AMERICAN UNIVERSITY OF BEIRUT

UNDERGRADUATE CAPSTONE PROJECT
IN
LANDSCAPE ARCHITECTURE

SUBMITTAL FORM

Ain Dara's Hidden Potential: The Quarry Park

by

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LDEM 242- ADVANCED DESIGN
SPRING 2019-2020
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Approved by Project Coordinator:

[Signature]

Maria Gabriella Trovato, Assistant Professor
Department of Landscape Design and Ecosystem Management

Date of project presentation: **May, 10, 2020**

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AIN DARA›S HIDDEN POTENTIAL:

THE QUARRY PARK

ACKNOWLEDGEMENTS:

I would like to express my sincere gratitude towards several individuals, along with the municipality of Ain Dara, for supporting me throughout this capstone project.
I wish to express my thanks towards my professors: Maria Gabriella Trovato, Balsam Al Ariss and Mona Khechen for their constant enthusiasm, patience, advice and constant availability, all of which helped me tremendously at times of need during both my research and design phases. I believe that thanks to their continuous support I was able to complete my project successfully.

Through this capstone project I believe I was able to use information acquired from previous LDEM courses, as well as learn new information from inidvidual research conducted.

Although it has been a tough year for us all, I like to believe that I made the most of my time at home improving my project both graphically and theoretically and would like to see this capstone project as a challenge I overcame.

INTRODUCTION:

While quarries serve an indispensable contribution to construction materials, the post-life of a quarry is nothing but a deserted and exposed "landscape at risk".
Quarries have the potential to cause alterations, decay, depletion or loss of both material and immaterial assets that characterize landscapes. Not only do they abruptly interrupt the continuity of habitats, cause soil erosion, air pollution and deterioration in water quality, but they also take a toll on people's overall health. Although quarries are needed for construction materials, they are landscapes at risk and therefore must be regulated in order to reduce their negative impacts on the environment.
While quarrying can be performed in a sustainable way, a vast majority of Lebanon's quarries are illegal, unregulated and rapidly destroying Lebanon's signature mountains. Most quarries existent today are located on sites that conflict with both the National Master Plan for Quarries and Stone Crushing Sites and with the recommendations of the National Physical Master Plan of the Lebanese Territory (NPMPLT), according to Public Works Studio. If no action is taken soon in order to regulate the current situation, landscapes will begin to disappear at an alarming rate.
The Case of Ain Dara:
Despite being located within the Shouf Biosphere Reserve's buffer zone, the illegal quarrying activity has been affecting the village of Ain Dara since the end of the civil war. Starting from 2009, these quarries (16 out of 17 of them) have been shutting down, however have left the village to deal with significant ecological damage, an overall change in its landscape character and identity, and have been putting locals' health in danger, leading to countless locally-led protests.

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CHAPTER TITLES:

Phase I:

Selection of the site of intervention

Phase II: Site Inventory

Inventory of the selected site components: Historical, Physical, Environmental, Geomorphological, Legal/Political

Phase III: Individual research development- Design Narrative

Individual research development on the topic of the course (Landscapes at Risk)

Phase IV: Design Analysis

Analysis of site components related to the design narrative (Hydrology, Soil, Geology, Vegetation)

Phase V: Design

Production of visuals to support the proposal

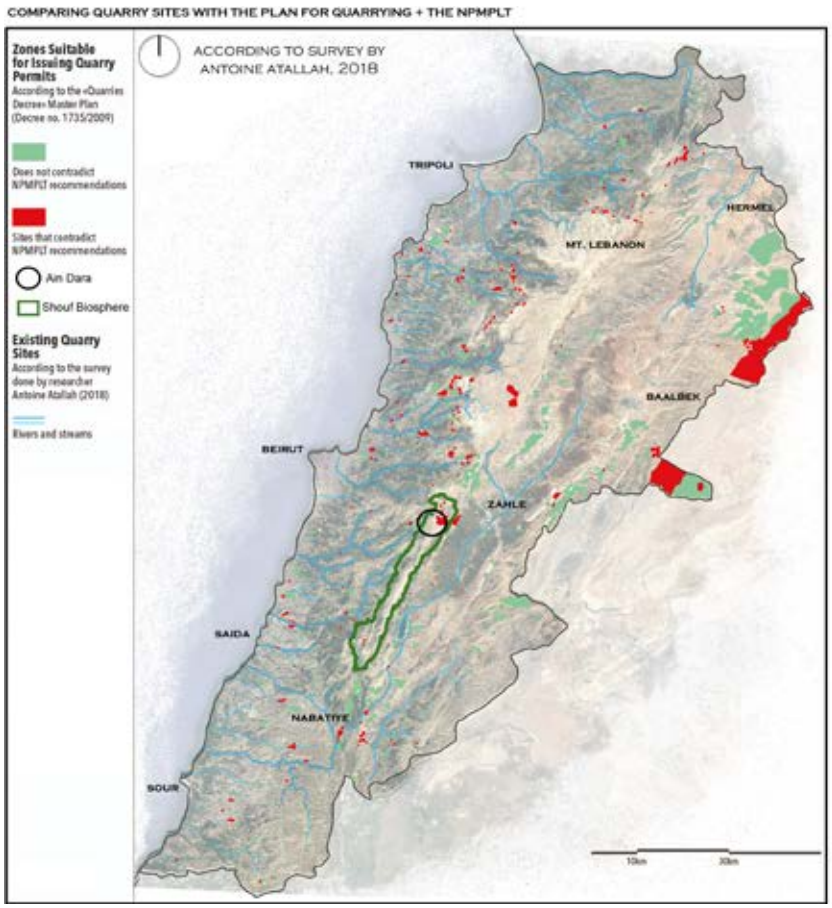
01- Project Statement:

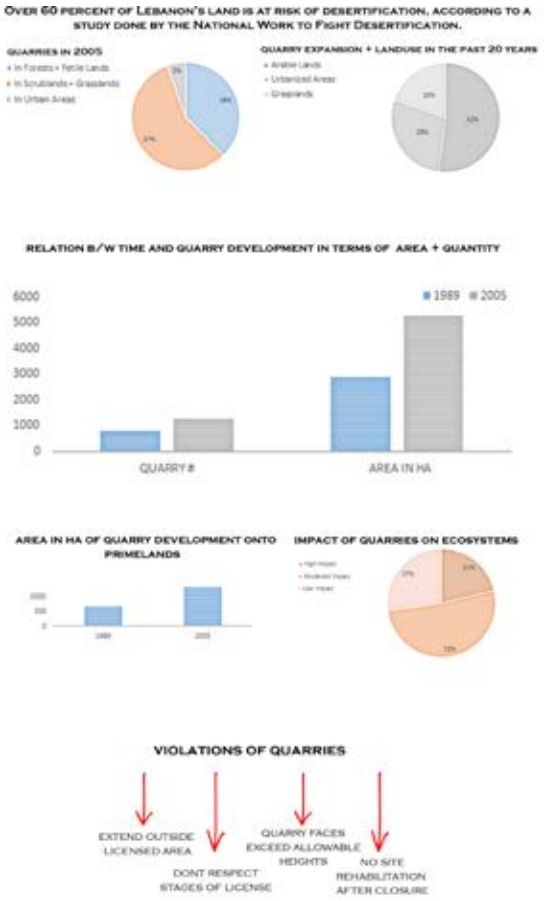
While quarrying can be performed in a sustainable way, a vast majority of Lebanon's quarries are illegal, unregulated and rapidly destroying Lebanon's signature mountains. Ain Dara is situated in the Chouf region, at approximately 30km from Beirut. Despite being located on the SBR buffer zone, the quarrying activity has been affecting the village since the end of the civil war. Starting from 2009, the quarries have been shutting down, leaving the village to deal with significant ecological damage and an overall change in its landscape character and identity.

The Quarry Park is a design proposal which emphasizes the necessity of a landscape intervention that aims at proposing scenarios of rehabilitation process within a landscape ecological context through the introduction of both water management and vegetation techniques.

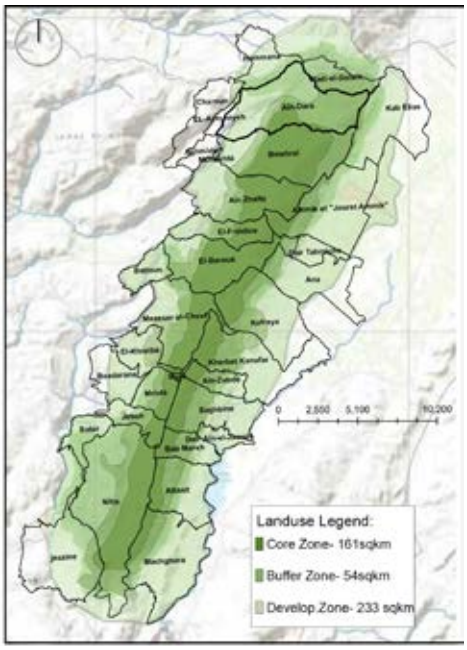
02- Issue: Quarrying Situation in Lebanon

With Landscapes At Risk being the theme of the semester, I found that although quarries are needed for construction materials, they indeed are landscapes at risk and must be intervened on in order to regulate their negative effects on the environment, especially in Lebanon.
A vast majority of Lebanon's quarries are illegal, unregulated and rapidly destroying Lebanon's signature mountains. Most quarries existent today are located on sites that conflict with both the National Master Plan for Quarries and Stone Crushing Sites and with the recommendations of the National Physical Master Plan of the Lebanese Territory (NPMPLT), according to Public Works Studio. If no action is taken soon in order to regulate the current situation, landscapes will begin to disappear at an alarming rate.





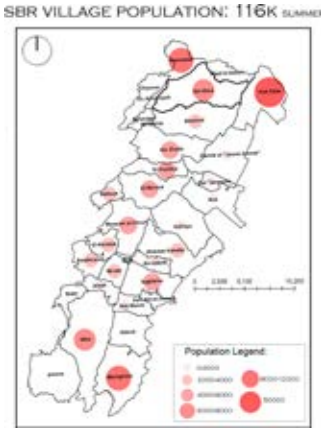
Shouf Biosphere Reserve Context:



Provides for longterm protection of the ecosystems, plant and animal species found there. must be large enough to ensure the preservation of there elements and may even constitute the reserve as a whole. also consists of exosystems evolving without intervention of human activities

Adjacent to or surrounding the core area, thus contributing directly to its preservation. only activities causing little disruption are allowed in this zone. These include research aimed at developing techniques for the use of the natural resources that respect the areas biodiversity

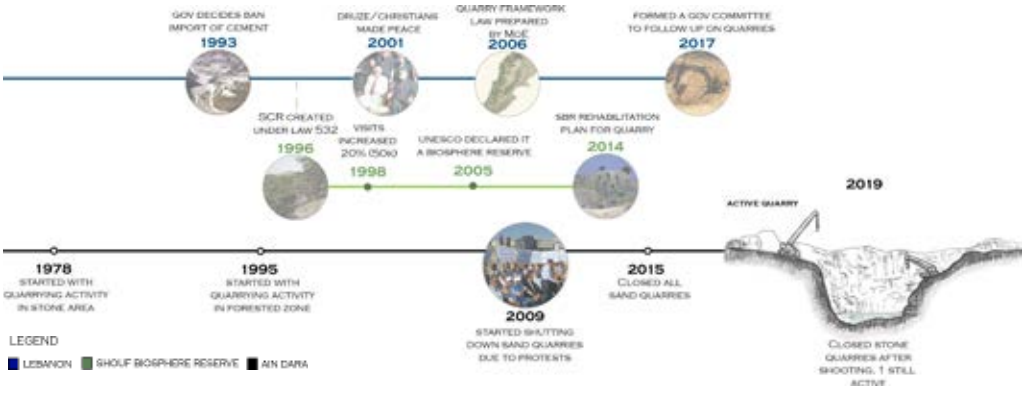
This zone includes human activities, villages and towns. The economic and social activities that are intended to provide sustrainable development for the benefit of the population will normally be sitted here



03- Inventory/Site Situation

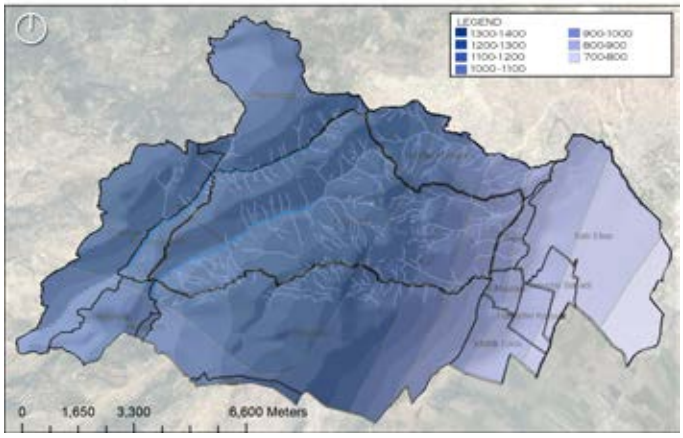
During the inventory phase, elements that were taken into consideration were mainly the historical, physical, legal and environmental aspects, both within ain dara itself or around it. from this phase it was understood that 2 important ecological hubs are accessible from ain dara: the shouf biosphere reserve + the ammiq wetlands

It was also understood that the size of quarries have more than doubled over the last 10 years, proving problematic to the overall ecological system of the area

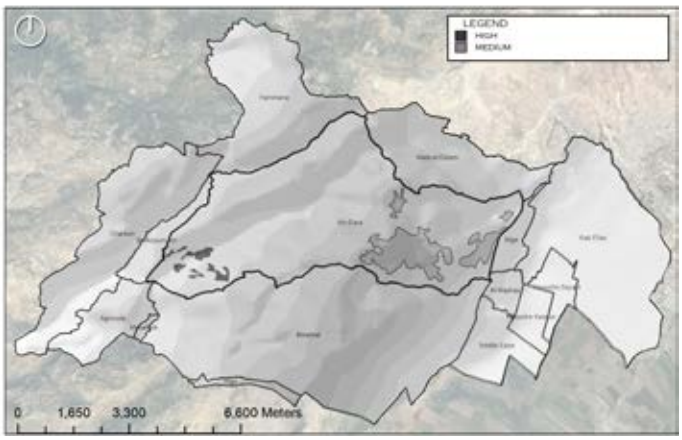


NEARBY ECOLOGICAL ATTRACTIONS

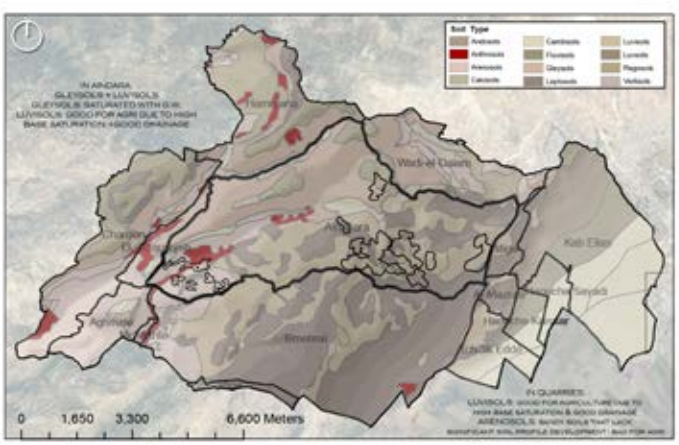
HYDROLOGY MAP



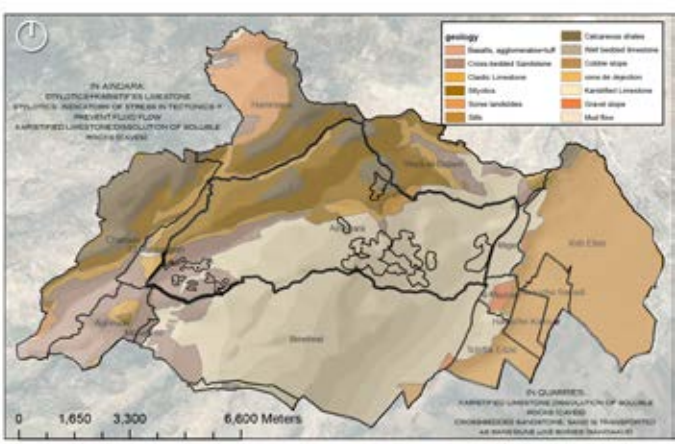
IMPACT OF QUARRIES ON ECOSYSTEMS



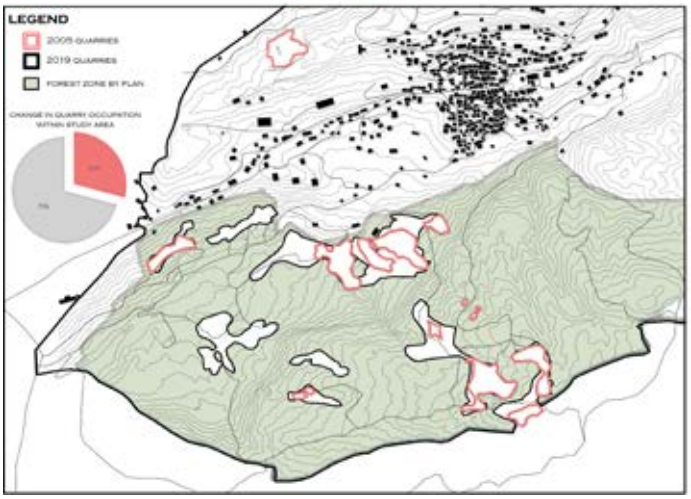
SOILS MAP



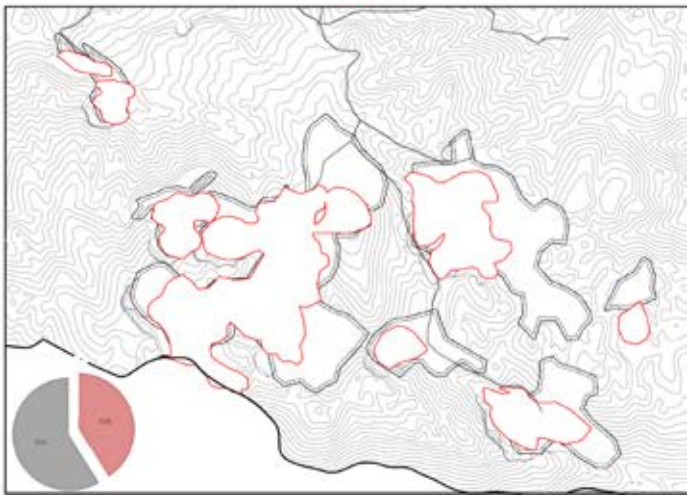
GEOLOGY MAP



SAND QUARRY EVOLUTION FROM 2005-2016 (ILLEGAL)

