

The Urban Arboretum

DEPARTMENT OF ARCHITECTURE, PLANNING
AND GEOMATICS

Masters Of Landscape Architecture Thesis
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Study Leader: Mr. C Hindes

D.L.
Griesel
GRSDAV002

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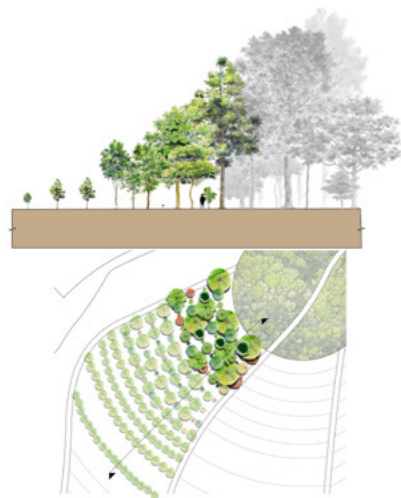
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1.1 EXECUTIVE SUMMARY OF THESIS PROJECT:

The Urban Arboretum:

Trees in the urban fabric are often overlooked, and their significance in the effect of their presence that they hold is most often lost.

Trees are seen as something of an afterthought, something purely aesthetic, or even something that poses a problem to the city instead of a solution to certain problems.

Through my study project, the "Urban Arboretum", the objective is to explore all the different potential possibilities and opportunities that trees could have in the urban realm, not only pertaining to aesthetics, but also in terms of spatial and architectural qualities, as well as cultural connotations, and especially the productive and ecological potential that they hold.

Through the study and understanding of these objectives they are applied to a chosen site through the concept of the dissertation which is "the Architecture of the Forest" This concept functions through the design and active maintenance of the scientific principles of succession of species.

1.3 STUDY ABSTRACT:

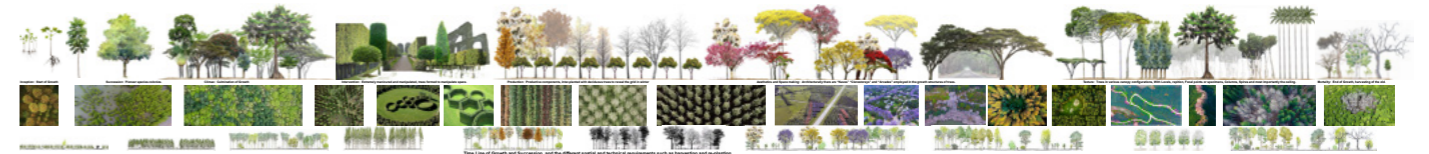


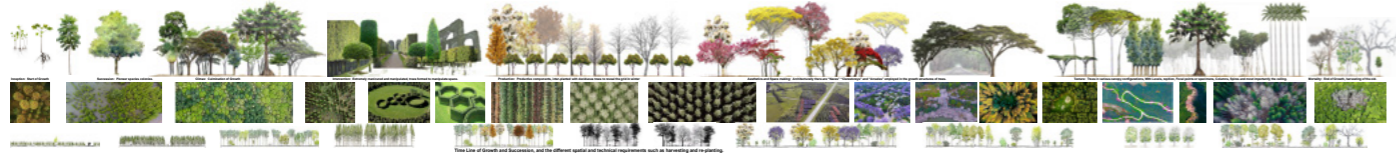
Fig.1: Tree Sequence, Tree Study

1.2 THESIS STUDY

The Urban Arboretum:

Through my project, the Urban Arboretum, the objective is to explore all the different possibilities and opportunities that trees could have in the urban realm, not only pertaining to aesthetics, but also in terms of spatial and architectural qualities, as well as cultural connotations, and especially the productive and ecological potential that they hold. a very important consideration in this is the relationship these different attributes have with each other as well as the time component throughout the life cycle of the tree.

1.4 STUDY DOCUMENT:



Hypothesis: Can you Change the way trees are used in the urban realm to be more than just an aesthetic “cladding” and to perform in multiple functional ways, by using an organized planting strategy vested in the natural processes of succession of species specific to the site requirements.

The study only applies to biomes that are highly tree rich or consisting of forests.

The aim then is to maximize the amount of trees to be planted throughout a given site (town/city), while at the same time satisfying objectives such as improving the urban fabric and setting through experiential qualities as well as through seasonality, succession and maintenance to bring out certain desired spatial or ecological qualities over time. The productive component as well as ecological services trees provide are also very important. The way to sustain the tree planting and manage the changes it goes through over time is also integral.

The “Pristine forest” or what was there before is ecologically speaking the ideal position regarding trees. In the urban environment, this is hardly ever achievable, therefore the study is concerned with the full spectrum of various tree planting combinations that relates to the various objectives. Exploring the use of trees from a single sapling and then from there the succession through a wide spectrum between a rehabilitated forest, highly manicured and formally structured shaping and management of trees, to the articulation of different architectural qualities and shapes perceived within the structures of the individual trees, or the combination of certain canopy types with purely productive units of planting all the way to the death or harvest of that tree or unit of trees.

The most integral part of this study is the reproduction component, that of mimicking the forest in the sense that young trees have to be constantly inter-planted to sustain the guise of trees on that given site or even change it completely as desired through maintenance over time.

2. DISSERTATION

2.1 DISSERTATION ABSTRACT:

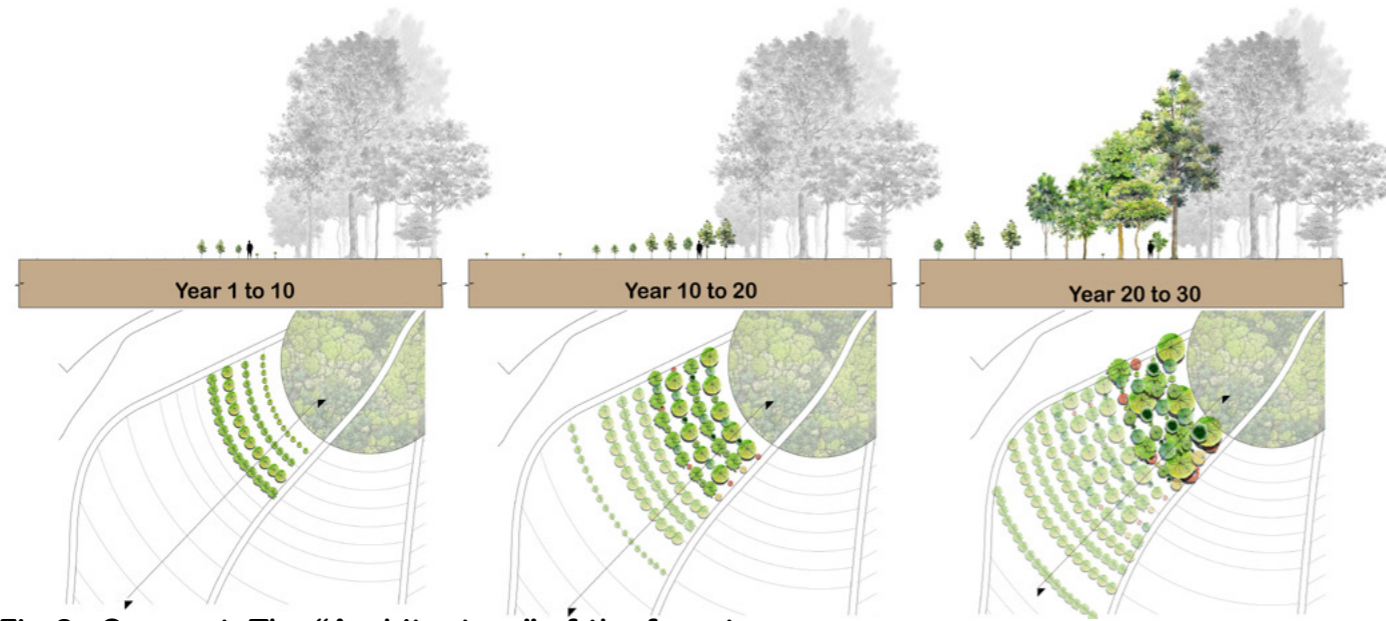


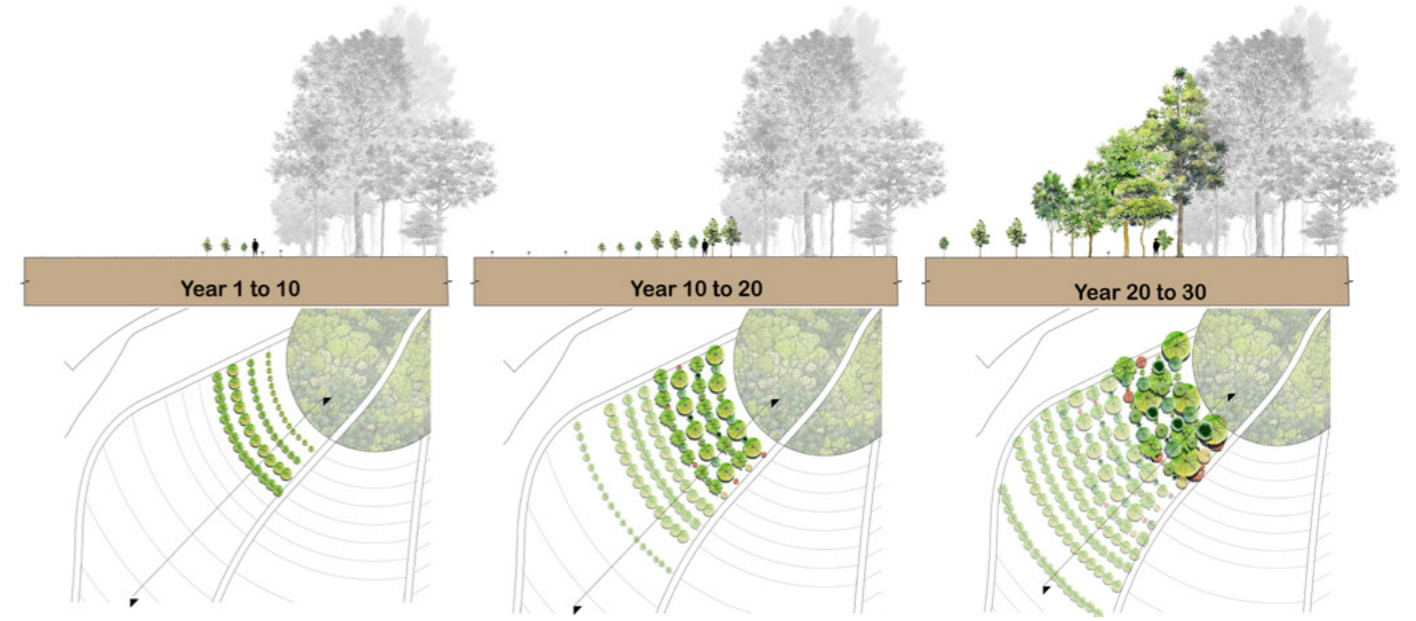
Fig.2: Concept: The “Architecture” of the forest

Through the study I have established that the “Pristine forest” is ecologically speaking the ideal position regarding trees. In the urban setting this is not feasible, therefore the planting regime of trees has to be designed in such a way to maximise the eventual possibility of the pristine forest, and that is where the concept of this dissertation comes into play. This concept through active manipulation can be employed to achieve any of the combinations or functions of trees that were set out in the study component.

