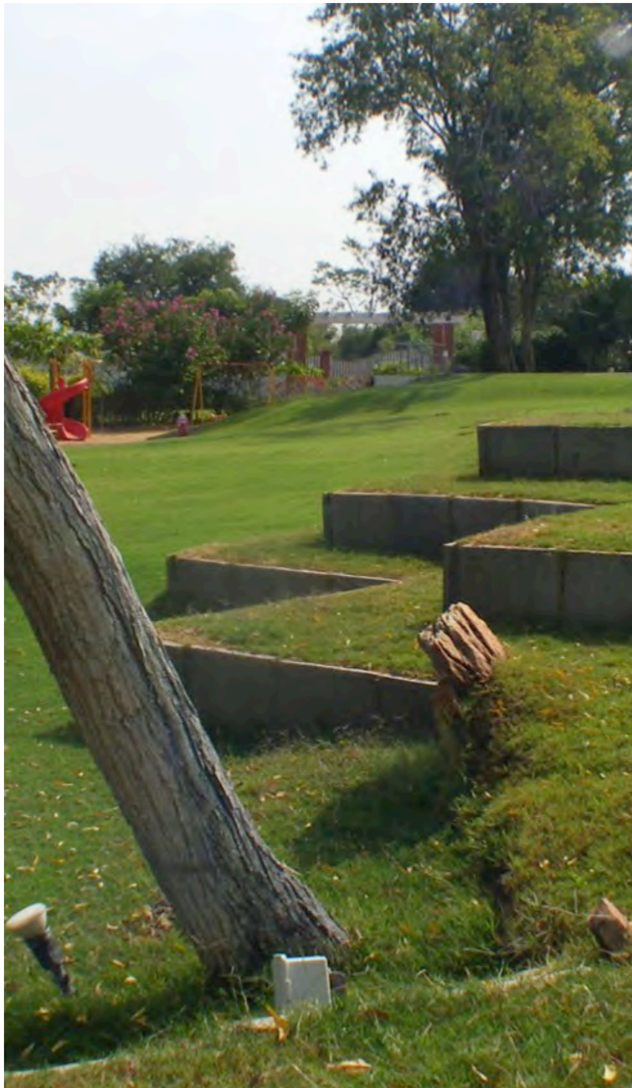
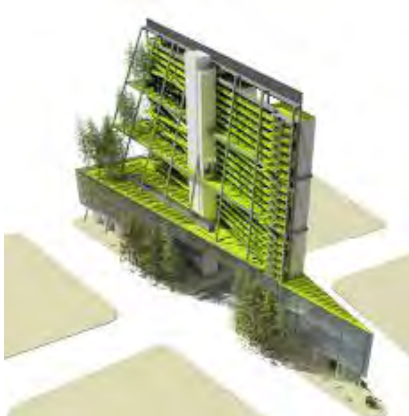
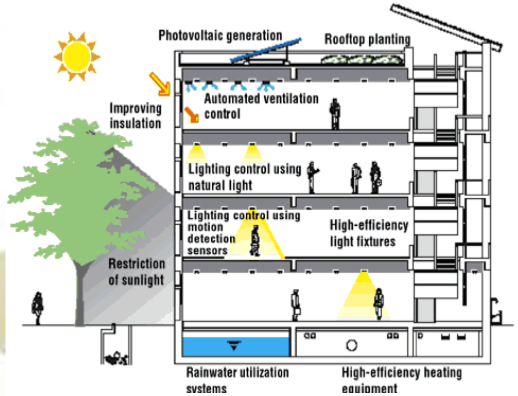


LAND

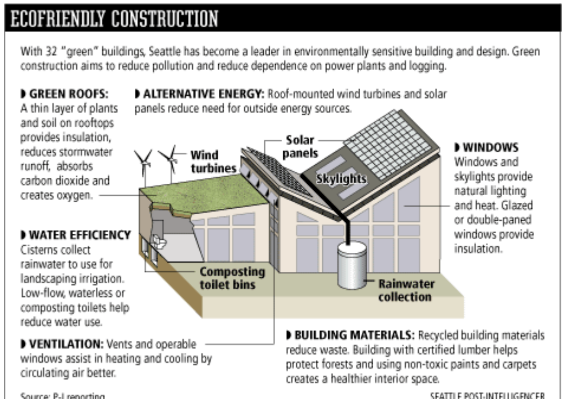
WATER

ECOLOGY





Photovoltaic generation
Rooftop planting
Improving insulation
Automated ventilation control
Lighting control using natural light
Lighting control using motion detection sensors
High-efficiency light fixtures
Restriction of sunlight
Rainwater utilization systems
High-efficiency heating equipment



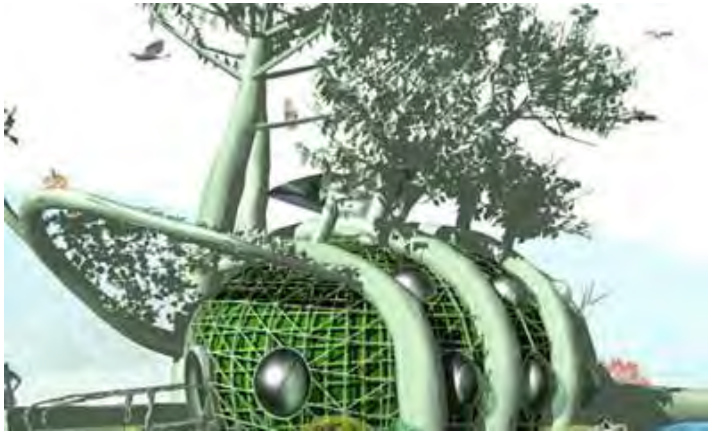
ECOFRIENDLY CONSTRUCTION
With 32 "green" buildings, Seattle has become a leader in environmentally sensitive building and design. Green construction aims to reduce pollution and reduce dependence on power plants and logging.
GREEN ROOFS: A thin layer of plants and soil on rooftops provides insulation, reduces stormwater runoff, absorbs carbon dioxide and creates oxygen.
ALTERNATIVE ENERGY: Roof-mounted wind turbines and solar panels reduce need for outside energy sources.
Wind turbines
Solar panels
Skylights
WINDOWS Windows and skylights provide natural lighting and heat. Glazed or double-paned windows provide insulation.
WATER EFFICIENCY Cisterns collect rainwater to use for landscaping irrigation. Low-flow, waterless or composting toilets help reduce water use.
Composting toilet bins
Rainwater collection
VENTILATION: Vents and operable windows assist in heating and cooling by circulating air better.
BUILDING MATERIALS: Recycled building materials reduce waste. Building with certified lumber helps protect forests and using non-toxic paints and carpets creates a healthier interior space.
Source: P-I reporting
SEATTLE POST-INTELLIGENCER

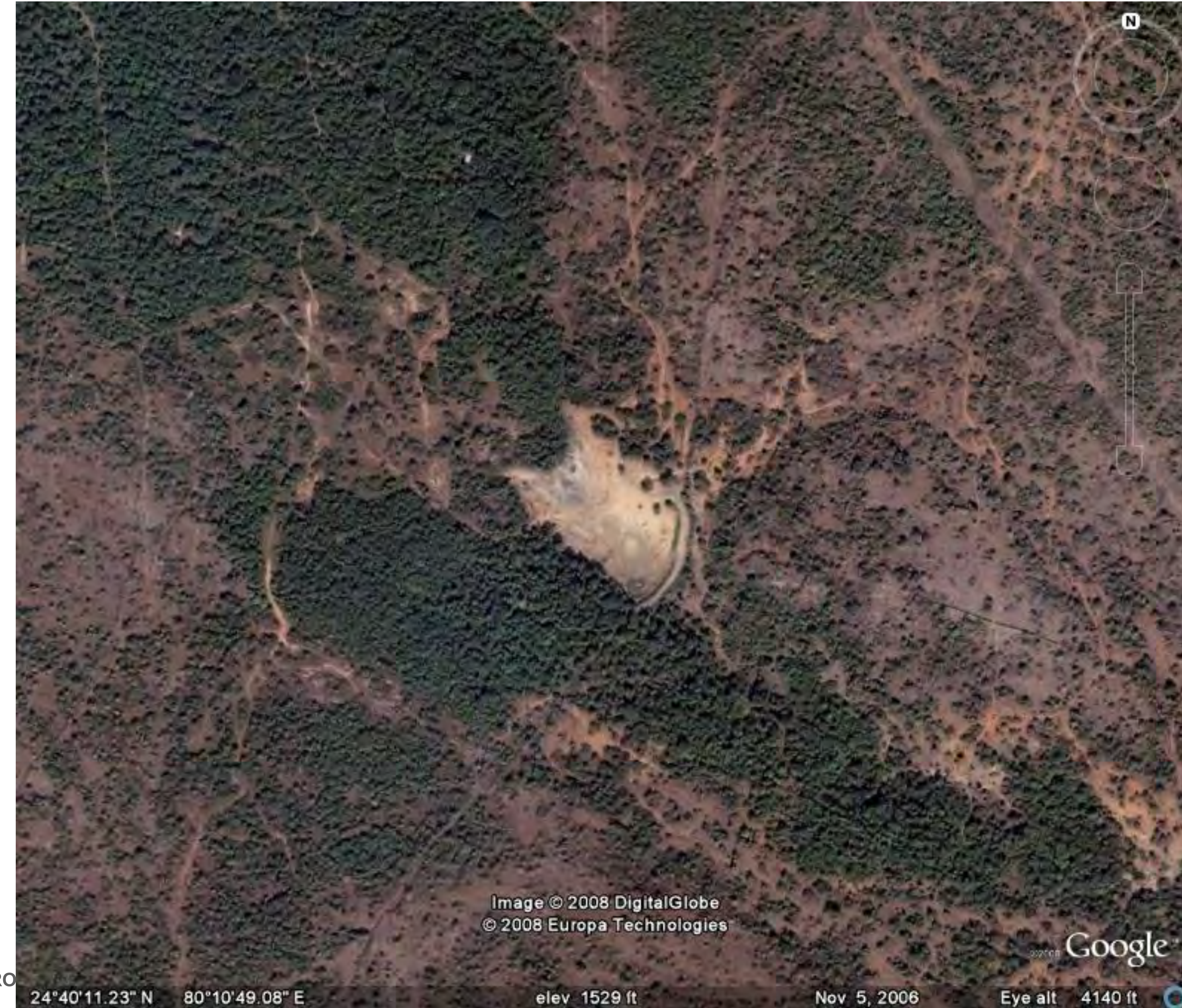
GREEN BUILDINGS

HOW TO MAKE YOUR BUILDING GREEN

CERTIFIED • CERTIFIED • CERTIFIED •

For A Sustainable Future
Ontario Green Building Resource Centre




N
Image © 2008 DigitalGlobe
© 2008 Europa Technologies
Google
24°40'11.23" N
80°10'49.08" E
elev 1529 ft
Nov 5, 2006
Eye alt 4140 ft