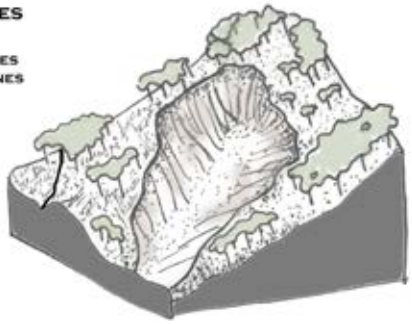


STONE QUARRY EVOLUTION FROM 2005-2016 (ILLEGAL)



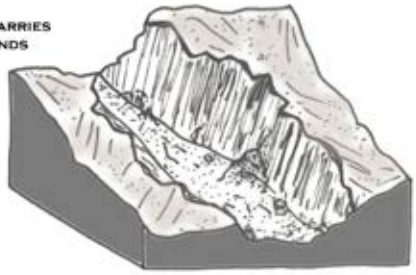
TYPOLOGY 1: SAND QUARRIES

LANDSCAPE BLOCK- SAND QUARRIES
POSITIONED WITHIN FORESTED ZONES

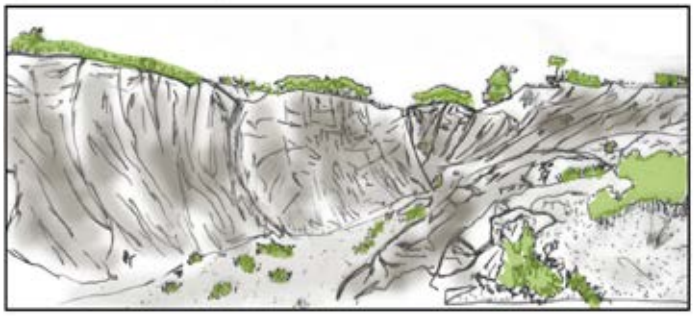


TYPOLOGY 2: STONE QUARRIES

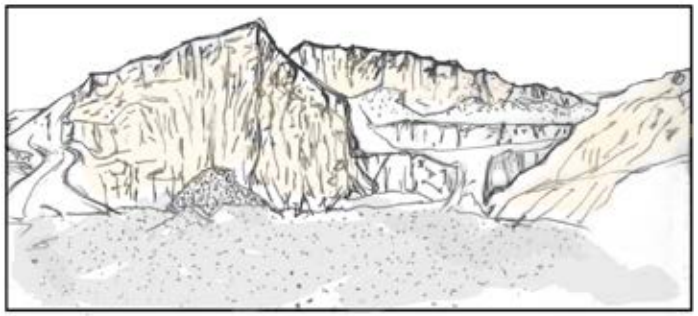
LANDSCAPE BLOCK- STONE QUARRIES
POSITIONED ON BARREN LANDS



QUALITY OF SAND QUARRY AREAS



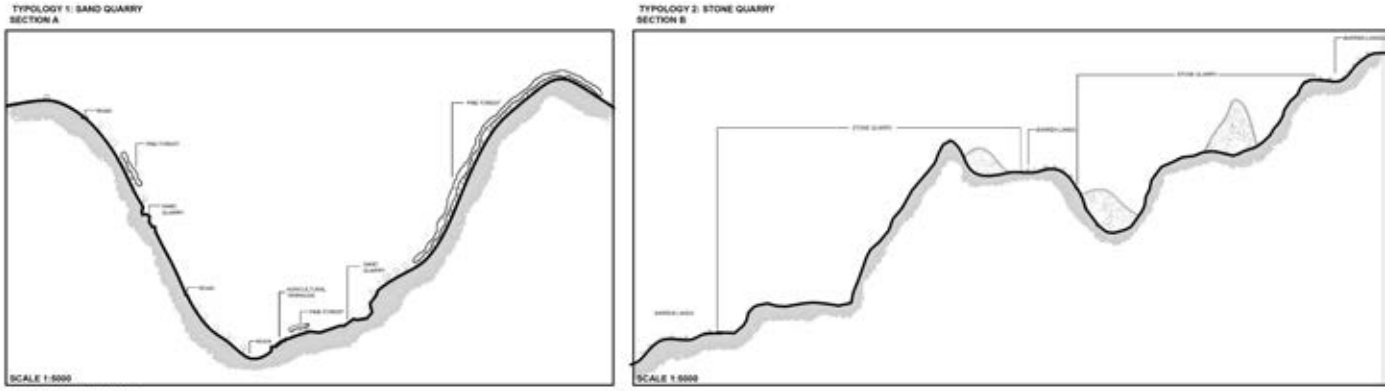
QUALITY OF STONE QUARRY AREAS



Inspiration elicited from the site itself: constructed ponds

Large Scale Base Map

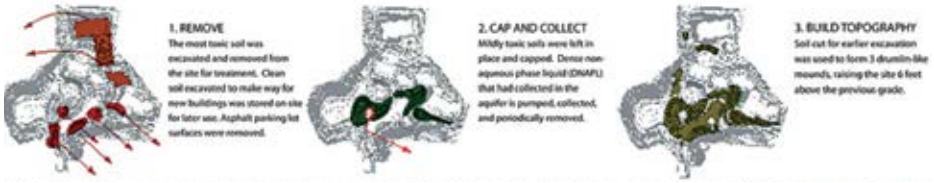
Overall schematic sections



04- Case Studies

This phase consisted of looking for case studies similar to my site in that they were ecologically damaging the area around them. Brownfields were taken as case studies in order to study how these ecologically degraded lands can be worked with and rehabilitated

LANDSCAPE ARCHITECTURE: MICHAEL VAN VALKENBURGH ASSOCIATES, INC
LOCATION: WELLESLEY, MASSACHUSETTS
AREA: 13.5 ACRES
COMPLETE: 2006
OWNER/CLIENT: WELLESLEY COLLEGE
THIS PROJECT WON ASLA HONOR AWARD 2006



SITE

THE ALUMNAE VALLEY LANDSCAPE REPRESENTS REWORKING OF 13.5 ACRES OF A CAMPUS OVER A 7 YR PERIOD
RESTORATION HAS A HISTORY OF CONTAMINATION WAS A PHYSICAL PLANT AND OVER TIME A PARKING LOT OVER A TOXIC BROWNFIELD

RESULTS IN A NEW ECOLOGICALLY FUNCTIONING LANDSCAPE STRUCTURED BY A REMEDIAL PURIFICATION SYSTEM

THE RESTORED VALLEY IS A VISUAL AND PHYSICAL LINK BETWEEN THE WANG CAMPUS CENTER AND LAKE WABAN

RECONNECTING SYSTEMS USING TOPO AND HYDRO TO TREAT SURFACE WATER THROUGH ECOLOGICAL RESOTRATION TECHNIQUES AND HYDROLOGICAL DESIGN

LANDSCAPE ARCHITECTURE: DESIGN WORKSHOP, INC
LOCATION: ROCKY MOUNTAINS, CO, USA
AREA: 20 HA
COMPLETE: 2015
OWNER/CLIENT: STADT DUISBURG/ LANDESENTWICKLUNGSGESELLSCHAFT NRW
THIS PROJECT WON ASLA HONOR AWARD 2012

A COMPLEX/DYNAMIC NATURAL ECOSYSTEM, WAS A VIRTUAL WASTELAND FOR ALMOST A CENTURY. ITS NATURAL RESOURCES HARVESTED AND MINED FOR USE IN BUILDING THE INFRA OF THE CITY

RECONNECT CRITICAL WILDLIFE CORRIDORS IMPROVE REGIONAL WATERSHED QUALITY AND ENCOURAGE RECREATIONAL OPPORTUNITIES

RESTORATION INCLUDED MINOR GRADING AIMED AT NATURALIZING LANDFORMS THAT HAD BEEN IRREGULARLY SHAPED BY MINING PROCESSES

SOIL ENHANCEMENT, LAND CONTOURING + NATIVE VEGETATION RESTORATION AT A MACRO-SCALE

STRATEGY:
TO CREATE TRANSITION B/W NEW AND OLD LANDS THEY IDENTIFIED EXISTING DRAINAGE PATTERNS + PLANTS ON ADJACENT PROPERTIES THEN EXTENDED, RESTORED OR RECREATED THEM

SITE

HEALTHFUL LIVING BY RECONNECTING RESIDENTS AND VISITORS TO THE ESSENTIALS OF: FEEDING THE BODY, MIND AND SPIRIT FROM THE LAND

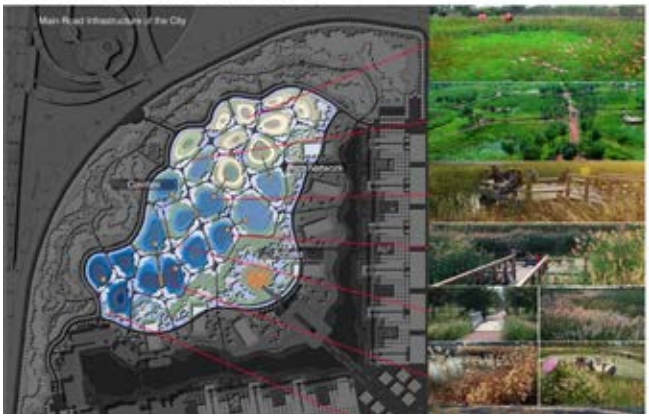
ANALYSIS OF NEARBY VEGETATION COMMUNITIES

TRAILS SHOWCASING DIFFERENT LANDSCAPE NARRATIVES

LANDSCAPE ARCHITECTURE: TURENSCAPE· BEIJNG TUREN DESIGN INSTITUTE
LOCATION: TIANJIN CITY, CHINA
AREA: 22HA
DESIGN: OCTOBER 2005 – MAY 2008
COMPLETE: 2008
OWNER/CLIENT: ENVIRONMENT CONSTRUCTION AND INVESTMENT CO., LTD TIANJIN CITY TIANJIN QIAOYUAN, CHINA - 2008
TURENSCAPE LANDSCAPE ARCHITECTURE

SITE

A GOOD EXAMPLE FOR THE REUSE OF A CONTAMINATED DERELICT URBAN SITE BY CLEANING UP WITH A SYSTEM OF DRY AND WET PONDS AND A VARIETY OF DIFFERENT PLANT SPECIES AND VEGETATION WHICH CONTROL THE PH-BALANCE TO CLEAN THE SOIL AND WATER BODIES



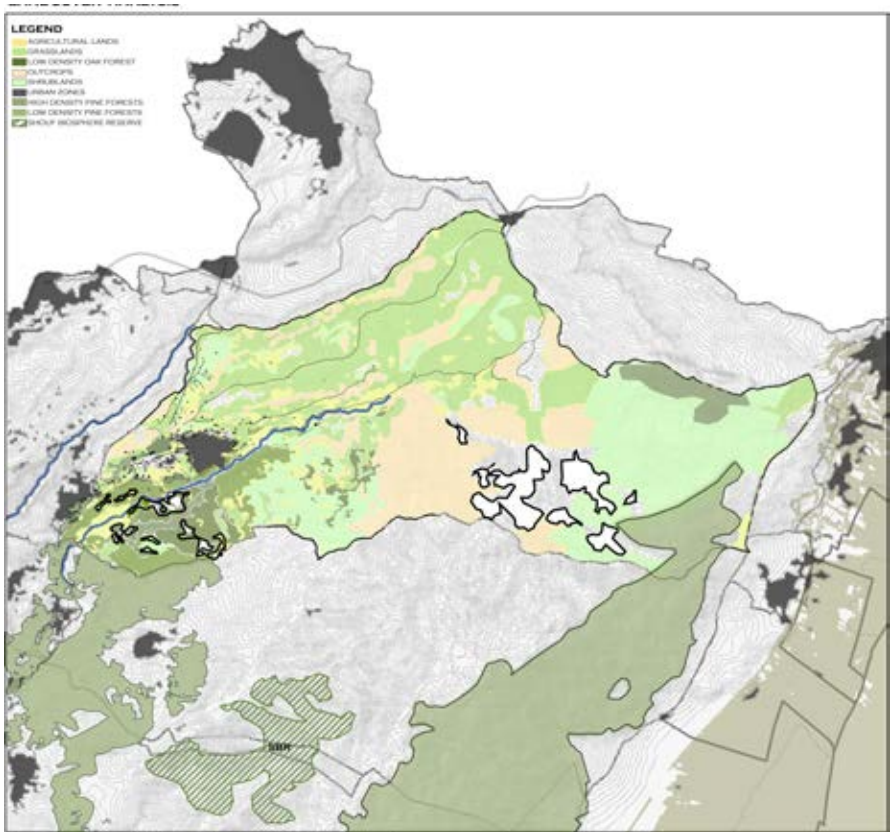
SITE WAS HEAVY POLLUTED + LITTERED + DESERTED +SURROUNDED WITH SLUMS +TEMPORARY RICKETY STRUCTURES

THROUGH REGENERATIVE DESIGN + BY CHANGING LANDFORMS, THE NATURAL PROCESS OF PLANT ADAPTATION +COMMUNITY EVOLUTION IS INTRODUCED TO TRANSFORM A FORMER DESERTED SHOOTING RANGE USED AS A GARBAGE DUMP, INTO A LOW MAINTENANCE URBAN PARK; PROVIDING DIVERSE SERVICES FOR THE CITY INCLUDING CONTAINING +PURIFYING, S.W +IMPROVING THE SALINE/ALKALI SOIL PROVIDING OPPORTUNITIES FOR ENVIRONMENTAL EDUCATION +CREATING A CHERISHED AESTHETIC EXPERIENCE

05- Analysis Phase

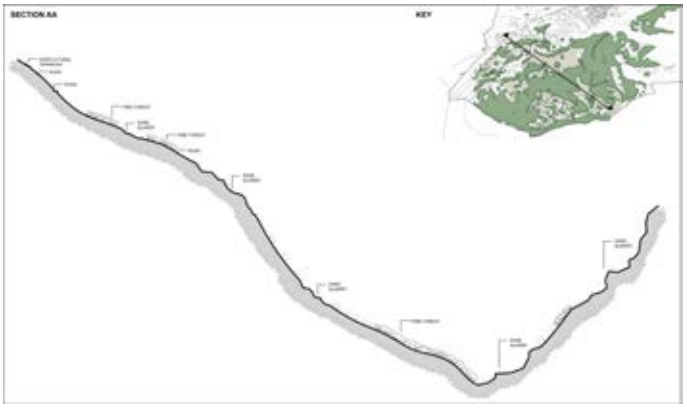
During this analysis phase, elements that were taken into consideration were mainly the ecological and touristic aspects, elements that i will be basing my design on in the future. From this phase it was understood that the biosphere reserve is physically connected to ain dara ecologically and infrastructurally. It was also noted that after typologizing the quarries, it was clear sand quarries were doing more damage to the ecology of ain dara than stone quarries due to their positioning within a pine forest

