentioned experiential topics while being a functional and productive space.

## PROPOSED DESIGN - SUMMARY

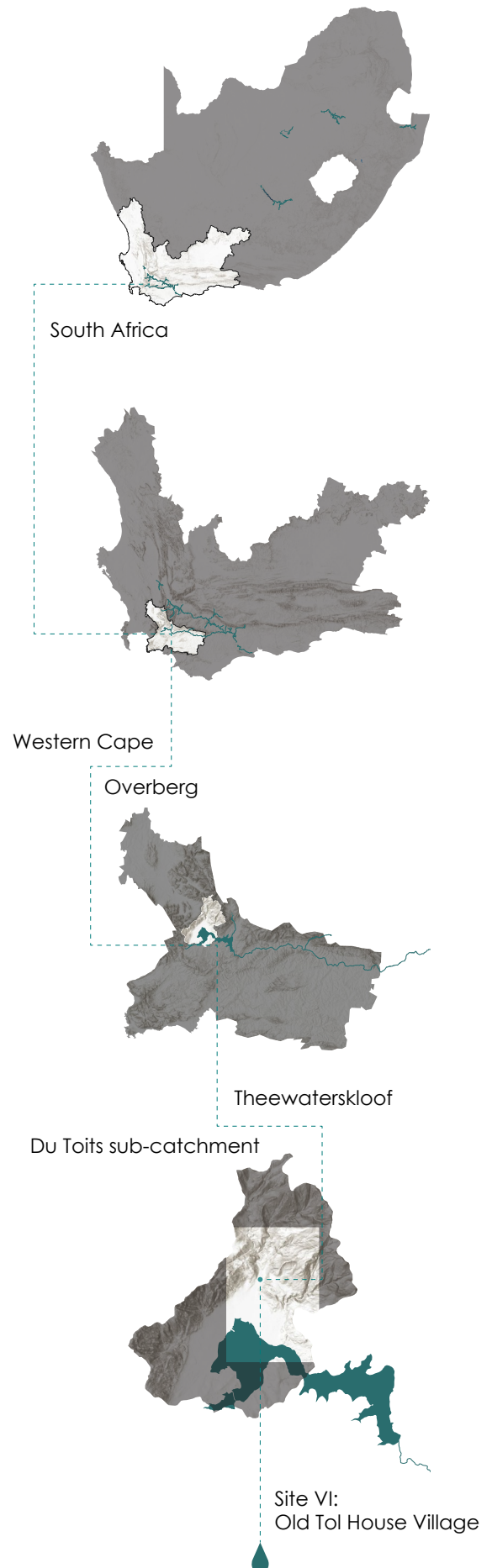
Before being able to intervene in the Landscape of the Alien it is important to understand the impact IAPs have onto the landscape in both a positive and negative light. The understanding and explorations from the design study are taken directly into the following steps to understand context and precedent.

First of all, an interrogation has been done on what current clearing and controlling techniques are in relation to the alien plant invasion in the study area. The outcome can tell us that most zones in the study area that are heavily infested by IAPs are not controlled, nor touched at all due to extreme site conditions and currently inaccessible terrain such as marshes, rivers and mountains. The other consensus comes forth as an act of clearing techniques that are not strategic and even counterproductive. Encouraging access to and in rather strategic locations to control, hold and contain while being able to do regular monitoring and clearing, can assist the management scheme immensely and create new opportunities for resource extraction, local skill development, ecosystem composition and tourism.

The second concept of transforming alienation through integration cannot be seen without the first concept of encouraging access and is essential to prevent IAPs growth & spread acceleration, as well as water sensitivity. This concept places itself onto the Theewaterskloof dam and calls for a transformation of the dam (back) into a wetland zone for aquifer recharge, sedimentation, climate adaptation and integration with the surrounding landscape.

The framework with new access routes, points of intervention, dam integration and enhanced engagement responds to the IAPs in the study area in a fashion to create a sense of belonging to our perceptions. Simultaneously the framework generates a shift in equilibrium to integrate and transform the IAPs in the mountain catchment as a valuable resource and potential asset for the future. Although this may sound as a clash and contradiction to water resources, it is important to find a place inbetween for both IAPs indigenous vegetation. We cannot eradicate IAPs from the landscape, therefore we should strive to rather safely and strategically integrate them in the landscape to make the best of it. This approach still extrapolates on water sensitivity by securing unaffected zones in the catchment from IAPs while allowing transformation of perceived alienation into a sense of belonging.

Within the framework critical points of intervention are highlighted as potential sites for design development. Such points will focus deeper on transformation and integration of alienation within the context of a site. Historical background, complex natural processes, celebration of IAPs as a resource and reflections on alienation and belonging are considered in such sites to hold the management strategies within the framework. These sites also allow users of the space to realize the potentials of the mountain catchment as a productive landscape machine for local and regional engagement. The Old Tol House Village site along the Franschhoek Pass has been developed further into a proposed design which brings the framework down to a human scale of understanding and experience.



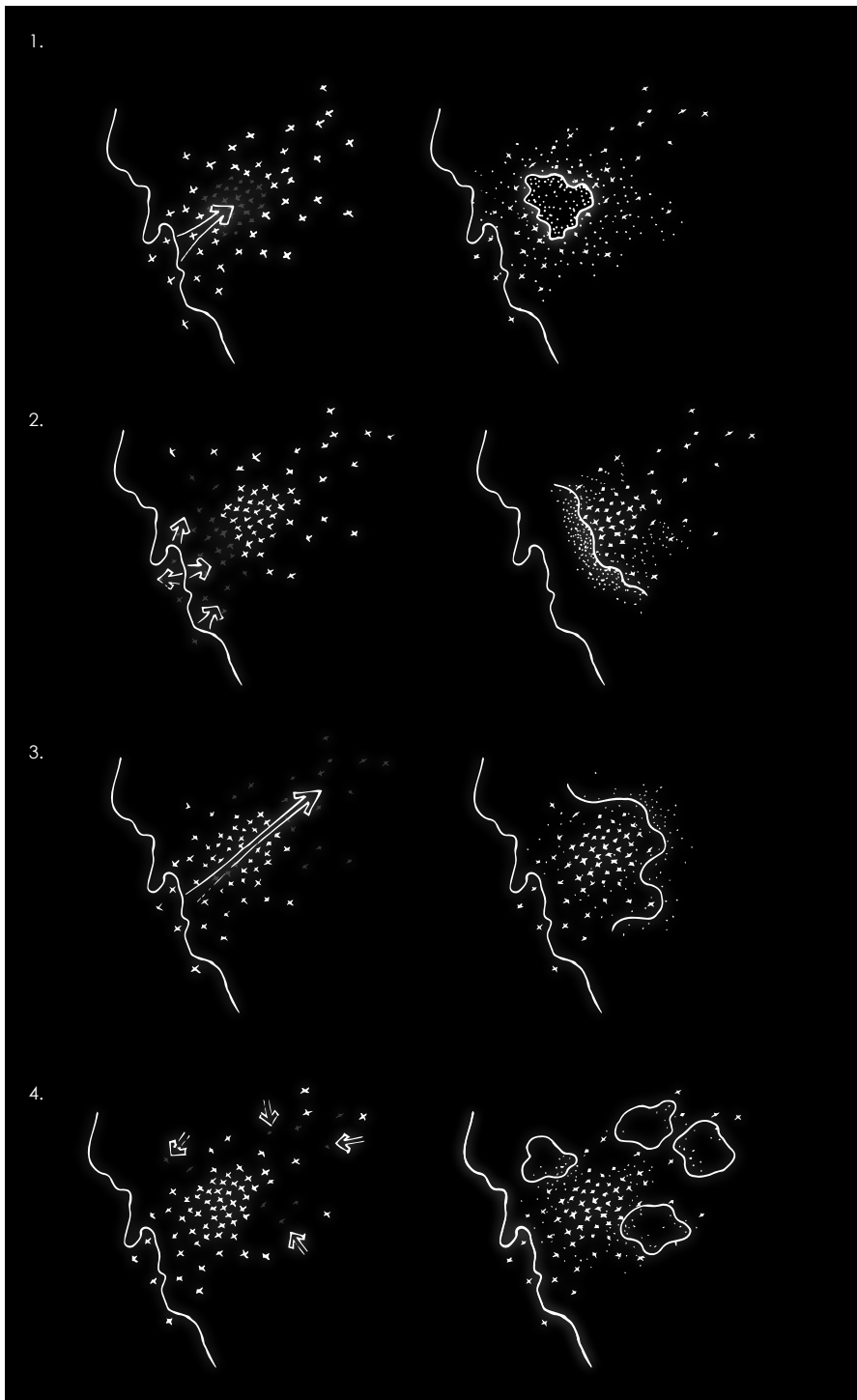
## + BATTLE\_STRATEGIES



It may seem quiet dramatic, but we are in battle. Invasive alien plants can destroy resources, habitats, biodiversity and livelihoods. We are now at a point where we will not be able to remove all the IAPs, in fact they will stay present for many more years to come. The goal therefore is to contain and reduce as much spread as possible, so that unaffected areas may be spared. There have been various 'battleground strategies' to remove and reduce the invasive alien spread. The diagrams below illustrate some of the most prominent current techniques and their impacts and performances.

Cleared space

Re-established space  
in 1 - 2 years



### 1. 'Smash attack':

This technique of clearing can get rid of dense stands at once. However, all the surrounding areas are left untouched and can increase the spread again within as well as to areas outside the range.

### 2. 'Defence / bide':

A defensive mode may help the spread along existing access relatively quickly, but actually conceals the real issue that develops further away. It is effective for reducing spread here, but ignores invasive spread elsewhere.

### 3. 'Sneak attack':

While it takes longer to reach these remote areas, it helps limit the spread into other areas beyond reach. It basically is an attack from behind, however leaving the front exposed to spreading.

### 4. 'Focus attack':

This strategy focuses on key areas (currently done by helicopter teams). This can assist in reducing invasive spread into critical unaffected areas. This leaves other areas untouched though. Even with biological control methods the impact of containing and reducing may stay minimal.

## < CURRENT\_CLEARING\_TECH

One can test design influences in scientific outcomes through various approaches about water sensitivity and mountain catchment resource systems. Depending how you set up the system, this will influence the outcomes.

The theory of forming is an approach and strong aspect of clearing, eradication and management techniques to sculpt the land in order to gain a productive outcome in the mountain catchment landscapes in terms of resources and habitation.

Materiality transformations through natural and human processes and activities of clearing: cutting, chopping, sawing, hacking, pulling, scraping, slashing, shooting, scratching, brushing, spraying, burning, digging, dragging and 'sjouwen' (Dutch for carrying heavy loads).

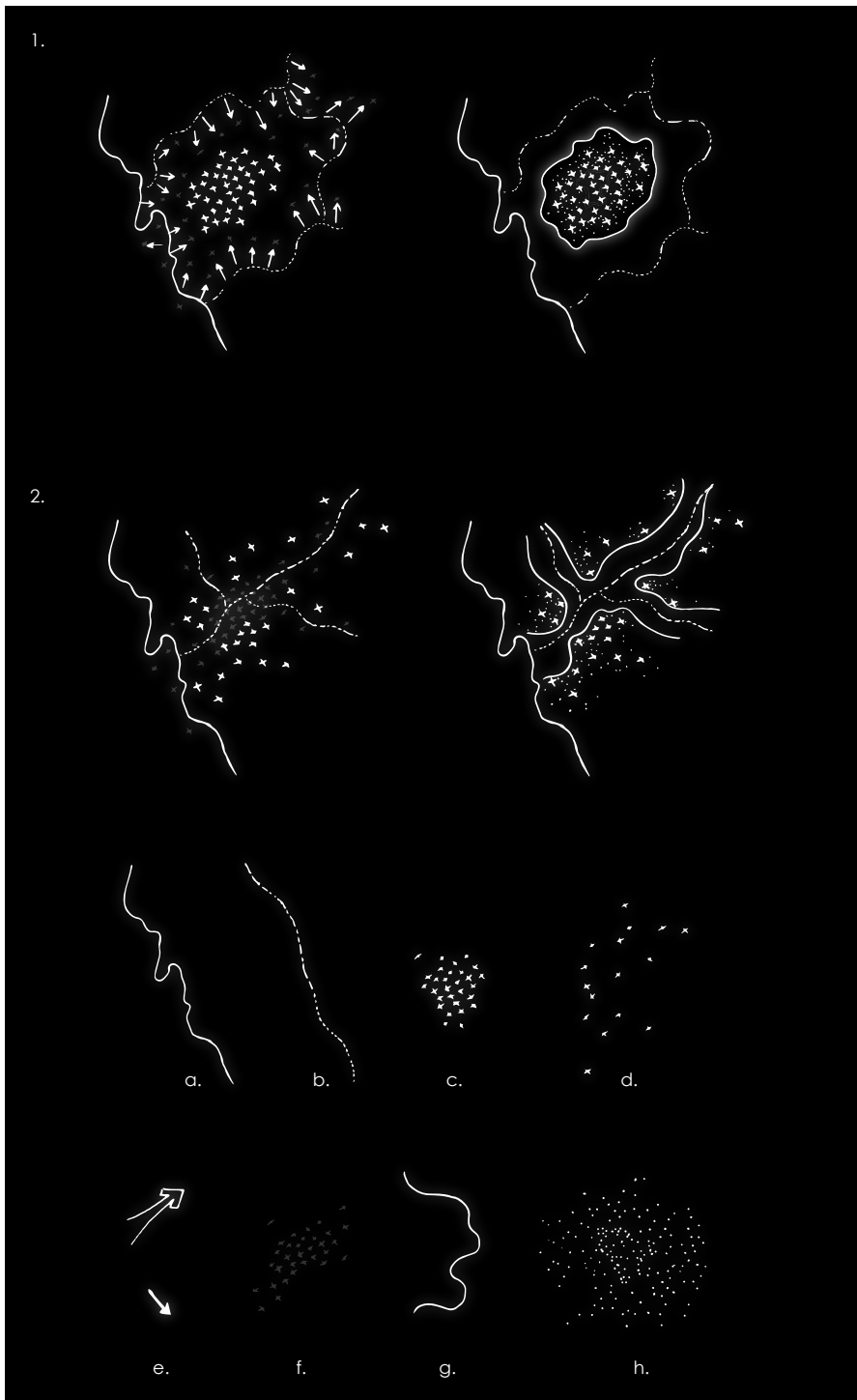


## > BATTLE\_STRATEGIES



In the current situation we will not even be able to contain the invasive alien plant spread due to a lack of support. The support needed comes forth from political, economical, social and cultural aspects. Some aspects include, financing, skills development, infrastructure, education and awareness on both local and regional scale.

In this diagram the infrastructural support in terms of access routes has been added to provide a greater performance and longer lasting effect in battle. This upgrade will not only assist in the fight against IAPs, but also generate a better understanding of the IAPs and its related practices. In addition, it will generate more education, awareness and experience from locals and internationals since it becomes a recreational component. The technique of 'Enclosing' has been considered most successful in containing IAPs.

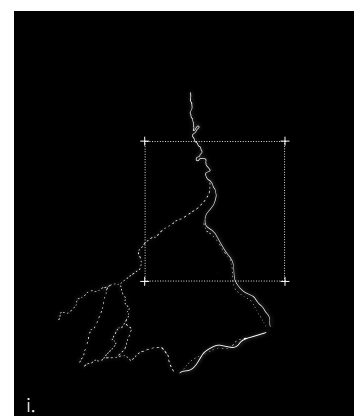


### 1. 'Enclose':

By having routes and access around dense stands and through scattered zones, one can actively control the movement of invasion and contain the group of IAPs in one spot. Once enough momentum has been made, one can remove the condensed stand easily.

### 2. 'Charge':

When routes and access are established through dense stands it can reduce the spreading factor greatly. However, areas that have a scattered character at that moment can become an issue in controlling and containing due to its wide range across the space.



### Legend:

- a. Main existing route (pass)
- b. New access routes (paths)
- c. Condensed IAP area
- d. Scattered IAP area
- e. Clearing activity (Large or small scale teams)
- f. Cleared existing IAPs
- g. Outline of cleared area
- h. New IAP spread potential
- i. Existing infrastructure in study area

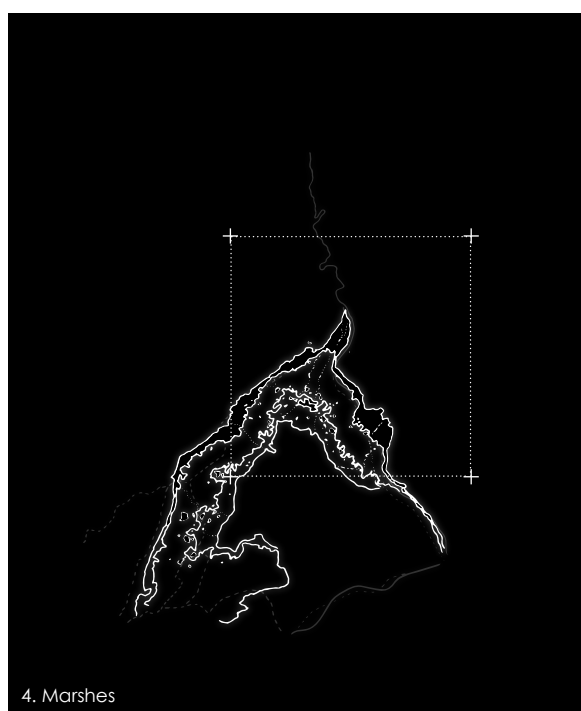
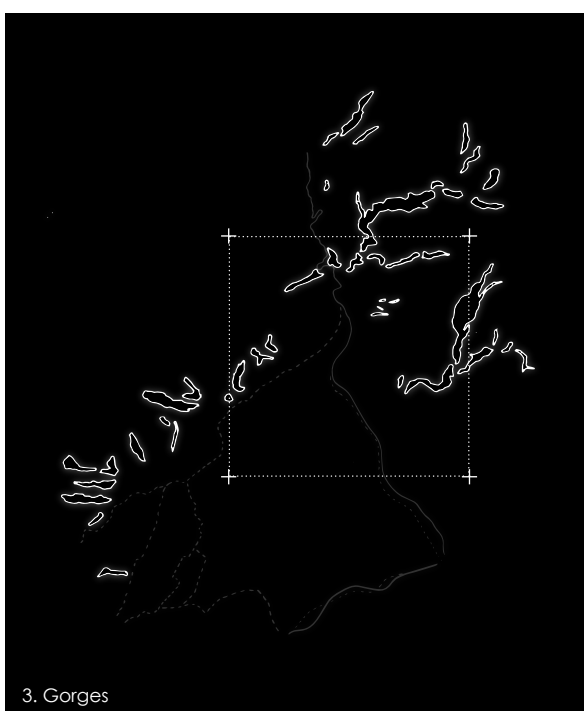
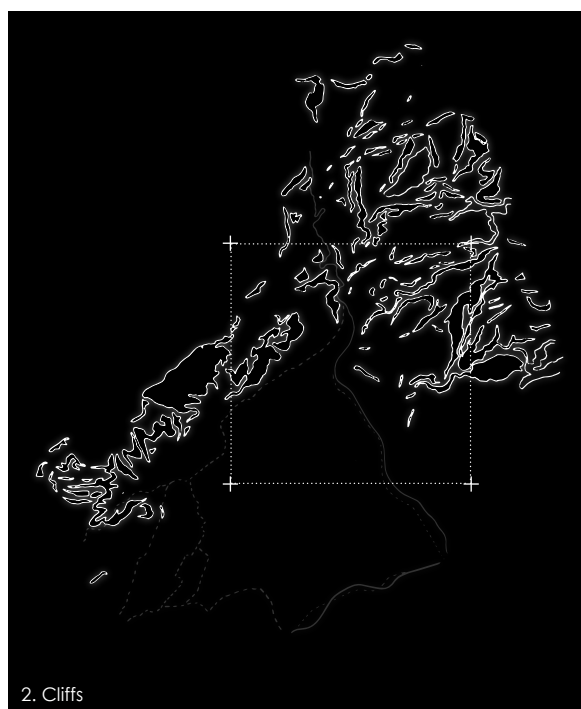
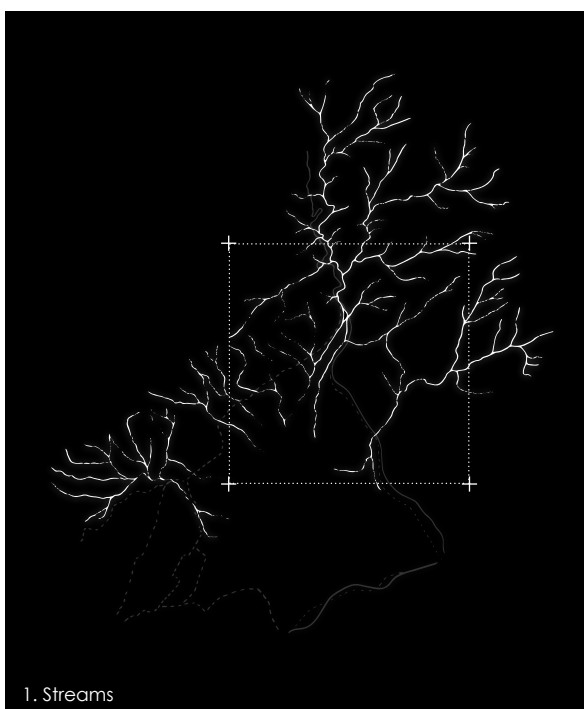




## + MOUNTAIN TYPOLOGIES

Current clearing management practices prefer to skip or ignore areas that are inaccessible; and that is understandable. Cliffs, gorges, ridges, edges, scree, marshes and streams, predominantly during peak rain or storm events, are typologies of the mountain that are preferably skipped when doing IAP clearing in the area due to their dangerous and difficult-to-cross character. Spaces without shade can be very harsh as well during hot summer days. The lack of infrastructure (specifically in this study area) extrapolates on that, leaving much of the area 'untouched'.

1. Topography allows run-off to be collected down specific areas. Streams and rivers pose a risk during peak rain and storm events.
2. Cliffs can reach slope percentages from 50 to 100. Many of these are mountaineer dreams, but completely inaccessible for the general public. Part of these are also scree and alluvial fans due to its loose rock debris by erosion, even forming landslides.
3. Gorges are dangerous mountain typologies when unnoticed. This typology, created by intense erosion through water, forms an obstacle when trying to move through an area.
4. Marshes and wetlands may pose a difficulty in access due to the lack of stable ground and undefined swampy depths.

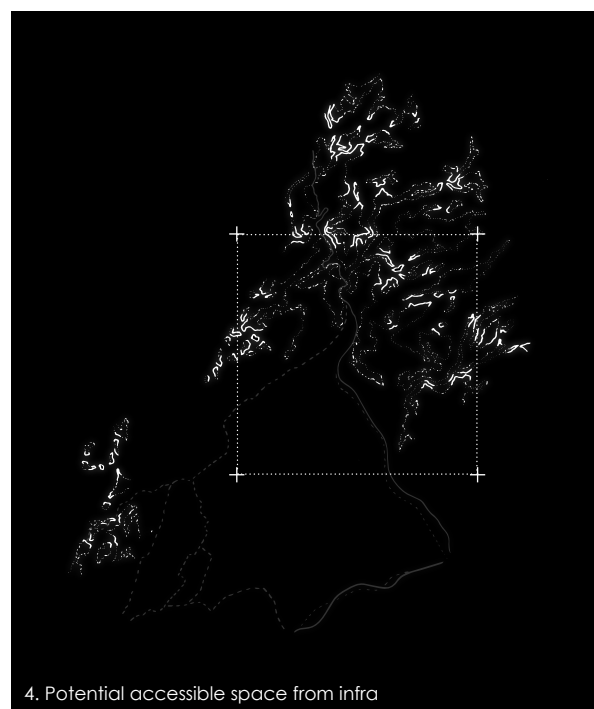
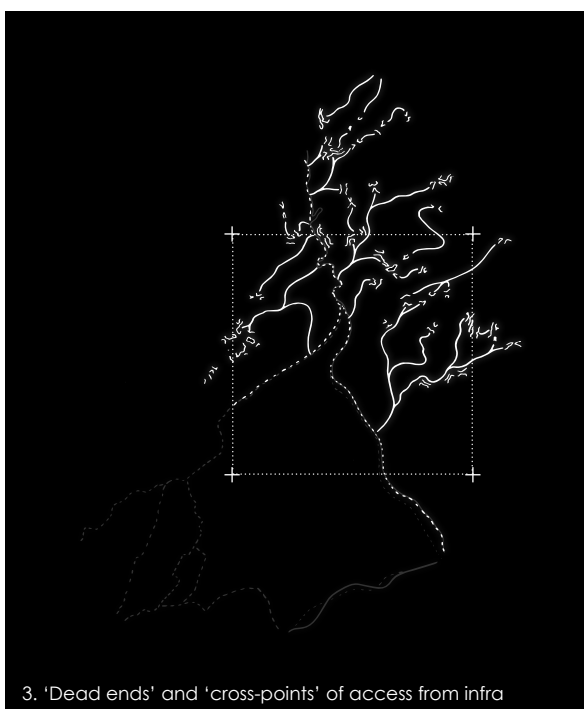
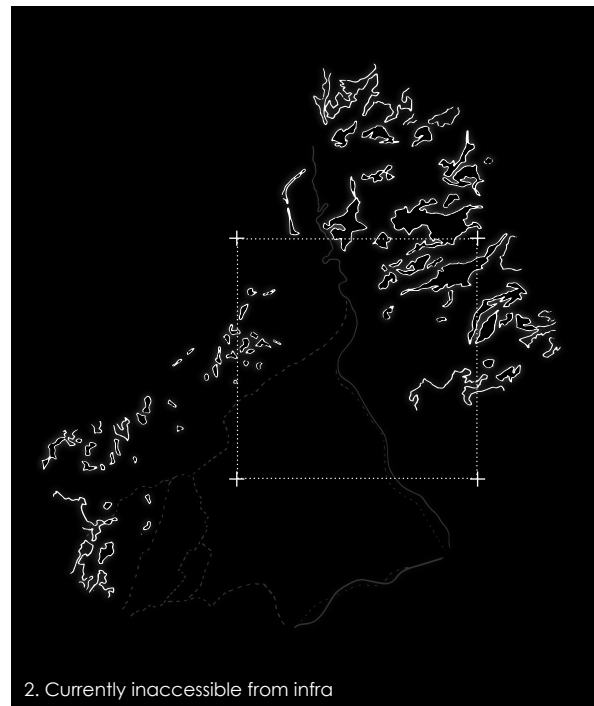
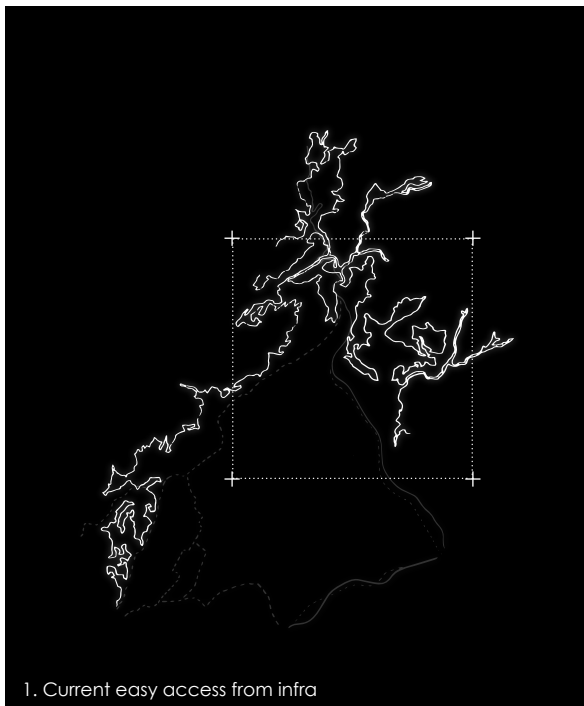


## >> MOUNTAIN\_ACCESS

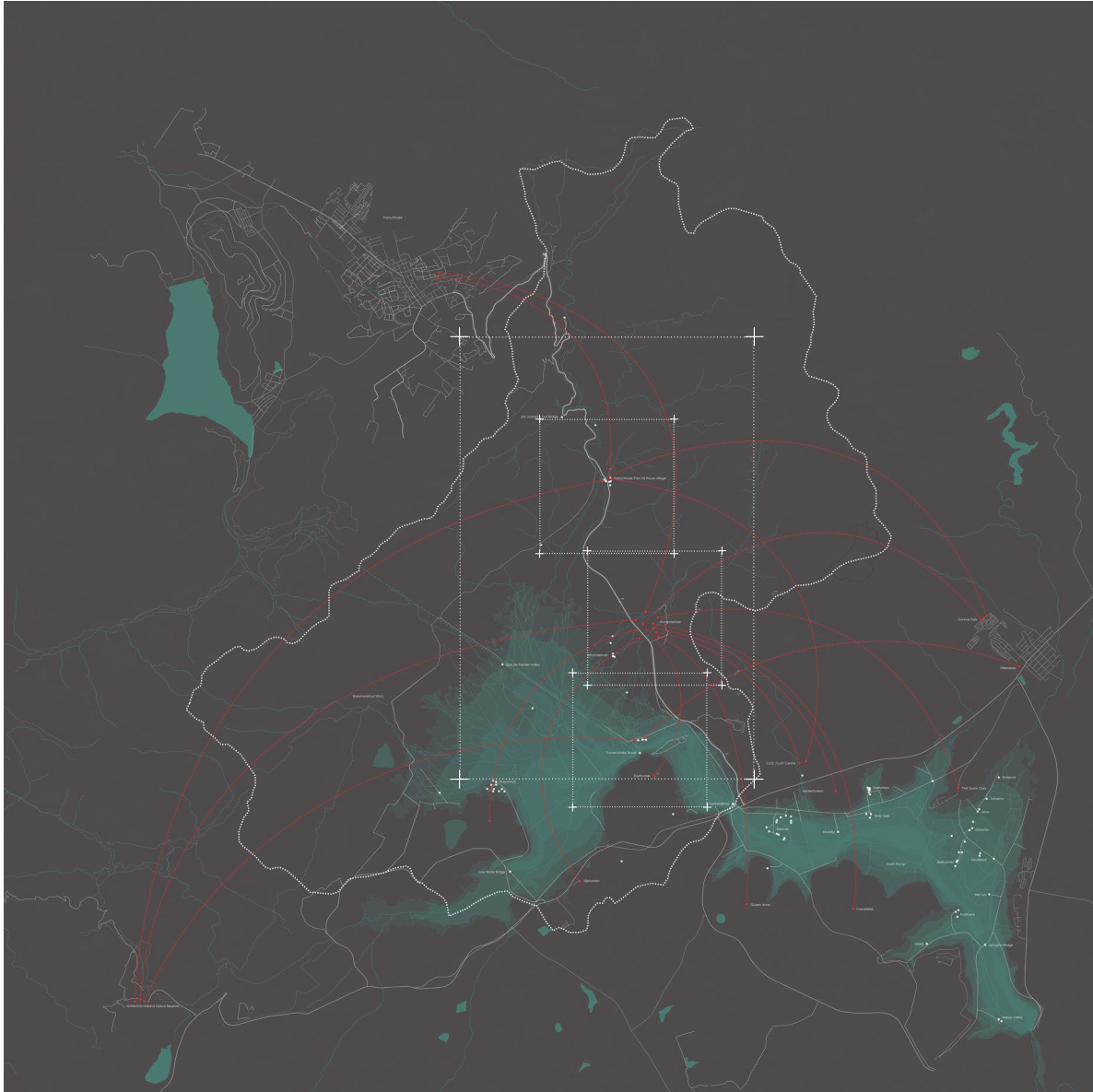


The most inaccessible areas are unfortunately the most affected by invasive alien plant spread. Access to isolated, relatively accessible areas is also limited due to the mentioned mountain typologies. Yet, if these spaces can or will not be entered, cleared, controlled and monitored, the IAPs can continue to spread across the area uninterrupted. By assessing the study area on specific accessibility factors such as existing infrastructure, gentle to steep slopes, streams and riverbanks, one can predict which areas will be ignored or skipped, where the easy access is halted and which isolated spaces could be reached easily once entered.

1. Currently relatively accessible spaces; infrastructure and gentle slopes <20% (coverage  $\pm 30\%$  of the study area)
2. Isolated relatively accessible spaces; gentle slopes (coverage  $\pm 30\%$  of the study area)
3. Furthest points at currently relatively accessible spaces (dead-ends) and their most narrow points to cross spaces.
4. Spaces that could be accessible once dead-ends are connected (>70% of the study area)



## THE WATERSKLOOF\_DAM

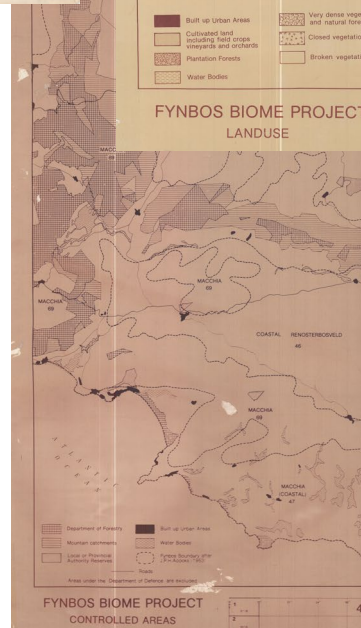
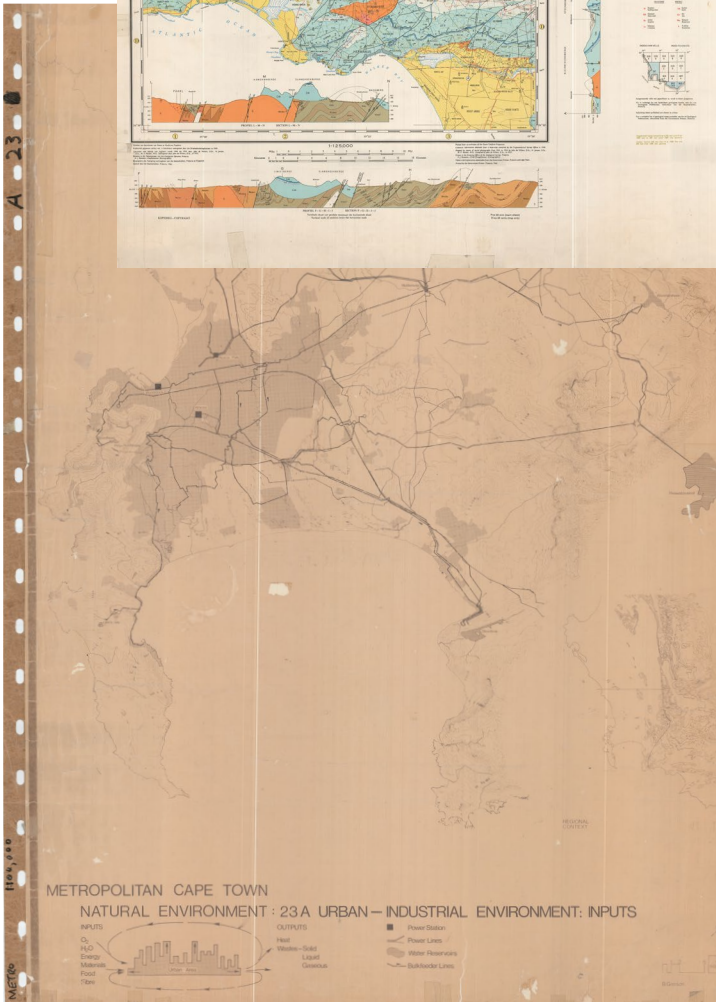
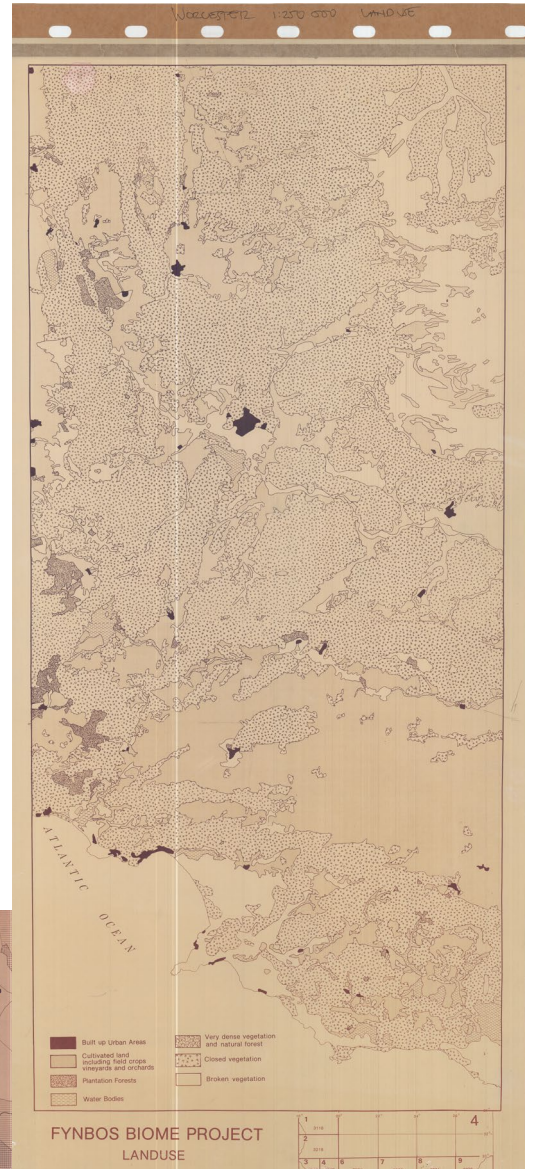
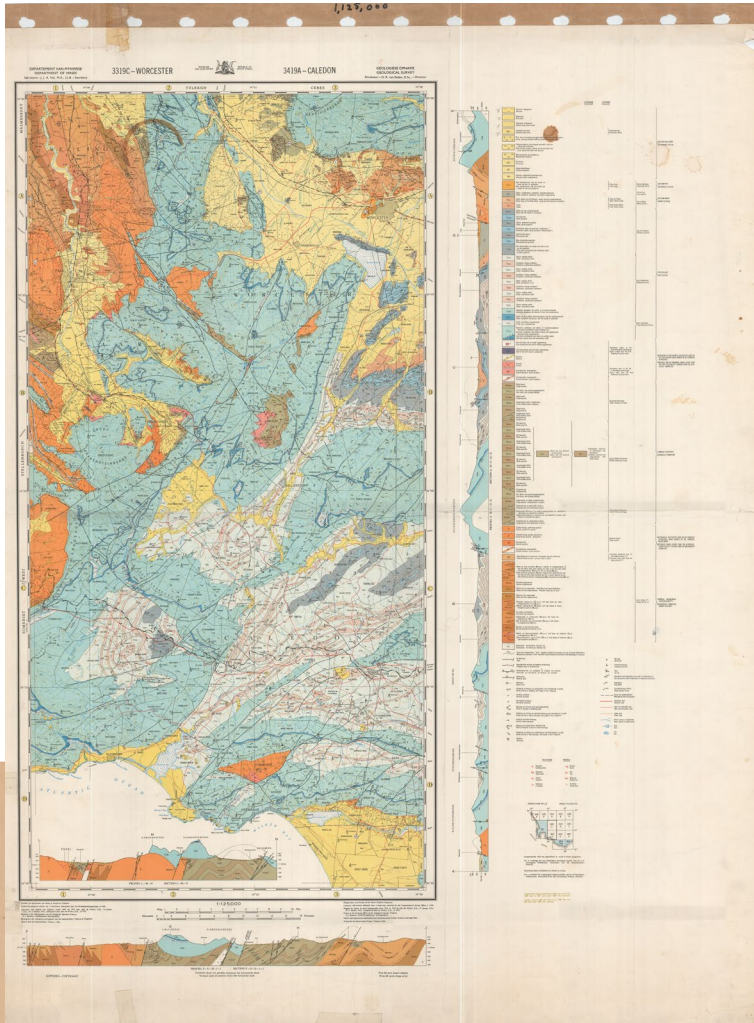


After analyzing the Du Toits sub-catchment it was discovered that I must zoom out to capture the necessary systems for connection and interaction with people. This is critical to make the proposed concepts function well with regards to management of clearing, monitoring, rehabilitation, processing, as well as creating a sense of ownership, empowerment, experience, consciousness and education.