JAN 2008

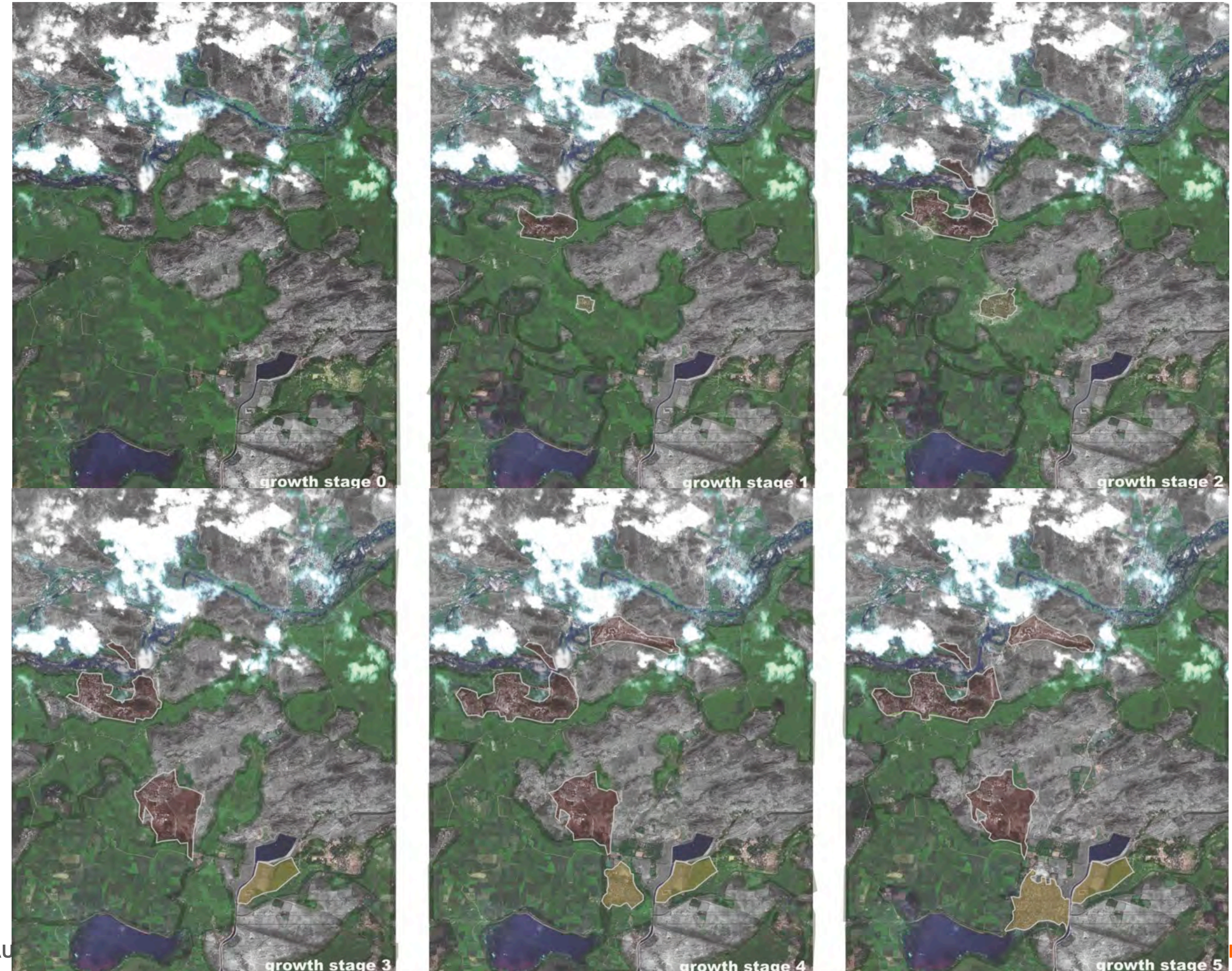
MAY 2008

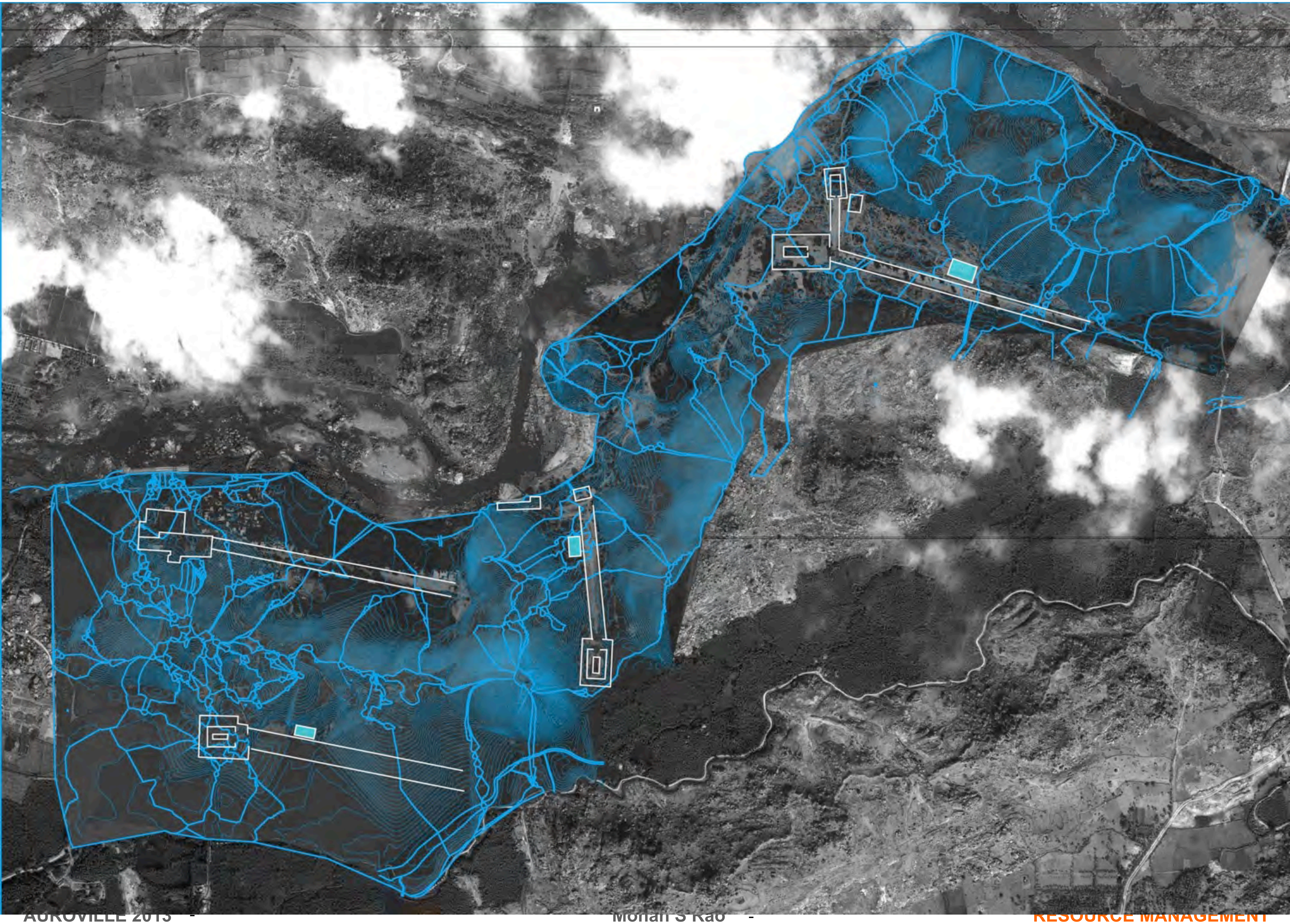
OCT 2008

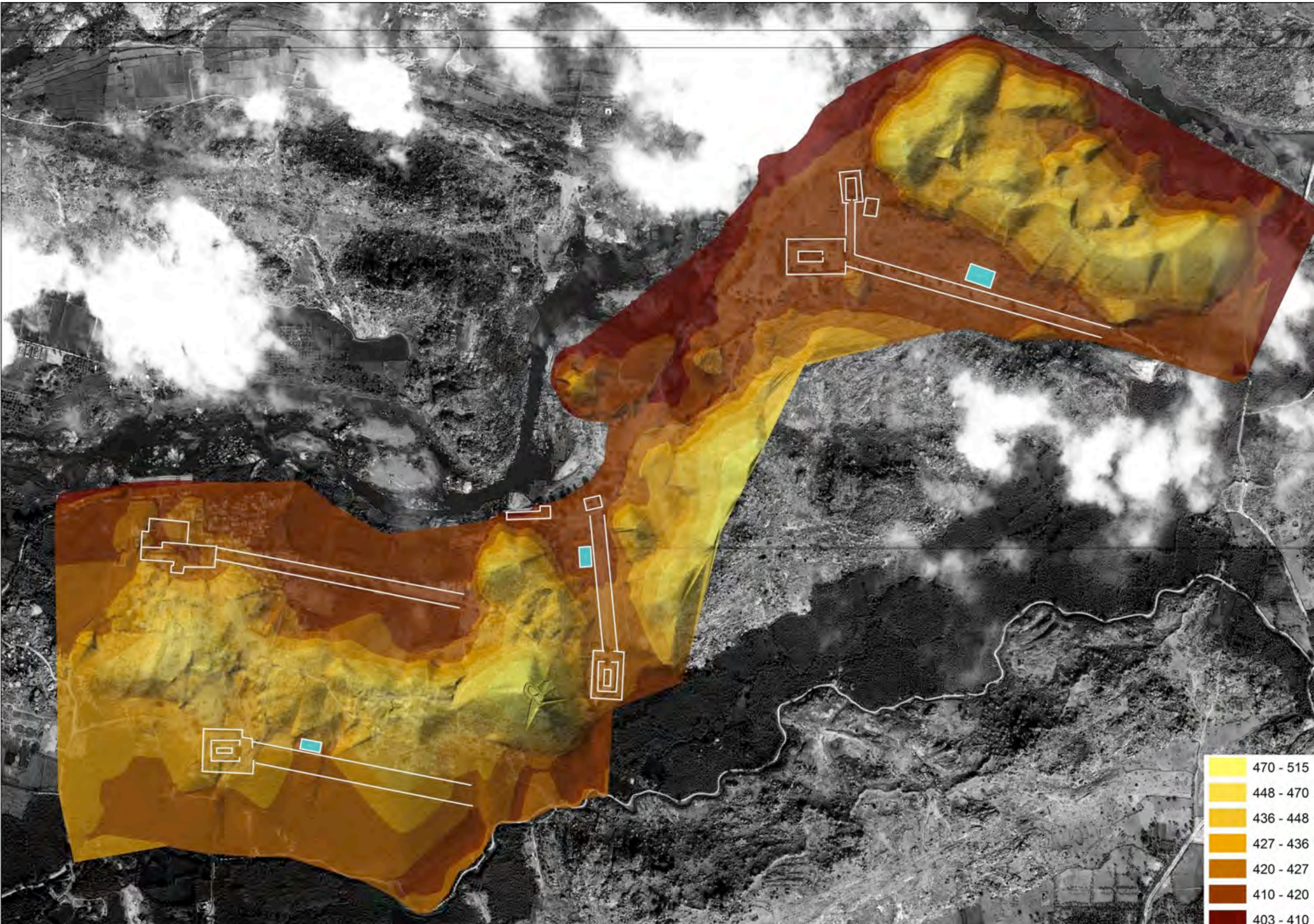
AUG 2008

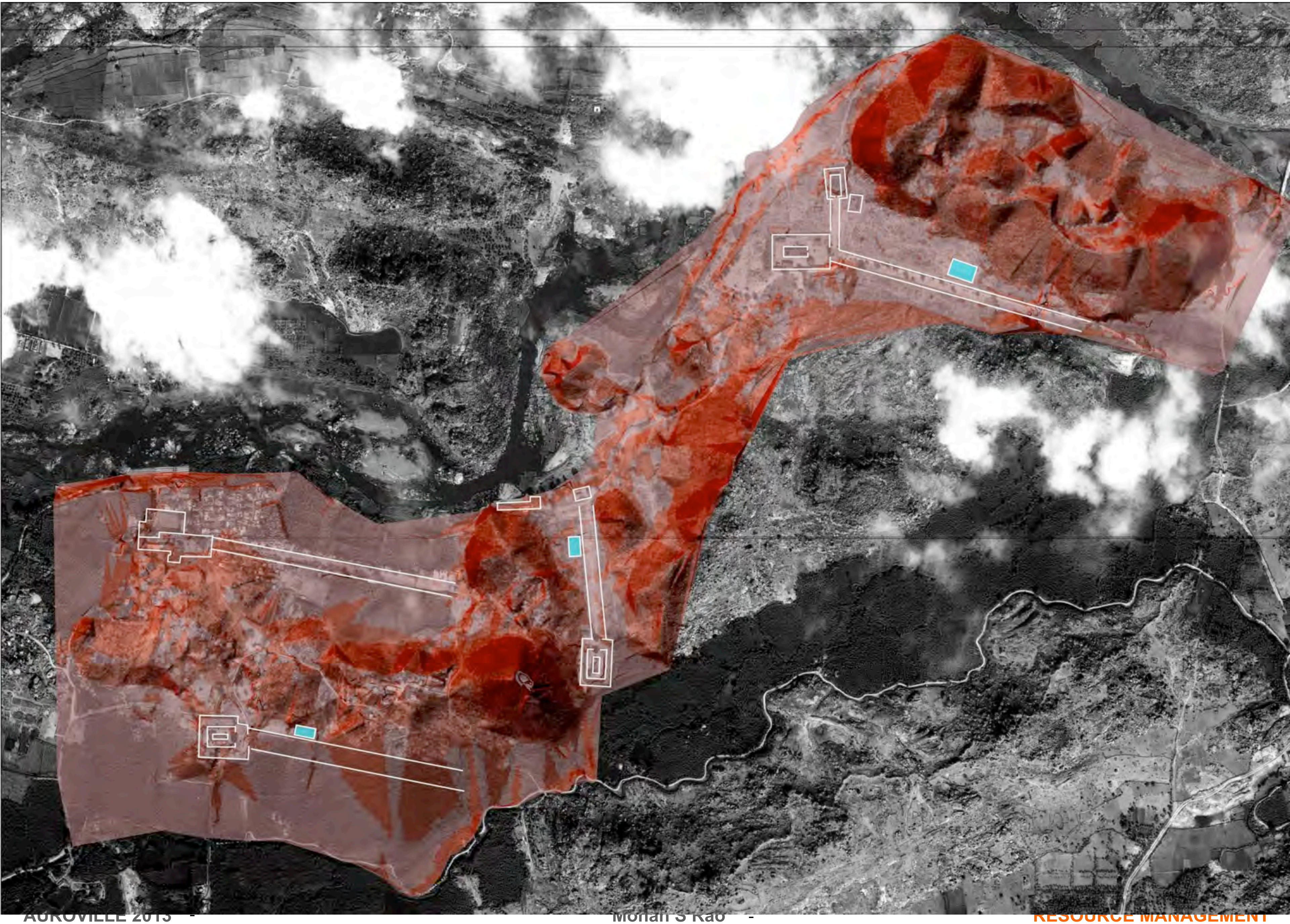

