

INTERPRETATION CENTRE

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SUMMARY

The Cradle of Humankind World Heritage Site covers an area of over 47 000 hectares in the north-western corner of Gauteng, straddling the boundary between Gauteng and North West Provinces. The area is of outstanding universal value as it contains a complex of palaeontological and palaeo-anthropological sites which have yielded some of the most valuable evidence worldwide of the origins of modern humans.

Embedded in the rocks found in the numerous dolomitic caves in the area are the fossilised remains of hominids, their lithic remains and fossils of other plants, animals and pollen. These give a complete picture of the hominids and their surroundings dating back over 3.3 million years. The richness and variety of these deposits, their excellent preservation in the caves, and the age of the specimens, make this area of world significance.

The aim of this dissertation is the development of an architectural product that aids interpretation of the meanings and values inherent in the COH WHS and its context. The design approach is rational and simplicity is explored in order to develop the building as communication medium and introduction to the context.

By its design, the building becomes an unobtrusive line in the landscape, focusing attention on the natural setting and exposing visitors to the unique character of this heritage site.

All architecture, without exception, is created to function in the time of the future. The future is uncertain, and human nature, changeable and inconstant, yet architecture must even then perform usefully throughout its lifetime. What we can do is gather fragments of life in the uncertain future and reconstruct them in the present. Architecture resembles archeology in this endeavor. Archeologists assemble an overall picture of the past using small fragments from ancient times. Architects assemble architecture using fragments from the future. The design of architecture thus involves a paradox it traces back to the future. Our clues in this endeavor vary from person to person, and our choices depend on the future life a building is expected to lead. Just as archeologists find their clues in topography and materials, I, too, look to topography and materials for the solid footing, the dependable fragments, on which to build my architecture. Topography, the foundation of a building's landscape; and materials, the compositional elements of its detailing, are macro and micro. Neither is easily disturbed by the vicissitudes of human affairs. For architecture, as an object of human desire, they are problematic dimensions, hard to control and impossible to ignore. This shows, all the more, how topography and materials are architecture's basic contours.

Hiroshi Naito

[JA, 2002, Issue 46.pg4]

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ABBREVIATIONS

CBO	Community Based Organization
CEP	Community Equity Partnership
COH	Cradle of Humankind
COH-WHA	Cradle of Humankind World Heritage Authority
COH	Cradle of Humankind World Heritage Site
WHS	
DACEL	Gauteng Province Department of Agriculture, Conservation, Environment and Land Affairs
DEAT	National Department of Environmental Affairs and Tourism
E & C	Environment and Conservation
EA	Environmental authorization
ECA	Environment Conservation Act
EIA	Environmental Impact Assessment
EIP	Environmental Implementation Plan
EMP	Environmental Management Plan
GPG	Gauteng Provincial Government
GTA	Gauteng Tourism Authority
ha	Hectares
HCMP	Heritage Conservation Management Plan under the NHRA
HRA	Heritage Resources Authority, as described in the NHRA
IAPs	Interested and Affected Parties
IC	Interpretative Centre
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICOMOS	International Council on Monuments and Sites
IDC	Industrial Development Corporation
IDP	Integrated Development Plan, as described in the LGMSA
IECMP	Integrated Environment and Conservation Management Plan
IF	Institutional Framework
IKS	Indigenous Knowledge Systems
IMP	Integrated Management Plan, as described in the WHCA
IN	Interpretative Network
I&RC	Interpretation and Research Centre
IUCN	World Union for Conservation of Nature
LDP	Land Development Plan
LGO	The Gauteng Local Government Ordinance No. 17 of 1939
LSM	Living Standard Measure
MA	Management Authority
MEC	Member of the Executive Committee
MICE	Meetings, Incentive, Conference and Exhibition
MCLM	Mogale City Local Municipality
m.y.	Million years
NBA	The National Building Regulations and Building Standards Act No. 103 of 1997, as amended
NCO	The Gauteng Nature Conservation Ordinance No. 12 of 1983, as amended
NEMA	National Environmental Management Act
NGO	Non Governmental Organization
NHRA	The National Heritage Resources Act No.25 of 1999, as amended
NHS	National Heritage Site formally declared by SAHRA under the HRA

NMA	The National Monuments Act No. 28 of 1969, as amended up to the date of its repeal by the NHRA
NMC	National Monuments Council (now SAHRA)
PDLA	Provincial Department of Land Affairs
PHS	Provincial Heritage Site, as described in the NHRA
PNE	Protected National Environment declared as such pursuant to Section 16 of the ECA
PPAs	The Physical Planning Act No. 188 of 1967, and the Physical Planning Act No. 125 of 1991
	Palaeontological Unit for Research and Education
PWD	Public Works Department
PWV	Pretoria Witwatersrand Vereeniging
RC	Representative Council
SAHRA	South African Heritage Resources Agency
SANHP	South African National Heritage Site Programme
Satour	South African Tourism
SAWHCC	South African World Heritage Convention Committee
SES	Socio-economic Study
SMME	Small, medium and micro enterprise
the area	The area described as the fossil hominid sites of Sterkfontein, Swartkrans, Kromdraai and environs, South Africa
TTO	The Gauteng Town Planning and Townships Ordinance No. 15 of 1986, as amended, which will probably be repealed when the GDPB is enacted
UNESCO	United Nations Educational, Scientific and Cultural Organization
USP	Unique selling point
VFR	Visiting friends and relatives
VIP	Visitor Information Point
WHA	World Heritage Authority
WHC	World Heritage Convention
WHCA	World Heritage Convention Act No. 49 of 2000, as amended
WHS	World Heritage Site
Wits	University of the Witwatersrand
WTO	World Tourism Organization
WTTC	World Tourism and Travel Council

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Louis

Sonia

Shawn

Bernard

Cornus

Andrew

Andre'

Frans

FIN

Geology	Archaeology	Thousand Millions of Years Ago	
Precambrian earliest era		4.5	Creation of the earth
		4	Formation of the primordial sea
			First life, single celled algae and bacteria, appears in w ater
		3	
		2	
		1	
		Millions of Years Ago	
Palaeozoic ancient live		800	First oxygen-breathing animals appear
			Primitive organisms develop interdependent specialised cells
		600	Shell-bearing multicelled invertebrate
			animals appear
			Evolution of armoured fish, first animals to possess backbones
		400	Small amphibians venture on to land Reptiles and insects arise Thecodont, ancestor of dinosaurs, arises Age of dinosaurs begins
		Mesozoic middle life	
80	Prosimians, earliest primates, develop in trees		
60			
40	Monkeys and apes evolve		
20			
Cainozoic recent life			Ramapithecus, oldest know n primate w ith apparently man-like traits, evolves in India and Africa
		10	
		8	
		6	Australopithecus, closest primate ancestor to man, appears in Africa
		4	

Geology	Archaeology	Millions of Years Ago	
Lower Pleistocene oldest period of most recent epoch	Lower Palaeolithic oldest period of Old Stone Age	2	Oldest known tool fashioned by man in Africa
		1	First true man, <i>Homo erectus</i> , emerges in East Indies and Africa <i>Homo erectus</i> migrates throughout Old World Tropics
		Thousands of Years Ago	
Middle Pleistocene middle period of most recent epoch		800	<i>Homo erectus</i> populates temperate zones Man learns to control and use fire
		600	
		400	Large-scale, organized elephant hunts staged in Europe Man begins to make artificial shelters from branches
Upper Pleistocene latest period of most recent epoch	Middle Palaeolithic middle period of Old Stone Age	200	
		80	Neanderthal man emerges in Europe
		60	Ritual burials in Europe and Middle East suggest belief in afterlife Woolly mammoths hunted by Neanderthals in Northern Europe
		40	Cave bear becomes focus of cult in Europe Cro-Magnon man arises in Europe
	Upper Palaeolithic latest period of Old Stone Age	30	Man reaches Australia Oldest known written record, a lunar calendar on bone, made in Europe Asian hunters cross Bering Strait to populate North and South America Figurines sculpted for nature worship Fine artists decorate walls and ceilings of caves in France and Spain
		20	Invention of needle makes sewing possible Bison hunting begins on Great Plains of North America
Holocene present epoch	Mesolithic Middle Stone Ages	10	Bow and arrow invented in Europe Dog domesticated in North America

Geology	Archaeology	Years B.C.	
Holocene	Mesolithic	9000	Jericho settled as the first town sheep domesticated in Middle East
	(cont.)		
	Neolithic		
	New Stone Age	8000	Pottery first made in Japan Goat domesticated in Persia Man cultivates his first crops, w heat and barley, in Middle East
		7000	Pattern of village life grows in Middle East Catal Huyuk, in what is now Turkey, becomes the first trading centre Loom invented in Middle East Agriculture begins to replace hunting in Europe
		6000	Cattle domesticated in Middle East Copper used in trade in Mediterranean area
	Copper Age		
		4000	Corn cultivated in Mexico Sail-propelled boats used in Egypt Oldest known massive stone monument built in Brittany First cities rise on plains of Sumer Cylinder seals begin to be used as marks of identification in Middle East
		3500	First potatoes grown in South America Wheel originates in Sumer Egyptian merchant trading ships start to ply the Mediterranean First writing, pictographic, composed, Middle East
	Bronze Age	3000	Bronze first used to make tools in Middle East City life spreads to Nile Valley Plough is developed in Middle East Accurate calendar based on stellar observation devised in Egypt Sumerians invented potter's wheel Silk moth domesticated in China Minoan navigators begin to venture into seas beyond the Mediterranean
		2600	Variety of gods and heroes glorified in <i>Gilgamesh</i> and other epics in Middle East Pyramids built in Egypt
		2500	Cities rise in the Indus Valley

Geology	Archaeology	Years B.C.	
Holocene (cont.)	Bronze Age (cont.)	2400	Stonehenge, most famous of ancient stone monuments, begun in England Earliest written code of laws drawn up in Sumer
		2000	Chicken and elephant domesticated in Indus Valley Use of bronze spreads to Europe Eskimo culture begins in Bering Strait area Man begins to cultivate rice in Far East Herdsman of Central Asia learn to tame and ride horses
		1500	Invention of ocean-going outrigger canoes enables man to reach islands of South Pacific Oldest known paved roads built in Crete Ceremonial bronze sculptures created in China Imperial government, ruling distant provinces, established by Hittites
		1400	Iron in use in Middle East First complete alphabet devised in script of the Ugarit people in Syria
			Hebrews introduce concept of monotheism
	Iron Age	1000	Reindeer domesticated in northern Europe
		900	Phoenicians develop modern alphabet
		800	Celtic culture begins to spread use of Iron throughout Europe Nomads create a far-flung society based on the horse in Russian steppes First highway system built in Assyria Homer composes <i>Iliad</i> and <i>Odyssey</i>
		700	Rome founded
		200	Wheelbarrow invented in China Epics about India's gods and heroes, the <i>Mahabharata</i> and <i>Ramayana</i> , written Water wheel invented Middle East
		0	Christian era begins

DESCRIPTION

The Cradle of Humankind World Heritage Site (COH WHS) covers an area of over 47 000 hectares in the north -western corner of Gauteng, straddling the boundary between Gauteng and North West Provinces. The area is of outstanding universal value as it contains a complex of palaeontological and palaeo-anthropological sites which have yielded some of the most valuable evidence worldwide of the origins of modern humans.

Embedded in the rocks found in the numerous dolomitic caves in the area are the fossilised remains of hominids, their lithicultural remains and fossils of other plants, animals and pollen. These give a complete picture of the hominids and their surroundings dating back over 3.3 million years. The richness and variety of these deposits, their excellent preservation in the caves, and the age of the specimens, make this area of world significance.

Coupled with this, the area contains archaeological sites dating to the Early Stone Age, the Middle Stone Age, Late Stone Age, the Early and Late Iron Age, and recent history such as Anglo -Boer War relics. It also has significant ecological value containing many plant communities some of which are rare, with associated diverse animal communities. The area is largely unspoilt and scenically attractive, making it an important potential tourism destination. It is also close to the major urban areas of Pretoria and Johannesburg, international and local airports, and the freeway system. The area already boasts a number of private nature reserves and game farms, trout farms, the oldest Gold Mine in the Witwatersrand, arts and crafts outlets, small hotels, lodges, conference centres and restaurants.

The site extends across over 30 farms, many of which have been extensively subdivided, and of which most are in private hands. Therefore plans for its future management must be drawn up in close consultation with all interested and affected parties including the landowners and people living and working in the area.

SIGNIFICANCE

The global significance of the COH WHS is given in the “Application for inclusion on World Heritage List” where it is stated that:

The Sterkfontein Valley landscape comprises a number of fossil -bearing cave deposits which are considered to be of outstanding value, because they encapsulate a superbly preserved record of the fauna, including an invaluable record of the stages in the emergence and evolution of humanity, over the past 3,5 million years. This makes it one of the most important sites for human evolutionary studies and research.

It was the Sterkfontein fossil specimens that provided the proof that Australopithecus could be classified as a member of the Homidae (the family of humans) and that established Africa as the cradle of humankind.



1-01



1-02

1-01 Mrs. Ples [Dacel booklet, Unearthed so far, 2000. pg5]

1-02 View to east from site

IMMEDIATE CONTEXT

These cave deposits provide a unique testimony of the presence, the structure, functioning and behaviour of *Australopithecus africanus* which shows many ape-like features and several human-like traits.

Fossils of a robust australopithecine known as *Australopithecus robustus* or *Paranthropus robustus* have also been recovered, for example from Kromdraai and Swartkrans. There are three scientific viewpoints as to what these fossils may represent. Some scientists hold that *A. africanus* was the ancestor of early *Homo*, but not of the robust apemen, alternatively it was the ancestor of the robust apemen but not of *Homo*, or that *A. africanus* represents the last common ancestor of both early *Homo* and the robust australopithecines. Also, fossils of the genus *Homo* from about 2.0 million years onwards have come from Sterkfontein and are associated with early stages in the stone tool cultures of Africa.

Thus it was these fossil discoveries in the Sterkfontein Valley that resulted in an understanding of the time, place and mode of evolution of the human family. Also, given the number of fossil specimens, it has made it possible for palaeo-anthropologists to study populations of early hominids in terms of their demography, variability, growth and development, functioning, behaviour and ecology. The Sterkfontein Valley cave sites are also valuable for the study of extinctions of communities of animals and the conditions under which this ancient fauna either adapted or became extinct.

In addition to its global, scientific and research significance, the COH WHS is also significant in a number of other critically important aspects. Given the relative degree of land still in a natural state which has not been significantly transformed by the actions of people, the COH WHS has important ecological significance especially for the conservation of biological diversity and for ensuring that the spectrum of current ecosystems continues to be sustained into the future. The site is considered to be important for the conservation of Bankenveld grassland, an example of the natural Highveld landscape, and various rare and threatened species of plants and animals.

It is these natural, aesthetic, fossil and archaeological resources that give the area its important socio-economic significance. There is little doubt that the COH WHS is a key tourist destination for local, national, and international tourist markets. Its tourism significance is not only relevant to Gauteng but to the whole of South Africa and therefore needs to be developed further in order for its full potential to be realised. The COH WHS is considered in the light of its tourism development potential to be an important and significant area for investment. In view of this development potential, the site is significant in terms of contributing to South Africa's economic growth and development plan, and in a local sense to job creation, skills development, and the establishment of SMMEs and new markets for local products.



1-03

The potential is therefore for possible substantial and sustainable economic development that would significantly contribute locally, regionally and nationally. The resources of the COH WHS are also of value and significance if they are used for education and interpretation and to create learning opportunities for students and visitors to the site. The potential for creating awareness of the origins of humankind amongst people visiting the COH WHS is possibly unparalleled anywhere else. This is because of its richness in fossils and other resources, its easy access, and proximity to the greater Johannesburg metro area with its international airport that is the country's largest port of entry for foreign visitors.

PROTECTION, CONSERVATION, AND DEVELOPMENT OF THE CRADLE OF HUMANKIND WORLD HERITAGE SITE

Given the World Heritage Site status of the Cradle of Humankind it becomes incumbent on the South African government to fulfil its international obligations in terms of the World Heritage Convention to protect the site. This requires that the palaeontology and palaeo-anthropology sites are preserved, that all forms of activities that may lead to a destruction of these sites and their values is avoided and prevented. However, the COH WHS also represents an important opportunity to promote both the site's outstanding universal values and the World Heritage Convention. To achieve these objectives it requires that the site is developed and managed sustainably, and economic and social development is promoted. The site also represents an opportunity to support and promote government's growth and development strategy. Arising from these opportunities and by enshrining the protection and conservation of the palaeontology, archaeology, and natural resource base, the COH WHS may be developed further to the benefit of communities and the country. These perspectives are encapsulated in the stated vision for the Cradle of Humankind World Heritage Site, which is:

"to achieve an acceptable balance in the World Heritage Site between the conservation of cultural and natural resources, access, education, and scientific research, the interests of those living and working in the area, and its use for the economic and social benefit of the population at large, within the framework of the World Heritage Convention."

In striving to achieve this balance between protecting, conserving and developing the COH WHS, it will be essential that the South African and Gauteng provincial governments meet the conditions contained in the World Heritage Convention and its Operational Guidelines. Developments or activities that may threaten a World Heritage Site and its values may lead to the placing of a site on the List of World Heritage in Danger by the World Heritage Committee. In essence there are two primary conditions under the Convention that State Parties are required to comply with, namely, the conditions of integrity (for natural properties) and authenticity (for cultural properties). Both of these World Heritage conditions are seen to be of critical importance to the COH WHS and its future strategic development



1-04

1-04 Swartkrans "Ape Man" *Australopithecus robustus*, about 1,7 million years old
 [Dacel booklet, *Unearthed so far*, 2000. pg8]

FRAMEWORK

The Department of Agriculture, Conservation, Environment and Land Affairs (DACEL) of the Gauteng Government prepared the nomination proposal for the fossil hominid sites of Sterkfontein, Swartkrans, Kromdraai, and environs in 1998.

As part of a planning phase, DACEL appointed a team of specialists to undertake the preparation of an Integrated Environment and Conservation Management Plan. Included in this plan were a series of reports: a State of the Environment Assessment, Tourism and Marketing Plan, Infrastructure and Land Use Management Plan, a Communications and Promotions Plan, and a Stakeholder Participation Report. These reports were needed to support the nomination proposal and were prepared for submission to the World Heritage Bureau.

Due to the scope and magnitude of the COH WHS project, this Integrated Management Plan was used as framework during the research done for this dissertation project.

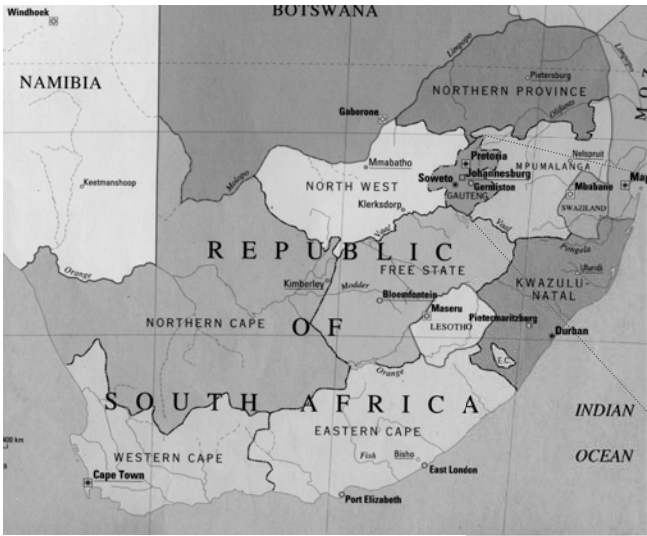
PROJECT BRIEF:

AIMS AND OBJECTIVES

- The proposal is aimed at developing an interpretative facility that:
- provide a broad contextual introduction to the natural, cultural and scientific heritage of the COH WHS and surrounding areas;
- provide opportunities for visitors to access a fossil excavation site and cave and learn more about the history and significance of palaeontological and palaeo-anthropological material, especially as it relates to humankind's search for its earliest ancestors;
- become a key tourist attraction for local residents and local and international visitors of all ages, offering an holistic interpretation of the COH WHS and surrounding areas that educates, entertains and enthrals;
- stimulate scientific research and related activity by providing a platform to make information about scientific processes and research findings accessible to the public, and offering facilities to support and encourage scientific research in the COH WHS and surrounding areas;
- promote educational and learning opportunities for the general public, including schoolchildren as well as students, scientists and other academics, through a range of activities and programmes;
- facilitate access to the scientific, cultural and historical heritage resources of the COH WHS in a way that avoids negative impact on the fragile environment; and
- facilitate the delivery of sustainable economic development to the local community in particular and the region in general.

GUIDING PRINCIPLES

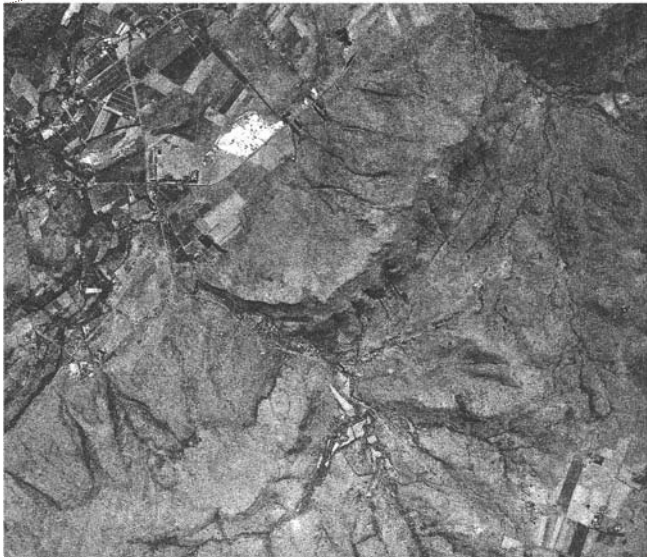
- In developing the proposals, the I&RC Technical Team was guided by the following principles:
- existing privately owned facilities and new public facilities should become integrated into an holistic network that facilitates the development of an holistic and integrated interpretation strategy by bringing into play the full breadth of the cultural, historical and natural significance of the site in an interconnected and interrelated way;
- while the palaeontological and palaeo-anthropological component will be given primacy, the thematic framework allows for the inclusion of all elements of significance and interest, from so-called pre-historic times up to the present;
- interpretative facilities should be viable and sustainable and facilitate the spread of benefits, both financial and other, to all stakeholders;
- exhibitions should encompass a wide range of themes and issues and should include interactive activities;
- interpretation media, including exhibitions and related activities, are to be integrated into the design of the building;
- the organisational and management structure should be developed so as to ensure optimal institutional capacity to effect the delivery of core functions to the interpretative network (IN) as a whole;
- the financial framework should accommodate and reconcile the diverse needs and interests of all stakeholders, while at the same time maximising opportunities for investment and enabling sustainability through creative income generation strategies and efficient management and organisation; and
- the staff component should provide optimal institutional capacity to deliver core services, and non-core functions should be outsourced to provide/facilitate community benefits.



1-05

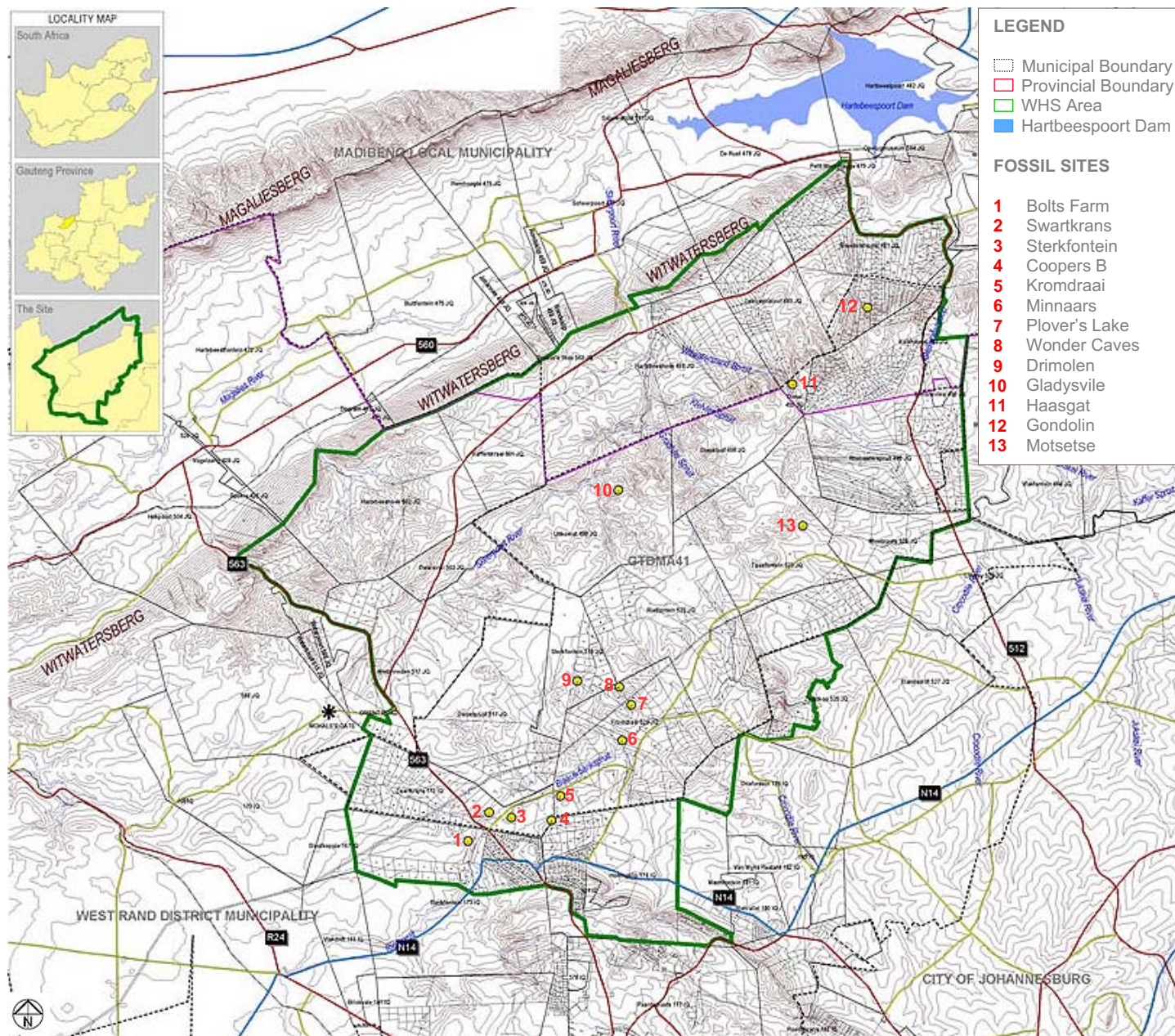


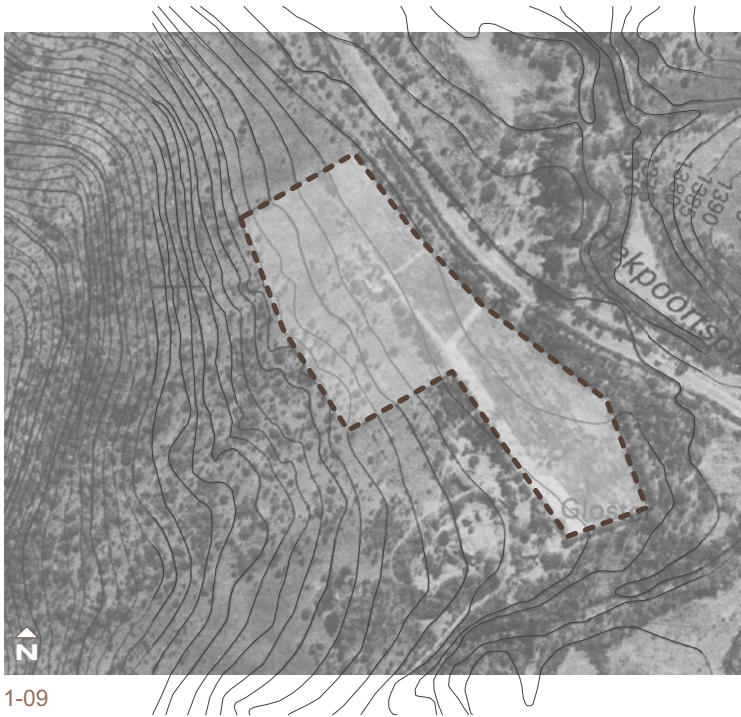
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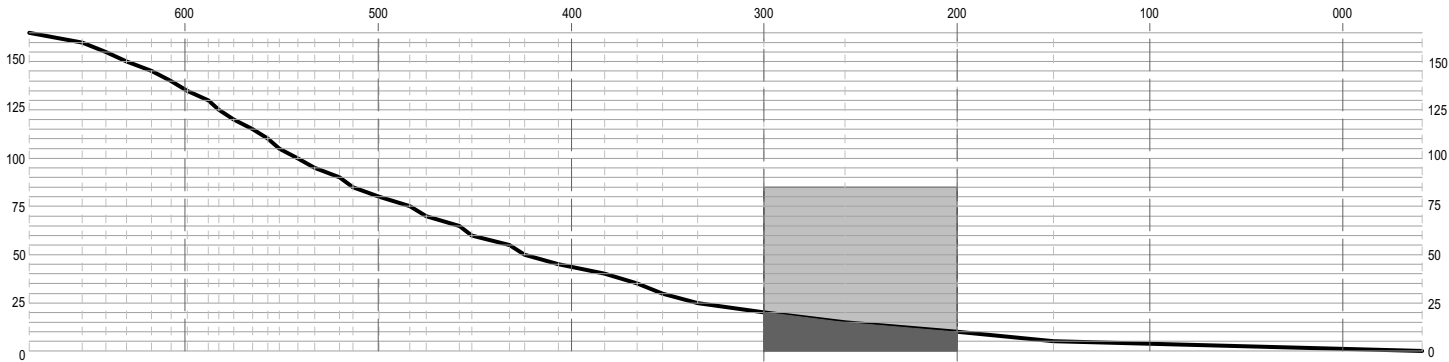
1-07

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1-06 Map of Gauteng province [Maskew, Miller, Longman, 1996. pg10]
1-07 Aerial photo of site [Landsurveyor General]





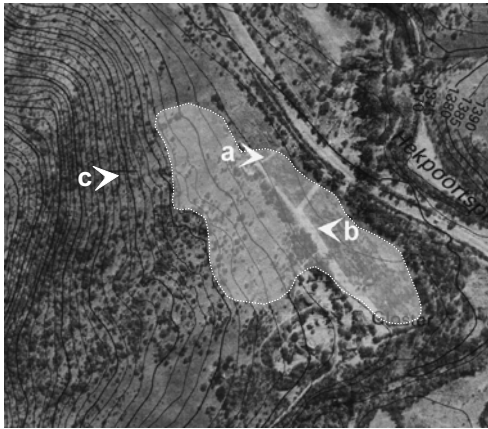
1-09



1-10

section site slope 1:11-1:12

1-09 Aerial photo of site indicating site borders and orientation
1-10 Section through site indicating the angle of slope at the location of the main building mass