This concept works on the principle of succession and the natural processes and building blocks in a forest which makes it function and develop.

These characteristics will then be applied in the urban setting on a site where the specific biome and vegetation type is carefully considered.

2.2 DISSERTATION PROJECT:



Succession: “Architecture of the Forest”

Methodology:

The concept is to plant as many trees as is scientifically feasible on a specific site or area, but in doing so following the laws of nature that govern that specific site and vegetation type in which the site is located.

This works on the principle, which I like to describe as “the architecture of a forest”, namely, succession of species over time.

This involves pioneer species.

These are fast growing hardy tree species that easily colonize a disturbed area, which then grow up and create micro-climates for the development of more permanent species that make up the phenotypical composition of the associated vegetation type.

Because this is in an unnatural setting, it has to be designed and actively managed by people.

The idea is to firstly start of by planting pioneer species applicable to the specific vegetation type, and in as high a density as the site would allow.

These trees will then be “harvested” by transplanting them in intervals of 5 years or more and in a frequency depending on the size and species of the trees into new ancillary or adjacent sites. A predetermined minimum amount of individuals in a 10x10m block reference has to be maintained determined by the specific site conditions and associated vegetation unit in which it falls.

Where these pioneer trees have then been removed new plantings of different successive species or climax species must then be planted replacing the ones that have been utilized.

These additional trees will then be treated similarly to the pioneer trees in the sense that as they mature over time and get bigger in size that they be removed or harvested and used to populate new sites.

The key point is that a predetermined minimum number of individuals and species composition has to be present in any given 10x10m plot on site. This will ensure the possibility of a rehabilitated forest to establish at any desired time. Therefore the possibility of full ecological recovery of a specific area is always possible throughout the lifetime of the site, be it 30 years or a 100 years.

This process can be tailored to any site to satisfy its specific opportunities and constraints such as the vegetation unit, its physical features, cultural requirements, or desired architectural or aesthetic ideals.

Connectivity:

The second point of enquiry that is of equal importance is that of connectivity between natural populations of trees as well as designed interventions. This has to be established as frequently and continuously as possible to ensure maximum ecological benefit as well as to indirectly address the more nuanced affects you would want trees to have in any given setting. (cultural, spatial, aesthetic)

Water:

The use or treatment of water associated with tree plantings is also integral especially when considering site-specific conditions. Either to use existing water sources in propagation phases, channelling runoff to trees or away from trees. This can also entail specifically using trees from the site-specific vegetation unit in order to be well suited and “water-wise” in that environment.

Going to site:

The site I have chosen to apply my thesis to is the town of Tzaneen in the Limpopo province in South Africa.

In terms of analysis with the onus to plant as many trees as possible on site as well as finding sites of intervention satisfying ecology, production, spatial qualities and aesthetics and cultural or social components I studied the following through a series of mapping and overlaying exercises.

Climatic data, Topography, Vegetation types and the information pertaining to it, as well as land use or public accessibility, existing site conditions in terms of forests, disturbed areas as well as the drainage regime. The possibility of establishing connectivity corridors using road reserves along major routes.

The town falls in an isolated very high orographic rainfall area. The climate is warm and humid, Tropical to sub-tropical with predominantly summer rainfall often in astonishing amounts over a 24hour period with an annual average of between 1600-2000mm per annum.

The Vegetation units as described by Mucina and Rutherford in, *‘The Vegetation of South Africa Lesotho and Swaziland’*, (Mucina and Rutherford, 2011) are broadly described as Tzaneen sour bushveld, mostly associated with North-West facing slopes, and the Northern Mist belt forest predominantly associated with South East facing slopes.

My analysis and personal exploration however as shown that there are also lowveld riverine or swamp forest present, and that the mist belt forest has a low altitude component which is what is present in and around the town.



Fig.3: Tzaneen Town and Surrounds



Fig. 3: Tzaneen Town and Surrounds

The presence and location of the vegetation units will greatly influence the species composition of any intervention, for instance the dominant tree in the Tzaneen area, which is absent from the vegetation analysis

literature namely: “*Anthocleista grandiflora*” which in the intervention will have a strong presence as the “cover tree” of the project.

From this mapping and overlaying process, I have identified five sites, which show the most potential pertaining to the objectives set out in a tree-planting-oriented intervention, the Urban Arboretum.

Each of the five sites respectively have their own quality in terms of the objectives that came out as the strongest such as productivity on site 1 and 1A, aesthetics on site 2 and ecology on site 3 and Production in the form of agriculture and forestry on site 4. Site-specific interventions would be tailored to emphasize these different attributes in each specific location, while still satisfying each of the other objectives in varying intensities.