MAY 2008

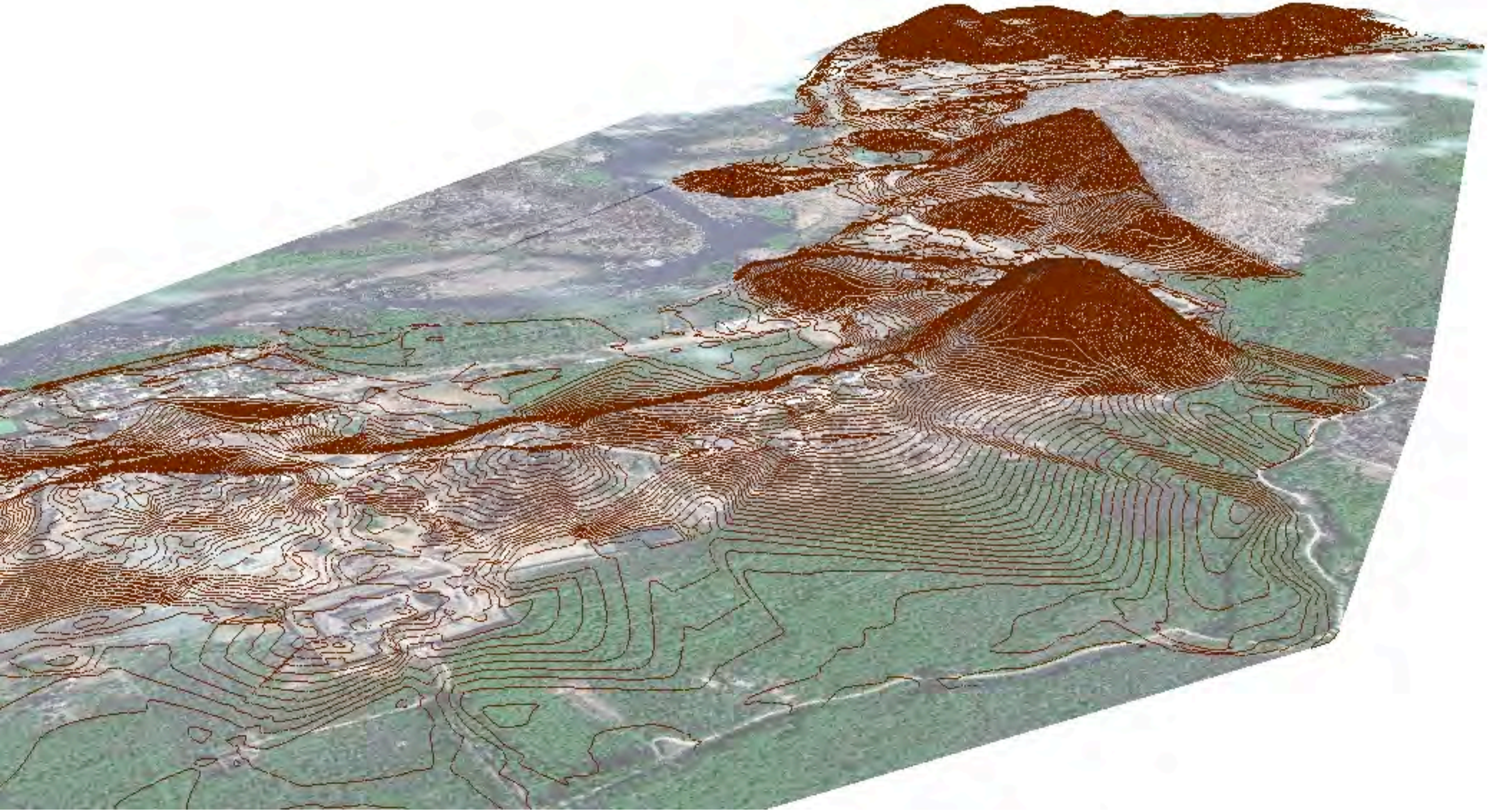

AUG 2008

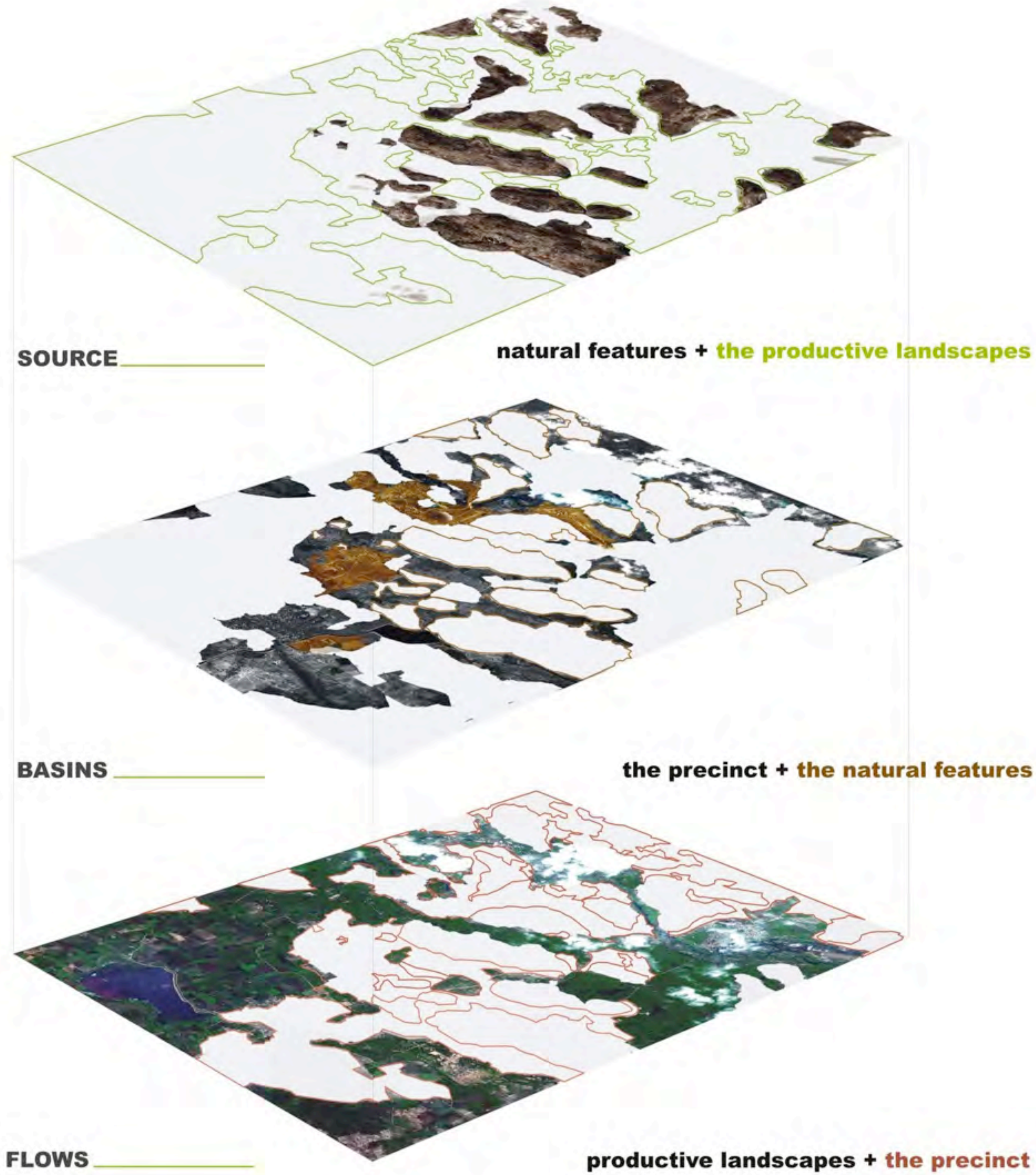

growth stage 0
growth stage 1
growth stage 2
growth stage 3
growth stage 4
growth stage 5



