

# MANIFESTING THE MEMORY

A MEMORIAL FOR A METEORITE

**ANJA BREDELL**

**Study leader:** Prof P. Vosloo

**Mentor:** J. Laubscher

**Course coordinator:** J. Laubscher

Submitted in partial fulfilment of the requirements for the degree of Magister in Architecture [Professional], in the Faculty of Engineering, Built Environment and Information Technology, University of Pretoria. Unless stated differently the research, drawings and photographs contained in this document are the author's work.

November 2009

# ACKNOWLEDGEMENT

To God, the architect of my life, for the inspiration, ability and guidance through everything I do. My family and friends, for the loyal support, love and understanding. Prof Piet Vosloo and Jacques Laubscher, for the support, guidance and inspiration throughout the year. The Class of 2009 for great times in the midst of all the hard work.



# ABSTRACT

**Keywords: memory, experience, light, heritage, industrial ruins, meteorite impact crater, memorial.**

Architecture extends far beyond the structuring of basic shelter. The role of architecture is to have a positive contribution on the human being and the surrounding environment.

The thesis proposes to re-address the experience of architecture in the public realm and investigate its responsibility and potential contribution towards cultural and environmental heritage.

The selected project is an Interpretation centre for the Tswaing Meteorite Crater, located within the historic salt and soda factory in the Tswaing Nature reserve, Gauteng, South Africa.

*Argitektuur beslaan oor meer as net die voldoening aan die primêre behoefte vir beskutting. Die rol van argitektuur is om 'n positiewe en invloedryke omgewing te skep vir die verbruiker en die omliggende gemeenskap.*

*Die doel van hierdie verhandeling is om die ervaring van argitektuur in die publieke milieu en die bydrae daarvan tot die kulturele en omgewingserfenis te ondersoek.*

*Die uitgekose projek is 'n interpretasie sentrum vir die Tswaing Meteoriet Impak Krater, geleë in die historiese sout en soda fabriek in die Tswaing Natuureservaat, Gauteng, Suid-Afrika.*



# Table of Contents

## LIST OF FIGURES

## ABSTRACT

## 01 PROJECT BRIEF

1.1 The site	01:1
1.2 Problem setting	01:2
1.3 Aims and objectives	01:3
1.4 Points of departure	01:3
1.5 Design objectives	01:3
1.6 Methodology	01:5
1.7 Client profile	01:6
1.8 User profile	01:6

## 02 CONTEXT ANALYSIS

2.1 Background	02:1
2.2 Meteoric impact craters	02:2
2.3 Regional Context	02:3
2.4 Climate	02:4
2.5 Context of the study area	02:5
2.6 Fauna and Flora	02:7
2.7 Historical Context	02:9
2.8 Environmental guidelines and policies	02:14

## 03 THEORETICAL DISCOURSE

3.1 Experience in architecture	03:1
3.2 Memory	03:4

## 04 PRECEDENT ANALYSIS

4.1 Historical Park	04:2
4.2 Showroom	04:3
4.3 Carlo Scarpa and the Castelvechio	04:5
4.4 Liliesleaf Legacy Project	04:7
4.5 Centre for Contemporary Arts Nottingham (CCAN)	04:9
4.6 In die sterre geskryf II [Written in the stars II]	04:10
4.7 Inspiration	04:11



## **05 SITE ANALYSIS**

<b>5.1 The salt and soda Factory</b>	<b>05:3</b>
<b>5.2 Invisible cities</b>	<b>05:8</b>

## **06 DESIGN DEVELOPMENT**

<b>6.1 Concept development</b>	<b>06:1</b>
<b>6.2 On seeing and being seen</b>	<b>06:8</b>
<b>6.3 Defining space</b>	<b>06:9</b>
<b>6.4 Atmosphere</b>	<b>06:10</b>
<b>6.5 Natural light</b>	<b>06:12</b>
<b>6.6 Route</b>	<b>06:13</b>
<b>6.7 Accommodation Schedule</b>	<b>06:18</b>
<b>6.8 Circulation: Movement through space</b>	<b>06:19</b>
<b>6.9 Memory in architecture</b>	<b>06:23</b>
<b>6.10 Working within existing structures</b>	<b>06:24</b>
<b>6.11 Museum design</b>	<b>06:26</b>

## **07 TECHNICAL INVESTIGATION**

<b>7.1 Structure and materiality</b>	<b>07:2</b>
<b>7.2 Roof</b>	<b>07:5</b>
<b>7.3 Storm water</b>	<b>07:6</b>
<b>7.4 Water elements</b>	<b>07:6</b>
<b>7.5 Sustainability</b>	<b>07:7</b>

## **TECHNICAL DOCUMENTATION**

## **CONCLUSION**

## **BIBLIOGRAPHY**

## **ACKNOWLEDGEMENT**

## **08 ADDENDA**

<b>8.1 Tswaing Framework: Site analysis</b>	<b>08:2</b>
<b>8.2 Tswaing Framework: Proposal</b>	<b>08:2</b>
<b>8.3 Soda-ash and salt extraction</b>	<b>08:6</b>
<b>8.4 Burra Charter</b>	<b>08:7</b>