Shown in red are the human movements to and from the area. Three sites are explained into further detail on page 66.

# HISTORIC\_MAPS

Before the 'aliens' had landed and made Theewaterskloof their home.



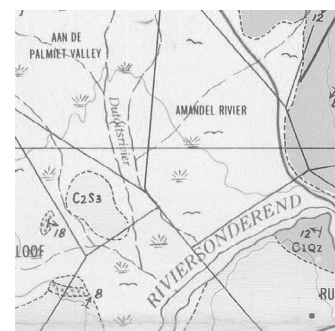
## < THEEWATERSKLOOF\_WETLAND

Historically the area where the Theewaterskloof Dam sits currently was once a vast, and one of the largest, mountain wetland / seeps in the Cape. Large herds of mammals such as elephants, Cape zebra, Buffalo, wildebeest, Eland and other antelope came to the Theewaterskloof dam area for grazing. This was also known to the Khoi-Khoi and San people who came through the space regularly before white settlers arrived.

Only 200 years after the arrival of the Dutch settlers, this area was reached through the construction of the Franschhoek Pass. By that time settlers spread across the Overberg Region and started farming communities. The Theewaterskloof wetland area was found very fertile, thus orchards, vineyards and tree plantations popped up along the wetland zones in this area. During the 1960's there was a huge water shortage in Cape Town and it was decided to build the Theewaterskloof Dam, submerging farming communities and large quantities of the wetland.

The 'Ghost Vineyards' have become a hidden icon of the submerged landscape of the Theewaterskloof Dam. The 'Ghost Vineyards' are the woody parts of grape vines standing on the Eastern side of the dam and have not rotted away due to limited water level fluctuations. Thousands of these wooden structures still stand today and are only visible when dam water levels reach 25% of its total capacity.

A map from 1941 (pre dam construction) overlaid by a map from the 1980's (post dam construction), revealing what lies underneath the water surface.



# GHOSTS\_OF\_THEEWATERSKLOOF

Water inflow into the Theewaterskloof Dam has been decreasing for many years. Water is lost through evaporation, extraction by IAPs, irrigation and human consumption. The result of these factors is that the dam becomes a dry, dusty bowl. However, there are hidden relics on the surface that become more frequently exposed and re-emerge as ghosts of the past. The 'Ghost Vineyards', are the icons of a drought due to their unique location, structure, pattern and relation to the area. Many exposed remnants draw hordes of people onto the floor of the dam by excitement, curiosity, inspiration and intrigue. When dam water levels are low, various unexpected activities take place such as festivals, movie recordings, photoshoots and group hikes searching for driftwood and other objects, as if it were a beach.



1. Ghost vineyards up close
2. Farm truck fires
3. Old Eucalyptus plantations
4. The old main road to Villiersdorp and nearby submerged farms
5. Organized group hike along the dam floor
6. Theewaterskloof Dam
7. Theewaterskloof Dam Island in a sand storm
8. Fresh traces of animals and vehicles on an old exposed farm road
9. Ghost vineyards along the old main road to Villiersdorp and nearby farm communities
10. The bridge over the dam
11. Ghost vineyards re-emerging
12. Exposed and submerged pine trees

## > THEEWATERSKLOOF\_DAM

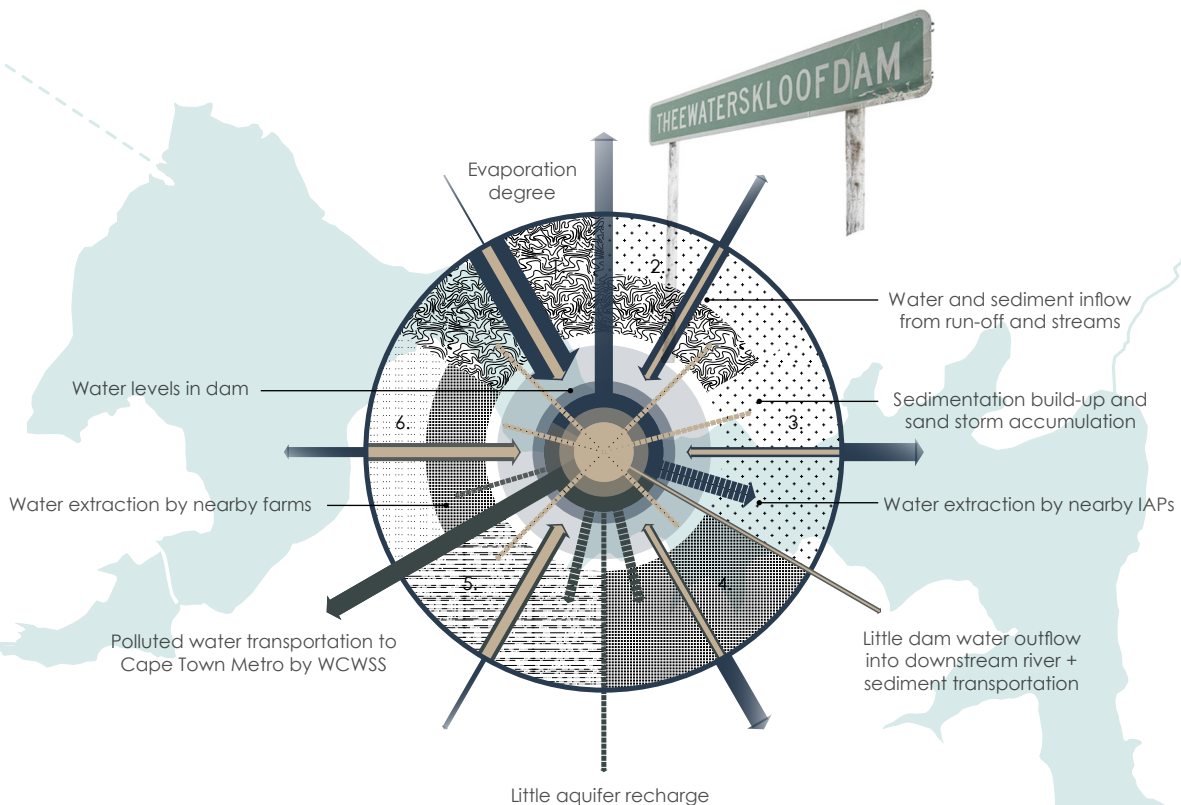
40 Years later the Theewaterskloof Dam is proving to be ever more inefficient due to climate change, alien plant invasion, siltation, pollution and an ever-growing population with increasing water demands. In April 2018 the water level reached its lowest point with a water capacity of 12,5% over its total yield. Sand storms are ever raging across the region into farms and villages, forming an emergence of desertification. Meanwhile, due to the low water levels, relatively increasing temperatures and polluted run-off from farms and villages, algal blooms and harmful bacteria start to develop in the water, posing serious health risks to human interaction with water, let alone the animal kingdom. The Theewaterskloof Dam has been considered as a 'dead' zone due to its decreasing (indigenous) biodiversity and species numbers, mostly in birds, fish and amphibians.

The diagram on the right reveals the decay of the Theewaterskloof Dam. The top image shows what the official water outline of the dam is, which it has reached only once in its lifetime. The bottom image shows the water patterns when the dam was at a mere 10,5% capacity. The dramatic shrinking water surface of the dam is predominantly the cause of siltation, increased evaporation and decreased water inflow. The shallowness of the dam only extrapolates on these impacts.



Zones of land-use and their impacts on water and sediment flow in the Theewaterskloof Dam catchment area:

1. 100% coverage by indigenous vegetation
2. 50% coverage by indigenous vegetation, 50% by IAPs
3. 100% coverage by IAPs
4. Plantations (orchards and tree plantations)
5. Urban settlement
6. Agriculture (crop, vineyards and life-stock) and windbreaks

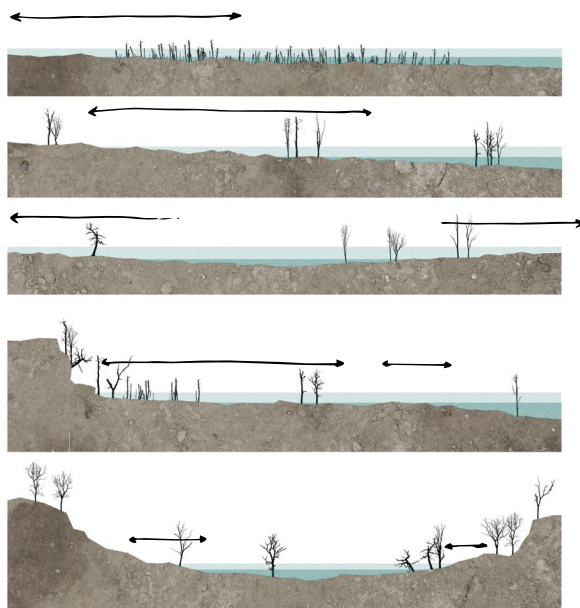


## >> THEEWATERSKLOOF\_DAMMED\_ WETLAND

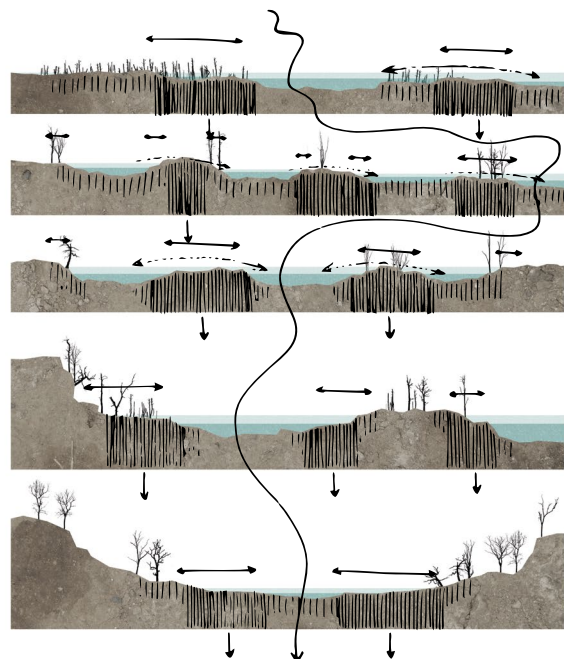
Theoretically the Theewaterskloof Dam has reached its lifespan. Physically, half of the dam is generally empty and consists of an exposed sediment layer. This exposed condition is due to the water level fluctuations which forms large edges around the relatively flat dam surface where hardly anything can grow. These edges are able to generate sand storms in extreme windy conditions, destroying surrounding vegetation. However, there may be a chance to elevate this dam into a new future through transformation and integration.

The concept of evolving alienation plays a role in the Theewaterskloof Dam as the dam is an alien itself. It has landed in the landscape and without any struggle or regard to its context, it has swallowed and taken over land. To elevate the landscape through transformation and integration, this dam can be halved. The Western side of the dam is generally on a higher elevation, thus becomes empty first in dry seasons. The Eastern side of the dam usually holds more water due to a slightly deeper surface and lower elevation. In the North-West, the priority wetland has gained momentum to grow since limited water level fluctuations by the dam have appeared as a result of droughts. Therefore the Western side of the dam can become a wetland zone again while the Eastern side stays a dam. The Eastern side will be more full, following the official dam outline and have less water level fluctuation.

The diagrams below reveal how the concept works and what the benefits are. Solid arrows indicate the water level fluctuation extend. The shorter the extend, the better for vegetation establishment. Having a variety of mounds and deeper zones (by cut & fill) helps to distribute water and sediment more efficiently to allow plant growth. Since water level fluctuation can be very dramatic it is important to create more depth in the dam to create the least amount of sediment exposure. Zones with dense hatching indicate a condition in which temporarily inundated wetland zones (high marsh and low marsh) can act as a sponge, enhancing infiltration and aquifer recharge.



Typical sections of current situation

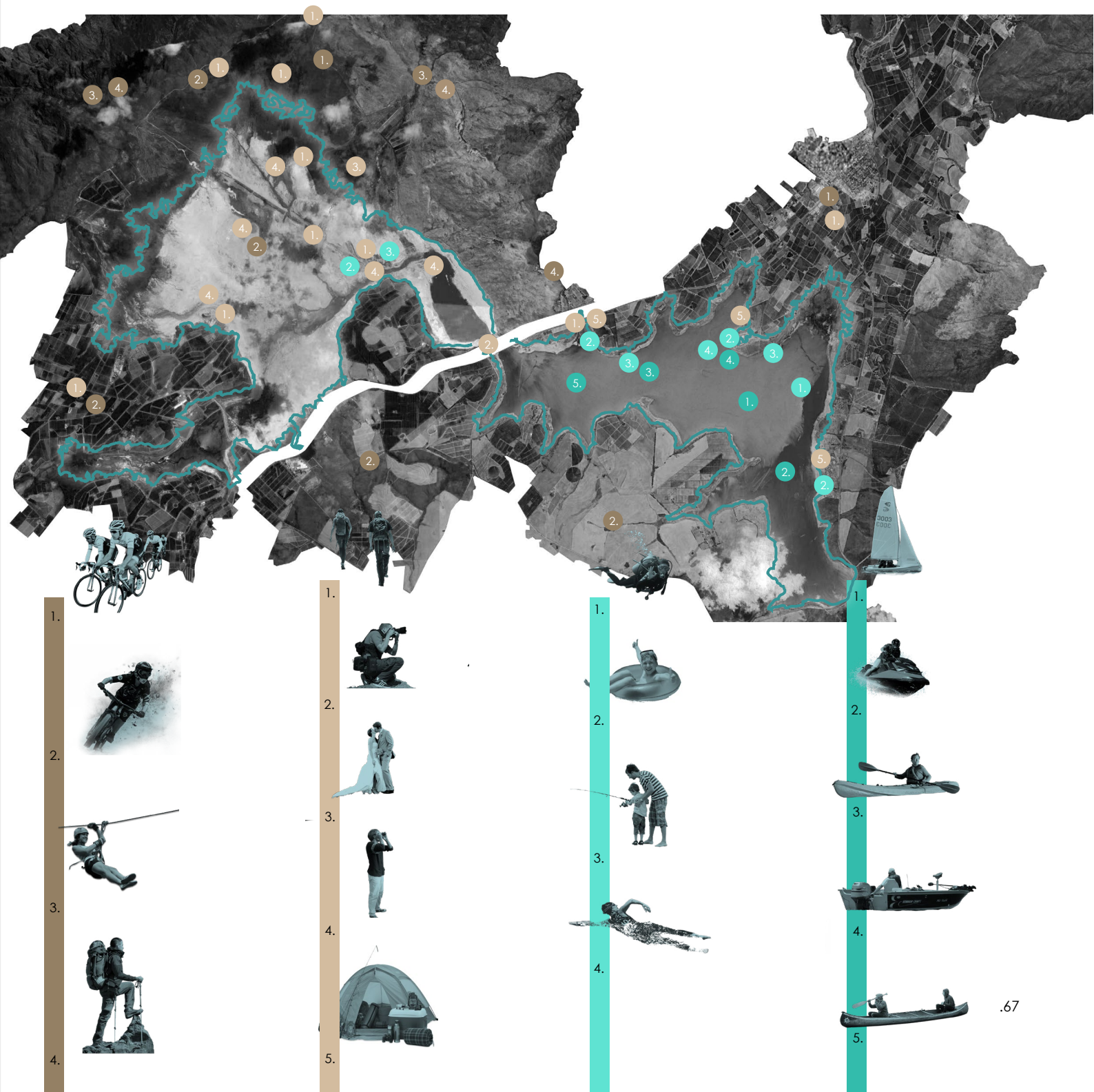


Typical sections of dammed wetland situation



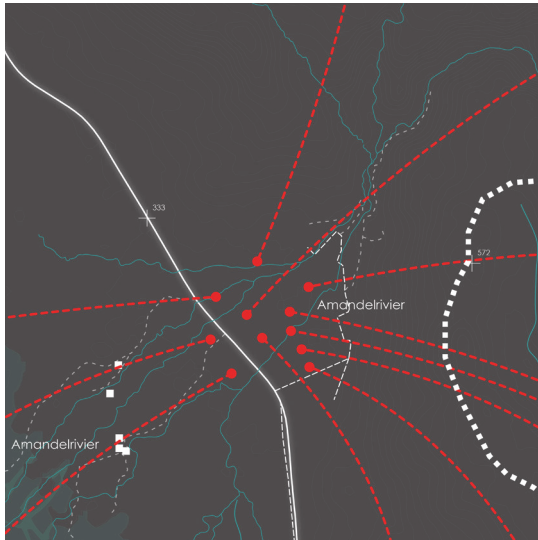
## < THE\_RESULT

The sense of not belonging / alienation in the landscape is strengthened on the one side and released on the other. Both wetland and dam perform some serious functions while being light-hearted and gentle in their approach. The transformation of the dam into a wetland on the West integrates and blends in well with the surrounding, rather 'natural' landscape features and systems while incorporating historic exposed elements of farm remnants into the experience of alienation and belonging. The Eastern side of Theewaterskloof, which will now be a much better performing dam as storage system, extrapolates further on alienation in the form of a relatively permanent water body. Yet, this condition of alienation does little harm compared to the existing state and builds on the existing characteristics of the landscape. The alien dam connects farms, people, water sports and other related activities to the dam that are solely located on this side of the dam to profit from its 'fuller' state.



## < THEEWATERSKLOOF

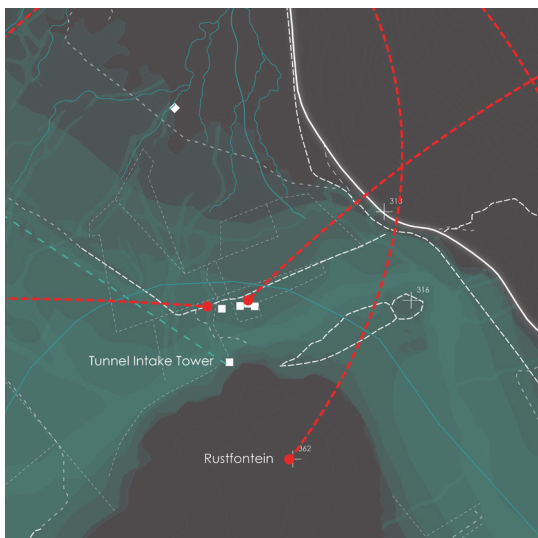
The three most active areas are listed below and play an important role in the system.



Once larger areas have been cleared they cannot be left alone. Rehabilitation is key to make sure the IAPs are controlled and indigenous vegetation can grow. Especially due to the fact that some IAPs, including *Acacia mearnsii*, thrive in disturbed zones. One aspect of rehabilitation is replanting which can be done through seeding and through manual planting. Seed growth can take a while and has a risk of not surviving its first years. Manual planting therefore is a much more effective approach, but requires more effort and space. This area can provide for a plant nursery which would assist rehabilitation in both mountain and dam. Plant saplings can be grown until a certain height by local communities and exchanged for something else by the nursery that takes the grown plant in.

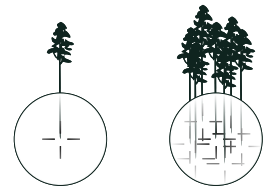


Clearing and monitoring in this vast landscape can be a pain without existing access and rough terrain. This area, which is where the Old Tol House Village is located, sits on the confluence of the most accessible and most inaccessible zones, where the Franschhoek Pass runs through the mountains, along a marshy river delta. From here, together with new strategic routes through the landscape, easier management can be achieved. From this area one can enter the 'Landscape of the Alien'. Besides being an entry for clearing teams from local communities, this can also become a hotspot for tourists and school groups. A training and skills centre, craft & process space & information hub can be located here to support the cause.



Similar to the above mentioned entry zone to 'the Landscape of the Alien', this area can become another entry point to this landscape. This area can focus on the clearing and rehabilitation, as well as change of the dam into a wetland zone. The unique historic remnants of submerged farms evoke an emotion different to the Old Tol House Village area. This area can also be set up to function as a local centre for healthy farming communities with wetland configuration & conservation and education.

# +++ THE\_RUNAWAYS

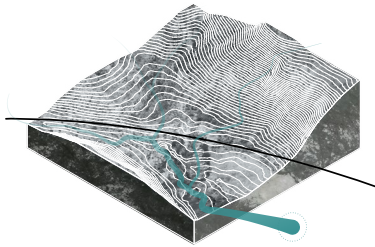


Mapping where exactly the IAPs are currently, their escape routes and densities.



## + CONCEPT\_DIAGRAMMING

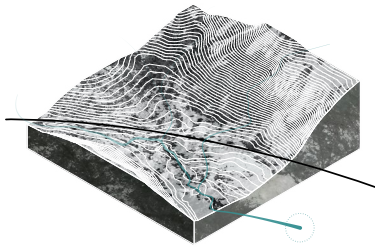
The concept diagrams below depict through a series of scenarios what the implications are of current-day IAPs clearing & management strategies, how the concept of encouraging access and sites of intervention may assist in the performance of containing and integrating IAPs in the landscape regarding water sensitivity and IAPs as a resource.



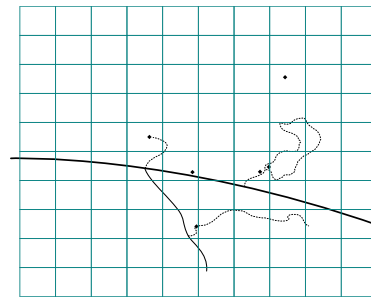
1. Water flow before the 1700's



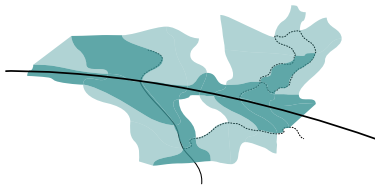
6. Effect and result of clearing tech (5.) in IAP growth and spreading



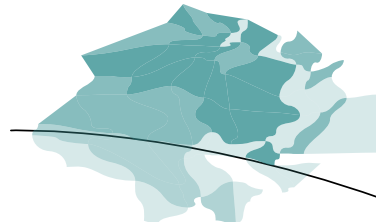
2. Water flow reduction after the 1700's until now



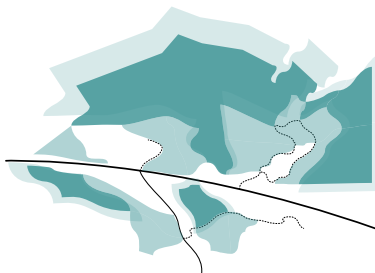
7. Encourage access; existing + new routes + built environment



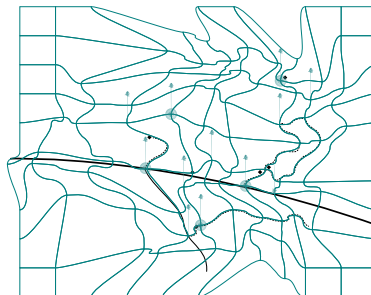
3. Current easy access IAP clearing strategy



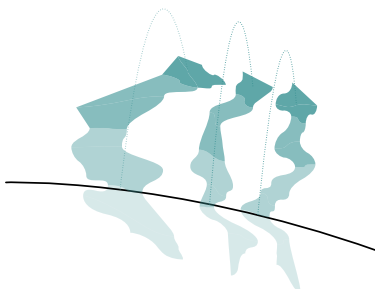
8. Zone IAPs; context specific growth patterns + location of IAPs + densities of IAPs



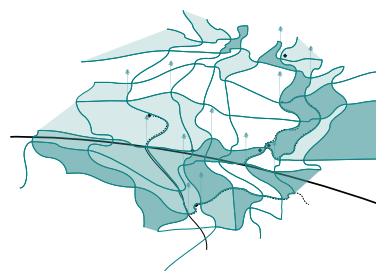
4. Effect and result of clearing tech (3.) in IAP growth and spreading



9. Drape; Net of access + sites of intervention + zones



5. Current IAP clearing strategy through helicopter access

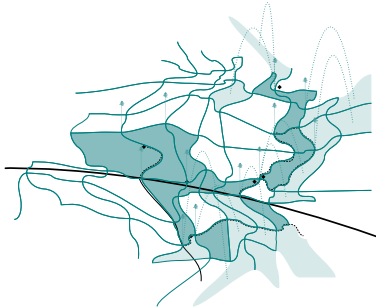


10. Critique; Key and strategic zones / sites of clearing and access intervention VS less critical zones and sites

## > LANDSCAPE\_LOADING...



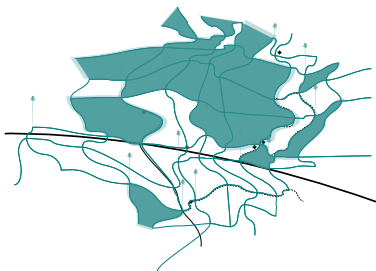
11. Remote;  
Clearing, control  
and IAP resource  
extraction by flight to  
extreme remote



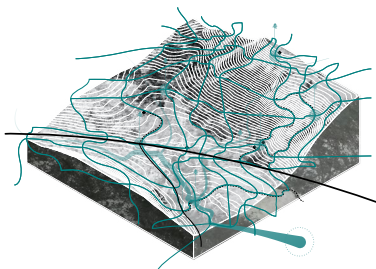
7. Close;  
Clearing, control  
and IAP resource  
extraction through  
recreational network



8. Critical mid-way;  
Clearing, control  
and IAP resource  
extraction through  
organized teams  
and labour groups



9. Mosaic;  
Cells expanding  
and contracting  
in place by active  
management and  
through access,  
zoning and sites of  
intervention



10. Water flow  
increase + security;  
Draped network  
of access + sites  
of intervention +  
mosaic landscape

# ELEVATING\_THE\_LANDSCAPE

## From alienation to belonging

By mapping out exactly where the alien invasive species in the study area are located a framework has been produced to allow for an effective and concise response to them. It was possible to see densities of invasive alien species which could be spotted by their difference in color and pattern. The framework consists of a network of new infrastructural routes that are placed in the landscape with connections to existing access points. By encouraging access with new infrastructure in this currently inaccessible landscape, this will assist immensely in the support to invasive alien plant control, management, clearing and resource extraction. The strategy of 'enclosure' is used to zone densities into condensed and scattered IAP patches, in which scattering is desired to be removed by clearing and condensed patches contained and monitored. The new infrastructure network (in red) focuses on closing 'escape routes', such as valleys, where scattering is happening, seeds are more frequently dispersed to and trees sprout more successfully. Once this scattering is being controlled and removed through human movement and clearing along the new trails, regular monitoring must happen to check upon newly sprouted IAPs in scattered patches to prevent germination. Therefore spread of the invasive alien plant species is limited to the contained condensed and clustered zones, while unaffected zones remain unaffected by IAPs. The on-going process of monitoring and control to hold and integrate IAPs in clustered zones can be seen as a cell which expands and contracts in place, storing and releasing energy in seeds, resources and human engagement.

Each of the new access routes within the network is carefully and strategically placed with sensitivity and experience of the landscape in mind. Most new routes through the relatively inaccessible landscape, whether in the marshlands / wetlands or the mountain range, become cleared pathways or trails for people on foot, since it has the least impact of disturbance in the landscape. These trails will need to be walked regularly (at least once in two weeks) to keep them open and accessible. From either side of the rather easier accessible trails one can enter the landscape by bundu-bashing to IAPs that have a scattered growth-pattern. Although predominantly organized clearing teams are doing the heavy work with machinery and equipped tools, volunteers are desired to join in for assistance. In fact, many visitors that will use the trails to experience the landscape by hiking, walking, birding, mountain biking, climbing, bouldering or other related outdoor activities to mountains and wetlands can assist in the cause by monitoring, reporting or clearing IAPs themselves. Any form of support is greatly appreciated, thus access and experience is key.

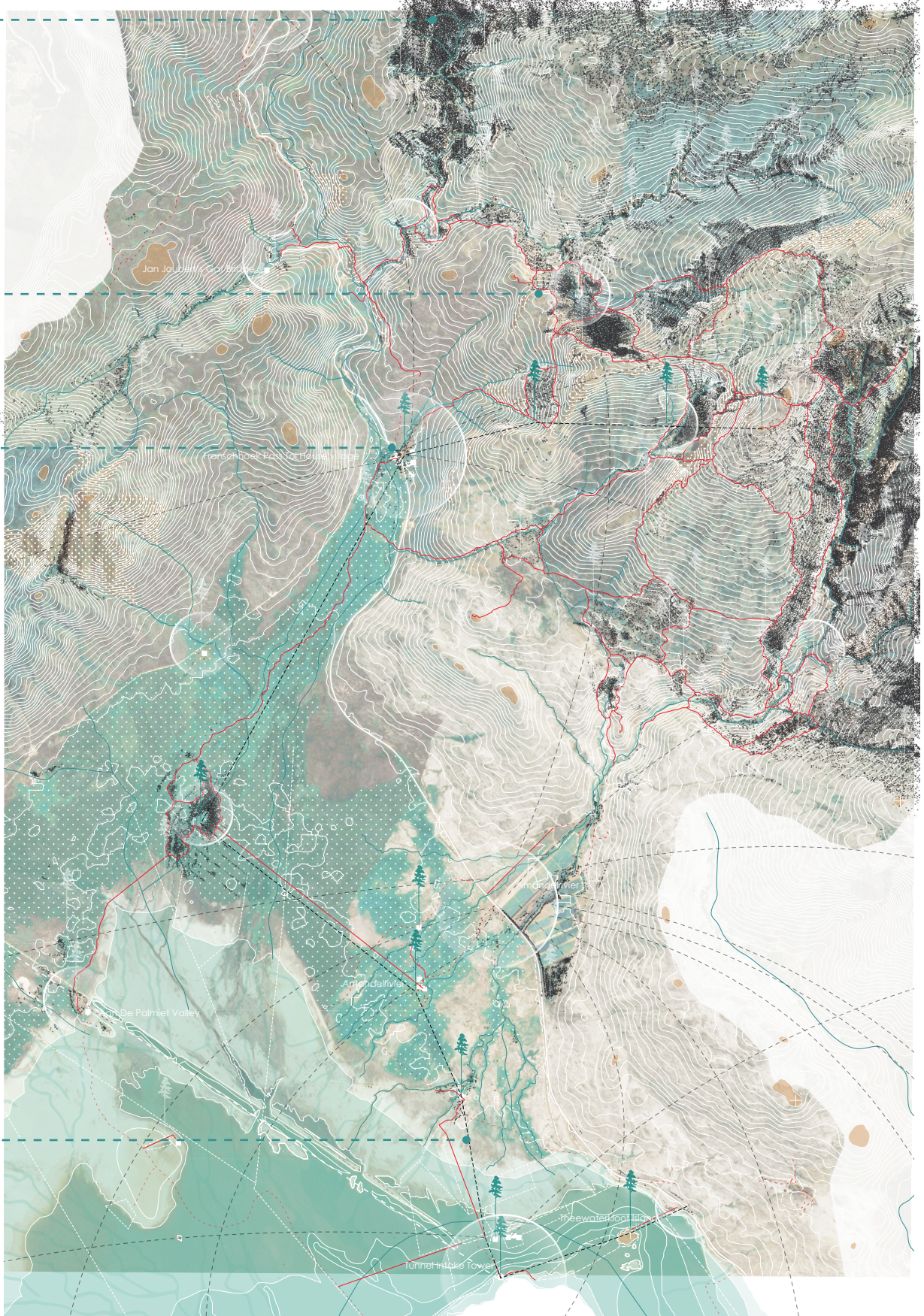
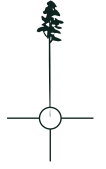
The nodes where routes intersect will have signage and a rest point to allow for change and choice of routes, for both outside visitors and clearing teams. The signage will also indicate the distance, time and name to the next node. Besides the nodes, critical moments in terms of access or experience, for example gorges, cliffs, rivers and flood-zones are addressed in a much bolder approach of intervention, providing a unique quality to the space that can form a set of new identities and characteristics to a place. Such interventions come in the form of bridges, platforms, ramps, steps, viewpoints or rest points that stand out of the landscape, creating a sequence of encounters that can also act as landmarks. Over time, if the invasive alien spread is managed and controlled in such a way that it becomes possible to remove large, dense stands of IAPs, the pathways or trails may slowly disappear and overgrow if usage is limited. However, preferably the network of routes can become more popular and successful over time, creating a rich and exciting characteristic of the landscape which will be visited more regularly, attracting people from far and wide. In any case, the approach is safe-to-fail instead of fail-safe, making sure that the implementation can adapt to an uncertain future.

While there are few points of access into the landscape from existing infrastructure, three sites are highlighted of which two sites become key entries to hook onto the network. The Old Tol House Village and the Theewaterskloof Tunnel intake tower are unique sites with good existing access and exciting history to experience more of the landscape. Especially the Old Tol House Village site has huge potential for the concept since it is the most accessible place closest to the most inaccessible regions of the mountain range. The site also sits on the confluence of river, mountain and wetland-to-dam, which links trails in various directions. The third highlighted site has been earmarked as a tree and plant nursery to rehabilitate severely damaged parts of the landscape. The nursery is powered by locally home-grown seedlings in exchange for funding various things, such as education, transport, goods or other.

The long section (in blue) that has been taken, goes through various critical sites (tree pin) which have unique potential and are all linked within the new infrastructure network. Cliffs and gorges have been marked in brown, wetlands and rivers in blue.

# +++ THE\_FRAMEWORK +++

A network of infrastructural systems and connected sites of intervention.



## + SYSTEMS\_LOGIC

### Systems logic in the infrastructural landscape of storage and release

The project starts to deal with invasive alien plant species (IAPs) as a management strategy and design opportunity for a large scale hybrid infrastructural network with specific and critical small scale sites for intervention. By encouraging access through infrastructure, in a rather inaccessible and remote mountainous landscape, one can contain, store and transform IAPs more actively and successfully. These acts help to integrate and facilitate IAPs into the landscape and allow people to see the species as a valuable resource and potential asset for the future without being irresponsible or naive. In the long run, the IAPs that are stored in the landscape through active management can be released when we can make a more clear and rational decision. To assist the management strategy the new infrastructural network will be flexible and hybrid, providing the option to respond to climate changes, unforeseen disturbances and paradigm shifts in the near future. Thus infrastructure must coexist with landscape and perform more than one function. The sites of intervention encourage awareness and celebration of IAPs stored in the landscape while transforming the alienation of the plants into a sense of belonging in our eyes, turning IAPs into IPs.<sup>1</sup> The project was initially approached to create a landscape machine using natural processes together with an introduced material input to deal with the issue. Nevertheless after intensive research it was found that the only inputs currently possible to deal with the invasiveness of species are human interventions and limited biological control agents, making it a subliminal landscape machine, yet powered by the people.