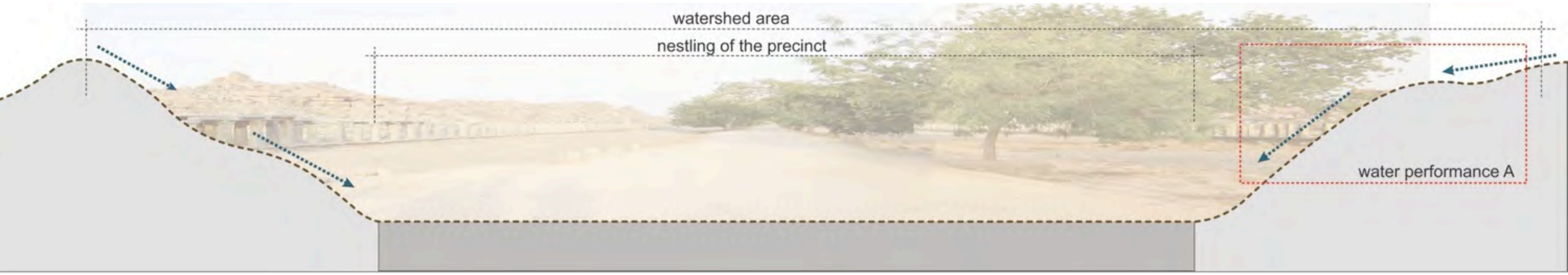

470 - 515
448 - 470
436 - 448
427 - 436
420 - 427
410 - 420
403 - 410

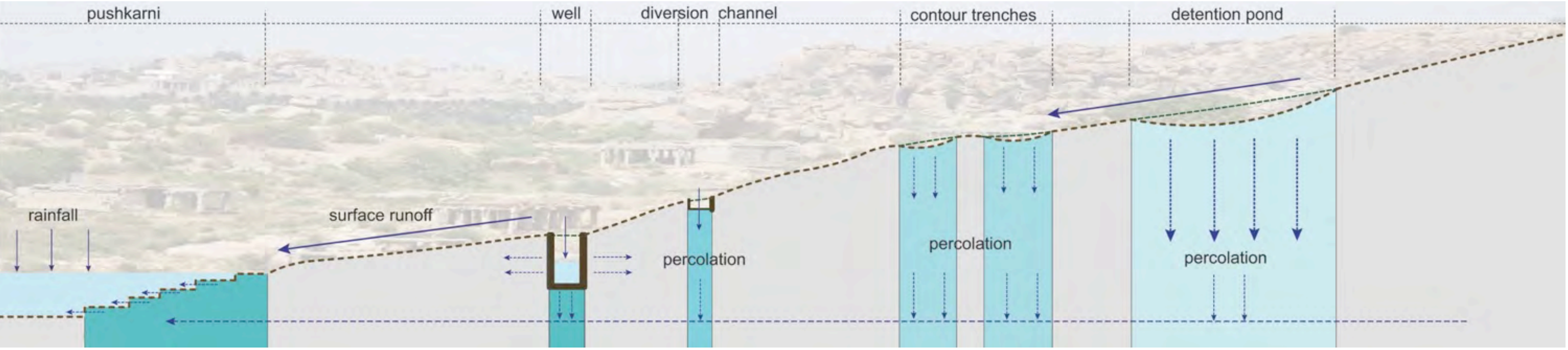





SOURCE
natural features + the productive landscapes
BASINS
the precinct + the natural features
FLOWS
productive landscapes + the precinct




watershed area
nestling of the precinct
water performance A


pushkarni
well
diversion channel
contour trenches
detention pond
rainfall
surface runoff
percolation
percolation
percolation


Dec 2003


Feb 2004


Jan 2005


Sep 2005

1. WATER INFRASTRUCTURE

2. ECOLOGICAL NETWORK

3. LANDSCAPE STRUCTURE

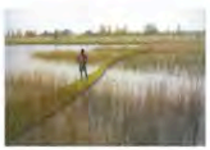
4. CONNECTIVITY NETWORKS

Based on the land analysis and the existing circulation and built profile , the above diagram represents the proposed Water System structure within the campus. Due to the response to various parameters such as flooding conditions, existing building profiles, issues of land management, the water structure has been categorized based on its interface with each parameter.This allows for different experiential and more importantly environmental expression to the water structure as a contiguous network within the campus. The water system thus identified, becomes the primary infrastructure to orient and distribute the character of Open Spaces in the Campus.

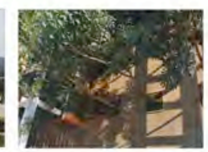
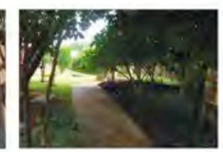
The diagram above represents the various Ecological Network within the campus that have been drawn upon based on the Water System established. The Ecological Corridor have been distributed as **Scrub Lands, Wetlands, Grasslands, Productive Landscape , Orchards, Riparian Vegetation** and **Hedgerows.**
Each of this zones are determined based on their environmental and ecological response and related to Water System established. Though each of the zones responds different to ecological and aesthetical demands of the campus, the overlapping and interlocking of these zones are seamless to unify the character for the Campus

Based on the Environmental responses to the larger campus that have been established , the above diagram represents the structured landscape designed spaces , mainly the Formal landscapes that are formed within and in close proximity or direct response with the Built Fabric. The landscape treatment along the Ring Road and other secondary vehicular circulation path formed by Avenue Planting also is part of the treated landscape spaces. These spaces shall be designed with both hard and softscape spaces and integrated with necessary landscape elements to enhance the usability and aesthetics of these spaces.

The diagram maps, all the Circulation spaces both Pedestrian and Vehicular that have been reflected in the Architectural Site Plan. Apart from the established Circulation routes, the diagram also indicates the informal set of pathways that have been woven within the landscape structure and connects the campus spaces through irregular patterns , experiences and connections.These connections apart from the formal pedestrian paths established in close interface with the buildings shall form the most accessible rote for students in the campus and allow for many informal gathering spaces and events to occur along its intersection with the landscape




RIPARIAN URBANISM

The edge along the River though technically not part of the Campus site need to be strengthened through careful of uses of Riparian vegetation that encourage the Natural Ecology along the River bed and also helps in protecting the banks of the river from eroding.

WALKWAY AND CYCLE TRACK

Apart from the Pathways integrated within the larger campus, all ROW as indicated in the Master Plan shall have a walkway /cycle path running along its edges. The walkway shall be buffered and shaded by vegetation and at certain points expanded to form Public Plazas with shading.

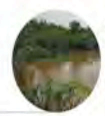
CARRIAGEWAY CHARACTER

The Carriageway of different widths as proposed in the Master Plan shall be treated with Avenue Plantation with dense undercover. The Planting and vegetation shall be grouped in a manner that it cuts the radiation from the road surface and also controls dust pollution in the campus

ECOLOGICAL CORRIDOR

The Ecological corridor integrated within the campus shall be a network of spaces, that would contribute in relation to the water system towards the overall land health management of the campus. It would include varying densities and ecologically contributing vegetation species, as well as measures that contribute to control flood , erosion as well increase the resilience of the campus. This corridor shall also include formal as well as well as informal pedestrian corridors that would link the overall Campus movement.


DETENTION POND / RESERVOIR



Based on the overall water management scheme, certain areas of the site shall be treated as Detention areas to collect and harvest water that in turn would help in risks of reducing flood. These detention zones shall be naturally formed and treated with dense vegetation along its edges to improve the micro -climate of the Campus as well as contribute to local Biodiversity and Ecology.

ECOLOGICAL ISLAND

Ecological islands as shown in the section shall be formed in the surface of the Detention zone/ Reservoir and shall be naturally constructed. These ecological islands help in shading the large surface of the waterbody thereby reducing evaporation losses as well serve habitats for the Bird species

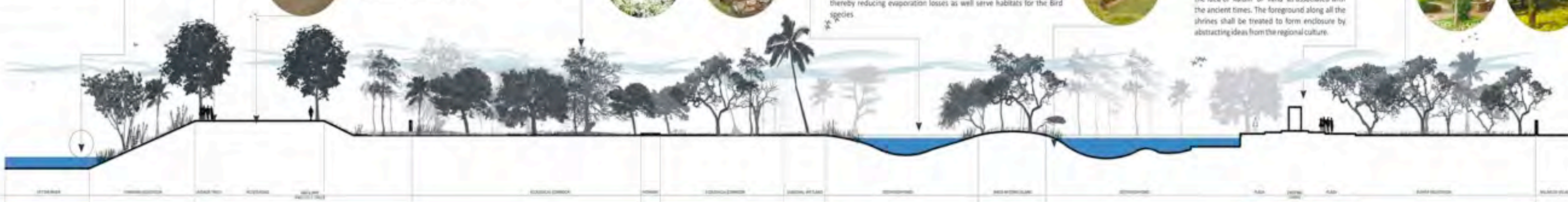
EXISTING SHRINE

Existng shrines shall be carefully integrated with the campus and as part of the Traditional wisdom from the region, most of the Detention zones shall be part of the Shrine so as to extend the idea of 'kulom' or 'kund' as associated with the ancient times. The foreground along all the shrines shall be treated to form enclosure by abstracting ideas from the regional culture.

BUFFER VEGETATION

Along the edges of the property dense buffer evegtation shall be incorporated that would not only act as visually buffering the Campus from the surroundings but would also form am informal layer of security for the campus.