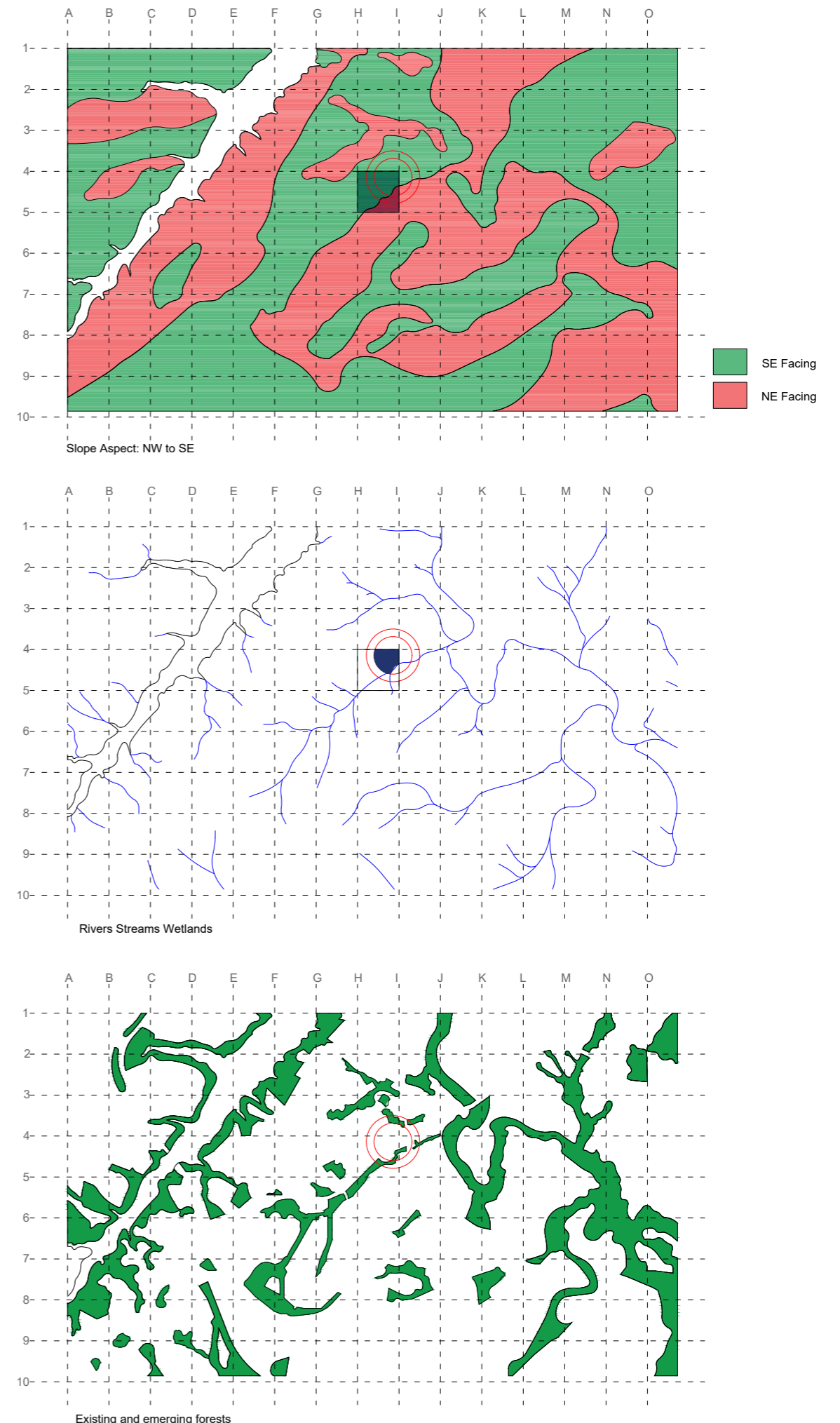


Fig. 4: Analysis: Mapping of Spatial Attributes

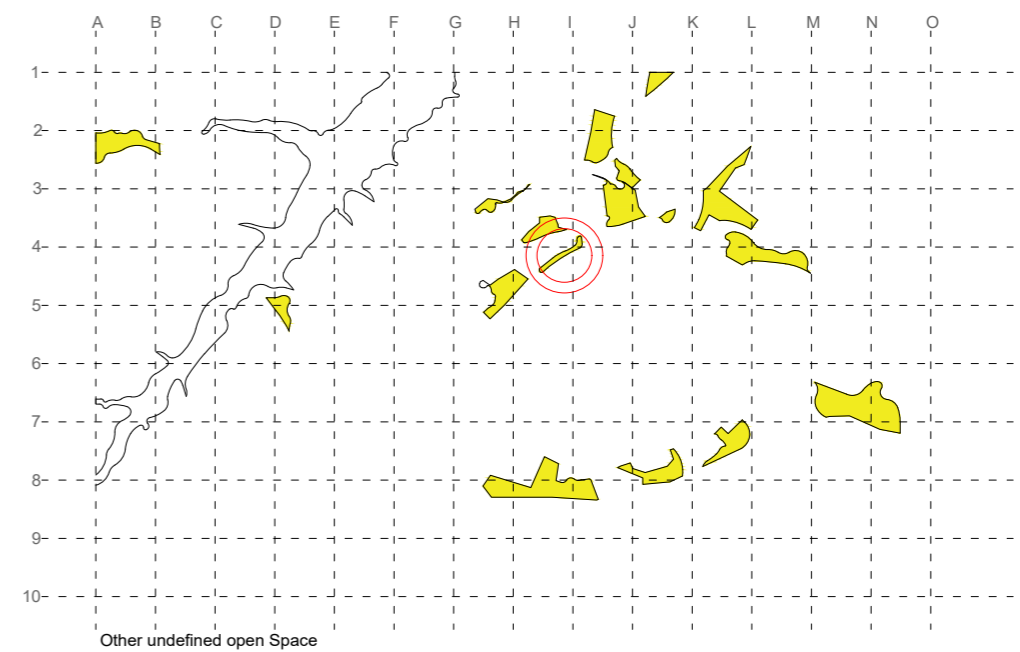
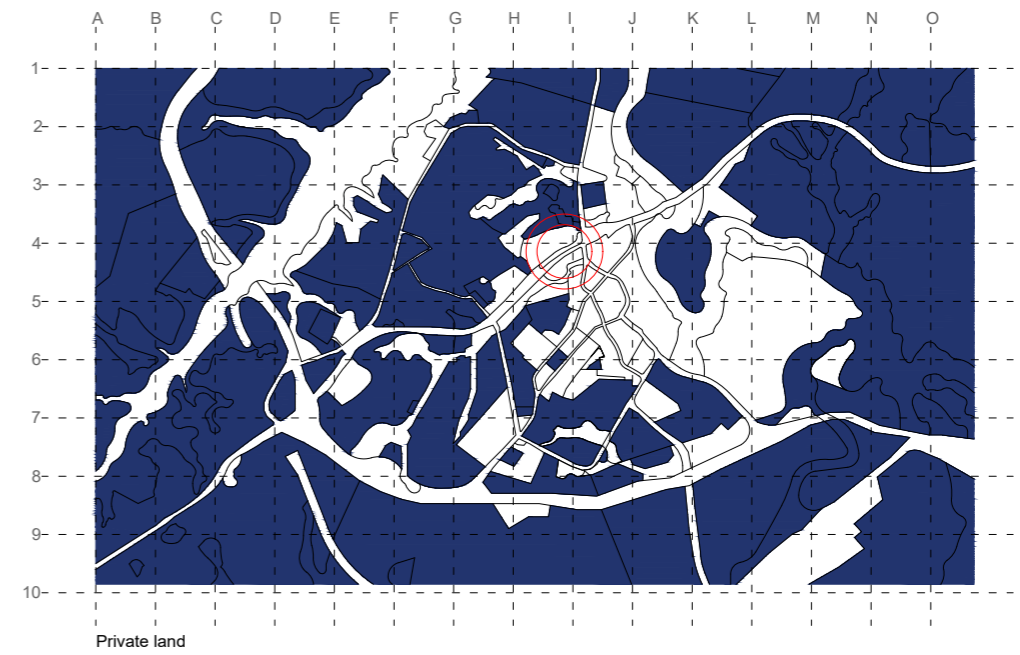
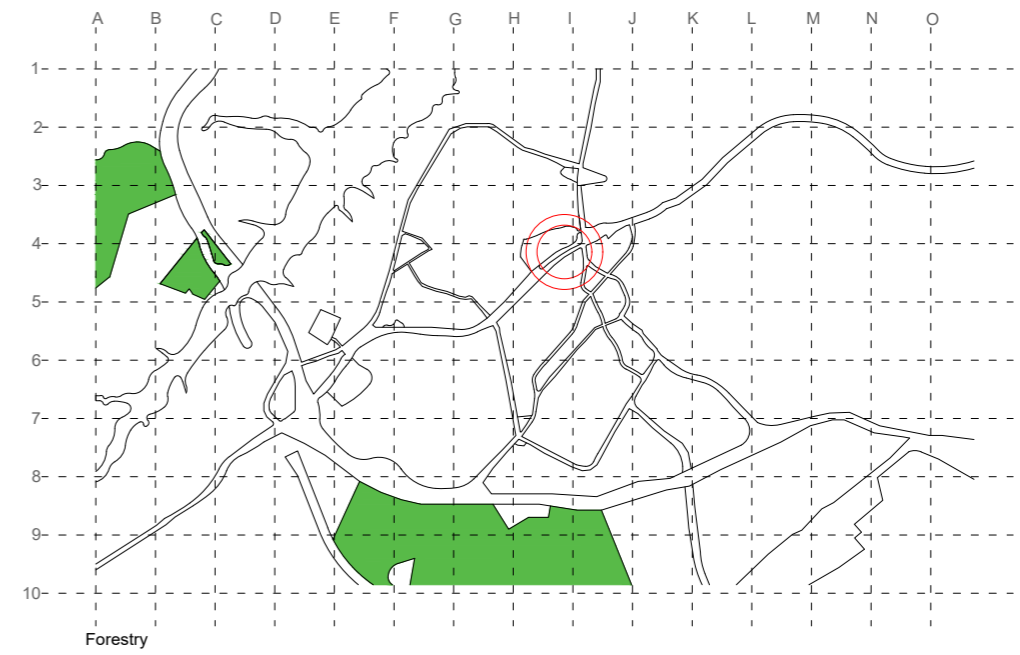
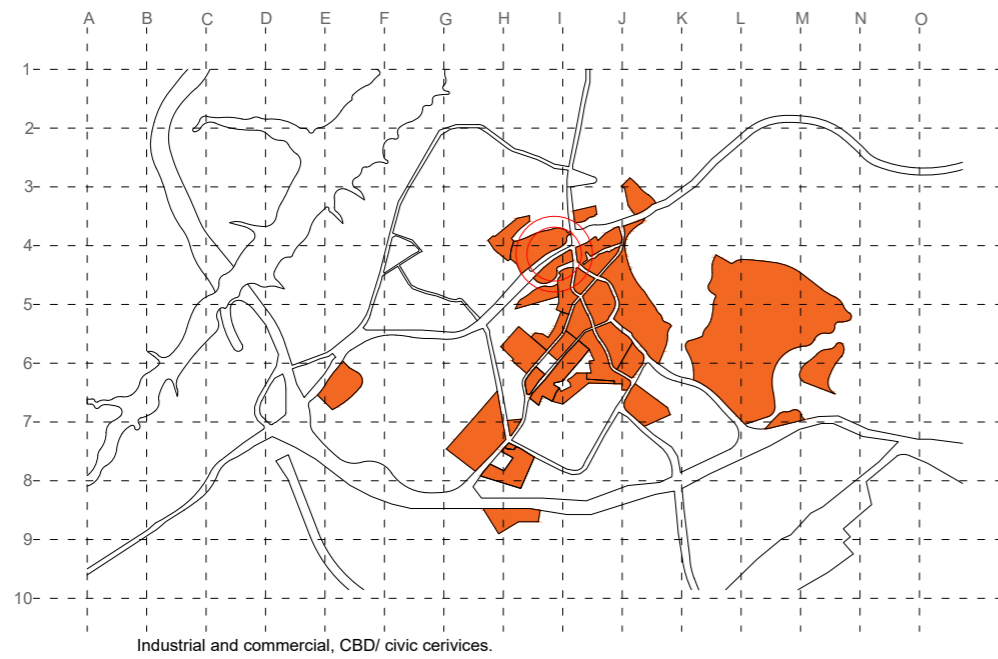


Fig. 5: Analysis: Mapping of Spatial Attributes

Fig. 6: Analysis: Mapping of Spatial Attributes

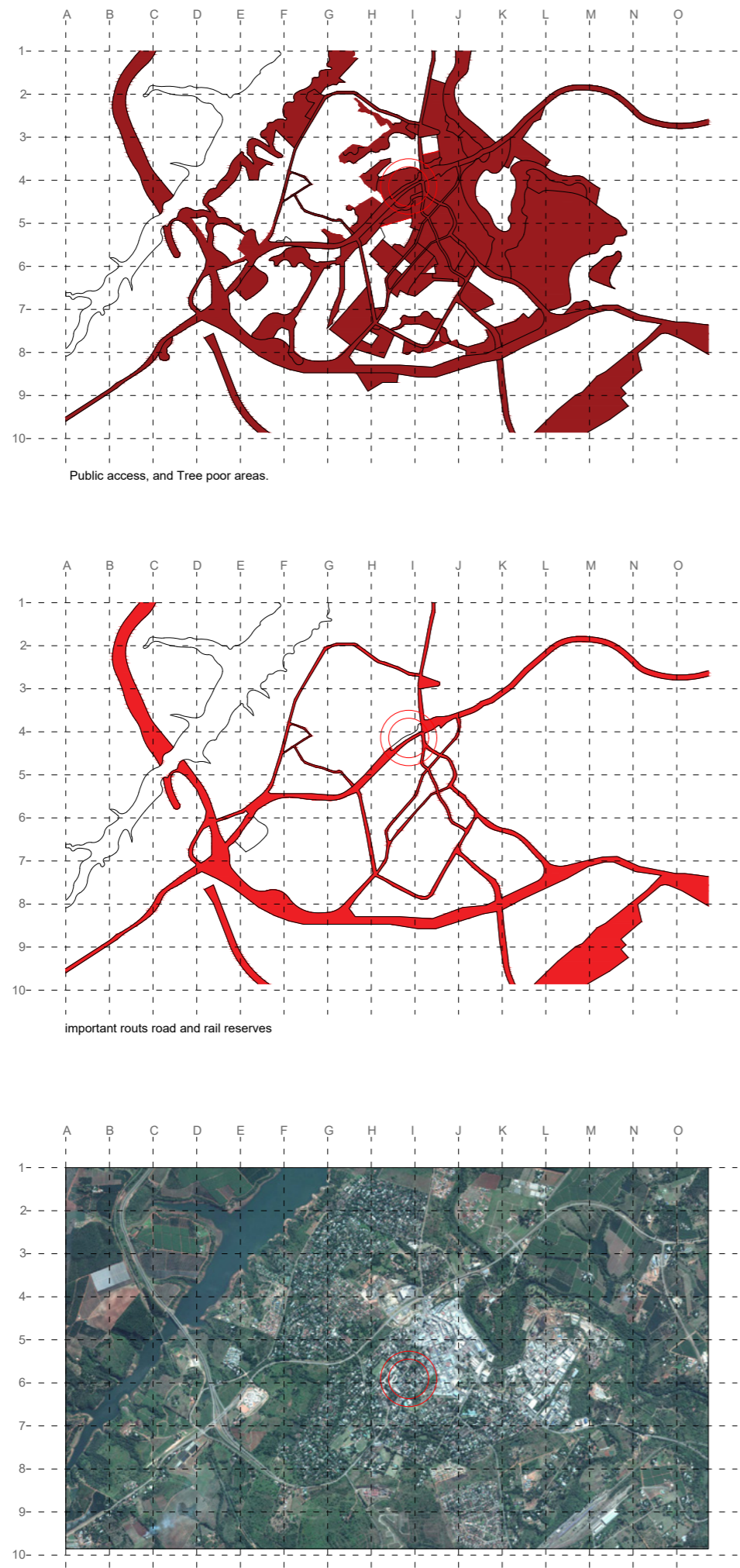


fig. 7: Analysis: Mapping of Spatial Attributes

Connectivity Network:

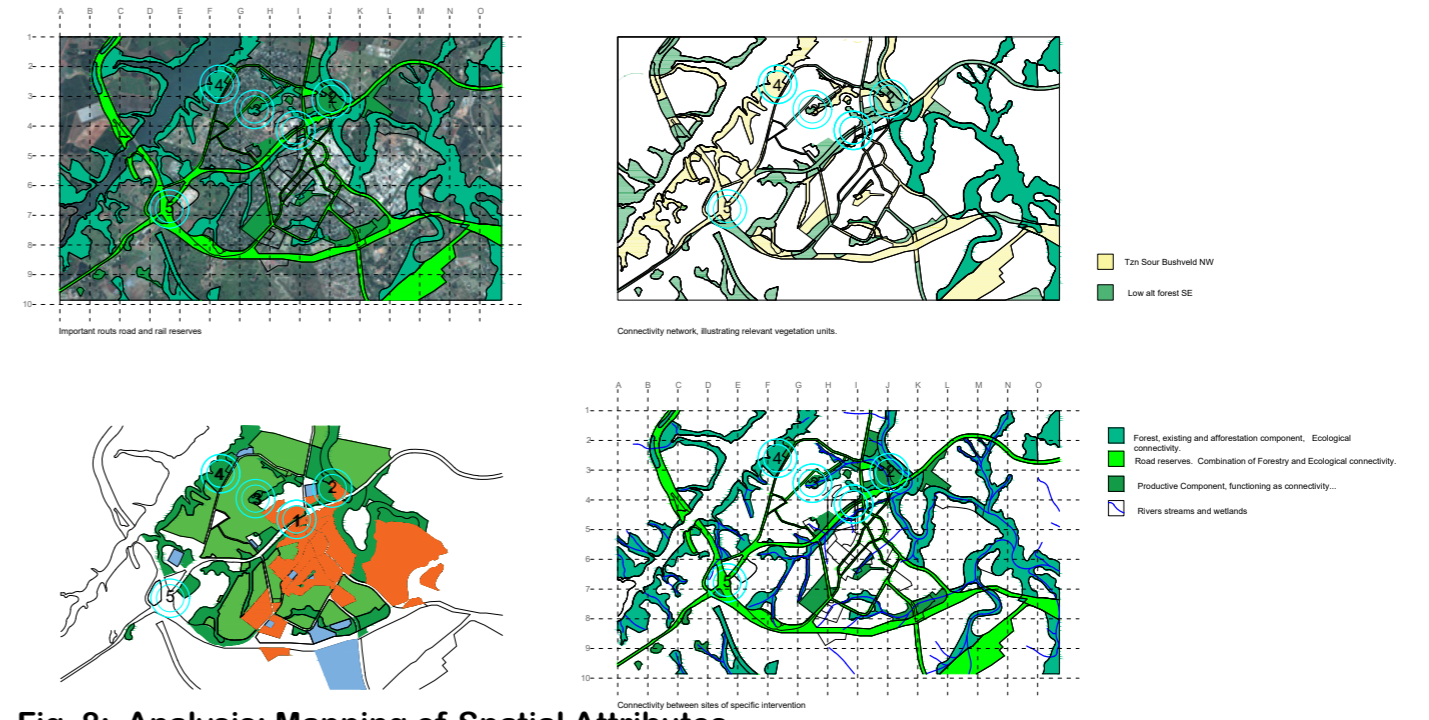


Fig. 8: Analysis: Mapping of Spatial Attributes

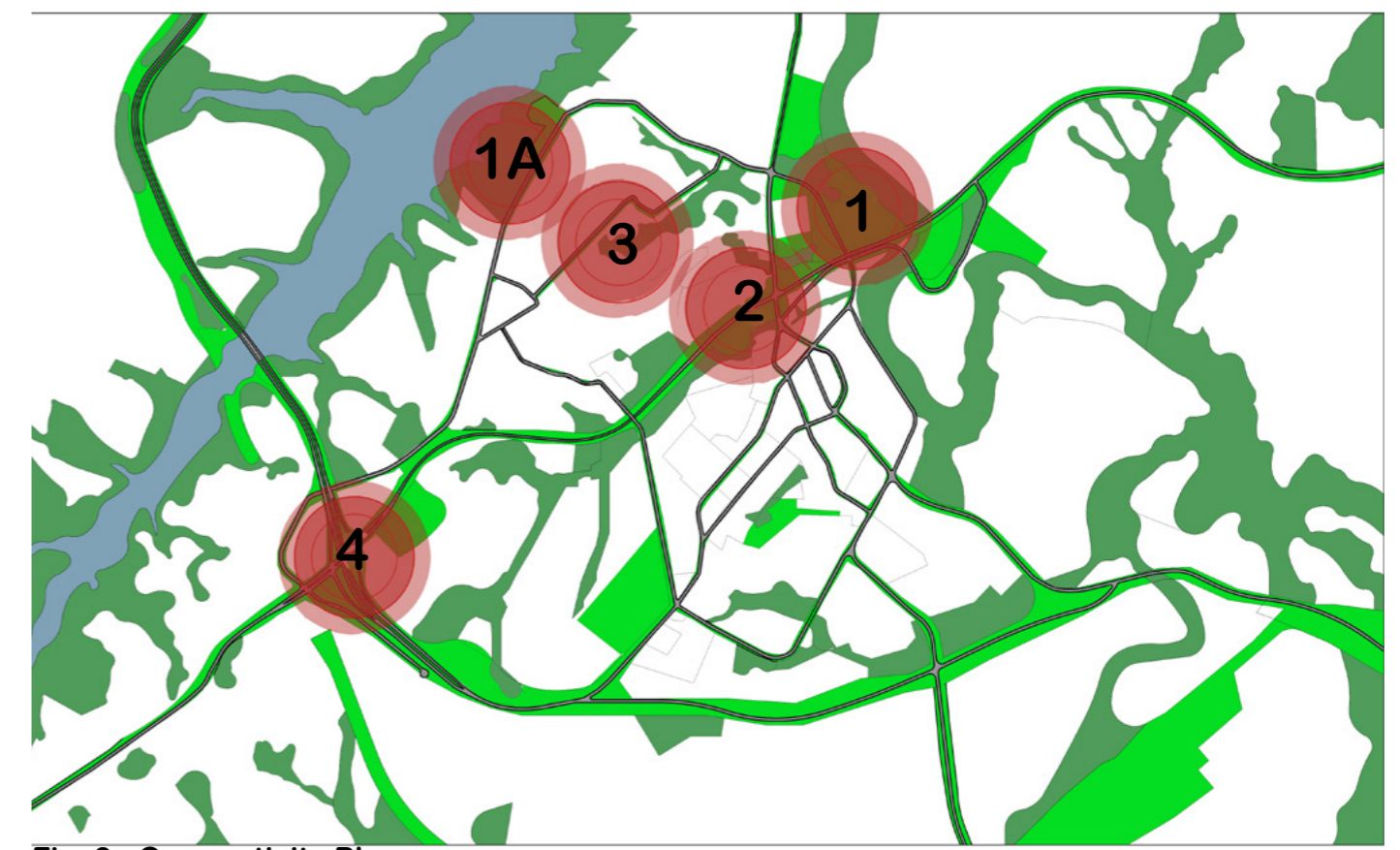


Fig. 9: Connectivity Plan

Other Favourable/Suitable Trees:

Encephalartos transvenosus Modjadji cycad,
 Sterlitzia coudata
 Trichelia dregeana
 Anselia Africa nb
 Xanthocercis zambeziaca
 Ficus trichopoda
 Raphia australis swamp forest section...
 Waterbessie, syzigium cordatum
 Borassus aethiopum
 Aloe barberae
 Adansonia digitata
 Melittia grandis
 Podocarpus falcatus
 Dombeya rotundifolia
 Dombeya burgesse
 Euphorbia tirucalli
 Voacanga thoursii
 Barringtonia racemosa

Lowveld Riverine Forest:

Densely populated, occurring at a density of Young trees: 7 /10m² mid life trees: 5/10m² and climax old trees 3/10m²

Planting Grid spacing of 2m.

Anthocleista Grandiflora
 Raufvolfia caffra
 Celtis Africana
 Combretum Erethrophylum
 Kaya Anthoteca
 Bridelia micrantha
 Diospiros mespiliformis
 Grysappel
 Spathodea Paciflora
 Ficus sycomorus
 Ficus sur
 Breonadia salicina (Matumi)
 Waterbessie, syzigium cordatum
 Borassus aethiopum
 Harpephyllum caffrum

Tzaneen Sour Bushveld (NW facing component)

Open tall woodland med densely populated, occurring at a density of Young trees: 6 /10m² mid life trees: 4/10m² and climax old trees 1/10m²

Planting Grid spacing of 3.5m

Acacia polyacantha
 Albizia versicolor
 Ficus sansibarica
 Parinari curatellifolia
 Piiostigma thonningii
 Pterocarpus rotundifolius
 Trichilia emetica
 Acacia davyi
 A sieberiana var. woodii,
 Antidesma venosum, Catha edulis
 Faurea rochetiana
 F. saligna,
 Ficus burkei,
 F. petersii,
 Heteropyxis natalensis
 Peltophorum africanum
 Terminalia sericea,
 Vernonia colorata
 Eckerbergia capensis
 Sclerocaria berrea

Low alt forest (SE facing component)

Densely populated, occurring at a density of Young trees: 7 /10m² mid life trees: 4/10m² and climax old trees 2/10m²

Planting Grid Spacing of 2.5m

Anthocleista grandiflora
 Ficus sycomorus
 Celtis africana
 Bridelia micrantha
 Trichelia dregeana
 Acacia sieberiana var. woodii
 Cussonia Spicata Forest variety.
 Antidesma venosum
 Harpephyllum caffrum
 Acacia polyacantha
 Albizia versicolor
 Albizia adiantifolia
 Kigelia africana
 Erithrina latissima
 Erithrina lysistemom
 Parinari curatellifolia
 Pterocarpus angolensis
 Spathodea pacodea
 Kaya Anthoteca

Fruit trees:

Planting Grid Spacing: crop specific

Avocado
 Leechie
 Macadamia
 Cashew nut
 Mango
 Guava
 Papaya
 Banana
 Dragon Fruit
 Rambotan
 Citrus

Favourable Forestry Species:

Planting Grid Spacing of 2m, or species specific

Kaya Anthoteca
 Podocarpus falcatus
 Podocarpus latifolius
 Celtis Africana
 Diospiros mespiliformis
 Eucalyptus grandis
 Terminalia sericea
 Trichelia dregeana
 Citrus trees
 Pterocarpus angolensis
 Eckerbergia capensis
 Indian Mahogany

(Mucina and Rutherford, 2011)

3. Site 1 & 1A: Productive focus, Nursery.

These two sites are respectively oriented to different phases of production, i.e., the nursery, supplying the rest of the sites, and the town wide project with trees.