1-11



1-12



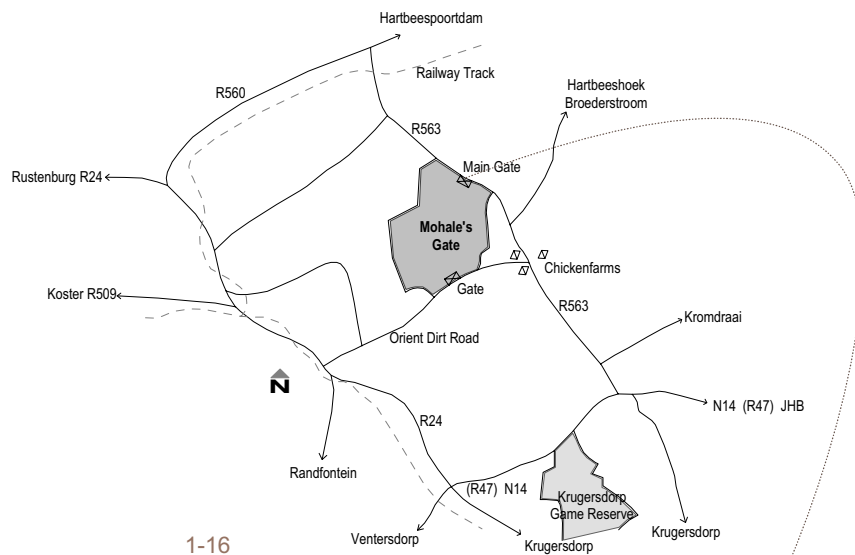
1-13



1-14

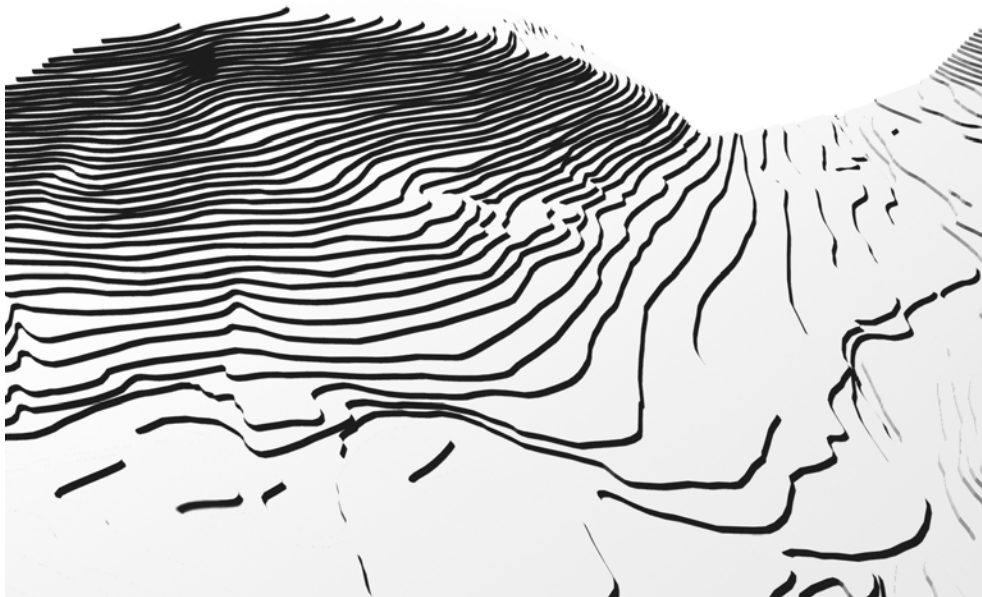
- 1-11 Aerial photo of site indication direction of views
- 1-12 View facing east from lowest part of site
- 1-13 View facing west towards site position at base of hill
- 1-14 Panorama view to the east from upper western part of building site





ACCESS

- Via the R563, a major road and the Orient road, a smaller un-tarred road
- Public transport limited
- Access easier for tour buses and private vehicles



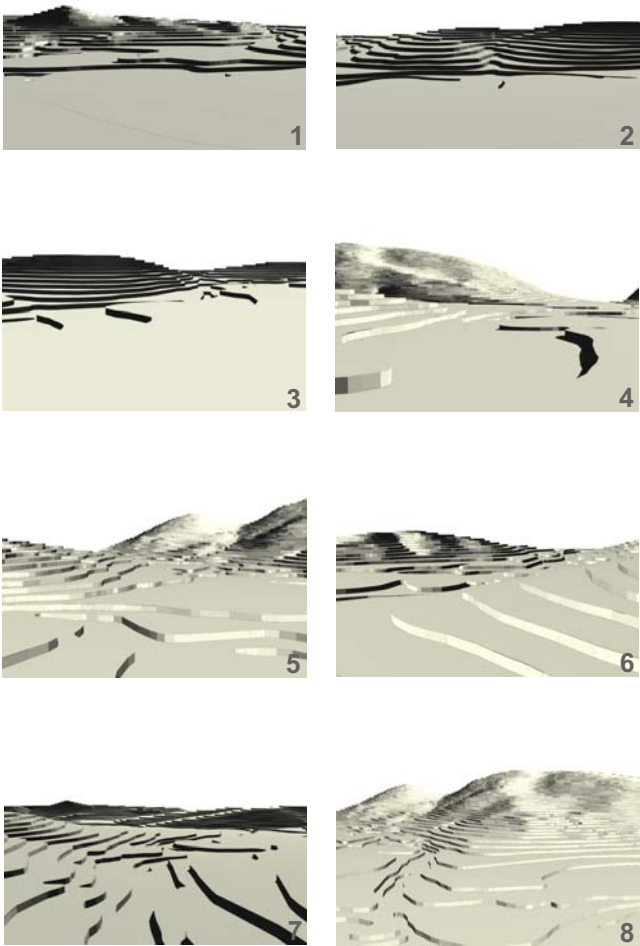
TOPOGRAPHY

The site comprises of moderate to steep topography. The slope of the possible building site varies between 1:11 and 1:12. This requires special attention to slope stability and substrate retaining. Hiking trails in the vicinity of the Interpretation Center will award visitors with scenic panoramas of the valley and COH WHS.

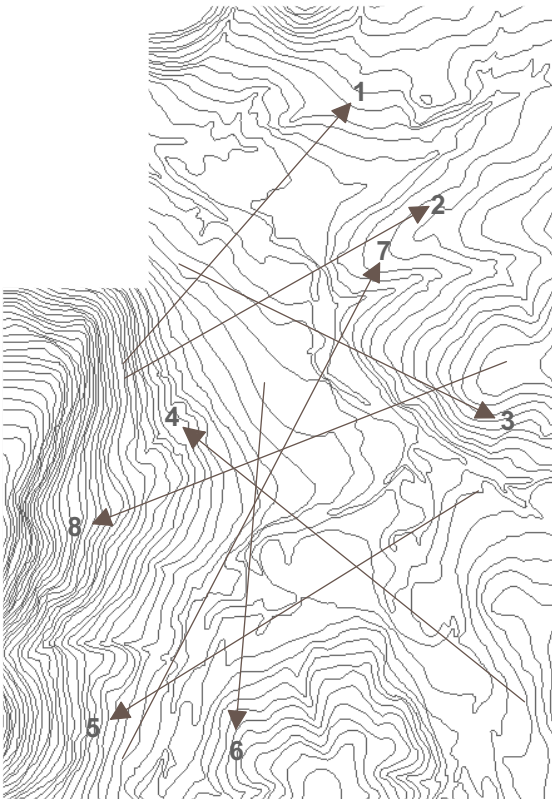
1-18 3D Topographical model of site and surrounding area

TOPOGRAPHY STUDY

Topographical study of site using 3D contour model.
Contours at 5m height intervals.



1-19



1-20

1-19 3D Topography models of site and surrounding area
1-20 Contour map indicating various view directions

CLIMATE

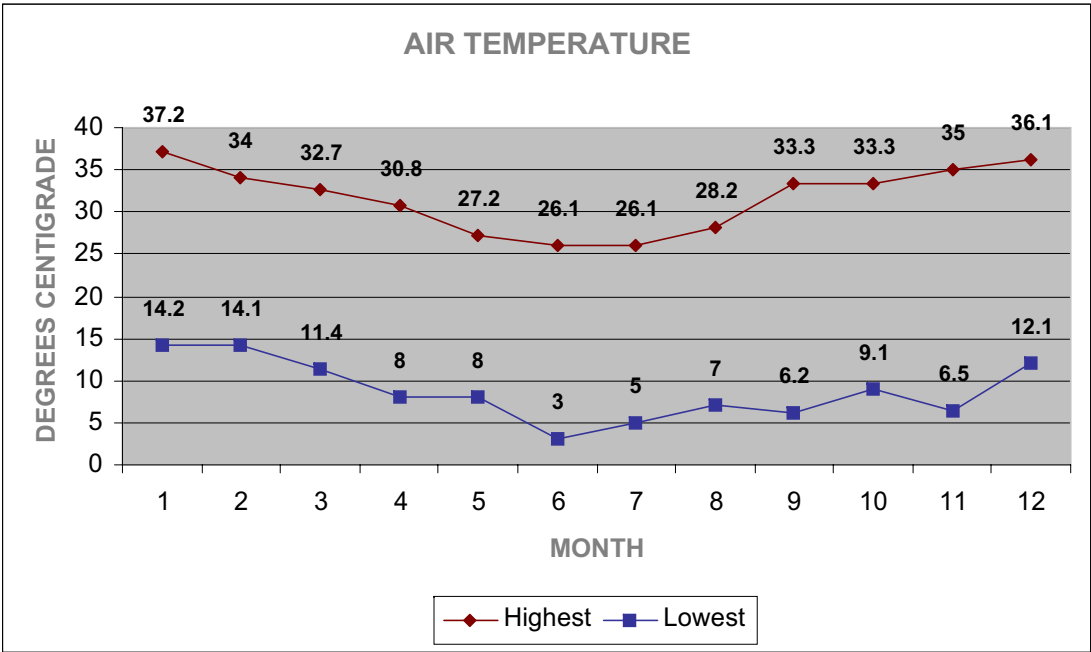
Climatic data taken at Krugersdorp, 20 km from Mohale's Gate site:

- Height- 1699 m above sea level
- Latitude- 27, 46 degrees east
- Longitude- 26, 06 degrees south

- Average humidity taken from 1951-1984- 75%

- Air temperature in degrees centigrade
- Averages taken from 1909-1984:

- Average precipitation taken from 1951-1984



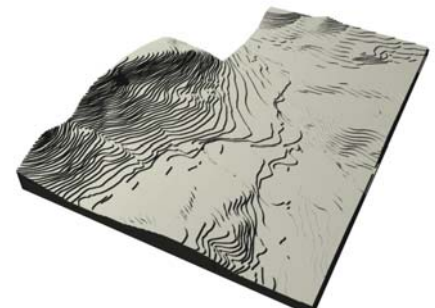
1-21 Table indicating min & max temperatures annually



summer 08:00



summer 12:00



summer 16:00



winter 08:00



winter 12:00



winter 16:00

1-22

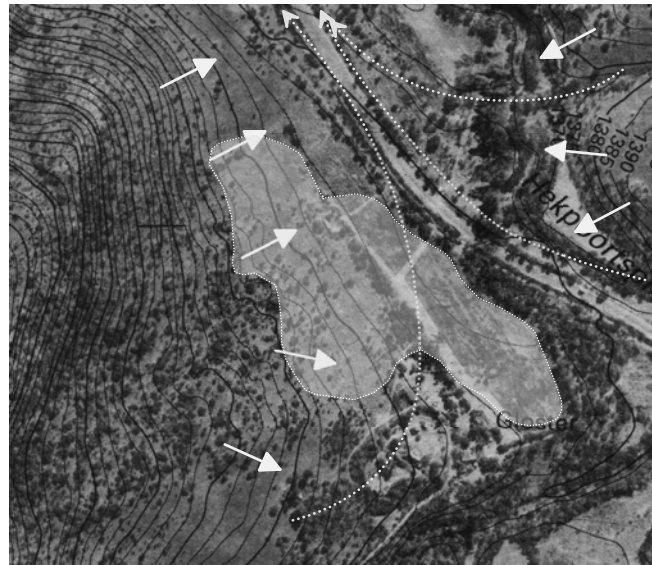
SUN ANGLES

The site can be divided into three areas with a predominant east west orientation. The site is bordered on the west by the steep slopes of the Witwatersberg. The eastern border is formed by the R 563 route with moderately steep slopes between these two borders. The site topography and sun altitude during the changing seasons will lead to varied natural light qualities and adds to the richness of the site. During the middle day hours, between 10:30 – 15:30 when visitor numbers is at its maximum, the topography will not cause drastic shadow patterns.

1-22 3D Topographical site model used to study sun-shade patterns

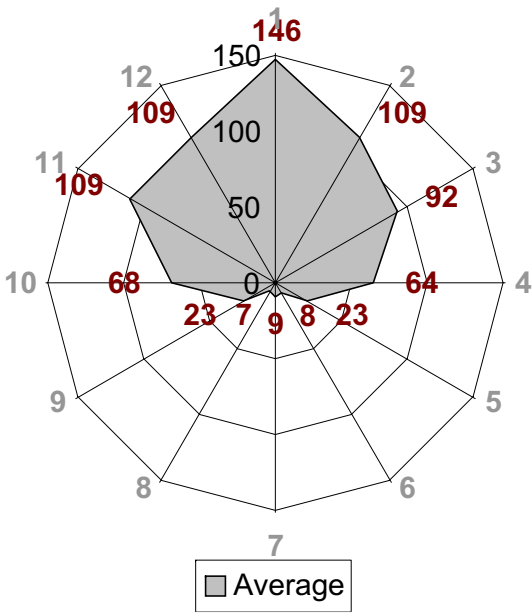
SITE HYDROLOGY

Due to the steep topography of the site, particular attention has to be given to storm water drainage. The location of hard paving must be carefully considered to avoid increased water speed and possible erosion of topsoil. The eastern border of the site could be considered as a possible location of rainwater storage containers.



1-23 Aerial photo of site indicating water drainage patterns

PRECIPITATION

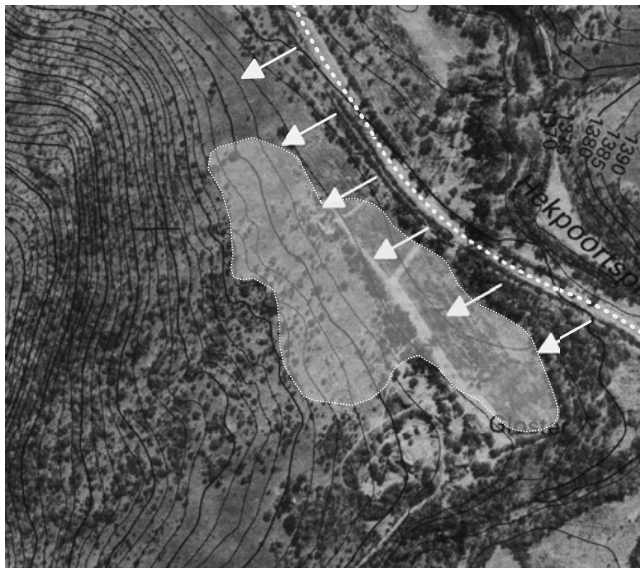


NOISE:

The R 563 road to the east of the site is a source of linear vehicle noise. The layout of the facility must accordingly be designed to reduce the impact of this noise. An agreement with the Department of transport could lead to the lowering of speed limits on the R563 in the vicinity of the Interpretation Center.



1-25



1-26 Aerial photo of map indicating road noise source

1-25 Views of the R 563 road in the COH WHS context

INTERPRETATION CENTRE MOHALE’S GATE				
Location	Access	Geography and aspect	Development potential	Links to other sites
Located adjacent to the R563 between the Sterkfontein Caves and Hekpoort Outside the COH WHS Well located to attract visitors to the North Western region of the COH WHS as well as traffic en-route to Magaliesburg and even to Haartebeespoort Dam	Via the R563, a major road and the Orient road, a smaller un-tarred road Public transport limited Access easier for tour buses and private vehicles	The site faces the COH WHS and overlooks, at present, a largely undeveloped natural landscape	This site would be suitable for large-scale development The site has been offered to DACEL by the owner who will continue to use and maintain the surrounding land The owner has also offered unlimited but negotiated access to the area surrounding the 1 sq km offered to the COH WHS	The site is in reasonably close proximity to Sterkfontein, although it will not necessarily attract or be visible to those visiting the caves

1-27

TOURISM PLANNING	
Advantages	Disadvantages
Appears to be no ecologically sensitive fauna and flora Site fits well into topography Views into site possible but at a great distance Services close by Suitable for an environmental interpretation centre with opportunity for game drives	Not visible from main roads Chicken farms and Rand Water Board in middle of viewshed Site requires archaeological investigation due to many stone walls, floors etc. within the demarcated site Not within COH WHS boundary Not on main road and ± 8 km back to nearest palaeo-site Significant road upgrade to site Soils are very thin with andasitic lava surfacing

1-28

LAND USE PLANNING				
Criteria	Strengths	Weaknesses	Opportunities	Threats
Ownership	Private but a portion offered to DACEL	Delays in transfer of site	Quick acquisition – low cost	Agreement between land owner and DACEL needs to be finalised
Land Use Rights		Consent for land use rights, subdivision and EIA required		Objection to applications, and environmental sensitivity.
Surrounding land uses	Unencumbered by development	Located away from the main road within a large farm, therefore spin-off effect may be limited	New development under control of DACEL	
Size and expansion	Large site, expansion possible	EIA may identify constraints		
Visitor access	Close to R563	Orient Road gravel, may need upgrading New access road onto site required	Located adjacent to the COH WHS	Degree of remoteness
Worker access		Remote, limited public transport		
Proximity to COH WHS	Adjacent		Views of COH WHS	
Responsible Authority	Mogale City			
Services	Near Rand Water Board Reservoir	No local authority services.		
Geology	Andesite	Geotechnical investigation required		
Surrounding Development opportunities	Located on the road to the North West Province. On link between Sterkfontein and Magaliesburg.	Single ownership of property precludes outside involvement. Off potential development corridor	DACEL can control development on the wider site.	Limited catalytic effect
Visibility	Good view of COH WHS	Visibility from main routes poor		
Topography and natural features	Moderate slopes			

INFRASTRUCTURE				
Criteria	Strengths	Weaknesses	Opportunities	Threats
Accessibility by Public Transport	On Taxi route On tourism transport corridor to the tourist destinations just west of Magaliesburg	Relatively remote from urban centres of Pretoria and Johannesburg, and from Lanseria airport	Hekpoort rail station on Spoornet line to Pretoria only 5-6 km away Advertise at Krugersdorp aerodrome Bus link with Magaliesburg railway station (Site 05) and other proposed sites	
Status of nearest main road(s)	In proximity of the R563 which links with the R560 to the tourism centres to the north and with the N14 which eventually leads to the urban centres of Johannesburg, Krugersdorp and Randfontein	Delay from slow moving trucks in hilly areas of R563 The R560 to the North West and the single carriageway portion of the N14 to the South East of the R563 have both fallen into a state of disrepair Safety and delay a serious concern on the four-way stop at the junction between the N14 and the M47 (Hendrik Potgieter)	Liaise with the Department of Transport (DoT) for the upgrade of the N14 between the R563 and the M47 (Hendrik Potgieter) and dress the shoulders of the R563 through the COH WHS; regarding Traffic channelisation on the four-way stop at the junction between the N14 and M47; for the creation of proper turn off facility on R563	R563 in average condition but deteriorating, and soon to reach capacity as it has at the Oaktree junction with the N14 Turn off from fairly busy route a safety concern
Geology and Soils	Not on dolomite going by 1:160,00 map			Instances of unstable chert rich formations in proximity to the West. A site investigation is necessary to confirm ground stability conditions

INFRASTRUCTURE				
Criteria	Strengths	Weaknesses	Opportunities	Threats
Supply of potable water		Possibility of reticulated water or sewage systems remote or expensive Low potential for ground water extraction (<1lt/sec), and systems bound to be deep because of terrain		
Topography and Landform				Moderate to steep Care required in design of storm water drains to river, suitability of residual soils and stability of cut slopes before construction
Availability of other bulk Infrastructure	Ordinary Telecomm services available Cellular phone coverage okay	A facility requiring more than 500KVA energy would require a large investment in energy owing to the large distance to the nearest ESKOM substations namely, Magalies and Springfarm, and the lack of overhead high voltage lines Neither a formal sewage reticulation system, nor a solid waste disposal system in area	Build solid waste and sewage disposal capacity in-house or out-sourced for this site	

THE CLIENT

In order to be viable and sustainable the Financial and Management Plan for the COH WHS must accommodate and reconcile the diverse interests and needs of all the various stakeholders in an integrated and holistic manner.

Department Of Agriculture, Conservation, Environment And Land Affairs (DACEL)

DACEL, as the management authority tasked by central government with responsibility for the development of the COH WHS, aims to develop world-class interpretation facilities through public/private sector partnerships, utilizing government support to leverage funding from private sources. In return for its investment government seeks to stimulate development in the region as a whole and to spread benefits to local communities. In order to deliver on its mandate and responsibilities, and given the wide number and diversity of stakeholders (including those from the community, the scientific community, the public sector and the private sector), the COH WHS Authority will therefore require a Financial and Management Plan that:

- Encourages/enables an integrated and holistic conservation and management plan,
- involving all stakeholders and landowners, for the entire COH WHS area.
- Encourages/enables integrated and holistic interpretation, marketing and tourism strategies, involving all stakeholders.
- Encourages/enables the participation of, and spread of benefits to, previously marginalised communities.
- Encourages/enables the sharing of capital costs and risks as well as the sharing of revenue amongst all stakeholders.

The University Of The Witwatersrand (Wits)

Wits, as a major landowner and as an institution with a long and illustrious history of scientific endeavor in the COH WHS, is a key stakeholder. The long-term investment in, and commitment by, the scientists who have investigated the sites, together with the institutions and organisations that have supported and continue to support them, must be acknowledged. The long-term sustainable value and benefit of the COH WHS can only be secured through the extension of these scientific processes. It is necessary then that mechanisms be developed to ensure that some of the economic benefits of the development of the COH WHS are utilised to support and promote scientific research



2-01

In addition to the above, Wits already operates, and has plans to extend, interpretative facilities at the Sterkfontein Caves.

It is assumed that Wits is willing to co-operate with the COH WHS to develop interpretative facilities provided that:

- the academic, scientific and financial integrity of the University is not compromised in any way;
- any development in which Wits participates will at the very least be self-sustaining and at best be profitable;
- a significant share of any income accruing from interpretative facilities, product development and merchandising will be used to support on-going scientific activity in the COH WHS.
- Wits has made some budgetary provision for investment in the COH WHS interpretative facilities and will lend its support to further fund-raising initiatives;
- while Wits hopes to profit broadly from its involvement in interpretative activity, it does not wish to be involved in the day to day management and operation of interpretative facilities;
- while the development of the COH WHS as a major tourism destination will increase the potential for income generation, the University will not seek to assert its rights narrowly, but rather to ensure that financial benefits support the broader scientific endeavour.

Fossil Site Landowners

The WHS Authority is in the anomalous position of having to control and manage a site owned by a number of different landowners. Given this fact, there are a number of potential scenarios for the development of interpretative facilities. On the one hand, fossil site owners could be encouraged to fund, develop, manage and market their sites as and when they wish, providing that environmental and conservation requirements are met. On the other, the development and management of these sites could be led and funded by the WHS Authority, working in close co-operation with the fossil site owners.

Consultation with landowners points to the desirability of adopting the second scenario on the basis that this would facilitate the development of an integrated interpretation strategy; facilitate controlled access to the sites, make provision for sites to be administered, developed and marketed through a centralized system; and encourage complementary rather than competitive development.

It is assumed that:

- While most fossil site landowners are willing for their sites to be incorporated into the IN, the nature and extent of interpretative activity will be different in each case.



2-02

- Incorporation of sites into the IN will be conditional on the WHS Authority and fossil site landowners negotiating and agreeing upon a set of conditions relating to access and security, and the recommendations of the Management Plan to be developed for each site.
- Some fossil site landowners will consider investing in infrastructure on condition that they can show a profitable return. Others want to recoup basic costs and be compensated for what is perceived as an invasion of privacy, reduced control over their land, and potential loss of income from farming activity.

Visitor Information Point License Holders

The Visitor Information Points located at all the major gateways to the COH WHS will serve to provide information to people passing through or entering the area and direct them to the interpretative facilities and other attractions.
It is assumed that:

- There are already a number of tourism information offices in the area.
- It is in the interests of all concerned to build a co-operative relationship between the COH WHS and these organisations.
- It is feasible to develop partnerships with the tourism information organisations, structures and other information providers already operating in the COH WHS and surrounding areas.
- While a certain amount of income may be generated from sales of interpretative materials, souvenirs and snacks, the VIPs will not be self-sustaining.
- While VIPs could easily be linked to existing initiatives, their establishment provides an opportunity to benefit the local community.

OPERATING FRAMEWORK

The institutional structure outlined below is intended to bring all decision-makers together into an integrated structure to ensure that the potential of the COH WHS for enjoyment, learning, engagement, and scientific and community benefit is maximised.

The COH WHS Management Authority

The COH WHS Management Authority will have ultimate responsibility for planning, regulation and oversight of the COH WHS and for co-ordinating the activities of various government agencies, the community, academic institutions and the charitable trust.

The COH WHS Charitable Trust

- The COH WHS Charitable Trust will operate as a non-profit organisation responsible for:
- Fundraising and generating income from other non-profit organisations and foundations, private contributors, NGOs, domestic and international agencies and other donors in support of the conservation, education and community benefit objectives of the COH WHS.
- Reinvestment or re-distribution of net operating revenues generated by the subsidiary units.
- Distribution of funds for community development and scientific research.
- Provision of information about the COH WHS, its mission and activities.
- Oversight of the visitor facilities. Responsibility for the day-to-day management and operation of these will vest in the Executive Director and management of the facilities.

These duties will be carried out under the direction of, and in accordance with, the policies of the COH WHA.

It is proposed that the Trust be divided into four executive/operating components:

- Interpretation Centre: This is the section responsible for the museum/interpretative centre(s);
- Fund Raising: Responsible for seeking funds;
- Marketing and Public Relations: Fulfills a public and media relations function and also co-ordinates the marketing activities of the COH WHS;
- Legal and Contracting: This unit will oversee contracts and concessions associated with subsidiary operations, and could also be involved in defining new development opportunities.

The COH WHS Charitable Trust will be guided and directed by a Board of Trustees representing a broad range of interests, expertise and stakeholders.

Scientific Advisory Committee

It is recommended that a Scientific Advisory Committee be constituted to offer specialist guidance and direction to the Board and management of the institution. The Scientific Advisory Committee would serve to inform decisions pertaining to interpretation and research policy and development, co-ordinate interpretation and research activity, and the distribute funds for research activity.

The COH WHS Community Trust

It is recommended that a Community Trust be established to facilitate the spread of benefits accruing from the development of the COH WHS to the community and to oversee the implementation of the programmes intended to stimulate and support development in the area, as outlined in the Community Benefits Report. The Trustees would establish or appoint implementing agent(s) to take day-to-day responsibility for the functioning of the community development programmes

Operating Concept

Primary interpretative facilities will be operated as a non-profit unit of the proposed Charitable Trust. This unit will maximise income from admissions, rentals, merchandising, conferencing and other sources.

At the same time, the Trust will generate contributory funding in support of these facilities and their programmes.

The conference centre and food and beverage outlets will be concessioned as profit-making units to a private operator. The operator will pay a concession fee to the Trust.

Visitor Information Points will be owned and operated by existing and new tourism agencies and entrepreneurs. Trading rights or permits to operate VIP's will be issued by the COH WHS on behalf of the Trust.

Site-specific facilities at fossil sites present a complex challenge. It is recommended that Wits retain ownership of Sterkfontein and Swartkrans, that Kromdraai (or a portion of the land on which significant sites are located) be purchased outright by Gauteng Province, and that the Trust enter into partnership or lease agreements with landowners of other significant sites.

Ownership

Ownership of interpretative facilities and infrastructure will be retained by Gauteng Government and Wits University as security for their capital contributions and investments in support of the facilities. The Trust will own the non -profit operating business units and oversee concession contracts where appropriate

FUNDING

Major Interpretive Facilities

Provincial Government could also fund the primary Interpretive Centre (IC) through Blue IQ or other public sources. In this case, Gauteng would retain ownership of the facilities as a security. The facility would be operated under a long-term lease paid through a nominal (R1/year) fee by the Trust.

However, an alternative financing approach is recommended based on international best practices, whereby the COH WHS Charitable Trust be established to take a lead in an international capital fundraising (or development) campaign. Such campaigns are the norm for generating funds in support of museums and heritage sites. Efforts would be focused on raising funds from major corporate, foundation, and individual donors worldwide. This campaign can run concurrently with the development of infrastructure funded by Government.

Gauteng (and/or North-West and central government) might also make sizeable contributions to the IC capital campaign, but should not expect to maintain rights of asset ownership or control. Rather, Government is one of several major contributors who would be represented on the Board of the COH WHS Charitable Trust. The Trust would control ownership of the facility and would receive income from any private concessionary operators (such as for meetings & conferences).

As the owner, the Trust would hire a contract development team for the project. In this case, a Capital Projects Director would be hired by the Trust (with funds raised at first by the Capital Campaign and technical assistance from Government) to manage the actual development of the project. That project director would also work with the Board as it moves into the operational phase.

USERS

- palaeontological, palaeo-anthropological and archaeological tourists who, although constituting a small tourist base, are fundamental to the nature of the COH WHS. These would be small volume but potentially higher value tourists;
- general interest tourists who would include both local day trippers, domestic tourists staying in the Gauteng area and international tourists also staying in the Gauteng area. A substantial portion of the international market is expected to be generated from MICE tourism and day visits. These tourists require less specialised facilities than the palaeontological, palaeo-anthropological and archaeological tourists. Their requirements include an informative, challenging and entertaining interpretation centre with attendant food and beverage outlets. International tourists in particular will require curio shops. The domestic day tripper will require additional activities such as nature trails and short walks. A garden centre is also recommended. Other possibilities include tours of established businesses in the area, such as flower farms and creating new business such as traditional African herbal farms;
- school groups which do not only come for day visits but also for three or four day trips where students learn about the local biology and geology. For day visits, groups are expected to range between 50 (private schools) and 150 to 200 (government schools). Clearly it is not possible for all students to visit the cave system at one time and alternative above ground activities will need to be provided. These include trails, the interpretation centre and such items as “mock digs”; real digs under the guidance of a palaeo-anthropologist or trained expert and the construction of a false cave, such as Lascaux 2. School groups could also come for longer field trips. Although there are some existing facilities within the northern Gauteng area, indications from educationalists are that more facilities are required closer to the Johannesburg and Pretoria markets. With increasing financial pressure on schools, trips are becoming shorter and closer to the originating city. COH WHS provides an excellent location; and
- adventure and sports tourism.