All buffer edges shall be treated with native vegetation in various groupings contributing to the ecology with dense under cover to hold the soil and lessen chances of erosion

1. SECTION THROUGH KNOWLEDGE GROVE AND CEREMONIAL PLAZA

2.SECTION THROUGH CENTRAL OPEN SPACE

3.SECTION THROUGH KNOWLEDGE GROVE AND ACADEMIC SCHOOL

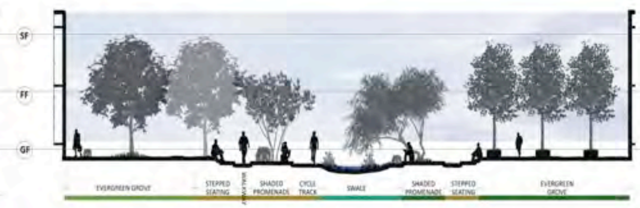
4.SECTION THROUGH OPEN SPACE BETWEEN ACADEMIC BLOCKS

5.SECTION THROUGH ACADEMIC BLOCK

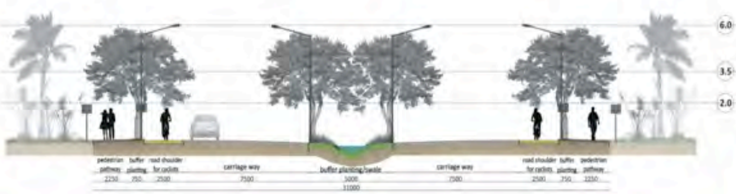
6.SECTION THROUGH BUILDING INTERFACES

7. SECTION THROUGH THE OPEN SPACE BETWEEN THE SPINE AND THE HOSTEL BLOCK

8.SECTION THORUGH OPEN SPACE BETWEEN ACADEMIC SCHOOLS

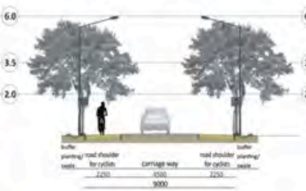


A.1 TYPICAL SECTION THROUGH 31 M WIDE ROAD



A.2 TYPICAL SECTION THROUGH 18M WIDE ROAD

A.3 SECTION THROUGH 9 M WIDE ROAD



A.4 SECTION THROUGH 6 M WIDE ROAD

9. SECTION THROUGH AGRICULTURAL PRODUCTION AND PRODUCTIVE LANDSCAPE SPACES

COMPUTATION OF ANNUAL WATER REQUIREMENT (IN LITRES)

A. Water requirement for elephants can be capped at 250 litre (drinking) + 300 litre (Miscellaneous):

550 l./day/elephant. Hence, 550x365 days x 100 nos.: **2,00,75,000 litres/ year.**

B. Domestic water requirement for Mahout settlements:

100 elephants x 2 dependants x 100 lpcd x 365 days: **73,00,000 litres/year**

C. Annual requirement for staff (30 nos.) at 60 l./day and visitors (500nos./day) at 50 l./day:

(60x365x30) + (50x365x500): 91,25,000 + 6,57,000: **97,82,000 litres/year**

D. Annual water requirement for Irrigation:

Site area x 1mm/sq.m. x (365-30 rainy days) x 1000: **11,76,68,750 litres/year**

Hence, Water Closure needs to be achieved for (A + B + C + D): **15,48,25,750 litres/year.** This requirement can be derived from water retained on site and from external water sources/ agencies.

ESTIMATED WATER RECHARGE AND RETENTION AT SITE

Site Area: **3,51,250 sqm.**
Annual Rainfall : **600 mm./ year.**
Recharge possible after deduction of losses to evapo-transpiration and percolation: **100-70: 0.3**

Therefore, recharge within site is [(Site Area + Area of higher elevation around site) x Annual rainfall x Recharge percentage]

(3,51,250 + 91,450) x 0.6 x 0.3: 79,686 cu.m. : **7,96,86,000 litres/year.**

But only **25%** will be perennially retained: 0.4 x 7,96,86,000: **3,18,74,400 litres/year**

Water that can be sourced from across the site (through a sluice network):
Annual rainfall x Area of site x Recharge percentage x Retention percentage:

0.6 m./year x 33,800 sq.m. x 0.1 x 0.4 x 1000 : **8,11,200 litres/year.**

Total sum of water available: 3,18,74,400+8,11,200: **3,36,85,600 litres/year.**

Therefore, the deficit is: 15,48,25,750-3,26,85,600: **12,21,40,150 litres/year.**

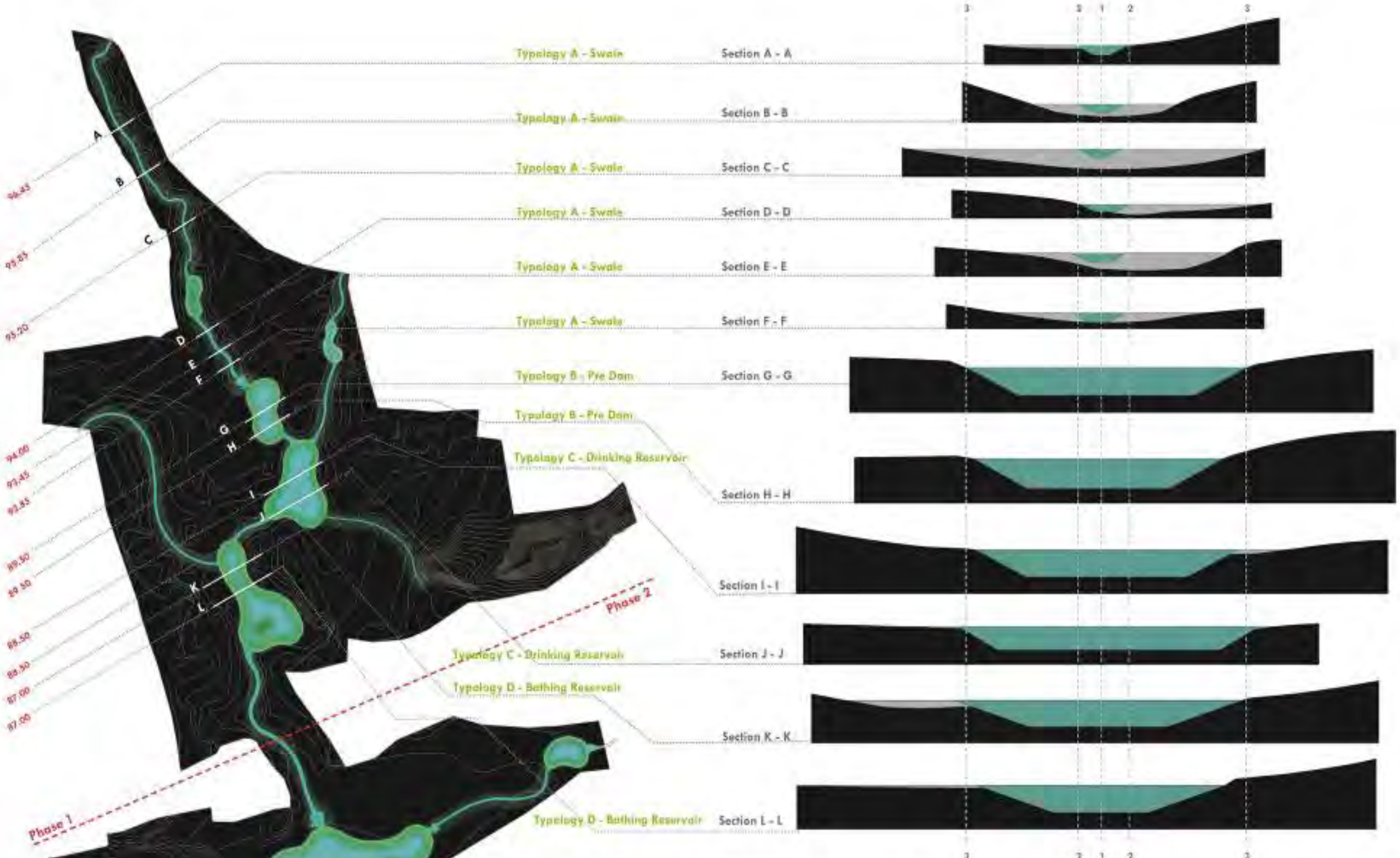
Note:
Recharge percentage will see a rise in its figure every consecutive monsoon, after treatment of site. This should reduce the expected shortage of water.

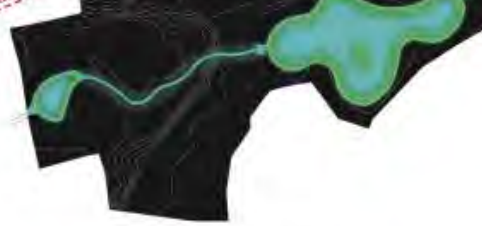
POSSIBLE SOLUTION TO OVERCOME WATER DEFICIT

Water for irrigation, which forms a considerable chunk of requirement, will definitely be high in the first few years of development. Hence, it is preferable to phase out the development. The second phase for future expansion can receive minimal treatment for the first few years, till the recharge and retention percentage of water within the site improves.

The estimated annual water requirement of this habitation including drinking, irrigation and bathing (for the elephants) is around 150 million litres. Scanty rainfall averaging less than 600mm per year renders water closure on site an unrealistic proposition. To reduce external dependency, design initiatives encourage the retention of the surface water and its recharge. A series of large, interlinked reservoirs at the central low-lying region of the site are to be fed by a network of vegetated swales, punctuated by retention basins and larger ponds.

Understanding that the total amount of rainfall incident on the site surface would not be sufficient to meet the water demands, it then became important to harness and redirect water from areas external to the site boundary through a system of swales. The external water sources identified were the surface run off from the barren hill, the natural depressions along the site edges and certain key valleys flowing along the boundary.





The water harnessed in the site is treated through a series of reservoirs of varying intensities and an integrated swale system. The system of reservoirs in the site vary not only in their physical form but also in their relation to topography as they incorporate the existing slopes of the terrain with minimum modulation. The system of reservoirs thus developed bear a strong hierarchical relationship that is based on two conditions - the principles of water management and on the relationship between elephants and water. The first components are the pre dams that hold water before the overflow reaches them to the reservoirs that also act as communal spaces for the elephants' mud bath. The second are the drinking water reservoirs with steeper sections, limiting direct access to water. The third are the bathing reservoirs integrated with ramps to allow access into the water for the mahouts to bathe the elephants. Thus the reservoirs become not only a system integral to the sustainable design initiative but also one that shapes the social interactions of the inhabitants of the site

Planting around the Perimeter

Kitchen garden patches for the mahouts

Levels of vegetation near elephants habitat

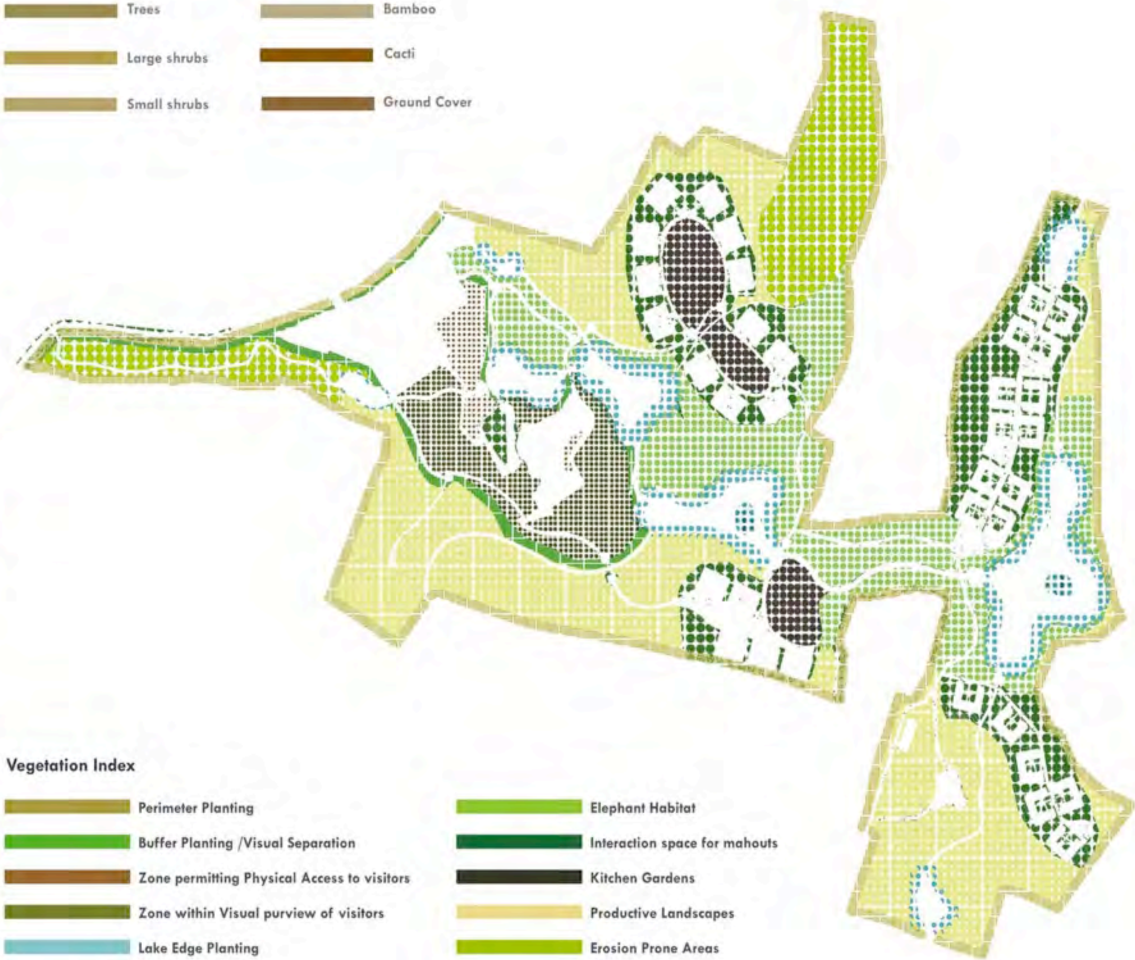
Space between visitor and elephant interaction