The design detail in this intervention is to design the exact process of planting, applying the process of succession.

The idea is to start of by planting only pioneer species, after 5 years removing every second one to be planted else where. Subsequently replacing those trees by the next step of successive trees native to that vegetation unit until over a period of 15-20 years you plant climax species. In doing this you can manage this site with the basic minimum composition and quantity of trees in the smallest recognizable portion geographically for that vegetation unit.

This process can be repeated indefinitely or until the demand for new trees decrease. If the site is no longer required to produce trees, every portion of the site will then still have the correct ratio of pioneer to climax species in order to establish a pristine example of the type vegetation and to maximize ecological functioning and connectivity to and from the site.

In terms of physical interventions, the site is located within a residential area and lends itself well to function as an urban park.

Constructed Pathways and predetermined open spaces will give the site a defined structure while the vegetation is ephemeral and ever changing around it, and even if the site is left to return to forest, there will be structured circulation routes and the site will therefore forever be able to function as a recreational park.

Fig. 10: Vegetation Units

The nursery component will make use of a large wooden crate design, made up of modular timber units, 2000x450mm that will provide seating and could also be arranged in a multitude of different guises and combinations to create space on site and program how certain spaces will function.

These are also integral in the functioning of the site as a nursery, because it provides more growing medium than conventional containers and the trees are effectively grown “in-situ”. The growth rate will be much higher than purely container grown trees. Evaporation is also much lower with this system compared to bags or containers.

Trees that are to be left in-situ afterwards to establish a forest are then effectively already “planted” and the Timber planting box can simply just be removed from around the root zone.

The site is also shaped in such a way that it is converted into a series of terraces that each are effectively a very shallow swale, which aids in infiltration and storm water detention.

The ecological connectivity component to the entire design is achieved through the planting of street trees in the form of “linear forests” instead of only having avenues. This is a linear forest, or mix of trees specific to the relevant vegetation unit it is crossing, but also follows routes of human movement. The second very important component in the town wide intervention is the use of residential and commercial areas, through specific typology designs, which pre-specify which tree species, and in which spatial configurations they are found and where. Integral in this, is how these typologies deal and treat runoff water. This then connects, intersects and physically join every site of specific intervention and in turn, where different attributes according to the objectives of the thesis intercept each other interesting spatial articulation is achieved related to the architectural qualities of the tree itself as well as how they are arranged.



Fig. 11: Site1: Nursery Overview. Scale 1:5000 (A1)



Fig. 12: Site 1: Nursery Scale 1: 1000 (A1) 



Fig. 13: Site 1: Section E-E



Fig. 14: Site 1: Voortrekker Road Nursery

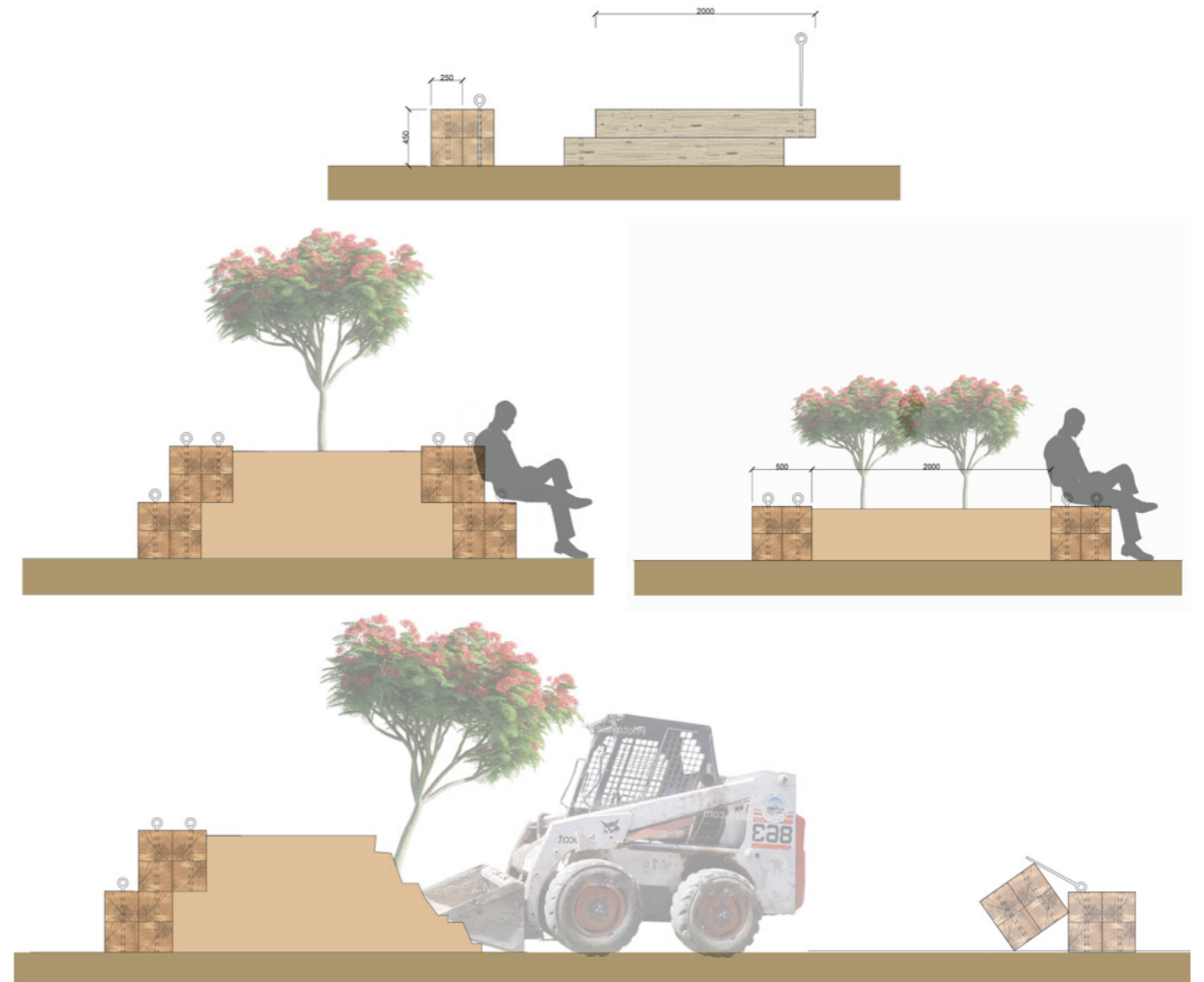


Fig. 15: Site 1 & 1A: Planter Box Detail

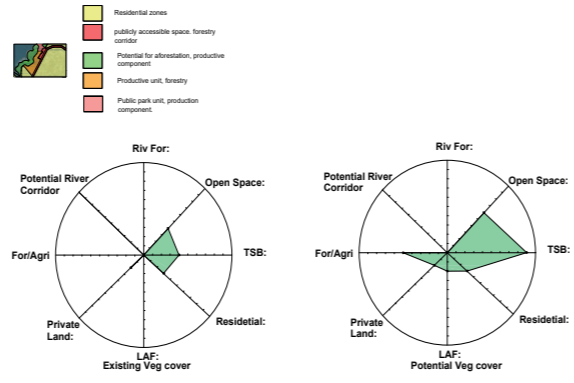
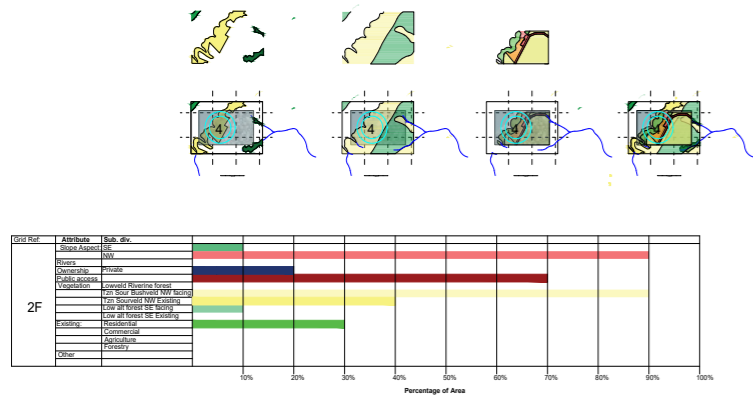


Fig. 19: Residential Typology

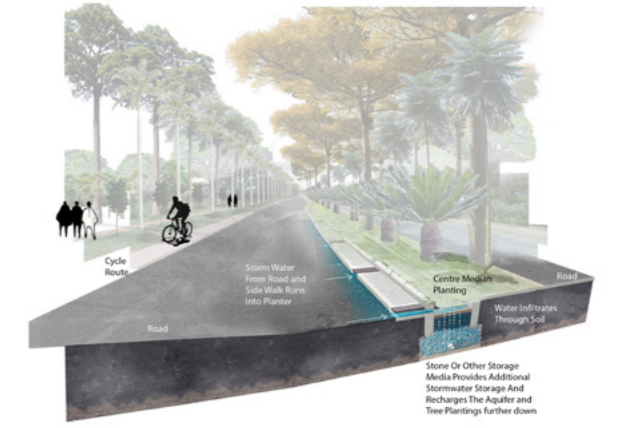


Fig. 20: Centre Median Typology



Fig. 16: Site 1A: Nursery Extension Plan Scale 1:1000 (A1)