### Which natural processes to facilitate?

The disturbance of accelerated seed dispersal through unnatural introduction without its respective natural controlling agent must be considered as a complex system and issue to natural processes in the landscape. Yet, the IAPs cannot be seen as unnatural processes now, but rather a disruption of natural processes by natural processes. Nature is accelerated in its survival of the fittest. With current management strategies fynbos vegetation will rapidly be out-competed by IAPs found in the study area which would lead to a mono-culture of a handful of IAPs, increased wild fire risks and severe water scarcity. Ongoing climate change impacts will only increase chances for IAPs to win from natural fynbos vegetation. However, this is one of few scenarios that can play out in the near future, and frankly we are not ready to let face the consequences of letting IAPs roam the natural landscape unattended. Thus, the proposed interventions must facilitate experiential learning<sup>2</sup> and natural processes related primarily to water, indigenous vegetation and sustainability of livelihoods, while containing and supervising IAPs in the landscape to reduce further disruptions. Two infrastructural interventions are proposed to achieve a favorable outcome: the Theewaterskloof dam transformation as integrated water system and a newly proposed network of trails, tracks, paths, roads, bridges, platforms and terraces to encourage public access in the mountain catchment landscape.



## Network of trails

The newly proposed infrastructure in the form of public access routes speaks about facilitating natural processes that encourage water and indigenous vegetation growth / uprising / survival. This in turn provides livelihood safety and sustainability of human life. Most new access routes in the landscape will predominantly come in the form of trails that are used by clearing teams to manage IAPs, as well as for leisure purposes such as hiking and other outdoor activities. Both users can practice the new trails in the network as a form of management, with the general public using citizen science as monitoring tool and able to join in on teams to remove scattering of IAPs in dedicated clearing zones. As simple and sensitive as the concept sounds to encourage access, it provides trails dedicated to clearing IAPs with combined factors of mountain experience. Critical points and nodes within the network of trails, such as crossing a river, gorge or steep cliff become designed highlights that reduce work load, increase monitoring and attract recreational experience. The catchment landscape is one whole, and consists of many complex relations and interactions. The design of the network therefore will host a specific aesthetic throughout to make the landscape legible and functional without putting emphasis on one particular aspect. The hybrid network of trails also allows for more engagement with the mountain catchment, as our primary source of water, thus landscape as infrastructure.

## Theewaterskloof dammed wetland

Climate change has been knocking on our door for a while now and won't go away. The Theewaterskloof Dam as a piece of modernist water infrastructure is a clear example and icon of climate change impacts & the water sensitivity campaign. However, not only climate change is a factor that has reduced water in the dam. Population growth in the city, siltation in the dam and IAPs in the mountain catchments have accelerated the dropping dam levels. The distressing state and efficiency of the Theewaterskloof dam calls for a transformation and integration to facilitate natural processes such as sedimentation, aquifer recharge and biodiversity. These in turn provide smart and more resilient ways to tackle water scarcity and climate change impacts. The dammed wetland concept as landscape machine becomes water infrastructure as landscape, and can only be seen in combination with the network of trails to provide the input of water run-off for infiltration and storage.

The concept consists of a transformation that creates a shift in equilibrium by deepening ground surface levels of the Eastern side of the dam and raising ground on the Western side. By deepening the dam, the water level fluctuations have less impact on the edges due to steeper slopes, while being able to store more water. In addition, this change halves evaporation of stored water since the existing dam surface area has been halved. Furthermore, many water related activities are ensured of a relatively consistent water level, potentially creating new forms of developments and habitats. By raising the other side of the dam, the space can return back to its original state as a vast wetland and seepage zone that allows for water filtration, sedimentation and recharge of aquifers, while adding new forms of recreation and biodiversity. Both sides of the dam can profit from this transformation to integrate and facilitate natural processes and human activities in a multifunctional space.

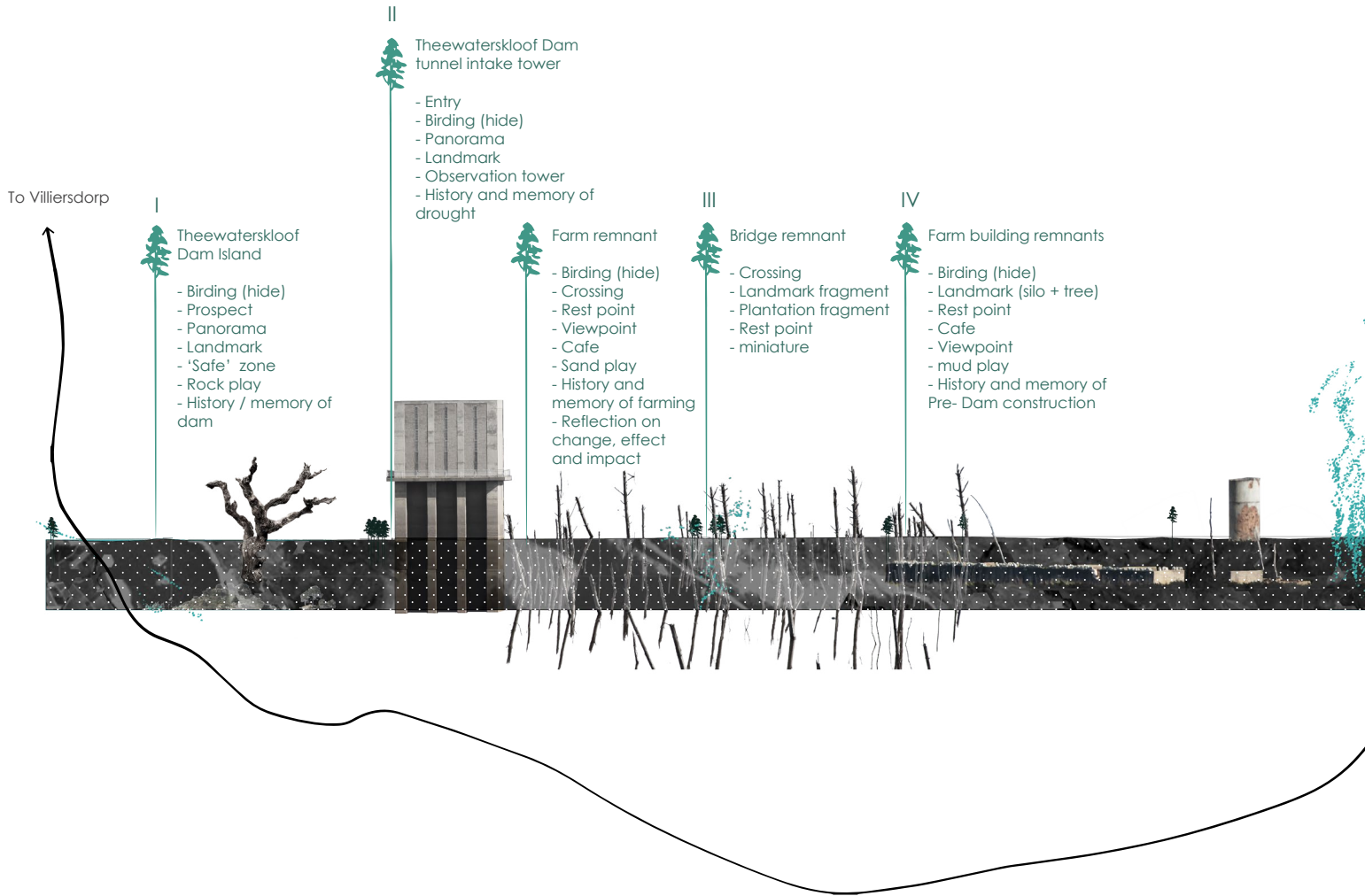
## Footnotes:

1. IAPs: Invasive plants; the alien has been taken out of the equation as the species must be seen as integrated resource and part of the landscape. Although the word 'invasive' carries connotations of xenophobia and war, it is the act of movement and tension apparent in the species related to impacts it has in the landscape and onto human sustainability. 'Prolific Novel plant species' is a new term in consideration as replacement of IAPs to decrease negative connotations and remove the militaristic language that is held in IAPs, which has clouded science, rational decision making and innovative thinking.
2. Experiential learning: a theory related to the future sublime to enhance design research in living landscapes.



## < LONG\_SECTION >

The long section has been taken through the study area, starting at the Franschoek Pass following the Theewaterskloof Dam Island, through the dam / wetland, through the Franschoek Pass again following with a portion of the mountain. Altitudes vary between 306m and 1260m, with the Franschoek pass cross-points being at 318m and 340m respectively. Points of interest and spaces that would require critical form of design have been pinned onto the long section as potential sites of intervention. Each of these sites is unique and connected within the framework / network. The Franschoek pass is the reference point and proposed interventions for the sites have been listed.

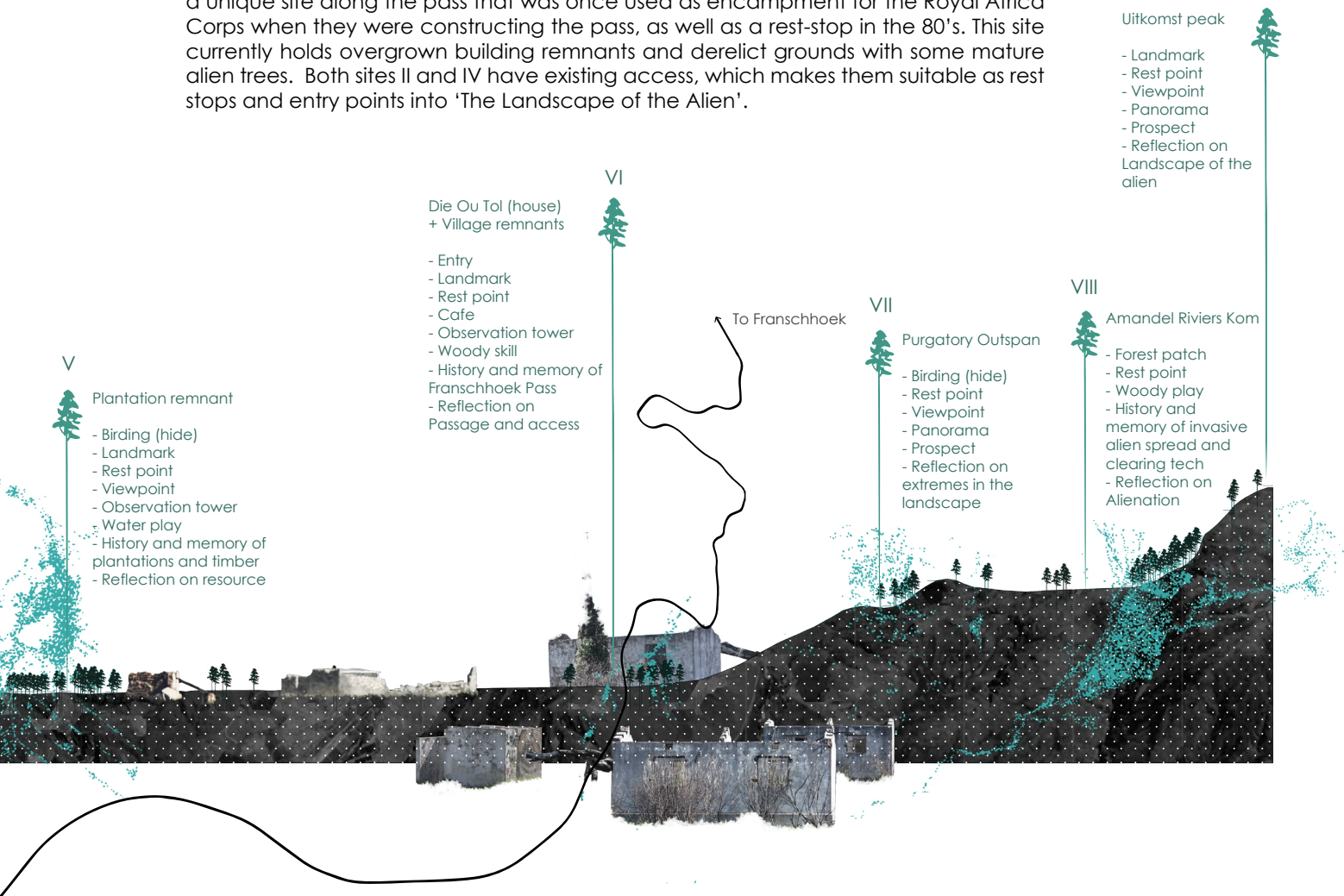


Site II: Theewaterskloof Dam tunnel intake tower and farm remnants.

90% of this satellite photo is currently (September 2019) submerged by water in the Theewaterskloof Dam. The farm remnants clearly indicate roads, pathways, enclosures, plantations, building footprints / foundations, low walls, dikes and even a farm dam. Thus, a dam inside a dam.

## + SITES

The most crucial sites are sites II and VI. The site of Theewaterskloof Dam tunnel intake tower and farm remnant have a strong foot in the landscape and feature some exciting possibilities. The site of Die Ou Tol (the old tolhouse) and its village remnants is a unique site along the pass that was once used as encampment for the Royal Africa Corps when they were constructing the pass, as well as a rest-stop in the 80's. This site currently holds overgrown building remnants and derelict grounds with some mature alien trees. Both sites II and IV have existing access, which makes them suitable as rest stops and entry points into 'The Landscape of the Alien'.



Site VI: Die Ou Tol (tolhouse) and its village remnants.

The old tolhouse was built by Mr. S.J. Cats along the Oliphants Pad (Elephant's Path). It was the first attempt of creating an accessible passage to the Overberg region before the Franschhoek Pass was created properly. The site sits at the foot of the priority wetland and confluence of multiple streams.

## > SITE\_I: THEWATERSKLOOF\_ISLAND

The island of Theewaterskloof Dam has become a well-known icon of the area as well as a model of for measuring the water level of the dam when passing by. Icons are existing elements of history, thus the island has been chosen as a site of intervention. The island is a Sandstone koppie / outcrop within a relatively sedimented dam surface and towers above the average water level at a height of up to 316 meters. The island hosts various indigenous and exotic plants, with a few pine youngsters on the rocky zones. During stages of low water levels one can pick up roads and pathways around the island. An artificially dug water channel in the dam surface has been made, perhaps as part of an old farm.



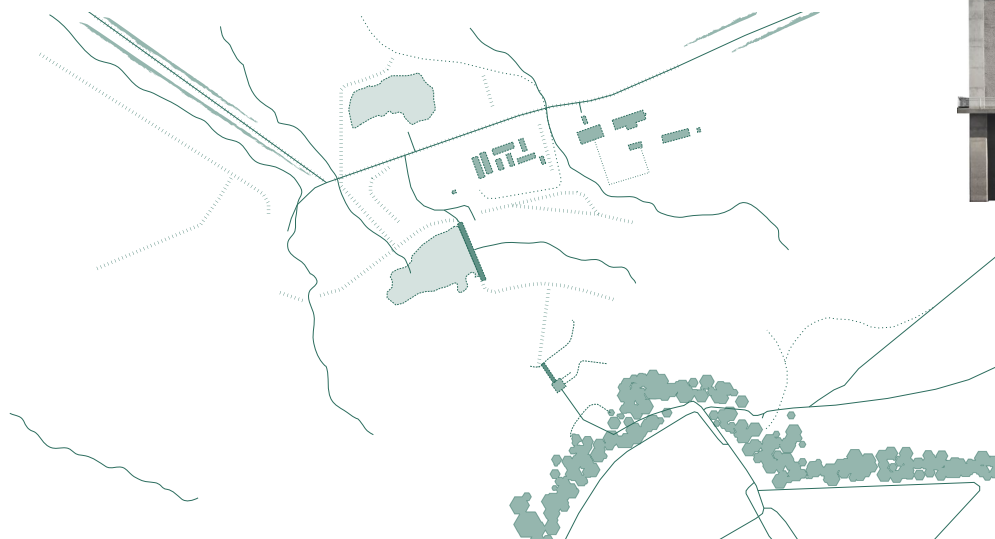
Site informants, artificial and water infrastructure and pattern

## > SITE\_II: TUNNEL\_INTAKE\_TOWER

The site of the tunnel intake tower of Theewaterskloof Dam and its approximate farm remnants is an interesting and critical area in terms of build informants, history and accessibility of the space. The farm remnants have only been visible when dam levels were at 25% or lower, with the satellite image below taken in April 2018, when the dam water level was at 12,5%. The tunnel intake tower nearby at that stage became a fortress along a stream. Of the image below, 90% is currently under water. Noticeable submerged elements of farm remnants are building footprints, walls, dikes, kraals, plantations, roads, pathways and even a smaller dam. When water flows in abundance into the dam, it flows over, through, against and along these decaying elements.

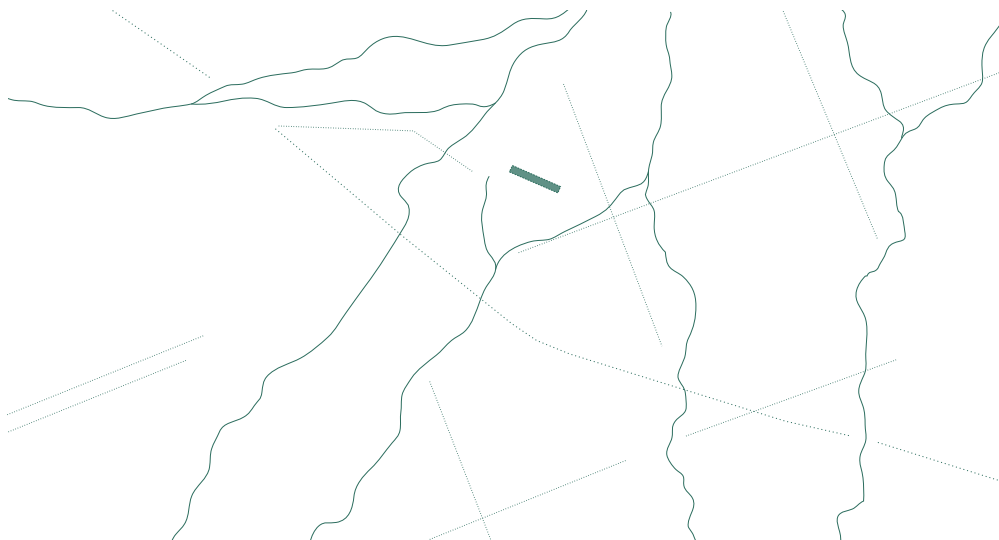


In the design concept development of transforming the Western side of Theewaterskloof Dam into a large wetland connecting the priority wetland of Du Toits, the tunnel intake tower will perform a different function than it currently does and may host new functions that enhance experience and understanding of alienation.



## > SITE\_III: BRIDGE\_REMNANT

Site III has been chosen as a potential site for a design intervention due to the remnants of a bridge over the Amandel River stream that has fallen in ruins by the implementation of the Theewaterskloof Dam. Another character of the site is the vast amount of invasive alien plants that are scattered around the streams that could inform an interaction with people. An interesting component of this site is the trace of an old plantation with its access routes along the form of a tilted grid, following a slippage between grid and natural lines such as streams and flood zones.



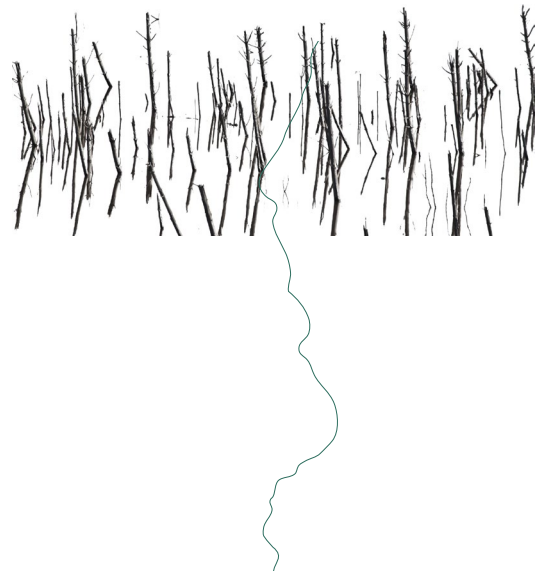
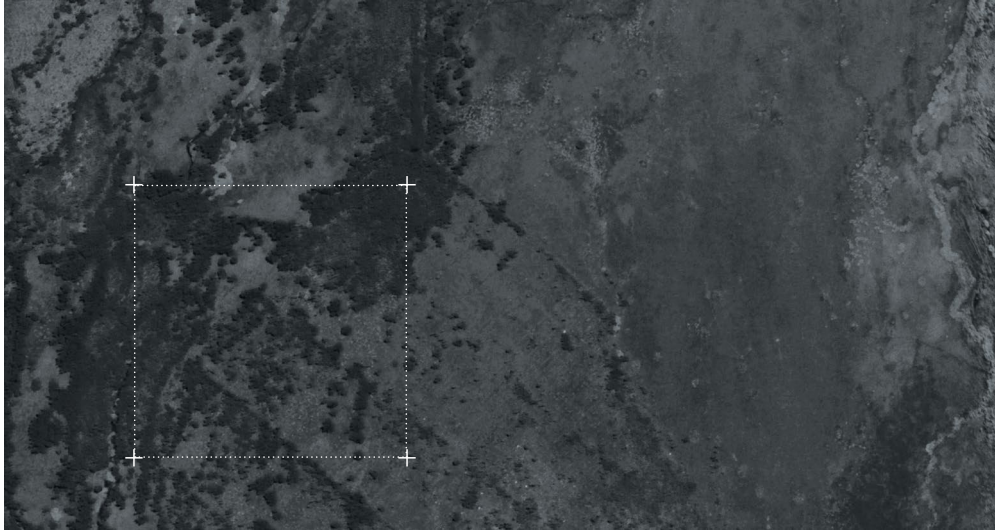
## > SITE\_IV: FARM\_BUILDING\_REMNANTS

When the Theewaterskloof Dam was implemented many farms were expropriated. Farm houses, sheds, gardens, dams, kraals and plantations (vineyards, orchards and timber plantations) became submerged and were destroyed by water, sediment and erosion through climate and weather. Along the string of sites a couple of farm remnants in the form of roads, building footprints, walls and a silo are visible in the wetland zone and verges of the Theewaterskloof Dam. A few streams run past the remnants through this wetland zone, while most of these remnants are now almost permanently on dry soil due to the losses of water in the dam.



## > SITE\_V: THE\_PLANTATION

Site V contains the remnants of an old plantation that has been submerged by the implementation of the Theewaterskloof Dam. Currently this plantation sits in relatively inundated part on the edge of the Theewaterskloof Dam and the priority wetland zone of Du Toits. Traces of the plantation are visible in the linear form and direction of trees in the space. Most of these trees are invasive alien plant species that have been able to survive the water level fluctuations and started spreading outwards. Dense and scattered patches of vegetation vary in this space where indigenous palmiet stands dominate.



## > SITE\_VI: DIE\_OU\_TOL

Elephants used to cross the mountains at the change of seasons from the Cape Flats into the Overberg Region before the Cape was colonized. The path of the elephants over the mountains was located at the easily accessible route of where the Franschoek Pass is situated currently. Semi-nomadic Khoi-khoi followed the cleared trampled trails of the Elephants. After the Cape was colonized, white settlers followed the cleared paths of Elephant migrations on foot and horseback. The old tolhouse was built by Mr. S.J. Cats along the Oliphants Pad (Elephant's Path). It was the first attempt of creating an accessible passage to the Overberg region for carriages before the Franschoek Pass was created properly.



The site sits at the foot of the priority wetland and confluence of multiple streams. It is a gentle space that breathes between steep slopes, gorges and rugged terrain. Alien (invasive) plants dominate the character of the site, together with building remnants.



Fun fact: the name 'Oliphants Pad' can be directly translated from Dutch to Elephant's Path. However, in Dutch the combination 'Elephant's Path', translated as 'Olifanten pad / paadje', does not literally mean that it is a path used / made by elephants. In fact, the combination means it is a path that has been made through force, generally over longer periods, to and from particular points, as a quicker / shorter route to the destination, even though there may be other existing routes that are available. 'Olifanten pad / paadje' can be directly translated as what we know; a desire line.

## + SPATIAL\_PRACTICES

### **Spatial practices in evolving alienation**

The theories of forming and spatial practices go hand in hand in the design project. Forming explains, through the design study of 'The Landscape of the Alien',<sup>1</sup> how the space and landscape is constructed and functioning.<sup>2</sup> Spatial practices, and predominantly the theme of 'Spatial Constructs', will extrapolate on the design study and project strategies thoroughly. In addition, the theme of 'Memory and Space' is explored in the historic elements and stories of the study area, such as expropriated farming communities and pre-colonization movements through the landscape. The development of the concept 'The Landscape of the Alien' into design with the use of spatial practices will be revealed in the concept 'Elevating the Landscape'.<sup>3</sup> This concept starts to evolve 'The Landscape of the Alien' into a space in which memories of alienation become reinforced and broken down. Tensions spoken of in theories of forming relating to this alienation will be strengthened, released and discovered in the design of a space. Many of the current practices that have done research and intervention of in the study area come forth through scientific reports of what 'is' and what 'must', not taking into consideration the sense of place, context and complex socio-environmental interactions. Therefore, phenomenology and 'Contested Space' will be touched on as well in 'Elevating the Landscape' to balance this scientific force.

The framework of the landscape will comprise of a sequence of intervention moments along a network that are either crucial to its function or key moments of interest. As mentioned in forming, many of the proposed spaces in these points will have a hybrid character, consisting of a strong combination of functional, experiential, educational and recreational purposes to maximize performance. Examples of the space typologies to be considered are rest points, viewpoints, observation structures, walkways, platforms, bird hides, entries to 'The Landscape of the Alien' and spaces for cafés, hospitality, markets, education and skills training.

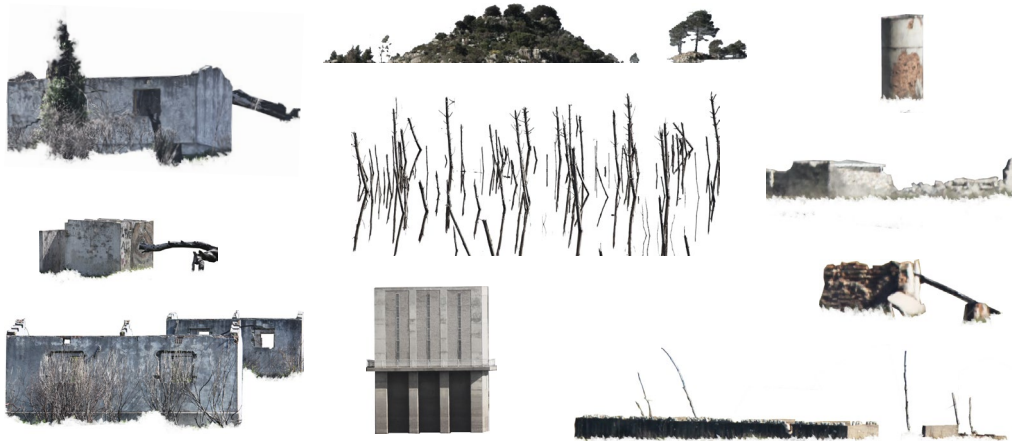
### **Spatial Constructs**

Within the theme of spatial constructs the concepts of Enclosure, Slippage, Syncopation, living tectonics and 'Miniature and Panorama' will be considered in the design of a space. While enclosure speaks about the functional preferred outcome to contain IAPs and their spread, it also reflects on the set of perceptions and feelings we experience when walking through moments of prospect and refuge. By doing so, we may get a feeling of what it is like to be an alien, unwanted in the landscape without any sense of belonging, as well as experiencing destruction, decay, complexity, trial and error, succession and emergence (with regards to clearing and tackling plant invasion). Emotions that are exchanged through amplified enclosure constructs can start to dissolve with the concepts of slippage, allowing spread. Cycles of growth, densification, clearing and dispersing are automatic outcomes related to the systems and processes in the landscape. Thus, 'Living tectonics' becomes evident, and finding ways of stasis and flow in plants in that sense crucial to create a performing and experiential landscape. Concepts of Syncopation and 'Miniature and panorama' are both inevitable and essential to the full experience of the landscape and design project. Up-close interactions of the IAPs and their impacts on affected landscape elements such as water, people and fynbos are opposed to the vastness of spread and impact of IAPs in the broader landscape. This may also help to reveal notions of what can be done and what still needs to be done in order to sustain ourselves and secure other desired components and resources.

### **Memory and Space**

'Memory and space' has a few concepts that the project must reflect on, such as Framed space, Remnant space and Heterodite. Firstly, framed space is a concept that can come into play through the importance of showing change in the landscape. Framed space can assist, when regular visits to the landscape and space come about, to illustrate and focus on what has changed, for example in either growth, emergence and clearing of IAPs or in water level fluctuation and sedimentation. Here, both Miniature and panorama could be combined with framed space to achieve a strong desired outcome. Secondly, Remnant space becomes exciting in

the many scattered and clustered remnants of expropriated and submerged farms in the current Theewaterskloof Dam. This alien structure, similar to the impact of IAPs in the landscape, has swallowed whole communities and landscapes without any form of struggle. The remnants, both structural as walls and foundations of farm, and skeletons of tree avenues and plantations, speak about the past and decay, when the tension had been broken with a brutal, relentless or unforgiving result. These interesting points, mostly exposed when water levels are low and drought knocks on our doors, can become placeholders and points of intervention along the framework. Thirdly, the Heterodite concept looks at what of these remnants must be remembered or showed. It will highlight the past and the present while creating a new future. The pre-colonization movements through the landscape should be addressed in relation to this concept as well. The story of the elephant migration through the Franschhoek Pass (pre-construction), clearing vegetation and allowing passage to the Overberg to Khoi-Khoi and settlers on foot and horseback, is a strong component that has roots in 'The Landscape of the Alien'. While elephants are no longer present in the study area, their story of clearing and moving through the landscape becomes key to the development of spaces along the Franschhoek Pass and the remnants of the Toll house village, following into the Theewaterskloof Dam, which was once an immense wetland and critical grazing spot for herds of game. (Adams, 2019) (Palma, 2016) (Smith & Schiele, 1890-1918)



### Contested Space

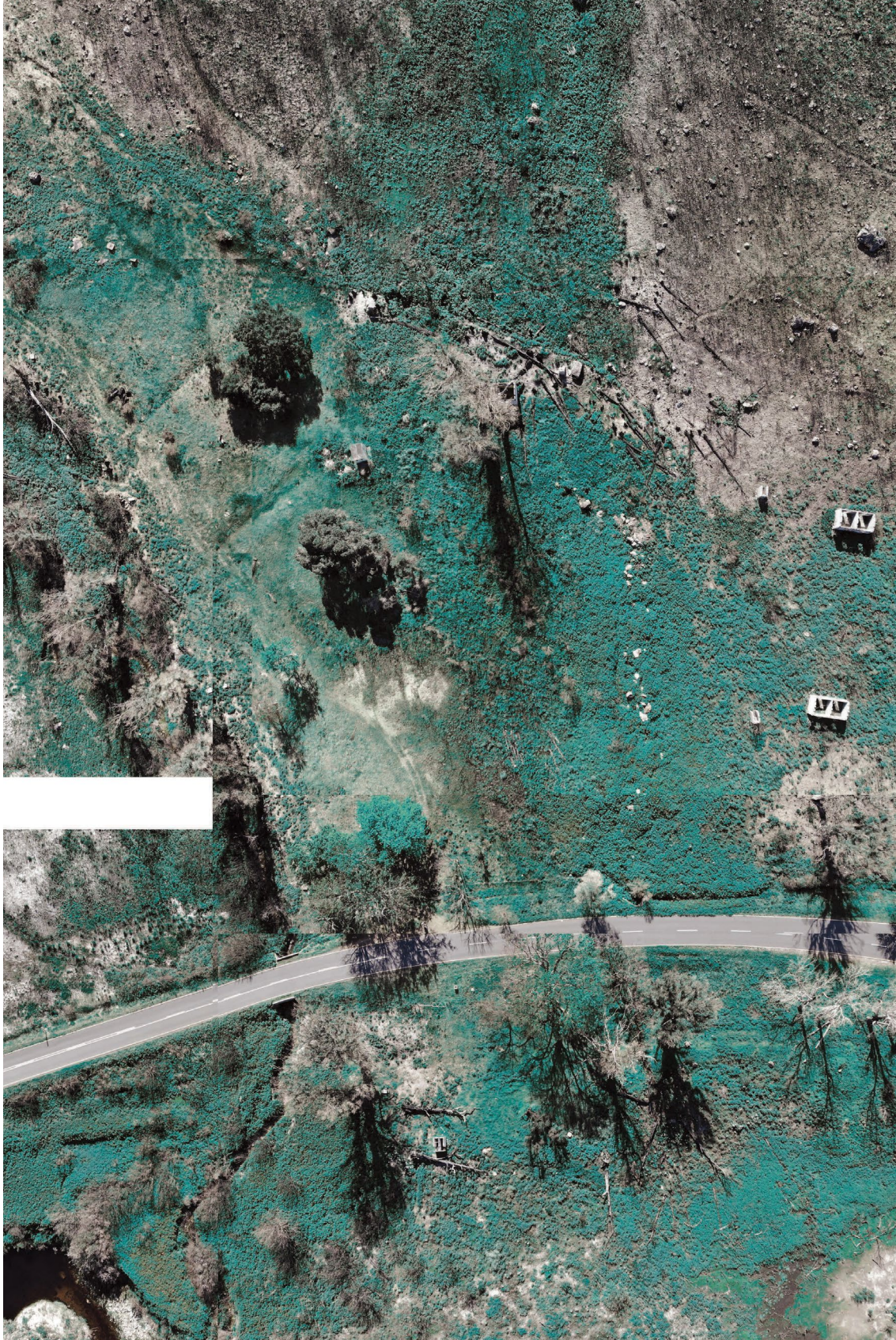
Contested space will come forth through notions of tension in the landscape, exploring utopias and heterotopias in the plant kingdom and water systems. It may seem odd, but the project goes against nature. What is essentially necessary to sustain ourselves and other desired components and resources such as fynbos and biodiversity, is that we contain natural processes to a point. If we let go of IAPs, we will basically doom ourselves and many of the unique indigenous South African plant and animal kingdoms.<sup>4</sup> Looking at it from another angle, the IAPs have been brought in by unnatural forces<sup>5</sup>, therefore the unnatural solution makes its way forward in a much more appropriate and sensible way. This seemingly contested spatial practice must illustrate somehow that in this case a form of utopia is desired within the heterotopia of nature. (Treib, 2009)

*"The forest ecosystem is held in a delicate balance. Every being has its niche and its function, which contribute to the well-being of all. Nature is often described like that, or something along those lines; however, that is, unfortunately, false. For out there under the trees, the law of the jungle rules. Every species wants to survive, and each takes from the others what it needs. All are basically ruthless, and the only reason everything doesn't collapse is because there are safeguards against those who demand more than their due. And one final limitation is an organism's own genetics: an organism that is too greedy and takes too much without giving anything in return destroys what it needs for life and dies out. Most species, therefore, have developed innate behaviors that protect the forest from overexploitation."* (Wohlleben, 2016)

With the chosen spatial constructs, memory and space concepts and a sense of contested space 'The Landscape of the Alien' can become a hybrid being on its own, allowing it to elevate from its current distressing state. Both experience and function are tackled to achieve the desired outcome of the design response.

## SITE\_VI: DRONE\_TO\_SITE

When taking the drone to the Old Tol House village site one can pick up traces of various kinds of disturbance, all of which accelerate invasive alien plant growth, dispersal, sprouting and thus spread.

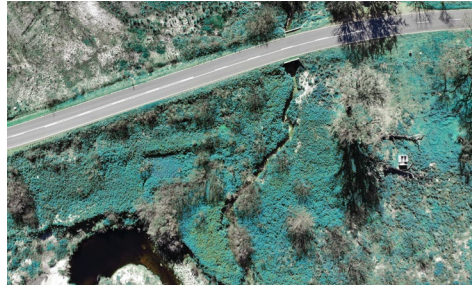


## SITE\_VI: TRACE\_TO\_DETAIL

Traces of water can be found by following the invasive alien plants, and vice versa. The seep is covered in a much more condensed patch than the drier zones, with the ruins being fully surrounded by a green carpet of IAPs. While water sources accelerate growth, fire can assist in the dispersal and sprouting of IAPs, as notable on site. Human impact and disturbance increases growth and spread when management is poor.



1. Franschoek Pass and Du Toits sub-catchment and the Old Tol House Village site.
2. Old Tol House village ruins on the foothill with a cluster of adult Eucalyptus trees.
3. Burnt landscape and seep contrast.
4. Main river bend and stream-flow under road.



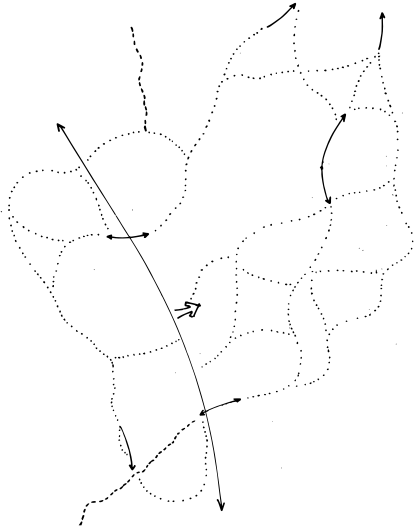
1. Framed view through old ruined house of the Landscape of the Alien.
2. Destroyed house due to fallen and burnt trees.
3. Main ruin next to a cluster of three adult Eucalyptus trees.
4. Scale of the trees and burnt landscape.



1. Up-close emerging vegetation on burnt ground.
2. Carnivorous plants in seep and wet recharge zones.

## SITE\_VI: INFORMANTS

The following informants are key components for the design of the site to a functional, as well as revelatory space and approach to the topic of alienation and resource perception.