Spaces for the Mahout Community

Visitors Zone

Erosion Control Mechanism

Trees
Large shrubs
Small shrubs
Bamboo
Cacti
Ground Cover



Vegetation Index

Perimeter Planting
Buffer Planting /Visual Separation
Zone permitting Physical Access to visitors
Zone within Visual purview of visitors
Lake Edge Planting
Elephant Habitat
Interaction space for mahouts
Kitchen Gardens
Productive Landscapes
Erosion Prone Areas

Planting Strategy

Establishment of a balanced ecosystem in this degraded site formed the crux of the design policy, an approximation of the natural habitat of the elephants. The selection of species for multi-storied vegetation is derived from the larger region, more specifically based on the ecosystem of the Aravali ranges. Zone-wise interpretation of the vegetation, such as the definition of the perimeter and microcosms of grasslands and wetlands, are characteristics that modulate visual access to the elephant habitat. The root system of the indigenous plant palette stabilizes the topsoil layer in this erosion-prone site in conjunction with other soil conservation measures.

The park/habitat is planned as an 'adaptable system' that is expected to evolve and grow in time by incorporating the existing ecology and then creating its own micro ecology Time becomes an important factor in understanding the nature of the habitat as it allows processes - natural and social - to exchange and produce new relations, thereby enhancing the experience of the site.

The images illustrates the possible evolution of the nature and the spatial conditions of the reservoir with respect to ecological conditions over time and the associative relations that would emerge through it..

The approach to such a landscape articulation focuses on the conversion of a terrain that contradicts the 'traditional' vocabulary of its location but mediates and expresses itself to the larger ecosystem setting. Such a project in particular, probably stages a more impure and unstable organization of landscapes as it attempts to intermediate between disparate and at most times un-comprehendable forces working within the territory.

The space produced is more the nestling of user demands against ecology and environment and moving further towards cultural and functional tendencies and adjacencies. Though the need and the functioning of the landscapes has an embedded quality and quantity, its appropriation remains more open ended due to the constant oscillations between the user and the consumer of the space.

In the peak of summer, the incomplete lake holds more than 1 metre deep water

Existing Site Condition 2009

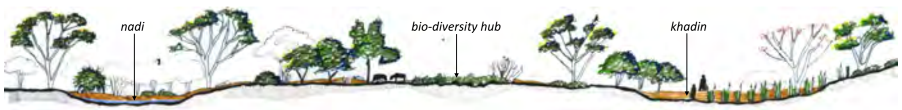
Evolution of the Lake - Stage 1 - illustration

Evolution of the Lake - Stage 2 - illustration

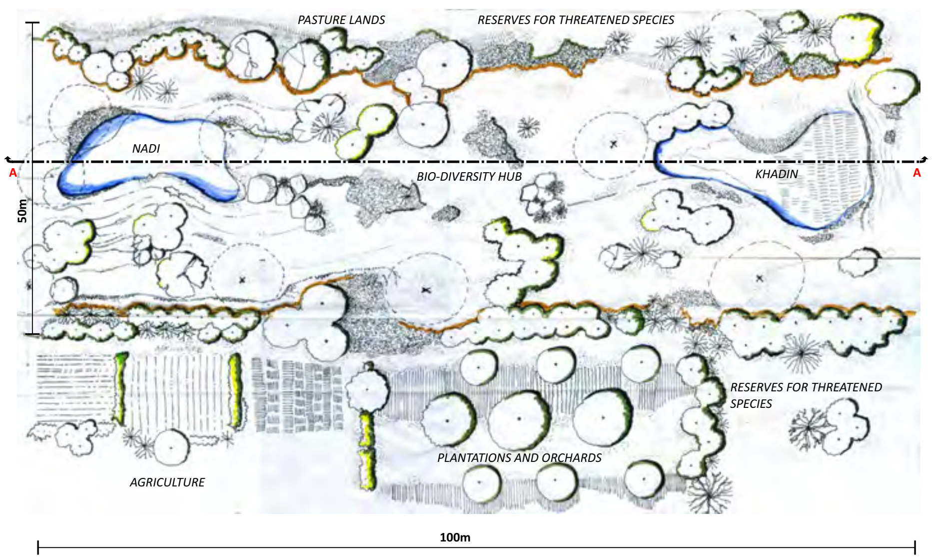
Gully Plug Treatment

INCORPORATING TRADITIONAL WATER HARVESTING FEATURES WITH PRODUCTIVE AND NATURAL LANDSCAPES

Section through pasture land, *nadi* and agricultural field



Section AA through *nadi*, bio-diversity hub and *khadin*



Water harvesting in and around bio-diversity hub (plan)

Jodhpur currently comes under the critical zone for depleting ground water levels. The site specifically has hydro-geological conditions such that ground water is available at 24-27m below in unconfined conditions only. Hence the need to create surface water retention ponds using the traditional system of water harvesting. These can be combined with agricultural practices like *khadins, nadis, johads* at a smaller scale or lined features like *tankas* where rate of evaporation is also controlled.

Each of these according to land use can be included with the bio-diversity hub, wildlife corridor, agriculture and horticulture fields, plantations and demonstrative landscapes. Topography conditions for each as below:

Nadi - Pond used for storing water from a natural catchment area during monsoons. Natural surface depression which could have stone walls on either sides to enhance retention period. *Nadi* a seasonal water source with water availability ranging from 2 months to 6 months depending on catchment characteristics, run-off and surroundings. Sandy plains (site) can have deeper *nadi*s with larger catchment area. Problems due to : heavy sedimentation, evaporation especially in dry seasons and seepage losses. For these, timely de-silting required, secondly if shady trees are provided near a *nadi,* the micro-climate can be enhanced to reduce evaporation losses, lesser surface area. Average water holding capacity of a *nadi* is 20000ltr (20m^3)

Khadin- harvest of rainwater on farmland and subsequent use of this water-saturated land for agriculture. This practice can provide an opportunity to tae up *rabi* crops without the use of groundwater irrigation. Millets can easily be grown in *khadins* which can also help restore the field fertility.

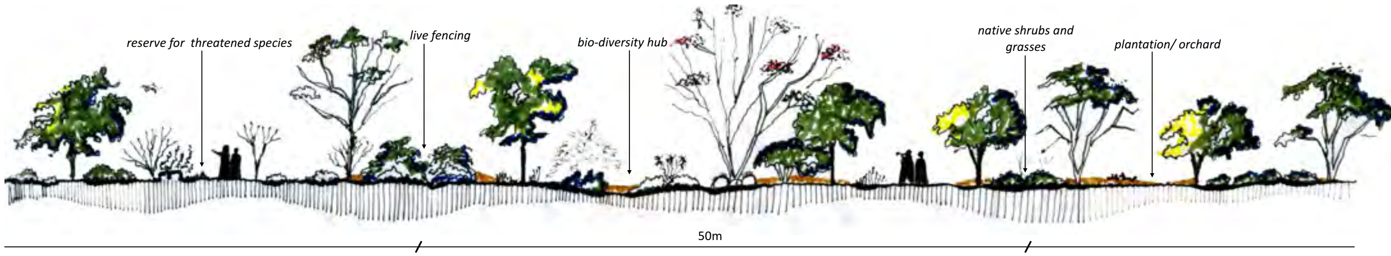
It consists of an earthen embankment built across the intended slope so that maximum rainwater runoff from the field can be conserved. Length of embankment rages from 100-300m (can be reduced as a part of demonstrative practice- a smaller catchment can be catered to)

- Shallow gravelly surface required
- Gently sloping plain with soils good for crop production
- Bund size depends on rainfall, catchment and soil type
- Provision of spillway to drain excess water
- Minimum 1:15 ration of *khadin* area to catchment required
- Good grass and plantations be maintained in catchment areas

Johads – Earthen check dams that capture and conserve rainwater, improve percolation and ground water recharge. Can be spread across the site

Paar – identification of a micro - catchment area *agor* within the site to create a *paar.* Here , *kuis* / *beris*/wells are dug with smaller mouths to contain evaporation losses. The number of *kuis* will depend on the type of catchment area, depth being around 6-8m. These could be more of artificial recharge wells that help tap run-off from surrounding areas. Water from these areas can be re-routed to use.

Kuis/ beris- dug next to tanks/ in *agor*/ to collect the seepage; usually 10-12m deep with *kuccha* structures, covered with wood planks.

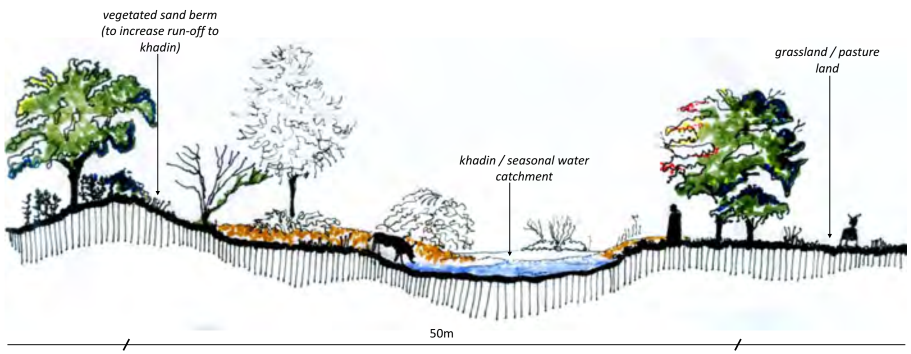


Section through vegetation reserves, bio-diversity hub and plantations/orchards

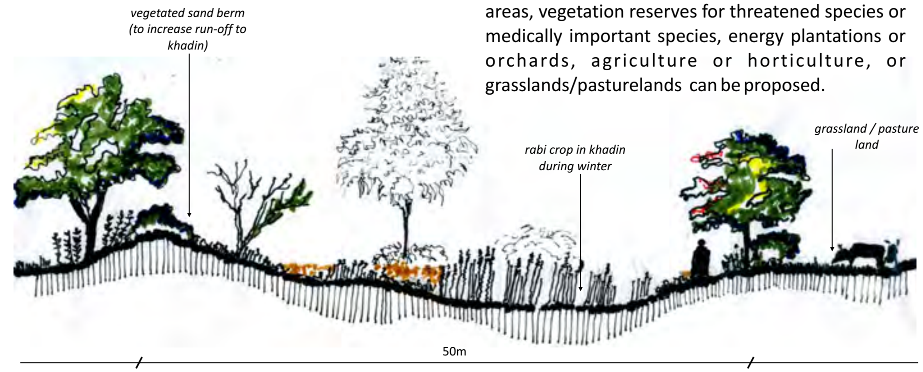
Bio-diversity hub deals with development and management of indigenous species of plants to regenerate natural landscape of the region. Best left undisturbed by heavy human interference, trails through this hub can be used for study purposes.