INTERPRETATION CENTRE

All the projected visitor numbers for the COH WHS are expected to utilise the interpretation centre. Mid and general interest and school children will also require a broader range of facilities, including refreshment facilities, short trails and picnic sites. Visits are not expected to occur evenly throughout the year but exhibit some seasonality. However, day visitors are more likely to visit the COH WHS during weekends and school holidays whereas school visits will be during term time and weekdays. Therefore these two groups are contra-cyclical.

In the initial two years, the majority of foreign tourists are expected to be day visitors or independent travellers rather than tour groups, as the lead -time for tour groups is in the region of 18 to 24 months. This represents the time between the product being launched, included in tour operators' brochures and itineraries and actually taking place. It is assumed that all foreign visitors will visit the Interpretation Centre.

In order to understand the demands for the Interpretation centre and the maximum visitor flow at any particular point in time, seasonality for the above groups has been modelled.

This seasonality in 2004 can be summarised as follows:

Tourist visits analysed by month and sector:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Weekend visitors	13,174	13,974	13,974	6,449	6,449	6,449	6,449	6,449	12,898	13,974	13,974	13,974
Domestic tourists	9,396	1,141	1,141	9,396	1,141	1,141	7,047	1,141	3,524	1,141	1,141	9,396
Foreign tourists	6,988	6,988	3,327	3,327	3,327	3,327	3,327	3,327	3,327	6,988	6,988	6,988
Schools	1,670	7,158	7,158	3,340	7,158	7,158	7,047	7,158	6,681	7,158	7,158	1,670
Total	32,028	29,261	25,600	22,512	18,075	18,075	23,870	18,025	26,430	29,261	29,261	32,028

2-03

From this analysis, peak demand is during the summer months, when visitors total some 32 000 per month. This equates to some 1 000 per day if spread evenly.

By applying the same seasonal trends, the visitor pattern for 2010 essentially follows the same trend as that for 2004 but is notably higher with a maximum visitor figure of 52 000 in peak months.

SOCIO-ECONOMIC

The area is largely characterised by commercial farms with low population densities, and nearby settlements, mostly informal, with high levels of in- and out-migration. Households are small, employment levels are high, education levels are relatively high, there is a general lack of community cohesion, alcohol abuse is felt to be a serious problem, and there is a lack of awareness of HIV/AIDS.

There are an estimated 14,600 people in the COH WHS area and its immediate environs, with possibly an equal number proximate to the directly affected area. Some 85% of these are living on commercial farms. Employment levels are very high in the area, estimated at 91% by the 1996 census, principally because people come to the area to work and, failing to secure work, look elsewhere. In this regard, actually unemployment in the area is "hidden" because unemployment is exported to other locations. Households averaged three members, in large part because commercial farmers generally only allowed a worker to bring his/her immediate family. It also appears that older children are sent elsewhere to go to school (only one-quarter of the population was under the age of 15); there are a number of single person and two-person households as well. 56% of the area's residents are male, reflecting in-migration to seek employment, and differential access to wage employment across gender. According to the 1996 census, two-thirds of the population is classified as African, and one-third is classified as White. 80% of the population had at least some education, with half of these having secondary education or higher.

The population in the area is diverse from both settlement and economic security points of view. Long-term commercial farm workers and farm owners tend to be well established in the area with adequate incomes and little desire to change their means of making a living. Farm workers with well-developed, often specialised skills arising from long experience can command good wages. While not directly measured, the technical team estimates that there are skilled farm workers in some 35-40% of the area's households. An equal number are involved in less secure, low-paid employment, often casual, stemming from fluid labour demands, and a consequent lack of skills development. This group was generally keen to secure formal employment in the area. A smaller number are living in the economic "margins" in the informal settlements proximate to the area. While some of these households are linked to employment on commercial farms, often this is through a casually employed seasonal labourer. Others in the informal settlements have lost even tenuous access to wage employment, or have only recently arrived in the area to seek work. Female-headed households are more common in the informal settlements than on the farms, and many of these are understood to be involved in marginal small enterprises. Levels of migration vary across these categories as well; with approximately 35-45% of households well established in the area with the remainder having a more tenuous hold in the area. This is reflected in income levels in the area, with most households earning less than R1000 (presumably the households without regular employment, qualitative findings suggest an average of R200-R300 per month), or between R1000-R2000.

2-04 Informal settlement in COH WHS



POTENTIAL COMMUNITY BENEFITS

Benefits will occur in three main areas:

- job creation, both temporary and permanent, through environmental initiatives, and the construction and upgrading of housing, the interpretation network facilities and infrastructure;
- small business opportunities in the tourism, hospitality and related service sectors, arising from the development of the interpretation network and increased tourism to the area; and
- community infrastructure and service delivery which will increase the quality of life of all residents of the area. This will include housing development and a programme to upgrade and secure tenure of residents where this is appropriate.

1. Economic benefits

- Formal employment opportunities
- Training for formal employment
- Training for self-employment
- Labour intensive infrastructural interventions
- Capital support for small business
- Access to land for productive and domestic use, including natural resources
- Access to markets
- Access to transport

2. Cultural benefits

- Wider understanding of culture & people in area
- Greater respect for varied cultures in the area
- Greater cultural cohesion in the area

3. Social benefits

- Access to formal housing
- Access to potable water
- Access to transport

- Access to schooling
- Place of safety for abused women and children
- Prevention of HIV/Aids
- Alcohol abuse prevention programmes and abuse interventions
- Violence prevention interventions
- Crime prevention interventions
- Access to electricity
- Health facilities access and improvements
- Recreational areas (including playgrounds)

4. Scientific Community Benefits

- Long term sustainability of the site for scientific processes
- Value of intellectual capital
- Development of capabilities of staff
- Raised scientific profile
- Employment opportunities, including for black, female and disabled scientists

5. Environment and conservation

- Land Care
- Alien plant control
- Road stabilisation
- Quarry rehabilitation
- Research projects
- Field guides
- Recycling and waste management
- Water bottling
- Traditional crops
- Waste swapping
- Crafts – training and production
- Signage
- Cultural village
- Community tourism on community land
- Bioprospecting – medicinal and cosmetic
- Indigenous and medicinal nurseries
- Indigenous crops
- Resource harvesting

Employment of Local People

As part of the process of employing people from the COH WHS area, a set of conditions and criteria should be applied to ensure that the majority of people who benefit from the creation of the jobs are currently resident within the COH WHS and surrounding areas. This will need to be handled carefully, as development will also attract people to the area looking for jobs and opportunities. The Gauteng Provincial Government should seek to prioritise the involvement of local people in the COH WHS and thereby ensure their 'buy-in'. It is important that social organisation in the area is strengthened to be able to deal with this.

The set of criteria to ensure that priority for employment is given to residents of the area would include that to qualify for employment on the project a person must live in the area (local employment). There will also need to be a focus on the employment of women, people with disabilities or youth in particular situations. In addition, to ensure there is a spread of jobs, projects will seek to use labour-intensive building or production processes.

There is a need to ensure that the creation of new job opportunities and employment of local people should not disrupt the existing jobs or dislodge those in employment, or else the programme will quickly lose the critical support of landowners.

It needs to be stressed that this is an artificially created situation. As the COH WHS rollout takes place, it will act as a magnet for employment seekers, as well as people hoping to gain access to the scarce resources and benefits.

The residents of the COH WHS area and the Management Authority will have to deal with this to minimise conflict and division. Leadership and organisation can help to act as gatekeepers, and to stabilise the dynamics that get played out in such a situation and the WHA will need to play a role in facilitating this.

The creation of jobs and employment of people is regarded by respondents to the SES as a priority. Labour-intensive processes for construction of buildings and roads will go a long way towards meeting the immediate pressures. Skills training and capacity building will be necessary for the jobs requiring greater expertise, funds for which can be accessed from a range of local and international agencies.

Jobs in the Interpretative Network

An impression exists that the interpretative facilities will directly create large-scale economic benefits to the community. This impression is not necessarily correct. The interpretative facilities will not solve the problem of local unemployment, and it is important to ensure that false expectations are not encouraged. Expectations should not be raised that the interpretation facilities will provide a huge number of jobs in the area. The Interpretation Centre and related facilities will create employment opportunities in the fossil casting and preparation facilities and tour-guiding programme. However, a number of these jobs are highly specialised and the skills required might not be found in the area.

While it is true that a carefully planned and implemented network of interpretative facilities will greatly add value to the site and therefore generate a number of economic knock-on and spin-off effects, the reality is that the facilities themselves are unlikely to yield a sizeable profit. There are, however, related components that can create direct economic benefits for the local community.

The location of the COH WHS Interpretative Centre can play a major role in the stimulation of tourism, support services and other developments, thus stimulating growth in its immediate vicinity, the COH WHS area, and the region as a whole.

Above all, one should be wary of calculating benefits only in purely financial and economic terms. There are, for instance, a large number of schools in this area which are extremely resource -disadvantaged, and their proximity to a centre which provides ex citing and possibly subsidised access to information about their immediate environment will have significant social benefit for local communities. The direct and indirect educational and capacity -building benefits to the region would be considerable.

Each of those components deemed to have particular potential for community benefits is dealt with in more detail, below.

- **On-Site Security Scheme**

It is essential that all public fossil sites and all non - public vulnerable fossil sites have 24 -hour security. A system of rangers/caretakers who live at the fossil sites would create employment and awareness in the local community, as well as provide some protection for the fossils and sites.

Capacity-building initiatives could also provide rangers and the ir families with the skills and knowledge to handle aspects of interpretative and administrative tasks. These rangers would have to be in communication with the hub and have good back -up systems. Provision would have to be made for housing and other infras tructural requirements on sites, which could be developed in conjunction with on-site interpretative facilities, where applicable.

There are already a number of people working in this area, and additional training will enable them to continue to provide a security and tour-guiding service within the COH WHS.

- **Education Resource Centre**

While the Education Resource Centre aims to provide resources to all schools visiting the site and to find creative ways to provide resources to those who are unable to visit the site,

a special focus will be to support the schools within and immediately surrounding the COH WHS. There are almost 50 schools operating in Circuit 5 of the Krugersdorp / Roodepoort district, many of them operating with very scarce resources. Teachers from schools in the area will be invited to training programmes and offered resource packages and access to equipment. Subsidised activities for local schools, along with sharing of resources for teachers to take back into local schools, will make a significant impact on community educational needs, and increase the likelihood of community "buy -in" on all levels. This interaction can be expected to engender a sense of local pride in the COH WHS heritage.

The Education Resource Centre will also function as a place of training for tour guides and others employed in the area to meet the needs of visitors.

The main community benefit deriving from the Education Resource Centre is educational and capacity building, not financial. Nevertheless, a number of jobs will be created as a dedicated staff of educationalists is needed.

- **Tour Guiding Programme**

A corps of highly -trained, enthusiastic and knowledgeable tour guides is essential for a world - class heritage attraction of this nature. Many of the tour guides currently working within the COH WHS are in urgent need of further training. In addition, the expected increase in visitor figures and opening of additional site -specific facilities will also necessitate the employment of more tour guides.

The tour guides will operate in a number of areas, both in the IC and at the site -specific facilities. Some may combine their guiding work with other duties, for example security at excavation sites or excavation work. Others will devote all their attentio n to guiding. Intensive training in both the content and the manner of presentation will be essential.

- **Staffing**

In addition to those posts specified above, a large number of staff will be needed to operate the Interpretative Network. Most of these posts will be situated within the central interpretative facility, with others at site -specific facilities, visitor information points and the many outsourced activities expected to function in the area. While various posts will necessarily be filled from outside the area, applicants for many of the positions will be sought within the COH WHS area and surrounds. A system of bursaries and on-the-job training will build capacity to fill some of these positions.

- **Training / Capacity-Building**

The commitment to employ local people in as many posts as possible, to deliver a world -class service to visitors, and to operate with scientific integrity assumes that there will be a substantial investment in training and capacity -building for those employed at the COH WHS Interpretative Network. Ongoing training resources for staff, independent tourist initiatives and community members can be administered through the Education Resource Centre.

- **Outsourced Functions**

The outsourcing of various functions will relieve the institution of the responsibility for providing these services and provide opportunities for local communities to benefit by establishing small commercial enterprises or collectives to deliver these functions. It is hoped that the provision of these opportunities will stimulate the development of a number of locally owned SMMEs in the area. In other cases, existing businesses within the area will benefit through the expansion of their operations. Where businesses from outside the area are involved, conditions stipulating the employment of local labour may be included in the contracts.

It is recommended that the following functions be outsourced:

- **Restaurants and Other Food Outlets**

It is recommended that, in the long term, a number of food outlets be included within the premises of the COH WHS. These should cater for a range of tastes, budgets and time constraints, ranging from kiosks, through takeaway outlets and tearooms, to restaurants.

- **Shops**

It is recommended that a number of shops operate within the premises of the IC. These can vary from the types of shops traditionally found within heritage attractions (e.g. souvenir shops, curio shops, bookshops) to shops of the type often found in tourist attractions and upmarket hotels (e.g. designer boutiques, jewellery shops). The majority of these should be outsourced, with the operators paying a rental or a percentage of profits to the COH WHS. Branded COH WHS goods may be sold through these shops under license.

Informal traders can be registered and provided with premises on routes in and out of the WHS to market a range of products such as arts and crafts, cloth and pottery products, and foodstuffs.

- **Security**

In addition to the On -Site Security Scheme, security will be needed in the Interpretative Centre, and possibly in other components of the Interpretative Network. There is the possibility of training and re -training people who are already employed in this capacity. In addition, security officials should also be trained in tour guiding skills, where appropriate.

The security of certain of the Interpretative Network components has the potential to be outsourced, although a decision will need to be taken by the Management Authority in association with DACEL as to the appropriateness of outsourcing this function for each component.

Should the function be outsourced, it could be contracted to a company with the condition that after a period of operating independently, it then hands over the function to a locally based company. In the interim it would have the responsibility of facilitating training.

- **Cleaning**

Cleaning services will be needed throughout the IC and possibly in other components of the Interpretative Network. It is proposed that this be outsourced to an outside company with conditions stipulating the use of local labour in the contract.

- **Exhibition Design**

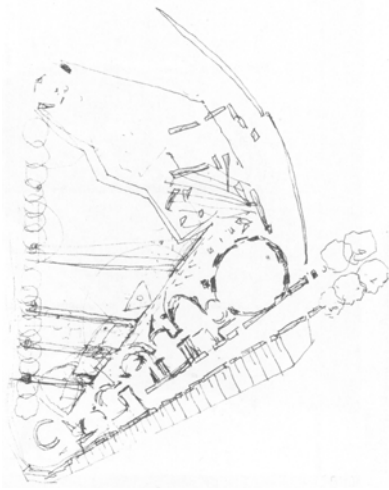
Exhibition design is a highly specialised function. It is recommended that this be outsourced, on the basis of a tender process.

- **Construction**

The Proposed Financial Plan for the COH WHS, drawn up in 1999, estimates that 1 172 temporary jobs will be created, either on or off site, during the construction period. While this may be an over-generous estimate and the exact number of jobs will depend on a number of factors, there is no doubt that the construction of the interpretative facilities will result in a significant amount of temporary employment. The construction will be outsourced and guidelines and conditions, built into tender procedures and contracts, can ensure that local communities receive maximum benefit in terms of these employment opportunities.



3-01



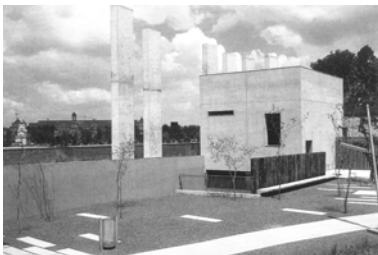
3-02



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3-05

3-01 Courtyard view of museum

3-02 Design concept sketch [Urban green file, 2001, vol 6, no. 5. pg25]

3-03 View of the ramp [Urban green file, 2001, vol 6, no. 5. pg27]

3-04 View of temporary exhibition space of museum

3-05 View of "Hall of remembrance" [Urban green file, 2001, vol 6, no. 5. pg28]

Apartheid Museum

The museum is located in the south of Johannesburg between the CBD and Soweto in a semi-industrial zone that also accommodates office and retail facilities.

The museum was envisioned to present a sensitive subject matter in a clear and rational manner. The initial concept comprised five separate pavilions that offered visitors different aspects of the exhibition. In the final design, the initial separate pavilions is incorporated but linked with transitional "mood" spaces in a single complex. The exhibition is arranged in a linear manner that comprises external as well as internal spaces. A extensive landscaping concept was used to extend the functions of the museum to the exterior. An outdoor amphitheatre was created that also doubles as picnic and meditation space.

The innovative use of inexpensive, robust building materials adds to the identity of the building. Flowing lines and primary forms is used to create a diverse experience of spaces that alters the perception to fit the exhibition matter. Attention to minor detail in workmanship contributes to the quality of the building.

Professional Team:

Client: Akani Egoli (Pty) Ltd

Project Architect and co-ordinator: Sidney Abramowitch
Architect

Project manager: Amdev (Ampros Developments Ltd)

Architects: GAPP Architects & Urban Designers,
Mashabane Rose Architects,
Britz Roodt Project Association,
Linda Mvusi Architecture & Design

Landscape Architects: Patrick Watson Landscape Architect

Quantity surveyors: Schneid Libera (Pty) Ltd

Thabo Senyolo & Partners cc

Structural engineers: Pure Consulting

Electrical engineers Monty Miller Associates

Mechanical engineers: Richard Pearce & Partners

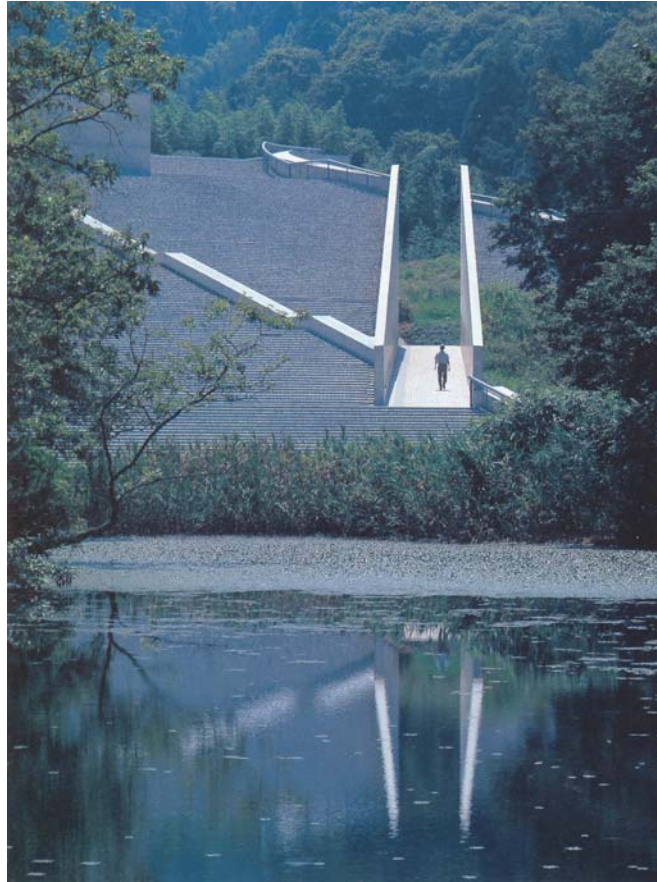
Traffic engineers: PD Naidoo & Associates

Curator: Christopher Till

Audio-visual consultants: Electrosonic

Fire consultants: Specialized Fire Technologies

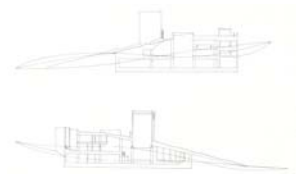
Main contractor: Murry & Roberts



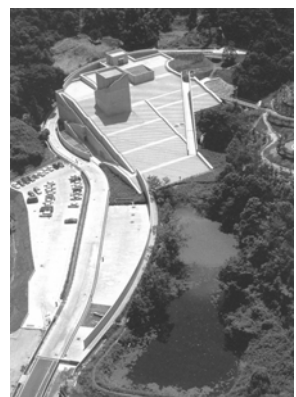
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Chikatsu – Asuka Historical Museum

The southern part of Osaka prefecture contains a remarkable aggregation of ancient Japanese burial mounds (*kofun*), dating from the fifth and sixth century. Scattered across the undulating terrain are about 200 tumuli, among them four imperial tombs with characteristic keyhole forms. The new Chikatsu - Asuka Historical Museum was conceived as a centre for exhibiting and researching *kofun* culture. Tadao Ando designed the museum as an organic extension of the landscape, creating an artificial monolithic structure that is partly buried in the landscape. The building also serves as a landmark in the natural environment. The different exhibition and museum spaces are bound together by a monumental staircase that doubles as an outdoor amphitheatre.

Ando used the inherent characteristics of geometric forms to convey the symbolic meaning of the building concept. The geometric forms are juxtaposed to create strong visual spaces that guide the eye to focus on specific aspects of the exhibition and the surrounding environment. The choice of building material, reinforced concrete, adds to the subject matter in creating a quality of permanence.

Project information:

Location: Minami-Kawachi, Osaka, Japan
 Architects: Tadao Ando Architect & Associates
 Structural engineers: Ascoral Engineering Associates
 Contractors: JV of Konoike Construction and Mitsubishi Construction
 Principal use: Museum
 Site area: 14 138 m²
 Building Area: 3 407 m²
 Total floor area: 5 925 m²
 Structure: Reinforced concrete; 1 basement; 2 stories and 1-story penthouse
 Completion date: March, 1994

3-06 South facade seen from beyond the pond [JA, Issue17, 1995. pg14]

3-07 Site plan of the museum [JA, Issue17, 1995. pg12]

3-08 Sections of the museum [JA, Issue17, 1995. pg15]

3-09 Interior of the foyer on the basement floor [JA, Issue17, 1995. pg15]

3-10 Aerial view of the museum seen from the southwest [JA, Issue17, 1995. pg12]

3-11 The exhibition hall on the basement floor seen from the first floor level [JA, Issue17, 1995. pg15]



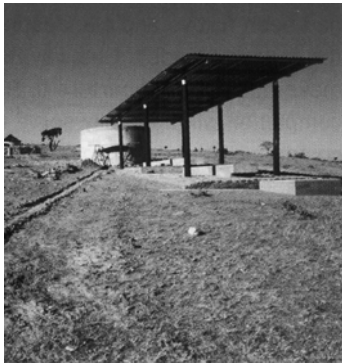
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Nelson Mandela Museum

This museum framework ensures ongoing social interaction and cultural benefit. The material choice as well as the way the structures are placed in the landscape was studied. The building material is inexpensive, locally sourced and a ll construction was done using local labor. This contributed positively to the local economy. The use of traditional materials in an innovative manner further strengthened local identity. This multi -functional program was executed on a strict budget but pr oves that good design is still possible with this restriction.

Project information:

Department of Arts and Culture
 Project Director: Gordon Mentz
 Robben Island Representative for
 Mandela Museum: Qesi Mpumlwana
 Community Representative and present
 Chairperson of Museum Committee: Vuyani Jarann
 Department of Public Works Pretoria
 Project Architect: Dirk le Roux
 Design Architects and Museum
 Conceptualisation: Cohen & Judin
 Graphic Designer: Jenny Sandler



3-13



3-14



3-15

3-12 Mvezo Pavilion [*Digest of South African architecture*, 2003. pg14]

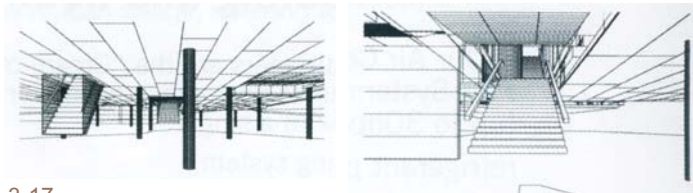
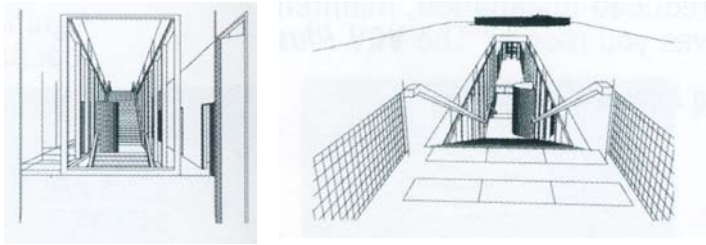
3-13 Qunu Pavilion [*Digest of South African architecture*, 2003. pg17]

3-14 Screened Shelter, Mvezo [*Leading architecture & design*, February, 2003. pg46]

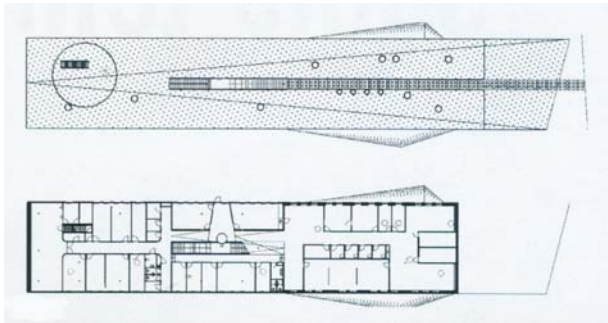
3-15 Qunu Pavilion, water source [*Leading architecture & design*, February, 2003. pg47]



3-16



3-17



3-18

RVU Broadcasting HQ

This building was chosen as a precedent because of the merging aspect between building mass and the landscape. The design concept focused on executing the program in a sensitive natural environment. To this extent, building materials were chosen to blend in with the natural setting. Landscaping on the roof plane is beneficial to the aesthetic aspect and insulation properties of the building. The use of a circulation element, a staircase, to penetrate the building mass is used to link the users of the building with the environment as well as to increase social interaction.

Project Information:

Location: Hilversum, The Netherlands

Client: RVU public broadcasting company,
Hilversum

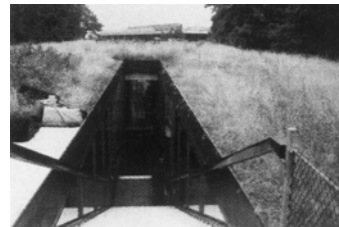
Design Team: Winy Maas, Jacob van Rijs and
Nathalie de Vries with Willem Timmer,
Duzan Doepel, Eline Strijkers

Facilitating office: Office for architectural engineering
Bureau, Bouwkunde, Rotterdam

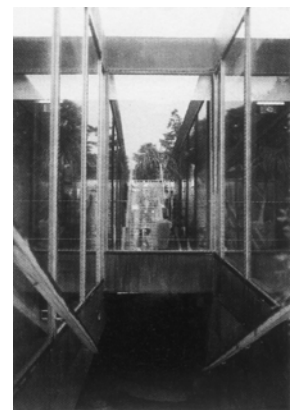
Project Architect: Duzan Doepel



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3-16 Landscaped roof from upper level [Leading architecture & design, February, 2003. pg38]

3-17 Architect's perspectives [Leading architecture & design, February, 2003. pg39]

3-18 Office roof plans [Leading architecture & design, February, 2003. pg39]

3-19-21 Staircase connecting park to upper level via entrance [Leading architecture & design, February, 2003. pg39]

The aim of this dissertation is not a study of the evolution of humankind, but the development of an architectural symbol system that can be applied as a framework tool to emphasise the importance of the Cradle of Humankind World Heritage Site.

The principles that guided the development of this framework tool were informed by the theoretical works, *Intentions In Architecture* and *Genius Loci - Towards a Phenomenology In Architecture* By Christian Norberg-Schultz.

The development and origins of a suitable symbol-system necessitates the study of the context in more depth. The site derives its importance from its inherent natural properties that facilitated the process of human evolution within its borders. The process of evolution presupposes a dynamic interaction between the natural environment and the Hominid development. The study of this dynamic interaction demanded that a distinction be made between the Hominid and the ecosystem in which the Hominid had its origins.

The interaction process brings us to the human processes critical to survival and primary to the process of evolution, perception and socialization. Perception gives an organism knowledge and insight of his immediate environment, on the basis of this knowledge, choices are made that influence future circumstances of the particular individual. The knowledge an individual obtains over a period of time forms the basis of his/her frame of reference. Study revealed that a multitude of factors influence perception. It is a fundamental misunderstanding that a similar world is given a priori to all. Perception is based on the individual's history and frame of reference. This frame of reference is in turn based on the society in which he is a participating member. Interaction between members of a society gives rise to a collective creation of a symbol-system. The creation of a symbol-system is thus crucial for a successful interaction between community members.

The perception of space is a gradual construction and is dependant on education of the individual within a society. A symbol-system can thus be described as an interpretation medium between individuals. A symbol-system parallels complexity in the society context and is developed according to interpretation need. Socialization can be seen as the process of adjustment of an organism to its environment. One of the products of the socialization process is the development of common signs and symbols that makes communication possible. Communication can be seen as necessary to integrate the individual in the common world and give him a sense of security.

It can be seen that order can be given to our environment by assigning symbols to it.

The COH WHS can be considered as a stage that made the above activities possible during the process of evolution. According to Norberg-Schultz, the natural landscape can be divided into Romantic, Cosmic, and Classic archetypal categories, each with its own characteristics. The COH WHS can according to these categories be described as having Classic characteristics. The Classic landscape can be described as a meaningful order of distinct, individual places with a "human" dimension.

The "Classic" landscape was first discovered in Greece and played a large role in the later Roman environment. The character of the classic landscape is neither monotonous nor multifarious, but we find a composition of distinct elements. Valleys and ridges are clearly defined and can be described as creating individual, defined spaces in the environment. In the classic landscape neither the ground surface nor sky dominates and a human scale is perceived where all is in equilibrium and in order. In this landscape human fellowship is possible and every part conserves its identity within the totality. The individual is neither absorbed by an abstract system nor has to find his private hiding space.

This then, can be described as the most suitable environment for the promotion of the process of evolution. In the COH WHS context, man could see himself as equal partner to nature and as nature complementing his own being. This stable relationship helped to release human vitality and it is not difficult to understand why the process of human evolution had its roots in this classic landscape.

To arrive at a suitable architectural framework that can be utilized as a interpretational tool, a symbol-system needs to be developed. For the framework to be suitable, it must be able to present a coherent, holistic image of the site and the role it played in the process of evolution. This informed the choice to model the symbol-system on the natural landscape. The natural environment will thus be used to inform a metaphoric language based on mass-, space-, and surface-elements. These elements will be further interpreted in terms of form, texture, order, character, light and time. This nature based symbol-system will ensure an accessible, multi-functional and adaptable architectural framework. A suitable framework will also aid the generation of identification and orientation. "The existential purpose of building (architecture) is therefore to make a site become a place that is to uncover the meanings potentially present in the given environment." Norberg-Schultz further describes how man can create an existential foothold through the acts of visualisation, complementation and symbolization.