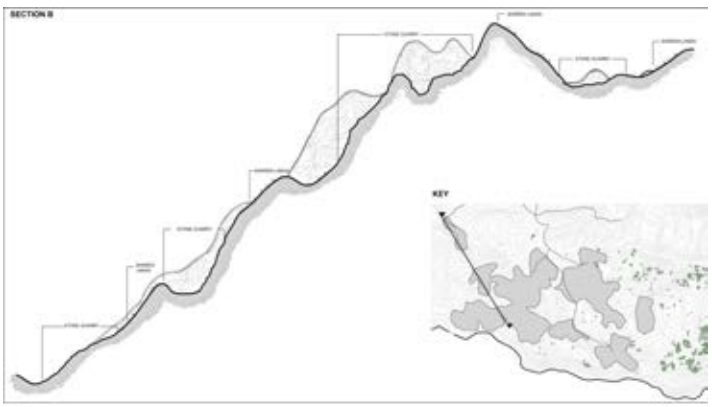
Overall Landcover



Succession in sand quarries

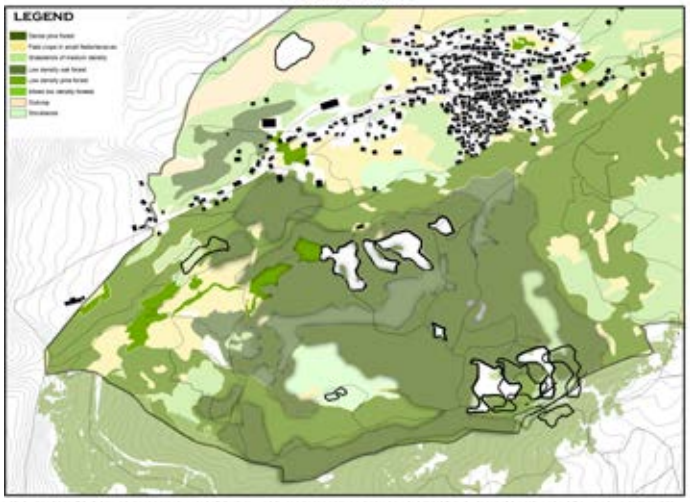
Barren lands in stone quarries

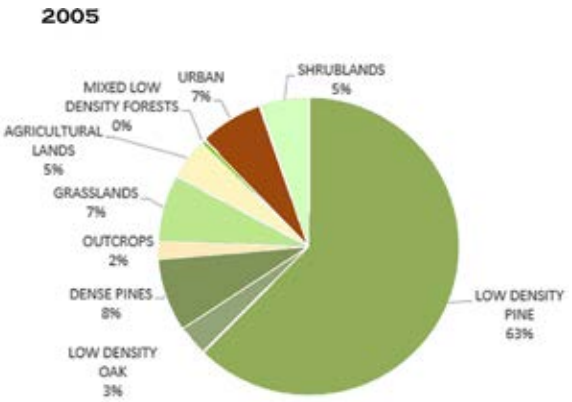




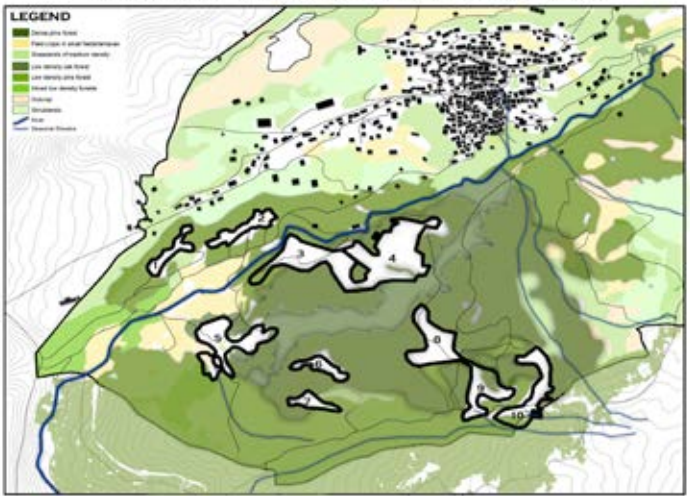
Landcover Situation in Sand Quarries

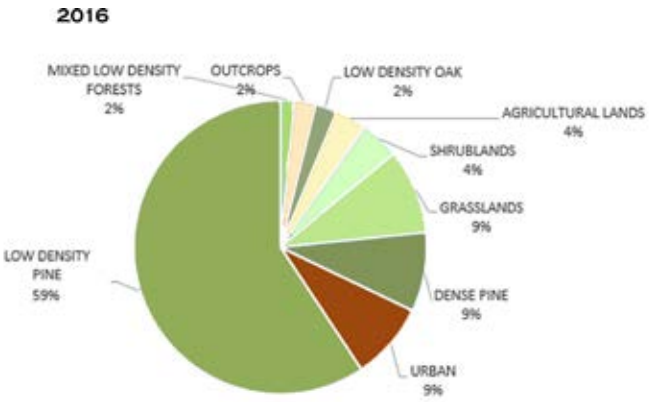
QUARRYING ACTIVITIES OCCURING IN CLOSE PROXIMITY TO URBAN CORE & WITHIN THE FORESTED ZONE

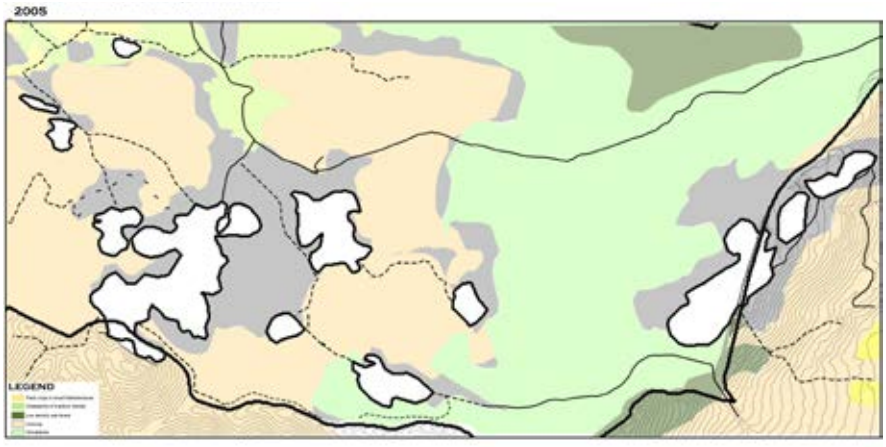


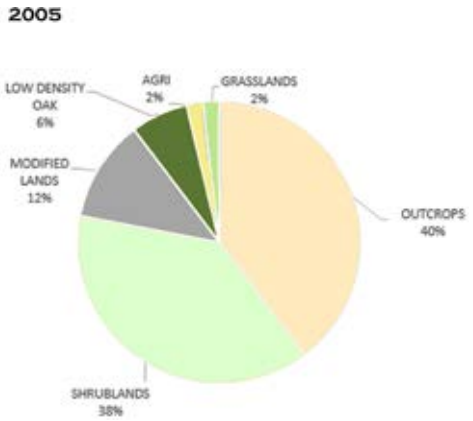


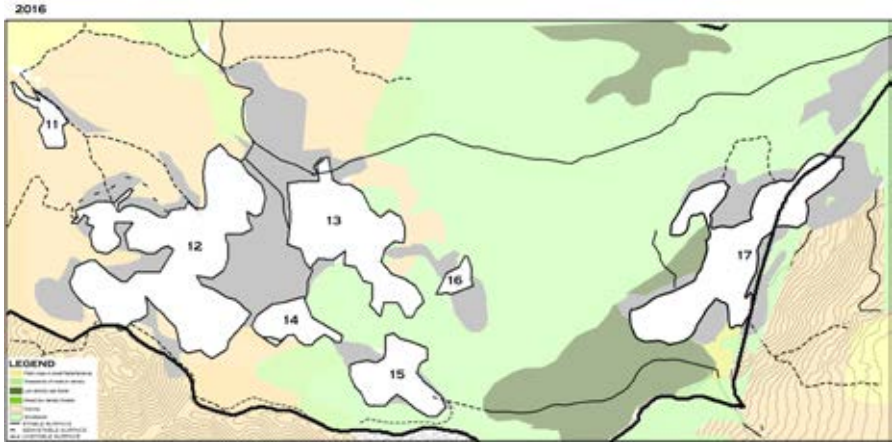
QUARRYING ACTIVITIES HERE HAVE STOPPED FULLY IN 2015,LEAVING THE QUARRIES AS EMPTY SPACES TODAY, RUINING THE OVERALL AESTHETIC OF THE AREA

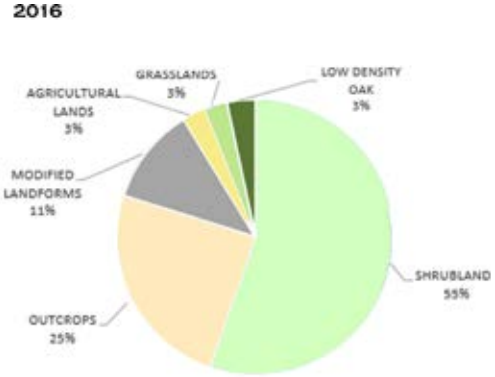




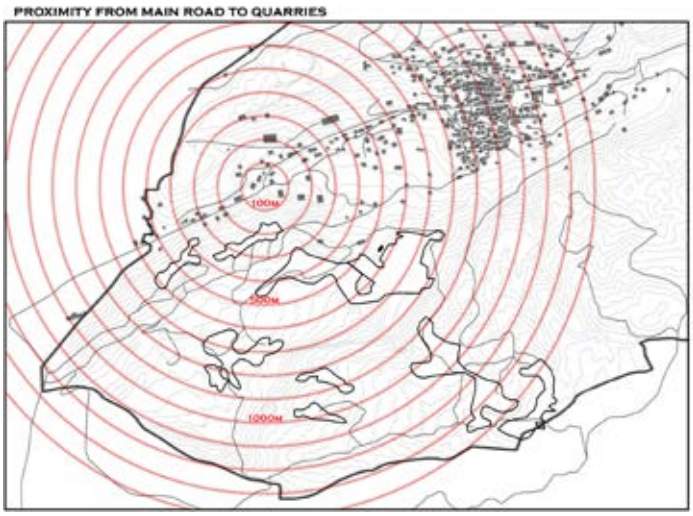


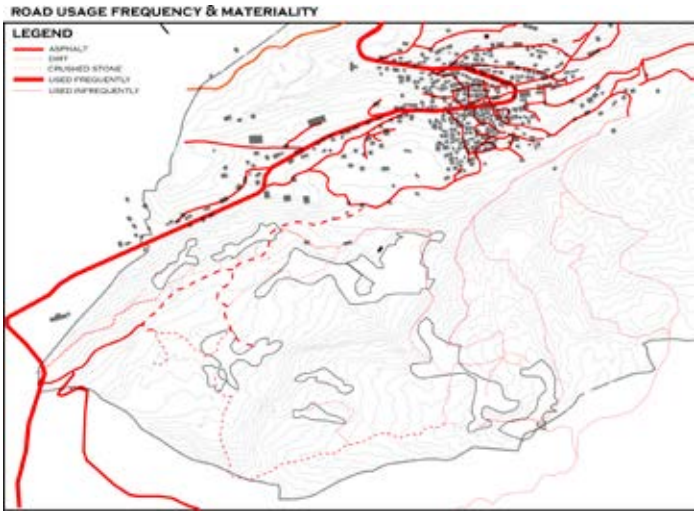


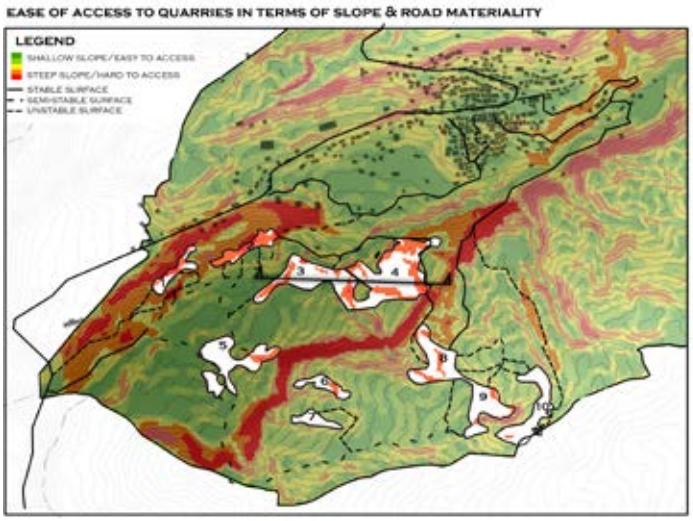


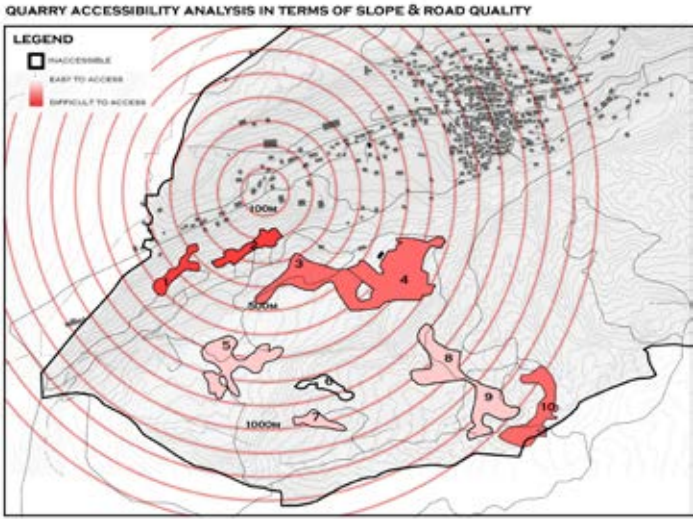


Sand Quarries:

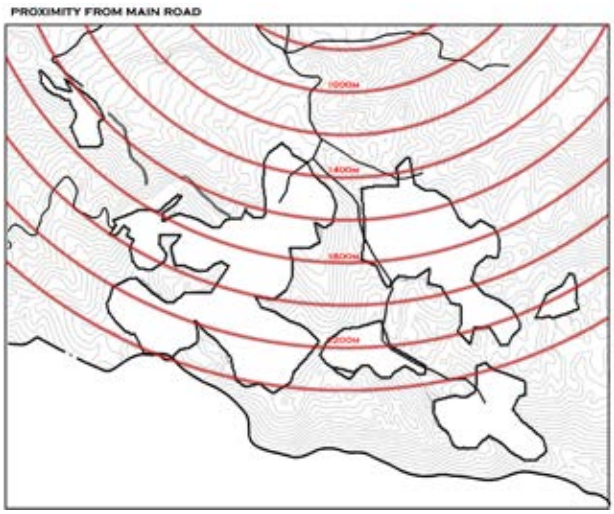


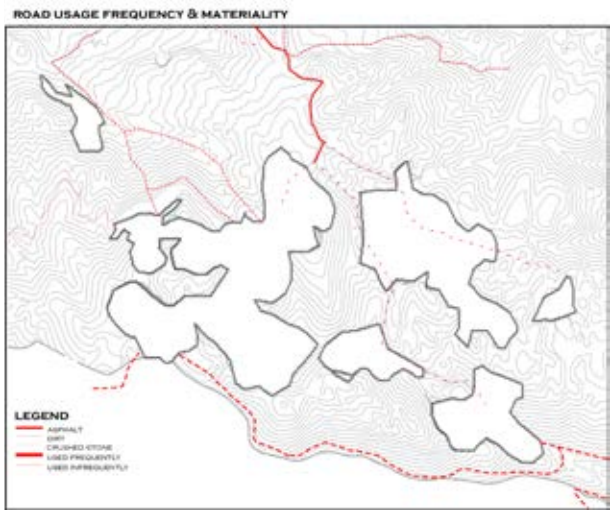






Stone Quarries:

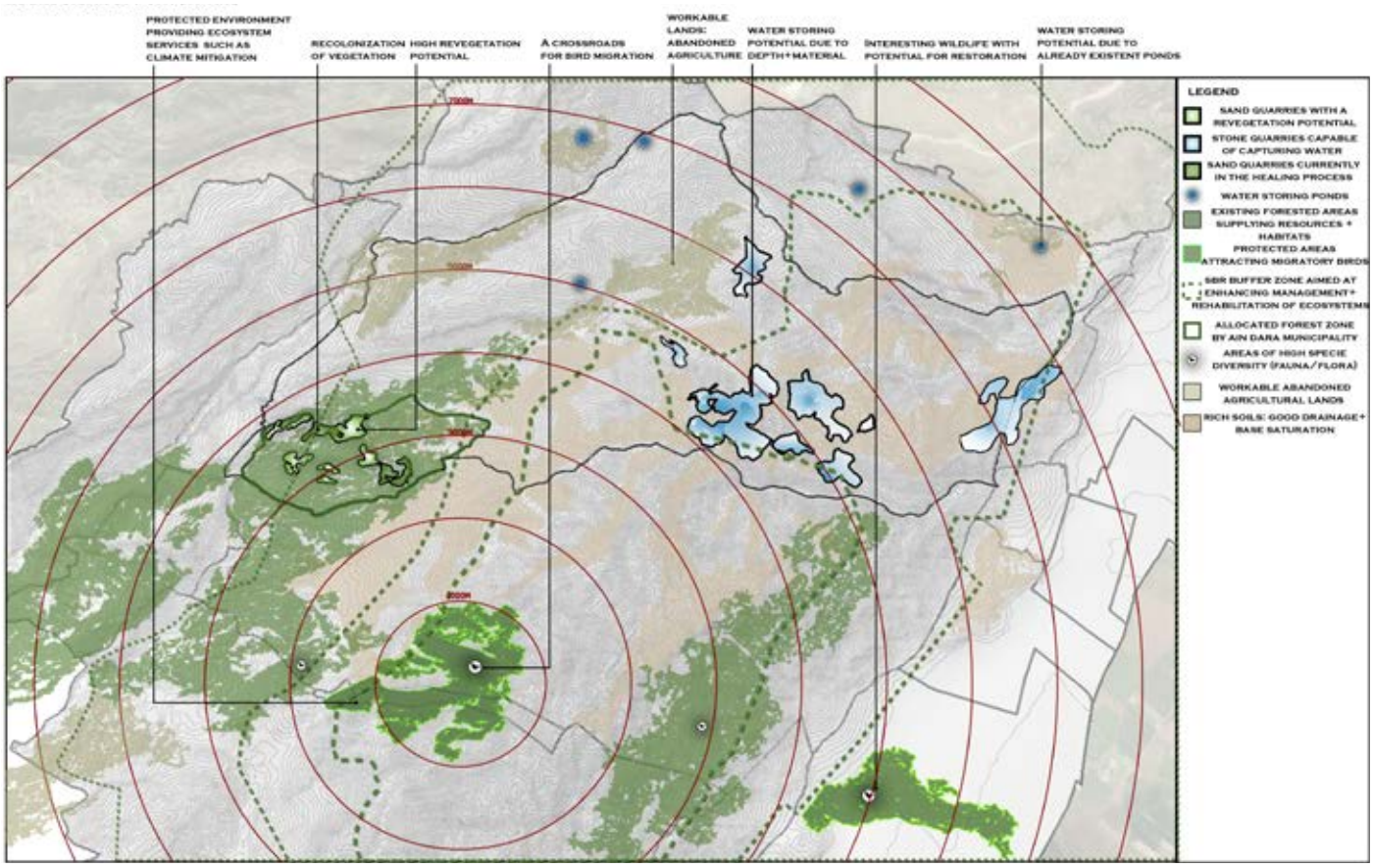




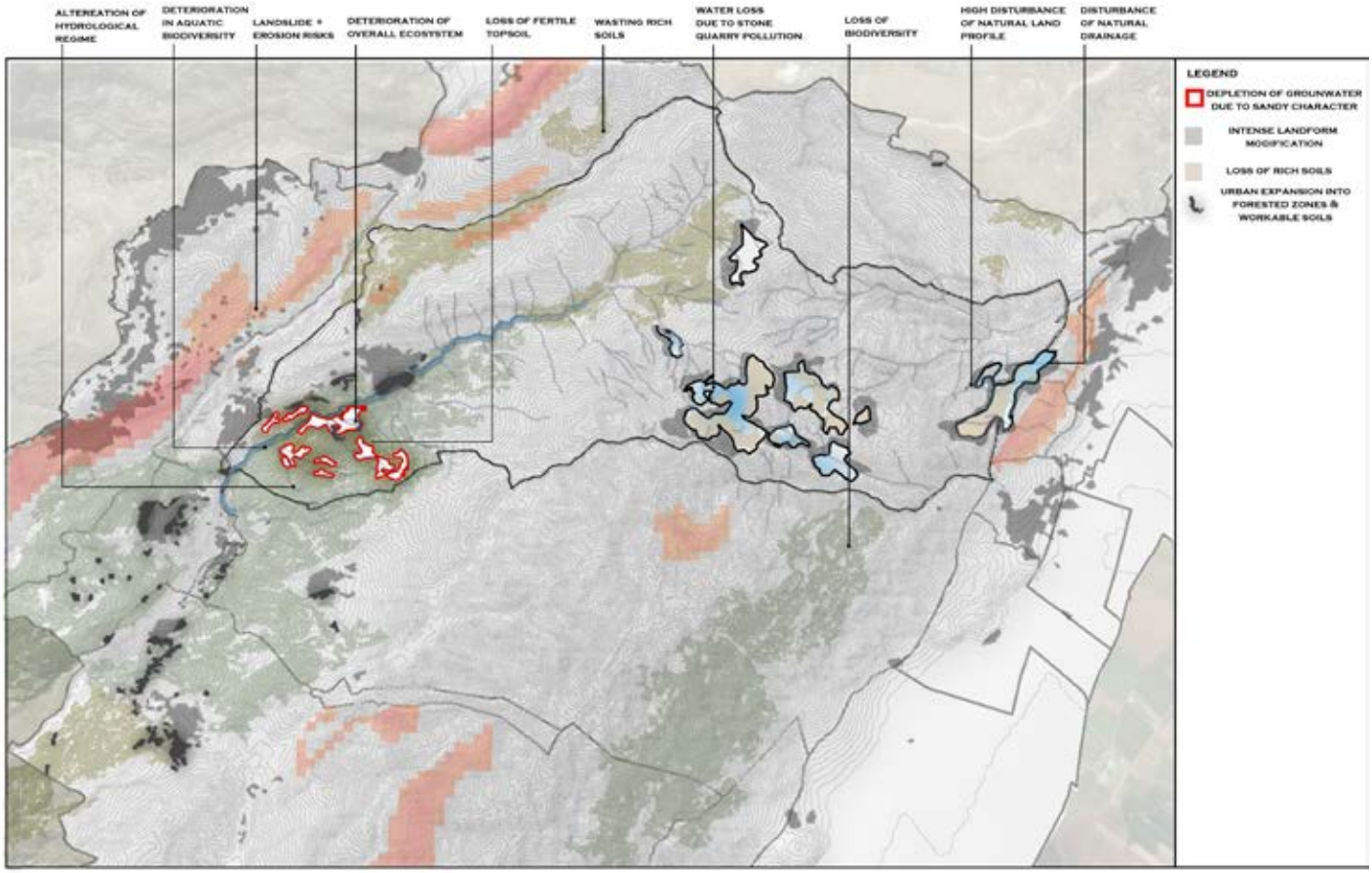
After realizing the differences in the accessibility and ecology of each quarry, constraints and oppportunities maps were produced in order to look at challenges and potentials of the area

06- Conclusions

Ecological Opportunities



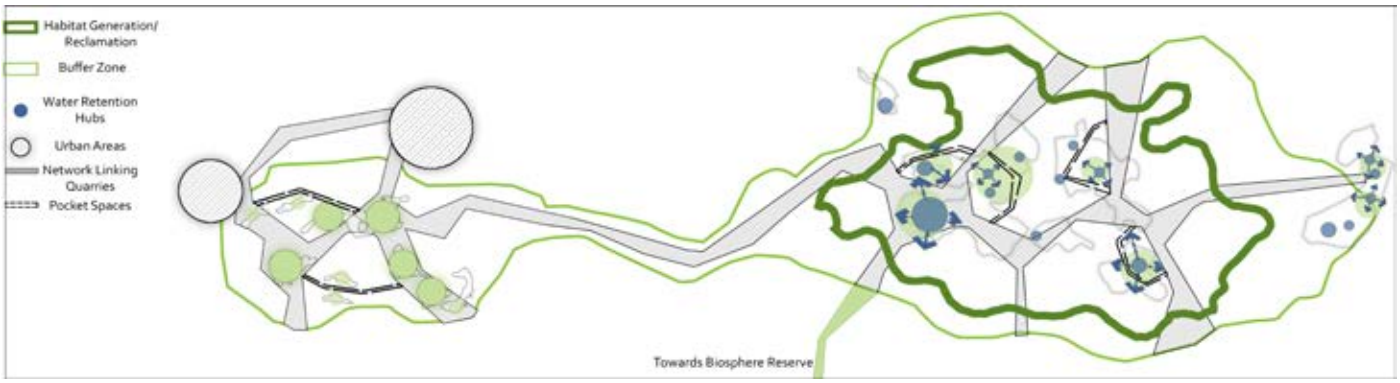
Ecological Constraints



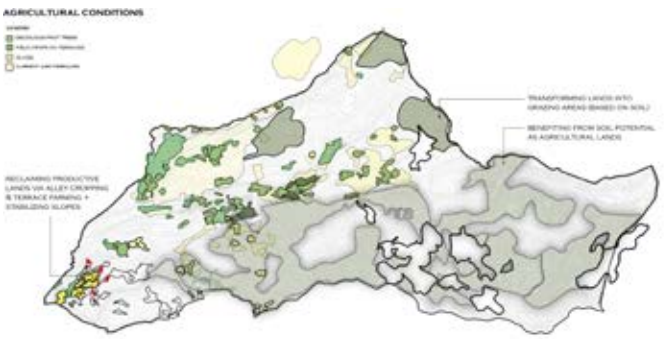
07- Vision & Concept

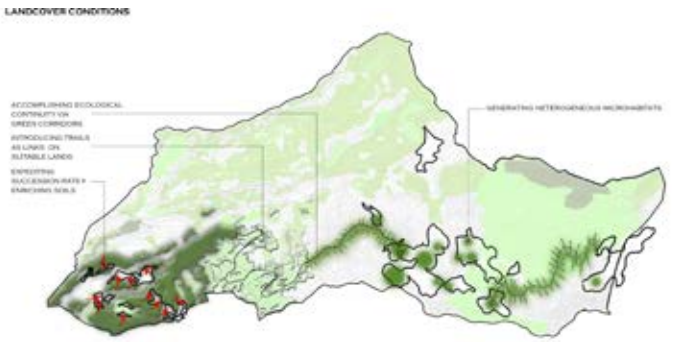
Project Statement: In response to the intensity of human induced disturbances that we are beginnning to see in the shouf biosphere reserve in the form of reckless quarrying activity, this project aims to create heterogeneous microhabitats through the introduction of water management and vegetation techniques both within as well as around the quarries, triggering a re-interpretation of ain dara's overall character

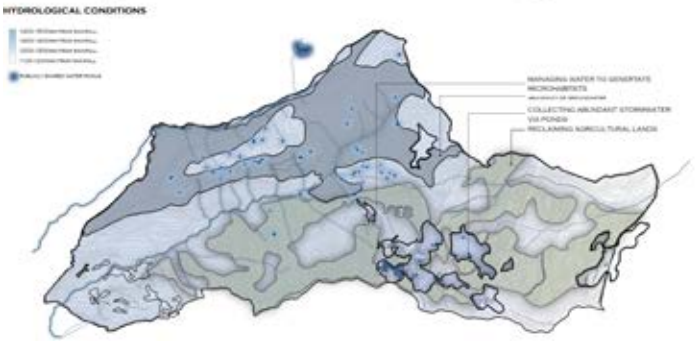
Concept: Creating a system of micro-ecological hubs in Ain Dara, connecting the village not only to the Shouf Biosphere Reserve context but also introducing it to the social, economic, touristic and ecological benefits/characters of the region

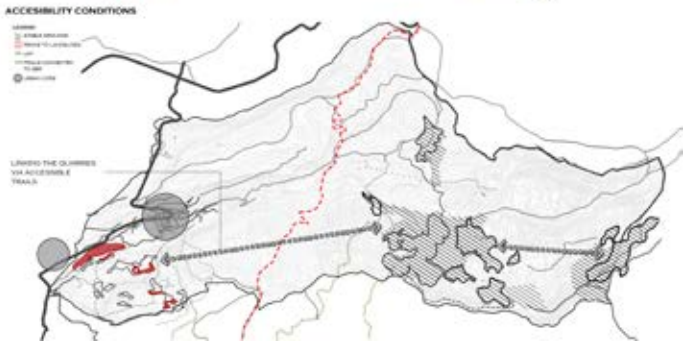


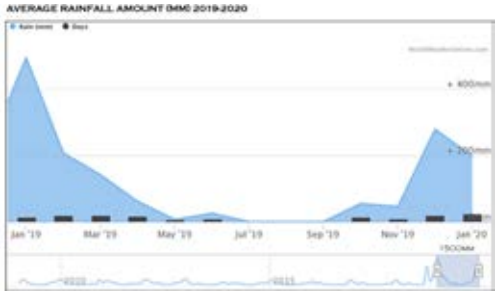
Strategy: This design aims to reinterpret ain dara's character which is currently defined by its quarries, mainly through the introduction of water resource management such as constructed wetlands, retention ponds, etc. and vegetative techniques such as terracing, which aims to satisfy the goal of creating new .microhabitats to generate needed heterogeneity in the area

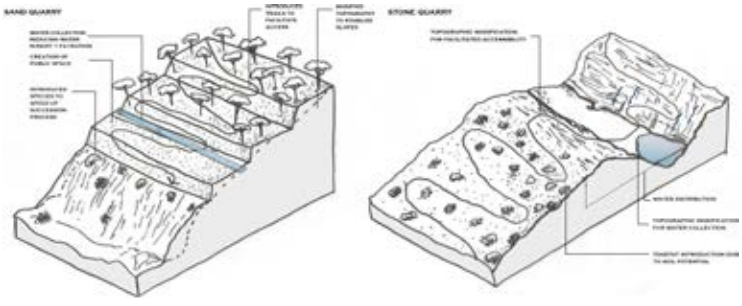






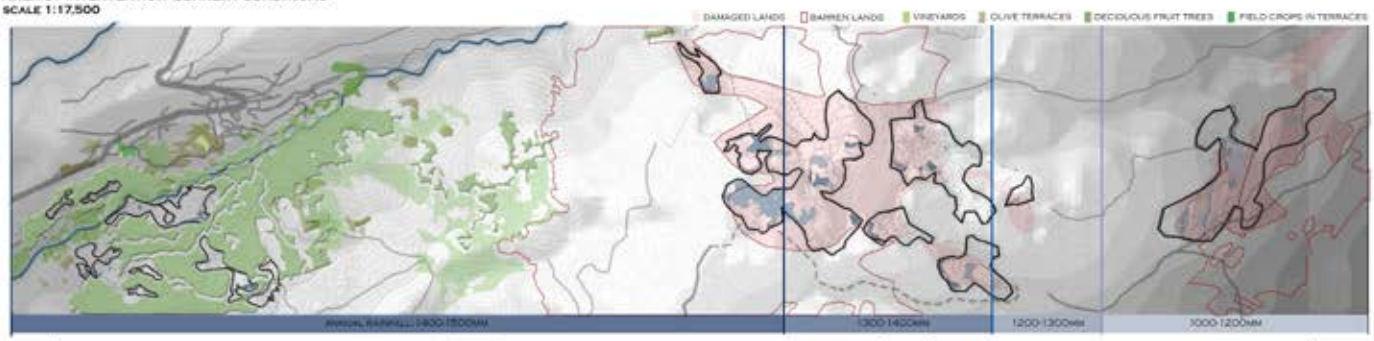


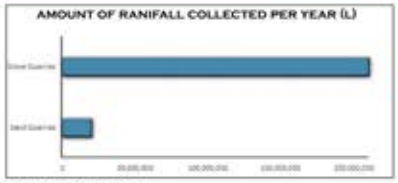


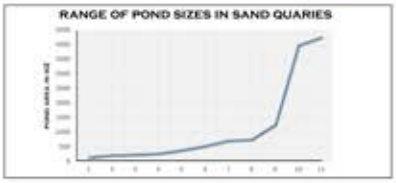


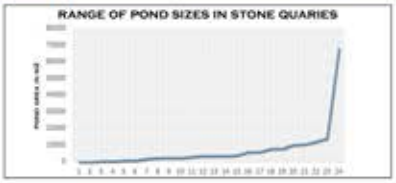
08- Action Plan

AREA OF INTERVENTION- CURRENT CONDITIONS
SCALE 1:17,500

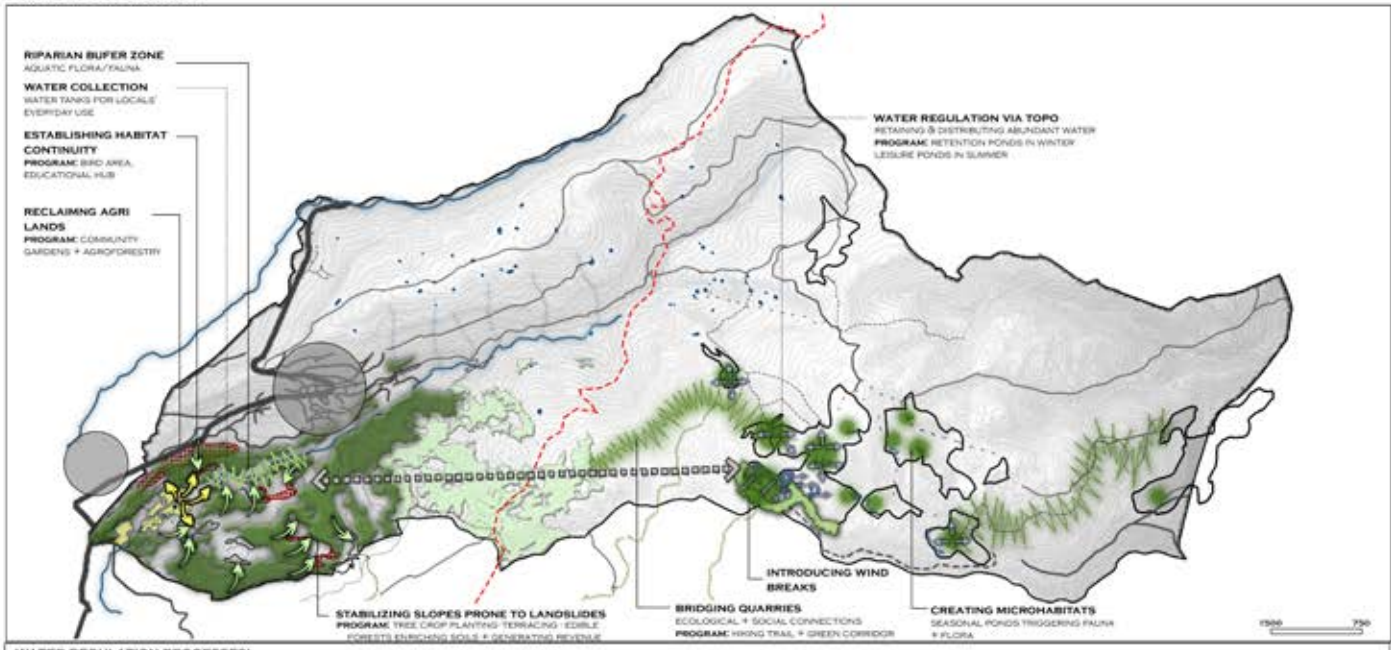




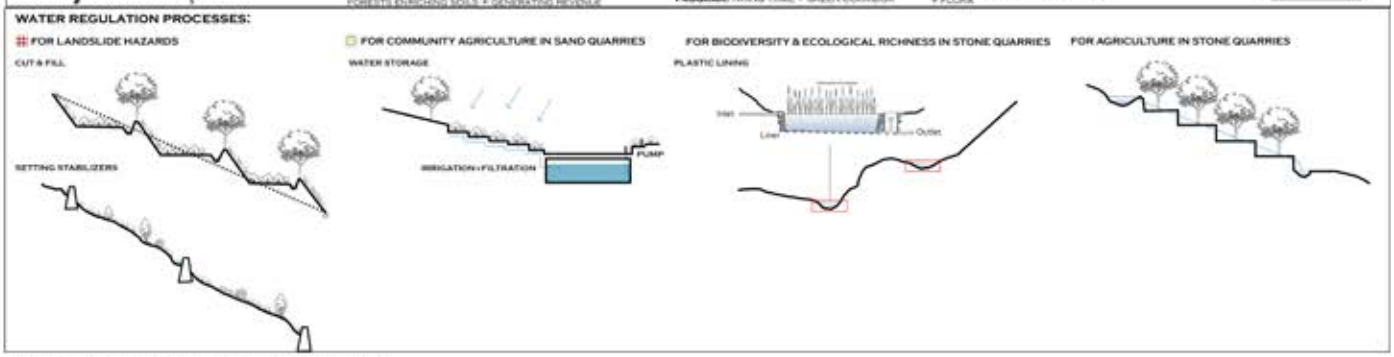




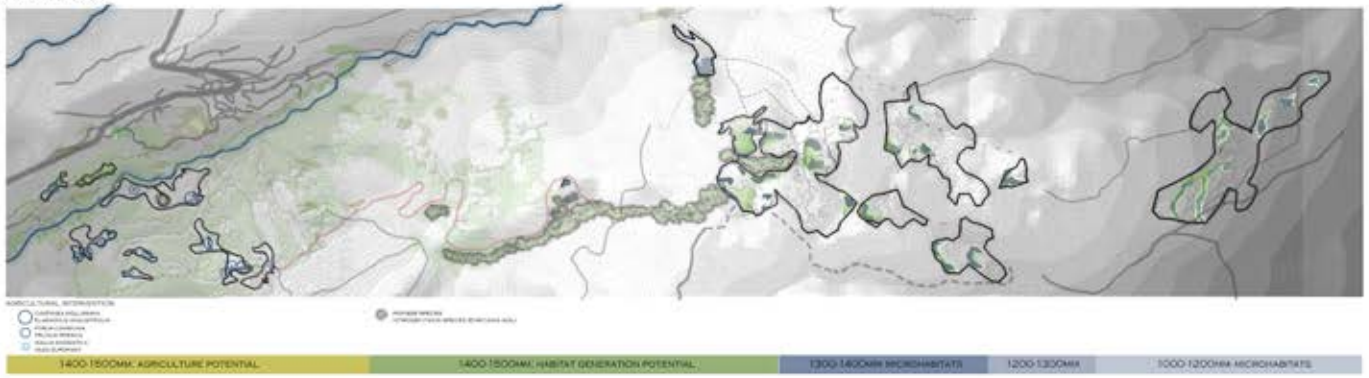
LARGE SCALE ACTION PLAN



WATER REGULATION PROCESSES:

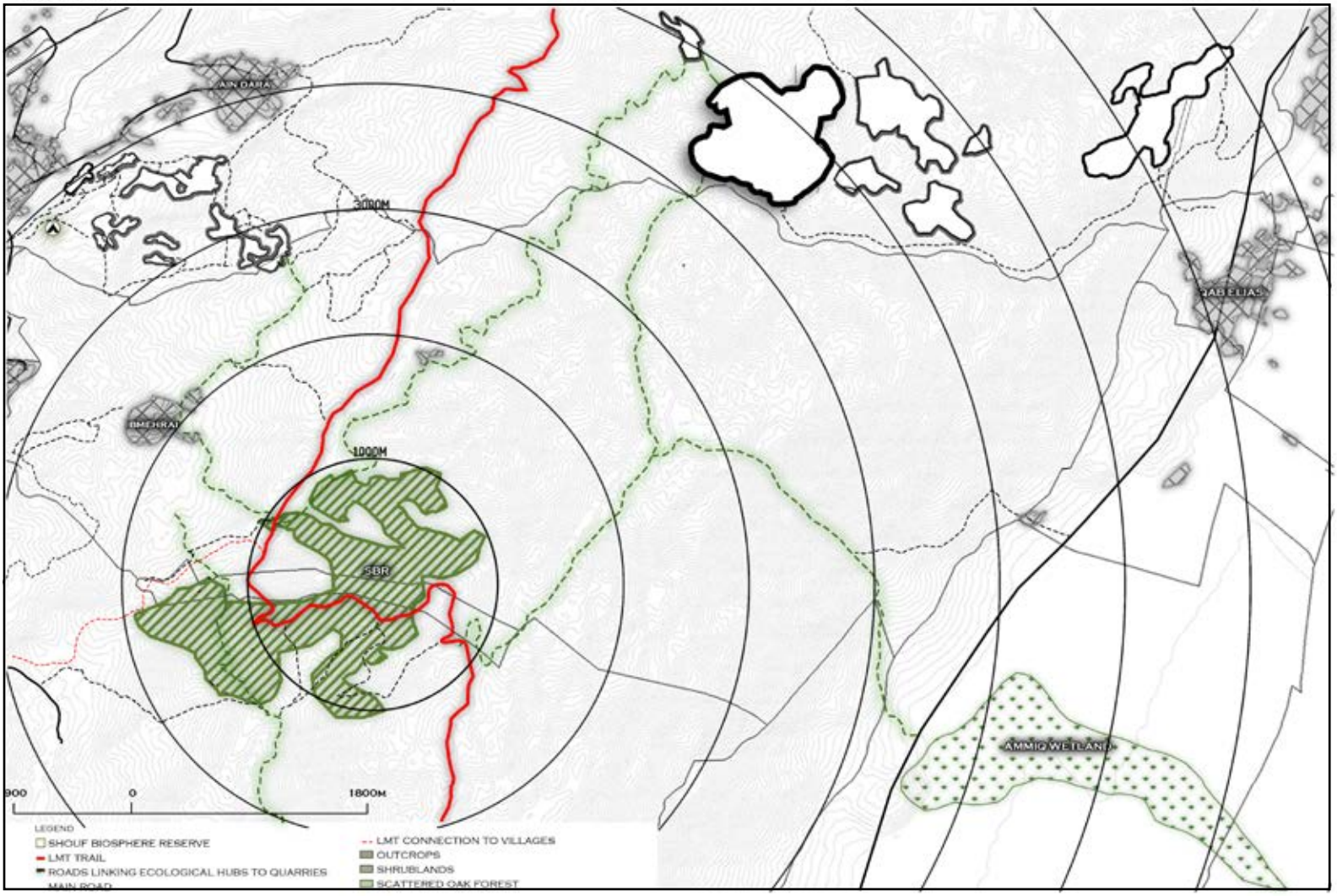


AREA OF INTERVENTION- PROPOSED CONDITIONS
SCALE 1:17,500



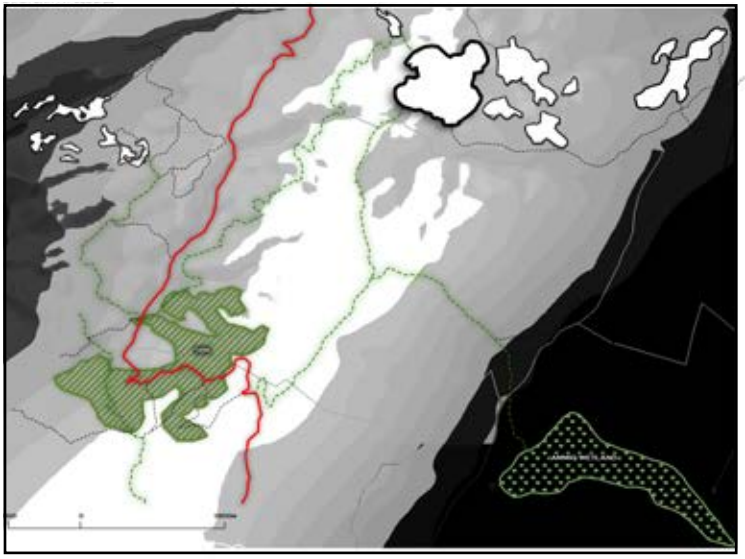
09- Large Scale Conditions:

Relationship to Nearby Ecological Hubs

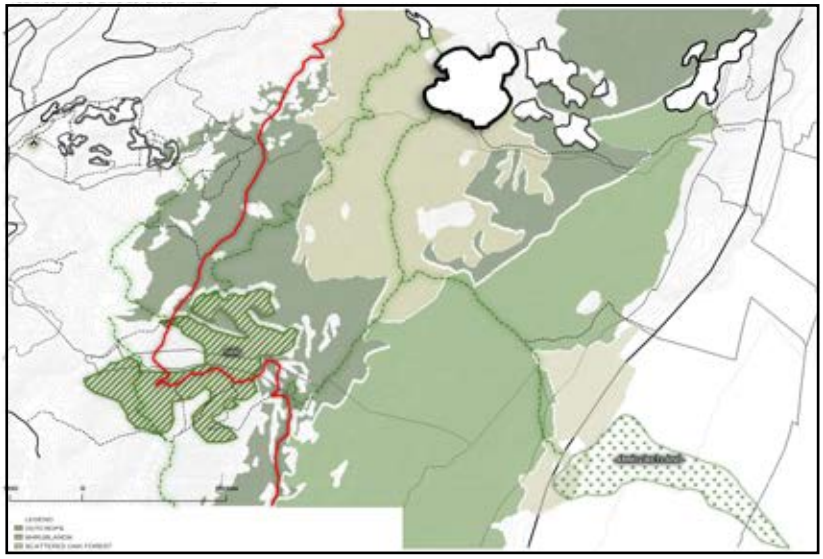


Layers taken into consideration for greenway typologies

Landform Typologies

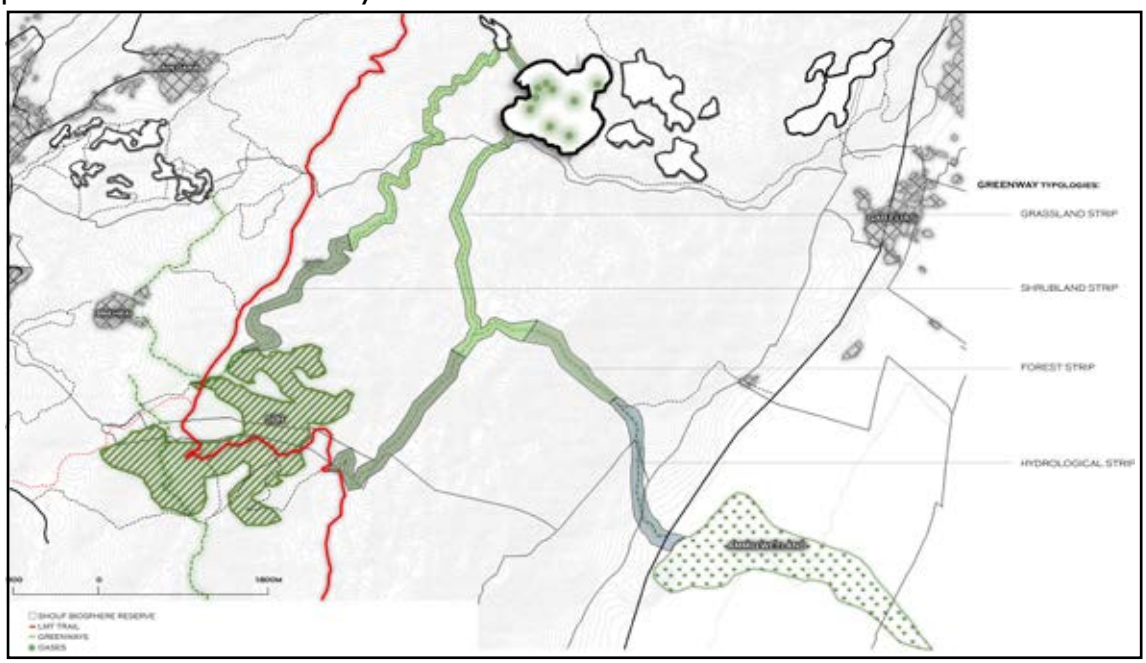


Landcover Conditions

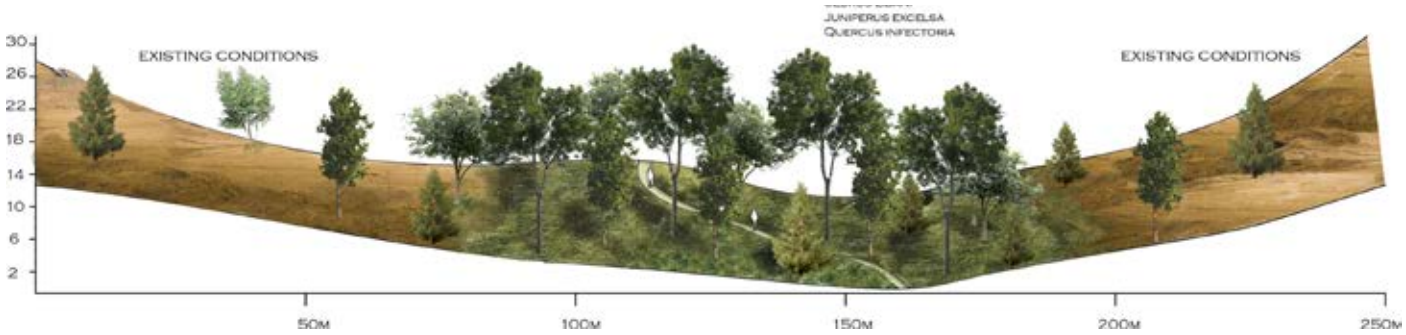


10- Large Scale Intervention:

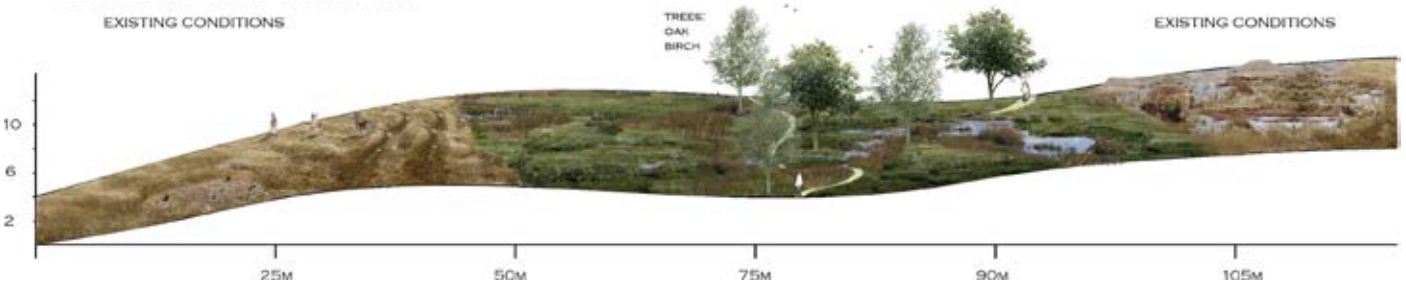
Proposed Conditions: Greenways



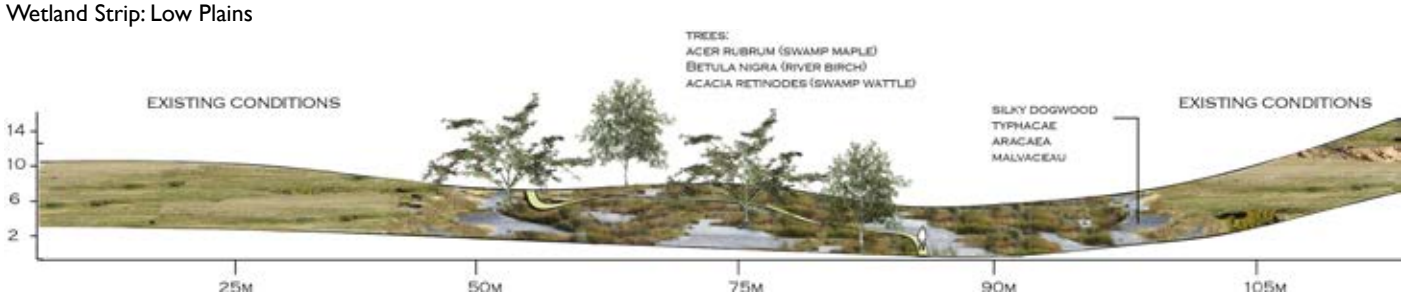
Forest Strip: Hilly Area



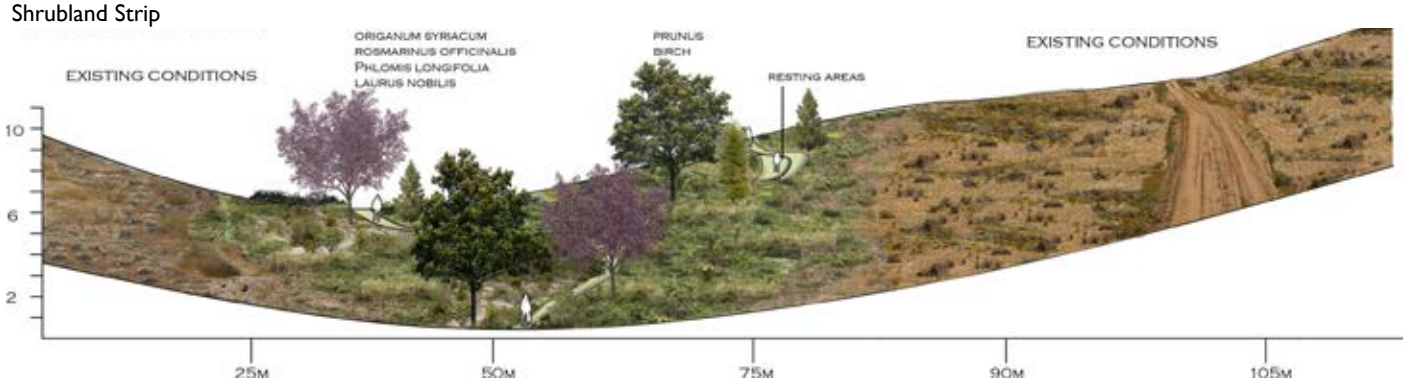
Grassland Strip: Flat Plains



Wetland Strip: Low Plains

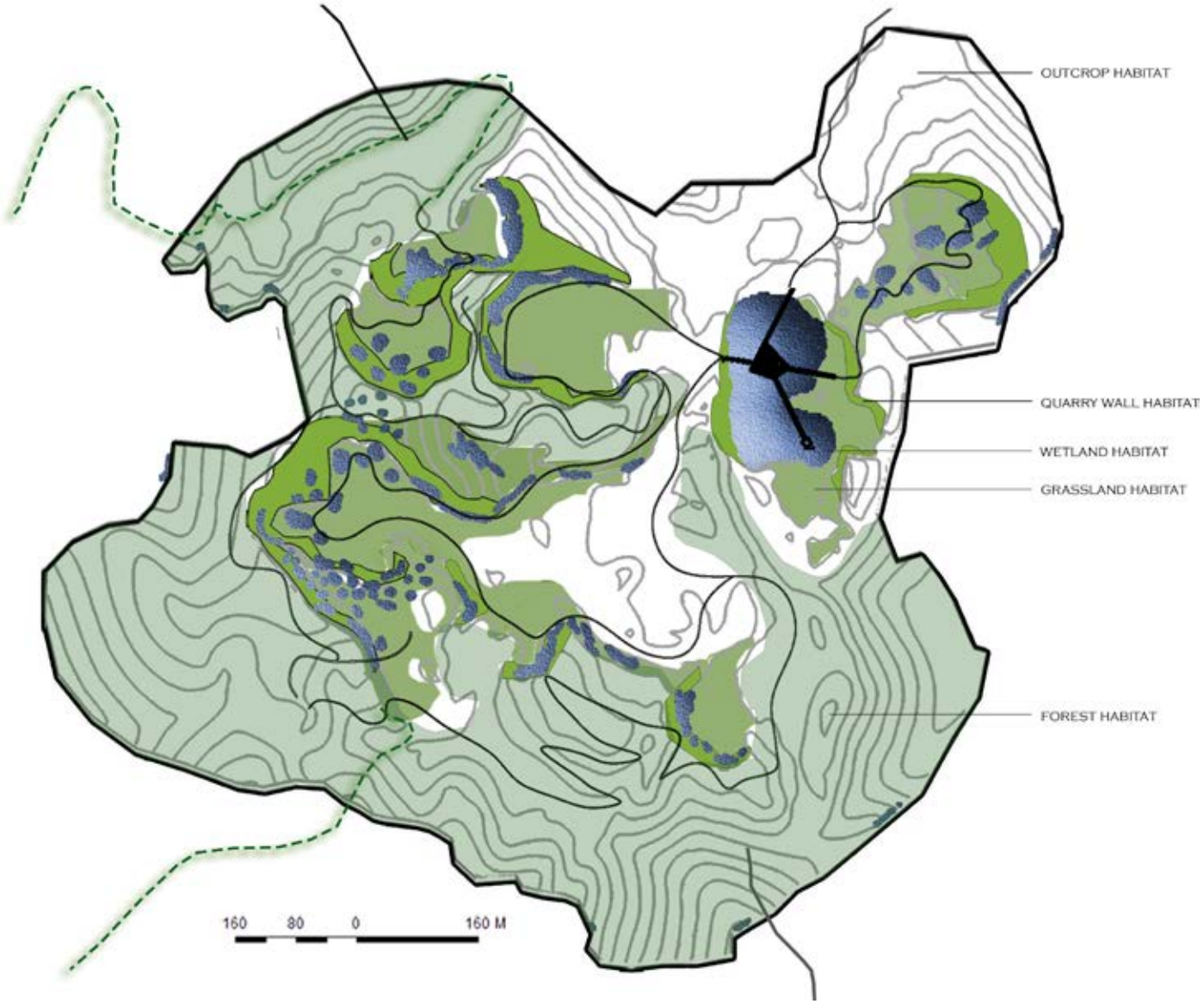


Shrubland Strip



11- Microhabitat Positioning

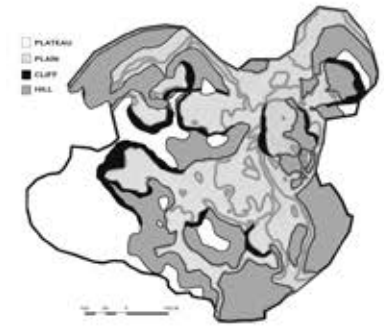
Microhabitats were located based on elevation (mostly), so wherever there were depressions capable of water retention is where microhabitatswere placed . These microhabitats were divided into 4 categories based on current landcover and elevation: forests,wetlands, grasslands and wall plantings



Seasonality of Flora

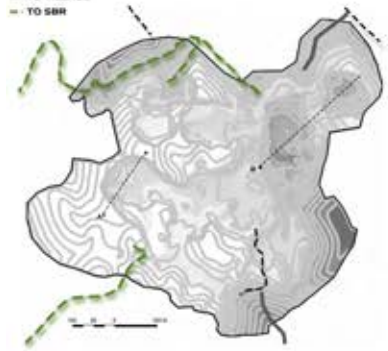
12- Design Diagrams

ELEVATION/LANDFORM TYPOLOGIES

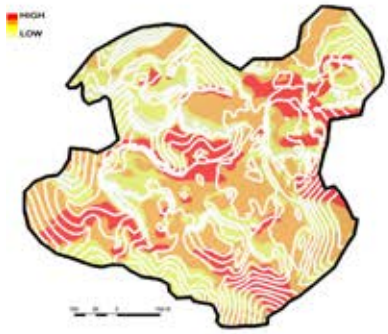


ACCESSIBILITY

- TO QUARRY
- TO VILLAGE
- TO SBR



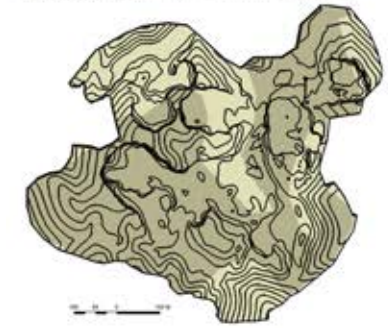
SUN EXPOSURE



SOIL TYPE

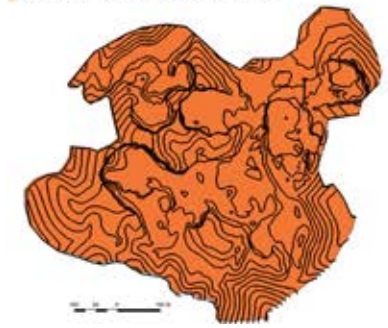
HALPIC/LEPTIC LUVISOLS: GOOD FOR AGRI DUE TO GOD DRAINAGE + HIGH BASE SATURATION

EUTRIC LEPTOSOLS: SHALLOW SOILS WITH MINIMAL DEVELOPMENT



GEOLOGY

KARSTIFIED BEDDED LIMESTONE: AFFECTS 0.W.

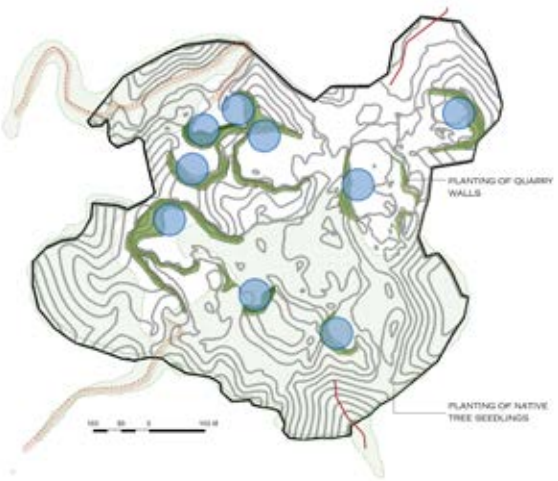


Strategy

Ecological Phasing

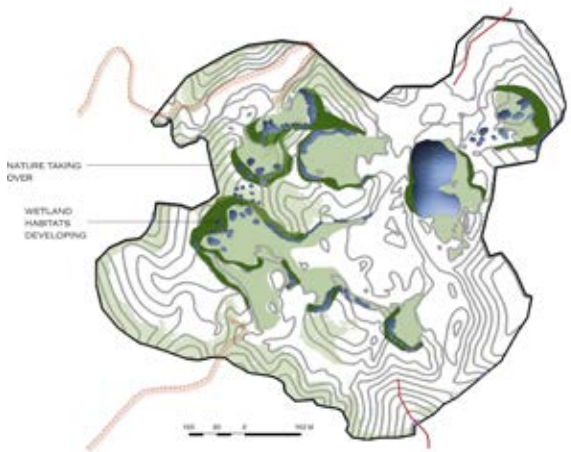
PHASE 1: SOIL PREPARATION, 20CM, + DISTRIBUTION OF NATIVE SEEDLINGS AROUND SITE PERIPHERY + IN QUARRY WALLS+ PLACING WETLANDS

0 - 5 YEARS



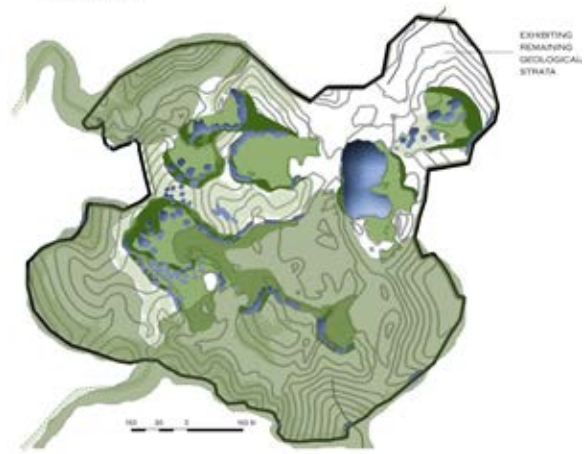
PHASE 2: WETLAND & QUARRY WALL HABITATS BEGIN TO DEVELOP

5 - 7 YEARS



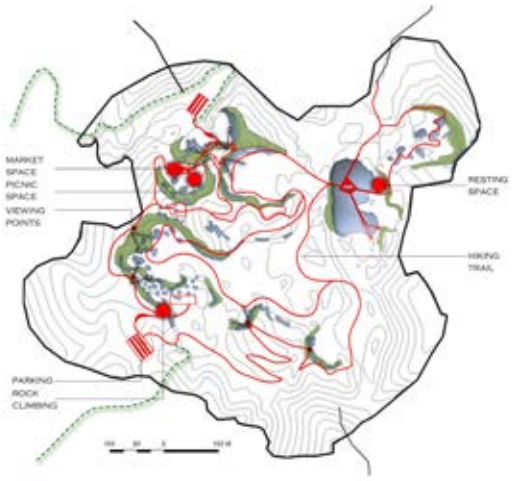
PHASE 3: TOPOGRAPHIC VARIETY TO ENCOURAGE MICRO-ECOLOGY DEVELOPMENT + DEVELOPMENT OF FORESTED AREA

10 YEARS



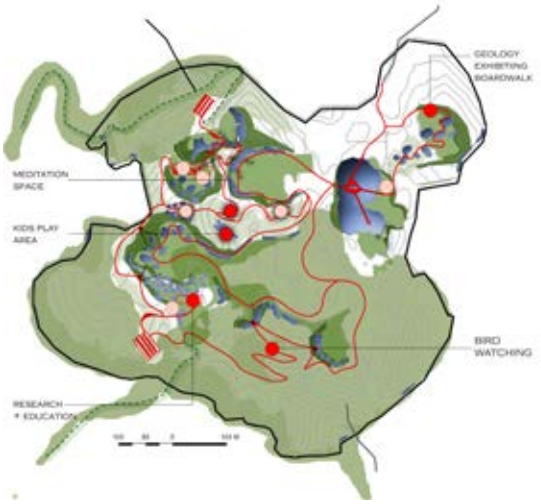
Program Phasing

PHASE 1: ACCESSIBILITY TO PARKING ZONES & HIKING TRIAL CONNECTING VIEWING POINTS

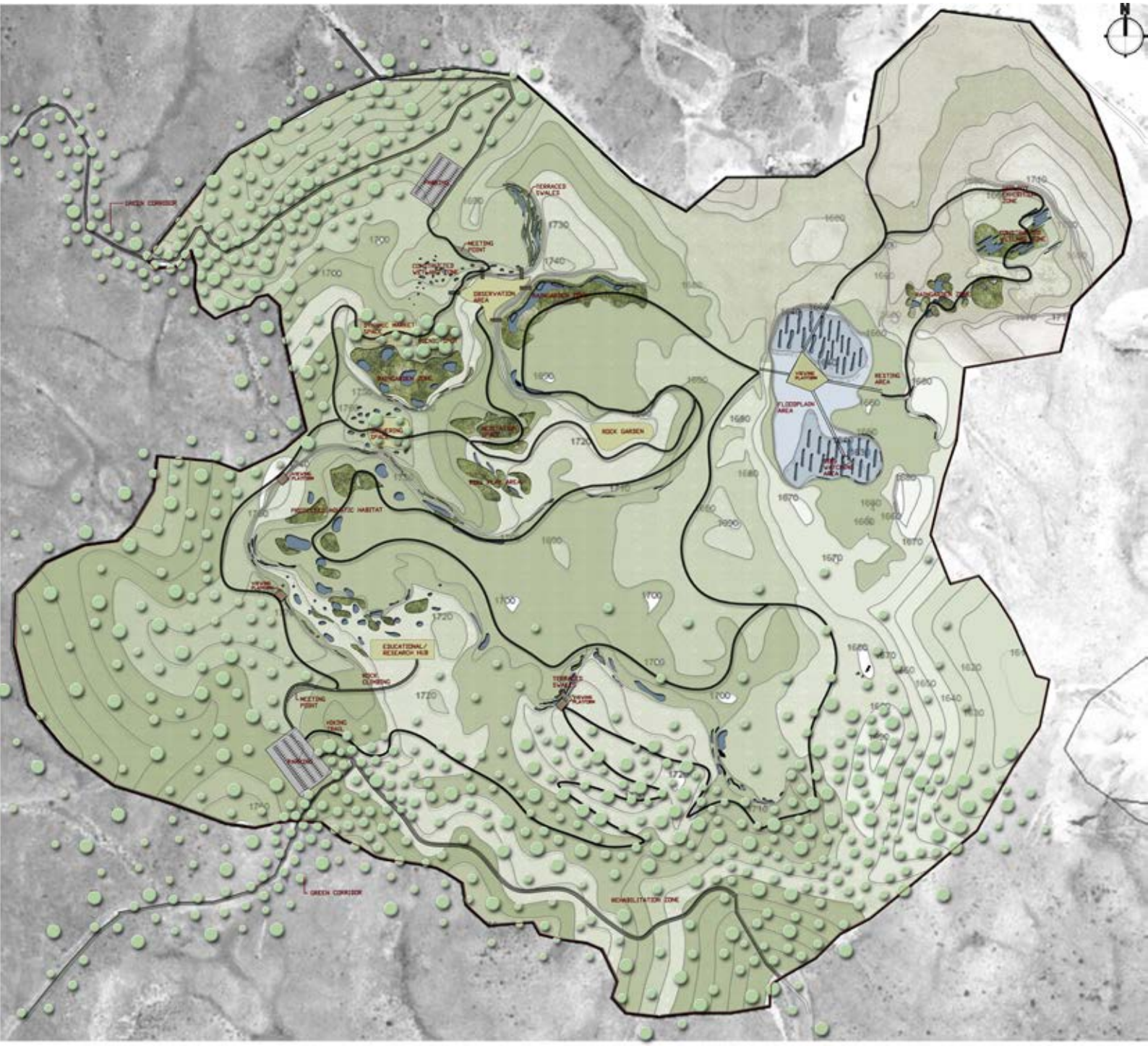


PHASE 2: INTRODUCTION OF LEISURE AREAS + COMMUNAL SPACES

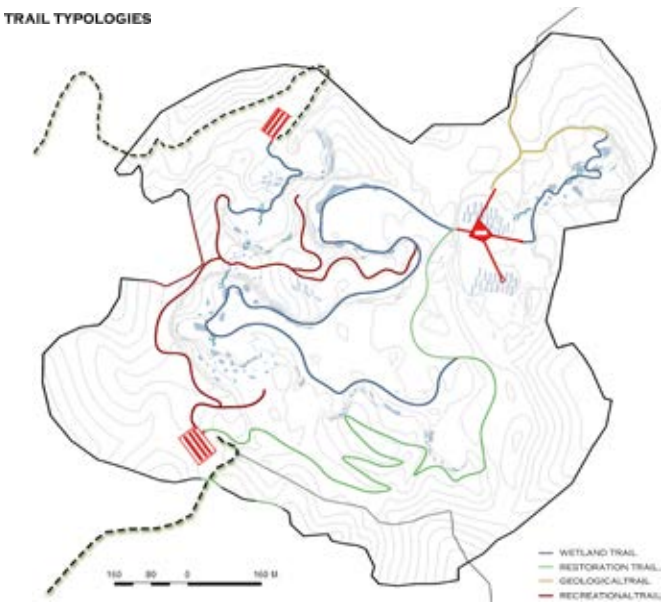
PHASE 3: INTRODUCTION OF LEISURE AREAS + ENLIGHTENING SPACES



13- Plan

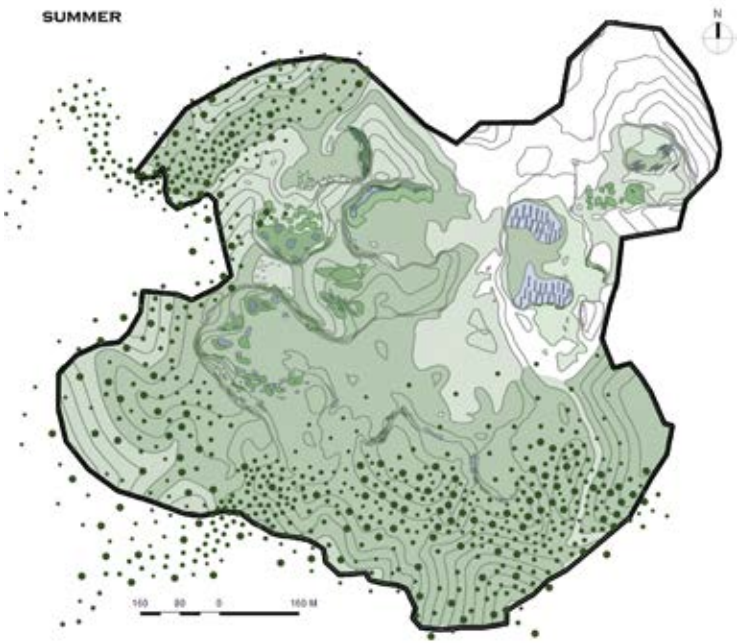

GREEN CORRIDOR
TERRACES SWALES
MEETING POINT
OBSERVATION AREA
ROCK GARDEN
FLOODPLAIN AREA
RESTING AREA
EDUCATIONAL/ RESEARCH HUB
ROCK CLIMBING
GREEN CORRIDOR
REHABILITATION ZONE