ECOLOGICAL RESTORATION OF NON-ARABLE LANDS

Starting with pioneering species of vegetation that occupy a piece of uninhabited land first, the regeneration process would continue with other native plant species of the region. As a buffer/transition from habitated spaces for such areas, vegetation reserves for threatened species or medically important species, energy plantations or orchards, agriculture or horticulture, or grasslands/pasturelands can be proposed.



Section through *khadin* during monsoons



Section through *khadin* during winters

WILDLIFE CORRIDOR AND BIO-DIVERSITY HUB

Trees

Prosopis cineraria -khejri
Tecomella undulata - rohida
Salvadora oleoides - Meetha jaal
Acacia senegal Kumath
Maytenus emarginata Kankera
Balanites roxburghii Hingoto
Salvadora persica peelu
Cordia gharaf Goondi
Moringa concanensis Sargooro
Acasia leucophloea – safed kikar
Anogeissus rotundifolia
Tamarix articulata- farash
Azadirachta indica Neem
Zizyphus rotundifolia Ber

Shrubs

Capparis decidua Ker
Leptadenia pyrotechnica Khimp
Balanites aegyptiaca Hingota
Acacia jacquemontii Bhu-bavali
Zizyphus nummularia Bordi
Acasia nilotica Babool
Grewia tenax Gangeti
Echinops echinatus Untkantara
Flueggia leucopyrus Ghatbor
Sarcostemma acidum kheer kheemp (outcrop)
Euphorbia caducifolia Thhor
Commiphora wightii Gugul
Calligonum polygonoides - phog
Suaeda fruticosa –potassium content good
Euphorbia nerifolia
Calotropis procera Aak

Herbs

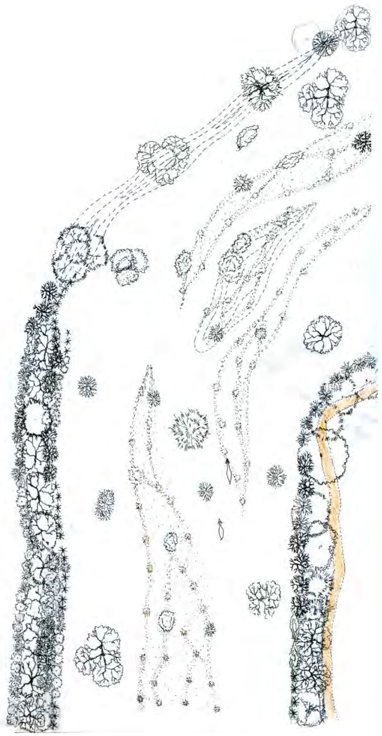
Tephrosia purpuria Buena
Solanum surattense Bhuringni (Chhoti Kateli)
Crotolaria burhia Sinia
Fagonia arabica Dhamasa
Indigofera cordifolia Bekria
Aerva javanica Bui
Cassia angustifolia Sonamukhi
Corchorus depressus Cham ghas

Climbers and creepers

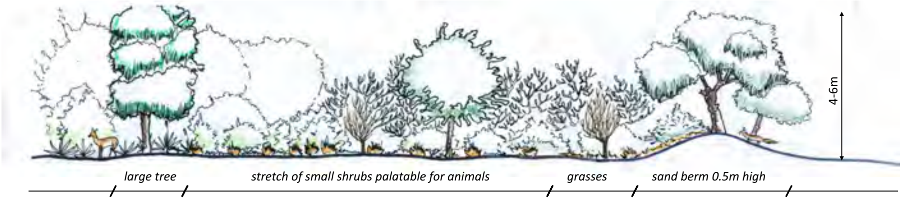
Cocculus pendulus Pilan
Citrullus colocynthis Tumba vel
Clerodendrum phlomidis Arni

Grasses

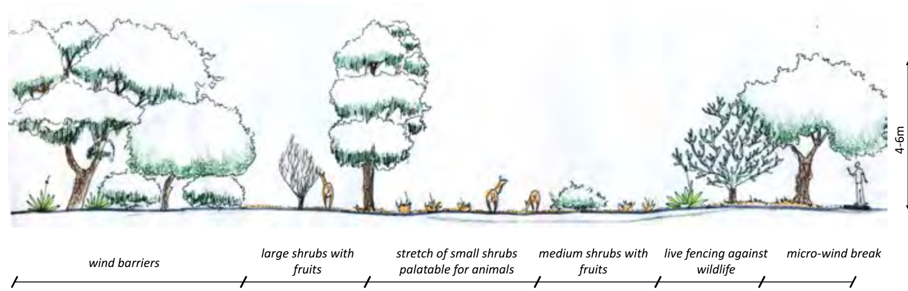
Cenchrus biflorus Bhurat
Desmostachya bipinnata Dab
Cenchrus ciliaris Dhaman
Lasiurus sindicus Sewan
Panicum antidotale Gramma
Aristida adscensionis Lapla



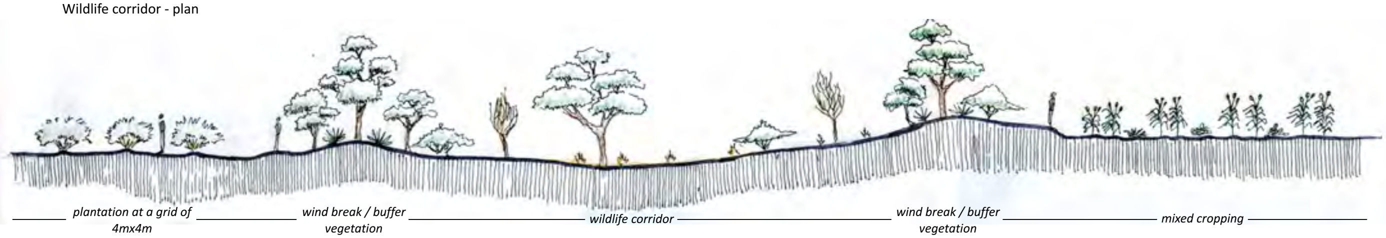
Wildlife corridor - plan



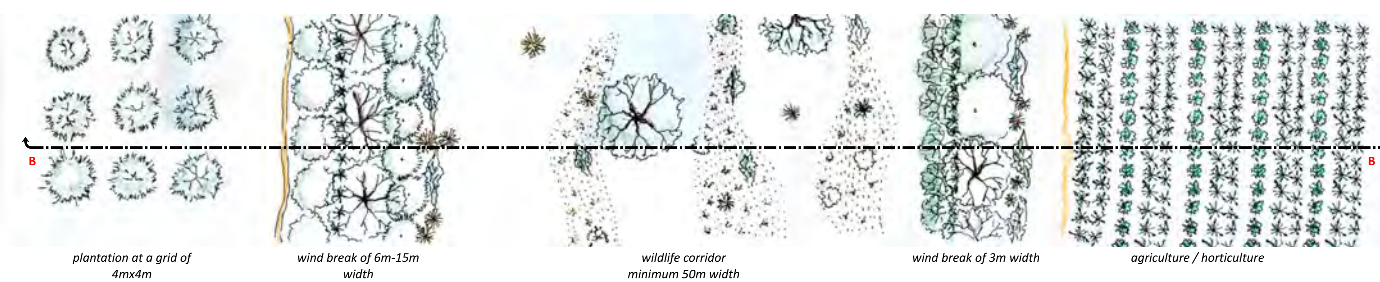
Longitudinal section through wildlife corridor



Transverse section through wildlife corridor - 30m-50m in length



Section BB



Incorporating wildlife corridors with productive landscapes (plan)

WILDLIFE CORRIDOR

Corridor is a linkage between habitat patches of wildlife. For an intervention of a huge scale like this campus design in an almost virgin landscape requires incorporation of wildlife corridors through the site to prevent an abrupt end to animal movements that have been going on since a long time. A continuous corridor may be required for large mammalian or even smaller reptilian species. For birds and certain other animals, stepping stones, discontinuous habitat patches might suffice. The site is inhabited or visited by species like blackbucks, *chinkaras*, gerbils, sand rats and reptiles. These corridors can be studies and visited by trails running parallel to the corridor without disturbing the fauna inside. Two kinds of corridor have been provided for:

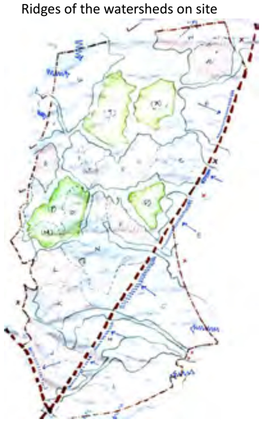
FAUNAL MOVEMENT FOR FORAGING ON THE GROUND

Continuous stretch of land 30 to 50 m wide runs from one end of the site to the other creating a conduit for black-bucks, *chinkaras* and habitats for gerbils, sand rats etc. The development of landscape is based on the scrub forest found in Jodhpur and nearby areas. Various species of plants required for feeding and shelter have been recognized and incorporated in the design of a wildlife corridor.