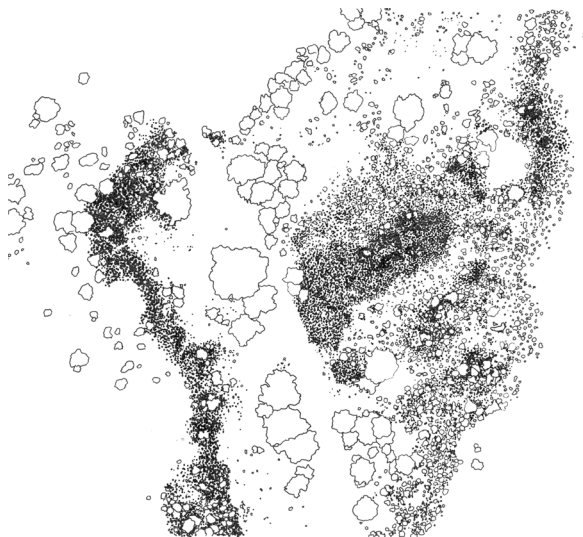
### Existing routing:

The site is held by the Franschhoek Pass, going through the site with an arc. Although parts of the site are fenced off with a low farm fence, there are existing desire lines visible going to and around particular objects on site. There are four desire lines that go out of the site into the larger mountain and wetland landscape.



### Existing site remnants:

The site is a historical site with some old remnants from the Tol House, build by Mr. S.J. Cats, that operated the Pass and some ruins of the village where Royal Africa Soldiers stayed during the construction of the Pass. Other noticeable objects include picnic tables from the 70's-80's that have been overgrown and stumps, logs and large branches of invasive alien trees that have been left to decay.

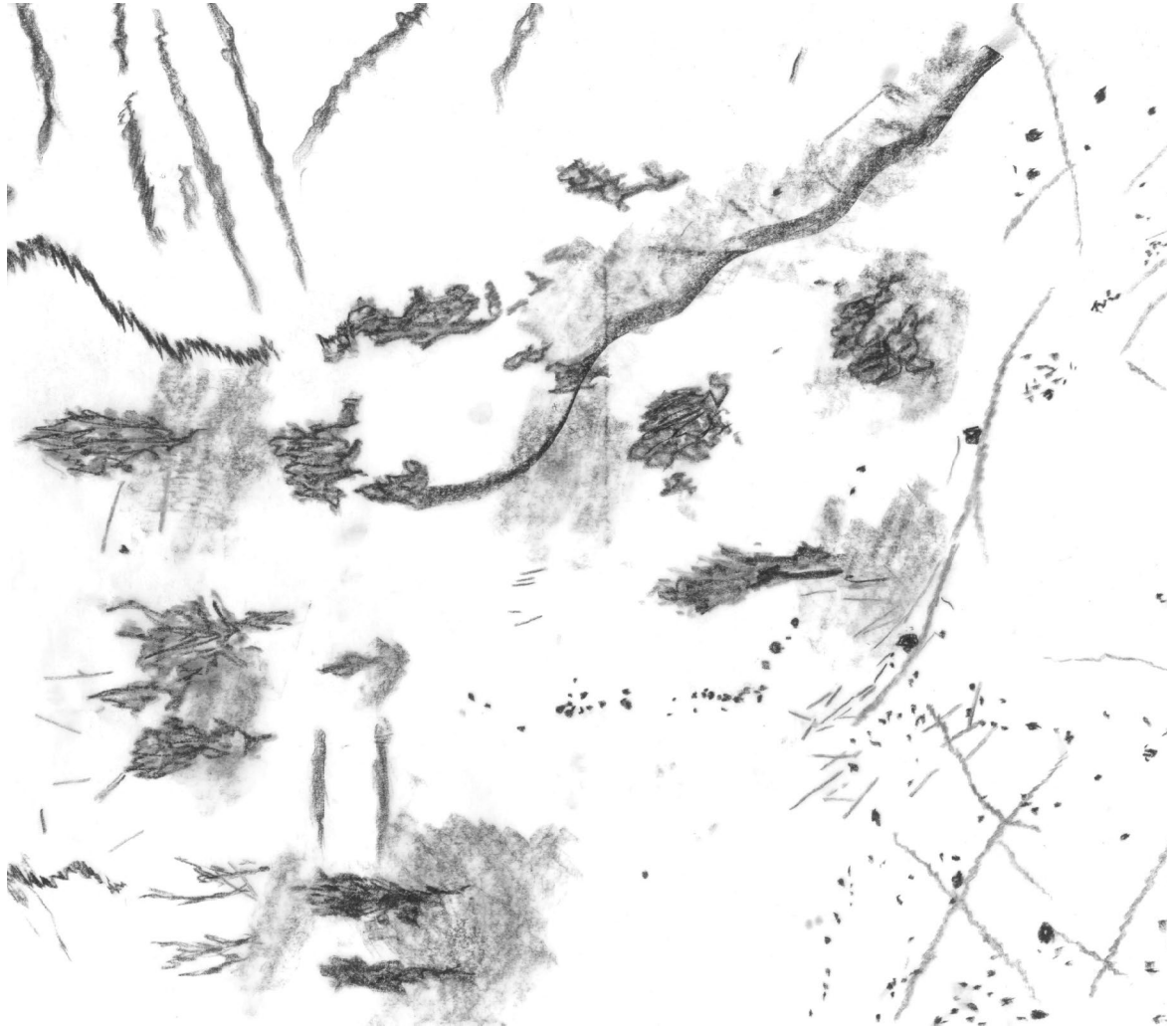


### Existing vegetation:

On the site are various vegetation types, species and typologies. While fynbos, wetland and riparian plants are present, clusters and scattering of (invasive) alien plants are most prominently characterizing the site. The different sizes and densities allow for an interesting interface between people, vegetation and the understanding and journey of alienation and resource.

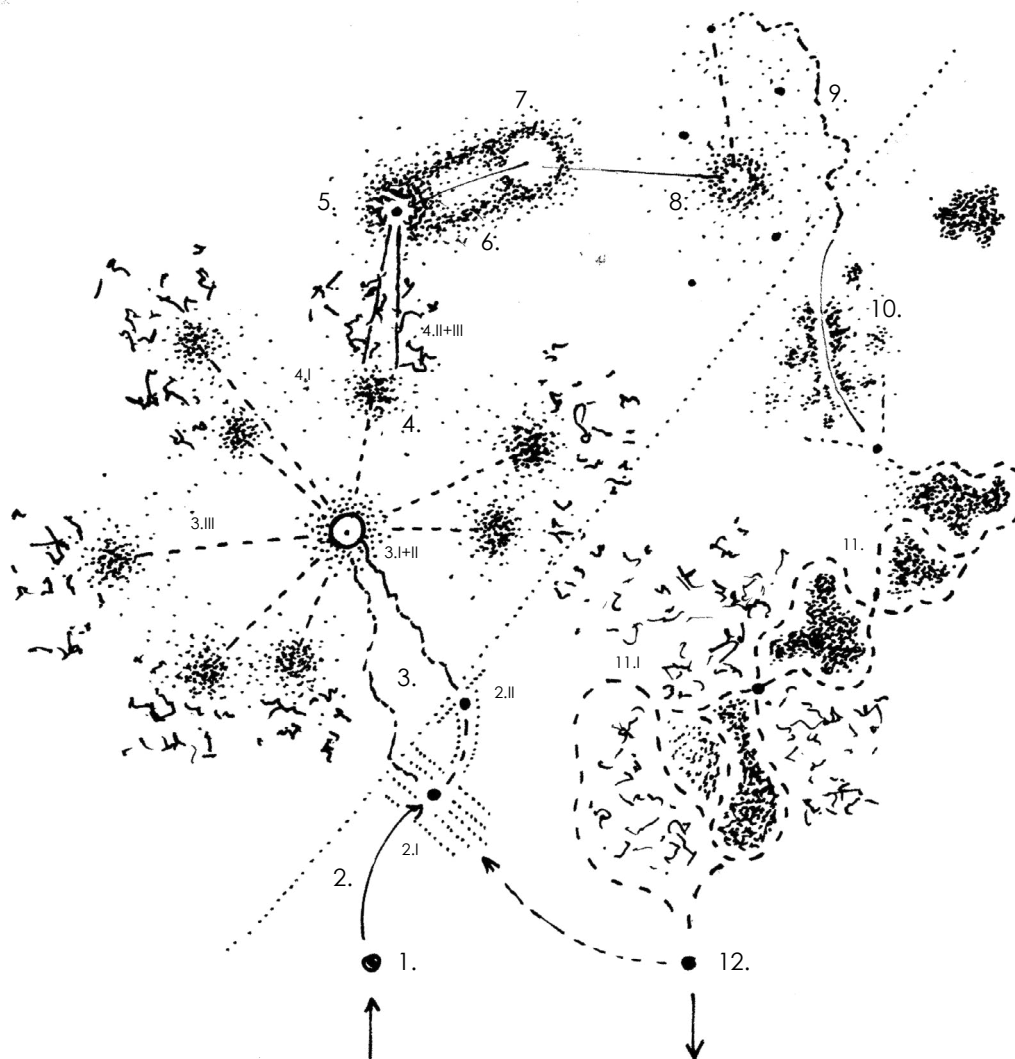
## SITE\_VI: TRACES\_OF\_TOPOGRAPHY

The following traces can be found on site which relate to the topography such as the direction of fallen trees, water flows, shadows and boulders or rocks that have rolled down leaving marks on the ground.



## ++ SITE\_VI: CONCEPT

The journey of resource of and alienation to invasive alien plants through growth, spread, process and clearing strategies.



### Description:

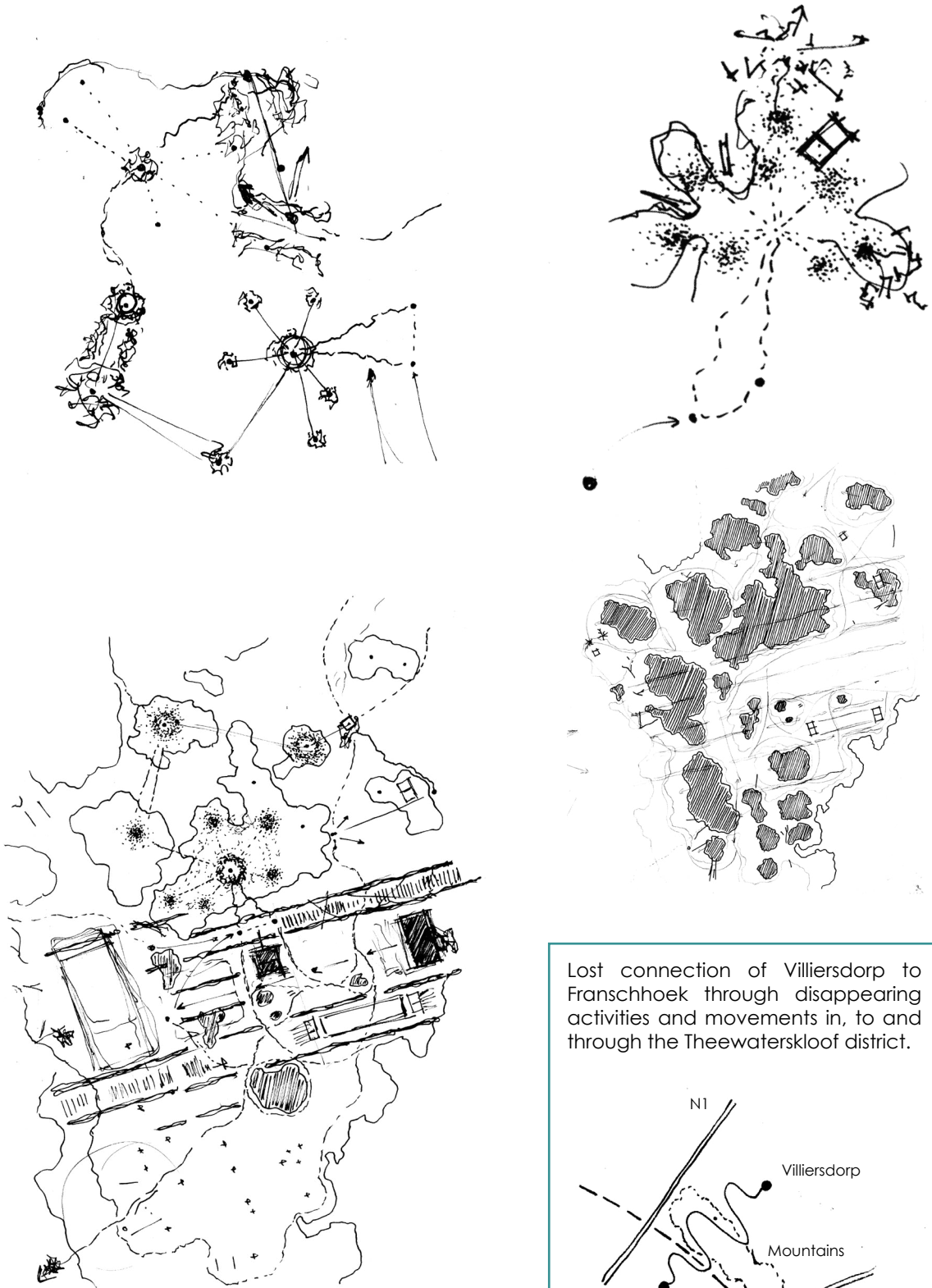
1. Begin of Journey
2. Species introduction from overseas
  - 2.I. Use in plantations
  - 2.II. Use as ornamental
3. Sneak / creep out of managed zone
  - 3.I. Establishment
  - 3.II. Scattering
  - 3.III. Spreading
4. Grow and densify, forming of clusters
  - 4.I. Overgrow and reproduce
  - 4.II. Damaging natural environment
  - 4.III. Diminishing valuable human resources
5. Overwhelm, suffocate and out of control
6. Edges and easy access (defensive management)
7. Large, destructive, dense clearing (offensive management)
8. Helicopter patrol and biological control (focus attack)
9. Team droppings and remote clearing (sneak attack)
10. Charge (concept idea, less access, least successful)
11. Enclose (concept idea, more access, most successful)
  - 11.I. Recomposition, storage and containment
12. Exit or return to cycle through