The ultimate goal therefore, is the creation of an architectural product that can, by its mere identity, aid in the interpretation of the importance of the Cradle of Humankind World Heritage Site. What clues then, can we find in the physical context of the proposed Mohale's Gate site? How can this be used to emphasize the meaning of the COH? A study of the topography of the site area reveals a natural gateway or entrance to the COH WHS. This relates to the need to create a centre that forms a introductory landmark in the natural landscape. The topography of the Mohale's Gate site reveals a dynamic character where a certain level of instability exists.

How can this relate to evolution?

We know that everything in nature tends towards a state of equilibrium. A state of instability can be compared to the process of evolution in that it remains in a state of change or flux. Through the act of building, man reveals his understanding of nature. By creating a landmark in the landscape, a higher level of worth can be associated to the process of evolution in this particular landscape.

To whom must this meaning be revealed? Who will benefit from an increase in meaning in this concept?

Ultimately all of humankind, because the process of evolution is something all humans can relate to. The manner in which the meaning and importance of the COH can be revealed to the users must form the basis of this investigation. This will generate the most appropriate solution. The natural context and its characteristics must form the basis of the design concept.

How will this context be presented to the users?

This experience can be equated to the process of evolution where humanoids had a close relationship with nature. It was experienced through all the senses. All levels of perception were utilized in the interpretation of the environment, this also ensured survival. The interaction between the individual and his perception of the physical environment is thus the basis that informs the design concept. Contrast creates voids to be filled by individual interpretation. The aim of this project is to construct a framework of architectural systems able to evoke individual interpretation of the context.

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THE STATUS OF THE COH WHS UNDER THE CONVENTION- LEGAL REVIEW

The World Heritage Committee inscribed the COH WHS onto the World Heritage List in December 1999 as a cultural property and not as a natural property. The conditions in the Operational Guide lines for the preservation of natural properties, namely, the conditions of integrity, are more stringent than the conditions for the preservation of cultural properties, namely, the conditions of authenticity. In order to maintain the listing of the COH WHS as a cultural property, the Republic of South Africa must continue to comply with these conditions of authenticity which require:

- adequate *legal (whether at the national, provincial or municipal level) and/or well-established contractual protection and management mechanisms* to preserve the COH WHS; and
- effective implementation of such laws or contracts, and management mechanisms by way of *suitable administrative arrangements*.

The conditions of integrity for natural properties are not obligatory for cultural properties such as the COH WHS. These obligations of integrity entail, *inter alia*:

- adequate long-term legislative, regulatory or institutional protection;
- the use of zoning to identify areas immediately adjacent to the WHS, so-called buffer zones, to protect the property from the direct effects of human encroachment and the impacts of outside resource use; and
- a management plan for the property which may differentiate between areas in the WHS by designating distinct management zones such as core, buffer and transitional zones.

The Republic of South Africa is not obliged to comply with the conditions of integrity in its management of the COH WHS. This means that, under the Convention, the use of zoning and a management plan are not strictly necessary for the preservation of the COH WHS.

Nevertheless, the fact that the COH WHS was not also inscribed onto the World Heritage List as a natural property does not mean that the COH WHS has no natural conservation value. The Convention does not prohibit the Republic of South Africa from managing the COH WHS as if it were a natural property. This would be in excess of the conditions of authenticity for cultural properties and more in line with the conditions of integrity for natural properties (including, the use of a zoning system in the management of the COH WHS).

The consultants share the view that the integrity of the natural environments included in the COH WHS (e.g. the geophysical formations such as the dolomitic ridges) is probably necessary for the preservation of the cave formations at the COH WHS (including their visual quality and “sense of place”). This applies particularly to those cave formations yet to be identified which house or may house palaeontological and other cultural heritage resources. In other words, as a practical matter, the preservation of the cultural heritage of the COH WHS is dependent on the preservation of its natural heritage. If there is a sound basis in fact for this view, then the alignment of the management strategy for the COH WHS with the conditions of integrity by way of the adoption by DACEL (as the COH-WHA) of environmental management standards would be legitimate. This would be provided that those standards are reasonable and rationally related to the cultural heritage preservation objectives as set forth in the WHCA and the Convention.

THE KEY CULTURAL AND ENVIRONMENTAL HERITAGE LEGISLATION IMPACTING ON LAND USE ACTIVITIES IN THE COH WHS

The key cultural and environmental heritage legislation impacting on the COH WHS are the WHCA, the NHRA, the National Environmental Management Act No. 107 of 1998 (the “NEMA”) and Section 23 of the Environment Conservation Act No. 73 of 1989 (the “ECA”), each as amended.

WORLD HERITAGE CONVENTION ACT

In the area of the COH WHS, the WHCA falls under the administration of the Environmental Minister and, once established, the COH -WHA. The Environmental Minister may make regulations for the management and preservation of the COH WHS, and may empower the COH -WHA to make rules on such matters affecting the COH WHS as prescribed by the Environmental Minister.

The main import of the WHCA is that the COH WHS must be managed and preserved in accordance with:

- the principles of sustainable development set forth in the WHCA and other legislation such as the NHRA and the NEMA, which together entail the balancing of socio-economic development needs with cultural and/or environmental heritage conservation needs; and
- an integrated management plan (“IMP”) approved by the Environmental Minister, subject however, to applicable law such as the NHRA and the NEMA.

The distinguishing feature of the WHCA is that it is expressly subject to applicable law, in particular, the NHRA and the NEMA which prevail to the extent of any inconsistency with the WHCA. These two Acts, therefore, remain as the pre-eminent pieces of cultural conservation and environment conservation legislation. Stated differently, the WHCA is a parallel regulatory instrument not intended to override or replace existing legislation, but instead, intended to be co-ordinated within and otherwise complement the existing regulatory framework.

NATIONAL HERITAGE RESOURCES ACT

According to the NHRA and its regulations, palaeontological sites and materials and any national monuments or cultural treasures declared as such under the now repealed National Monuments Act No. 28 of 1969 (the “NMA”), which are located in the COH WHS, fall under the administration of the South African Heritage Resources Agency (the “SAHRA”). This is unless Gauteng establishes its own Heritage Resources Authority (the “HRA”). However, if the SAHRA declares the COH WHS to be a National Heritage Site (the “NHS”), and any palaeontological materials located therein as “heritage objects”, then the COH WHS and any such heritage objects will remain under the administration of the SAHRA notwithstanding the appointment of the Gauteng HRA. It has been assumed that the SAHRA will declare the COH WHS as a NHS and, accordingly, that the Gauteng HRA, once established, will not be the responsible HRA for cultural heritage matters affecting the COH WHS.

The main import of the NHRA and the regulations thereunder, is that it:

- provides for ownership by the State of those fossils that are not held by the possessor thereof under a permit (whether issued under the NHRA, the NMA or equivalent provincial legislation) and that are not registered with the SAHRA by 31 March 2002; and
- provides for notification to, and approval by, the SAHRA of certain types of land developments in all areas, and for compulsory assessments of and reporting on the potential impact of those land developments on heritage resources.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT NO. 107 OF 1998 (THE “NEMA”) AND SECTION 23 OF THE ENVIRONMENT CONSERVATION ACT NO. 73 OF 1989 (THE “ECA”), EACH AS AMENDED

In the area of the COH WHS, the NEMA and Section 23 of the ECA (which relates to the establishment of limited development areas, an “LDA”) fall under the administration of the Environmental Minister, the Director General of the national Department of Environmental Affairs and Tourism (the “DEAT”), the Gauteng MEC for environmental matters (the “Gauteng Environmental MEC”) and the head of DACEL (the “HOD DACEL”).

The main import of the NEMA is that it:

- empowers the Gauteng Environmental MEC, with the concurrence of the Environmental Minister, to make regulations prohibiting or otherwise controlling specified new land use activities in a specified geographical area (such as the COH WHS), and to require environmental impact assessments of such specified activities prior to their commencement;
- empowers the HOD:DACEL to require land users (including those in the COH WHS) who have engaged or are engaging in land uses, whether lawful or unlawful, that have polluted or are polluting the environment to undertake measures for the remediation of the affected land; and
- empowers the Gauteng government to influence the content of the integrated development plan (the “IDP”) and spatial planning decisions of the WRDM.

The main import of Section 23 of the ECA is that it empowers the responsible authority in the Gauteng government to declare the whole or any part of the COH WHS an LDA. This would result in the automatic prohibition of any new land development in the LDA which is undertaken without an assessment of the impact thereof on the environment in the LDA or without the prior approval of the responsible authority.

Extract from Master Planning Document-www.cradleofhumankind.co.za

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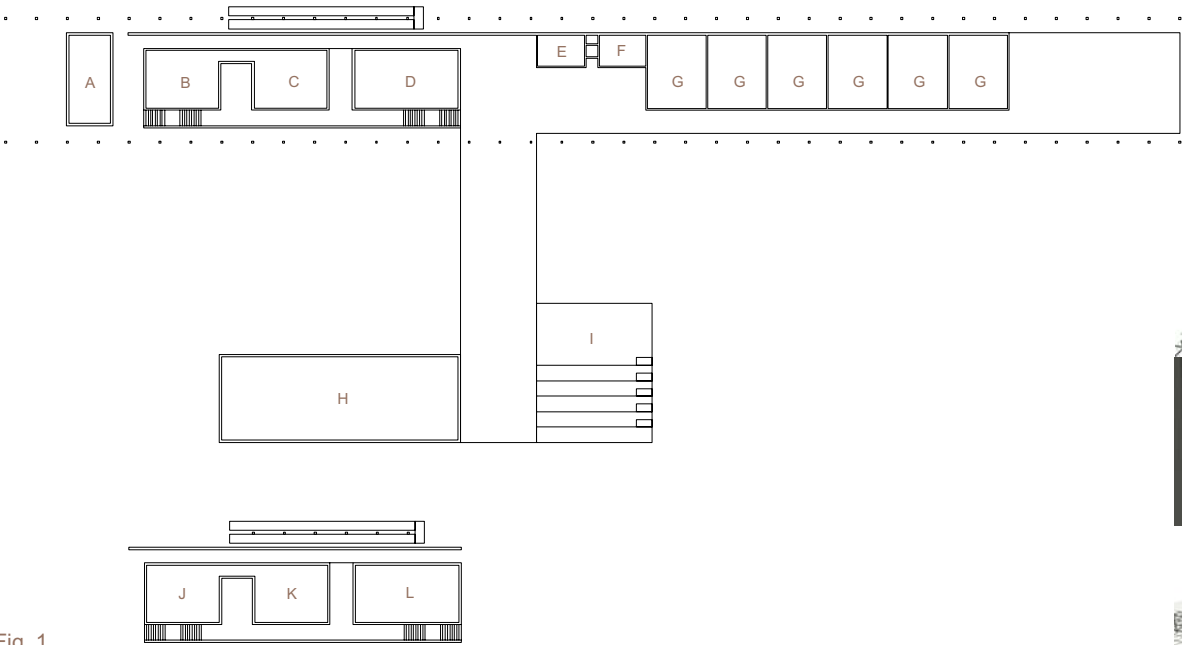


Fig. 1

LEVEL 1

- A - RECEPTION AND RETAIL
- B - COMPUTER LAB
- C - EDUCATION CENTRE LECTURE HALL
- D - STAFF OFFICES AND CONFERENCE FACILITY
- E - MALE ABLUTION
- F - FEMALE ABLUTION
- G - FOOD AND BEVERAGE OUTLETS
- H - SITE SUPPORT FACILITY
- I - OUTDOOR AMPHITHEATRE

LEVEL 2

- J - MULTI-MEDIA AUDITORIUM
- K - EXHIBITION SPACE
- L - EXHIBITION SPACE

- 1 - AERIAL VIEW LOOKING SOUTH
- 2 - ENTRANCE VIEW DOWN PASSAGE
- 3 - NORTH EASTERN AERIAL VIEW
- 4 - PASSAGE VIEW
- 5 - VIEW FROM OUTDOOR AMPHITHEATRE
- 6 - VIEW OF RAMP AT EASTERN EDGE
- 7 - VIEW OF COURTYARD LOOKING NORTH



Fig. 2

SO.1 OCCUPANT COMFORT

SO.1.1 Ventilation

The following ventilation rates are required for each of the main functions of the Interpretation Centre:

Function	Air exchange rate required in	Comments
Theatre (Indoors)	3,5	Rate required per person
Education centre	7,5	Rate required per person
Cafeterias	5,0	Rate required per person
Kitchens	17,5	Rate required per person
Retail	7,5	Rate required per person
Conference facility	5,0	Rate required per person
Offices	5,0	Rate required per person
Exhibition space	3,5	Rate required per person
Ablution	20	Rate required per urinal/w c

Fig. 3 Table of required ventilation rates

All ventilation in the Centre will be provided by natural means. The design will incorporate the existing wind patterns on site to facilitate the necessary air volume changes. Wall and opening design will further exploit passive ventilation and the natural convection characteristics of heated and cool air to aid ventilation. Where additional forced ventilation is required such as in kitchen and ablution facilities, mechanical systems powered by renewable energy sources may be utilised. The natural, rural setting of the centre ensures quality fresh air without the need for filtering.

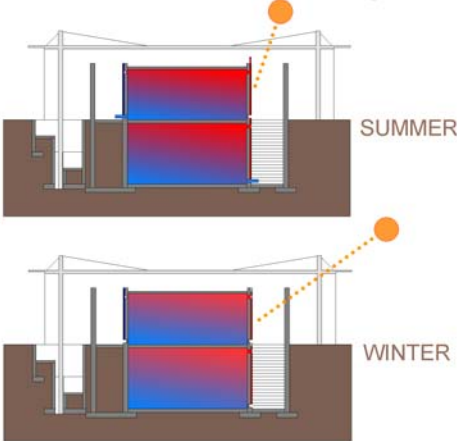


Fig. 4 Sections illustrating function of Trombe Wall during Summer and Winter months

The wall section will function as a trombe wall making use of the convective qualities of air flow to aid ventilation. The construction will use Cor-ten steel panels bolted to a steel channel spacer to form a cavity with the reinforced concrete walls.

SO.1.2 Thermal comfort

The climate of the site will be tempered with passive design elements and controls that is both energy efficient and operable to suit individual user preferences. The thermal qualities from a range of building materials will be utilised according to properties. In-situ concrete with its thermal storage characteristics is used to construct the main structure. This will ensure a more constant climate in the exhibition spaces forming the core of the facility. Shade structures is used to avoid overheating of this functions.

The existing wind directions in the site area will be directed to further aid ventilation. The main building structure is placed almost parallel to the summer wind direction, this provides protection from low east-west sun positions but allow cooling winds to cool the building structure.



Fig. 5 Site layout plan indicating general wind direction during Summer and Winter.

SO.1.3 Views

Controlled views of the natural surrounding landscape forms an important part of the visitor and staff experience of the centre. Vistas and lines of sight aided the layout and design of the facility. A connection between visitor and landscape formed the basis of the design. Views out of, and into the various functions is controlled and guided by the level of privacy required. Workers in the office space need have a wide field of view to ensure and enforce security. A need for passive security thus also necessitated views through out the facility.

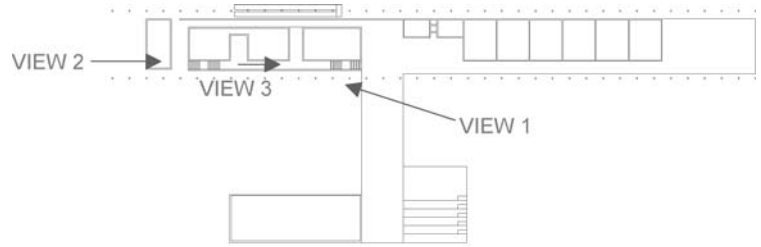


Fig. 7 Building plan indicating view directions

SO.1.4 Noise

The R563 road is the main source of noise pollution. Various solutions can be utilised to curb this problem. Soft landscaping and earth berms is used to attenuate the sound. Speed reductions of the speed limit on the road can also be agreed upon with the local authority. Noise from vehicles of visitors can be attenuated by distance and soft landscaping.

Construction methods and the use of sound absorbing, reflecting, and insulating materials will further reduce unwanted noise. Considering the natural setting, noise plays only a minor role in comparison to other influences.

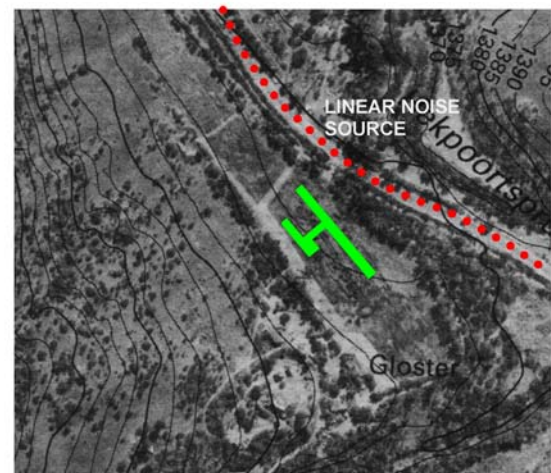


Fig. 8 Site layout indicating road noise source

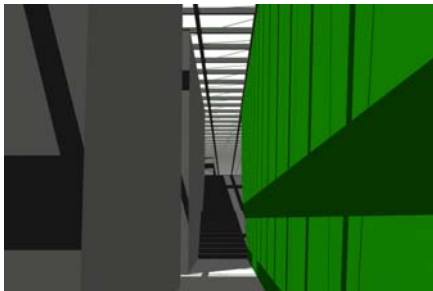
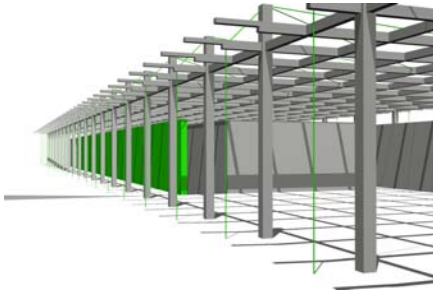


Fig. 6 3D Concept building model. Views, see fig-7

SO.1.5 Indoor/Outdoor connection

As mentioned in the "Views" section, the connection between visitors and staff members with the natural landscape forms a main component of the experience and the interpretive function of the facility. The design and detailing of transitional spaces between indoor and outdoor areas will receive particular attention.

SO.2 INCLUSIVE ENVIRONMENTS

SO.2.1 Transport

The larger part of visitor numbers to the centre will utilise private transport, foreign visitors will mainly make use of tour busses for transport. To make the facility more accessible to local visitors without private transport, scheduled tours can be organised. This will mainly serve the surrounding community. The relative proximity of the centre to the town of Krugersdorp and surrounding towns will ease staff transport to and from the centre. A daily pick up and drop off service of staff members can be organised to ensure worker attendance.

Increased mobility is proposed by means of a themed bus service running on a circuit that links the proposed visitor information points and places of interest. This facility will be available for public use only between those points. The main transport terminus will be at Mohale's Gate.

A COH WHS themed steam train is proposed on the disused SPOORNET rails to the west and north west of the area.

SO.2.2 Entrance

The entrance and approach to the Interpretation centre form part of the whole visitor experience. In view of the function of the centre as Interpretive tool, the entrance and approach must be easily identifiable and transparent. The setting and site layout, where the building can be seen as an object in the landscape, needs to be manipulated to direct new visitors to the entrance. The connection between initial view after arrival on the site, the parking area and approach to the centre needs to be designed in detail.

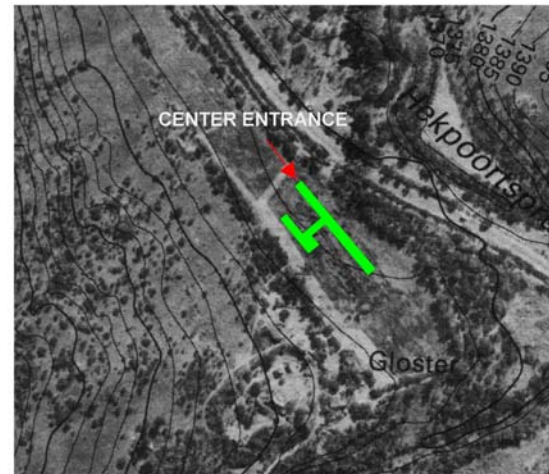


Fig. 9 Centre entrance location

SO.2.3 Circulation

The circulation of visitors in and around the centre was directed and manipulated to fit the hierarchy and order of the functions in the facility. The projected visitor numbers according to time of day and function guided the layout of the circulation route. A further guide to the layout of the circulation routes was the views and vistas to and from the centre. The circulation also had to aid passive security.

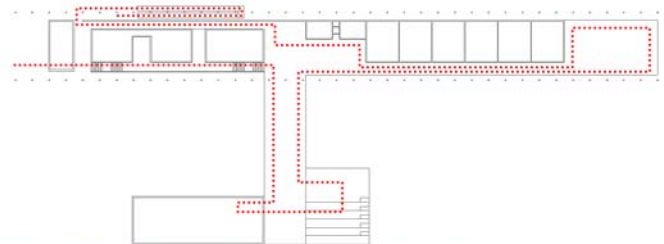


Fig. 10 Possible circulation routes through centre

SO.2.4 Furniture and fittings

The use and type of fittings and furniture varies according to function. The conference facility will be a multi-function space with movable furniture and partitions.

The multi-media theatre leading to the permanent exhibition space will have fixed seating. All area where groups can meet for a presentation or meeting will be equipped with sound and intercom systems. The multi-media theatre will also be equipped with projectors and other presentation technology. This equipment requires a high level of security to avoid theft and misuse. The kiosks and food outlet facilities will be equipped by the independent licence holders. The exhibition areas will also be equipped with specialist lightning and presentation systems.

SO.2.5 Toilets and kitchens

Ablution and restaurant facilities will be outsourced to local private businesses, with employment as aim in the contract.

SO.3 ACCESS TO FACILITIES

SO.3.1 Childcare

Care of children during visits to the centre will be the responsibility of the parents. Educational programs may be presented aimed at various age levels.

SO.3.2 Banking

A ATM machine will be available close to the retail facility.

SO.3.3 Retail

The retail facility will also be outsourced to local private businesses. The facilities will centre mainly on the sale of locally manufactured curio, jewellery and liquor. A percentage of the profits of the retail function and use of local labour will form part of the contract agreement.

SO.3.4 Communications

Wireless telecommunication systems such as cellular phones and microwave dishes are considered to be ideal for preserving the aesthetic quality of the COH WHS environment. However, innovations are required to mitigate the visual impact of towers, as they inevitably are built on ridges. It is therefore recommended that towers be restricted to high intensity use zones. Telkom's DECT towers cannot be easily camouflaged and so it is recommended that they be relocated to ridges outside the COH WHS. Discussions need to be held with Telkom for cost-effective alternatives to the poor service especially at Kromdraai. It is recommended that new line telecommunication infrastructure is constructed on existing poles or else kept in the existing servitudes underground.

A network of communication hubs between the visitor information points is also proposed.

SO.3.5 Work/ Residential

No additional residential facilities will form part of the program of the Interpretation Centre. Staff members will be transported from nearby cities, towns and farms. All work opportunities will be filled by local labour. All outsourced functions will have this requirement stipulated in the contracts.

SO.4 PARTICIPATION AND CONTROL

SO.4.1 Environmental control

To ensure personal satisfaction and comfort, permanent staff will be able to adjust their personal working environment including natural lightning, ventilation and heating. This will promote productivity.

SO.4.2 User manual/training

Staff members will be educated in the sustainable use of the building as well as specialist equipment used in the normal functioning of the centre. The aim is to keep systems as basic and easily operable as possible to ensure proper use and avoid down time and maintenance.

SO.4.3 Social spaces

Spaces for social interaction is provided next to or in close proximity to all meeting areas, both outdoors as well as indoors. Seating spaces will also be designed in addition to seating in the open air amphitheatre.

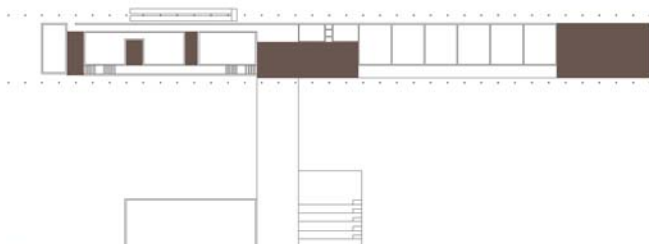


Fig. 11 Location of social spaces interspersed between functions

SO.4.4 Amenity

Ease of access to all supporting function including kiosks, restrooms and waterpoints will be ensured.

SO.4.5 Local community

Potential community benefits

1. Economic benefits

- Formal employment opportunities
- Training for formal employment
- Training for self-employment
- Labour intensive infrastructural interventions
- Capital support for small business
- Access to land for productive and domestic use, including natural resources
- Access to markets
- Access to transport

2. Cultural benefits

- Wider understanding of culture & people in area
- Greater respect for varied cultures in the area
- Greater cultural cohesion in the area

3. Social benefits

- Access to formal housing
- Access to potable water
- Access to transport
- Access to schooling
- Place of safety for abused women and children
- Prevention of HIV/Aids
- Alcohol abuse prevention programmes and abuse interventions
- Violence prevention interventions
- Crime prevention interventions
- Access to electricity
- Health facilities access and improvements
- Recreational areas (including playgrounds)

4. Scientific Community Benefits

- Long term sustainability of the site for scientific processes
- Value of intellectual capital
- Development of capabilities of staff
- Raised scientific profile
- Employment opportunities, including for black, female and disabled scientists

5. Environment and conservation

- Land Care
- Alien plant control
- Road stabilisation
- Quarry rehabilitation
- M&E – training and data collection
- Research projects

- Field guides
- Recycling and waste management
- Water bottling
- Traditional crops
- Waste swapping
- Crafts – training and production
- Signage
- Butterfly farm
- Cultural village
- Community tourism on community land
- Bioprospecting – medicinal and cosmetic
- Indigenous and medicinal nurseries
- Indigenous crops
- IKS
- Resource harvesting

Benefits will occur in three main areas:

- job creation, both temporary and permanent, through environmental initiatives, and the construction and upgrading of housing, the interpretation network facilities and infrastructure;
- small business opportunities in the tourism, hospitality and related service sectors, arising from the development of the interpretation network and increased tourism to the area; and
- community infrastructure and service delivery which will increase the quality of life of all residents of the area. This will include housing development and a programme to upgrade and secure tenure of residents where this is appropriate.

SO.5 EDUCATION, HEALTH & SAFETY

SO.5.1 Education

Education Resource Centre

While the Education Resource Centre aims to provide resources to all schools visiting the site and to find creative ways to provide resources to-

those who are unable to visit the site, a special focus will be to support the schools within and immediately surrounding the COH WHS. There are almost 50 schools operating in Circuit 5 of the Krugersdorp / Roodepoort district, many of them operating with very scarce resources. Teachers from schools in the area will be invited to training programmes and offered resource packages and access to equipment. Subsidised activities for local schools, along with sharing of resources for teachers to take back into local schools, will make a significant impact on community educational needs, and increase the likelihood of community "buy-in" on all levels. This interaction can be expected to engender a sense of local pride in the COH WHS heritage.

The Education Resource Centre will also function as a place of training for tour guides and others employed in the area to meet the needs of visitors.

The main community benefit deriving from the Education Resource Centre is educational and capacity building, not financial. Nevertheless, a number of jobs will be created as a dedicated staff of educationalists is needed.

SO.5.2 Safety and Security

Security

In addition to the On-Site Security Scheme, security will be needed in the Interpretative Centre, and possibly in other components of the Interpretative Network. There is the possibility of training and re-training people who are already employed in this capacity. In addition, security officials should also be trained in tour guiding skills, where appropriate.

The security of certain of the Interpretative Network components has the potential to be outsourced, although a decision will need to be taken by the Management Authority in association with DACEL as to the appropriateness of outsourcing this function for each component.

Should the function be outsourced, it could be contracted to a company with the condition that after a period of operating independently, it then hands over the function to a locally based company. In the interim it would have the responsibility of facilitating training

SO.5.3 Smoking

No smoking will be allowed indoors and in public spaces. Spaces allocated for smoking outdoors will be provided

SO.5.4 Indoor air quality

The rural, natural setting of the facility ensures fresh air quality without the need of filtering.

SO.5.5 Exercise & recreation

The activities presented in and around the COH WHS includes: Game viewing, bird watching, fishing, horse trials, hiking trials, 4 x 4 trials, mountain bike trials, camping, craft and art viewing, day tripping (Crocodile Ramble), hot air ballooning, spelunking, picnicking, canoeing, river rafting/tubing, Magalies meander, indigenous craft manufacturing and agri-tourism activities.

EC.1 LOCAL ECONOMY

EC.1.1 Local contractors

As part of the process of employing people from the COH WHS area, a set of conditions and criteria should be applied to ensure that the majority of people who benefit from the creation of the jobs are currently resident within the COH WHS and surrounding areas. This will need to be handled carefully, as development will also attract people to the area looking for jobs and opportunities. The Gauteng Provincial Government should seek to prioritise the involvement of local people in the COH WHS and thereby ensure their 'buy-in'. It is important that social organisation in the area is strengthened to be able to deal with this.

The set of criteria to ensure that priority for employment is given to residents of the area would include that to qualify for employment on the project a person must live in the area (local employment). There will also need to be a focus on the employment of women, people with disabilities or youth in particular situations. In addition, to ensure there is a spread of jobs, projects will seek to use labour-intensive building or production processes.

There is a need to ensure that the creation of new job opportunities and employment of local people should not disrupt the existing jobs or dislodge those in employment, or else the programme will quickly lose the critical support of landowners.

It needs to be stressed that this is an artificially created situation. As the COH WHS rollout takes place, it will act as a magnet for employment seekers, as well as people hoping to gain access to the scarce resources and benefits.

The residents of the COH WHS area and the Management Authority will have to deal with this to minimise conflict and division. Leadership and organisation can help to act as gatekeepers, and to stabilise the dynamics that get played out in such a situation and the WHA will need to play a role in facilitating this.

The creation of jobs and employment of people is regarded by respondents to the SES as a priority. Labour-intensive processes for construction of buildings and roads will go a long way towards meeting the immediate pressures. Skills training and capacity building will be necessary for the jobs requiring greater expertise, funds for which can be accessed from a range of local and international agencies.

Construction:

The Proposed Financial Plan for the COH WHS, drawn up in 1999, estimates that 1 172 temporary jobs will be created, either on or off site, during the construction period. While this may be an over-generous estimate and the exact number of jobs will depend on a number of factors,

there is no doubt that the construction of the interpretative facilities will result in a significant amount of temporary employment. The construction will be outsourced and guidelines and conditions, built into tender procedures and contracts, can ensure that local communities receive maximum benefit in terms of these employment opportunities.

EC.1.2 Local building material supply

The proximity of the site location relative to the industrial centres of Krugersdorp, Johannesburg and Pretoria ensures a local building material source. This proximity reduce travel distance and costs.