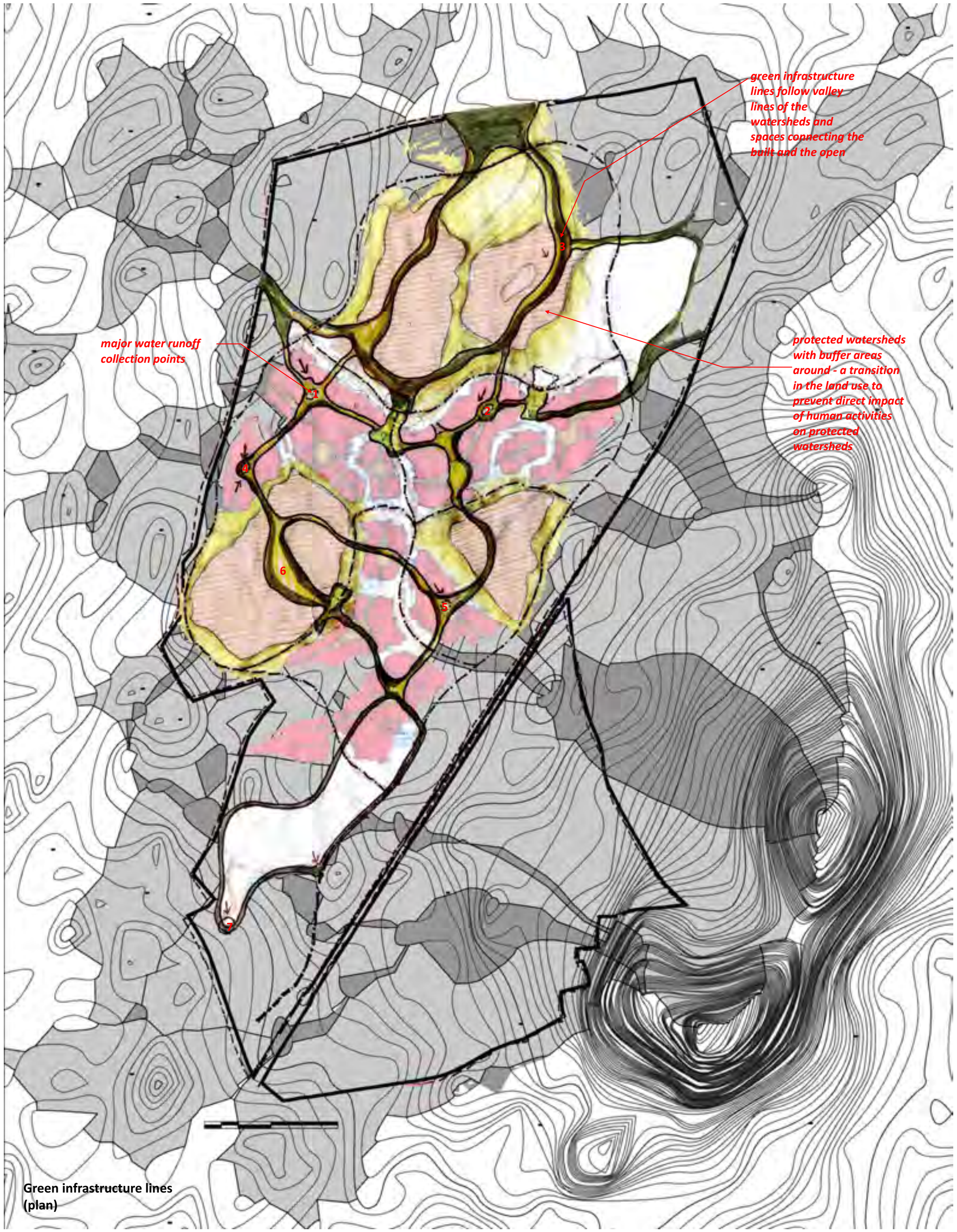
FAUNAL MOVEMENT WITH STEPPING STONES

Distance for movement between stepping stones (habitat patch or foraging ground) is determined by the ability to see each successive stepping stone by animal species. A maximum of 30-50 m space has been provided between agricultural fields, pasture lands, plantations of fruit bearing trees, bio-diversity hubs etc. The space has been incorporated as open grounds, scrub vegetation etc. for clear visibility between two patches.


Ridges of the watersheds on site


Watersheds - water flow directions


Protected watersheds



Green infrastructure lines (plan)

GREEN INFRASTRUCTURE

In a broader sense, green infrastructure consists of the inherent natural green resources as well as the built infrastructure comprising of storm water drains, waste water utilization set ups etc. which can be merged with the surrounding landscapes.

NATURAL

Ecological corridors:
wildlife corridors
bio-diversity hub

Special vegetation reserves:
For threatened species
For medically important species

Buffer plantations:
Shelterbelts and wind breaks
Woodlands '*orans*'
Orchards
Energy plantation
Horticulture
Agriculture

BUILT

Storm water collection:
Surface run-off (paved surfaces)
Roof top run-off
Reed beds
Water harvesting structures

Waste water and sludge treatment and re-utilization (DEWAT)
Settling tanks
Underground chambers
Gravel filter (constructed wetlands)
Polishing pond (constructed wetlands)
Vermicomposting pits
Biogas chambers

Circulation:
Pedestrian
Cycle
Vehicular

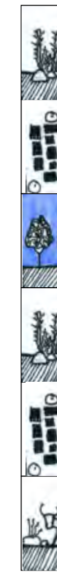
Other Services

LEGEND

Green infrastructure

Built infrastructure

Buffer area around protected watersheds



GREEN INFRASTRUCTURE
THROUGH ECOLOGICAL CORRIDORS

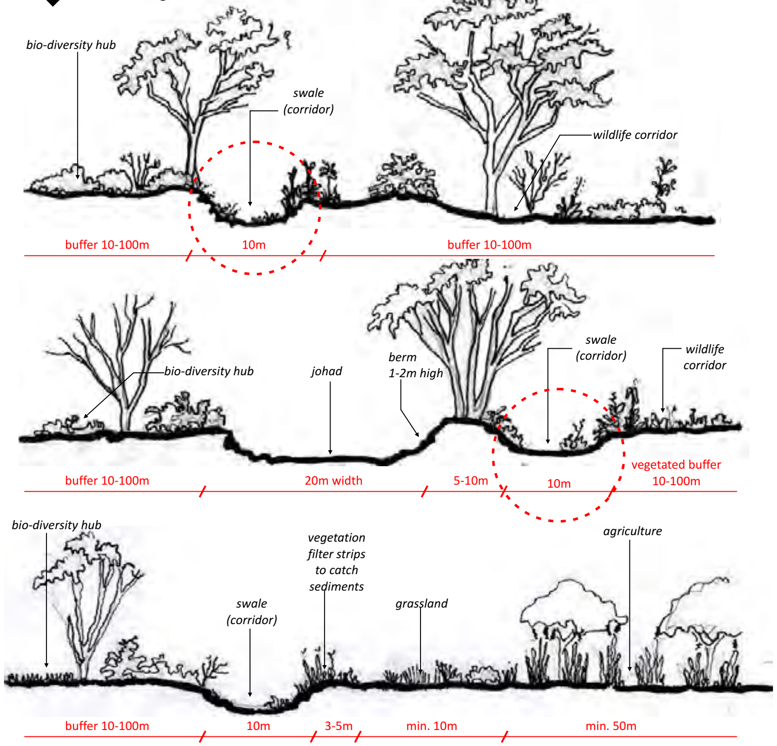
Green infrastructure comprising of the natural elements will have ecological corridors and demarcated native vegetation areas.

An ecological corridor will be either a movement corridor for the smaller and bigger mammals with islands of vegetation along, or part of the bio-diversity hub.

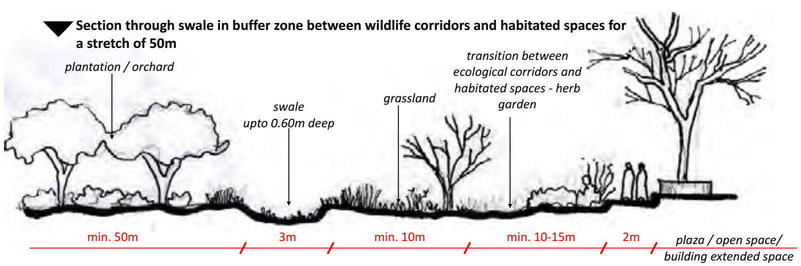
A typical ecological (wildlife) corridor of 50m stretch consists of

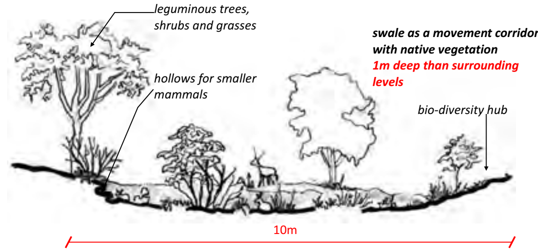
- 10m wide swale as a movement corridor
- a berm (1-2m high) on either or both sides of the swale, rather than just a depression, to exaggerate the slope and enhance the surface run-off into the swale; also for burrows / hollows of smaller mammals;
- vegetation specific to tolerance towards water as also drought conditions (native species) and provide food and fodder for mammals and avi-fauna;
- leguminous (nitrogen fixing ability) vegetation along the swale and waterbodies
- immediate buffer spaces between the swales and the surrounding areas of min. 10m

Sections through swale in wildlife corridors for a stretch of 50m

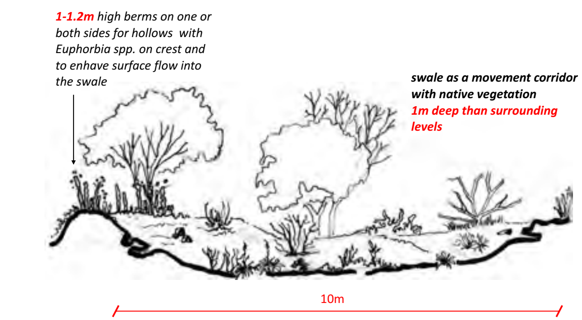


Section through swale in buffer zone between wildlife corridors and habitated spaces for a stretch of 50m

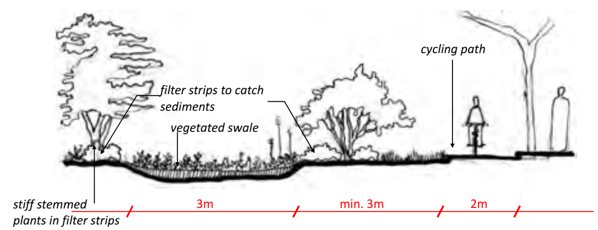




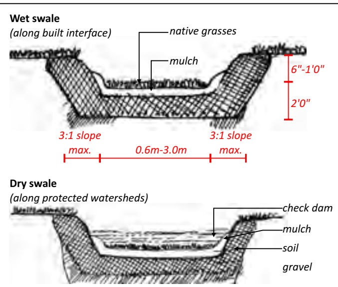
Detail section through swale in wildlife corridor-10m swath

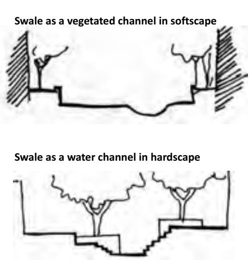


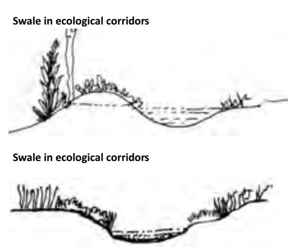
Detail section through swale in wildlife corridor 10m swath

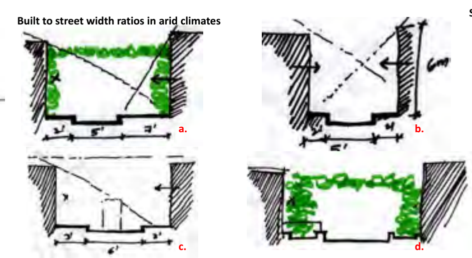


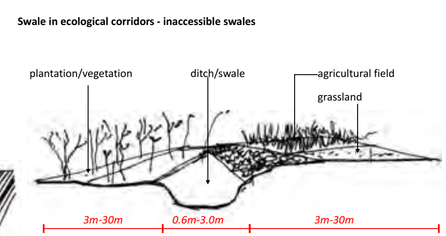
Detail section of swale in buffer zone between wildlife corridors and habitated spaces











Wetlands integrated with the Open Space Development


भारत