Fig. 21: Stormwater Tree Trench: Checkers Parking lot



Fig. 17: Commercial Typology



Fig. 18: Commercial Typology Major Routes

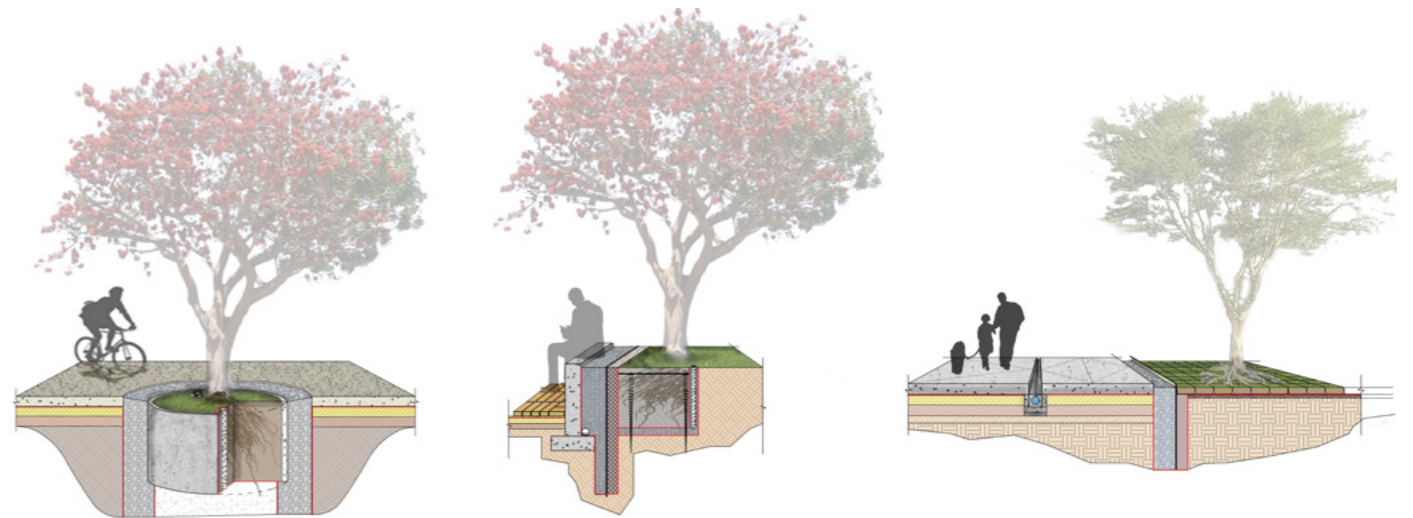


Fig. 22: Tree Root Management Details

4. Site 2: Aesthetic focus

This site is geographically located at a point where numerous routes join up in the heart of the town, it is well connected to other sites and existing vegetated areas. It is also currently completely void of any existing features, just an open piece of land, and therefore lends itself to most intensive intervention.

The design of this site takes on a strongly aesthetic approach to aggressively draw attention to the town wide intervention of tree planting, through the use of vegetation for aesthetic and spatial requirements.

Trees are used in semi informal Bosque's showing off their individual qualities and attributes. The site is all about showcasing the vegetation of the lowveld region and certain plants pertaining to regional cultural specificity. Specifically mentioning the Modjadji cycad "Encephalartos transvenosus" as well as the ancient Borassus palm Borassus aethiopum, which in South Africa is only found in the Tzaneen area.

Another specific cultural consideration is the stripping of Anthocleista grandiflora bark for traditional medicine, these trees are often killed in and around the town, on this site because it is socially oriented and located, a Bosque of Anthocleista will be planted, maintained and replaced specifically for the harvesting of bark in order to save wild trees.

The saying by Roberto Burle Marx rings true in which he states that to be able to fully appreciate the qualities of an individual plant you have to see many of them together in order for it to truly reach its full aesthetic potential...

The site also has to address logistical requirements such as accessibility and negotiating topography and collecting and managing runoff from the surrounding buildings and vast paved surfaces.

The time aspect of the concept is poetically celebrated by the use of sculptural dead specimens of the Leadwood tree, Combretum imberbe, which are visually dominant as skeletons that stand for hundreds of years in the lowveld bush.

Tree species are still selected according to vegetation units and site requirements, not planted purely for ecological function, but for a strong visual impact. Therefore certain exotic species are employed if they do still perform the specific niche governed by the vegetation type or site-specific constraints if not invasive. (ex. required to be very tall to allow for a clear view onto buildings, Schizolobium parahyba, Delonix rigea, Spathodea campanulata... or dead leadwood trees...)

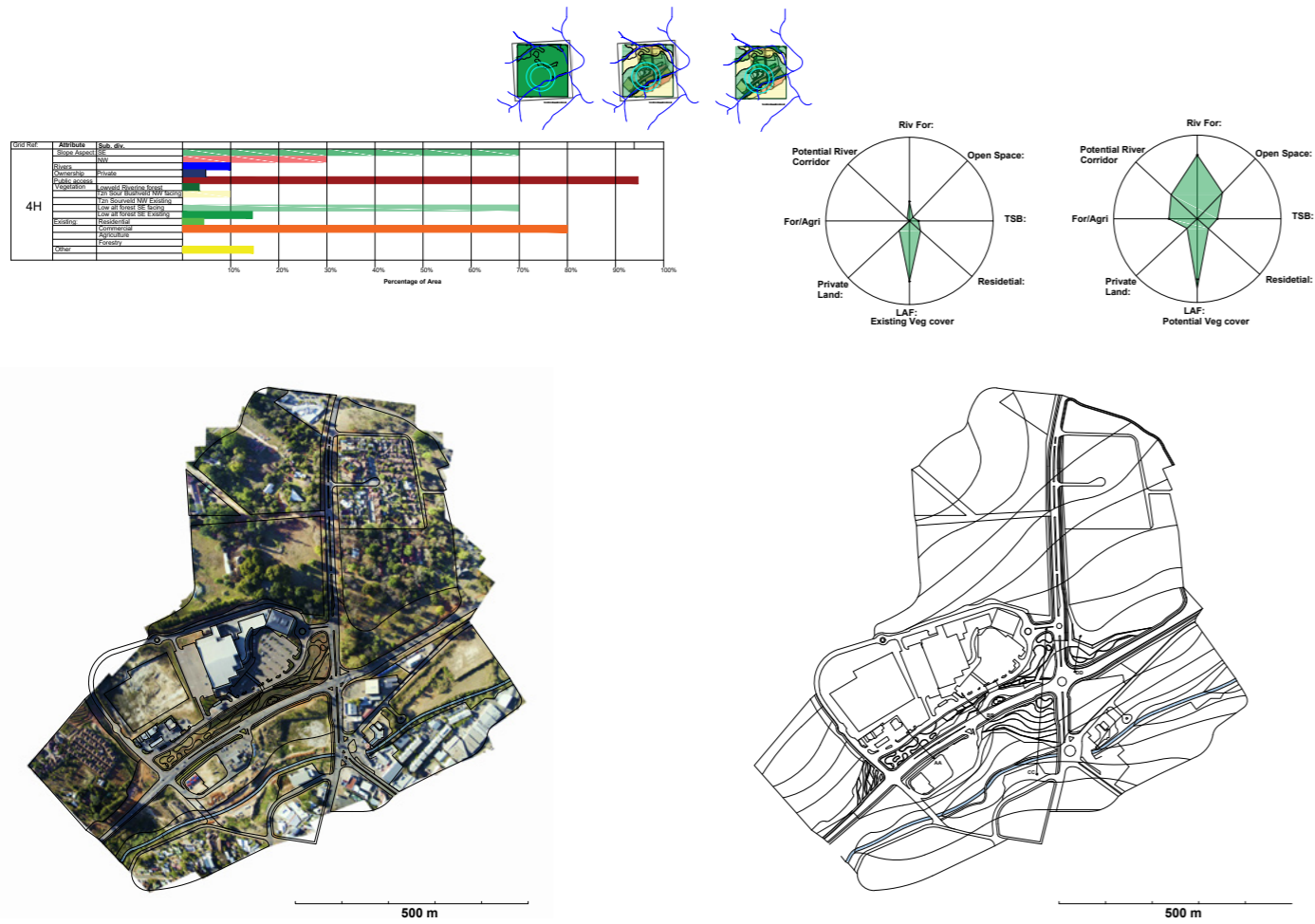


Fig. 23: Site 2: Aesthetic Expressions Scale 1:1000 (A1)