EC.1.3 Local components

All building materials and components will be sourced locally from the centres mentioned above. Specialist equipment will also be sourced from local suppliers with maintenance services and knowledge.

EC.1.4 Repairs and maintenance

Building components, systems and construction techniques will be designed to ease and reduce maintenance needs. This will also be done with the skill level of local contractors in mind.

EC1.5 SMME support

Households with access to sufficient capital may want to consider using this capital to engage in medium-sized enterprises. Some very poor households are engaged in extremely marginal, easy-to-enter enterprise arenas, and may want to access micro-financing, skills training support, etc.

DACEL needs to consider how to help residents of the COH WHS access varied programmes that provide capital and technical support. This support will need to be co-ordinated preferably through an NGO or private organisation.

There is a strong emphasis in many of the proposals that community benefits will accrue as a result of small business activity, much of it as an outsourced set of income-generating possibilities.

The Interpretative Network and Housing Development are the primary sources of outsourced economic activity, as detailed above.

From a "demand-side" perspective, the SES results indicate that very few of the existing small businesses owned and carried out by historically disadvantaged people are suited to the future market about to be created. In addition, it is anticipated that each of the identified opportunities would be "snapped-up" by entrepreneurs from outside the COH WHS area.

On the supply-side, attention needs to be paid to the extent to which a programme for SMME support should be set up, who is responsible for this and who would manage and fund it.

Alongside this, a systematic process needs to be established within the COH WHS to identify possible SMME opportunities that would require government facilitation to establish. Each of these opportunities will need to be analysed in detail to assess the sustainability of the opportunity.

There is a wide range of support available for small business development in South Africa, however, this support is not easy to access and it can be a complex process. It seems that a support mechanism would need to be introduced to the area designed specifically for the SMME market. Such support needs to consider non-financial support such as mentoring and training.

DACEL needs to consider the establishment of an agency with a defined mandate to oversee, support, project manage and mentor SMMEs for a stipulated time period. This agency would have no part of the running of the COH WHS or any of its components. It could be a non-governmental organisation or even an established SMME itself.

A business planning exercise would need to be undertaken within DACEL to determine the viability of this proposal. Critical would be the accessing of funding over a 3 – 5 year period. Funds are available from within Provincial and National Government and a variety of donor agencies.

SMME DEVELOPMENT AGENCY

DACEL should appoint an implementing agent with a defined mandate whose responsibility within the context of the establishment of the COH WHS would be to oversee, support, project manage and mentor SMMEs for a stipulated time period. This agency would have no part of the running of the COH WHS or any of its components. Although the responsibility for the implementation of the SMME support programme should not rest with DACEL or the COH WHS Management Authority, DACEL should undertake to seek sources of funding for so that an Agency can be appointed. DACEL should also seek the involvement of the Department of Trade and Industry as a priority.

EC.2 EFFICIENCY OF USE

EC.2.1 Space use

Occupancy and the use of space will vary according to season and time of day. Certain functions such as the conference centre and the outdoor amphitheatre can be used as multi-functional space that can be hired out to various private/public meetings to increase use.

EC.2.2 Occupancy schedule

A schedule of functions and presentations have to be kept to ensure a smooth flow of proceedings. Multi-media presentations in the indoor theatre will have to be timed according to visitor numbers and the required through flow of numbers.

EC.2.3 Management of space

The use of functions and spaces needs to be monitored for the sake of security. Supervision over space use is necessary due to excessive visitor numbers expected.

EC.2.4 Use of technology

Motion sensors will be installed to ensure optimum use of energy systems. These sensors can also be used for security. Systems controlled by occupancy of spaces includes artificial lighting, ventilation and heating. The economy of infra red sensors in ablution appliances to restrict water usage will also be investigated.

EC.2.5 Disruption & downtime

To eliminate or reduce disruption and downtime ease of access to supporting services must be ensured. Local contractors can be used to reduce travel distances in the case of failure of a system. Back-up systems will be used to enable the continuous use of functions.

EC.3 ADAPTABILITY & FLEXIBILITY

EC.3.1 Vertical dimension

To ensure maximum flexibility of functions, the vertical dimensions can be generous. The height in the exhibition space is a minimum of 3,5 meters. This will allow adaptability according to the requirements of the exhibited medium.

EC.3.2 Internal partitions

The temporary and permanent exhibition spaces will be laid out using partitions according to specialist requirements. This will allow flexibility in the flow of visitors.

EC.3.3 M&E Services

To allow maximum flexibility of spaces, the M&E services will be located in the floor and ceiling spaces. The plant room will also be located in an easily accessible location to enable maintenance work.

EC.3.4 Structure

The exhibition as well as the transport node will be designed to eliminate supporting columns. The main structure consists of a linear fragmented arrangement of functions covered by a light weight steel louver structure.

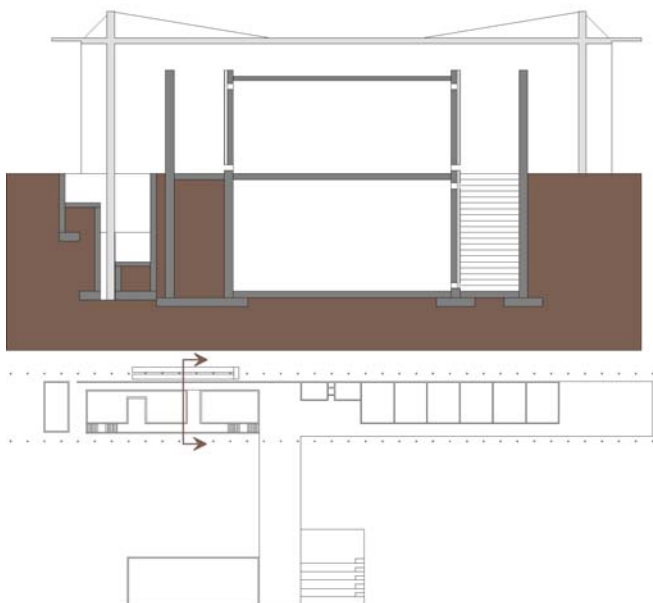


Fig. 12 Section indicating vertical scale

EC.3.5 Circulation & service spaces

The adaptability of circulation and service spaces will depend on the function of the space. The circulation spaces will be laid out to ensure flexibility and adaptability according to the functions they serve.

EC.4 ONGOING COSTS

EC.4.1 Maintenance

Maintenance can be contracted out to local specialist providers to the benefit of the local community.

EC.4.2 Cleaning

Cleaning services will be needed throughout the IC and possibly in other components of the Interpretative Network. It is proposed that this be outsourced to an outside company with conditions stipulating the use of local labour in the contract.

EC.4.3 Security/Care taking

In addition to the On-Site Security Scheme, security will be needed in the Interpretative Centre, and possibly in other components of the Interpretative Network. There is the possibility of training and re-training people who are already employed in this capacity. In addition, security officials should also be trained in tour guiding skills, where appropriate.

The security of certain of the Interpretative Network components has the potential to be outsourced, although a decision will need to be taken by the Management Authority in association with DACEL as to the appropriateness of outsourcing this function for each component. Should the function be outsourced, it could be contracted to a company with the condition that after a period of operating independently, it then hands over the function to a locally based company. In the interim it would have the responsibility of facilitating training.

EC.4.4 Shared costs

THE COH WHS MANAGEMENT AUTHORITY

The Management Authority (MA) has ultimate responsibility to ensure the protection of the unique cultural resources of the site. For all intents and purposes, this responsibility should be concentrated and can reside in, an existing regulatory authority as provided for in Section 8 of the World Heritage Act.

The Authority would have ultimate control over land use and development approvals within the area, through the implementation of standards, zoning appeals, and trading permits. Local authorities would retain initial approval review, but decisions would be subject to final

approval from the Management Authority. As such, the MA and local authorities work as partners to both control and promote certain types of development. Primary responsibilities include the following:

- Planning, Regulatory and Oversight Responsibilities
- Inter-Agency Coordinating Responsibilities

Staffing & Operating Budget

If coordinated as a regulatory agency within DACEL, the operation of the MA will require a total annual budget of R1.498.000 in Years 1 through 5. This budget would be funded through Gauteng Provincial Government and would support a full-time equivalent (FTE) staff of 7,5. The budget would fall to about R571.000 in years 6 through 10, for a total staff compliment of 3 FTE.

In the event of the MA becoming an independent co-ordinating and facilitatory body, then it would need to have its own auxiliary support services. Team members suggest that additional auxiliary staff requirements might include a financial manager & accountant, personnel office manager, administration officer, and legal advisor.

The Management Authority would occasionally recover a portion of this running cost through the distribution of trading permits. Property owners and entrepreneurs will want to take advantage of the market created as a result of investments in infrastructure and visitor facilities. Thus, permits for retail trading sites will have a value that can be used as a basis for permitting fees in support of the Management Authority's activities.

EC.4.5 Cost monitoring

CRADLE OF HUMANKIND CHARITABLE TRUST

The Trust would act as the principle driver for social benefits. A non-profit trust has the ability to leverage contributory funding in support of the COH WHS social objectives with regards to conservation, education, and community benefits.

These objectives would become the mission of the organization.

The Cradle of Humankind WHS Charitable Trust would operate as a non-profit organization subject to the laws and restrictions on charitable contributions. As a charitable organization, the Trust would operate separate and apart from both Government agencies and for-profit corporations. Its functions would include the following:

- Fundraising and generating income from other non-profit organisations and foundations, private contributors, NGOs, domestic and international agencies, and other donors in support of the mission of the WHS.
- Information. The Trust would be the primary source for information about the COH WHS, its mission and activities.
- Oversight. The Trust would have ultimate oversight for the successful operation of the visitor facilities.

However, the Trust and its Board are not responsible for day-to-day operations. That responsibility is given to the Executive Director of the Interpretive Facilities, who is hired by the Board. The Executive Director would hire experienced managers who, in turn, would staff their own departments. These facilities would operate as a "subsidiary" of the Trust that would generate income in support of their own operations

EC.5 CAPITAL COSTS

EC.5.1 Use of existing

Use of existing infrastructure including roads, pipelines and electrical supply lines will be used to minimise construction of new services.

EC.5.2 Shared costs

DEVELOP AN INSTITUTIONAL FRAMEWORK THAT WILL SUSTAIN THE INSTITUTION IN THE LONG TERM

The institutional structure outlined below is intended to bring all decision-makers together into an integrated structure to ensure that the potential of the COH WHS for enjoyment, learning, engagement, and scientific and community benefit is maximised.

The COH WHS Management Authority

The COH WHS Management Authority will have ultimate responsibility for planning, regulation and oversight of the COH WHS and for co-ordinating the activities of various government agencies, the community, academic institutions and the charitable trust.

The COH WHS Charitable Trust

The COH WHS Charitable Trust will operate as a non-profit organisation responsible for:

- Fundraising and generating income from other non-profit organisations and foundations, private contributors, NGOs, domestic and international agencies and other donors in support of the conservation, education and community benefit objectives of the COH WHS.
- Reinvestment or re-distribution of net operating revenues generated by the subsidiary units.
- Distribution of funds for community development and scientific research.
- Provision of information about the COH WHS, its mission and activities.
- Oversight of the visitor facilities. Responsibility for the day-to-day management and operation of these will vest in the Executive Director and management of the facilities.

These duties will be carried out under the direction of, and in accordance with, the policies of the COH WHA.

It is proposed that the Trust be divided into four executive/operating components:

- Interpretation Centre: This is the section responsible for the museum/interpretative centre(s);
- Fund Raising: Responsible for seeking funds;
- Marketing and Public Relations: Fulfills a public and media relations function and also co-ordinates the marketing activities of the COH WHS;
- Legal and Contracting: This unit will oversee contracts and concessions associated with subsidiary operations, and could also be involved in defining new development opportunities.

The COH WHS Charitable Trust will be guided and directed by a Board of Trustees representing a broad range of interests, expertise and stakeholders.

EC.5.3 Plate efficiency

The use of floor area and space will be utilized to its maximum potential

EC.5.4 Ratio of capital to ongoing costs

The COH WHS Charitable trust will ensure a balanced approach in expenses and income generation. The phasing of the project according to need will further limit costs.

EC.5.5 Proportions of cost/building size

Economy of materials and construction techniques will be kept in mind during the design phase of the project. This will control expenses and control capital investment.

EN.1 WATER

EN.1.1 Rainwater

Rainwater falling on building roofs will be collected and stored. This water will be used in the growing of produce next to the Centre. A part of the rainwater will also be used to flush toilets and urinals.

Potential annual rainwater harvesting volume

Total roof area	= 1222m ²
Approximate annual rainfall	= 767mm
	= 1222 x 0,767
	= 937.274m ³
	= 937 274l

Highest monthly rainfall (January) harvesting for sizing of storage container

Total roof area	= 1222m ²
Rainfall in January	= 146mm
	= 1222 x 0,146
	= 178.412m ³
	= 178 412l

Possible annual savings by using greywater for flushing of wc's and urinals instead of municipal piped water

Harvested rainwater volume	= 937m ³
Current cost per 1 Kl water	= R3
	= 937 x R3
Possible savings	= R2811

EN.1.2 Water use

The use of water will be rigorously controlled. Water efficient appliances will be used in the ablution and kitchen functions.

PROPOSALS FOR WATER

Tests from boreholes and observations of spring flows suggest that there is a large potential for groundwater extraction water in the karst formations and in the Crocodile Alluvium. The extent of this reservoir, however, is not fully understood and it is believed to be under pollution threat from mining operations and sewage plants adjacent to the World Heritage Site. In the event of reduced water availability, the Rand Water pipelines on the periphery are a potential source of bulk water into the region. Two bulk water sources from the Rand Water bulk main are estimated to cost R7.9 million for Catchment D to the south and R12.9 million for Catchment A to the north. Selling Rand Water is a potential source of revenue for the Management of the COH WHS, but problems in motivating communities to abandon cheaper sources from already installed boreholes and rivers are envisaged. The recommendation to monitor the groundwater and surface water near potential sources of pollution, and from springs is made.

WATER RESOURCES

- The ground water potential for the area was estimated at 34.3Mm³/a in 1986, but is a source that is threatened by pollution from effluent from water treatment works, mine dumps and animal farms.
- 5.5Mm³/a can be obtained from the Danielspruit spring and Kromdraai eye (1986 estimates), but once again its quality depends on the protection of the underground water and the quantities depend on the seasons.
- With respect to surface or river water, the two main sources are the Blaauwbankspruit (23Mm³/a at Zwartkop)/Crocodile (133Mm³/a at Kalkheuvel) system and the Skeerpoort system (12Mm³/a at Hartbeeshoek). This source is unpredictable in terms of quality and quantity.

- Reticulated bulk water supply from the Rand Water Board is from bulk pipelines that go past Mohale's Gate ($37\text{Mm}^3/\text{a}$) and to Pelindaba in the North, but there is no connectivity to the COH WHS.
- A limited reticulated supply potential from Mogale City Local Council (0.04Mm^3 reservoir capacity) exists.

The estimated potential 2013 averaged daily water demand in the COH WHS area is $1.2\text{ML}/\text{day}$ in Gauteng and $0.8\text{ML}/\text{day}$ in North West. At present 78.9% of the population have access to tapped water mostly from boreholes.



Fig. 13 Position of produce crop growing

EN.1.3 Grey water

Biodegradable cleaning solutions will be used by cleaning staff and in dishwashing. This will prevent ground water pollution and allow the recycling of water. Grey water will also be collected and used for agricultural as well as toilet flushing uses.

EN.1.4 Runoff

New and existing developments will be required to demonstrate that the adverse effects of uncontrolled storm water such as erosion, pollution and the threat to public health are mitigated. Steep slopes $>1:4$ and flood lines are to be kept free from development. A more comprehensive regional hydrology study needs to be done to indicate flood lines and check the adequacy of storm water routing structures, such as bridges and culverts, and dams in the area.

The use of hard paving and other impervious surfaces will be kept to a minimum. Parking areas will be constructed using pervious concrete blocks that prevent erosion and aid infiltration of rainwater.

EN.1.5 Planting

Only indigenous plant species will be specified in the construction of the Interpretation centre. Species selection will match existing, natural material. Soft planted terraces and open spaces will be specified for picnic space instead of hard man made surfaces. All plant species specified will also need to have low water requirements.

EN.2 ENERGY

EN.2.1 Transport

Visitors to the Interpretation Centre will be encouraged to leave their vehicles at the centre and travel through the COH WHS on organised tours using busses and open roof safari type vehicles. This will reduce emissions, congestion and noise. These organised tours will depart and return to the Interpretation Centre at regular intervals and according to need.

EN.2.2 Ventilation

Where possible, ventilation of the building will be achieved with passive systems. Other functions where this is not possible, will make use of mechanical ventilation systems using renewable sources of energy, i.e. solar energy.

EN.2.3 Environmental control

Where possible, environmental control systems will be achieved using passive design methods. This will reduce energy consumption. Individual control of systems will also be possible according to preference.

EN.2.4 Appliances & fittings

Energy efficient appliances and fittings will be specified through out the building. This will include fluorescent/low energy consuming light fittings, kitchen appliances and automatic control systems that functions according to need and use of particular functions.

EN 2.5 Energy sources, renewable energy

Just over 60% of the population in the COH WHS do not have access to electricity and depend on alternative fuels, including firewood. The problem for many low-income families usually lies in connection and capital costs. A wide selection of tariff structures is available, that can be customised to the customer's energy requirements. Provision of affordable electricity is seen as a potential generator of substantial social benefit. The projected domestic and visitor energy demand is 25.3MW in 2013. ESKOM is the only supplier of grid power in the region. It has an installed capacity of 210MW in 16 substations all within 5 kilometres of the COH WHS. Capacity problems have been identified in the Broederstroom area because of large tourism developments, and in the Honingklip area south of the COH WHS, below the Krugersdorp Ridge. Upgrades are planned for the Broederstroom area.

Renewable energy sources are attractive for remote sites in the COH WHS because of their modular nature. Solar power in particular is attractive because of its lesser visual impacts compared to wind and because of the solar potential of the area estimated at 1943kWh/m²/a on a horizontal surface compared to Wind 100-250W/m².

Solar and wind energy are more expensive than ESKOM grid power (R12 and R15/kWh respectively for stand alone systems compared to R0.3/kWh, 1998 costs), but technology improvements are reducing the costs year by year. Solar energy is still considered cost effective on remote sites where the cost of constructing a feeder to a site is large.

Solar energy using photovoltaic cells will be highly effective given the amount of cloudless days at the site area as well as the absence of obstructions. The use of gas burning instead of electrical appliances will also be specified. Solar water heaters will also be used for the preheating of water used in the food and beverage outlets.

Approximate annual electricity use of building

Predicted electricity use of centre	= 200kWh.m ² .a
Total building area	= 1943m ²
	= 200 x 1943
	= 388 600kWh.a
Electricity use per day	= 388 600 / 365
	= 1064 kWh

Possible solar power potential in site area

Potential	= 1943 kWh/m ² /a
Daily potential per m ² panel area	= 1943 / 365
	= 5.3 kWh

Solar panel area required

$$= 1064 / 5.3$$

$$= 200\text{m}^2$$

Approximate capital cost for installation of solar panel system

Cost per 0.5m ² panel area (2001)	= R3100
	= 200 / 0.5
	= 400
Cost	= 400 x R3100
	= R1 240 000

Approximate cost of grid electricity

Cost per 1 kWh	= R0.32
Electricity used annually	= 388 600 kWh
	= 388 600 x R0.32
	= R124 352

Time lapse before Solar panel system becomes cost effective

Annual predicted grid electricity cost	= R124 352
Capital cost of solar panel system	= R1 240 000
	= R1 240 000 / 124 352
Time lapse before system becomes sustainable	= 9,97 years

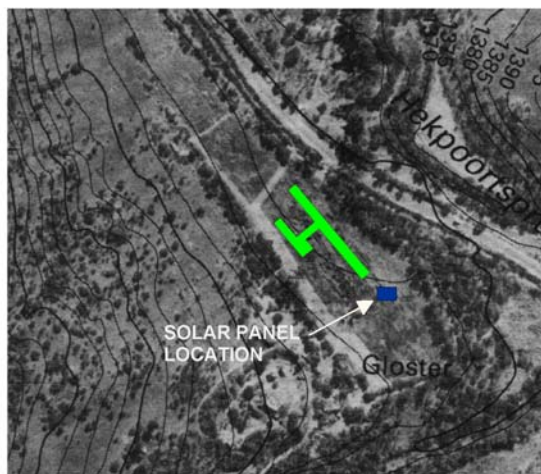


Fig. 14 Position of solar panel plant

EN.3 WASTEEN.3.1 Organic waste

Organic waste produced at the food and beverage outlets will be collected and used as compost in the growing of produce at the centre.

EN.3.2 Inorganic waste

It is recommended that no landfill sites be developed in the COH WHS, but that all non-compostible waste is disposed of outside its boundaries. An efficient collection system is required and hence, four collection and transfer stations have been proposed, at which waste will be separated for recycling and carted away. Residents will be asked to bring their waste to the collection centres. Problems are envisaged motivating the residents to abandon old practices of simply disposing the waste on their farms. The residents' and business community's cooperation is seen to be crucial to the success of any waste collection scheme in the area. Potential community benefits are envisaged by way of new jobs: collecting waste, sorting it, and attending to the centres; improved public health; and opportunities for training in handling waste.

EN.3.3 Toxic waste

The production of toxic waste at the Interpretation Centre will be prohibited. Wastes including used oil used in the preparation of food from kitchens will be collected and disposed of in a efficient manner. Provision of points specifically for the discarding of used batteries and printer toners will be provided.

EN.3.4 Sewerage

Recognising the rural character of the COH WHS, the ventilated improved pit latrine is proposed as a minimum sanitation standard. Furthermore, sealed sanitation systems are to be constructed in dolomite and fissured rock, to protect underground water resources. Upgrades to water borne central collection and disposal units are encouraged.

Possible locations for bulk sewers are recommended along the Blaauwbankspruit in Catchment D to the south for R2.5 million, and in Catchment A to the north for R0.45 million before cost of treatment. Bulk reticulation is considered as a long-term proposal.

A septic tank connected to a soak away system is proposed. The layout of this system will be constructed following the study of the site topography. Contamination of food crops will be avoided.



Fig. 15 Location of soak-away drain

EN.3.5 Construction waste

The production and disposal of construction waste will be strictly managed. Waste will be reduced using modular construction techniques as well as prefabricated components. Where possible, construction material will be recycled.

EN.4 SITE

EN.4.1 Brownfield site

The Interpretation facility will be constructed on a Greenfield site, but the impact on the environment will be controlled in a manner that allows returning the site to its previous natural condition. The size of the building and its footprint will be limited to form a compact whole. To further limit impact, existing roads will be utilised.

EN.4.2 Neighbouring buildings

The existing buildings near the site will have no major influence on the centre. Views to these buildings will be limited.

EN.4.3 Ecosystems

Impact on the natural existing ecosystems is reduced by the considered site position and layout of buildings and functions. Construction on sensitive areas such as slopes and ridges are avoided. The existing ecosystems play an important role in the quality of the visitor experience and strict measures will be taken to ensure its present state.

EN.4.4 Landscape inputs

The planned agriculture of produce for use at the centre will make use of organic waste as source of fertilizer. This will allow a decreased dependence on fertilizer from other distant sources and enables recycling of nutrients.

EN.4.5 Construction processes

Prefabricated and modular construction systems will be used to limit impact of construction processes on the site. These systems will also reduce construction time. Access to the site for vehicles transporting construction materials are with ease and unhindered.

EN.5 MATERIALS & COMPONENTS

EN.5.1 Material/Component sources

The proximity of the site location relative to the industrial centres of Krugersdorp, Johannesburg and Pretoria ensures a local building material source. This proximity reduce travel distance and costs. The recyclability of materials will also be considered.

EN.5.2 Embodied energy

All aspects of possible building materials will be studied to inform design decisions. Material with high embodied energy might have a low maintenance need that balances the equation.

The following table gives an indication of the main materials that will be used in the construction of the centre and the respective embodied energies of each:

MATERIAL	EMBODIED ENERGY kWh/(kg/m2/l)
Sand and gravel	0.02
Cement materials	2.3
Paint	106.6
Water	0.0022
Timber	70
Plaster	0.3
Glass	80
Finished steel	13.2

Fig. 16 Table indicating embodied energy of construction materials

EN.5.3 Manufacturing processes

Prefabricated components will be used to minimise site impact and speed up construction time. Standard components will also be specified.

Fig. 17 Shade structure assembled of modular units

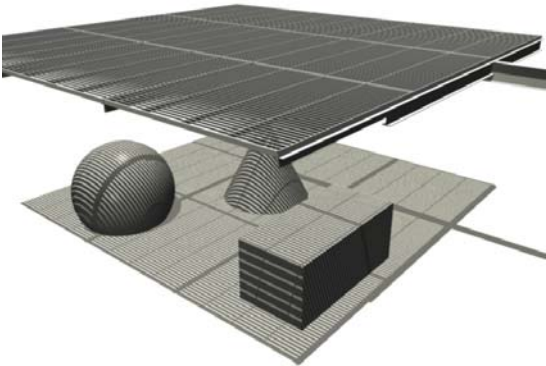
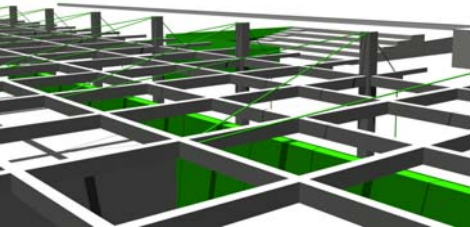


Fig. 18 Example of shadow patterns using louvre structure

EN.5.4 Recycled & reuse of materials & components

A percentage of building materials could be sourced from recycled or reuse sources to promote energy efficiency.

EN.5.5 Modular coordination

Modular components can be used to limit construction waste and speed up construction.

	Area m2	Quantity	Function of space	Finishes	Special equipment	Light levels-	Norms & standards SABS 0400
Visitor info point	12	1	Point providing visitors with info concerning facility	Tiles, brick walls, timber counter	Signage, computer system, intercom system	150	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Transport hub	306.4	1	Vehicular pick-up, drop-off point	Hard paving	Signage	150	Part B, C, D3, DD2, DD3, H, J, K, O, SS1-SS4, SS7, T, U, W
Orientation & exhibition	175.2	1	Permanent and temporary exhibition space	Tiles, stone walls, timber-steel exhibition equipment	Audio-visual equipment, intercom system, special lightning effects	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Education centre	139	(100 p) 1	Facility presenting educational activity programmes for school children, computer room, lecture room	Tiles, stone walls, timber-steel computer stand equipment	Computer network point, audio-visual equipment	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Field & site support facility	24	1	Recreational site activities centre, e.g hiking, mountain biking, 4x4 trails, horse riding, rock climbing, caving,	Tiles, stone walls,	timber-steel equipment shelving-stands	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Conference centre	50	(25 p) 1	Conference function	Carpet, acoustic wall-ceiling finish	Audio-visual equipment, intercom system, special lightning effects	750	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Restaurant & food outlets	433.2	6	Sit down and take away food outlets	Tiles, stone walls, timber-steel computer stand equipment	Computerised till point	300	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Outdoor amphitheatre	270	(min 300 p) 1	Multi-function gathering space	Hard paving-seating-stage area	Audio-visual system	100	H, J, K, M, R1, RR2, RR4-RR6, SS1-SS4, SS7, T, U, W
Retail outlet	49.5	1	Curio's, Gifts, Branded merchandise	Tiles, brick walls, timber-steel counter-shelving	Computerised till point	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Admin Offices	49.16	(4+2) 6	Office space for various trust members	Tiles, brick walls, timber-steel office furniture	Computer network point	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Ablution	50.65	(max 300 p) 2	Male, female, disabled ablution facilities	Tiles, brick walls, timber-steel partitioning	Water saving equipment	100	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, P, SS1-SS4, SS7, T, U, W
Parking	2100	Cars-148, Buses-6	Parking	Hard paving	Signage, lightning	150	Part B, C, D3, DD2, DD3, H, J, K, O, SS1-SS4, SS7, T, U, W

Fig. 19 Accommodation schedule table

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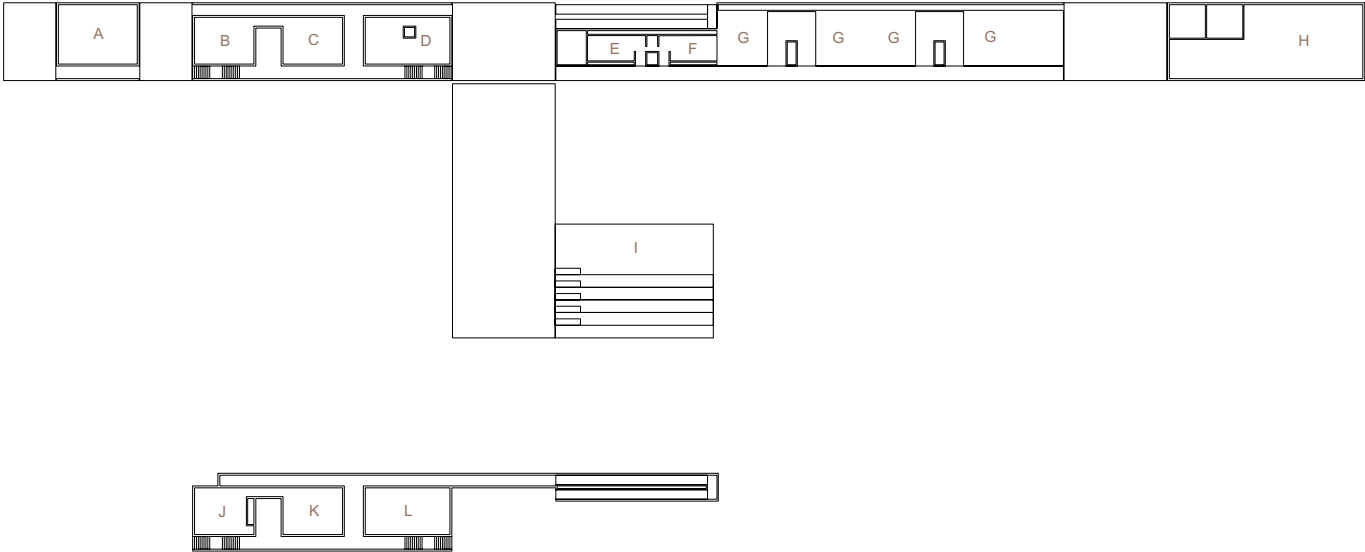


Fig. 1

LEVEL 1

- A - RECEPTION AND RETAIL
- B - COMPUTER LAB
- C - EDUCATION CENTRE LECTURE HALL
- D - STAFF OFFICES AND CONFERENCE FACILITY
- E - MALE ABLUTION
- F - FEMALE ABLUTION
- G - FOOD AND BEVERAGE OUTLETS
- H - SITE SUPPORT FACILITY
- I - OUTDOOR AMPHITHEATRE

LEVEL 2

- J - MULTI-MEDIA AUDITORIUM
- K - EXHIBITION SPACE
- L - EXHIBITION SPACE

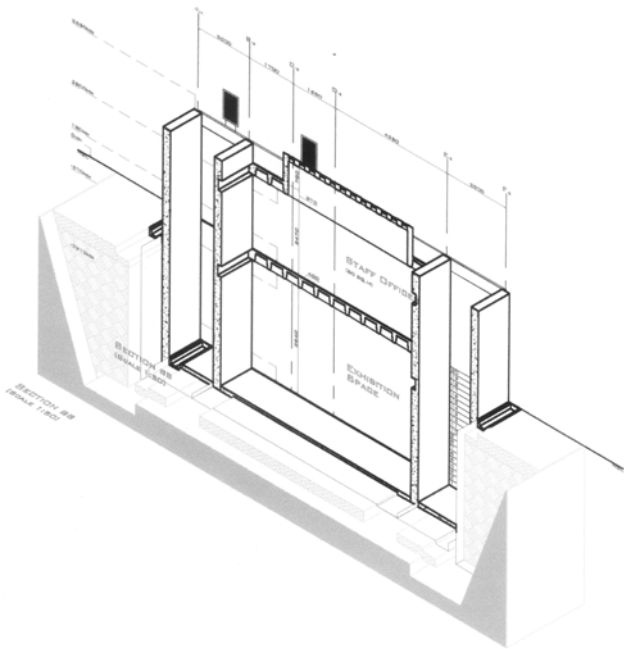


Fig. 2 Axonometric section through office and exhibition functions

SO.1 OCCUPANT COMFORT

SO.1.1 Ventilation

A range of methods was used to ventilate the different functions of the building. Where natural methods alone were not sufficient, mechanical ventilation is used. Specialized functions such as the Multi-media theatre and the exhibition areas, where heat generating equipment is used, especially required mechanical ventilation.