### Legend:

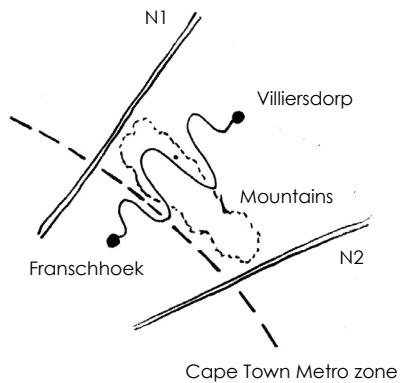
- ..... Boundary line of managed zone
- Easy movement
- ~~~~~ Sneak / creep out movement
- - - - - Hidden movement
- ..... Plantation
- ..... Ornamental
- Point of reflection and pause
- ⊙ Point of establishment and scatter
- Dense patch of IAPs
- Fynbos, water, farms and settlement
- Impact by IAPs on element

# SITE\_VI: CONCEPT\_DEVELOPMENT

From concept to site; exploring how the concept can be implemented onto the site using the site's informants, systems and program.



Lost connection of Villiersdorp to Franschhoek through disappearing activities and movements in, to and through the Theewaterskloof district.

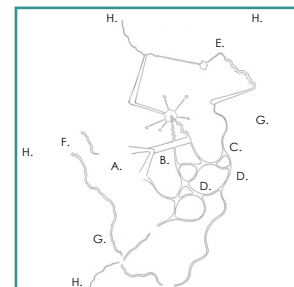


## +++ SITE\_VI: CONCEPT DESIGN I

Concept design I of the Old Tol House site focuses on being a revelatory space. The journey of IAPs and clearing vegetation is told in a circular walk.



1. Entry to 'Garden and Landscape of the Alien'
2. Introduction of invasive alien species
3. Sneak / creep out of managed zone and establish
4. Grow, spread and densify
5. Overgrow, suffocate and destroy
6. First line of defense (defensive clearing)
7. Large dense stand clearing (offensive clearing)
8. Focus attack (dropping and shooting)
9. Sneak attack (long distance, remote clearing)
10. Charge (concept idea + reflection)
11. Enclose (concept idea + reflection)



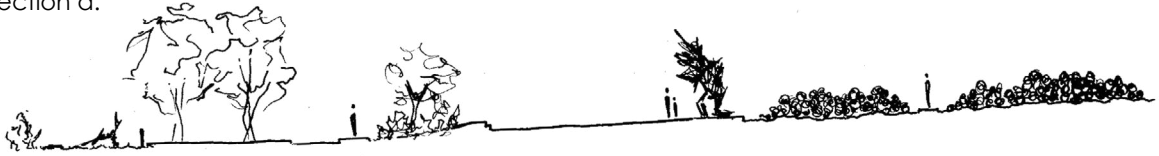
Enclose reveals a successful approach and new concept to encourage access to clear regularly as a form of management and find space in the landscape for IAPs, as a contained identity and character of the landscape. These patches of IAPs can be both temporarily and permanent, depending on the rate of success made in management and standing point of the future. This creates a recomposition of the invasive alien plants.

- A. Parking area
- B. Small workshop space
- C. Main workshop / cafe space
- D. Botanical ruins
- E. Observation structure
- F. Braai and play
- G. Wood stockpile
- H. To the network

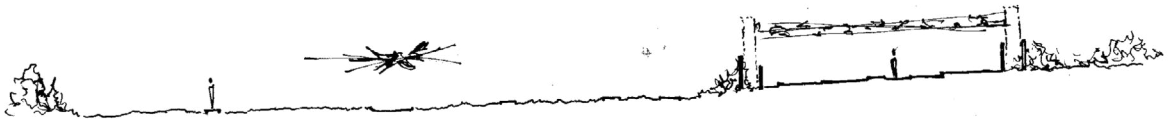
# SITE\_VI: CONCEPT\_SECTIONS

The sections are taken through strategic spaces in the Old Tol House area of concept design I. Some of these spaces can better be explained and visualized in section to understand what feeling is supposed to be given off or emotion to be evoked.

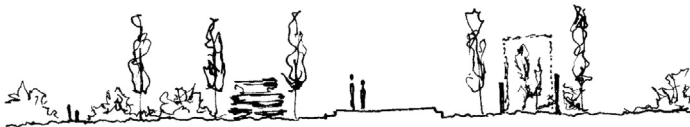
Section a.



Section b.



Section c.



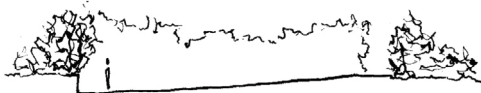
Section d.



Section e.



Section f.



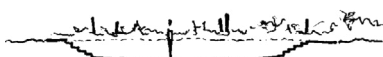
Section g. + h.



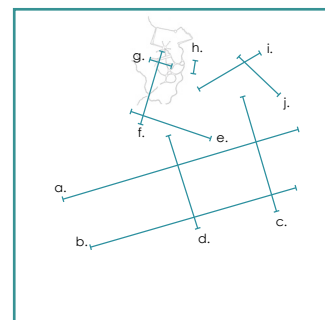
Section i.



Section j.

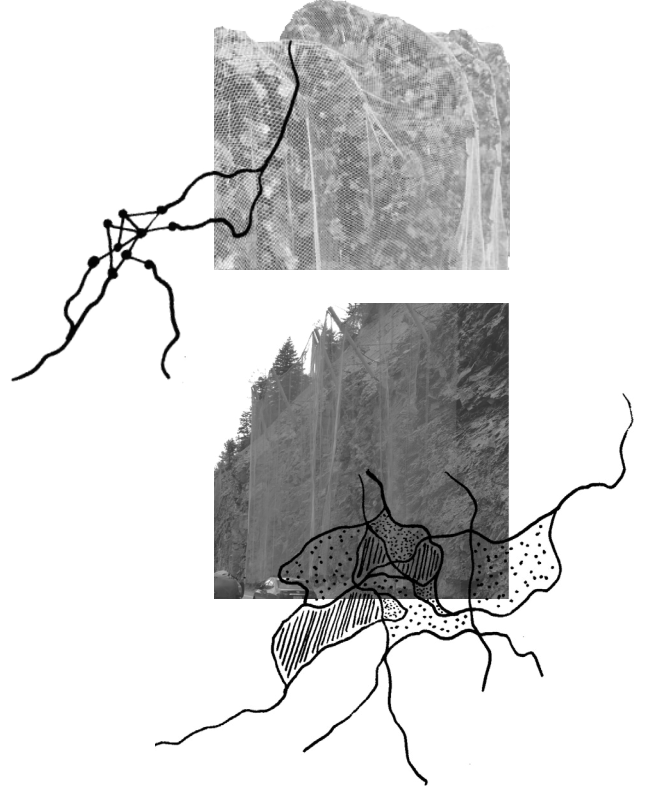
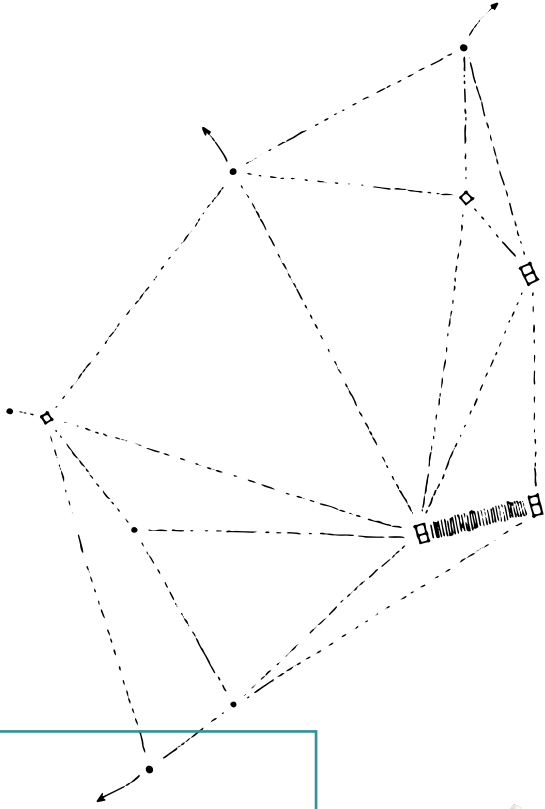


Sections



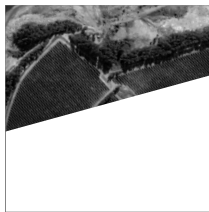
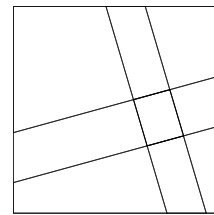
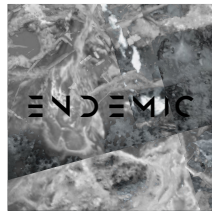
## > THE\_NET-WORK

Net draping over the landscape is the concept used to create the network of trails within the framework which encloses spaces and assists management by encouraging access. This concept can be miniaturized onto site using key site informants to find a structure that holds invasive alien plants and halts alien sprawl.

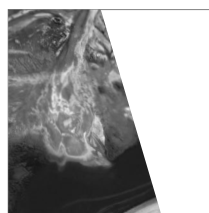


## < A\_SHIFT\_IN\_EQUILIBRIUM >>

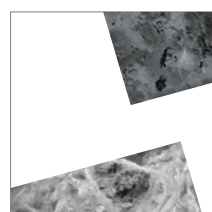
The draped routing network is connected to the site of the Old Tol House village at various entry points. Therefore, the 'net-work' is spanned under pressure, forming a rotated grid, similar in direction as the old tol building remnants. The site's program and design come forth from an inspiration to a metaphorical, experiential and symbolic understanding of alienated and connected space. Tension between components of the landscape is explored to find a shift in equilibrium. Each zone of the tile can contain a specific theme, referring to the site's context, which is overlapped by other themes, creating slippage and variety in the space. The programs are ordered in this grid accordingly. The superimposed grid is interrogated further in a later stage to find a language that speaks about the systems complexity, richness, context and traces on site which is lacking in concept design II.



Between the alien and the endemic / indigenous one must find a place in which both can exist without doing harm or posing threats to one another. A transformation of either two may be required for integration.



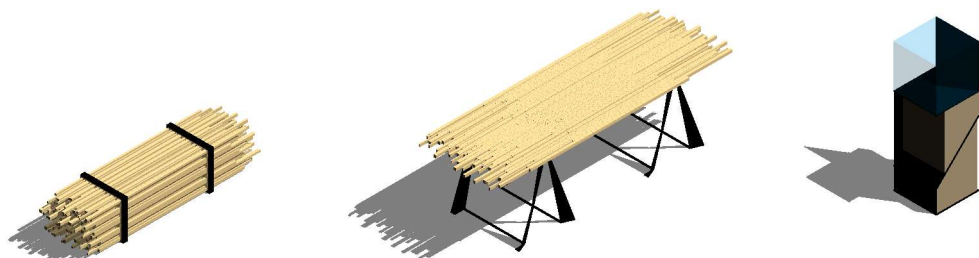
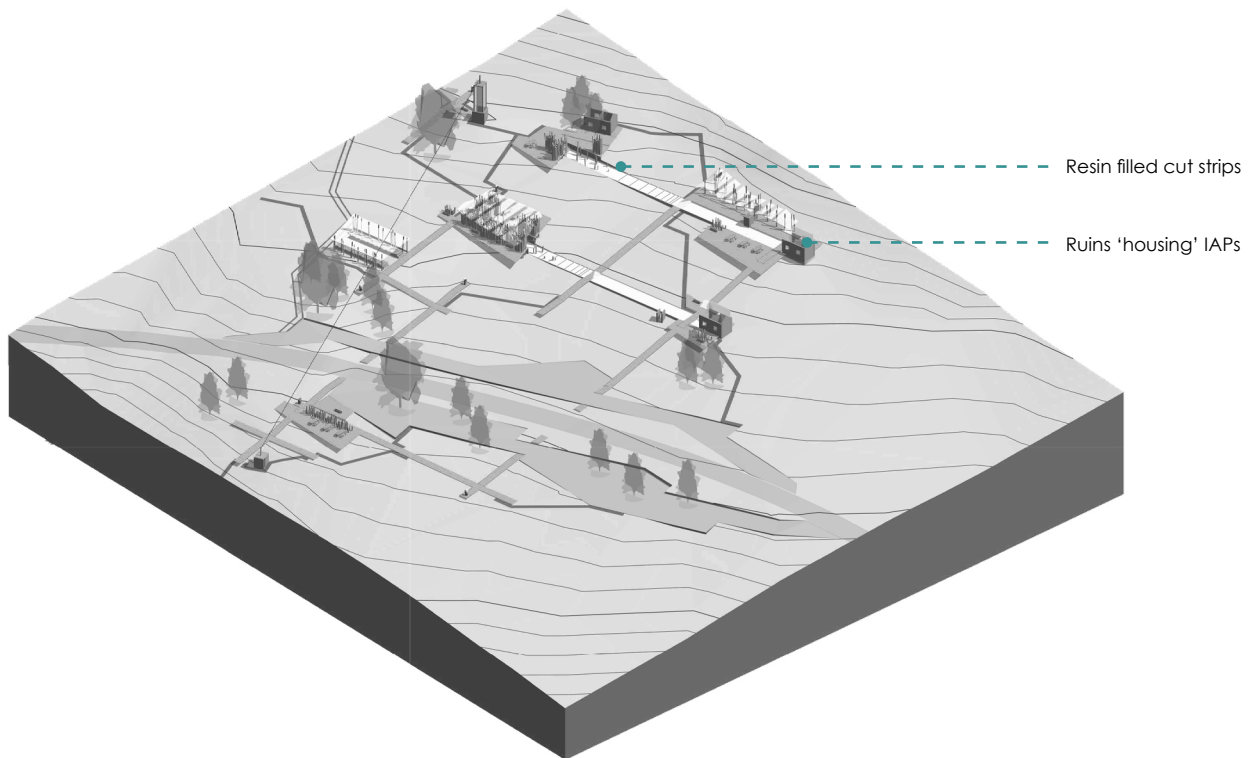
Both water and vegetation are strong, valued characteristics and resources of the landscape. However, to understand the landscape qualities, processes and potentials better, we need to explore beyond these two components.



Life and death; emergence and decay will always be part of the landscape. The price of life can be the death of something else. Sustainability is never an easy task in the eyes of nature. An equilibrium comes at a cost. - Tol

## +++ SITE\_VI: CONCEPT DESIGN II

Concept design II of the Old Tol House site focuses on being an operative space with poetic elements tested. The personification, emergence, decay and perceived alienation of IAPs in the landscape is told in a rather structured fashion. Quiet a heavy emphasis is laid onto the ruins on site and the qualities of IAPs in the landscape. The two wide strips in extension of the ruins are surfaces filled with solidified resin, submerging IAPs on site and are carved out of the earth suggesting a cut by human impact onto IAPs in the landscape leaving a scar that has healed over time. The two ruins themselves 'house' a living invasive alien plant to let it grow to it's full potential. The reflective space within the 'housing' starts to engage up-close with the visitor to rediscover the values, qualities and beauty of the IAPs without feeling looked upon negatively by society, allowing a paradigm shift to be approachable. Suitable furniture related to clearing processes is scattered around the site.



## SITE\_VI: CONCEPT\_DEVELOPMENT

Although concept design II is poetically and functionally strong in particular points, the design of the site as a whole is lacking a cohesive and composed aesthetic which is required to speak about the context of the site and complex processes involved in IAPs behavior, management strategies and resources within the scheme of the design framework. Understanding the site by celebrating water, working with topography, implementing focus on resource and entry into the Landscape of the Alien become key aspects to take the essence of concept designs I and II into a coherent final design. A form of contested space related to alienation and belonging must stand out, along with a functional heart and exciting moments for various activities that are generally included in rest-stop typologies and working sites.





## TERRITORIAL\_SCOPE

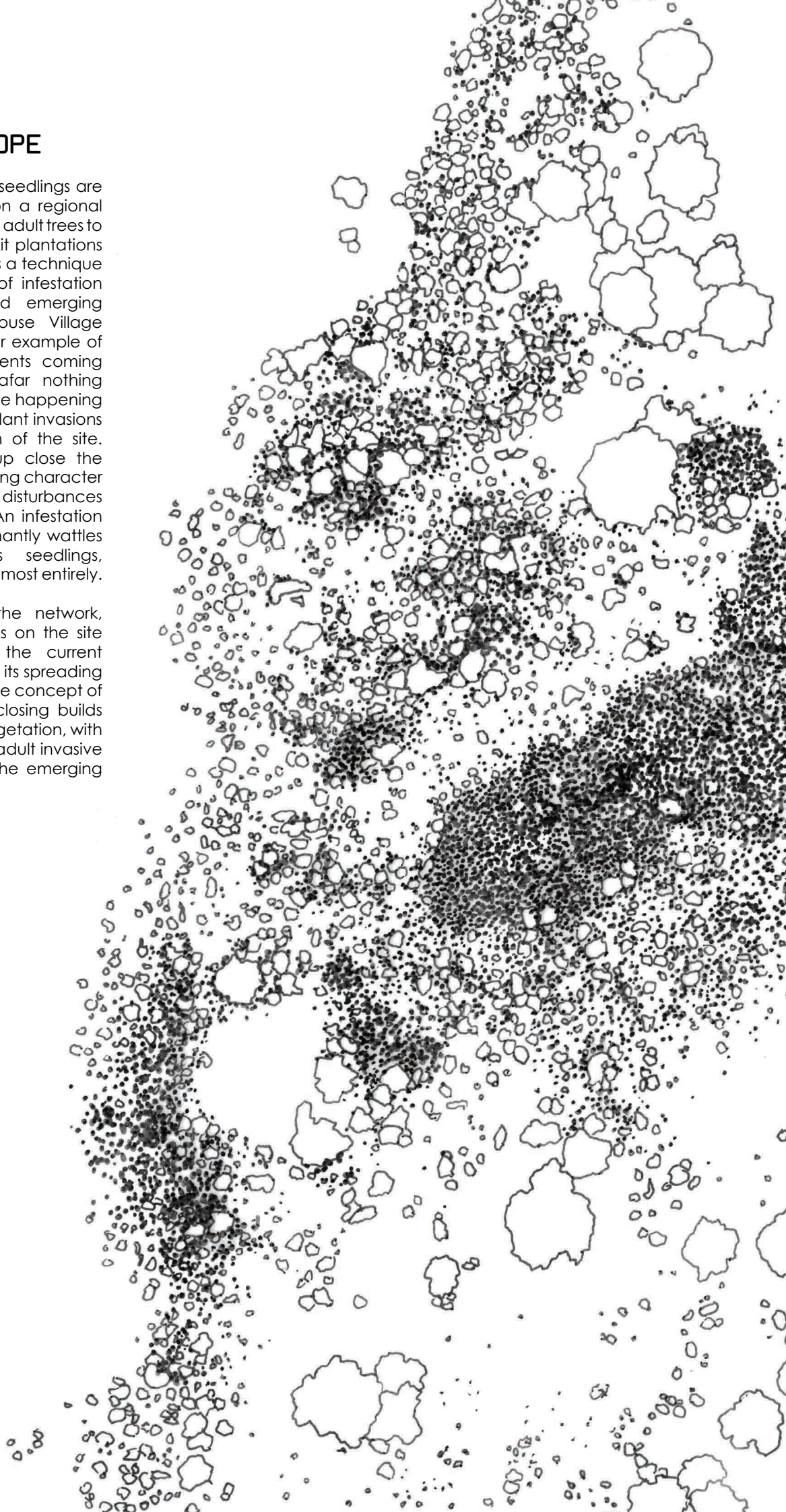
The extend and spread of invasive alien plant species on a local site is as severe as the scope on a large scale. From the road things may look fine and unaffected, but just on and over the mountain ridges things play out much worse. Vast inaccessible areas are covered by dense invasive alien plant species that outgrow and vanquish indigenous vegetation, reduce water run-off by 50% and change soil conditions negatively.

Tracing adult trees helps to understand which areas are lost forever and which unaffected areas need protection from impending spread. Scattering of species is the source of the 'invading' character of the IAPs. By zoning areas per densities, one can decide to control the zones with a scattered condition, to reduce further impact onto the landscape.

## LOCAL\_SCOPE

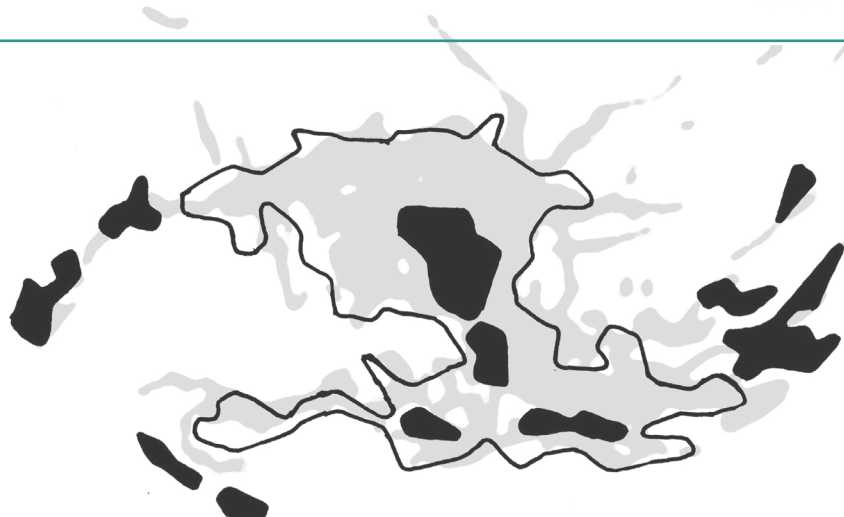
Young trees and seedlings are difficult to spot on a regional level. Thus, tracing adult trees to water courses, exit plantations and burnt areas is a technique to find patches of infestation with smaller and emerging IAPs. The Tol House Village ruins site is a clear example of all four components coming together. From afar nothing serious seems to be happening in terms of alien plant invasions and degradation of the site. However, from up close the site has a frightening character due to several disturbances and conditions. An infestation of IAPs, predominantly wattles and eucalyptus seedlings, covers the area almost entirely.

The design of the network, spaces and forms on the site is informed by the current cover of IAPs and its spreading characteristics. The concept of clearing and enclosing builds on the existing vegetation, with emphasis on the adult invasive alien trees and the emerging IAP seedlings.



## << INVASIVENESS\_IN\_ACTION

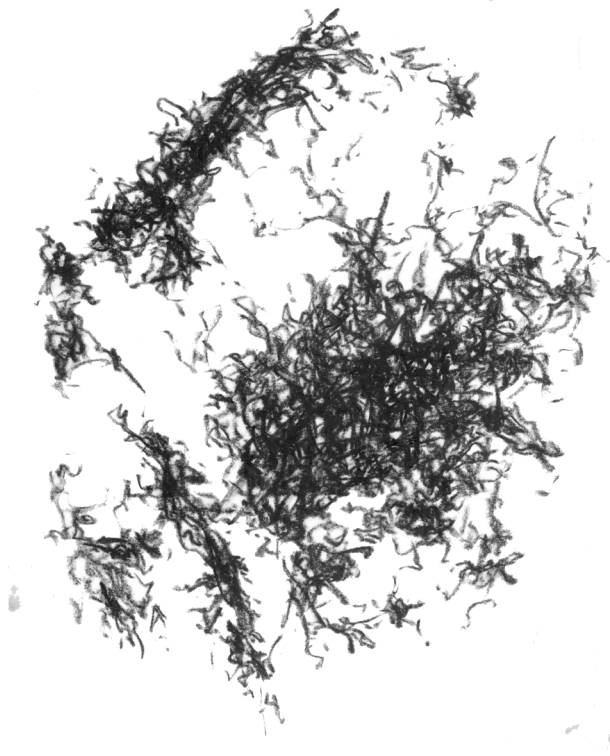
The natural process of invasiveness in vegetation is a complex system which is more difficult to predict or measure than climate change. Invasive plants have little biological controlling agents and are adapted to many extreme site conditions and weather patterns. The act of invasive movement through growth, spread, emergence and competition creates unique and intricate process patterns. These hard-to-perceive natural processes have been interpreted by tracing zones holding IAPs with a hard, fast moving, loose hand and unpredicted direction. By abstracting these natural processes to an understandable human perception one can find deep form which brings more meaning to the site.



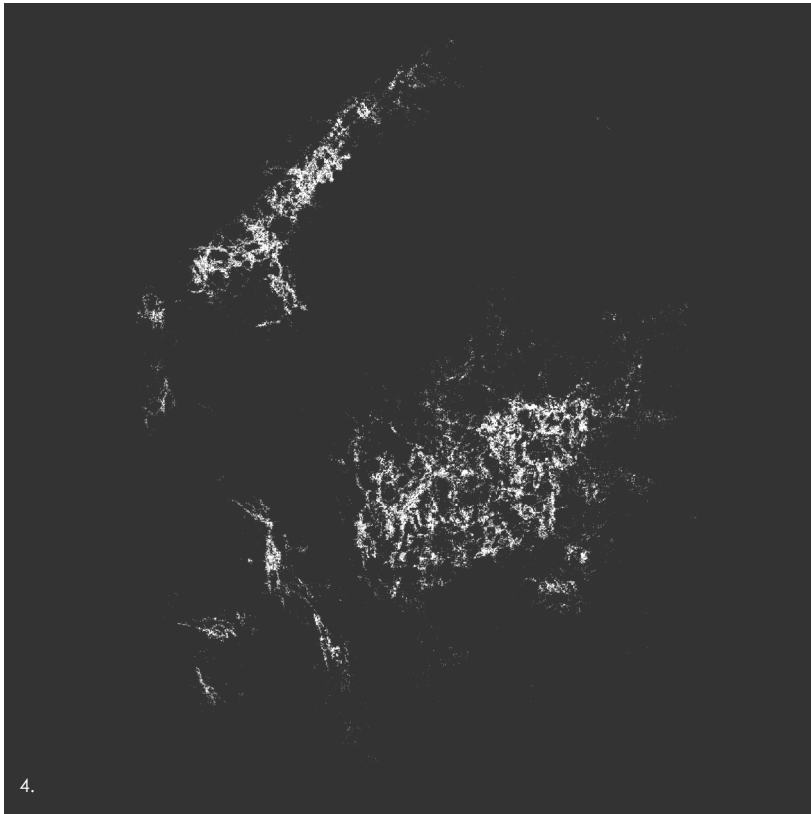
2.

## > INVASIVENESS\_ON\_SITE

1. Invasiveness of nine densely covered zones with IAPs in the study area
2. Abstracted invasive process forms
3. Invasiveness on site
4. Thick dense cores of IAPs on the site
5. Threshold of invasiveness on site, implying spread, emergence, response and dispersal of seeds



3.



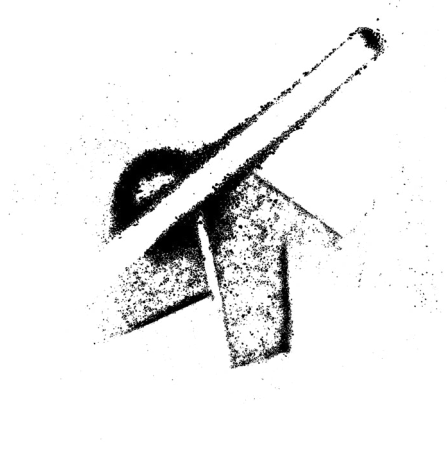
4.



5.

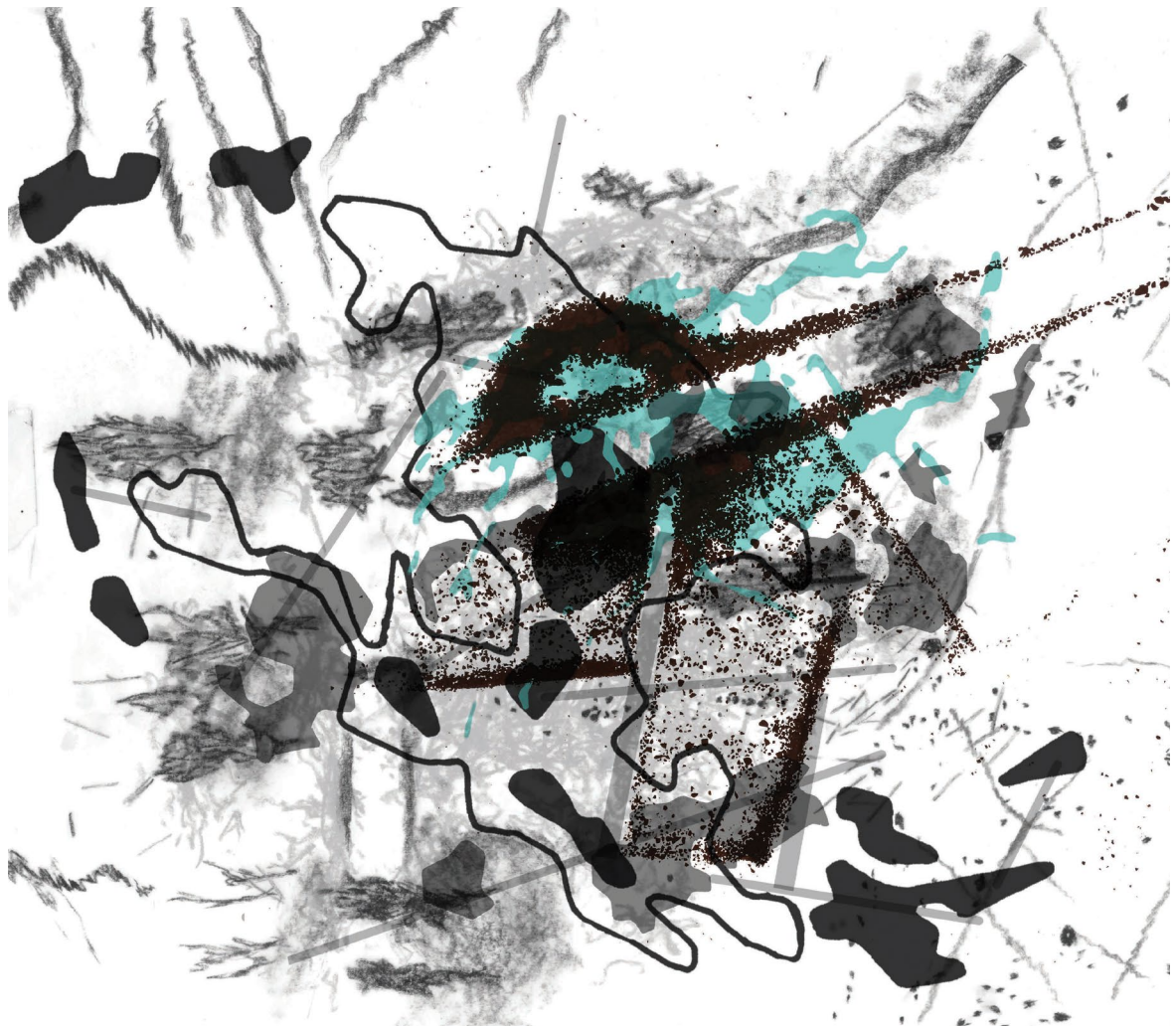
## SITE\_VI: CONCEPT\_DEVELOPMENT

Key elements from concept design I and II, together with new informants and compositions, are taken into consideration in the forming of the final concept design, which subsequently will be developed further into the Final Design of the site.



When building the installation 'Recomposing the Decomposing' a seed-head of *Eucalyptus camaldulensis* exploded inside my flat when I dropped it. The hundreds of (instant) coffee-sized seeds that were released upon explosion made me realize the impact invasive alien trees can have on the landscape after dispersal. The release of seeds is given a boost through any form of disturbance.

An experiment on dispersal, spread and scattering was done with instant coffee held in the heart of the site and 'dispersed' by wind to explore effects of IAPs into unaffected landscapes. Clues of disturbances on site and sources of water allow the spread to halt and cluster. Other disruptions or counter-forces were informed by specific conditions on site related to human impact to IAPs.

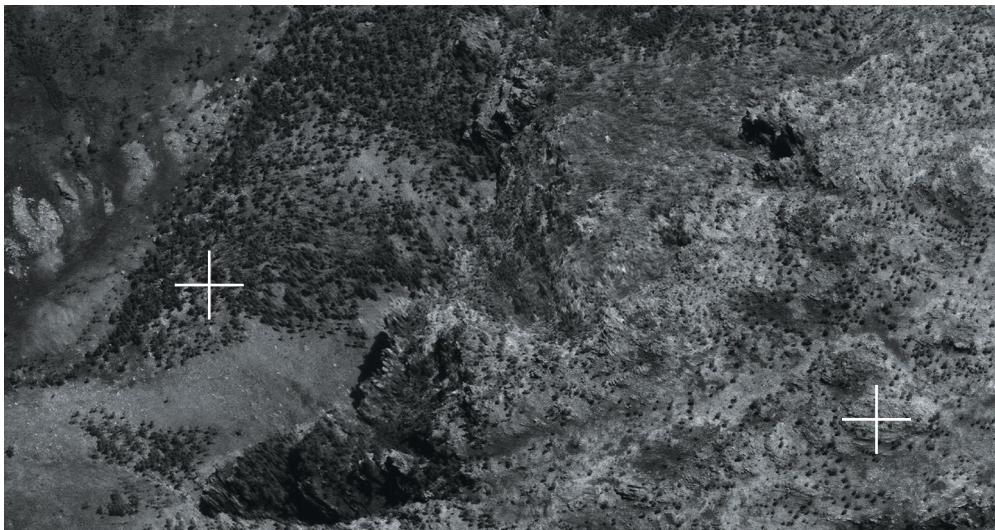


## > SITE\_VII / VIII: PURGATORY\_AND\_AMANDEL\_RIVIER\_KOM

The sites VII and VIII are located further in from the Franschoek Pass where currently no access routes are to be found. Site VII hosts the first, rather scattered patch of IAPs, which predominantly exist of *Pinus pinaster* on a mountain plateau. This plateau has a generally low slope percentage. To be able to get onto the plateau, the shortest and easiest route is through a gorge with magnificent rocks, cliffs and an Southern Afromontane Forest. The patch and scattering of IAPs is visible from the pass and directly connected with new routes to / from site VI; Die Ou Tol.



Site VIII is situated in a valley and seep, consisting of a dense cluster of IAPs, along the confluence point of multiple streams. The western side of the site is found on a much higher part of the mountain with large scattering of IAPs, mostly *Pinus pinaster* and *Hakea sericea*. A koppie / peak of the mountain range forms a landmark in this landscape and potential viewpoint.

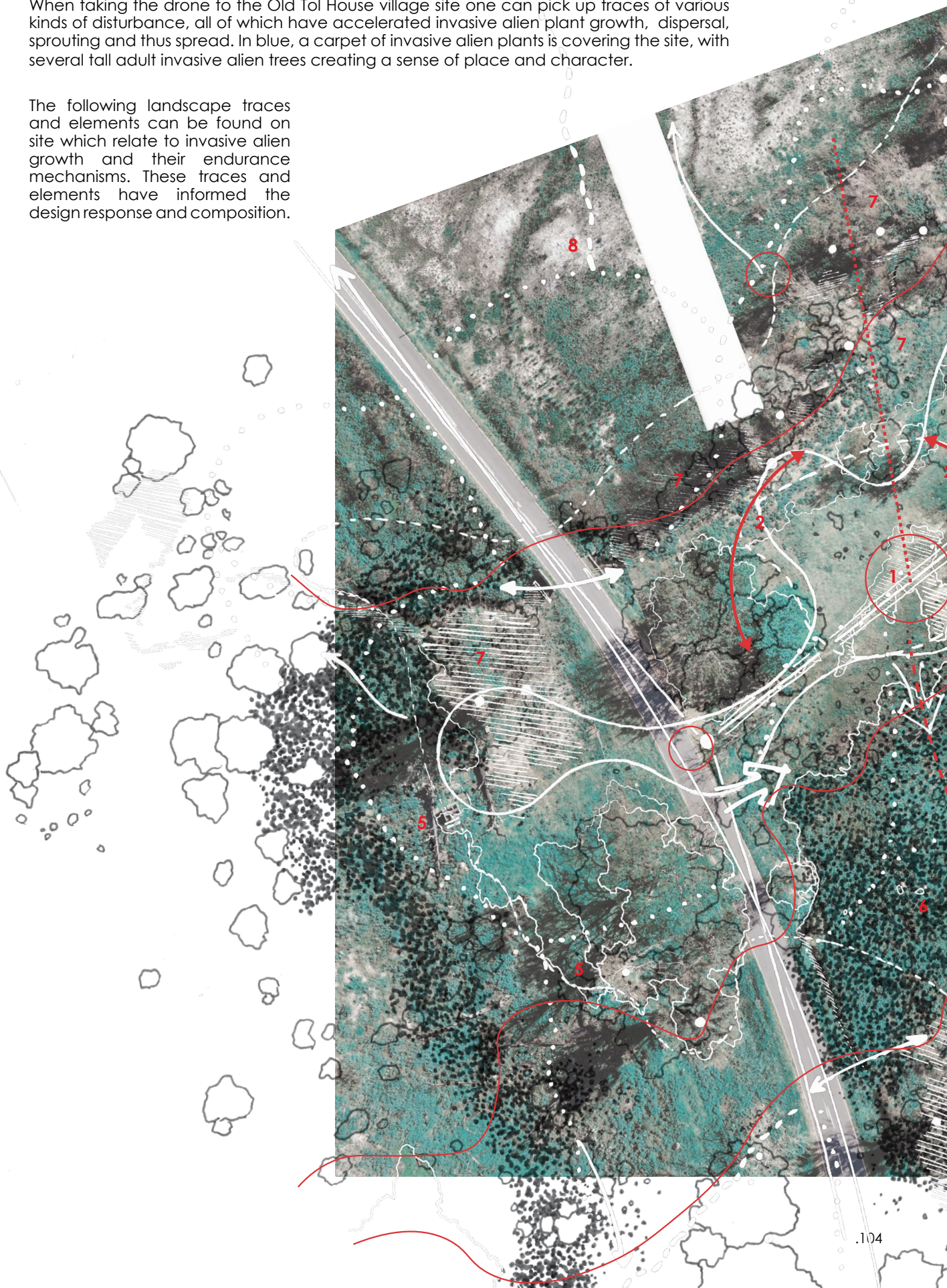


Both site VII and VIII are taken into the larger scheme of the framework as critical locations, yet due to their isolated and inaccessible character these sites will not be considered further in the design of this project. However, these sites are in relatively close connection to site VI of the Old Tol House Village (Die Ou Tol) as critical zones for intervention, only accessible by entry through site VI and visible from this site.

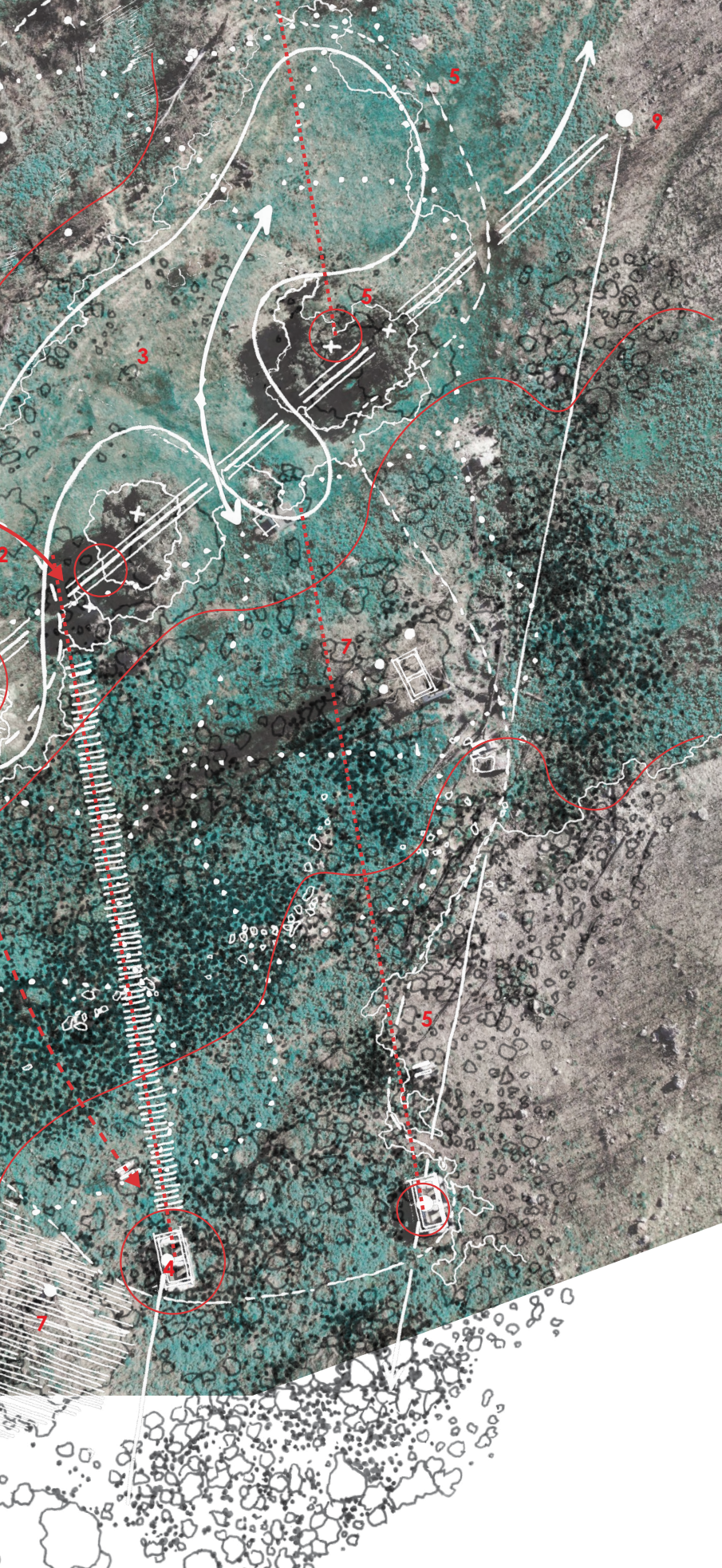
## + LINKING\_LANDSCAPE\_TO\_INVASIVE\_MECHANISMS

When taking the drone to the Old Tol House village site one can pick up traces of various kinds of disturbance, all of which have accelerated invasive alien plant growth, dispersal, sprouting and thus spread. In blue, a carpet of invasive alien plants is covering the site, with several tall adult invasive alien trees creating a sense of place and character.

The following landscape traces and elements can be found on site which relate to invasive alien growth and their endurance mechanisms. These traces and elements have informed the design response and composition.



Drone footage of the site + existing invasive alien plants



Design informants

1. Large eroded dry patch
2. Near enclosed space by trees
3. Primary open active space
4. Primary directionality through ruins and paths
5. Site's character extent
6. Heavy infestation by IAPs
7. Tall invasive alien trees
8. Desire lines
9. Key view points

Scale 1:1000



# RECHARGE

THEEWATERSKLOOF\_DAM

## V. FINAL\_DESIGN - INTRODUCTION

### Evolving Alienation

In the framework the draped Network of trails includes key points of intervention where more public engagement and awareness can be explored through design on a human scale. The site of the Old tol house village was found to be the most promising site since it is an existing disturbed site which is the most accessible site within the most inaccessible part of the landscape in the study area, sitting on the confluence of multiple water sources, a priority wetland of the Theewaterskloof Dam and along the Franschoek Pass.

The concept of the final design is to build a working node and experiential route around elements in the landscape that are linked to invasive alien plant growth mechanisms as found in the design study. The prominent elements are traces of disturbance and the presence of water. The final design includes key components from the three design approaches and focuses on the IAP mechanisms with aspects of management practices and resource related activities to achieve public awareness and engagement while assisting management and celebrating resource potential.



Mechanisms



Management



Resource

## FINAL\_DESIGN – SUMMARY

The working node has both functional and experiential program. It is envisioned as a laboratory-type space where the activities associated with the management and resource processing of the plant species can take place, as well as being a space that is open to the public and creates awareness of the issues around alien invasive plants in the catchments.

Unpacking invasiveness through 3 design approaches for the final design:

1. The first approach explores management of invasiveness spatially through miniaturization, exposing the journey of IAPs into South Africa and revealing the different management strategies with notions of clearing, spread and suffocation.
2. The second approach explores tension in invasiveness by creating contrast between IAPs and elements such as water, fynbos, forestry and landscape experience, revealing notions of scarring and healing.
3. The third approach explores the complexity in invasiveness, using natural processes to create form which can expand an understanding to mechanisms behind invasiveness.

The overarching principle of the design is to tread lightly on the site, create as little disturbance as possible to prevent opportunities for accelerated IAPs growth and spread. This resulted in a design choice to centre activities on the site and work with the existing topography as much as possible.

A large eroded dry patch on the site, between the stream and seep, forms the space where activity is centred, using this heavily disturbed area to remain in continuous disturbance through management and resource related activities.

This area is surrounded by tall invasive alien trees that define the character of the site. This site characteristic is enhanced by planting a ring of *Populus simonii* each year around the core to start a vortex of growth and spread. Underneath these trees a transformation of invasive alien plant material takes place. This transformation process consists of two different approaches. One is the use of woody invasive alien plant material for timber products, creating opportunities for skill development in woodwork. The other is the process of turning invasive alien plant material not suitable for timber into biochar and carbon through the process of pyrolysis. In the process of pyrolysis two rehabilitation techniques come out. The first is to coat indigenous seeds with biochar, forming pods that can then be taken up by drones to reseed cleared areas previously infested by invasive alien plants. Thus, the invasive alien plant material is placed back into the landscape to assist indigenous plant growth, making it able to compete with invasive alien plants. The other rehabilitation technique uses the by-product of smoke, generated by the pyrolysis plant, channelled through the site into smoke germination tents where indigenous seeds lie in trays. The seedlings can then be taken care off by local communities in exchange to assist in education and livelihood development.

The site currently already has quite a lot of invasive alien growth which can be divided into two groups; sprouting invasive alien plants in the seep, and tall majestic adult Eucalyptus trees along the stream and close to the ruins, classified as invasive. The existing invasive alien trees are used as feature trees which inform the extent and focus of the design, making the working node a visually contrasting landmark in the area. Together with the ruins and existing pathways, that connect the site with the Network of Trails, a circular link is created, which intersects the seep and stream. The link consists of a 500mm wide steel elevated walkway, holding two invasive alien timber planks, and skirting along the elements that are linked to invasiveness. This allows for individual engagement with the surrounding landscape, and most specifically the planting scheme, without disrupting the ground. However, if desired, one can climb off the walkway and bundu-bash through the vegetation, clearing a path and letting the visitor decide on disturbing or respecting the ground, making new marks on the landscape that may potentially result in accelerated invasive alien plant growth.

The steel grate walkway, which extends from one of the key ruins intruding the activity centre, linking human disturbance to invasiveness, allows visitors to trim the new wetland plants by walking over the grate. This grate also mimics in action by trampling the elephant migrations from the past in this direction and space. The winged seeds, which appear as scattered lightweight seating platforms, bring pause moments into the site that reflect on the impact of fire, wind and erosion to invasive alien plants, and the impact of shade, fuel load and degradation of biodiversity that these species create.