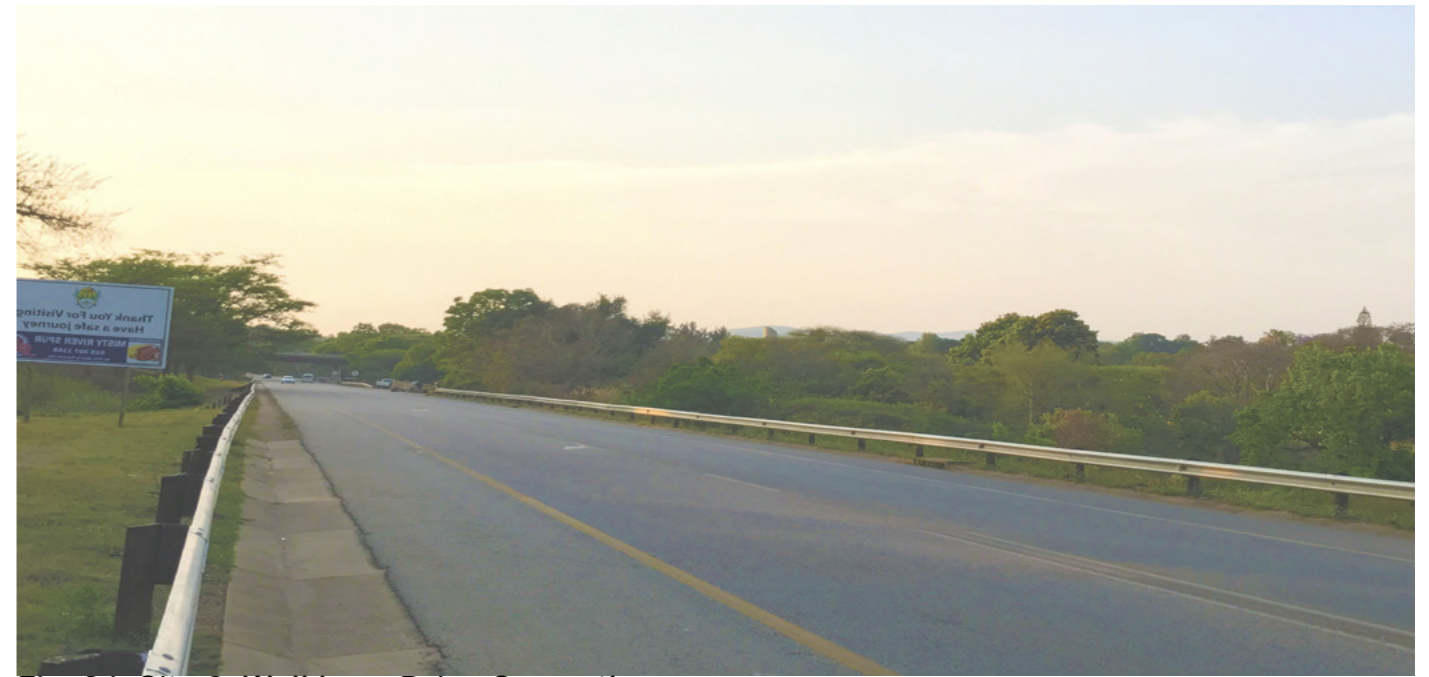


Fig. 24: Site 2: Wolkberg Drive Currently



Fig. 24: Site 2: Wolkberg Drive Arcade: 0-10 Years



Fig. 24: Site 2: Wolkberg Drive Arcade: 50+ Years



Fig. 25: Site 2: Entrance to Total Garage



Fig. 25: Site 2: Entrance to Total Garage, 0-10 Years



Fig. 25: Site 2: Entrance to Total Garage, 50+ Years



Fig. 26: Site 2: Top View over Site



Fig. 26: Site 2: Top View over Site 0-10 Years



Fig. 26: Site 2: Top View over Site 50+ Years



Fig. 27: Site 2: Checkers Parking Lot



Fig. 28: Site 2: Voortrekker Road



Fig. 27: Site 2: Checkers Parking Lot 0-10 Years



Fig. 28: Site 2: Voortrekker Road 0-10 Years



Fig. 27: Site 2: Checkers Parking Lot 50+ Years



Fig. 28: Site 2: Voortrekker Road 50+ Years



Fig. 29: Voortrekker Road Green Wall 0-10 Years to 50+ Years



Fig. 32: Section: D-D



Fig. 30: Section: A-A



Fig. 33: Section: C-C



Fig. 31: Section: B-B



Fig. 34: Anthocleista Grandiflora Bark Harvesting

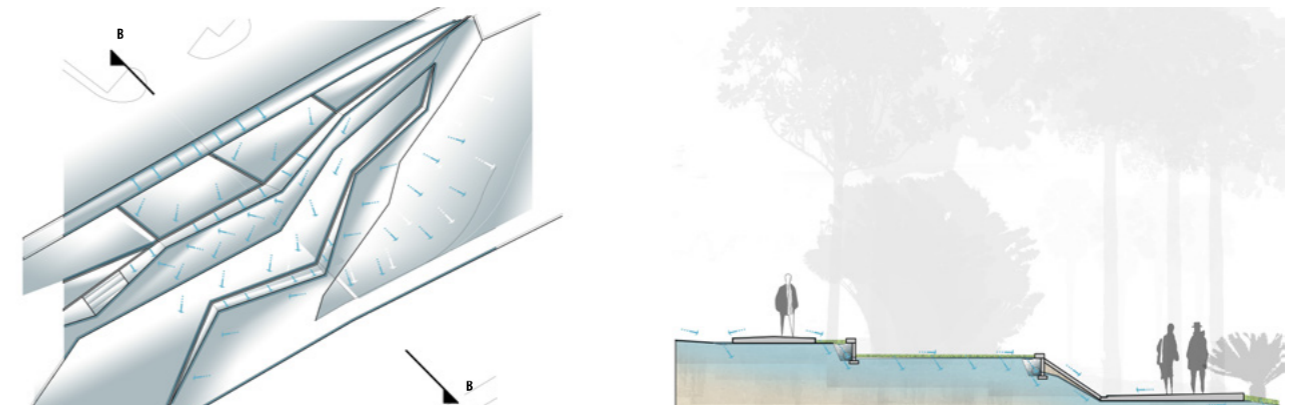


Fig. 35: Runoff Management and Drainage B-B

5. Site 3: Ecological Functioning: Rehabilitation.

On this site there is an incredibly beautiful existing forest surrounded by deforested patches between residential areas.

The only plantings that are made on this site has the sole purpose of ameliorating this already existing forest.

The design detail in this intervention is to design the exact process of planting using the process of succession to establish a pristine example of the type vegetation and to maximize ecological functioning and connectivity to and from the site.

The existing forest edge was used to create offset lines in a 5-10m spacing.

In the first 5 years the first 10 offset lines will be planted with pioneers, as soon as it is perceived that the existing forest is extending into the pioneer species then the next 10 offset lines will be planted up with pioneers. Throughout the life cycle of the intervention inter-planting of successive and climax species will be planted where the germination of existing forest trees are too slow or struggling.

Physical intervention entails limited and well-defined access routes of thoroughfare to minimize human impact on this forest.

These take on the form of raised walk ways through the canopy and under story of the forest, minimizing foot traffic on the ground also functioning as an educational tool for visitors.

Low altitude forest (SE facing component) densely populated, occurring at a density of Young trees: 7 /25m² mid-life trees: 4/25m² and climax old trees 2/25m²
General Planting Grid Spacing of 2.5m

It is tall forests fringing larger rivers (gallery forests) and water pans. When dominated by *Ficus sycomorus* or *Diospyros mespiliformis* (alluvial sediments along major rivers) these forests are dense and tall, structured into several tree layers and with a well-developed dense shrub layer.

Anthocleista grandiflora *Ficus sycomorus* *Celtis africana* *Bridelia micrantha* *Trichelia dreageana* *Acacia sieberiana* var. *woodii* *Cussonia Spicata* Forest variety. *Antidesma venosum* *Harpephyllum caffrum* *Acacia polycantha* *Albizia versicolor* *Albizia adiantifolia* *Kigelia africana* *Ertihrina latissima* *Erithrina lyssistemon* *Parinari curatellifolia* *Pterocarpus angolensis* *Spathodea pacodea* *kaya* *Anthoteca*
, *Phoenix reclinata* ; tall shrubs: *Abutilon angulatum*, *Acacias schweinfurthii*, *Ficus carprefolia*; soft shrub: *Hypoestes aristata*; herb: *Achyranthes aspera* (d); and graminoids: *Digitaria eriantha* (d), *Panicum maximum* (d), *Echinochloa pyramidalis*, *Eriochloa meyeriana*, *Panicum coloratum*, *Phragmites mauritanus*, *Seraria incrassata*, *S. sphacelata*, *Sporobolus consimillis*.

Important taxa includes: Tall trees: tall shrubs: *Abutilon angulatum*, *Acacias schweinfurthii*, *Ficus carprefolia*; soft shrub: *Hypoestes aristata*; herb: *Achyranthes aspera* (d); and graminoids: *Digitaria eriantha* (d), *Panicum maximum* (d), *Echinochloa pyramidalis*, *Eriochloa meyeriana*, *Panicum coloratum*, *Phragmites mauritanus*, *Seraria incrassata*, *S. sphacelata*, *Sporobolus consimillis*.

Planting requirements: 0 - 10 years: 0-5 small trees and 0-5 shrubs per 25m² as well as 200 large tree species (Mucina and Rutherford, 2011)

Pioneer species:

- Acacia (Vechelia) sieberiana var. woodii
- Acacia (Vechelia) Polycantha
- Albizia adiantifolia
- Trema orientalis
- Anthocleista grandiflora

Midlife forest: 10 - 30 years: 5 small trees and 5 shrubs per 25m² as well as 19.5 large tree species

- Acacia (Vechelia) sieberiana var. woodii
- Albizia adiantifolia
- Trichelia dregeana
- Bridelia micrantha
- Anthocleista grandiflora
- Antidesma venosum
- Celtis Africana
- Cussonia spicata
- Albizia versicolor
- Erithrina lyssistemom

Climax forest: 30 > years: 10 small trees and 10 shrubs per 25 as well as 15 large tree species.

- Acacia (Vechelia) sieberiana var. woodii
- Albizia adiantifolia
- Trichelia dregeana
- Bridelia micrantha
- Anthocleista grandiflora
- Antidesma venosum
- Celtis Africana
- Cussonia spicata
- Albizia versicolor
- Erithrina lyssistemom
- Kigelia Africana
- Parinari curatellifolia
- Pterocarpus angolensis
- Spathodea pacodea
- Kaya Anthoteca

Tree Species and Quantities required in 25m² of Forest to represent an Ecologically Functioning portion of Northern Mistbelt Forest (low altitude component) and Lowveld Riverine Forest Vegetation types:

Species:	0-10 years		10-20 years		30> years	
	Quantity:	Spacing 500	Quantity:	Spacing 2000	Quantity:	Spacing 2500
Acacia sieberiana var. woodii	40		3		0-1	
Acacia Polycantha	40		1		0-1	
Albizia adiantifolia	40		2		0-1	
Trema orientalis	40		0-1		0-1	
Bridelia micrantha	40		5		0-1	
Antidesma venosum	0-1		2		0-1	
Celtis Africana	0-1		2		0-1	
Cussonia spicata	0-1		2		1	
Albizia versicolor	0-1		2		1	
Erithrina lyssistemom	0-1		2		2	
Kigelia Africana	0		0		1	
Parinari curatellifolia	0		1-2		1	
Pterocarpus angolensis	0		0-1		1	
Spathodea pacodea	0		0-1		3	
kaya Anthoteca	0		0-1		3	
Total	200		40		30	

Source: Vegetation of Lesotho, Swaziland and South Africa

Table 1: Site 3 Forest Rehabilitation Species Composition

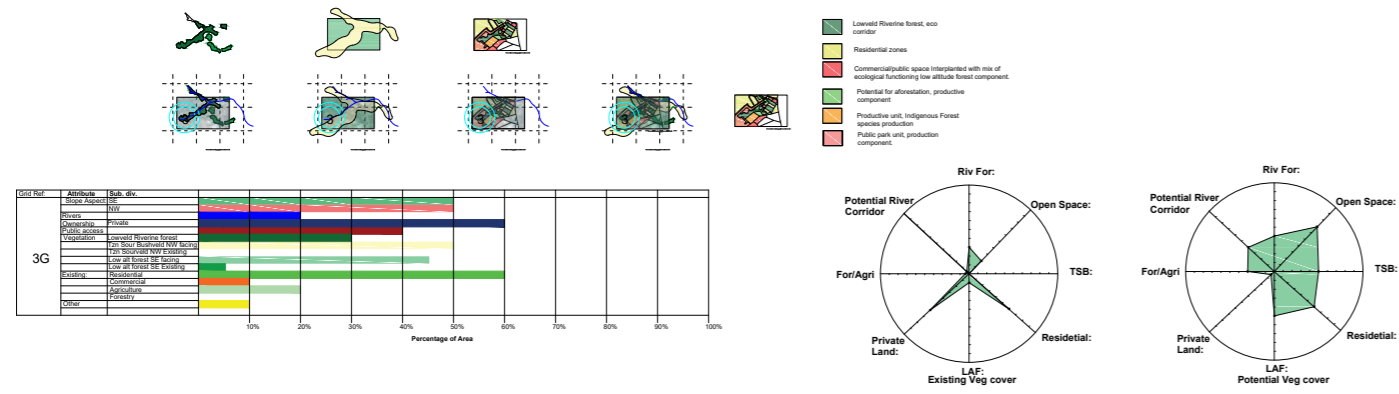


Fig. 36: Site 3: Forest Rehabilitation Scale 1: 1000 (A1)