The mechanical extraction fans and ductwork used in the multi-media theatre and exhibition spaces extracts heated air at the upper part of the functions and draws in cooler air through openings located near the floor.

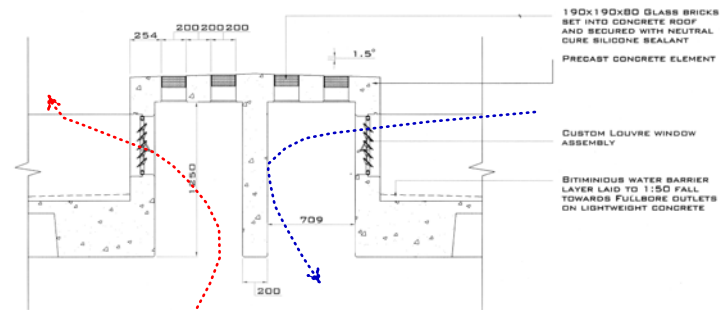


Fig. 4 Section through roof monitor, indicating predicted ventilation

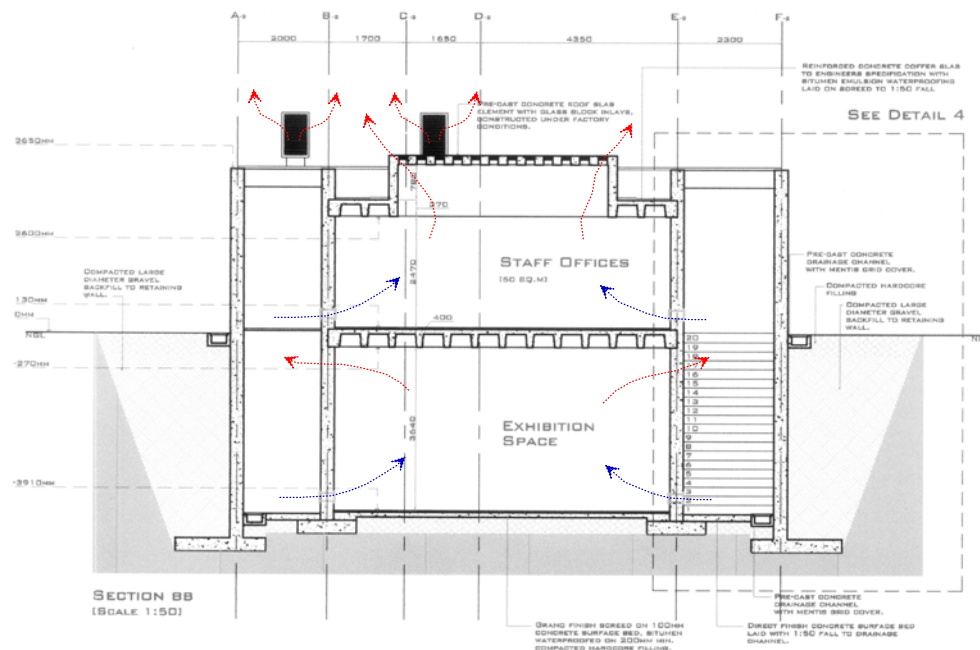


Fig. 3 Section through office and exhibition functions, indicating predicted ventilation

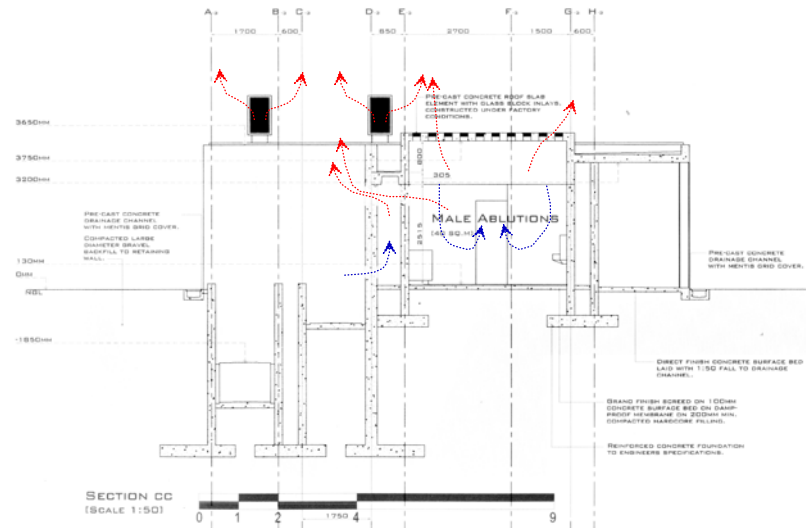


Fig. 5 Section through ablution function, indicating predicted ventilation

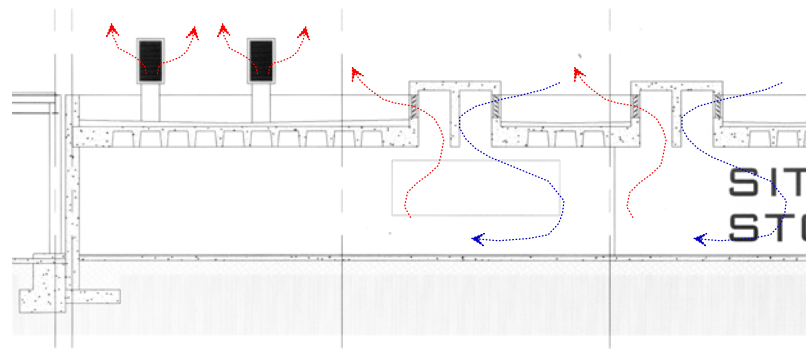


Fig. 6 Section through site support function, indicating predicted ventilation

The natural wind directions on the site were studied to inform the design of the monitor roof structures that serves as ventilators and wind directors.

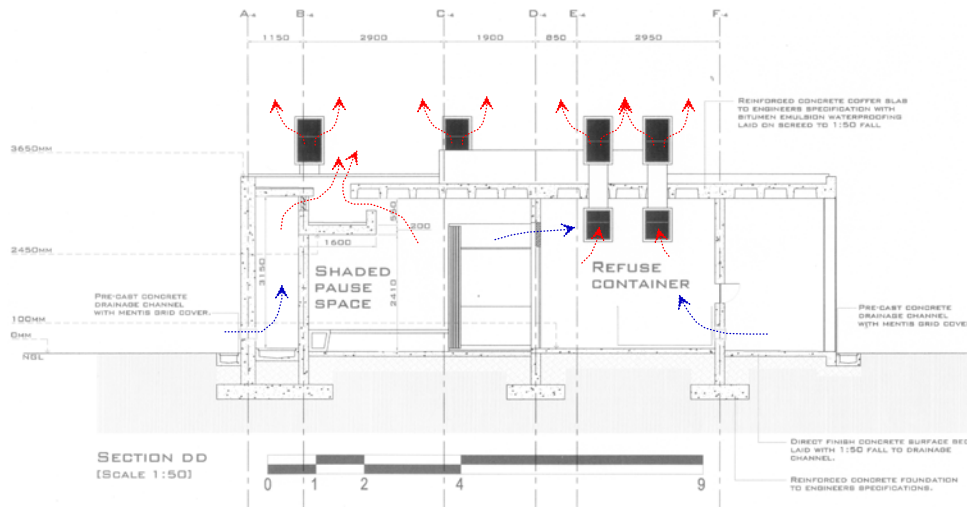


Fig. 7 Section through refuse function, indicating predicted ventilation

The refuse functions are ventilated by means of steel ventilators that rely on the convective properties of heated air. This method requires no electrical power supply input.

SO.1.2 Thermal comfort

Adjustable louver windows in the monitor structures allows building users to control their own environment. The mass quality of the concrete walls also act as thermal stores to create an equilibrium between thermal fluctuations of day and night.

SO.1.3 Views

The views indicated in the concept design is further strengthened in the latest design. Views parallel to the structure and views into the landscape forms an important part of the visitors experience.

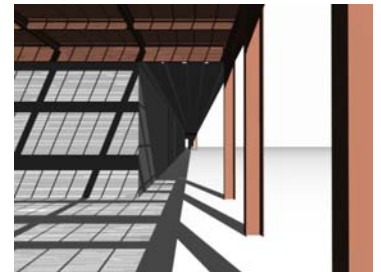
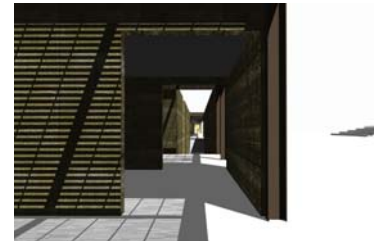


Fig. 8 Various views along the linear route

SO.1 4 Noise

Noise generated by motor vehicles on the R 563 road is the main noise source. To stop unwanted external noise from entering the office, theatre and lecture hall functions, mass wall structures is used in the design to act as deflection screens.

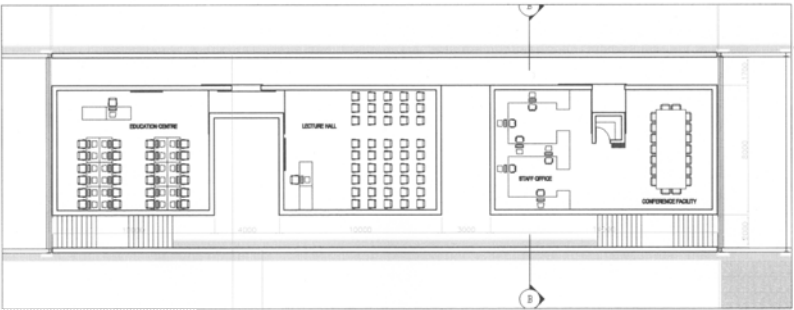


Fig. 9 Plan of education and office functions

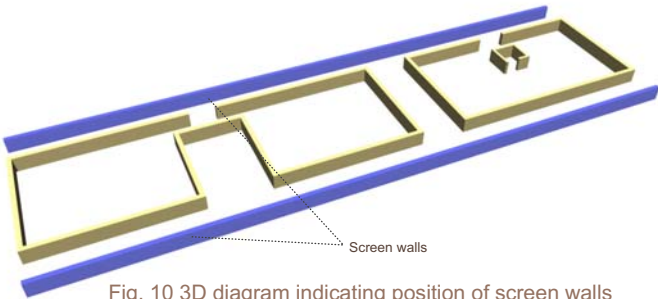


Fig. 10 3D diagram indicating position of screen walls



Fig. 11 Site plan indicating position of road relative to the building

SO.2 INCLUSIVE ENVIRONMENTS

SO.2.2 Entrance

The entrance and approach to the building is designed to guide visitors from the parking area to the building. The steel shade structure identifies the reception area and also forms the first social area.

The position and layout of the parking area between the R563 road and the Interpretation centre aims to guide views onto the building as well as into the surrounding landscape.

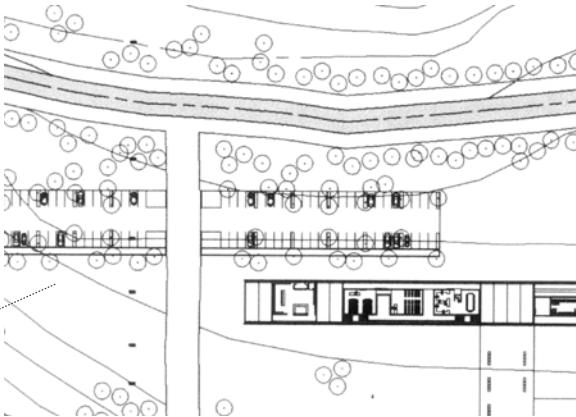


Fig. 12 Plan indicating position of building entrance and approach

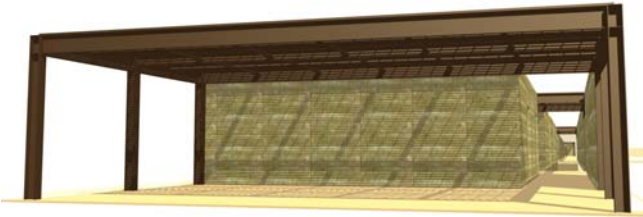


Fig. 13 3D model of building approach and entrance

SO.2.5 Toilets and kitchens

Ablution facilities are located next to the food outlet functions. This includes male/female as well as disabled ablutions. The ablutions are centrally located to facilitate easy access.

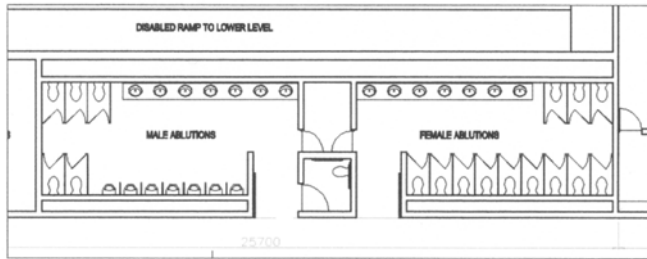


Fig. 14 Plan of ablution function

The kitchen functions forms part of the food outlet function. The equipment will be specialized according to the outlet function and will be supplied by the private businesses hiring the premises.

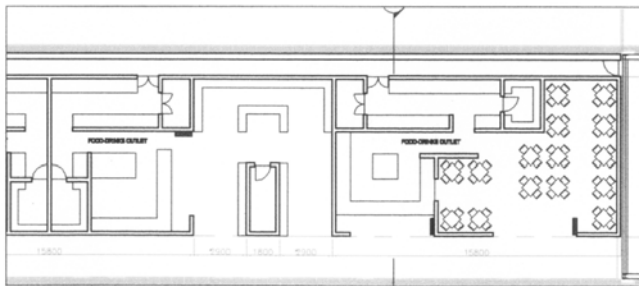


Fig. 15 Plan of food and beverage functions

SO.3 ACCESS TO FACILITIES

SO.3.2 Banking

A ATM machine will be located in the reception and retail facility. This location provides the necessary security required.

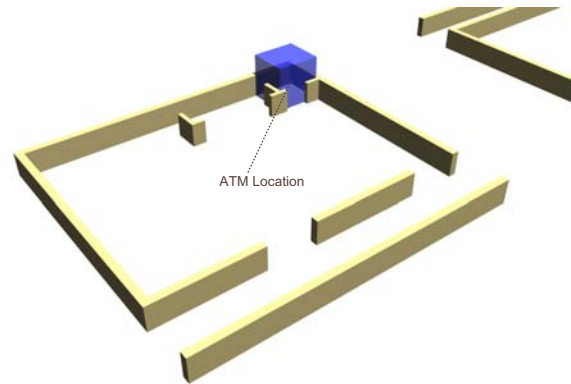


Fig. 16 3D diagram indicating position of ATM facility

SO.3.3 Retail

The retail function is located at the entrance to the facility, this ensures enough visitor exposure as well as security.
(see fig. 13)

SO.4.1 PARTICIPATION AND CONTROL

SO.4.3 Social spaces

Social spaces form the transitional spaces between the different functions of the building. Some of these spaces is defined by steel shade structures providing pause spaces. The shade patterns cast by the structures emphasizes the time concept used in the design of the building.

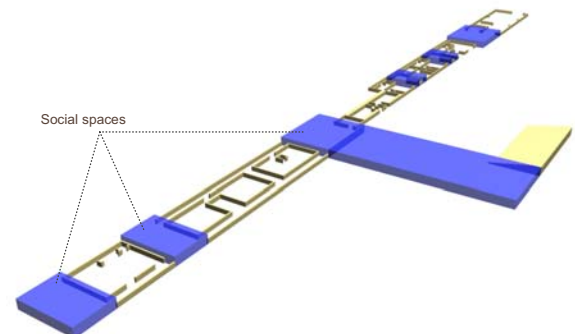


Fig. 17 3D diagram indicating position of social spaces

SO.5 EDUCATION, HEALTH & SAFETY

SO.5.1 Education

The educational function of the facility consists of a commuter laboratory with 24 computers as well as a lecture hall with seating for 45 pupils. This functions is located next to the staff offices to ensure security and supervision.

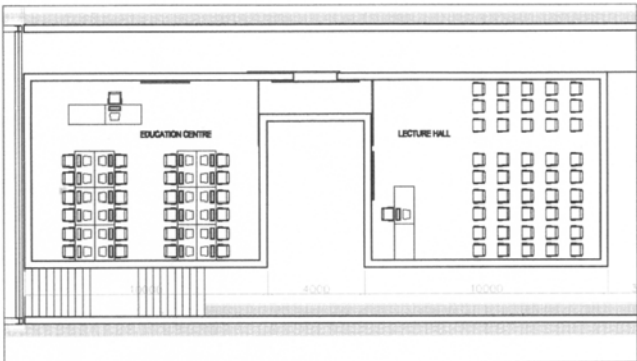


Fig. 18 Plan of education function

SO.5.5 Exercise & recreation

The site activity function is located at the southern most part of the facility with separate access to the R 563 route. From this function, tourists can go on 4x4 open-roof vehicles on drives through the COH WHS. The function also serves as store for equipment that includes off-road bicycles, abseiling and spelunking gear.

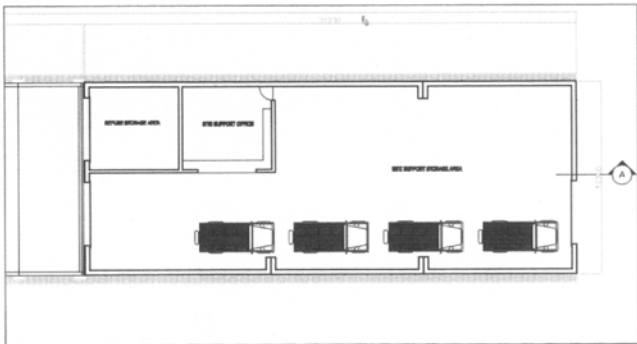


Fig. 19 Plan of site support function

EC.3 ADAPTABILITY & FLEXIBILITY

EC.3.1 Vertical dimension

The vertical dimension of the educational and office functions is 2470 mm and the floor to ceiling space of the exhibition areas is 3640mm. This heights allow for multi-functional uses. The height in the exhibition areas allow for different exhibition material to be displayed. The scale of the interior spaces adds to the visitor experience of the building and confronts the visitor in the context of the site.

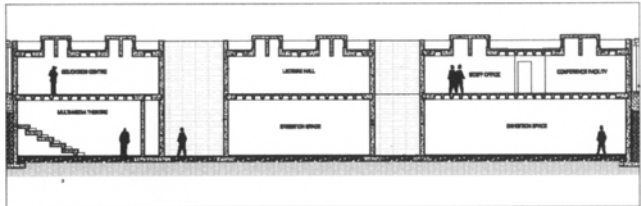


Fig. 20 Section indicating vertical dimensions

EC.3.2 Internal partitions

Movable partitions is used in the office function to separate the office function from the conference function when needed. This makes the multi-functioning of the different spaces possible according to need. Partitions will also be used in the exhibition areas, but this will be done according to the specialists that coordinate the exhibition display.

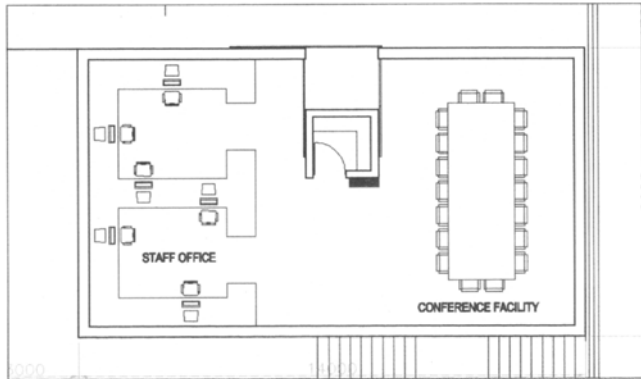


Fig. 21 Plan of office and conference facilities

EC.3.4 Structure

The main building structure consisting of a linear fragmented arrangement of functions is retained as proposed in the concept design. These linear functions is divided by steel shade structures. The building is laid out on two levels with a ground floor level and a sub-surface level housing the multi-media theatre and exhibition spaces. The walls and roofs is constructed of reinforced off-shutter concrete. The roof structures is of coffer slab construction. The shade structures is assembled of steel sections with louver modular units bolted to the super structure. The steel is galvanized and finished with a powder coating.

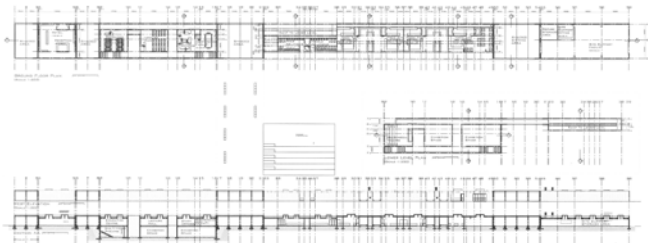


Fig. 22 Plans, section and elevation of building

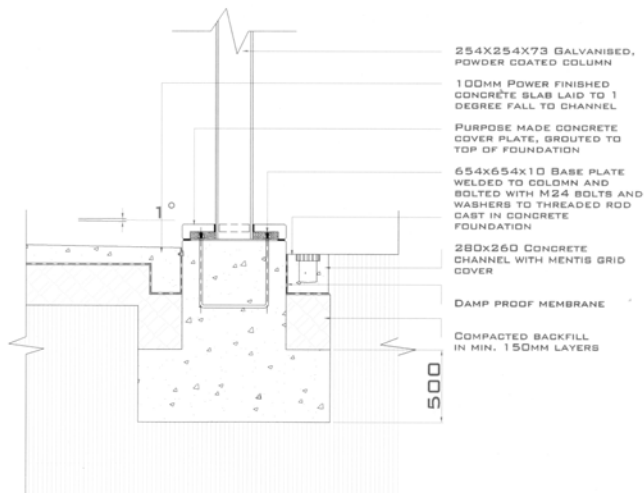


Fig. 23 Detail of shade structure foundation

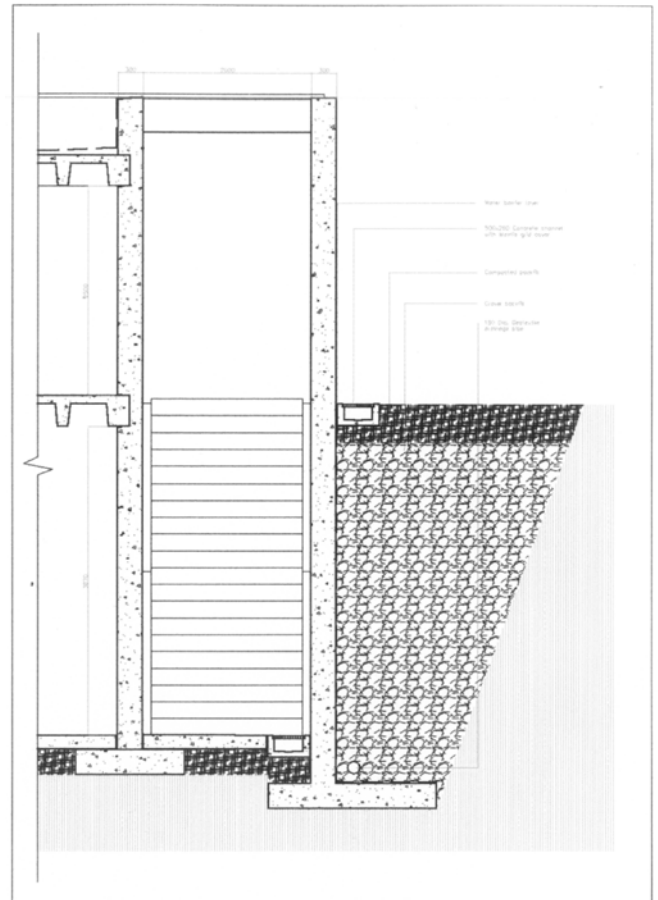


Fig. 24 Detail through retaining wall structure

EC.4 ONGOING COSTS

EC.4.1 Maintenance

The materials chosen for the construction of the facility ensures hard wearing surfaces and requires very little maintenance. Any maintenance required can be done by untrained labor.

EN.2 ENERGY

EN.2.5 Energy sources, renewable energy

Approximate annual electricity use of building

Predicted electricity use of centre	=200kWh.m2.a
Total building area	=1677m2
	=200 x 1677
	=335 400kWh.a
Electricity use per day	=335 400/365
	=918 kWh

Possible solar power potential in site area

Potential = 1943 kWh/m²/a
Daily potential per m² panel area = 1943/365
= 5.3 kWh

Solar panel area required

$$= 918 / 5.3$$
$$= 173 \text{ m}^2$$

EN.3 WASTE

EN.3.4 Sewerage

A Septic tank in combination with a wetland construction is proposed to break down the sewerage before it is released into the stream.

The capacity of the septic tank will need to be about 30 000L, and the capacity of the wetland about 70 000L. The sewerage will be contained in the septic tank for 2-3 days before it is released into the wetland construction where it will be for 5-7 days.

The septic tank as well as the wetland will be sealed to avoid contamination of the produce cultivation.

EN.4 SITE

EN.4.5 Construction processes

Modular construction systems is used in the construction of the steel shade structures. As far as possible, all the steel components will be bolted together to allow for easy disassembly and reuse in future.

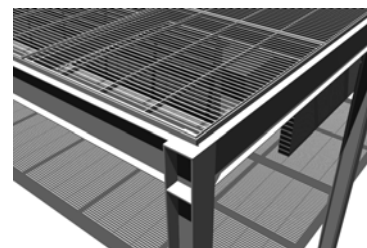


Fig. 28 Detail of shade structure

EN.5 MATERIALS & COMPONENTS

EN.5.3 Manufacturing processes

The main building material used in the construction of the centre is in-situ concrete. This construction method will use only reusable shuttering equipment to lower environmental impact. The flat roofs of the facility will consist of coffer slabs constructed with reusable plastic domes.



Fig. 29 Structure slice indicating materials and assembly

	Area m2	Quantity	Function of space	Finishes	Special equipment	Light levels-	Norms & standards SABS 0400
Visitor info point	12.5	1	Point providing visitors with info concerning facility	Tiles, concrete walls, timber counter	Signage, computer system, intercom system	150	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Transport hub	293	1	Vehicular pick-up, drop-off point	Hard paving	Signage	150	Part B, C, D3, DD2, DD3, H, J, K, O, SS1-SS4, SS7, T, U, W
Orientation & exhibition	171	1	Permanent and temporary exhibition space	Tiles, concrete walls, timber-steel exhibition equipment	Audio-visual equipment, intercom system, special lightning effects	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Education centre	171	(100 p) 1	Facility presenting educational activity programmes for school children, computer room, lecture room	Tiles, concrete walls, timber-steel computer stand equipment	Computer network point, audio-visual equipment	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Field & site support facility	30.2	1	Recreational site activities centre, e.g hiking, mountain biking, 4x4 trails, horse riding, rock climbing, caving,	Tiles, concrete walls,	timber-steel equipment shelving-stands	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Conference centre	50	(25 p) 1	Conference function	Carpet, acoustic wall-ceiling finish	Audio-visual equipment, intercom system, special lightning effects	750	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Restaurant & food outlets	306	6	Sit down and take away food outlets	Tiles, concrete walls, timber-steel computer stand equipment	Computerised till point	300	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Outdoor amphitheatre	270	(min 300 p) 1	Multi-function gathering space	Hard paving-seating-stage area	Audio-visual system	100	H, J, K, M, R1, RR2, RR4-RR6, SS1-SS4, SS7, T, U, W
Retail outlet	105	1	Curio's, Gifts, Branded merchandise	Tiles, concrete walls, timber-steel counter-shelving	Computerised till point	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Admin Offices	50	(4+2) 6	Office space for various trust members	Tiles, concrete walls, timber-steel office furniture	Computer network point	500	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, SS1-SS4, SS7, T, U, W
Ablution	82.8	(max 300 p) 2	Male, female, disabled ablution facilities	Tiles, concrete walls, timber-steel partitioning	Water saving equipment	100	Part B, C, D3, DD2, DD3, H, J, K, L, M, N, O, P, SS1-SS4, SS7, T, U, W
Parking	3346	Cars-144, Buses-6	Parking	Hard paving	Signage, lightning	150	Part B, C, D3, DD2, DD3, H, J, K, O, SS1-SS4, SS7, T, U, W

Fig. 30 Accommodation schedule

ESTIMATED BUILDING COST

	Area m²	Cost per m²	Cost of Function
Visitor info point	12.5	2200	27,500
Transport hub	293	1610	471,730
Orientation & exhibition	171	6000	1,026,000
Education centre	171	2380	406,980
Field & site support facility	30.2	2200	66,440
Conference centre	50	2800	140,000
Restaurant & food outlets	306	4500	1,377,000
Outdoor amphitheatre	270	1610	434,700
Retail outlet	105	3000	315,000
Admin Offices	50	2800	140,000
Ablution	82.8	2500	207,000
Paving	5871.6	800	4,697,280
Total Cost:			R 9,309,630.00

Fig. 31 Table of estimated building cost

MANAGING STAKEHOLDERS

	POWER			LEVEL OF CONCERN			
	Influence on others	Direct control of labour	Y-Axis	Technical	Social	Environmental	X-Axis
STAKEHOLDERS	0.35	0.65		0.2	0.4	0.4	
A. DACEL	5	0	1.75	1	3	4	3
B. Wits	3	0	3.35	2	1	5	2.8
C. Fossil Site Landowners	2	0	0.7	0	2	5	2.8
D. VIP Licence Holders	0	0	0	0	3	3	2.4
E. Local Community	1	0	0.35	0	5	2	2.8

Fig. 32 Table of management of stakeholders

STAKEHOLDER HIERARCHY

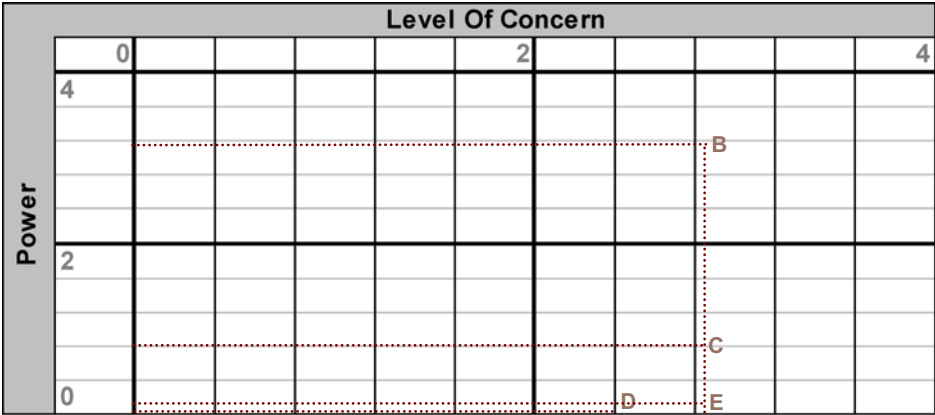


Fig. 33 Table of stakeholder hierarchy

RISK MANAGEMENT

Risk	Probability	Impact	Factor (PxI)	Risk Catagorizing
Financing	1	5	5	Low
Fire	2	5	10	Med
Vandalism	1	1	1	Low
Construction difficulties	3	4	12	Med
Unknown soil conditions	2	4	8	Med
Legal-Heritage Acts	1	4	4	Low
Community acceptance	1	4	4	Low
Crime	3	4	12	Med

Fig. 34 Table of risk management

Construction Delays

An important risk is construction delays that can be caused by unforeseen material shortages, site labor problems, construction techniques and the physical distance of the site from material supply centers. This risk could be managed by employing experienced construction management personnel. A study in the availability of building materials could be done prior to the start of construction work.