PROPOSED ZONES
N
PARKING ZONE
GREEN LINK TO SBR
C.W. ZONE
GEOLOGICAL PRESERVATION ZONE
RAIN GARDEN ZONE
FLOOD ZONE
RECREATIONAL ZONE
EXPANDING GREEN BOUNDARY
EDUC. ZONE
HABITAT RESTORATION ZONE (LINK TO SBR)
GREEN LINK TO SBR
150 80 0 150 M

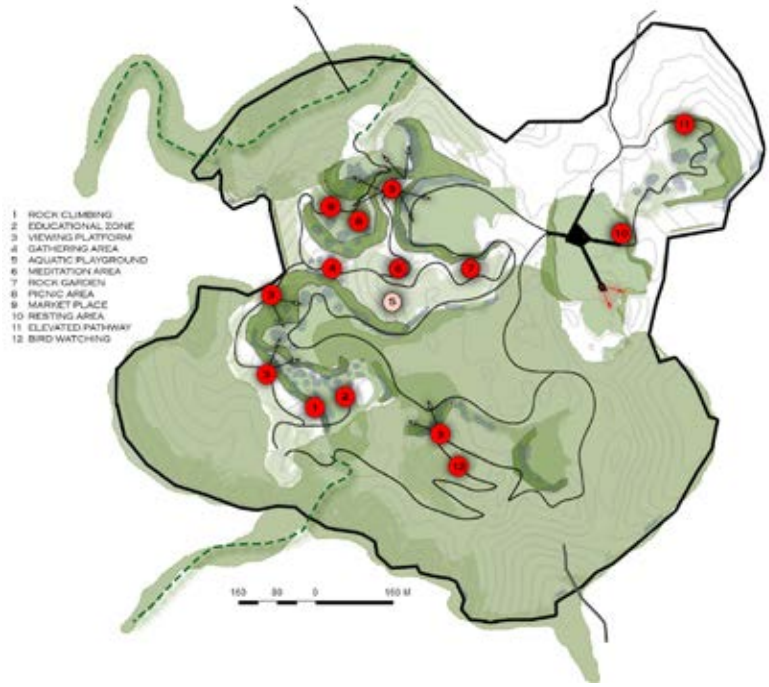

TRAIL TYPOLOGIES
150 80 0 150 M
WETLAND TRAIL
RESTORATION TRAIL
GEOLOGICAL TRAIL
RECREATIONAL TRAIL

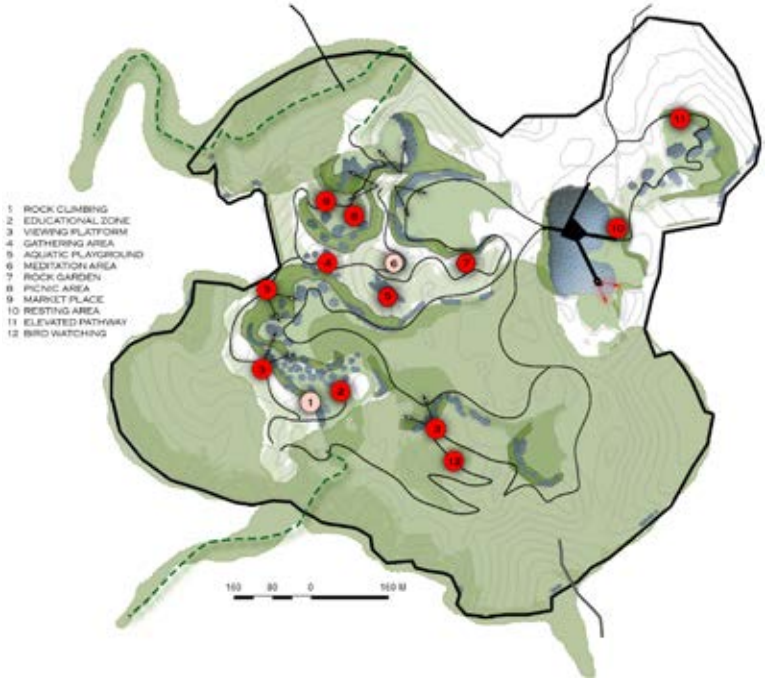
14- Seasonality

Ecological Layer



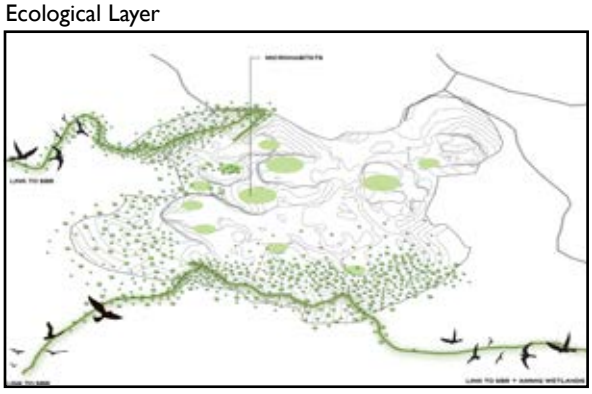
Program Layer



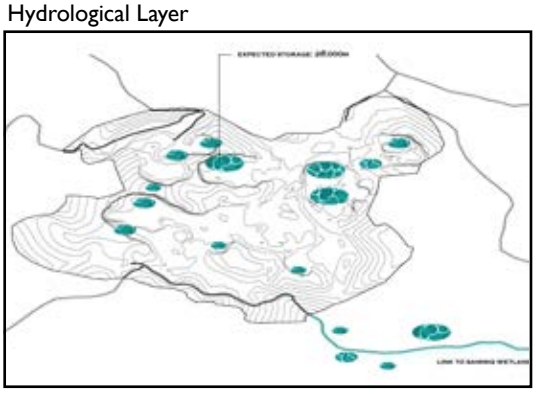


Integrated Systems

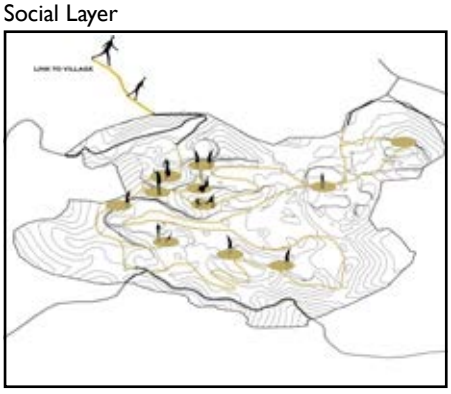
Ecological Layer



Hydrological Layer

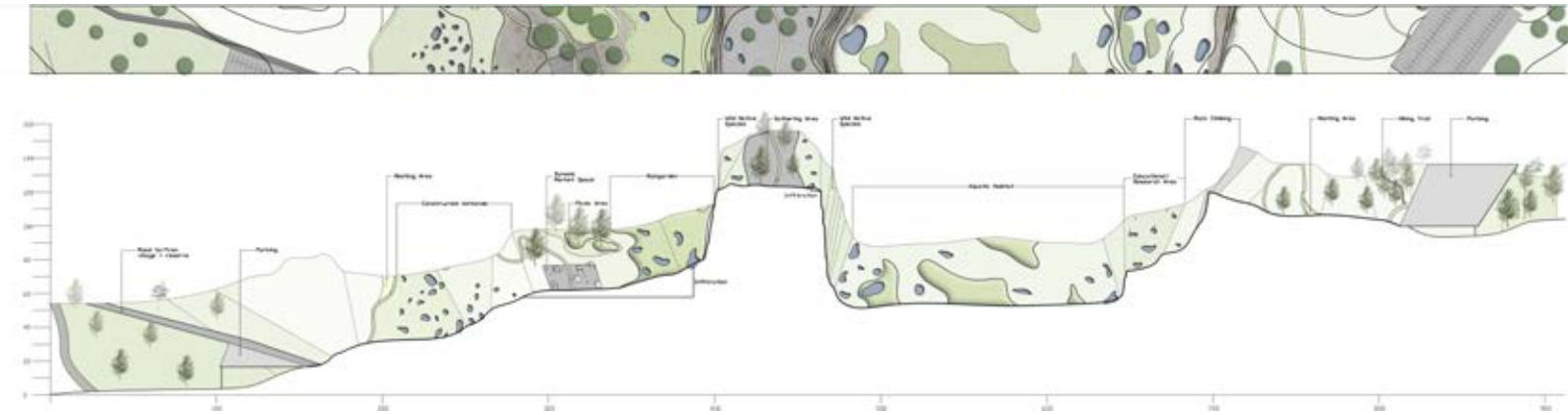


Social Layer

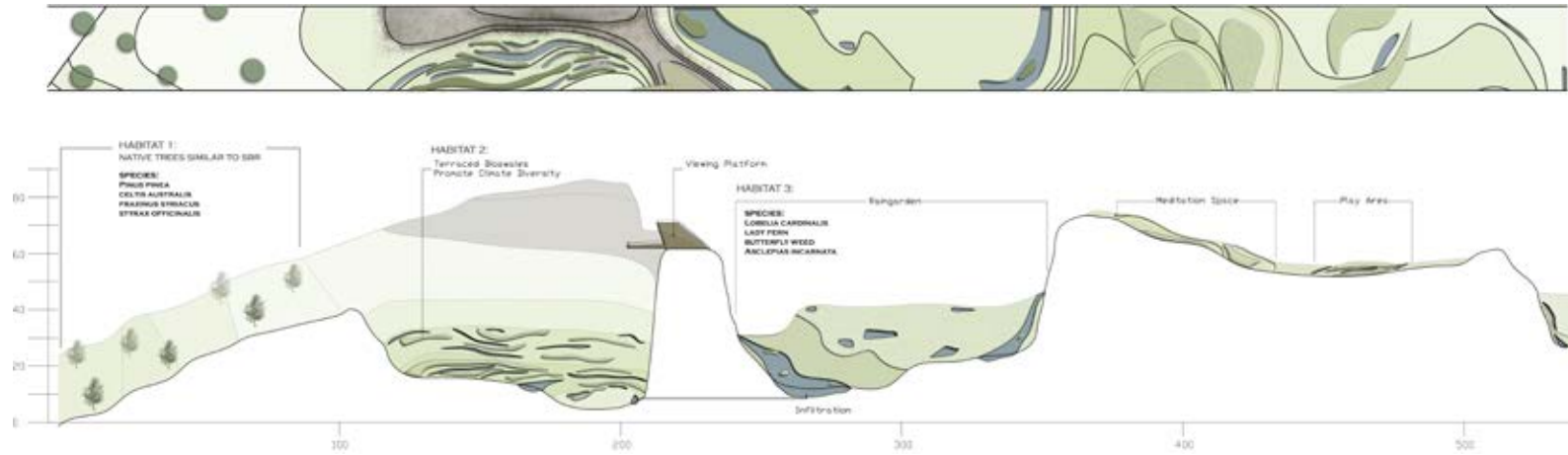


15- Schematic Sections

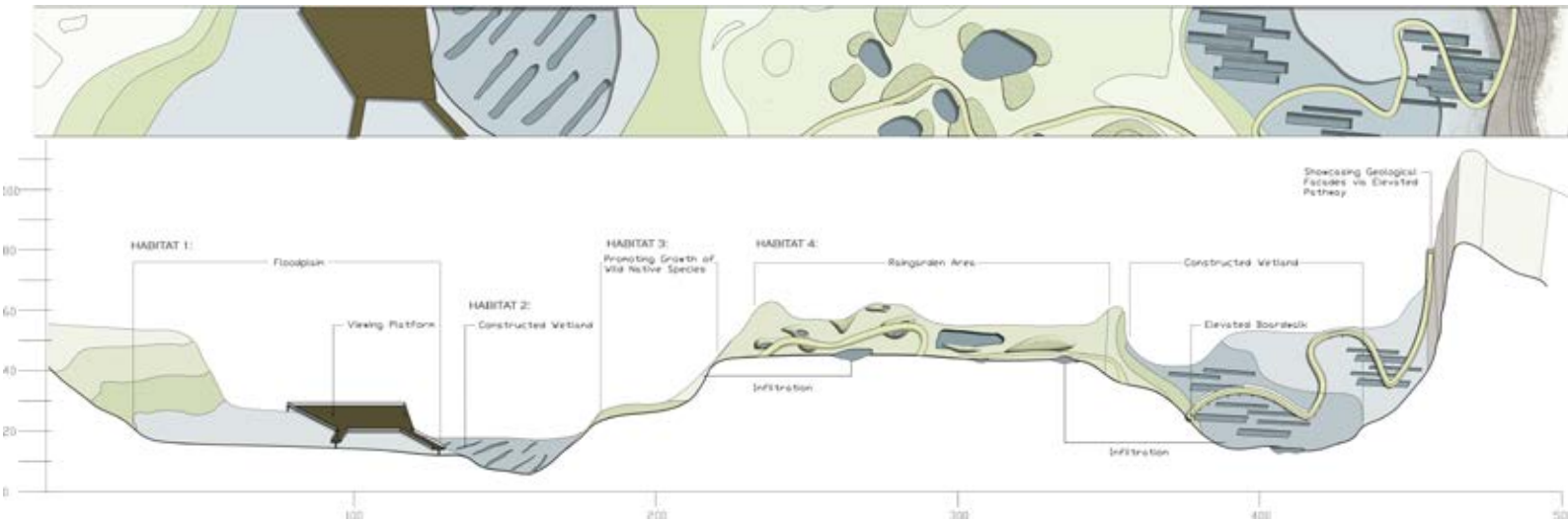
Overall relationship between leisure areas (highest elevations) and water systems: lowest elevations



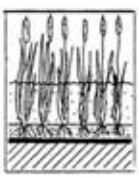
Identification of microhabitats: positioned based on water abundancy and topography



Relationship between ecological and social layers



Wetland Typologies



Water level is above the ground surface; vegetation is rooted and emerges above the water surface: waterflow is primarily above ground

WETLAND PLANTS AND WATER

SOIL
LINER
NATIVE SOIL

Surface Flow Wetland

Water level is below ground; water flow is through a sand or gravel bed; roots penetrate to the bottom of the bed

WETLAND PLANTS

SOIL SAND AND GRAVEL
LINER
NATIVE SOIL

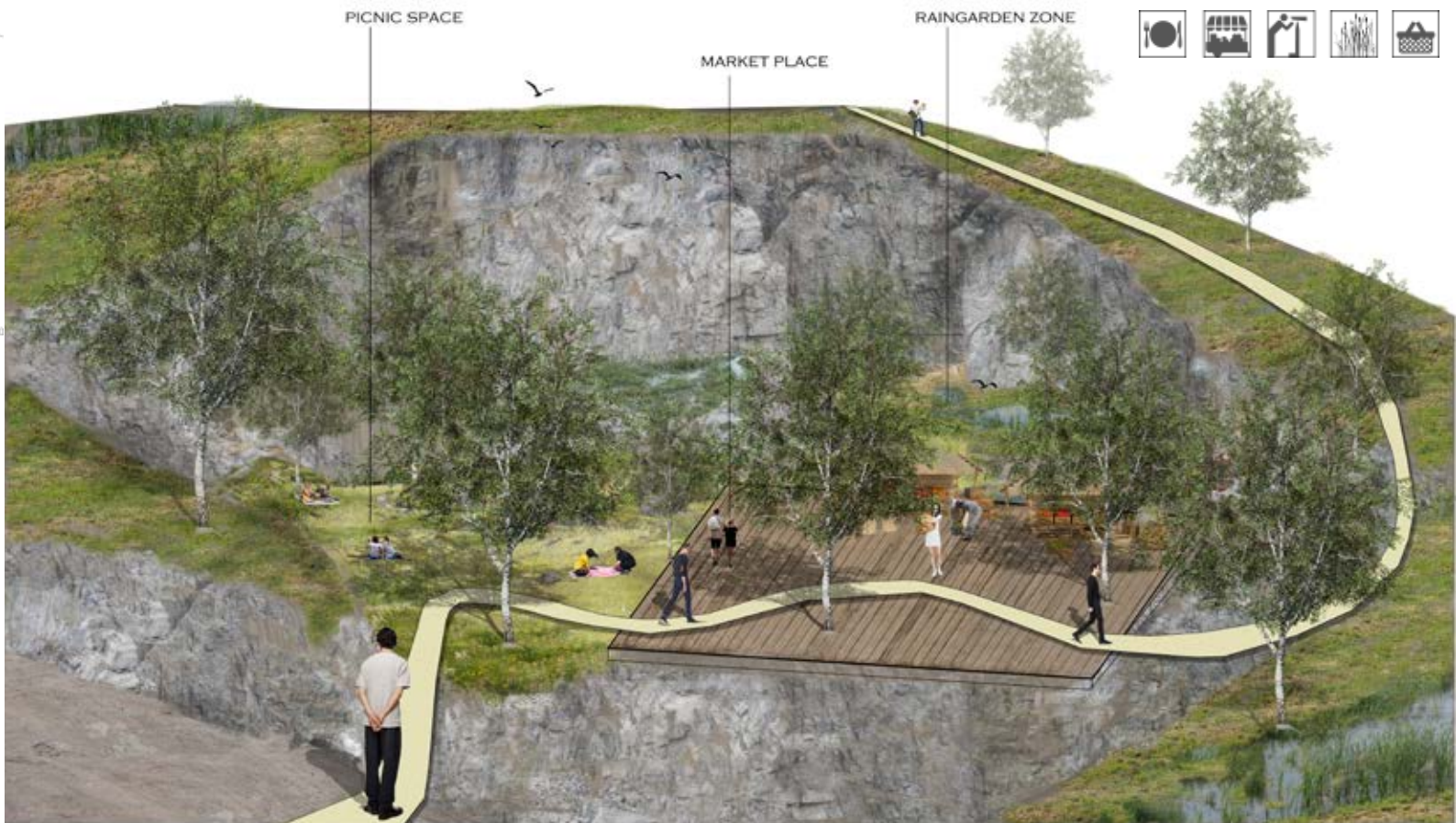
Subsurface Flow Wetland

Figure 1. Surface flow and subsurface flow constructed wetlands (from Water Pollution Control Federation 1990).