As much as invasive alien plants are a serious threat that needs to be addressed better and urgently, we must also create ways to find a balance, in which both water and the enduring invasive alien plants are resources to be considered. By expanding on management and awareness around invasive alien plants, using an understanding of the mechanisms behind invasiveness spatially and experientially, water resources can be protected while also addressing many challenges facing local communities and the urban realm.

# +++ FAMILIARIZING\_THE\_ALIEN +++

Designing a working node that reveals the opportunity of invasive alien plants as a resource in the Theewaterskloof catchment area.

## Franschhoek Pass

The Franschhoek Pass goes through the site with a slight dip in the road where the seep intersects. The road will have pullover spaces for trucks

## Entry

Entry point into the 'Landscape of the Alien'

## Walkthrough

A circular walkway, 'encloses' the site's extent and skirts critical landscape components such as ruins, traces of disturbance and water sources. The walkway consists of a stepped modular rusted steel structure with two timber planks to enhance the individual experience, reflection and engagement to the surroundings

## Vortex

A large number of non-invasive alien trees are planted in a vortex composition, which represents the infinite amount of seeds which can be dispersed and sprouting through disturbance. The enclosed space these trees create provides a shade and contrast to the vast landscape of the mountains. The trees can be removed and replanted as they grow over time. The trees also provide a comfortable wind protected space

## Access

Exposed aggregate concrete tracks allow vehicles to drive into the core to deposit and withdraw invasive alien plant material, assemble management teams and provide access to visitors

## Elevation

Rising from the timber walkways, rusted steel walkways start to elevate up to specified heights to emphasize on panoramic views and specific sights. This elevated steel walkway connects both sides of the road with each other in the design. The piled logs assist as support structures.

## Secondary core

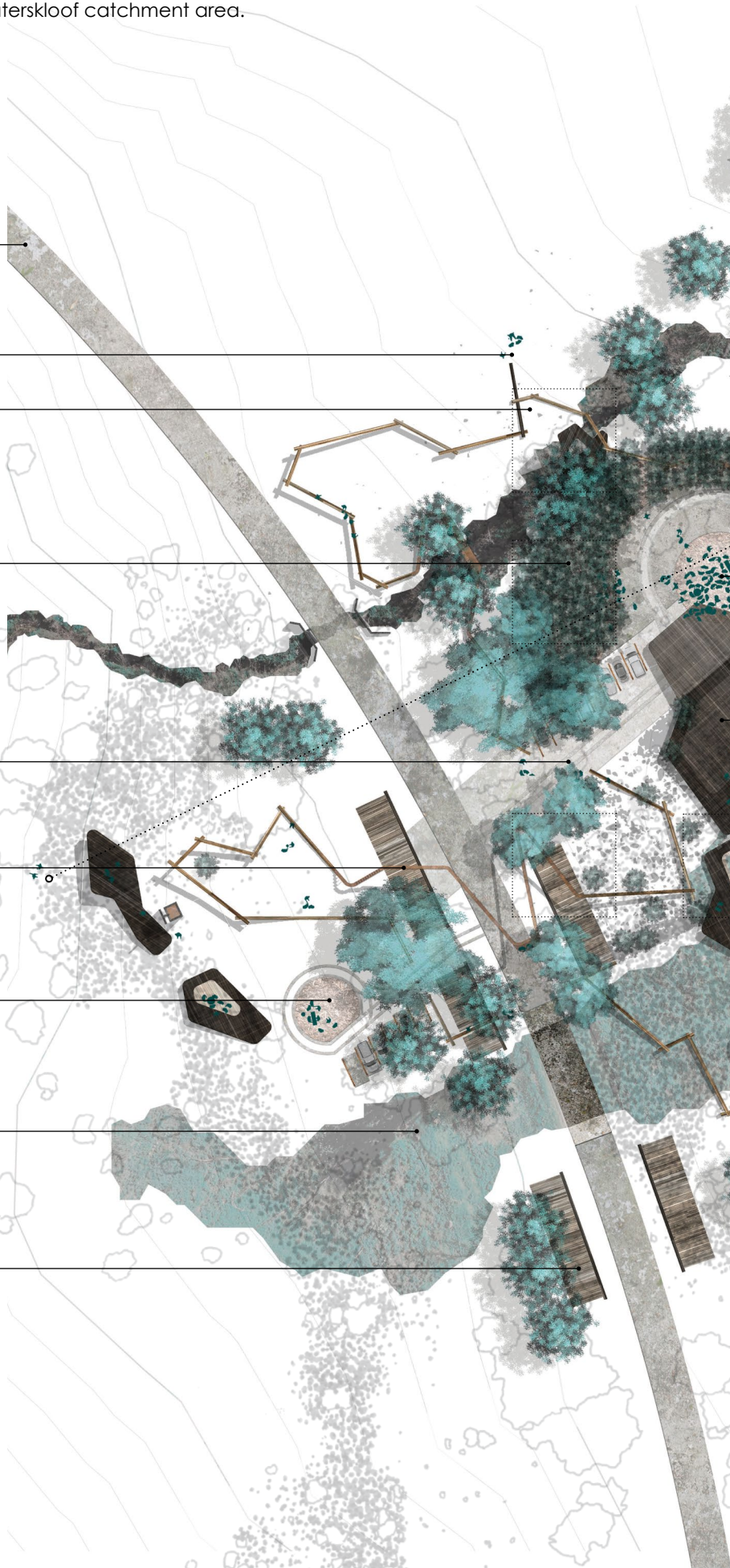
In the secondary core, which is an open space of the turning circle for vehicles, an allowance is made for an installation or sculpture that can be build to create a centered meeting point and active engagement zone

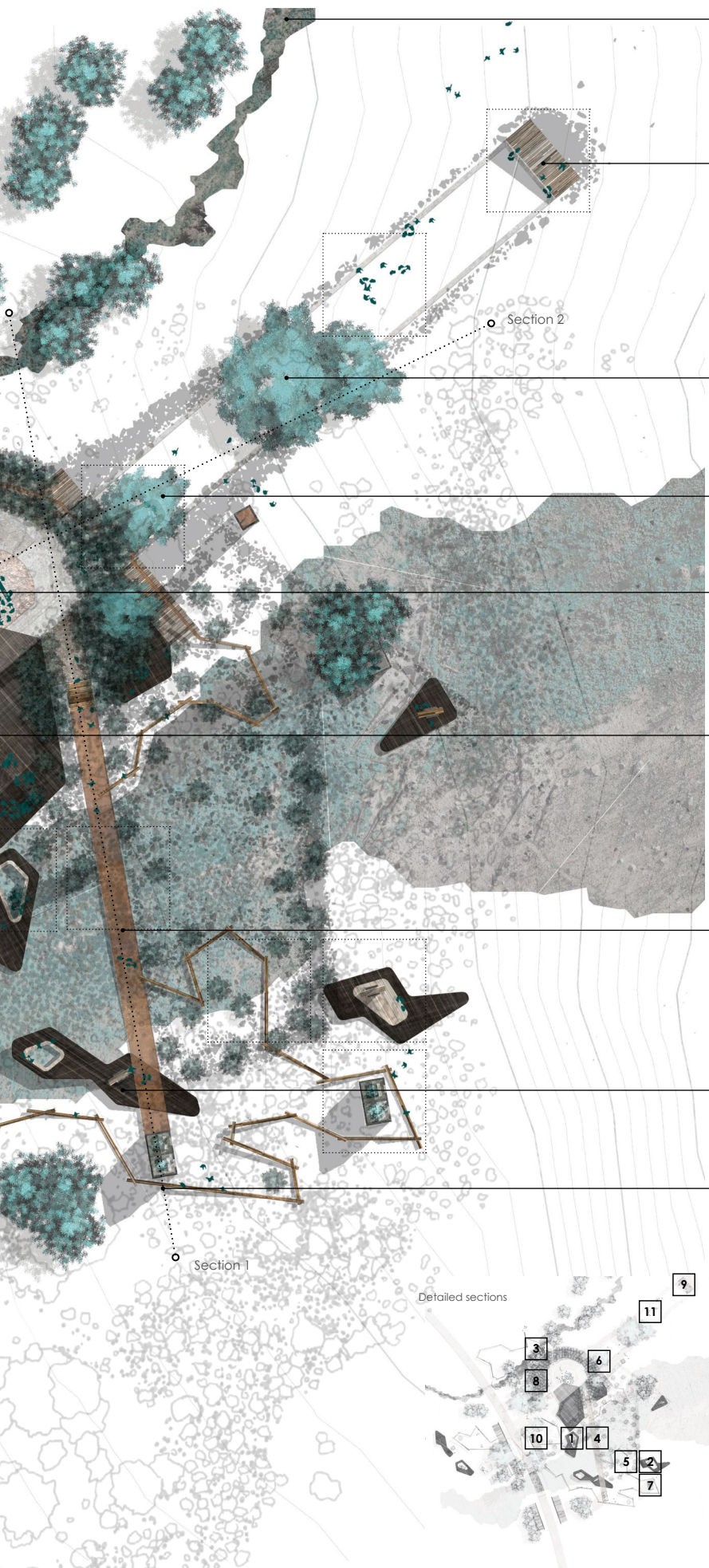
## Seep

The seep which runs across the site is cleared from almost all its sprouted IAPs and rehabilitated with fast growing indigenous wetland plants and regular monitoring practices. Interaction with this critical water source, filtration, infiltration and sedimentation zone is maximized with minimal footprint impact on the site's ground

## Log gateway

Most of the woody invasive alien plant material which is too large to bring into the cores of the site by trucks will be placed along the sides of the road. This design decision starts to engage with passer-by drivers as a gateway feature instead and can form a structural element to some elevated walkways and seating elements. These piles of logs are not entirely permanent and can vary in height and length, depending on the amount of IAPs extracted from the landscape





### Stream

The stream that runs alongside the site is surrounded by multiple adult invasive alien trees and somewhat covered by smaller emerging IAPs. The stream is used as a major informant to the design by in fact positioning the core between the stream and the seep, sightlines, walkways and platforms reach to and over the stream, leading to points of entry into the 'Landscape of the Alien'

### Log theatre

The disturbances on site reach up to this point, with clear traces thereof. The log theatre consists of invasive alien wooden logs, piled and shaved to a stepped seating element and blocks views to the mountain to focus instead on views related to water sources such as the stream, seep and even Theewaterskloof Dam.

### Feature trees

The existing adult invasive alien trees (Eucalyptus spp.) which stand in the main direction and sight line of the log theatre create a contrasting setting which evokes emotions of displacement, while enhancing the site's characteristic

### Elevation

Some elevated walkways are married with the principle of surrounding / embracing existing adult invasive alien trees to provide additional experience in bringing the visitor into the tree canopy and draw attention to the species only

### Core

The core of the site contains the main outdoor activities that facilitate and celebrate the storage and processing of invasive alien plant material through wood craft and forestry related aspects. The core consists of an enclosed area. This open space, slightly raised, is covered by woodchip, over time spreading across the site through impacts of climate and movements

### Pod

The pod is the main structural component of the site. The function of this architectural pavillion / building can vary and is not prescribed to specific applications. The pod will be able to house ablution facilities, a cafe, storage of tools and machines, an information centre, meeting space and workshop space. The pod is build and clad with IAP material and sits on a lightweight timber platform. This platform wraps up against the facade of the pod and over the connective strip, as a shade structure or timber canopy

### Grate

A rusted steel mentis grate is placed in extension of one of the key tol house village ruins and intrudes the activity core, representing the general human impact and perception on IAPs. By breaking through vortex, a wave of disturbance and scarring has happened, releasing energy, growth and potential. The grate allows new wetland plants to grow through the holes and visitors to 'mow' and trample the plants to find a way through

### Seeds

These seeds, which appear as scattered, lightweight platforms with seating pockets pause moments, view points, places of play and engagement with water. Signage is applied onto re-used ruined ablution structures

### Ruins

A translucent resin / glass house is slotted inside the ruin structures which 'houses' the IAPs to let them grow to their full potential. Although the species may still be perceived as out of place initially, in this space they are harmless to the landscape and can be reflected upon individually, familiarizing the alien

# >> PARTI\_DIAGRAM\_BREAK-DOWN

The parti-diagrams deconstruct the design into four significant aspects, of which the landscape traces are the initial informants.



## Landscape traces

The design of the working node and experience walk is informed by landscape traces that can be found on site. These traces all have a notion of disturbance to them, resulting in the acceleration of MPH spread and the invasive characteristics. Form and function are derived from complexity in natural and management processes.

## Stream flow

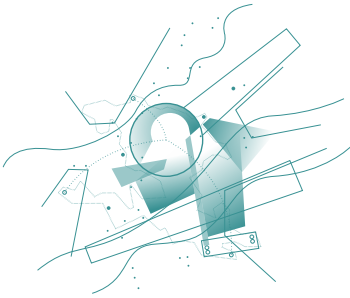
Water run off from the slopes of the mountain to the Transvaal Dam. But the streams are mountain topologies that are in fact created by MPH. Highest and vegetation loss is paired with reduced water flow due to MPH. The focus on water should therefore become central to the design to find ways to reveal nature's resource calibration.

## Sleep

The user has suffered from rapid growth in vegetation. Unfortunately MPH know the best method in a context of sleeping and drinking MPH bedding. The user is one of the most important drivers to MPH and the most critical topology to allow for water infiltration and quality recovery. The user creates unique habitats within the mountains for wildlife.

## Forsythia Pass / Elephants pad + and for House ruins

Elements must cover the valley where the mountain has been cut on a way to migrate across the mountain ridge gaps. The location of the Forsythia Pass resulted in initial large distances to vegetation, ground and water. Once established the act of disturbance is reversed. The user has however remained a constant disturbing factor.



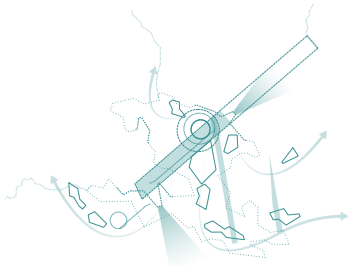
## Planting

All planting has a direct relation to water. Existing adult invasive alien trees form part of the planting scheme while young spreading invasive alien plants will be considered in a more static fashion as harmless plant material. The new planting is comprised of non-invasive, alien trees and spreading native wetland plants.



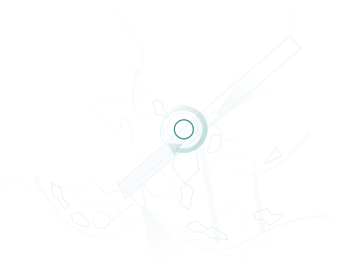
## Vortex

The complex mechanisms of invasive alien plants in the landscape, and spreading aspect of spreading has informed the enclosed space within the design. A lot of interest of non-invasive alien trees are planted in the vortex shape which represents the diffuse amount of work which is dispersed and distributed. Resulting in large quantities of emerging and thriving MPH, resulting in creating a strong focus with a distinctive 'S' shape and 'circle' shape together, the process of spreading growth and creative planting is reimagined to many positive directions.



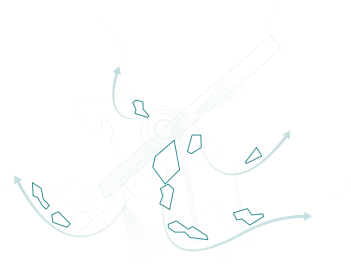
## Surfaces

The existing surfacing is kept as is to enhance contextual connection, while new surfacing becomes second and imposed. New surfacing encourages access, experience and energy flow and storage to maximize activities and engagement.



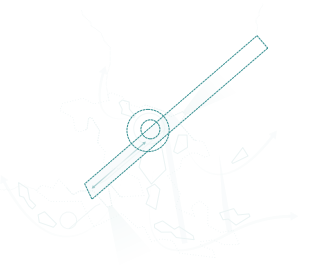
## Core

The core of the site contains the main cultural activities, their facilities and elaborate the storage and processing of invasive alien plant material through wood craft and timber related aspects. The core consists of an open space within an enclosed area. This core space, slightly raised, is covered by a structure that is formed over time through wood processing and naturally spreading across the site by concrete and movement.



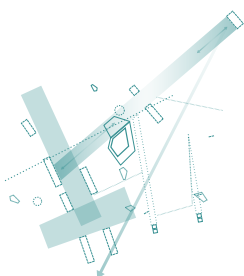
## Dispersal

The contextual activities of the core are dispersed by a scattering of smaller moments of interest. These moments are primarily defined by emerging lightweight timber platforms that can host similar activities to the core, but on a smaller scale. The program is dispersed in the north direction of distance and focus on various habitats of the site.



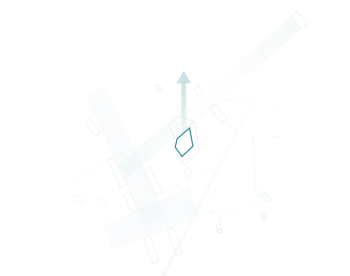
## Connect

The core is defined by an outer fabric and an inner core of other trees surrounding the space. To connect the core with the context of the site and the landscape of the site, a wide strip of benches has been placed through the core, following topographic and geological features on site. The strip also encourages public access to and from the core.



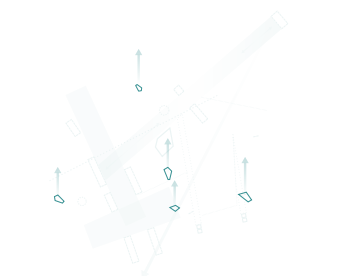
## Structure

Only the essential structural elements have been pushed forwards from the concept designs to create comfort, space, experience and identity. While the surfacing holds the site components together, the structure creates spaces that provide a sense of recognition, reflect and wayfinding.



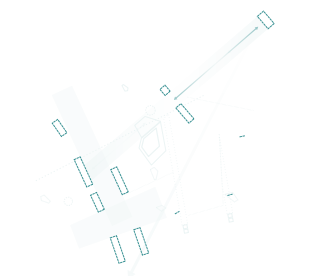
## Pod

The main structural component of the site is the pod. The function of the architectural element of building can vary and is not prescribed to specific applications. The pod will be able to house similar facilities, a cafe, storage of tools and machines, an information centre, meeting space and conference room.



## Seeds

While the pod houses the main, relatively factor related activities, the seeds become the main platform for learning. This allows for the main ship topology to show through in the form of small facilities, plants and other moments of interest. The seeds have been placed strategically to create maximum engagement with water and disturbance on site.



## Complie

Part of the structural elements on the one wooden logs lifted up to create generous, screening, structural support for the sheltered surfaces and a visual experience. The logs are too large for work to be done in the core. The ground remains on the site of the most dense the most dense site in the setting. The wooden poles are non-rotic, and change height and length depending on the amount of rain.



**Tracks and trails**

The tracks and trails on the site are evident through eroded and cleared areas within vegetation patches. Vehicles have used the tracks on site to drive to water further up on the slope. The trails lead from the site to water sources and other rocks in the mountain.

**Rocks and boulders**

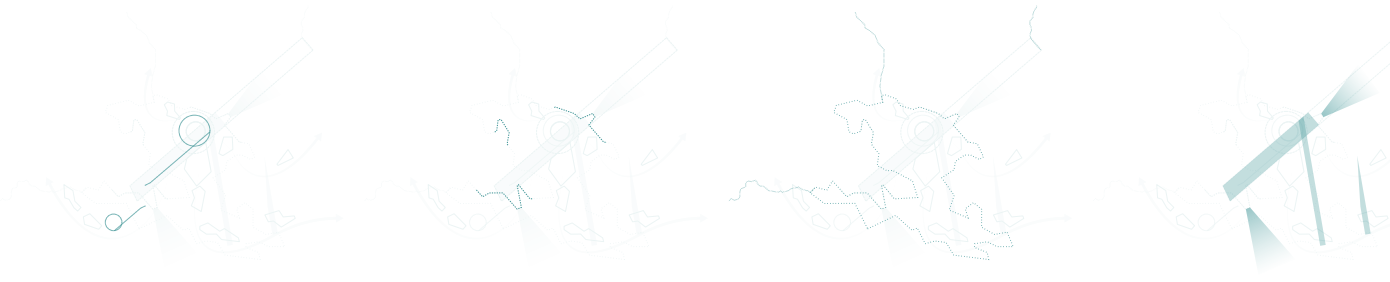
Rocks has resulted in rocks and boulders to collect over the site. The natural process does not happen often, but when it does, the impact creates large obstructions. Some rocks however seem to have moved on site by human forces.

**Existing trees, fire extent and charred logs**

In the last 10 years there has been rapid through the site. Burning most in form of burnt trees, charred logs (blackened) and ash. The fuel load on the site has been used high which can be derived from the large quantities of charred logs lying on the ground. The high intensity fire, due to increased fuel loads, has resulted in a reduction of AP's, grasslands and trees, while leaving few to recover.

**Prospect**

From the higher mountain one can see the Theoretical Dam. From certain angles one can see AP's, standing on the mountain edge and in gorge nearby.



**Movement**

To make the core perform well and allow vision onto the site, two drive through tracks have been placed on either side of the core. These tracks are also used for landscape strategy and vehicle movement of AP material from the core, but also provide parking and access for visitors.

**Elevation**

Additional experience is created by opening elevated walkways in proximity of the core. The elevation these walkways create emphasizes views onto the panoramic landscape, as well as key aspects of it, such as the stream, small houses along the bank and the dam. The most prominent elevated walkways is one that connects both sites of the road.

**Walkthrough**

Reaction to elevation and behaviour of AP in a human perspective is emphasised by a circular walkway. The walkway is slightly raised from the ground to create internal structure and encourage water flow and plant growth around. Spatial elements are not direct by the walkway, instead the walkway around the moments and questions the composition of space through a wide landscape, as well as the walkway have the width of one person, creating a personal selection and engagement with the surrounding landscape and other approaching visitors.

**Views**

To draw attention to specific contextual elements, lightness and open spaces are created through surfacing with minimal structures. Another technique used is to create surfaces that are elevated from the ground or with clearly defined edges and materials palette.



**Adapt**

The post site, similar to the seeds, on a seemingly lightweight repair platform. The platform adapts to support the structure of the post and drive the connective site, on a stable structure or repair canopy. The adaptive fabric of the repair platform and canopy represents the adaptability of AP seeds.

**Mark**

Within the core, as well as in space across the road, sculptural reactions and moments mark the site and reference to the landscape of the Area. These moments have temporal character and can symbolically mark those where a certain amount of AP material is selected from the landscape.

**Alter**

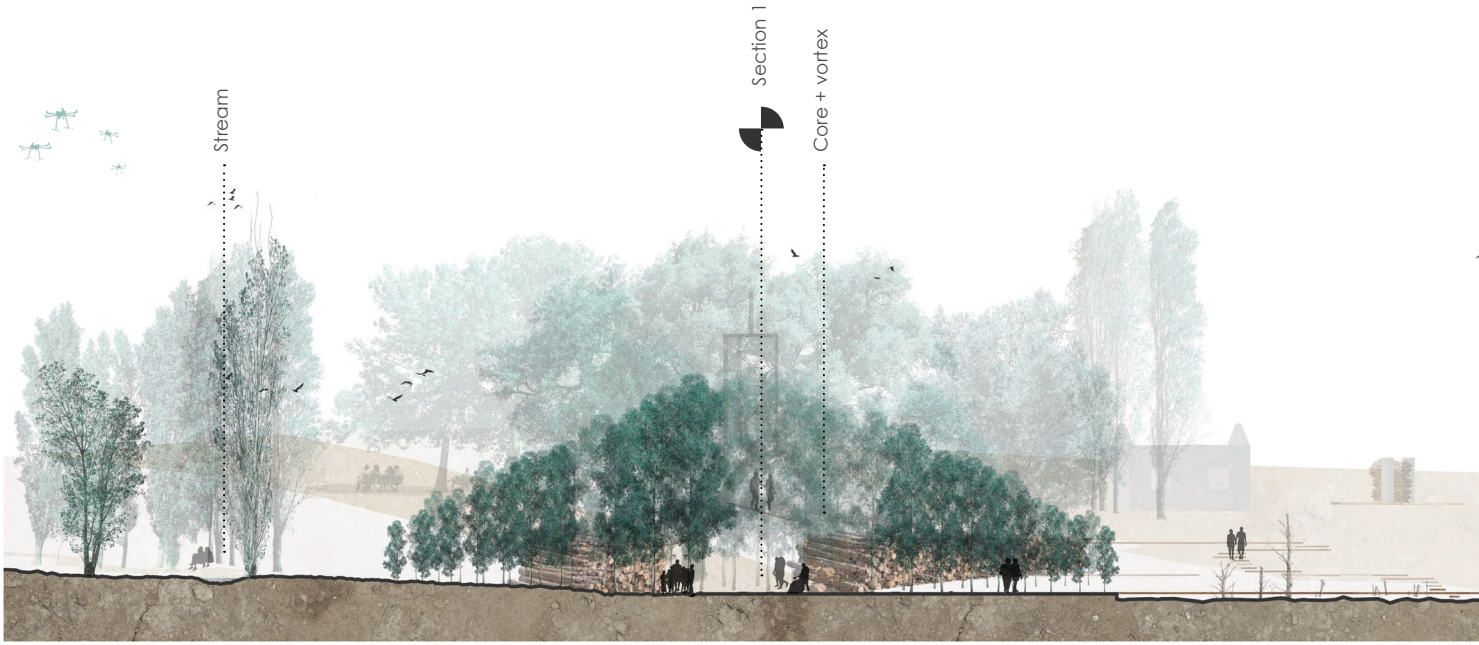
Two sites in the structural focus of the post, in with the elements of the design. The two sites represent the alteration on the landscape by AP removal and seeding, creating a disturbance. A vertical AP seed is placed in one of these sites to link the main flow with the core of the site, allowing plant growth and increase stone.

**Views**

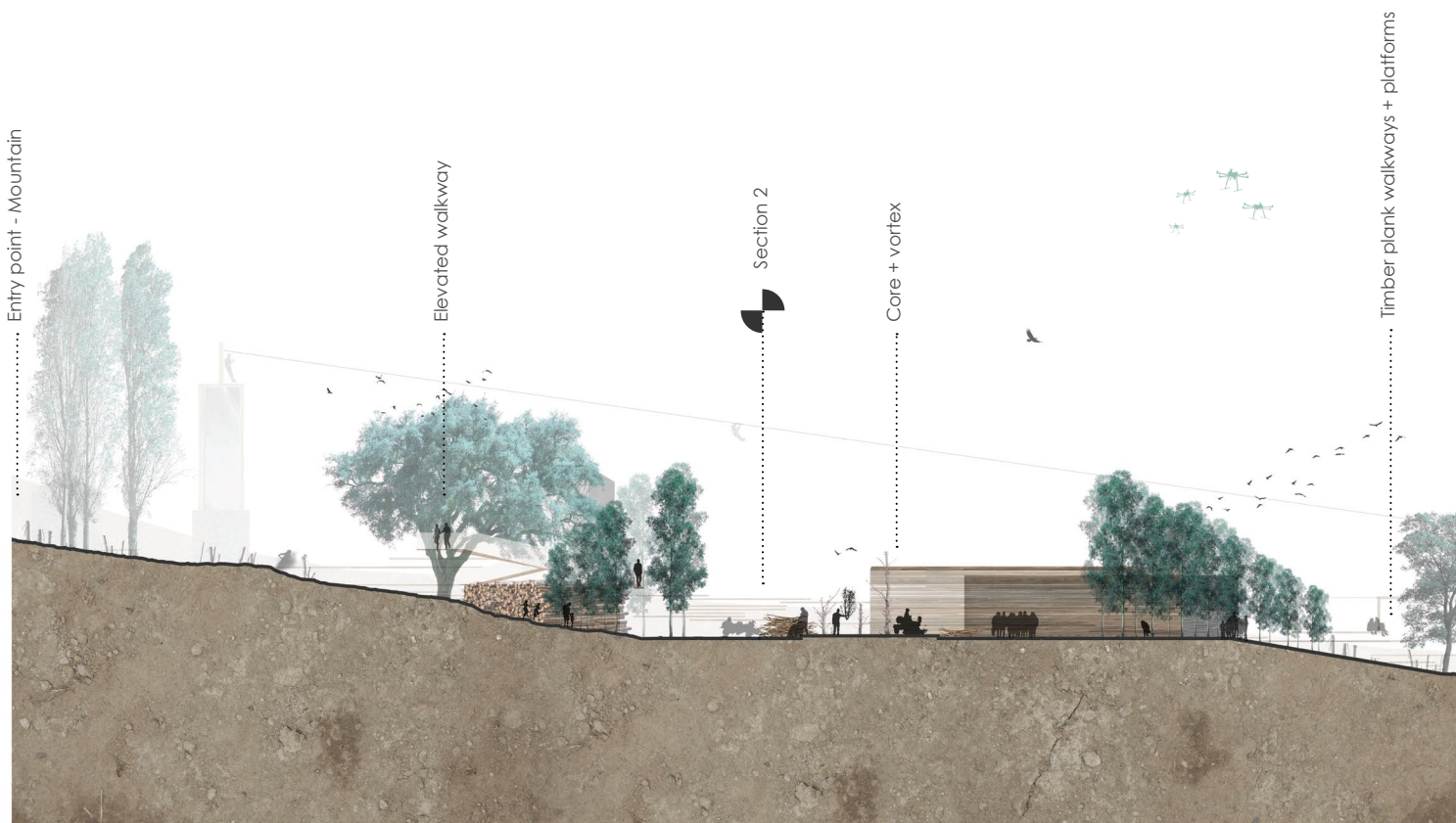
Accented views on the site to guide the eye are created by various structural elements. View from the high structure of the site focus on both moments after trees and water flowing to the Theoretical Dam. Other important views focus on water sources and the link between mountain and valley.

## < LIFE\_LINES >

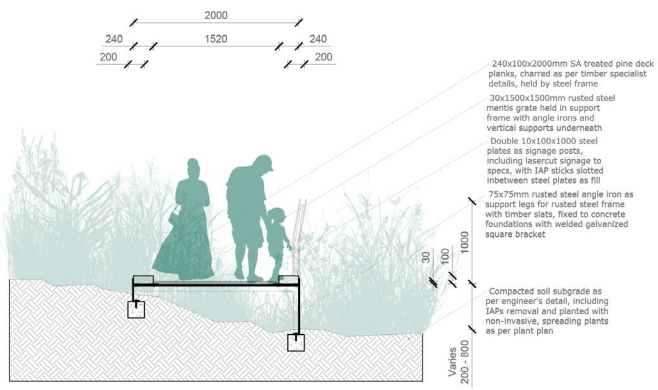
The design starts to create a sense of awareness to the enduring presence of invasive alien plants in the catchments by linking elements that impact invasiveness in the landscape. The long sections manifest the concept of connecting mountain resources with each other to reveal their values, contributions and tensions in a landscape which has limited accessible engagement with people, but acts as a great support and life-line to sustainability of habitats, lives and livelihoods.



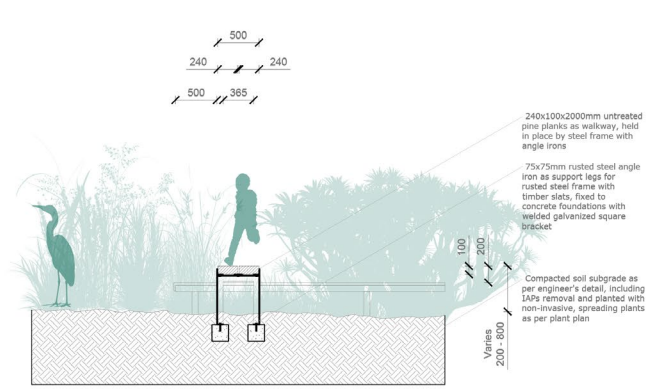
Section 1: stream - seep connection with activity core, vortex of progress, walkways, grate and Old Tol House Village ruins  
1:200



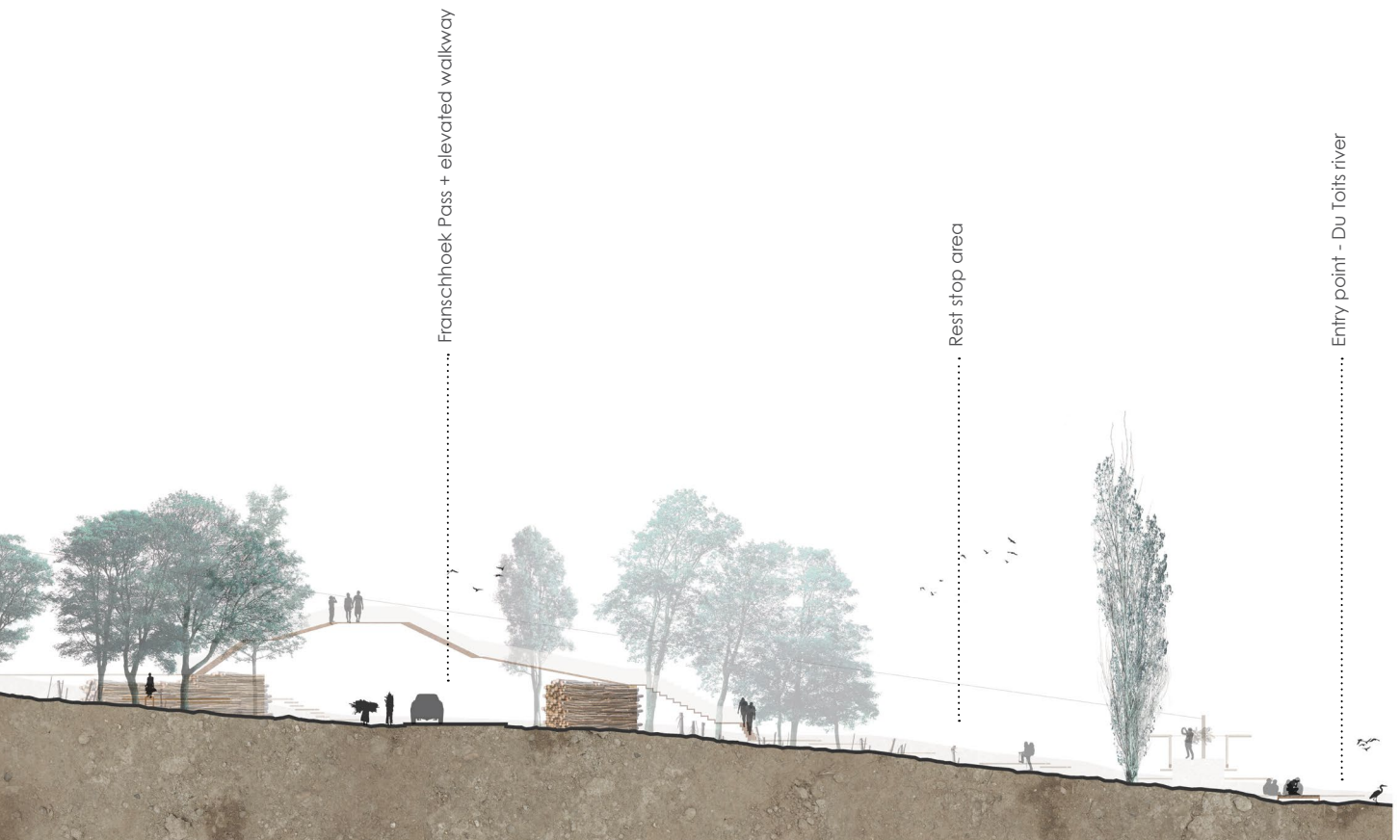
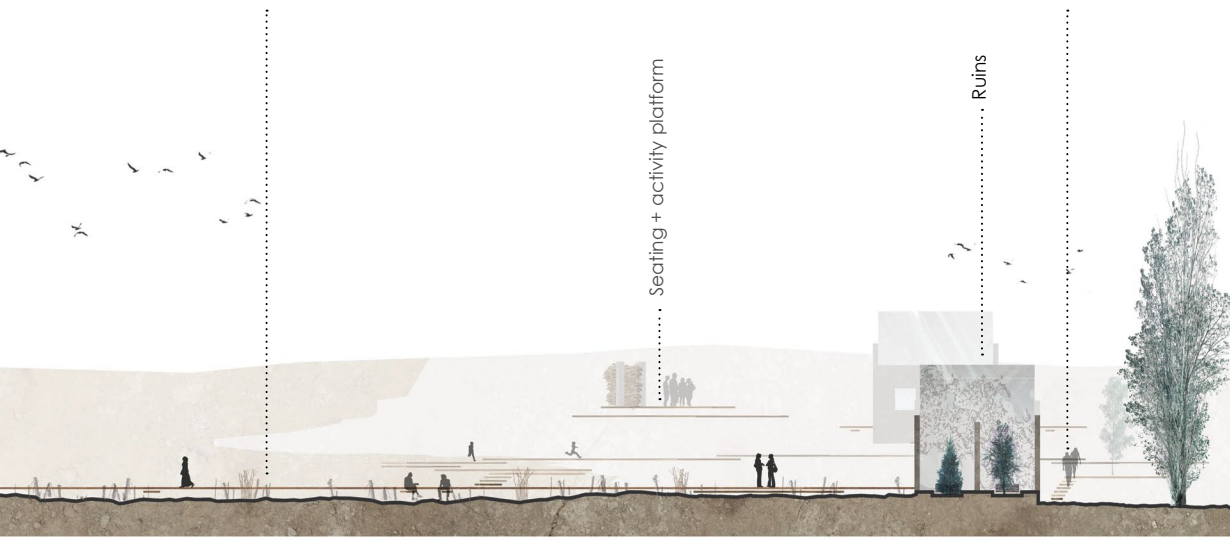
Section 2: mountain - river connection with activity core, vortex of progress, walkways and Franschoek Pass  
1:200



2. Rusted steel grate walkway 1:50

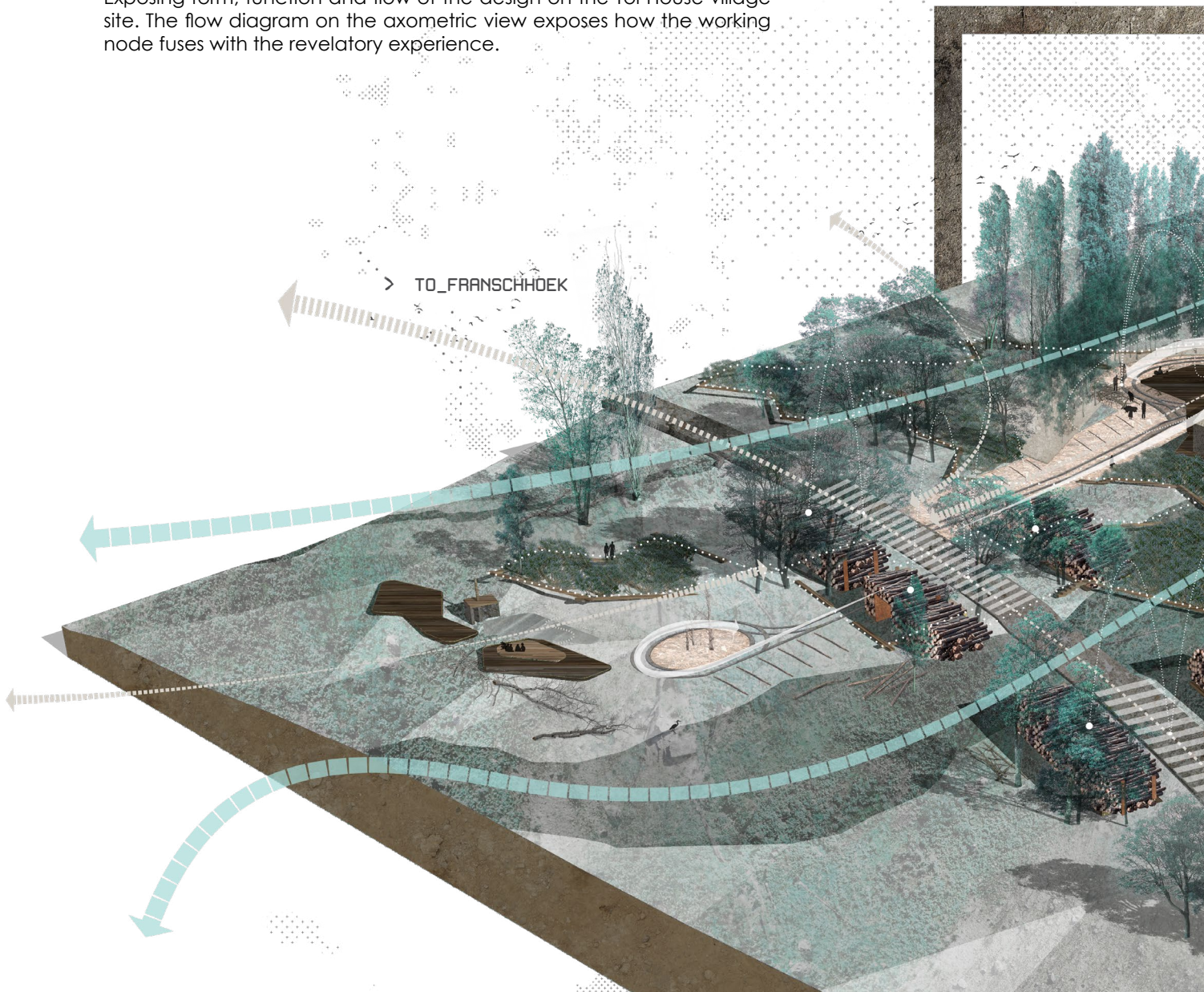


1. Timber plank walkway 1:50



## + FROM\_AN\_ALIEN\_PERSPECTIVE

Exposing form, function and flow of the design on the Tol House village site. The flow diagram on the axometric view exposes how the working node fuses with the revelatory experience.



### Flow diagrams

Water



Work



Deposit



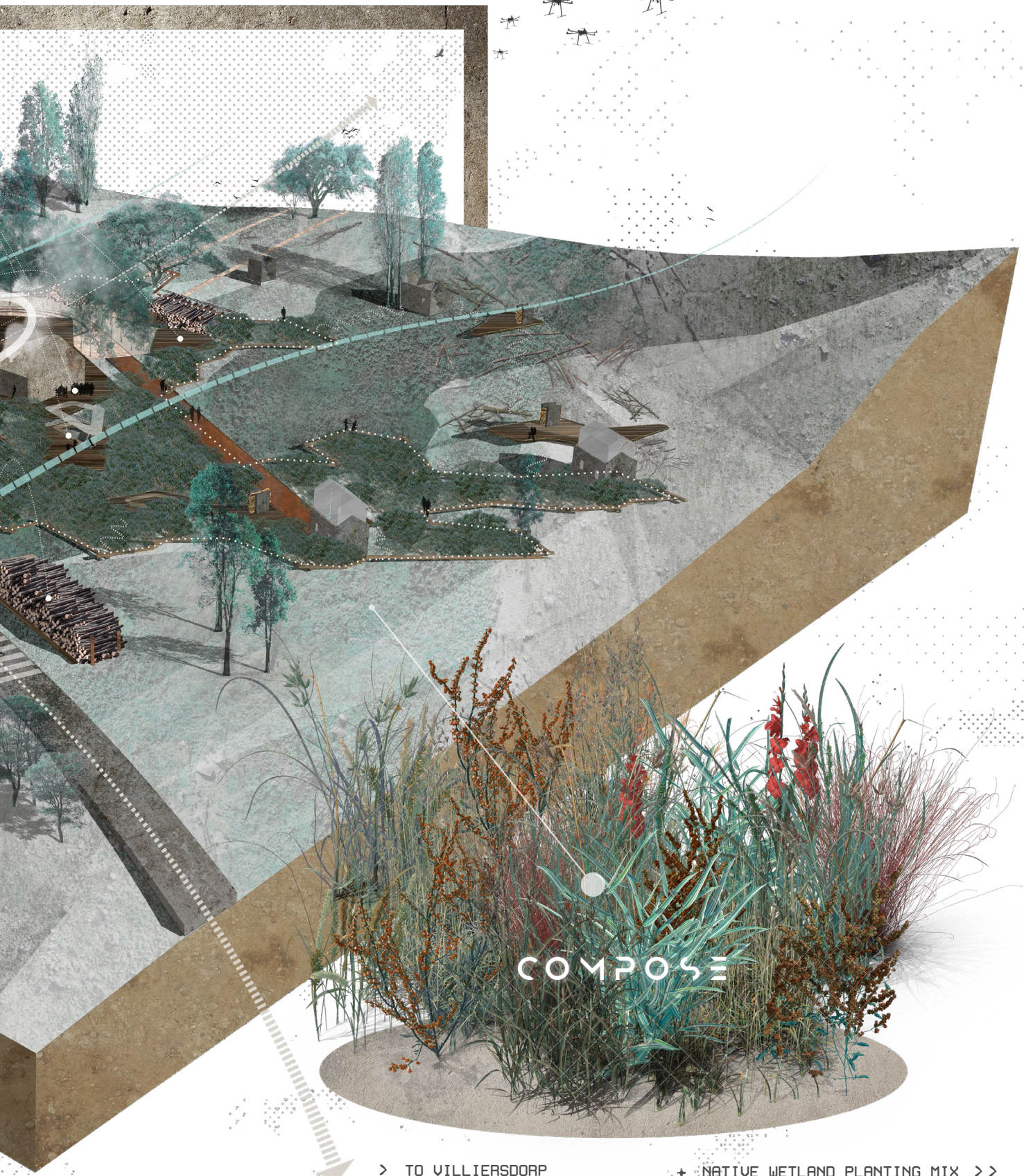
Withdraw



Visit



+ ENTRY\_INTO\_LANDSCAPE\_OF\_THE\_ALIEN



COMPOSE

> TO\_VILLIERSDORP

+ NATIVE\_WETLAND\_PLANTING\_MIX >>

## + MATERIAL\_MATTERS

### **Material matters in a landscape where resource is disputed**

One of the most important aspects of the project is materiality. Alienation in the landscape, with focus on invasive alien plant species, is captured and transformed to help integrate landscape elements within its environment. The uncertainty of what these IAPs will do, what their impact will be on the landscape, how it will affect people in the future and how adaptive the plant species are to unforeseen disturbances becomes part of a strategy to embrace, yet contain the IAPs as much as possible. This unknowability of the IAPs in the Anthropocene comes forth through extreme potential scenarios that lack clear predictions since much comes down to human intervention on both local and global scale.

It is clear that IAPs cannot be eradicated entirely by human intervention. Instead, they are contained through management to prevent further negative effects related to water scarcity in the short run. In the long run, the IAPs that are stored in the landscape through active management can be released when we can make a more clear and rational decision. Thus, instead of letting the IAPs roam the fynbos landscape now, we could apply the IAPs, that are contained in the landscape, at a much more strategic moment in time. (Latour, 2014)



The project encourages awareness and celebration of IAPs stored in the landscape while turning the alienation of the plants into a sense of belonging. This management strategy allows people to see the species as a valuable resource and potential asset for the future without being irresponsible or naive. (Stremke, Dobbelsteen, & J., 2011)