Crime

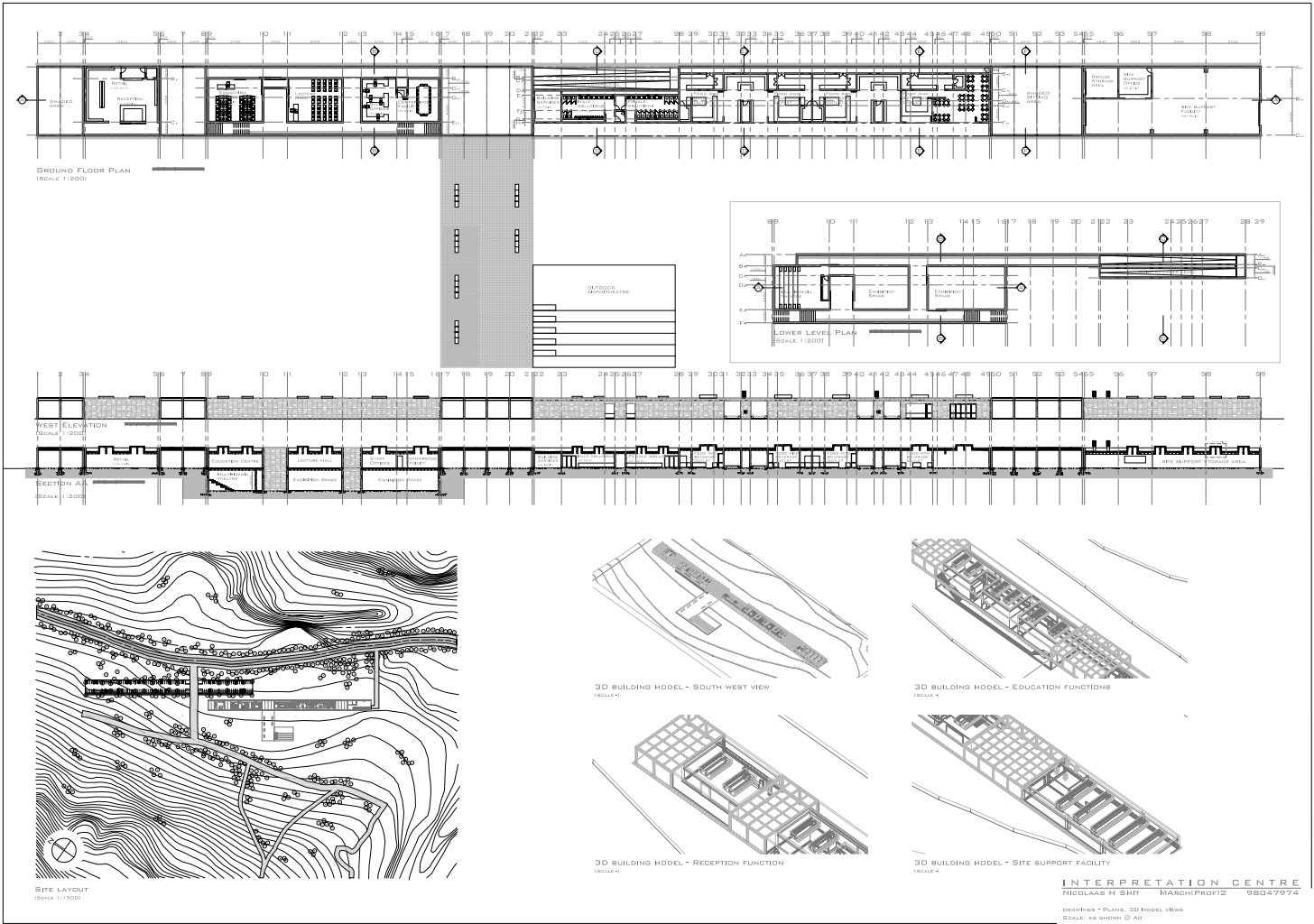
The level of isolation and lack of use of the building during nighttime is a weak point in the security program. Alarm systems and guard patrolling will need to form part of the security program. Information regarding the location of the nearest police station and medical facilities could be provided at the Visitor Info Point.

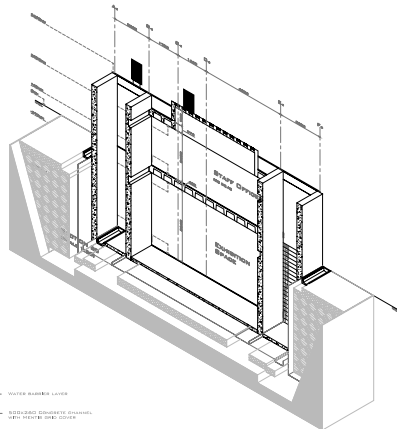
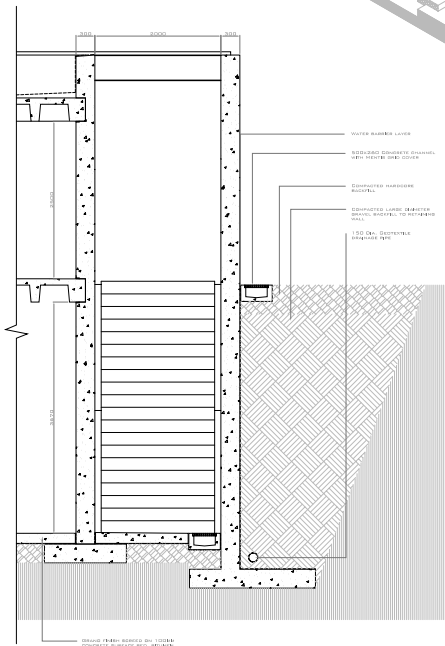
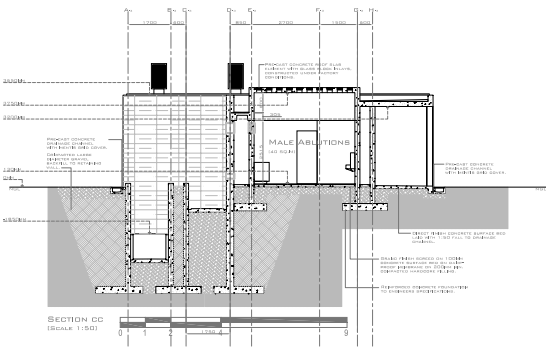
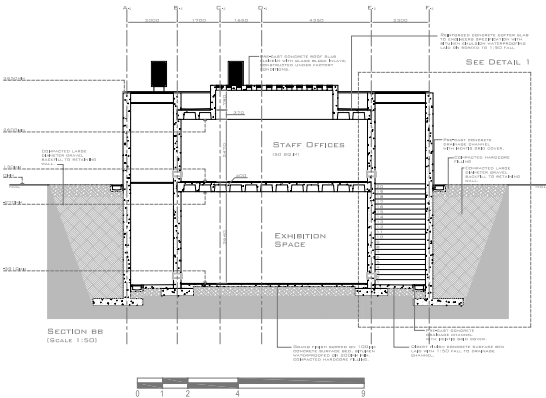
Fire

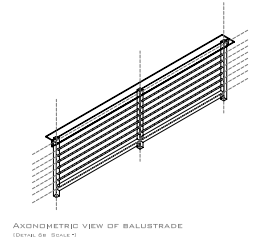
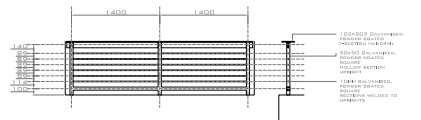
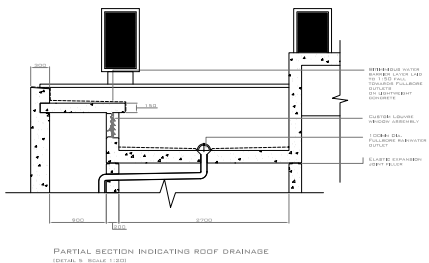
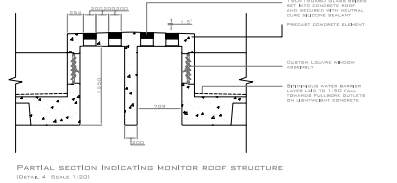
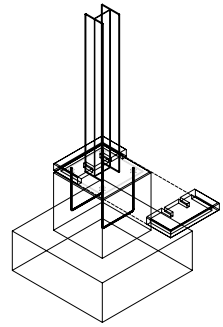
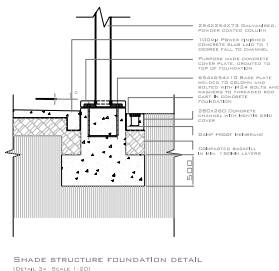
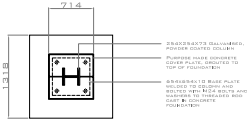
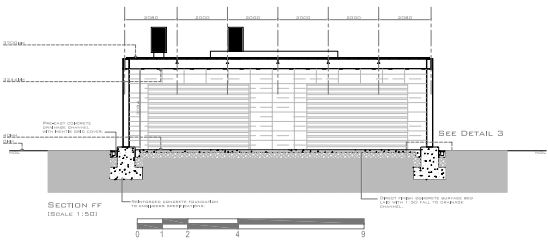
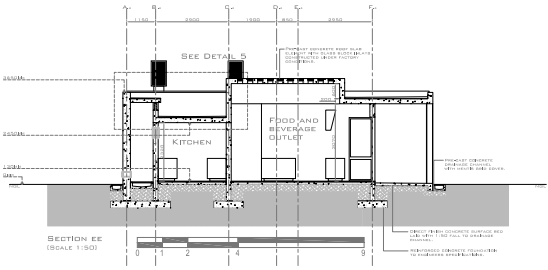
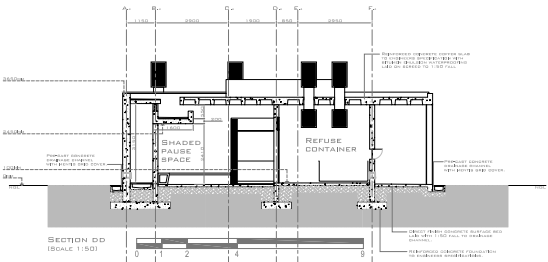
The location of the building in the natural environment, surrounded by plant material puts it at risk of run-away fires. The design of the building had to make provision for emergency exits. Fire hose reels as well as extinguishers must be visible and accessible. Training of the facility staff in emergency procedures must form part of their basic training program.

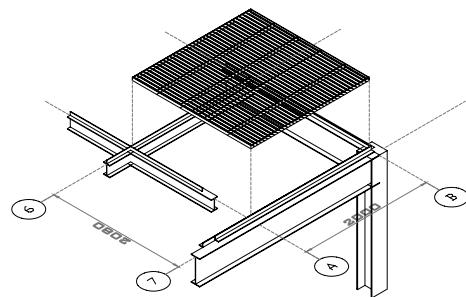
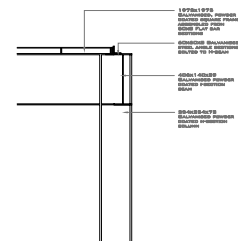
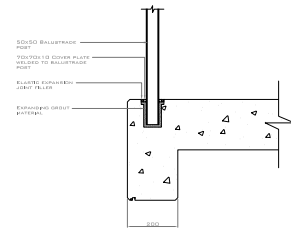
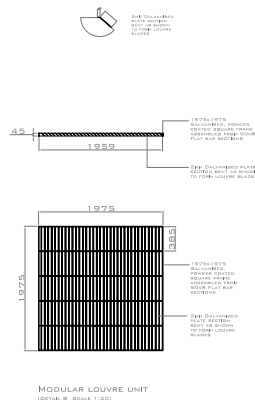
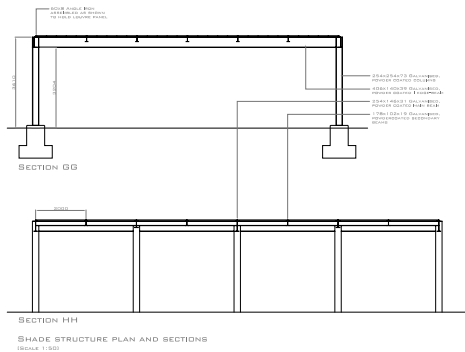
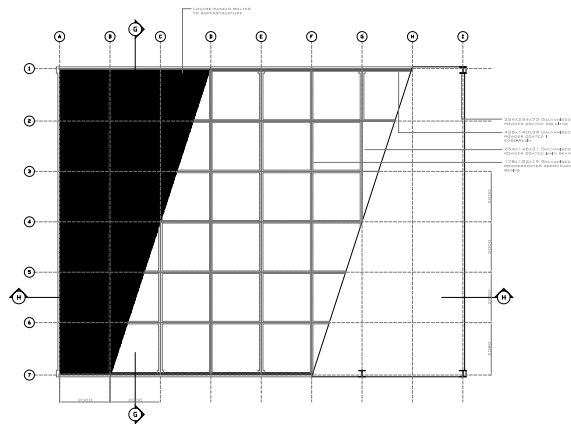
Soil Conditions

Soil conditions and the stability thereof should form part of the pre-design phase of the project. The steep slope of the site and the stability of the topsoil must be assessed to plan soil erosion prevention strategies. Construction techniques should be planned to disturb the existing, natural quality of the site as little as possible.









DESIGN DISCOURSE

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The aim of this essay is the summary of a design process. The process had distinct stages that includes selection of project and the aspects that informed the decision, context studies, the theoretical approach, precedent studies, concept development and final design concept. This process spanned a period of roughly eight months. The development was not linear and revision and refinement was continuously necessary to reach the final product.

Different aspects informed the decision to make the Cradle Of Humankind World Heritage Site (COH WHS), and the design of a new Interpretation Centre facility as part of the development, the focus of this dissertation process.

The most important aspects include the unique character of the COH WHS development as well as the South African identity and heritage value. The complete and detailed research study done by DACEL, which was used as framework during the process development, enabled the design of a single building as part of a broad and far reaching development scheme.

For the sake of unity and the ability of this essay to be read as a stand alone document, some of the facts and information contained in the briefing document will be repeated. Reading of the complete document will, however, give a more informed view of this broad context and study area.

DESCRIPTION

The Cradle of Humankind World Heritage Site (COH WHS) covers an area of over 47 000 hectares in the north-western corner of Gauteng, straddling the boundary between Gauteng and North West Provinces. The area is of outstanding universal value as it contains a complex of palaeontological and palaeo-anthropological sites which have yielded some of the most valuable evidence worldwide of the origins of modern humans.

Embedded in the rocks found in the numerous dolomitic caves in the area are the fossilised remains of hominids, their lithicultural remains and fossils of other plants, animals and pollen. These give a complete picture of the hominids and their surroundings dating back over 3.3 million years. The richness and variety of these deposits, their excellent preservation in the caves, and the age of the specimens, make this area of world significance. Coupled with this, the area contains archaeological sites dating to the Early Stone Age, the Middle Stone Age, Late Stone Age, the Early and Late Iron Age, and recent history such as Anglo-Boer War relics. It also has significant ecological value containing many plant communities some of which are rare, with associated diverse animal communities. The area is largely unspoilt and scenically attractive, making it an important potential tourism destination. It is also close to the major urban areas of Pretoria and Johannesburg, international and local airports, and the freeway system. The area already boasts a number of private nature reserves and game farms, trout farms, the oldest Gold Mine in the Witwatersrand, arts and crafts outlets, small hotels, lodges, conference centres and restaurants. The site extends across over 30 farms, many of which have been extensively subdivided, and of which are in private hands. Therefore plans for its future management must be drawn up in close consultation with all interested and affected parties including the landowners and people living and working in the area.

SIGNIFICANCE

The global significance of the COH WHS is given in the "Application for inclusion on World Heritage List" where it is stated that: The Sterkfontein Valley landscape comprises a number of fossil-bearing cave deposits which are considered to be of outstanding value, because they encapsulate a superbly preserved record of the fauna, including an invaluable record of the stages in the emergence and evolution of humanity, over the past 3,5 million years.

This makes it one of the most important sites for human evolutionary studies and research. It was the Sterkfontein fossil specimens that provided the proof that *Australopithecus* could be classified as a member of the Homidae (the family of humans) and that established Africa as the cradle of humankind. These cave deposits provide a unique testimony of the presence, the structure, functioning and behaviour of *Australopithecus africanus* which shows many ape-like features and several human-like traits.

Fossils of a robust australopithecine known as *Australopithecus robustus* or *Paranthropus robustus* have also been recovered, for example from Kromdraai and Swartkrans. There are three scientific viewpoints as to what these fossils may represent. Some scientists hold that *A. africanus* was the ancestor of early *Homo*, but not of the robust apemen, alternatively it was the ancestor of the robust apemen but not of *Homo*, or that *A. africanus* represents the last common ancestor of both early *Homo* and the robust australopithecines. Also, fossils of the genus *Homo* from about 2.0 million years onwards have come from Sterkfontein and are associated with early stages in the stone tool cultures of Africa.

Thus it was these fossil discoveries in the Sterkfontein Valley that resulted in an understanding of the time, place and mode of evolution of the human family. Also, given the number of fossil specimens, it has made it possible for palaeo-anthropologists to study populations of early hominids in terms of their demography, variability, growth and development, functioning, behaviour and ecology. The Sterkfontein Valley cave sites are also valuable for the study of extinctions of communities of animals and the conditions under which this ancient fauna either adapted or became extinct.

In addition to its global, scientific and research significance, the COH WHS is also significant in a number of other critically important aspects.

Given the relative degree of land still in a natural state which has not been significantly transformed by the actions of people, the COH WHS has important ecological significance especially for the conservation of biological diversity and for ensuring that the spectrum of current ecosystems continues to be sustained into the future. The site is considered to be important for the conservation of Bankenveld grassland, an example of the natural Highveld landscape, and various rare and threatened species of plants and animals.

It is these natural, aesthetic, fossil and archaeological resources that give the area its important socio-economic significance. There is little doubt that the COH WHS is a key tourist destination for local, national, and international tourist markets. Its tourism significance is not only relevant to Gauteng but to the whole of South Africa and therefore needs to be developed further in order for its full potential to be realised. The COH WHS is considered in the light of its tourism development potential to be an important and significant area for investment. In view of this development potential, the site is significant in terms of contributing to South Africa's economic growth and development plan, and in a local sense to job creation, skills development, and the establishment of SMMEs and new markets for local products. The potential is therefore for possible substantial and sustainable economic development that would significantly contribute locally, regionally and nationally. The resources of the COH WHS are also of value and significance if they are used for education and interpretation and to create learning opportunities for students and visitors to the site. The potential for creating awareness of the origins of humankind amongst people visiting the COH WHS is possibly unparalleled anywhere else. This is because of its richness in fossils and other resources, its easy access, and proximity to the greater Johannesburg metro area with its international airport that is the country's largest port of entry for foreign visitors.

Theoretical Approach

The aim of this dissertation is not a study of the evolution of humankind, but the development of an architectural symbol system that can be applied as a framework tool to emphasise the importance of the Cradle of Humankind World Heritage Site.

The principles that guided the development of this framework tool were informed by the theoretical works, *Intentions In Architecture* and *Genius Loci - Towards a Phenomenology In Architecture* By Christian Norberg-Schultz.

The development and origins of a suitable symbol system necessitates the study of the context in more depth. The site derives its importance from its inherent natural properties that facilitated the process of human evolution within its borders. The process of evolution presupposes a dynamic interaction between the natural environment and the Hominid development. The study of this dynamic interaction demanded that a distinction be made between the Hominid and the ecosystem in which the Hominid had its origins.

The interaction process brings us to the human processes critical to survival and primary to the process of evolution, perception and socialization. Perception gives an organism knowledge and insight of his immediate environment, on the basis of this knowledge, choices are made that influence future circumstances of the particular individual. The knowledge an individual obtains over a period of time forms the basis of his/her frame of reference. Study revealed that a multitude of factors influence perception. It is a fundamental misunderstanding that a similar world is given a priori to all. Perception is based on the individual's history and frame of reference. This frame of reference is in turn based on the society in which he is a participating member. Interaction between members of a society gives rise to a collective creation of a symbol-system. The creation of a symbol-system is thus crucial for a successful interaction between community members.

The perception of space is a gradual construction and is dependant on education of the individual within a society. A symbol-system can thus be described as an interpretation medium between individuals. A symbol-system parallels complexity in the society context and is developed according to interpretation need. Socialization can be seen as the process of adjustment of an organism to its environment. One of the products of the socialization process is the development of common signs and symbols that makes communication possible. Communication can be seen as necessary to integrate the individual in the common world and give him a sense of security.

It can be seen that order can be given to our environment by assigning symbols to it.

The COH WHS can be considered as a stage that made the above activities possible during the process of evolution. According to Norberg-Schultz, the natural landscape can be divided into Romantic, Cosmic, and Classic archetypal categories, each with its own characteristics. The COH WHS can according to these categories be described as having Classic characteristics. The Classic landscape can be described as a meaningful order of distinct, individual places with a "human" dimension.

The "Classic" landscape was first discovered in Greece and played a large role in the later Roman environment. The character of the classic landscape is neither monotonous nor multifarious, but we find a composition of distinct elements. Valleys and ridges are clearly defined and can be described as creating individual, defined spaces in the environment. In the classic landscape neither the ground surface nor sky dominates and a human scale is perceived where all is in equilibrium and in order. In this landscape human fellowship is possible and every part conserves its identity within the totality. The individual is neither absorbed by an abstract system nor has to find his private hiding space.

This then, can be described as the most suitable environment for the promotion of the process of evolution. In the COH WHS context, man could see himself as equal partner to nature and as nature complementing his own being. This stable relationship helped to release human vitality and it is not difficult to understand why the process of human evolution had its roots in this classic landscape.

To arrive at a suitable architectural framework that can be utilized as a interpretational tool, a symbol -system needs to be developed. For the framework to be suitable, it must be able to present a coherent, holistic image of the site and the role it played in the process of evolution. This informed the choice to model the symbol-system on the natural landscape. The natural environment will thus be used to inform a metaphoric language based on mass -, space -, and surface - elements. These elements will be further interpreted in terms of form, texture, order, character, light and time. This nature based symbol -system will ensure an accessible, multi -functional and adaptable architectural framework. A suitable framework will also aid the generation of identification and orientation. "The existential purpose of building (architecture) is therefore to make a site become a place that is to uncover the meanings potentially present in the given environment." Norberg-Schultz further describes how man can create an existential foothold through the acts of visualisation, complementation and symbolization.

The ultimate goal therefore, is the creation of an architectural product that can, by its mere identity, aid in the interpretation of the importance of the Cradle of Humankind World Heritage Site. What clues then, can we find in the physical context of the proposed Mohale's Gate site? How can this be used to emphasize the meaning of the COH? A study of the topography of the site area reveals a natural gateway or entrance to the COH WHS. This relates to the need to create a centre that forms a introductory landmark in the natural landscape. The topography of the Mohale's Gate site reveals a dynamic character where a certain level of instability exists.

How can this relate to evolution?

We know that everything in nature tends towards a state of equilibrium. A state of instability can be compared to the process of evolution in that it remains in a state of change or flux. Through the act of building, man reveals his understanding of nature. By creating a landmark in the landscape, a higher level of worth can be associated to the process of evolution in this particular landscape.

To whom must this meaning be revealed? Who will benefit from an increase in meaning in this concept?

Ultimately all of humankind, because the process of evolution is something all humans can relate to. The manner in which the meaning and importance of the COH can be revealed to the users must form the basis of this investigation. This will generate the most appropriate solution. The natural context and its characteristics must form the basis of the design concept.

How will this context be presented to the users?

This experience can be equated to the process of evolution where humanoids had a close relationship with nature. It was experienced through all the senses. All levels of perception were utilized in the interpretation of the environment, this also ensured survival. The interaction between the individual and his perception of the physical environment is thus the basis that informs the design concept. Contrast creates voids to be filled by individual interpretation. The aim of this project is to construct a framework of architectural systems able to evoke individual interpretation of the context.

Precedents:

The precedents that was studied was chosen on merit of belonging to the same building typology and on subjectively admired design concepts. All the precedents are of pavilion type buildings that have a strong connection with its site and surrounding topography.

Theory:

Architecture cannot exist without people to experience it. The visitors to this centre are thus the crucial element to make this project successful. The most valuable property of the area, the process of evolution that occurred there, underlines the universality of the expected visitor profile. This profile includes local as well as foreign visitors to the area and to the building. To refer back to the theoretical approach, a suitable symbol-system must be developed. This system must be universal to convey the importance of the area to every visitor.

This need to find a suitable symbol-system necessitated a study into the basic forms of perception, the senses. Through our senses we experience our environment and receive information from it. The following action, to judge these perceptions, is a personal and highly subjective act that is uncontrollable. Because the end product of this process is an architectural composition or building, architectural elements must be composed in such a manner that evokes a unique sensory experience. This perception is not only for perception's sake, but intended to convey the full meaning inherent in the site.

The theoretical concept guidelines mentioned in the theoretical approach were developed and refined parallel to the concept design phase of the building. The design phase was not linear and the boundaries between the different stages and concepts are not clear and defined. For the sake of description, the concepts are divided into five different stages.

The first concept design comprised a layout where the functions are contained in fragmented spaces. These functions are linked with a path that leads visitors through the different parts of the building on a linear route. In this concept, the exhibition areas and supporting functions are compactly arranged. The building is also situated on the more steeply sloping east-facing part of the site.

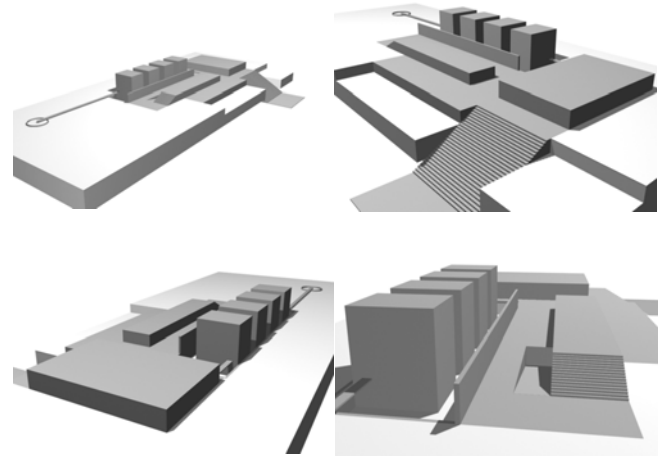


Fig. 1 3D block model of first building concept design

The critique on the first concept design led to the design of the second. In this design, the more private exhibition areas and the supporting public functions are separately grouped but linked with a path that also forms a linear route that takes visitors through the different functions of the building while simultaneously exposing them to the natural environment. An attempt was made to extend the building functions into the landscape and create a unifying whole. This building concept was also situated on the sloping, east-facing part of the site. After critical assessment of the second design, a third concept was developed.

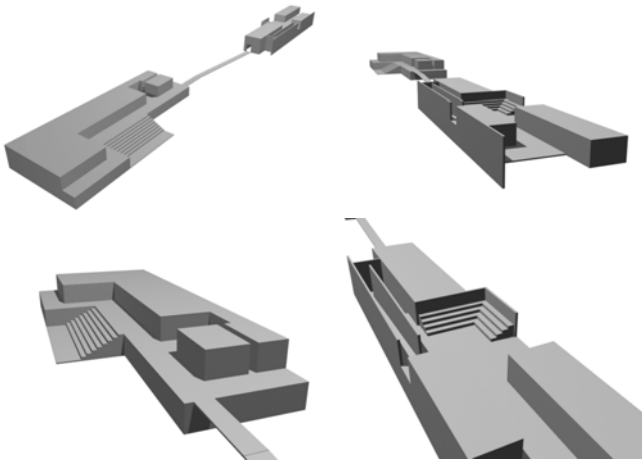


Fig. 2 3D block model of second building concept design

The third concept design was situated on the less-sloping part of the site. The decision to situate the building on this part of the site was influenced by various aspects. These aspects include the enormous environmental impact by building on the steeper slopes, a need for the Interpretation Centre to be located as close as possible to the visitors parking area as well as accessibility to the building site during the construction phase. The third building concept unified the functions contained in the previous concept designs in a more coherent whole. In this design, the building functions are arranged around a central outdoor amphitheatre that also functions as an outdoor socializing space that extends the building functions into the site and natural environment. This design also aimed to find a balance between the overall building design, and the functional needs contained in the building. A linear route guides visitors through the building and connects the various private and supporting functions. The critique on this design included a possible feeling of isolation of the building from its surrounding site. The enclosing, inward-facing quality created by the amphitheatre might aggravate this view. The connection of the building with its site forms an important guideline to the success of the design and cannot be compromised.