16- Design Details

Zone 1- Social/Commercial Area: Dynamic in its activities (farmers market/festivals) based on the season

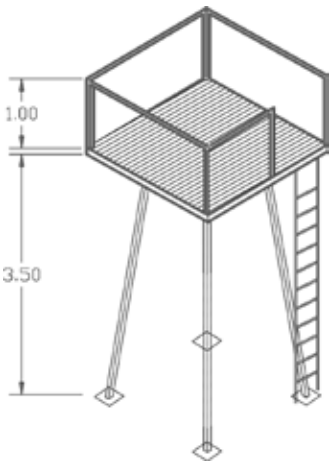
Perspective showing the coexistence of habitats and commercial spaces



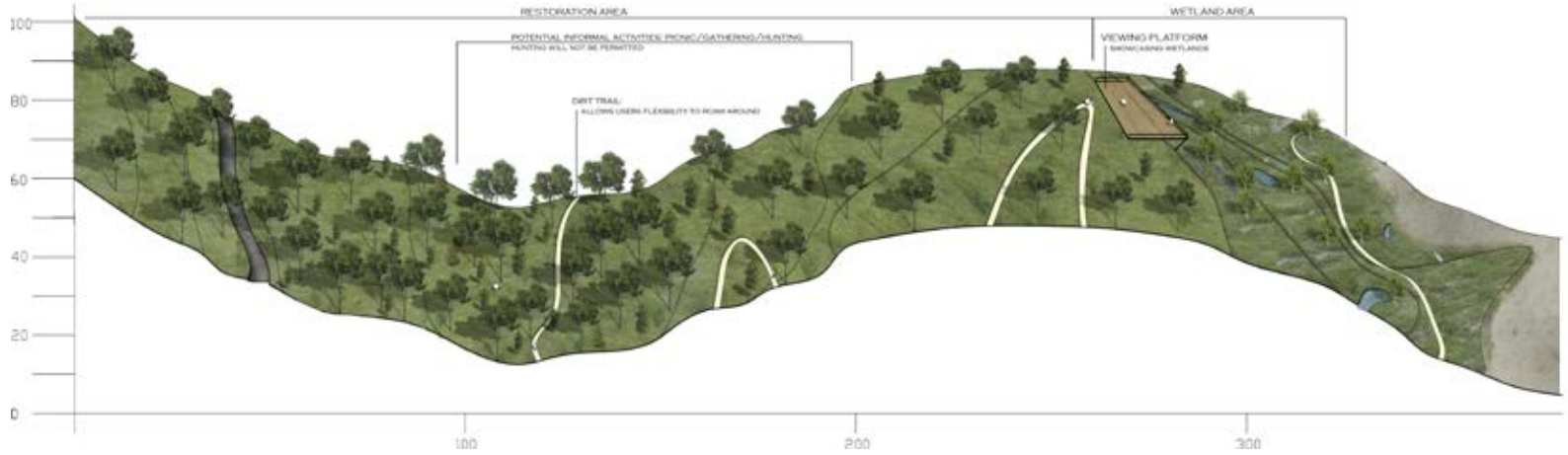
Birdwatching Towers Details

Regulating Accessibility

Promoting Stewardship

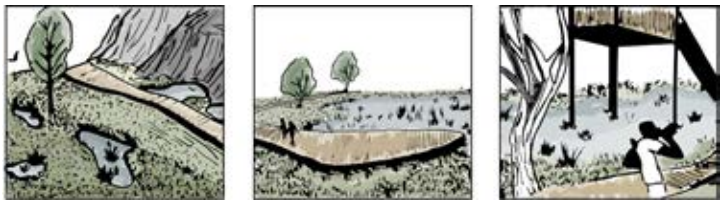


Zone 2- Restoration Area: Focusing on the introduction of native flora and fauna, serving as an extention of the SBR

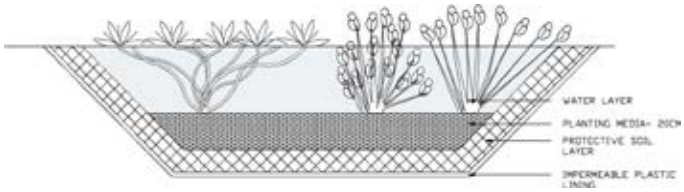


Perspective Showing the sensitivity taken in order to minimize habitat disturbance

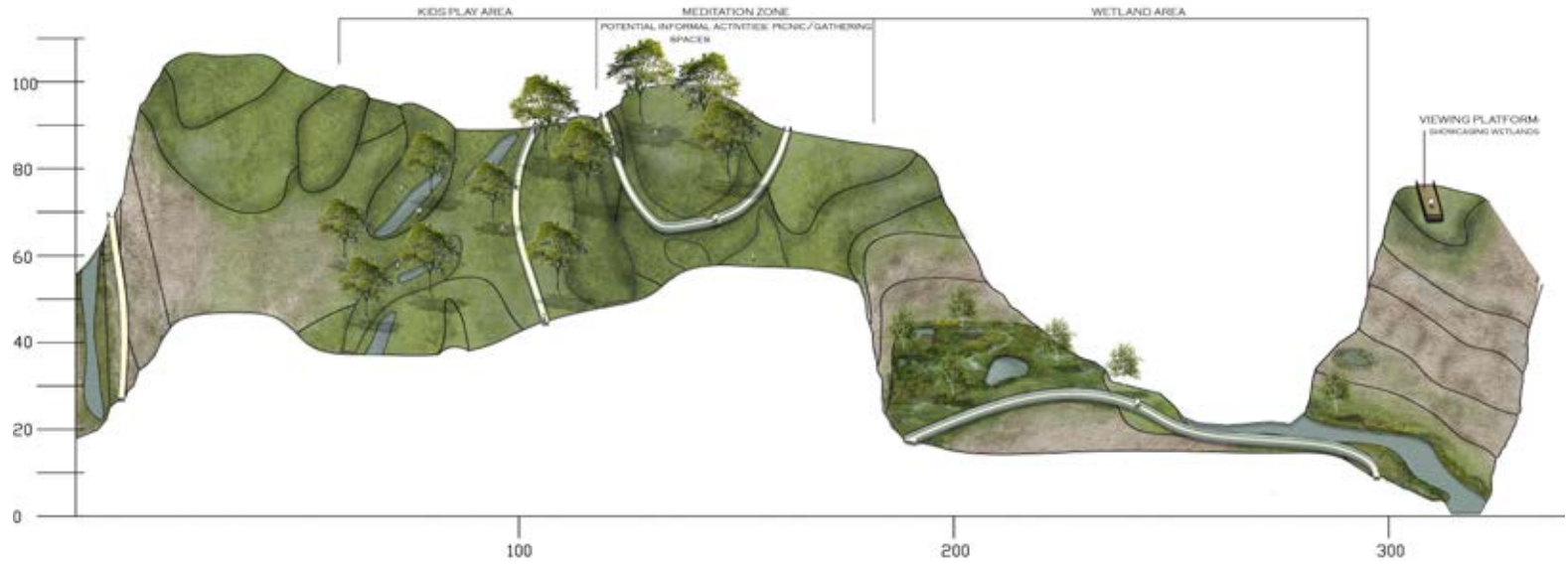
Constructed Wetland Details

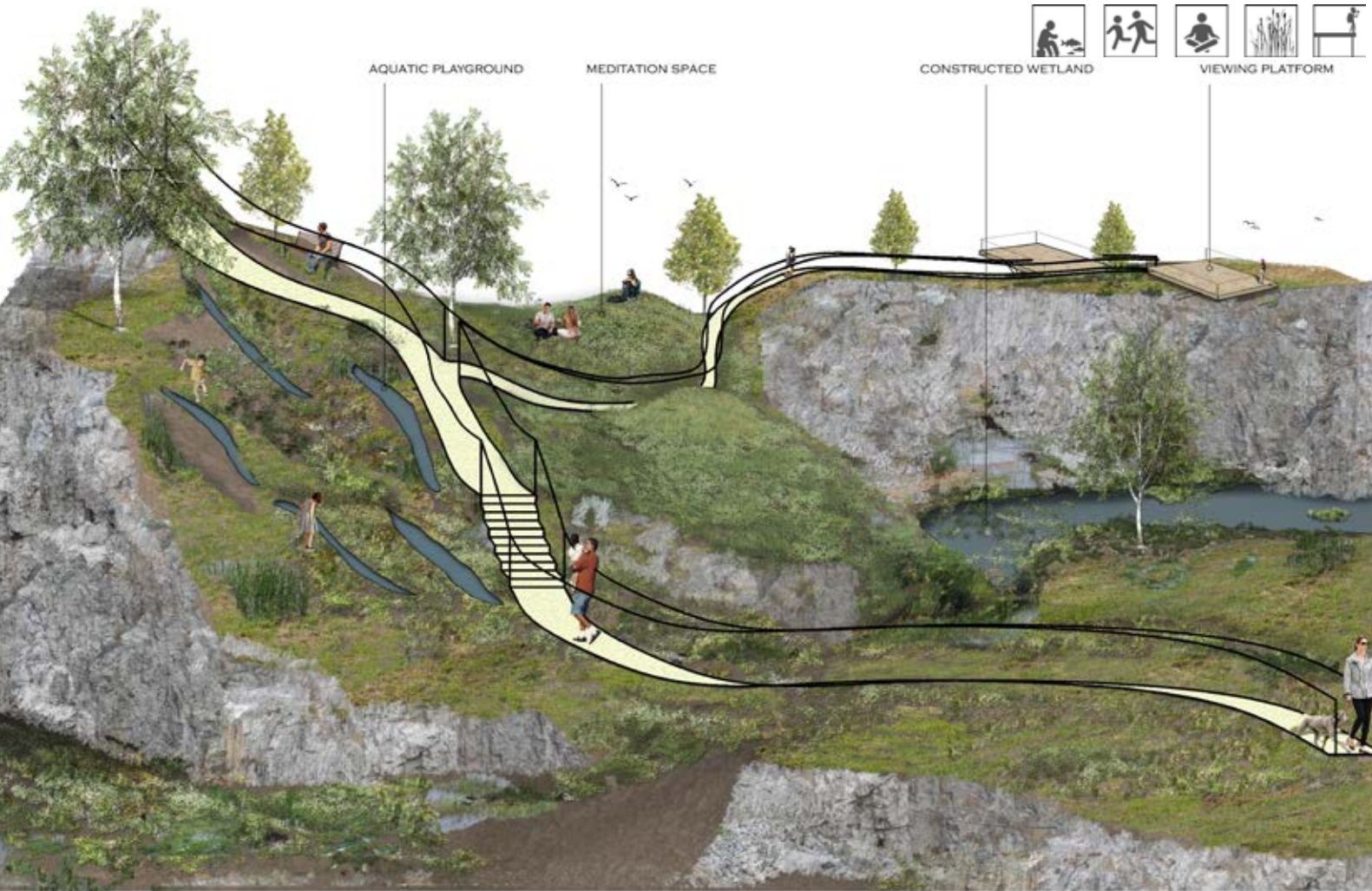


Constructed Wetland Details



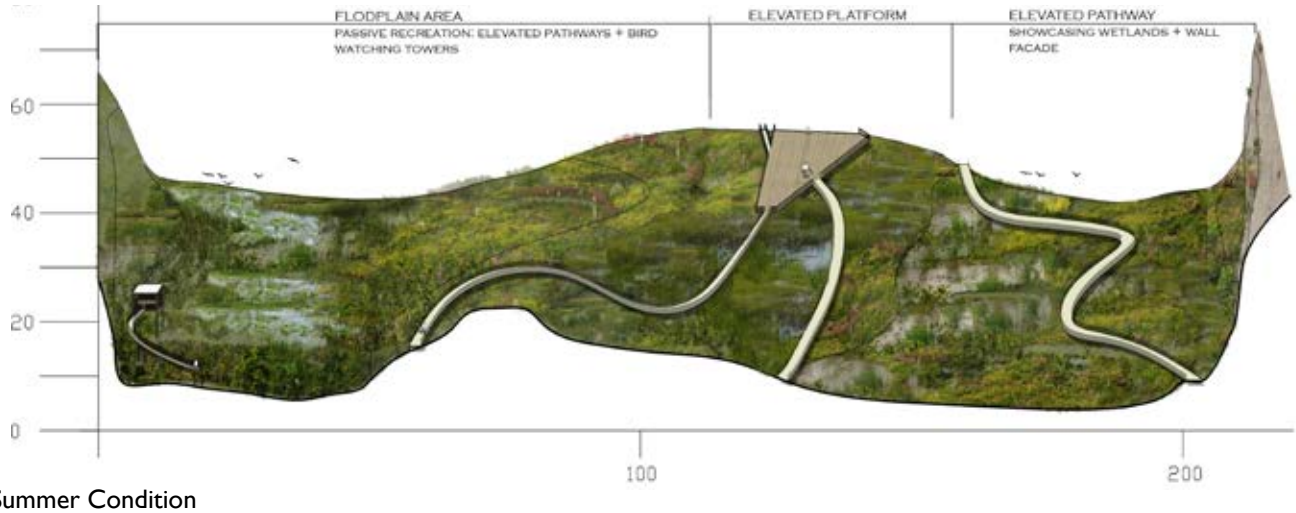
Zone 3- Wetland Area: Promoting both active and passive leisure areas whilst conserving microhabitats



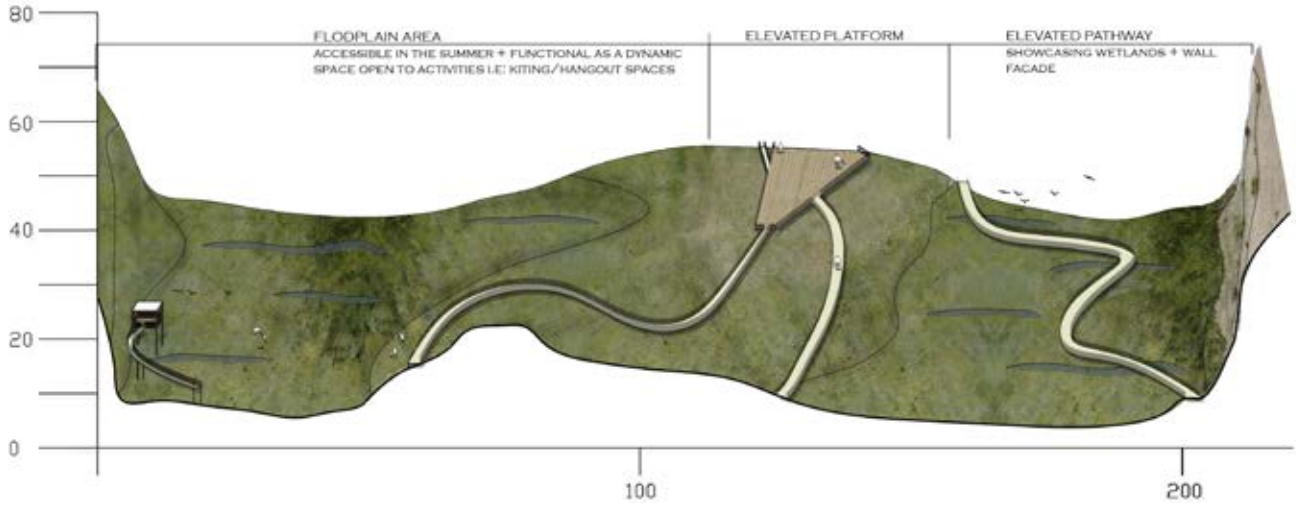


Zone 3- Wetland Area: Promoting both active and passive leisure areas whilst conserving microhabitats

Winter Condition



Summer Condition



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