The design of the project, site and space will feature a prominent aspect on materiality. An understanding, engagement and rethinking of the IAPs as a valuable resource is key to the site and concept in which both storing and releasing energy and tensions in resource celebration should be considered. In the design a strong emphasis is put on the complex natural systems involving IAPs in the landscape, the sense of alienation and belonging related to the species, as well as introductions to the potential applications and processing of IAPs as a resource within the management strategies. The IAPs also carry an interesting journey with themselves as a legacy of the past. Their initial application, origin and meaning is of utmost importance to reveal onto the site to enhance experience and awareness.

### **Traces and disturbances**

The site is one filled with traces, predominantly related to water, fire and human disturbances which have accelerated IAP growth and spread. Such disturbances have become visible by applying techniques of 'air photography' using a drone to find shadow-sites, soil-sites and crop-sites. The Old Tol House village ruins on site are relatively clear archaeological remnants, yet by walking as a way of finding, much more opaque traces of the past were discovered under a carpet of wattle and eucalyptus seedlings such as burnt logs, broken brick walls, overgrown concrete surfaces, boulders, pathways and seepage areas. (Crawford, 1953)

The design turns the site into place that can assist management strategies, while creating a space for awareness, engagement and celebration of the IAPs as a resource using traces of disturbance that are found in the landscape, which have accelerated IAP growth and spread, as a structure for the design. The act of clearing, exposing, and transformation is made by poetically and strategically cut into a slope on site where many young IAPs are currently growing as a precise incision to remove the scattering zones where IAPs are growing which assists in reducing and containing spread. This cut is a wound in the landscape now, but must be able to heal over time. As the wound in the landscape starts to heal, finding a way to protect itself with a little assistance, it leaves a scar behind. Once healed, a place has been found between the traces in

the landscape where the IAPs are allowed to grow and belong. The materiality palette and design details reflects on the acts of disturbance to enhance the experience and narrative. Contrast is created in materiality and tech to experience a tension between elements, forces and emotions, questioning initially perceived alienation to IAPs in the landscape. (Huysen, 2003)



### **Wood and rusted steel**

The maritime characteristic of the combination of wood and rusted steel brings the journey of IAPs into the design of the site as a primary introduction. All the woody material will be from invasive alien plants that are found and cleared in the region. The rusted steel contrasts the dark, woody and translucent tones that will be present in the design. The wood and rusted steel palette also reveals the decay, weathering and transforming aspect that characterizes the site and concept of how we deal with the IAPs. The bundling, compacting, compressing and storing of wood is a form in which the wood is revealed and composed, with reference to traditional and historical methods and actions that have played out to the IAPs in the region.

### **Charred wood**

Much of the IAPs consists of a woody component. Charred wood as a material technique is ideally suited to create a strong contrast which starts to speak about disturbances and scars. Besides the more poetic meaning, its relation to IAPs in the landscape is strong because IAPs actually cause increased and more intense wild fires and loss of habitats, lives and livelihoods due to heavy fuel loads and oils inside the wood. Contextually charred wood can put emphasis on the fires that have raged through the site, which have been picked up from traces of eroded ground, burnt logs, destroyed structures and the emergence of mass, scattered sprouting IAPs.

### **Resin**

Another component that is relevant in the project is resin. When plants, and predominantly trees, are damaged they secrete resin as a protective response to injury. This viscous and translucent material is poetically embedded in the concept of the site's design symbolizing the life, blood, sweat and tears of the IAPs which become exposed after alteration. The levels of translucence of resin brings the element of traces into the design, diffusing light and space. This translucence concept also alludes to the submerging factor of shade that IAPs impose onto fynbos, and the water level fluctuations in the Theewaterskloof Dam caused by IAPs, exposing and concealing submerged landscape elements such as the Ghost Vineyards. As part of the design the resin can capture, hold and preserve smaller woody plant material that has been cut out of the landscape and often seen as useless material, such as fynbos, twigs, leaves, needles, seeds and cones. In the larger scheme of the concept framework the condensed patches of IAPs that are stored and contained in the landscape can become a place for sustainable resin harvesting. The collection of resin can be done from the invasive pine, eucalyptus and wattle trees and applied into the design of the Old Tol House Village site. When woody material with resin is put under pressure and heat, it transforms into pine tar / pitch and charcoal. The black pine tar and charred wood technique act as wood preservatives and suit aspects of the design on site to create a dark sublime aesthetic experience while protecting woody material from the elements.

## TRANSFORM / PRESERVE + CHARRED\_WOOD

### Scars, ash and smoke: the process of alteration and irreversible change

Surface charred wood – an ancient Japanese technique known as Shou Sugi Ban.

Open celled timbers work best, as during the charring process the outermost cellulose burns off, which leaves blackened lignin behind. Depending on the level of char, this can create a very charred alligator type skin on the wood.

It is critical that a minimum of 2-3mm of char is created in order to create a “wear layer” when the wood is exposed to weather. Many hardwoods do not achieve the depth of char required to provide long lasting durability, beware of charred hardwood. Char depth is critical. A heavy char will last longer than a light char, due the way wood weathers when exposed to weathering. When exposed to rain and UV, wood slowly erodes, and it is this sacrificial char layer that erodes, maintaining the black char colour, along with it's preservative benefits. One can use proprietary oils to create a harder char layer, which in turn reduces flaking of the coating, and improves durability of the char layer.

Brushing the charred wood often creates a beautiful appearance which can be finished with a natural oil. This finish is more suited to interiors, and will quickly weather once exposed in an exterior environment.

### Application:

The charred wood technique is used to link fire with invasiveness, and reflects on the impact of fire to invasive alien plants. The charred wood is applied in the seating platforms as decking component with potential cladding of the building structure on site. The idea of charring is informed by evident traces of fire on the site such as logs, ground and stone. Consequently one can pick up the traces of destruction and emergence.

Charring by human interaction also happens through the process of pyrolysis, in which invasive alien plant material that is not suitable for timber and timber products is transformed into biochar and carbon.

In the process of pyrolysis two rehabilitation techniques come out. The first is to coat indigenous seeds with biochar, forming pods that can then be taken up by drones to reseed cleared areas previously infested by invasive alien plants. The drones can plant around 40.000 seeds a day in rugged inaccessible terrain compared to 900 planted seeds per day by people in accessible areas. So the invasive alien plant material is placed back into the landscape to assist and accelerate indigenous plant growth, making it able to compete with invasive alien plants.

The other rehabilitation technique uses the by-product of smoke, generated by the pyrolysis plant, channelled through the site into smoke germination tents where indigenous seeds lie in trays. The seedlings can then be taken care off by local communities in exchange to assist in education and livelihood development. Schools and educational facilities such as the SOS school in the wilds near Villiersdorp can build and even contribute on the educational value this working node has to offer.

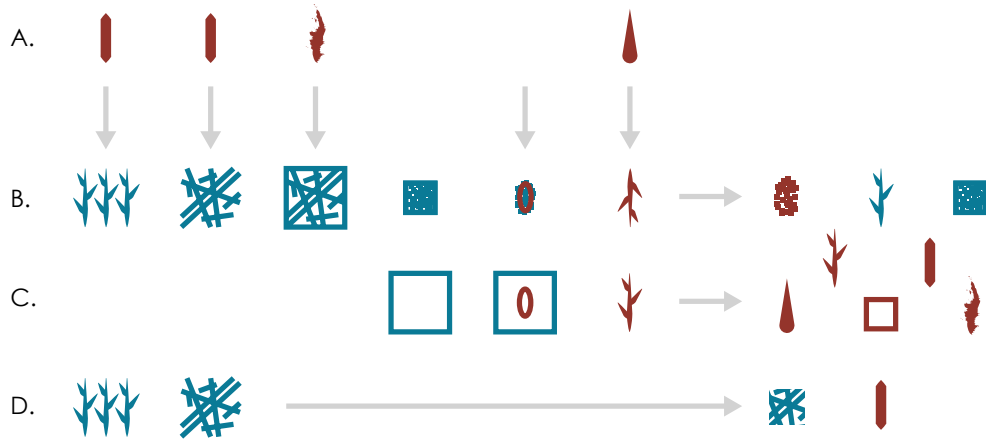
The pyrolysis plant and seed germination tents have been integrated into the design using parts of their structures as walkways, seating and experience of the process publicly, surrounding the resource potential of invasive alien plants directly with their mechanisms and alive forms on site.



# + THE\_ENERGY

## The resource process

"What you take out, you must give back." - It is the alien that has been negatively impacting mountain resources and it is the alien that can contribute to reload mountain resources..



- A. Input
- B. Biochar coated seeds
- C. Smoke germination
- D. Timber and woodcraft

- Skill, training and management
- Fire (pyrolysis)
- Seeds (non-invasive)
- Water
- Accelerated plant growth
- Accelerated germination
- Soil improvement
- Habitat and livelihoods



Invasive alien plant clearing



Carpentry and wood craft



Drone seeds dispersal



# + THE\_CORE

## 3. Separator

The char, tar and smoke-byproduct are separated from each other, while the heat is exchanged and guided to re-use in the dryer.

## 2. Pyrolysis

Through a pyrolysis reactor, which has a burner without flame (no air), the invasive alien plant biomass turns into char(coal) and tar.

## 1. Chip-n-dry

Invasive alien plant material / biomass can be placed inside the feeder and is dried to remove as much water as possible.

## 4.1 Smoke

The smoke byproduct, which is pushed through a channel above the ground allows and accelerates fynbos seed germination in so-called 'smoke tents'. The channel follows the direction of the elevated walkway.

## 4.2 Germination

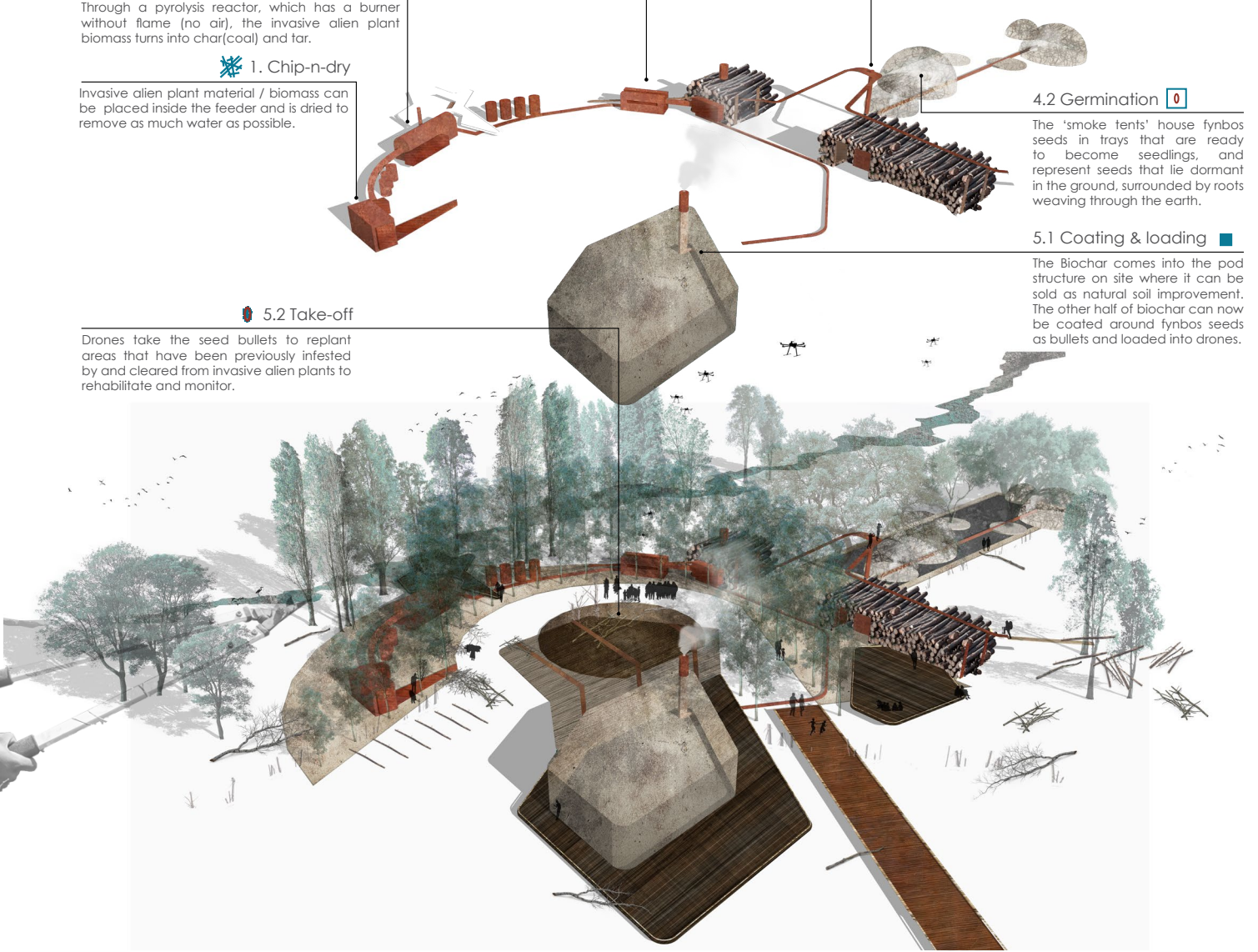
The 'smoke tents' house fynbos seeds in trays that are ready to become seedlings, and represent seeds that lie dormant in the ground, surrounded by roots weaving through the earth.

## 5.1 Coating & loading

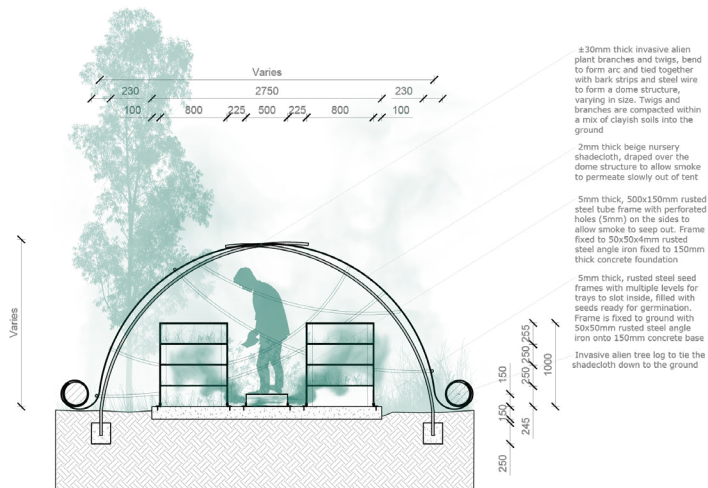
The Biochar comes into the pod structure on site where it can be sold as natural soil improvement. The other half of biochar can now be coated around fynbos seeds as bullets and loaded into drones.

## 5.2 Take-off

Drones take the seed bullets to replant areas that have been previously infested by and cleared from invasive alien plants to rehabilitate and monitor.



## Seedling nurturing



# STORAGE / RELEASE + BUNDLED\_WOOD

## Composition, energy and pattern: the process of construction and deconstruction

Bundling wood is a practice and technique used for many centuries by people to compile this material in a compact and stacked manner, used to storage or transport easily. The concept of bundling is informed by the piles made currently by invasive alien plant clearing teams in the mountains. The material is so detached from an accessible place where it can be processed or transported further that it is mostly compiled and left behind onto heaps or stacked strips, allowed to rot and decay, yet creating the risk of setting alight by fires due to increased fuel loads.

The concept of bundling is poetically also made by bundling power and energy through people when a crisis is near. The core bundles people together and strengthens their physical and mental power to achieve a positive outcome.

Another concept poetically informed by storage is the invasive alien plant mechanisms in which energy is bundled and released in components such as (dormant and sprouting) seeds, seed pods / cones, flowers and the trees themselves.

### Application:

The materiality of the design is derived from alien plant matter from the site and the larger management region, showcasing the resource potential of the species.



The bundled form comes in the design through the primary concept of holding woody material together in steel frames, yet loose, so that fires can rage through the site and the mere steel skeleton can easily be reassembled with invasive alien woody plant material.



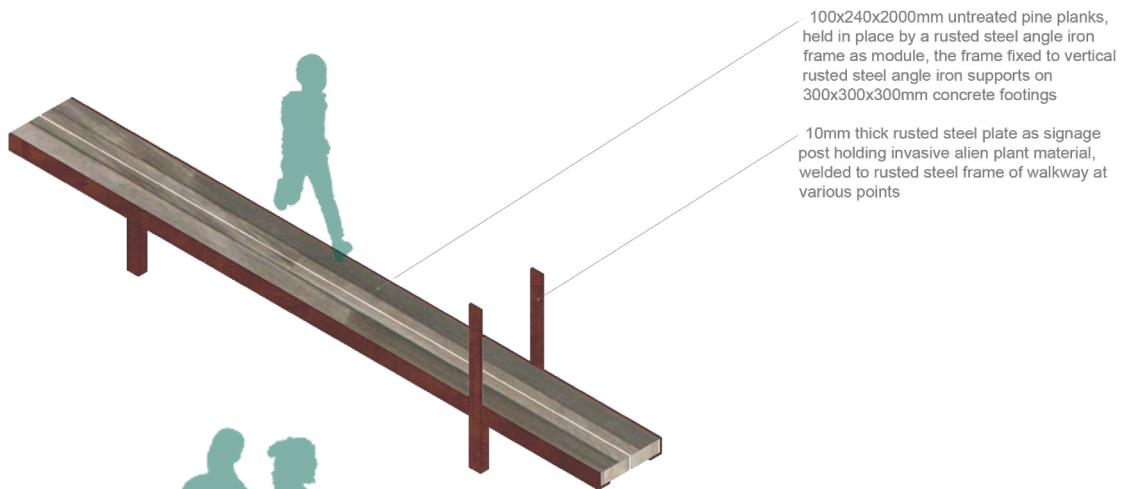
The concept also applies techniques of storage and release functionally by allowing places for both permanent and temporary storage of timber and other woody material.





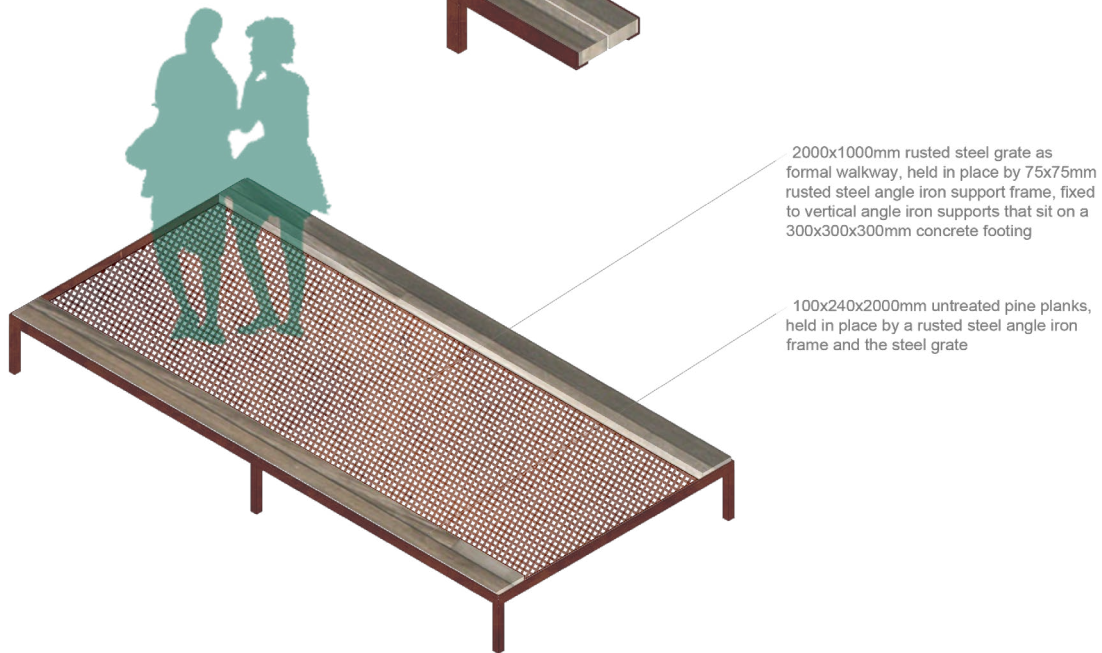
## + THE\_BUNDLING

Natural disturbances such as fire are allowed to continue on the site, leaving a mere steel skeleton framework behind that can easily be reassembled with invasive alien plant material, mimicking the adaptive and enduring characteristic of most invasive alien plants.



100x240x2000mm untreated pine planks, held in place by a rusted steel angle iron frame as module, the frame fixed to vertical rusted steel angle iron supports on 300x300x300mm concrete footings

10mm thick rusted steel plate as signage post holding invasive alien plant material, welded to rusted steel frame of walkway at various points



2000x1000mm rusted steel grate as formal walkway, held in place by 75x75mm rusted steel angle iron support frame, fixed to vertical angle iron supports that sit on a 300x300x300mm concrete footing

100x240x2000mm untreated pine planks, held in place by a rusted steel angle iron frame and the steel grate

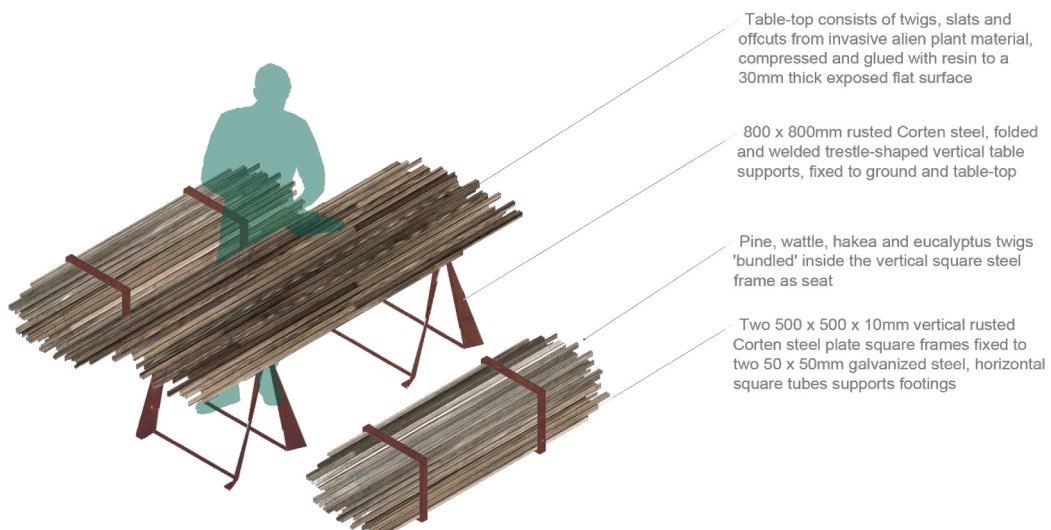


Table-top consists of twigs, slats and offcuts from invasive alien plant material, compressed and glued with resin to a 30mm thick exposed flat surface

800 x 800mm rusted Corten steel, folded and welded trestle-shaped vertical table supports, fixed to ground and table-top

Pine, wattle, hakea and eucalyptus twigs 'bundled' inside the vertical square steel frame as seat

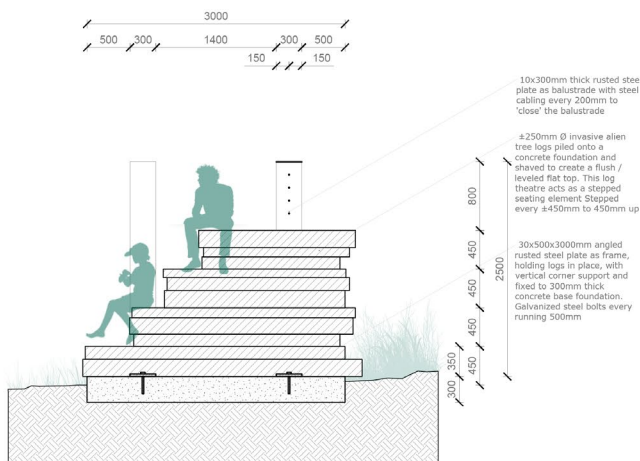
Two 500 x 500 x 10mm vertical rusted Corten steel plate square frames fixed to two 50 x 50mm galvanized steel, horizontal square tubes supports footings

## > LOGS, BRANCHES, TWIGS...

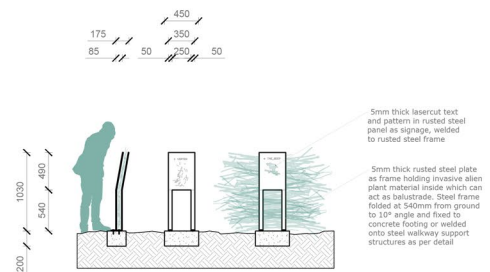
Logs that come in or through the site can be stored in the log depository frames, which are placed alongside the Franschoek Pass. The frames have two steel plates holding the logs together in bundles when stored temporarily and form a gateway into the site for passer-by traffic. Although logs are stored in the frames relatively for a short period, which reveals change and action in the landscape, the frames also have a permanent façade with passage-ways for visitors leading deeper into the site from the parking areas.

The permanent façade is still susceptible to decay and rotting processes since the bottom logs sit on damp ground, revealing contrast between human intervention and natural processes to the invasive alien plant matter. By bundling the logs with steel frames a play on notions of storage and release is created, with a nod to other large storage systems in the region such as the dams.

Signage in the form of similar steel frames acts on the same principle of bundling invasive alien plant material temporarily, but instead using sticks and branches to form a balustrade, screen or fence. These bundled spatial components can now also act as micro habitats for insects and other small wildlife.

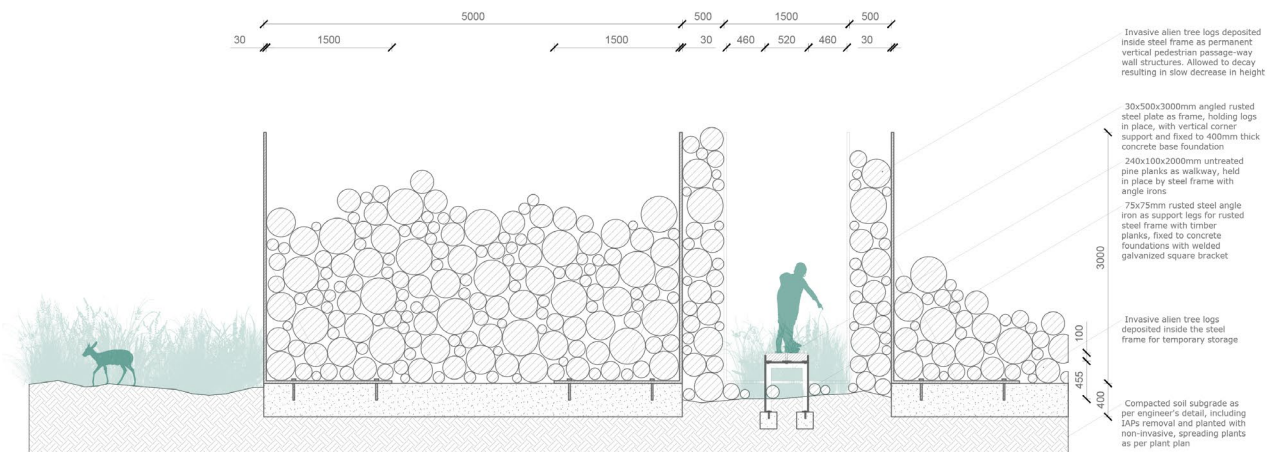


9. Log theatre 1:50



Signage bundles

1:50



10. Log gateway and depository frame with pedestrian passage-way

1:50

# DAMAGE / RESTORE + BLEEDING\_WOOD (RESIN)

## Blood, sweat and tears; the process of healing and sealing

### Resin:

Resin is a very viscous and solid substance of a plant or tree. Predominantly coniferous trees secrete resins as a protective response to injury. The resin acts as a seal to damage and can assist the plant in protection from bacteria, insects, pathogens and the weather. Due to its sticky nature, it enables the growth and spread of bacteria. Although the resin keeps unwanted intruders out, it may attract parasitoids or predators of the animals that attack a plant. For human use, resin can act as a protective layer to wounds as well, avoiding infections.

The word is derived from the Greek *rhētīnē*, 'Resin of the Pine' and the oldest known application of resin is found in Southern Africa during the late Middle Stone Age. At that moment in time the use of resin come forth as adhesive or glue for hafting stone tools.

Earliest evidence of harvesting resin was found in Gallo-Roman times in Gascony, Southern France. To harvest resin from pines one can either use a sustainable approach without harming the life of the tree, or extensively in the years before a tree is felled.

There are synthetic resins that act on the same principle as natural resins. Pines, wattles, and eucalyptus secrete a resin when in pain or injury. The pine and wattle have a golden yellow to creme white resin while the Eucalyptus *camaldulensis* has a blood-red colouring. Resins that come from plants are mostly composed of terpenes.

### Rosin:

When resin solidifies through removal of the volatile terpenes by distillation it becomes rosin. Rosin is usually a transparent solid and yellow to brown colouring.

### Amber:

Over long periods, resin can become fossilized, which then creates the gem-like appearance called Amber. Since resin is very sticky it can trap insects and other (plant) particles which follow the process of fossilization, capturing a movement or degradable object in time.

### Pine tar / pitch:

The transformation of resin through a process of heating wood with resins under high pressure which creates both charcoal and pine tar. This black type of resin is equally sticky and serves as a great preservative for wood and weatherproofing element. Pine tar or pitch has long been used in the Scandinavian countries where wood is exposed to harsh weather conditions. Outdoor furniture, asphalt, shipbuilding and coating of houses are some examples in which this resin is used.



1. Eucalyptus *camaldulensis* resin
2. Pine and wattle resins
3. Fossilization to Amber
4. Transformation to pine tar / pitch with applications
5. Synthetic and natural resin as transparent material or glue
6. Resin harvesting techniques and tree scarring



## + THE\_PRESERVATION

### Application:

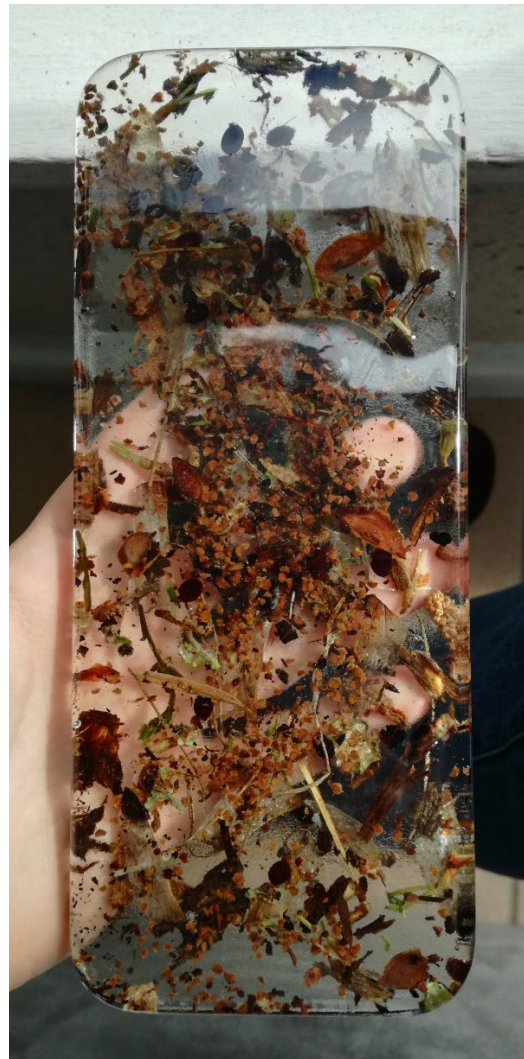
The sprouting IAPs that have established themselves in the seep currently will be taken out and preserved within tree resin as translucent shade panels to several of the seating platforms, placing these youngsters higher above the ground, and forming a thick green carpet again. This approach reflects on the impact of shade invasive alien plants have to their near surroundings, supressing most endemic plant growth.