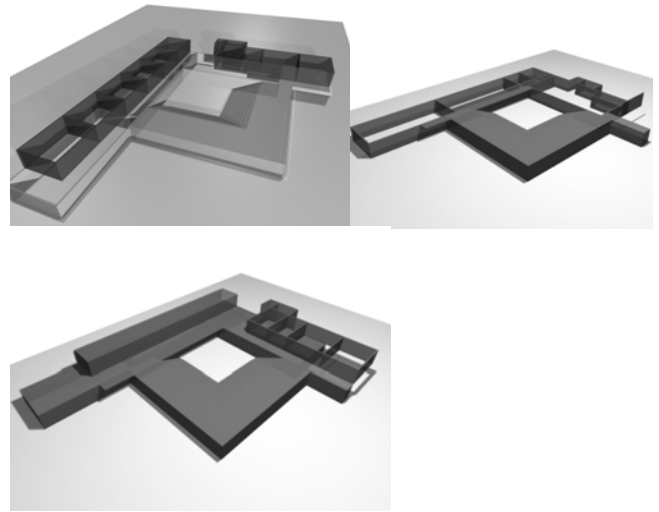


Fig. 3 3D block model of third building concept design

The fourth concept design is a refined continuation from the previous. This design can be described as an unfolding of the previous concept. The functions are fragmented and arranged along a linear route. Visitors arrive at the centre and are taken on a linear tour of discovery through the building. The different functions of the building are divided by enclosed as well as open social spaces that act as buffers. Views onto the landscape and building functions are guided by walls and stairs along the route.

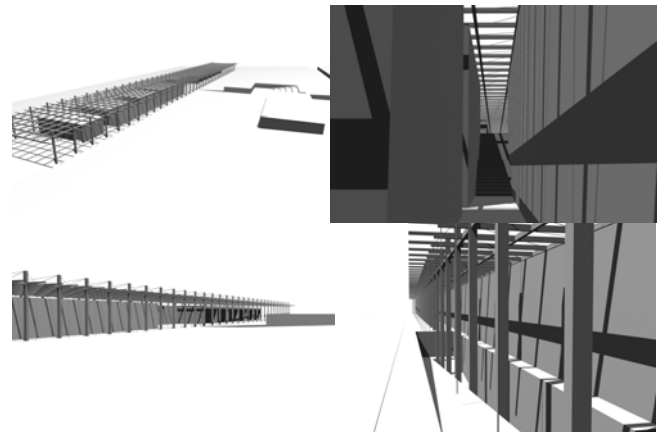


Fig. 4 3D block model of fourth building concept design

The theory that was developed during all the previous concept designs is most clearly manifested in the fifth and final design. In this design, equilibrium was sought between the natural setting and the building mass. With its function as gateway and introduction to the COH WHS, the Interpretation Centre had to have a degree of monumentality without being dominating. The unique quality and value of the site and area demanded an equally distinctive and unique building design.

The aim of the design was not to recreate a fake, cave type scenario, but a unique sensory experience that prepares visitors for the real cave geology experience.

With its name best describing its function, the Interpretation Centre have to present visitors with the full value and identity of the area in an informative and entertaining manner. With its design the building aimed to extend its function as container of information by becoming an interpretation tool in itself. This was done by creating a structure that acts as setting or stage for a sensory experience accessible to all visitors. As mentioned, the design aimed to focus attention on the intrinsic qualities of the site and environment.

Two main elements were interpreted in the final design, time as a factor of evolution and light as factor of architecture. Architectural elements were used in the building to represent light and time in different relationships. These divers' relationships will form part of the experience and can be seen as metaphor of light conditions found in and near cave geology. Elements that represent these relationships is used both internally and externally in the building. External elements include the louvered steel shade structures that create shadow patterns according to the time of day and sun position. In the exhibition and auditorium functions, light levels are intentionally reduced to create the desired ambiance. The contrast in light levels with which visitors are confronted while moving from one function to another further adds to the experience of the building.

The best way to describe the design might be to subdivide it under the six senses of human perception:

Tactility

Materials were chosen that matched the qualities of the site in terms of mass and roughness of texture. Off-shutter concrete was extensively used in floor, wall and roof structures. Materials considered experienced by most people on an everyday basis was avoided in an attempt to create a distinctive tactile opportunity. Visitors are presented with different occasions to come in contact with the structural elements. This includes proximity and narrowing of passages and structural elements in direct opposition to the expected flow of human traffic patterns. The borders where the building structure ends and the natural site material starts, is diffused in an attempt to fuse the tactile experience.

Visual

By design of its layout, the structure guides visitor's views according to observation point. The design aimed to supply visitors with a multitude of viewpoints on the linear route. This views was intended to make observers aware of the position of the location of the building in the natural setting.

Auditory

Part of the experience of visitors to the building will be the sounds of nature. Although man made sounds cannot be eliminated, the building design aimed to provide a setting for sound perception. Noise generating activities such as the exhibition and multimedia theatre is shielded in an attempt to keep noise levels down. The building structure itself acts as a barrier between the road, the parking area and the social areas of the building.

Movement

Together with the concept of time associated with the process of evolution, movement through the building is designed on a linear route and can be seen as metaphor of a timeline. During this process of movement, visitors might acquire insight as they are exposed to the exhibits and the setting. The movement can be seen as a dynamic action that links visitors to the site and the meaning inherent in it.

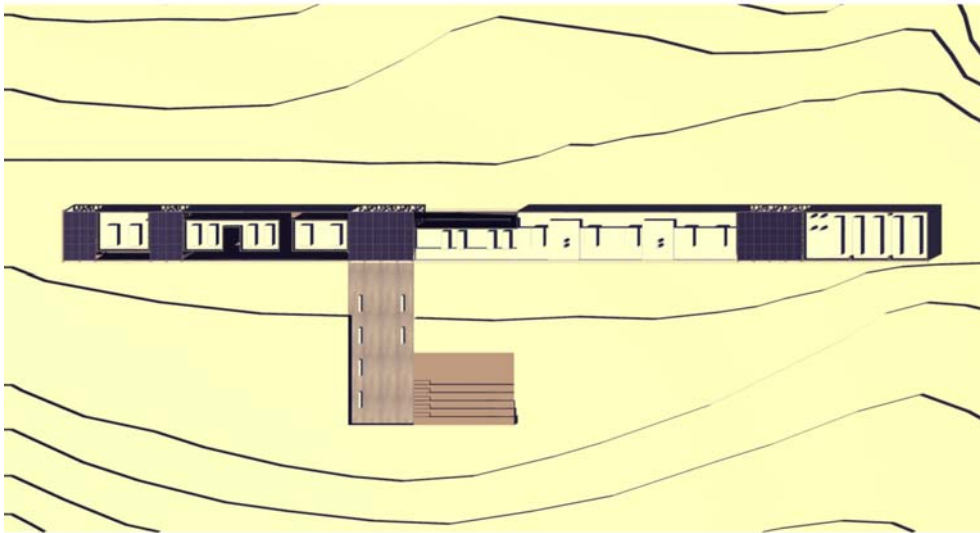


Fig. 5 Top view of 3D model.

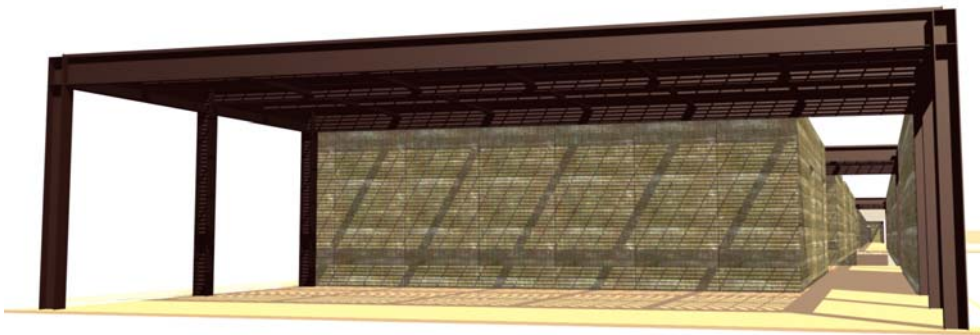


Fig. 6 Approach and entrance to building.

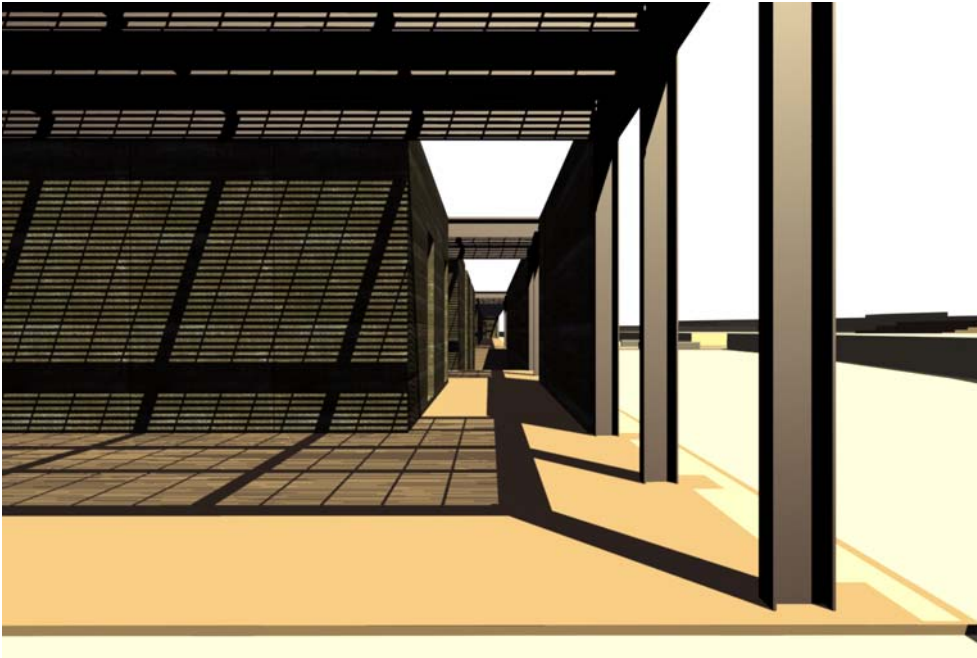


Fig. 7 View towards entrance.

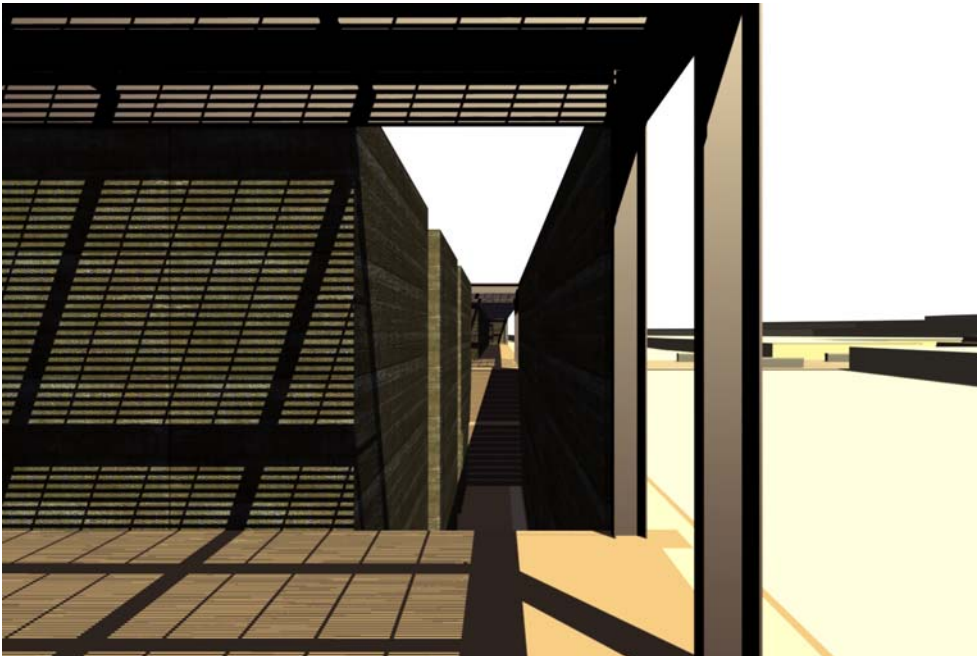


Fig. 8 View of lower level from shading structure.

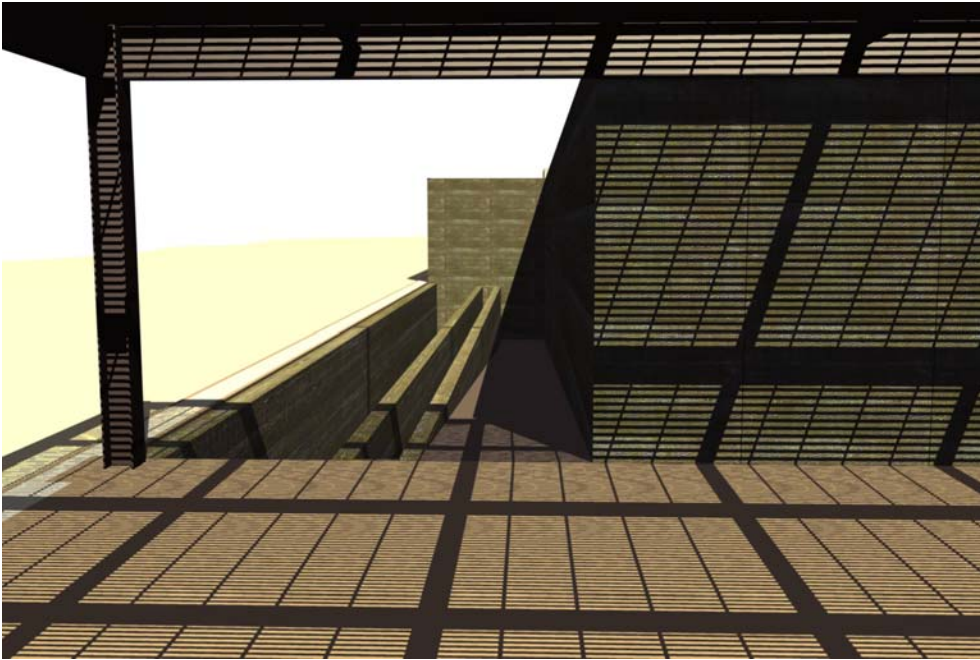


Fig. 9 View of ramp to lower level on eastern side of building.

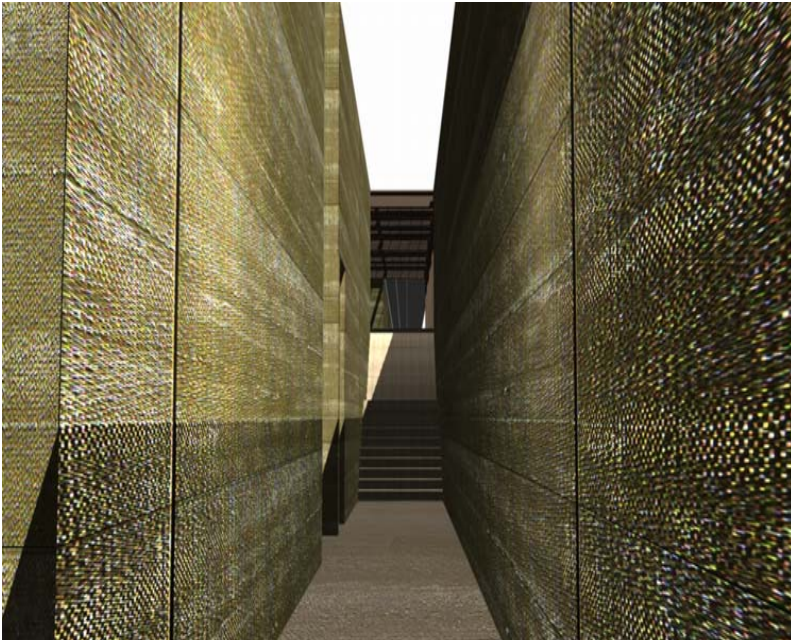


Fig. 10 View of walkway on lower level.



Fig. 11 View of stairs leading to upper level.

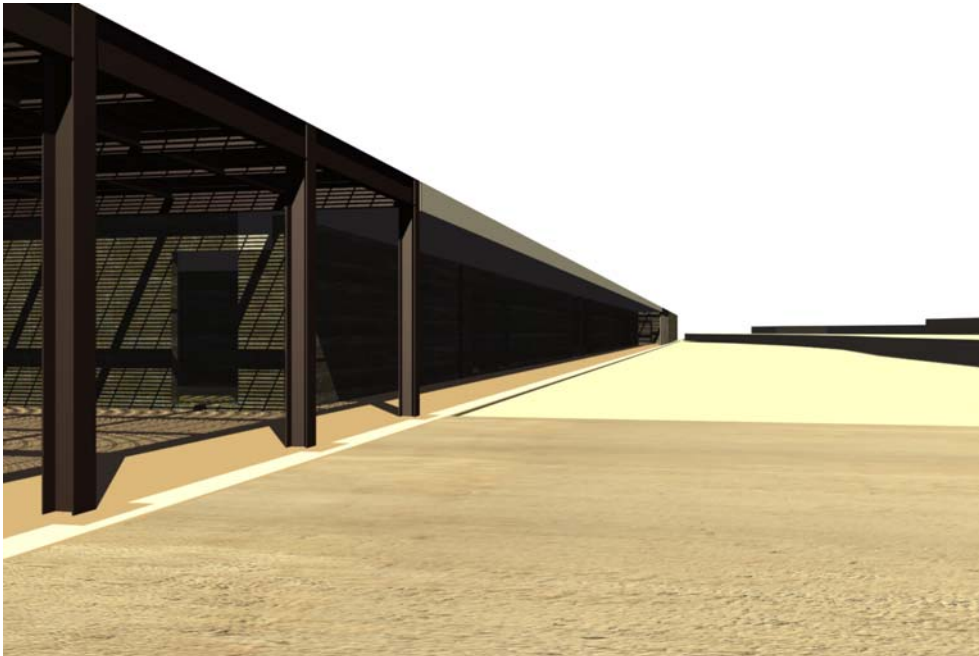


Fig. 12 View of west facing facade of the building..



Fig. 13 View of shade structure between conference and ablution functions.

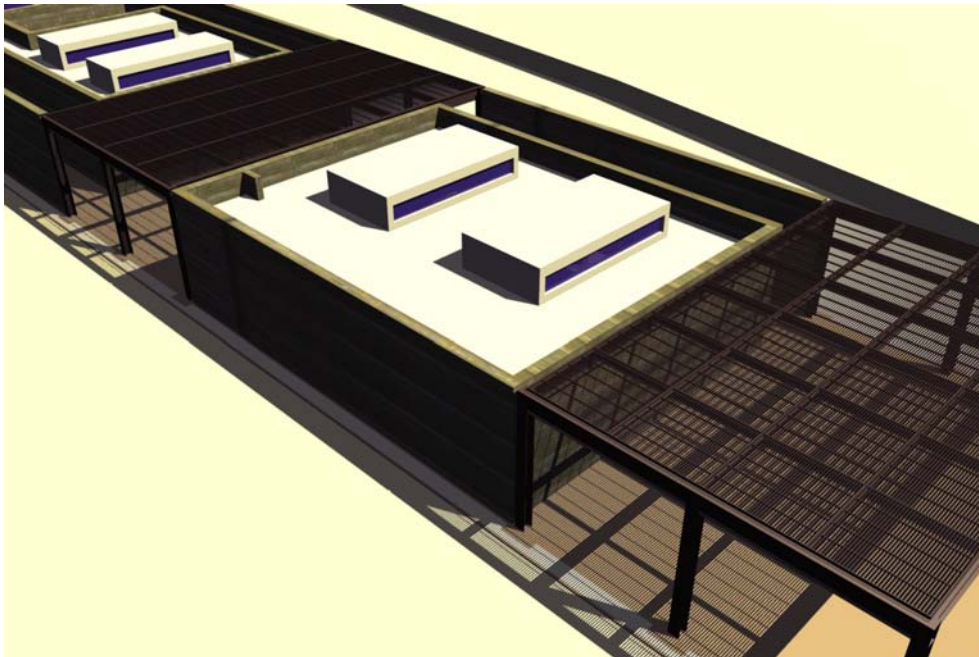


Fig. 14 Top view of reception and retail function.



Fig. 15 3D model slice indicating building structure assembly.



Fig. 16 3D detail indicating assembly and material use.

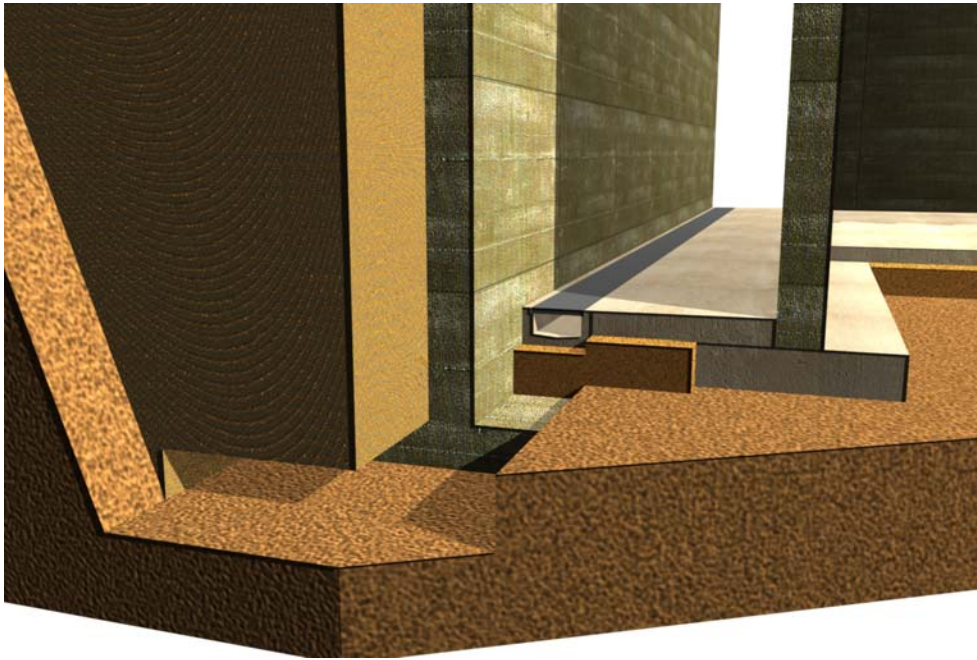


Fig. 17 3D detail of building foundation and drainage channel.



Fig. 18 3D model interior of staff office and conference functions.

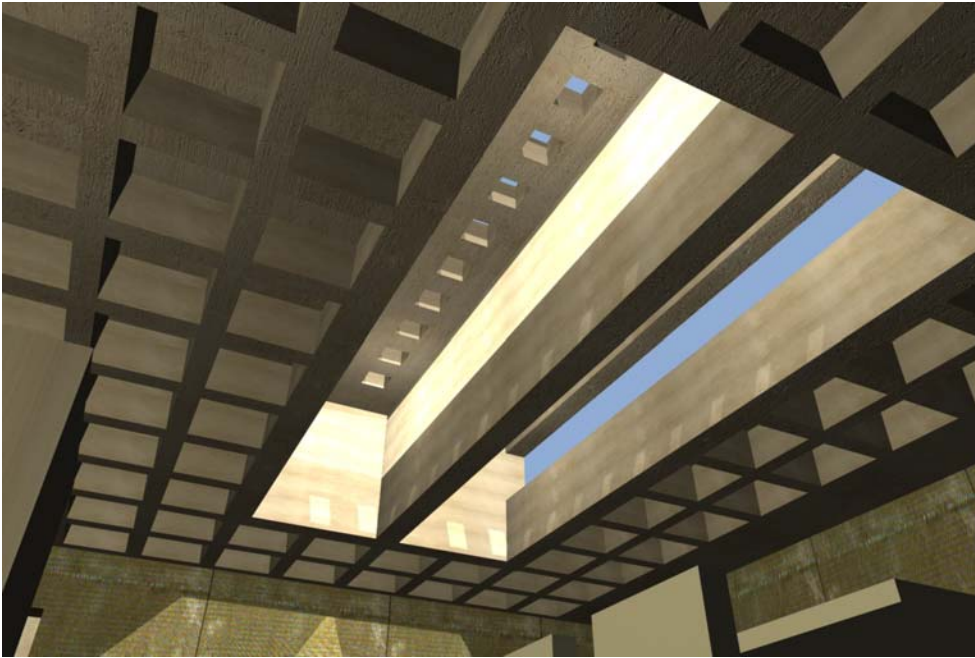


Fig. 19 View of roof monitor structure.

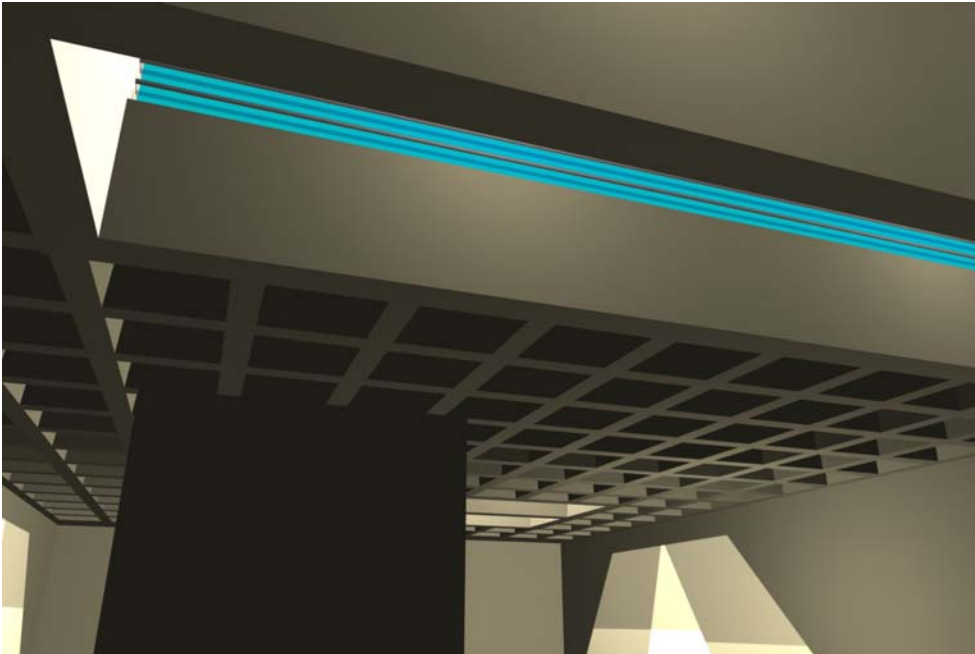


Fig. 20 3D model of roof detail in office function.

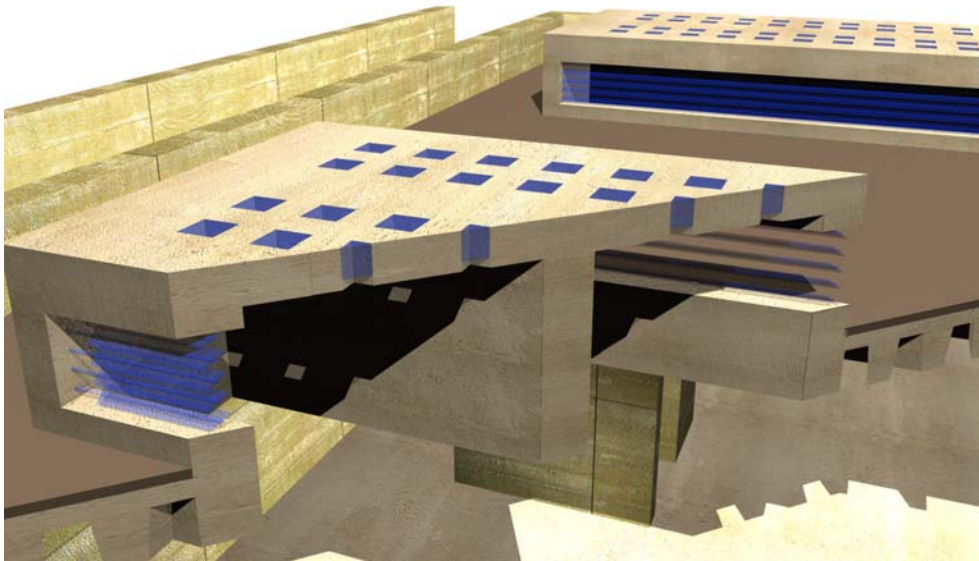


Fig. 21 Section through roof monitor structure.

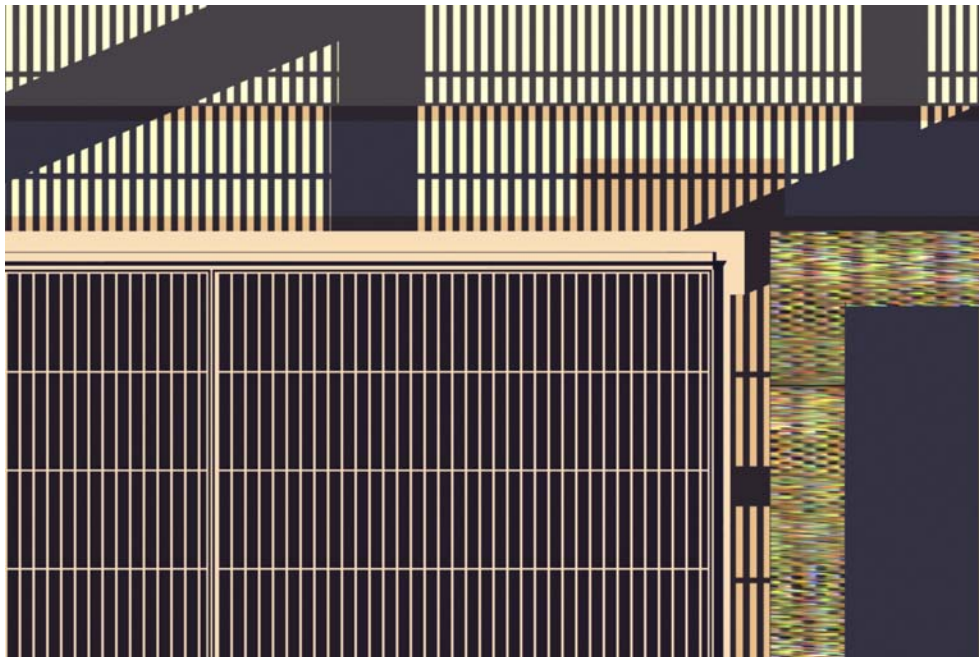


Fig. 22 View of shade structure detail and shading patterns.



Fig. 23 3D interior view of auditorium.



Fig. 24 3D view of auditorium seating.