Fig. 37: Site 3. Forest walk Through Existing Forest

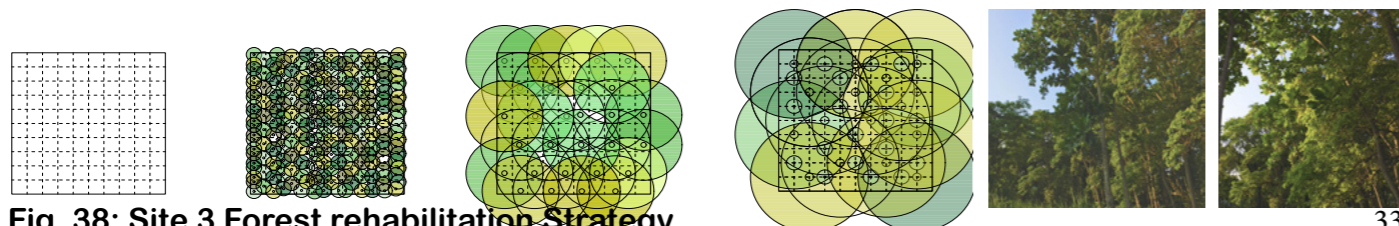


Fig. 38: Site 3 Forest rehabilitation Strategy

6. Site 4: Productive Component: Forestry

The final site is a site dedicated to forestry and timber production, as well as fruit or other tree associated tree crops. This site around a major highway intersection that has been excavated and extensively disturbed. Putting more exotic species there but to perform and fulfil specific project criteria is acceptable. Since the site has various levels of topography with an overpass trees can be seen from various levels from cars passing by. This is designed with a specific harvesting and planting regime, as well as species specificity in order to ensure an aesthetically enticing graphic as well as still maintaining a degree of ecological functionality once again filled by plants that fit in a similar ecological niche.

Maintenance:

The final and always present component of this thesis is the maintenance opportunity. Trees have to be maintained in all aspects pertaining to its existence in this intervention. From planting seedlings through to harvesting a mature tree. Specific to this is the pruning of trees for desired architectural qualities such as an arcade or the “clear-story” and “elevated ceiling” effect that is desired in some instances. The manipulation of canopies to achieve desired lighting effects... also the management of tree related waste to be used in composting plants and reintroduced throughout the landscape as compost and ameliorate soil.

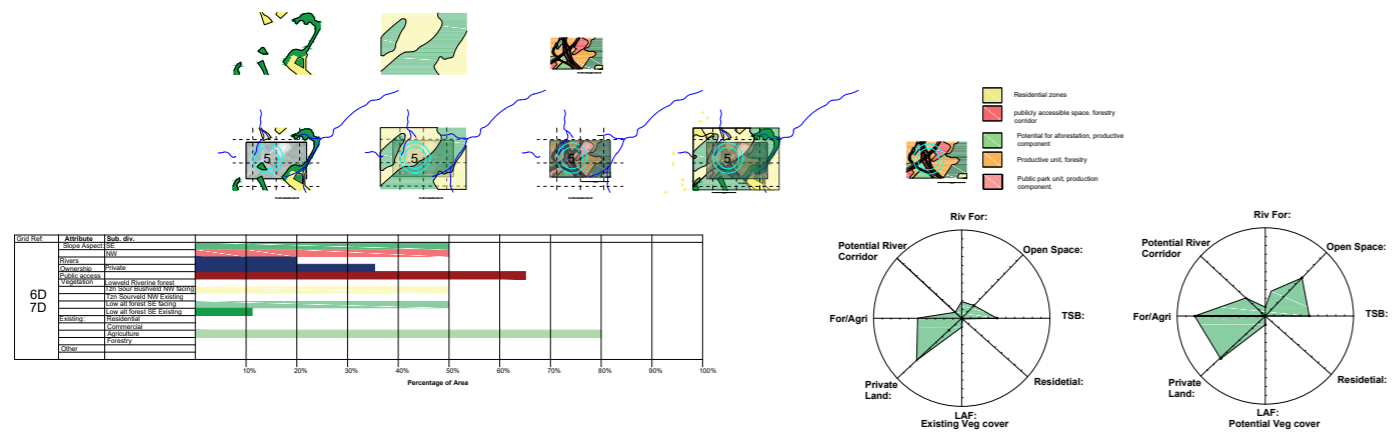


Fig. 39: Site 4: Forestry Scale 1:1500 (A1)



Fig. 40: Site 4 R71: "Linear Forest" 0-10 Years Site 4 R71: "Linear Forest" 50+ Years 35



Fig. 41: Site 4 R71: Road Reserve

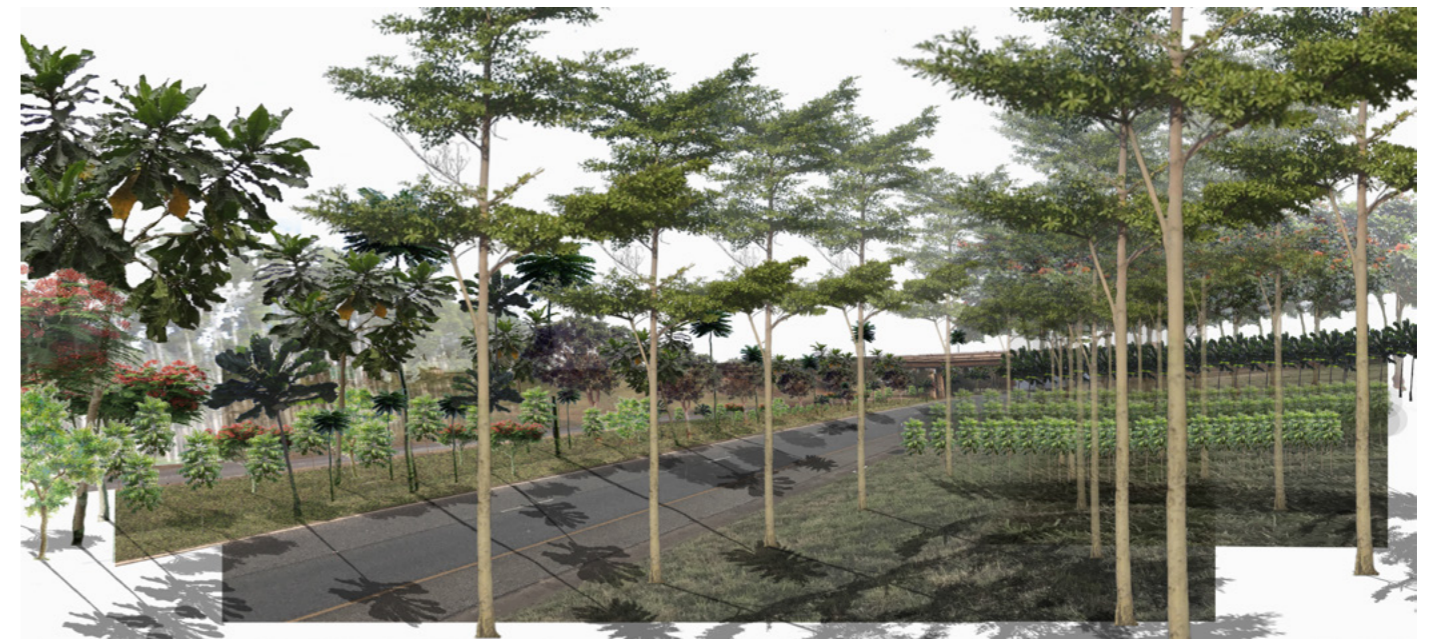


Fig. 41: Site 4 R71: Road Reserve Forestry 0-10 Years



Fig. 41: Site 4: Road Reserve Forestry 50+ Years



Fig. 42: Site 4 R71: Road Reserve



Fig. 42: Site 4 R71: Road Reserve Forestry 0-10 Years



Fig. 42: Site 4: Road Reserve Forestry 50+ Years



Fig. 43: Site 4 R71: Section F-F

7. Conclusion:

Through my research and thinking pertaining to the subject of the urban arboretum, through the application of the process I like to refer to as the “Architecture of the Forest” I feel that it is definitely a feasible process and most definitely sustainable.

It is time dependent and needs to be actively managed, and over which time it has the potential to create many jobs over a large study area if applied to multiple towns.

The study of the area, site conditions, climate and especially micro climates, tree planting combinations and tree planting requirements are imperative. If the wrong tree species are used for the wrong conditions the self sustainability of such a project will never be achievable.

This might be perceived as a major constraint, but can be turned into an opportunity because it creates employment opportunities throughout the employment spectrum, from professionals (detailed studies, and design and planning) right through to maintenance and installation personnel

8. References:

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APPLICATION

Please Note:

Any person planning to undertake research in the Faculty of Engineering at Cape Town is required to complete this form **before** collecting application *prior* to embarking on research is to ensure that the auspices of the EBE Faculty, are met. Please ensure that you have read the **Handbook** (available from the UCT EBE, Research Ethics website at <http://www.ebe.uct.ac.za/ebe/research/ethics1>)

at the University of Cape Town, conducted under the auspices of the **Ethics in Research** committee. Please complete this application form:

APPLICANT'S DETAILS		
Name of principal researcher, student or external applicant	David Griesel	
Department	Architecture	
Preferred email address of applicant:	david.griesel20@gm	
If Student	Your Degree: e.g., MSc, PhD, etc.	Masters of Landscap
	Credit Value of Research: e.g., 60/120/180/360 etc.	120
	Name of Supervisor (if supervised):	Clinton Hindes
If this is a research contract, indicate the source of funding/sponsorship	Click here to enter text.	
Project Title	The Urban Arboretum	

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 the research will not compromise staff or students or the other
- the stated objective will be achieved, and the findings will have been verified by independent parties
- limitations and alternative interpretations will be considered; and
- the findings could be subject to peer review and publicly available
- I will comply with the conventions of copyright and avoid any

arism.

SIGNED BY	Full name
Principal Researcher/ Student/External applicant	David Lambertus Griesel
APPLICATION APPROVED BY	
Supervisor (where applicable)	Full name CLINTON HINDES Click here to enter text.
HOD (or delegated nominee) 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.
Chair : Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the above questions.	

Date
Sep 2017
Date 14/09/17 Click here to enter a date.
Click here to enter a date.

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Harvard convention for citation and referencing. Each contribution to, and quotation in, from the work(s) of other people has been attributed, and has been cited and referenced.
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ed, and will not allow, anyone to copy my work with the intention of passing it off as his or
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