Similar resin filled panels are used to construct a translucent structure, slotted within the main ruins on site to 'house' the 4 most dominant IAPs in a neutral environment.

### Sample:

A sample of the translucent shade panels has been made by collecting plant material that is not suitable for timber of the *Pinus pinaster*, *Acacia mearnsii*, *Eucalyptus camaldulensis* and *Hakea sericea* from UCT Middle campus's gardens (where little maintenance has left the invasive alien plants to thrive).

By using clear casting resin a translucent brick, filled and pressed with this invasive alien plant material is made, which could be translated into a panel. Another, much thinner and less stuffed sample was made with seeds and tiny plant material only (from the mentioned invasive alien plant species). This thin slate illustrates exactly how the panels can be made and function as intricate translucent shade panels, sealing the seeds away for eternity.



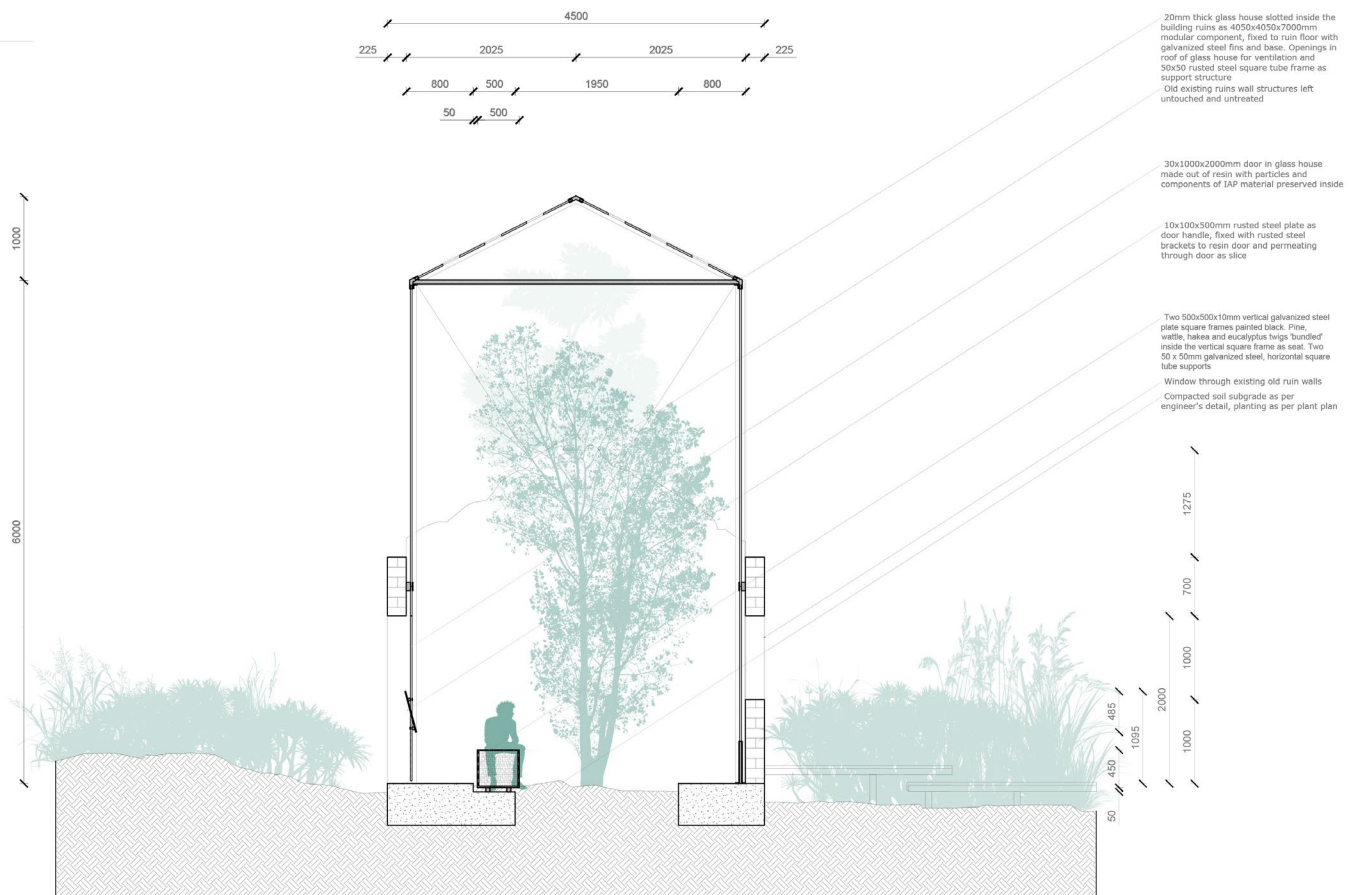
## > SEEDS, LEAVES, NEEDLES...



Emerging *Acacia mearnsii* and *Eucalyptus*



Emerging *Acacia mearnsii*, Kikuyu grass and *Elegia tectorum*



# INVADE / SUPPORT + EMERGING\_WOOD

Sensory experience revealed alongside the working node through detailed sections.



Fig. 19. *Prionium serratum* (L. f.) Drège. 1. Place of origin, showing the dense mat of old leaf bases. 2. One of the leaf bases of the mat spread out, nat. size. 3. Margin of leaf of plant. 4. Transverse section of leaf, showing the fibrous bundles. 5. Flower, nat. size. 6. Flower, showing the seeds. 7. Ripe fruit, carpels densely on the ventral surface. 8. Seed, with loose testa.

## Prionium serratum > (Palmiet)

This 'wonder' plant was misunderstood as 'alien' and harmful when the Cape Colony was established, resulting in mass removal from streams, wetlands and rivers. In contrast, this indigenous wetland plant functions as a sponge and releases water in droughts, traps sediments, purifies water, creates prolific new growth and flowers after fires, stores massive amounts of carbon in peat layers and acts similarly to invasive alien plants in terms of its dense and spreading character. Pre-colonization, the leaves of this plant were used by the Khoi Khoi as thatching material while the core of the plant had edible / healing properties. Palmiet is unique in that it is the only species in the world in its family and it can create the thickest peat layers in the world (up to 7m deep).

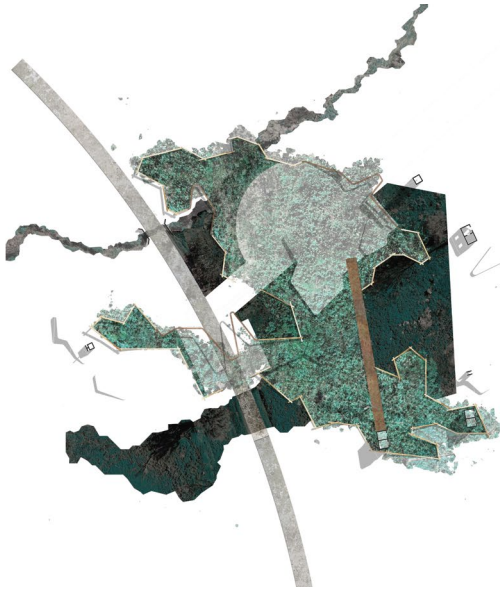
1.5 m x spreading / / / / ^ Δ ▲

### Application:

Palmiet originates from the area, and found in the Theewaterskloof priority wetland in masses. It is therefore planted in mono-culture, alluding to the invasive alien plants taking over to dominate as a single species. Over time, Palmiet will march into the mix of planted wetland vegetation due to its invading character. Even though the circular walkway was implemented to 'enclose' Palmiet, it has failed, which visually shows the impact of plants, with and without human disturbance / intervention.

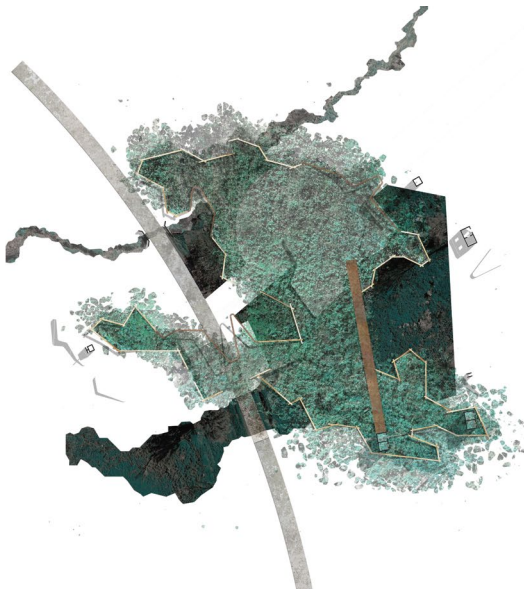
## + THE\_SEEP

The wetland planting scheme.



### 1. Planted phase

A mono-culture of Palmiet and the mix of other indigenous plants is planted on site.



### 2. Invading phase

While Palmiet is thriving and spreading prolifically, the mix of plants stays relatively in place, having to compete with palmiet



### 3. Wildered phase

Palmiet becomes wildered across the site due to ideal growing conditions

- ▲ Can compete with IAPs
- △ Can persist under IAPs
- ∧ Can grow in nutrient rich soil
- / Can grow on slopes
- ↙ Prolific growth by water
- ↘ Prolific growth by fire
- ↗ Prolific growth by wind

## > NATIVE\_WETLAND\_PLANTING >>

In contrast to the mono-culture planting scheme of Palmiet within the circular elevated walkway, a mix of tall indigenous wetland plants will surround the Palmiet stands. This large variety of restios, sedges, reeds, bulbs and wetland shrubs is a literal exemplification of the native fynbos vegetation types that can be found in the area. The mix of indigenous wetland plants that are able to grow fast in altered soils, under the extreme weather conditions of and are able to grow under or compete with newly emerging invasive alien plants. However these plants, planted around the circular walkway, do not have this invading character. So, over time, Palmiet will start to spread outwards, under the elevated walkway and invading into the wetland mix. Both the pathways and the seating platforms reveal this natural process of invasion.



*Psoralea pinnata*  
Fountain Bush - 4 x 2 m  
/ ^ Δ ▲



*Restio dispar*  
2 x 1 m  
/ / / / ^



*Restio subverticillatus*  
Broom Restio - 2 x 1.5 m  
/ / / ^



*Elegia capensis*  
Horsetail Restio - 3 x 1.5 m  
/ / / / ^



*Elegia tectorum*  
Cape Thatching Reed - 1.5 x 2.5 m  
/ / / / ^



*Wachendorfia thyrsiflora*  
Bloodroot - 1 m x spreading  
/ / ^ Δ



*Cyperus textilis*  
Basket Grass - 1.5 x 1.5 m  
/ / ^ Δ



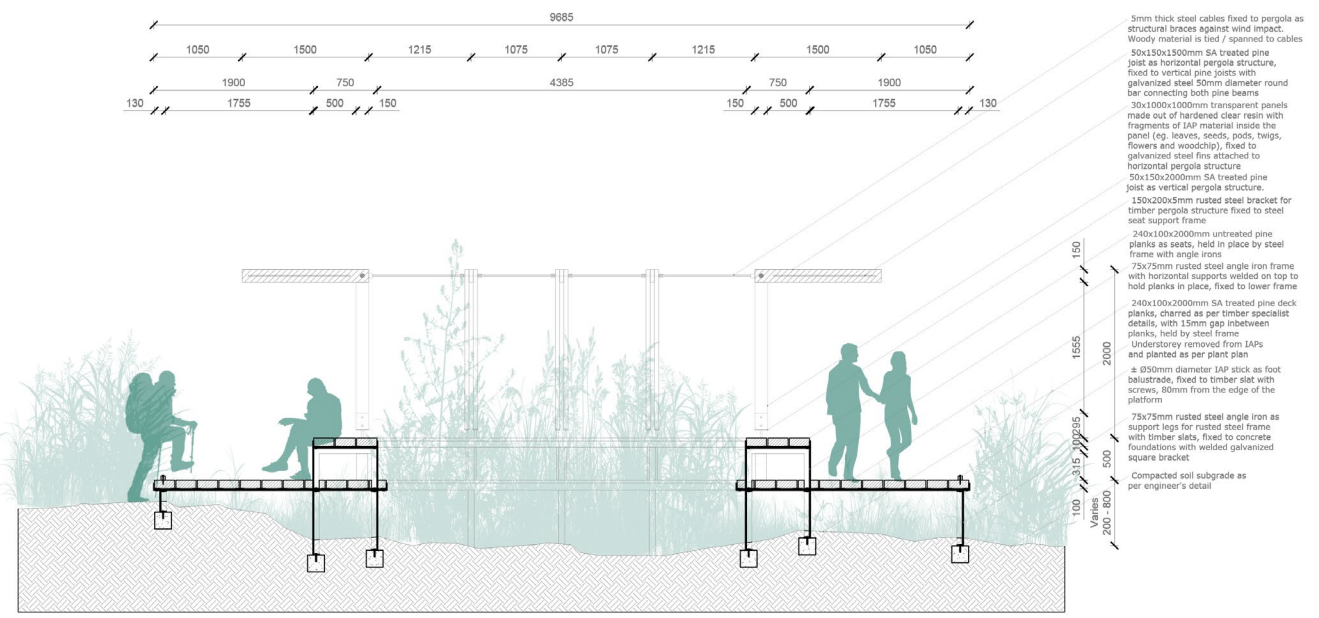
*Watsonia vanderspuyiae*  
Watsonia - 2 x 1 m  
/ / / / ^ Δ



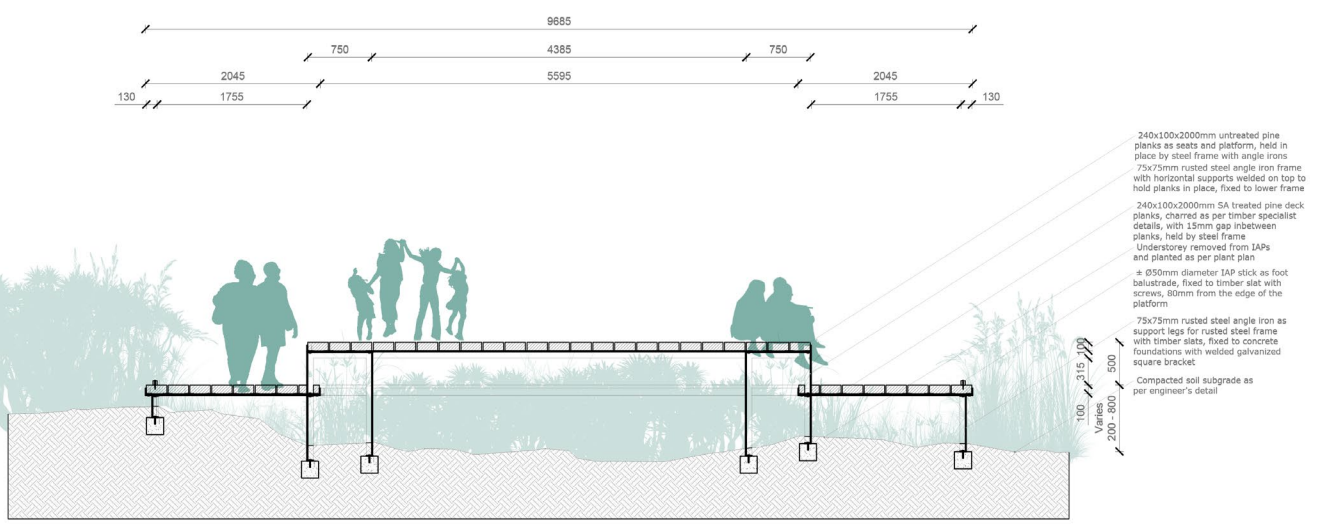
*Berula erecta*  
Water Parsnip - 1 m x spreading  
/ ^ Δ ▲

# ✦ THE\_WINGED\_SEEDS

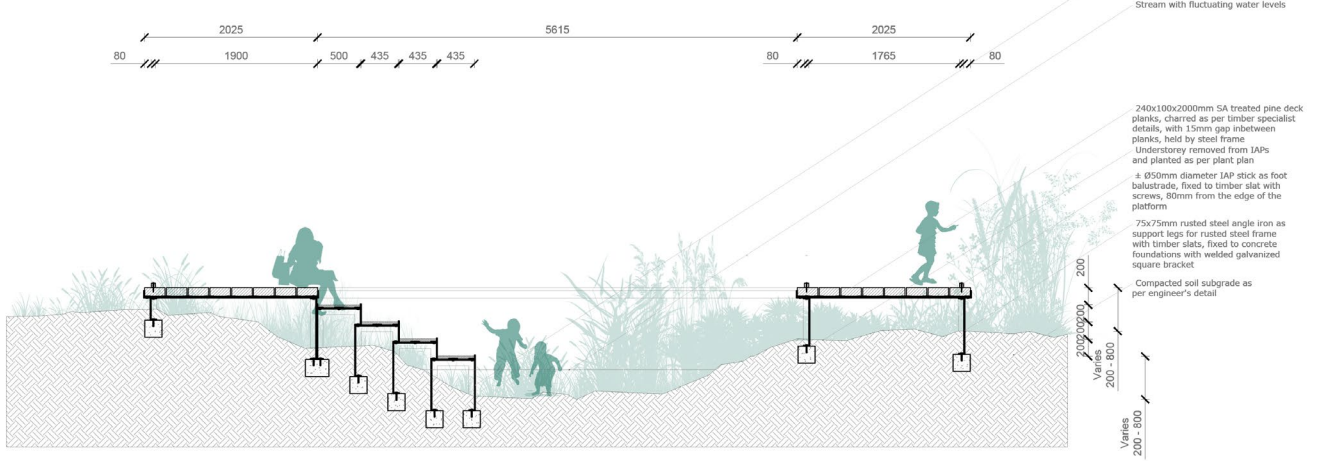
The winged seeds, which appear as lightweight seating platforms, hover over the transition of seep and dry rugged ground, bringing pause moments into the site that reflect on the impact of fire, wind and erosion to invasive alien plants, and the impact of shade, fuel load and degradation of biodiversity that these species create.



3. Seating / activity platform type A with opening and shade structure 1:50



4. Seating / activity platform type B 1:50



5. Seating / activity platform with opening and steps to stream 1:50

## STASIS / FLOW + DETAILED\_WOOD

Stasis, flow and accelerated flow to reveal spread and interrogate human disturbance.



### Populus simonii > (Simon Poplar)

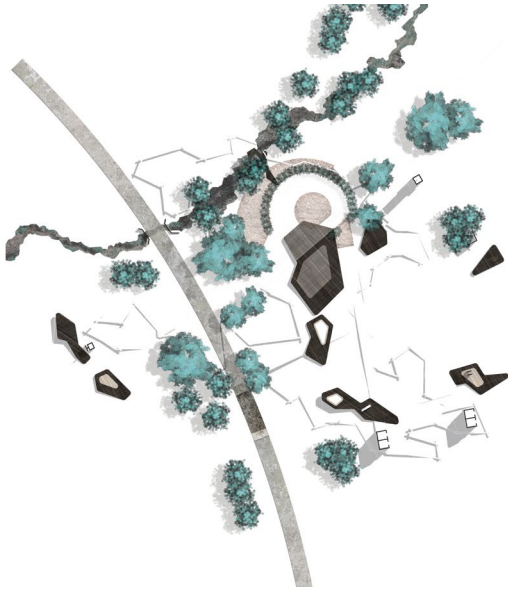
The Simon Poplar is a deciduous tree which originates from East Asia. This tree has had a tough beginning in South Africa, due to its family member being declared an invasive alien plant. Even though this tree is recognized by many tree nurseries as a delightful urban and rural tree, it is slightly difficult to distinguish this Poplar species from its invasive members to the common eye. The use of this tree in the planting design is strategic. The Simon Poplar is one of the few non-invasive alien trees that can grow in the mountains, which allows the character of the site (as a 'tree-dominated') to be strengthened. This site characteristic is enhanced by planting a ring of *Populus simonii* each year around the core where IAPs resource is celebrated to start a vortex of growth and spread. It also brings the plantation process including thinning up close to visitors.

### EXISTING\_ ( INVASIVE ) \_ALIEN\_TREES

It is the character of the site to contrast the vast spacious mountainous landscape with a tree dominating, visually obstructing, enclosed, human scale space. Thus, all existing trees on site are kept, whether invasive, alien, both, or neither. The value of trees in the context of the site is immense, which must be considered above its impact. Of course the adult invasive alien trees also assist in telling the narrative of the design; changing mindsets to see IAPs as a resource and valuable asset for the future can only be done through one-on-one engagement.

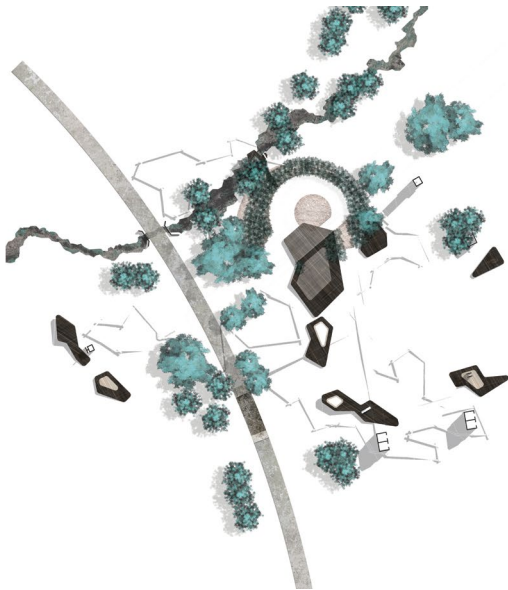
## + THE\_VORTEX

The tree planting scheme.



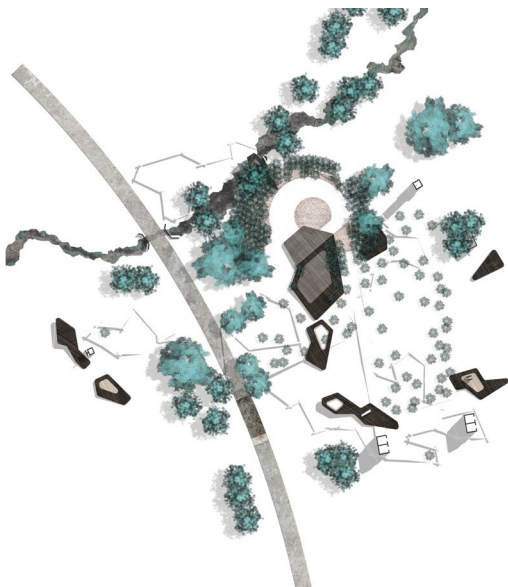
### 1. Planted phase

Simon Poplar is planted to enclose the activity core while enabling to mimic the impacts of invasive alien plants



### 2. Nurtured phase

Simon Poplar rows are planted each season to strengthen the 'alien' presence on the site and context, enhancing existing characteristics

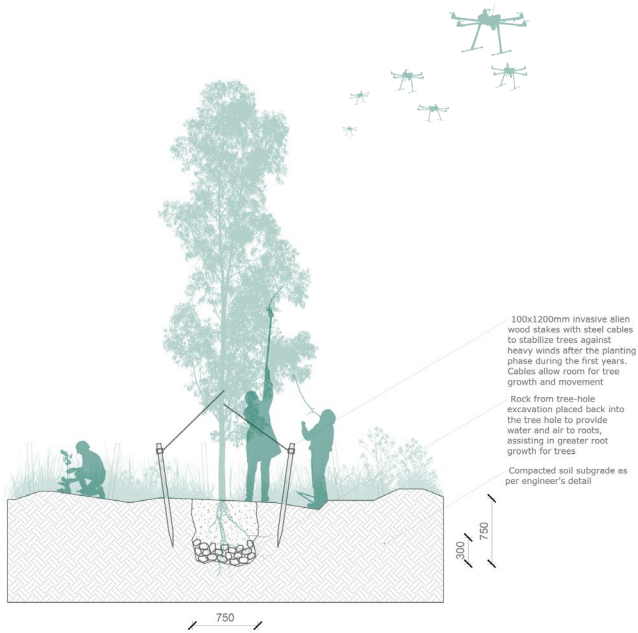


### 3. Thinning phase

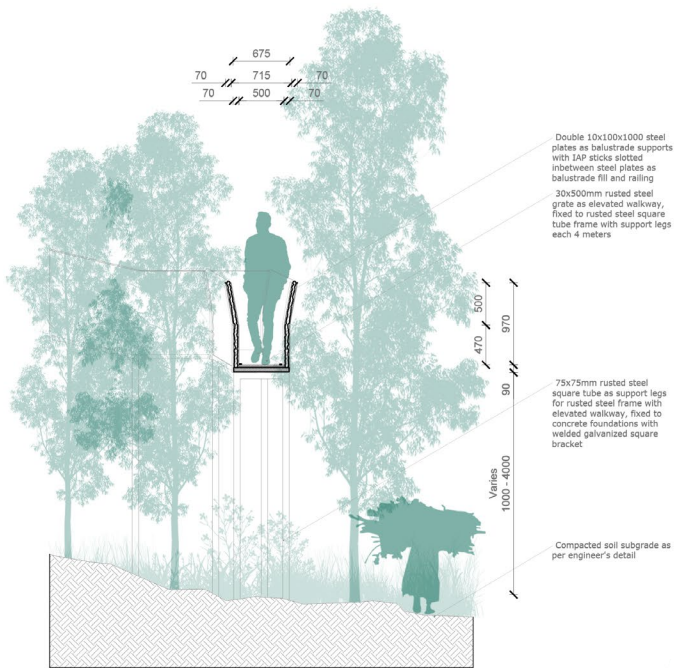
Once the inner ring of Simon Poplar has grown too big, some of these trees are thinned to allow for better growth.

## + THE\_LOGGING

Applying trees in the mountain working node to mimic logging practices that happen deep in the mountains and on plantations, revealing the processes of clearing, thinning and planting.



6. Tree stabilization 1:50



7. Rusted steel elevated walkway 1:50

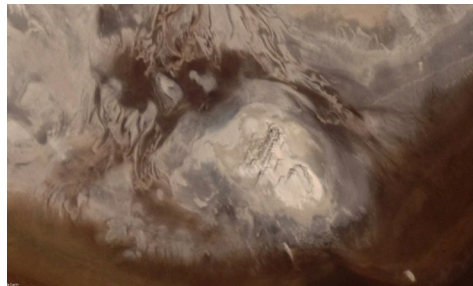
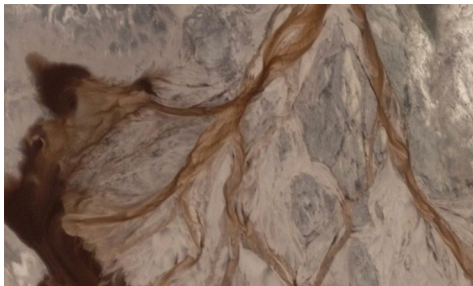
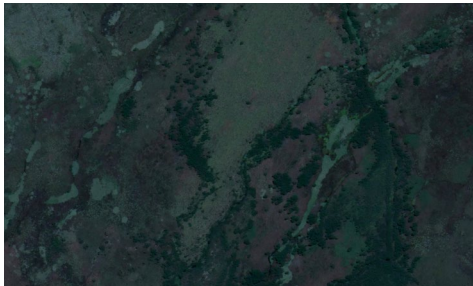
## ✦ COLOURS\_OF\_THE\_ALIEN ✦

The landscape of Theewaterskloof Dam and the Mountains portray very particular colours. These colours have been used as the palette for the project representation and may reflect in the design somewhat.



Pine, palmiet and fern

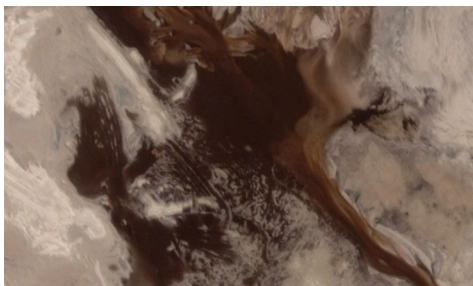
The priority wetland in the Du Toits sub-catchment contains both IAPs and dense stands of indigenous restios, palmiet and other green - blue wetland plants



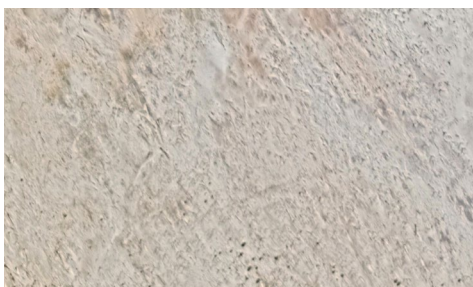
Tea, coffee and coke

In mountain stream, rivers and the North-Western part of Theewaterskloof Dam tea-coloured waters appear, especially when dam water levels are low. This colour is created by high concentrations of humic acids and tannins in the water from organic material. This is mostly drinkable water and contrasting to the Green - blues close-by.

*Fun fact:* the name Theewaterskloof Dam can be directly translated from Dutch as 'Tea water gorge Dam'.



Before this dam was built, a gorge existed East of this dam that was named by Dutch settlers 'Theewaters Kloof', most likely due to the tea-coloured water. The word Tea translated in Dutch is Thee.



Smoke, spruce, charcoal and stone

Erosion and hard inorganic surfaces of the landscape contain colours such as white smoke in sandy and sedimented areas of streams, rivers and dams. Meanwhile stone, spruce and charcoal colours cover vast surfaces in the mountains where erosion is evident on a different time-frame.

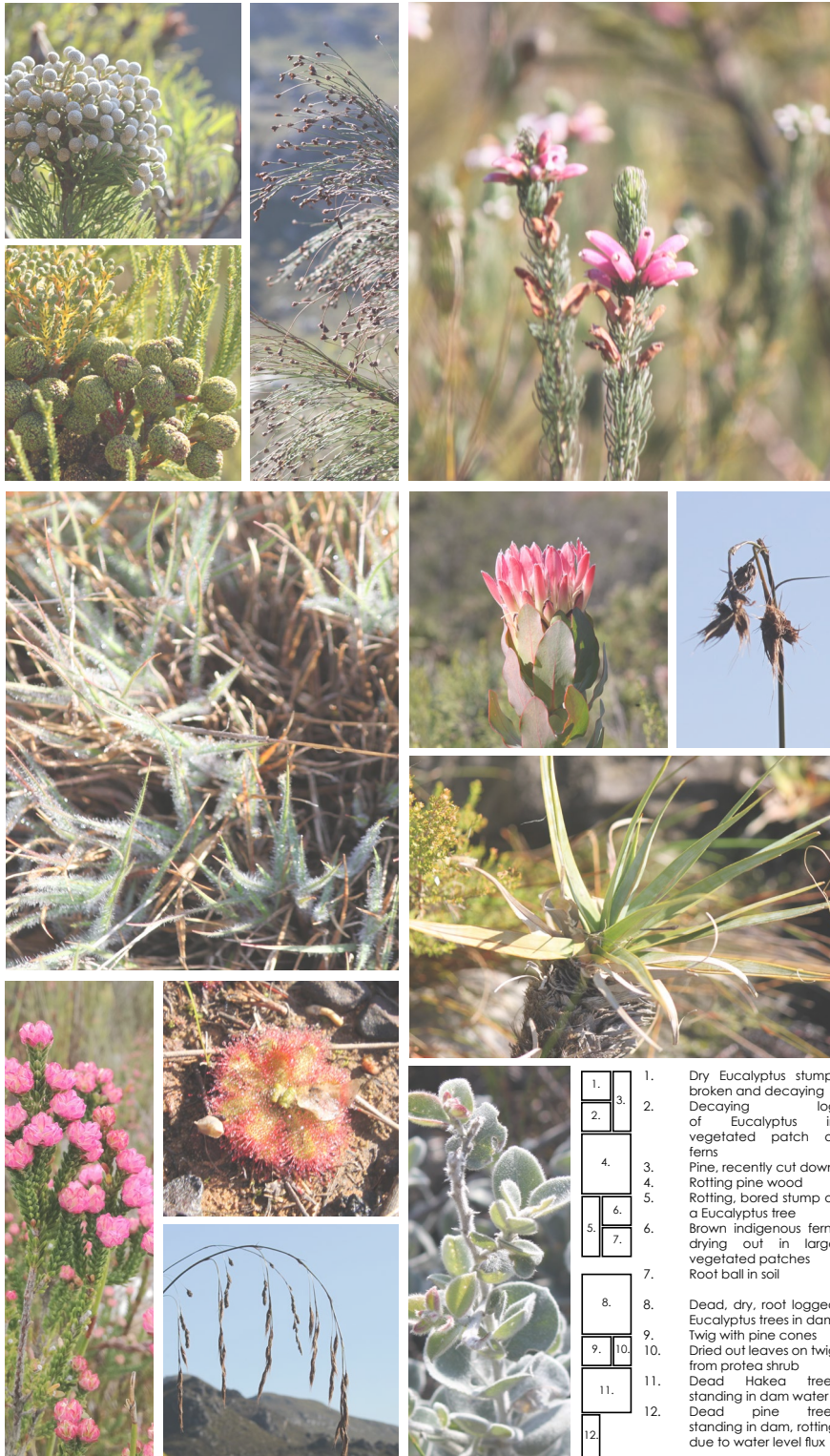
# ORGANIC + DECAY <<

Recomposing the Decomposing and the design study on Invasion Science in the landscape of the Alien both draw on the palette of the landscape and its plant species, as alien invasive plants are very adaptive, alive, full of energy and a source of intelligence and technology. This given will actively shape design aspects. Wood, and in particular invasive alien wood, becomes central in the use of materials and its possible technologies. In the study area many different forms and stages of wood are present, from moist rotting logs to dried up stumps and from pine cones to ferns leaves. Colours of the wood vary between brown, red, orange, yellow, grey and charred.



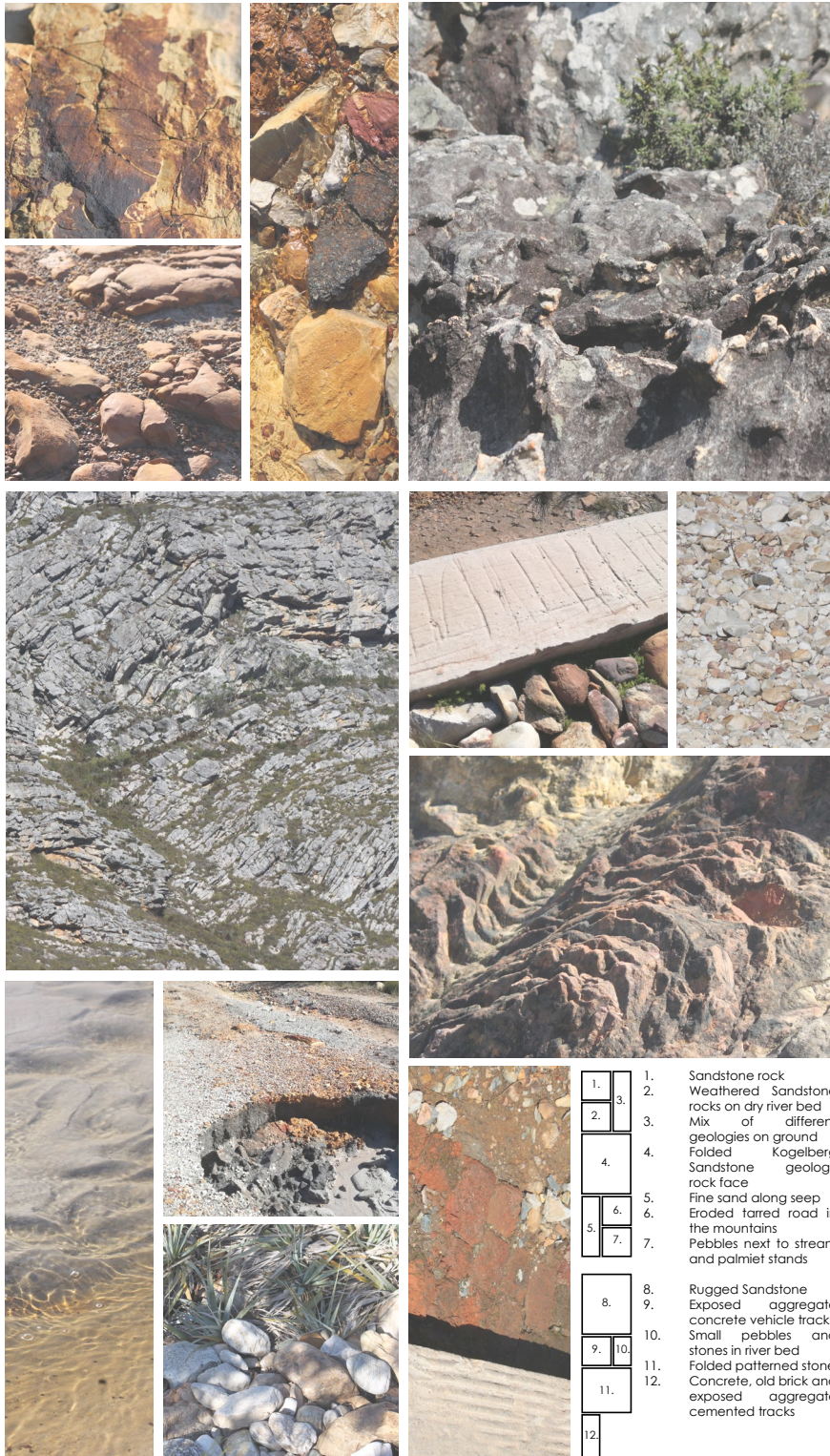
## ORGANIC + LIFE >>

While woody material is in abundance in the study area, it is only one particular element that stands out. Hard material such as stone, sand and brick are the surface of many materials. Soft plant material has very intricate detail and elegance, of which fynbos probably is the most delicate softness. Water is another valuable element in the landscape and key component in this design study. The combination of the four elements creates the tense material palette composition.



# INORGANIC + DECAY <<

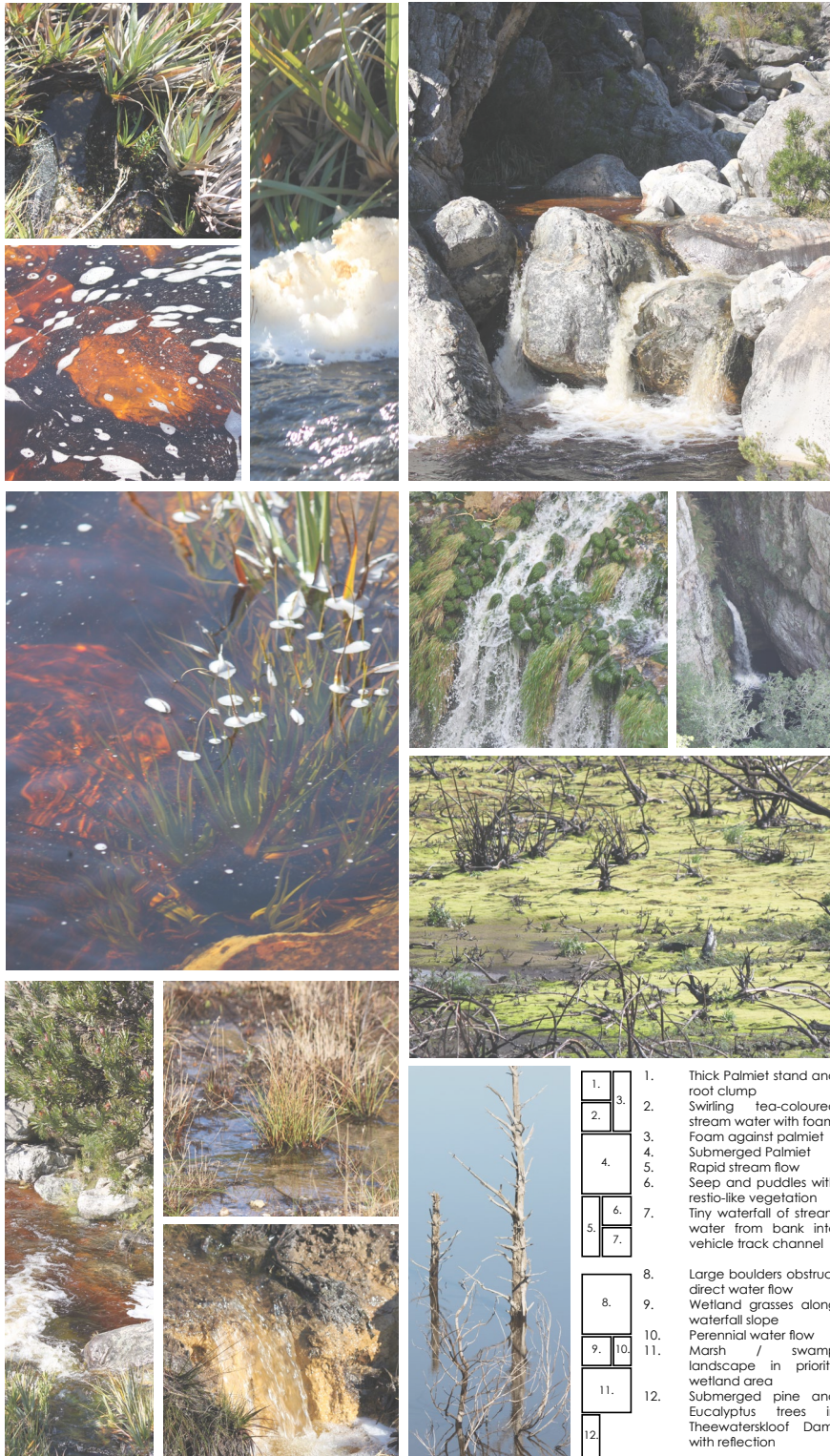
Hard surfacing can be linked to invasiveness as erosion plays a huge role to accelerated growth and spread. This hard material is studied as it is one of the few aspects that can withstand much of the extreme weather conditions and elements such as fire and human impact. Inspiration is drawn from these hard elements that slowly decay as structural components for the design that are intended to stay and remain relatively untouched. Besides stone, steel is another component that has a stronger durability which can also be applied on the site in a less disturbing fashion to the ground.



- |     |     |    |   |
|-----|-----|----|---|
| 1.  | 2.  | 3. | <p>1. Sandstone rock<br/>2. Weathered Sandstone rocks on dry river bed<br/>3. Mix of different geologies on ground<br/>4. Folded Kogelberg Sandstone geology rock face<br/>5. Fine sand along seep<br/>6. Eroded tarred road in the mountains<br/>7. Pebbles next to stream and palmiet stands</p> <p>8. Rugged Sandstone<br/>9. Exposed aggregate concrete vehicle tracks<br/>10. Small pebbles and stones in river bed<br/>11. Folded patterned stone<br/>12. Concrete, old brick and exposed aggregate cemented tracks</p> |
| 2.  | 3.  |    |   |
| 4.  |     |    |   |
| 5.  | 6.  |    |   |
| 6.  | 7.  |    |   |
| 7.  |     |    |   |
| 8.  |     |    |   |
| 9.  | 10. |    |   |
| 10. |     |    |   |
| 11. | 12. |    |   |
| 12. |     |    |   |

# INORGANIC + LIFE >>

The patterns and presence of water on site will be deeply valued and engaged with in the design. The engagement plants and rocks have with water stands in a similar line as to invasive alien plants and their mechanisms to growth and spread. Although water itself is inorganic, it bring everything to life, including life within. The tea-coloured water in the mountains of the Western Cape comes from humic acids with is plant based matter through processes of decay and burning. Seeps and streams are the main source of water to the Theewaterskloof Dam and the Table Mountain aquifers.



- |     |    |   |
|-----|----|---|
| 1.  | 3. | 1. Thick Palmiet stand and root clump   |
| 2.  |    |   |
| 4.  |    | 2. Swirling tea-coloured stream water with foam                                 |
| 5.  |    | 3. Foam against palmiet   |
| 6.  |    | 4. Submerged Palmiet  |
| 7.  |    | 5. Rapid stream flow  |
| 8.  |    | 6. Seep and puddles with restio-like vegetation                                 |
| 9.  |    | 7. Tiny waterfall of stream water from bank into vehicle track channel          |
| 10. |    | 8. Large boulders obstruct direct water flow                                    |
| 11. |    |   |
| 12. |    | 9. Wetland grasses along waterfall slope  |
| 13. |    | 10. Perennial water flow  |
| 14. |    | 11. Marsh / swamp landscape in priority wetland area                            |
| 15. |    | 12. Submerged pine and Eucalyptus trees in Theewaterskloof Dam, with reflection |



## VII. CONCLUSION +

Water is essential to all life, and with increasing temperatures and climate uncertainty, a water scarce future will become the new normal. As much as invasive alien plants are a serious threat that needs to be addressed better and urgently, we must also create ways to find a balance, in which both water and the enduring invasive alien plants are resources to be considered. By expanding on management and awareness around invasive alien plants, using an understanding of the mechanisms behind invasiveness spatially and experientially, water resources can be protected, while also addressing many challenges facing local communities and the urban realm. What is presented here is but one tool to help us achieve this.

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## IX. APPENDIX

Name: Yvo Cornelis Adrianus Suijs

Student number: SJSYVO001

Course: APG5052S

### DECLARATION OF FREE LICENSE

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### PLAGIARISM DECLARATION

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

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Signed by candidate

## ETHICS\_APPLICATION\_INTERVIEW

Before initiating any interview I will notify the person to be interviewed that this interview is part of a dissertation by a UCT Masters of Landscape Architecture student and that the outcome will have no implications and effects on the person interviewed or anything/anyone related to the person interviewed, and that the interview and outcome is purely and only for academic purposes.

Questions for the interview to local people with a relation around freshwater landscapes:

1. What is your relation to this site and the near area around it?
2. What do you feel when you are in this space? (freshwater landscape)
3. What is the reason you would come to this space?
4. Have you seen this space in the drought? If so, what comes to mind when you saw this space in that situation?
5. Have you seen this space before it became man-made hydrological infrastructure? If so, how do you feel by looking at what is now present?
6. What are the positive factors of the freshwater landscape for/to you? If so, would you want to improve these factors to create more benefit or experience?
7. What are the negative factors of the freshwater landscape for/to you? If so, is there anything you would want to do to make these negative factors positive?
8. How do you interact in or around the freshwater landscape when the water levels have dropped to a bare minimum?
9. How do you interact in or around the freshwater landscape when the water levels have risen due to good rainfall?

## ETHICS\_APPLICATION\_APPROVAL >>

## APPLICATION FORM

**Please Note:**

Any person planning to undertake research in the Faculty of Engineering and the Built Environment (EBE) at the University of Cape Town is required to complete this form **before** collecting or analysing data. The objective of submitting this application *prior* to embarking on research is to ensure that the highest ethical standards in research, conducted under the auspices of the EBE Faculty, are met. Please ensure that you have read, and understood the **EBE Ethics in Research Handbook** (available from the UCT EBE, Research Ethics website) prior to completing this application form: <http://www.ebe.uct.ac.za/ebe/research/ethics1>

APPLICANT'S DETAILS	
Name of principal researcher, student or external applicant	Click here to enter text. <b>Yvo Suijs</b>
Department	Click here to enter text. <b>APG</b>
Preferred email address of applicant:	Click here to enter text. <b>Yvosuijs@hotmail.com</b>
If Student	Your Degree: e.g., MSc, PhD, etc. Click here to enter text. <b>MLA</b>
	Credit Value of Research: e.g., 60/120/180/360 etc. Click here to enter text. <b>120</b>
	Name of Supervisor (if supervised): Click here to enter text. <b>Clinton Hindes</b>
If this is a research contract, indicate the source of funding/sponsorship	Click here to enter text.
Project Title	Click here to enter text. <b>Choreographing the <del>pre</del> adaptation of Freshwater Landscapes</b>

I hereby undertake to carry out my research in such a way that:

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

SIGNED BY	Full name	Signature	Date
Principal Researcher/ Student/External applicant	Click here to enter text. <b>Yvo Suijs</b>	Signed by candidate	Click here to enter a date. <b>5 April 2019</b>

APPLICATION APPROVED BY	Full name	Signature	Date
Supervisor (where applicable)	<b>Clinton Hindes</b> Click here to enter text.	Signature Removed	<b>5 April 2019</b> Click here to enter a date.
<b>HOD (or delegated nominee)</b> Final authority for all applicants who have answered NO to all questions in Section 1; and for all Undergraduate research (Including Honours).	Click here to enter text.	Signature Removed	Click here to enter a date.
<b>Chair : Faculty EIR Committee</b> For applicants other than undergraduate students who have answered YES to any of the above questions.	R Behrens	Signature Removed	24 May 2019