# LIST OF FIGURES

## 01 PROJECT BRIEF

Figure 1.01 Aerial view of the TMC [Adapted from the image accessed on [[http://rst.gsfc.nasa.gov/Sect18/Sect18\\_6.html](http://rst.gsfc.nasa.gov/Sect18/Sect18_6.html) accessed 24.02.2009 ]

Figure 1.02 Location map of the Tswaing Meteor impact Crater [TMC]

Figure 1.03 Integration of aims and objectives throughout the project

Figure 1.04 Proposed research methodology

Figure 1.05 Identified user groups and associated requirements

## 02 CONTEXT ANALYSIS

Figure 2.01 Aerial photograph of the TMC [[http://rst.gsfc.nasa.gov/Sect18/Sect18\\_6.html](http://rst.gsfc.nasa.gov/Sect18/Sect18_6.html) accessed 24.02.2009 ]

Figure 2.03 Meteor impact sites on the African continent [adapted from [www.saa0.co.za](http://www.saa0.co.za) accessed 24.02.2009]

Figure 2.02 Schematic representation of the sequence of events during the formation of an impact crater. [Reimold, 1999:29]

Figure 2.04 The visitor centre at Vredefort dome [May 2009]

Figure 2.05 Location map of the TMC in relation to the African continent

Figure 2.06 Transport and development corridors of the greater Tshwane [Adapted from [www.tshwane.gov.za](http://www.tshwane.gov.za) accessed 15.03.2009]

Figure 2.07 Annual precipitation graph for Tshwane [Adapted from [www.tshwane.gov.za](http://www.tshwane.gov.za) accessed 15.03.2009]

Figure 2.08 Annual temperature graph for Tshwane [Adapted from [www.tshwane.gov.za](http://www.tshwane.gov.za) accessed 15.03.2009]

Figure 2.09 TMC Temperature in relation to Pretoria CBD [Adapted from [www.tshwane.gov.za](http://www.tshwane.gov.za) accessed 15.03.2009]

Figure 2.11 Soshanguve - informal housing [February 2009]

Figure 2.10 Economic development of the greater Tshwane region in relation to Pretoria CBD [Adapted from [www.tshwane.gov.za](http://www.tshwane.gov.za) accessed 15.03.2009]

Figure 2.12 Green nodes and conservation areas within the greater Tshwane [Adapted from [www.tshwane.gov.za](http://www.tshwane.gov.za) accessed 15.03.2009]

Figure 2.13 Crater lake, view towards eastern rim of crater [February 2009]

Figure 2.14 Pink Nebo Granite at TMC [February 2009]

Figure 2.15 Aerial photograph indicating the Soutpanspruit in relation to the crater rim

Figure 2.16 Soutpanspruit [February 2009]

Figure 2.17 Schematic block diagram [cross-section through the crater] showing different features of the crater environment and interior, as well as some sedimentary characteristics [Reimold et al, 1999:62]

Figure 2.18 View of crater floor and Southern crater rim from Northern rim [February 2009]

Figure 2.20 Natural vegetation at TMC. View towards M35 and Pretoria North from north-eastern crater rim [February 2009]

Figure 2.19 Lichens on the crater trail [February 2009]

Figure 2.21 View towards Southern rim of crater and Pretoria [February 2009]

Figure 2.22 Natural vegetation at the TMC [March 2009]

Figure 2.23 Middle and Late Stone Age artefacts found at Tswaing Crater [Reimold et al, 1999: 120]

Figure 2.24 Examples of decorated and undecorated potshards found at Tswaing [Reimold et al, 1999, :121]

Figure 2.25 Boundaries of Zoutpan and Uitspan farms [Reimold et al, 1999: 121]

Figure 2.27 View of the crater from the northwest showing the pipelines and other works. Photograph by P.A.Wagner taken in 1921 [Reimold et al, 1999: 122]

Figure 2.26 The earliest known photograph of Tswaing, taken by H.F. Gros in 1889 [Reimold et al, 1999: 122]

Figure 2.28 Plan of crater area showing bore holes, pipelines, central pumping station and reservoir [Reimold et al, 1999: 123]

Figure 2.29 The soda factory in 1921, photographed by P.A. Wagner [Reimold et al, 1999: 122]

Figure 2.30 The TMC after the fire destroyed 500 ha and most of the existing visitor centre on 23 August 2009 [August 2009]

Figure 2.31 Map of green nodes in Tshwane with Tswaing indicated. [Adapted from [www.tshwane.gov.za](http://www.tshwane.gov.za) accessed 15.03.2009]

### 03 THEORETICAL DISCOURSE

Figure 3.01 The Palace at 4A.M. , Alberto Giacometti [Ruhrberg, 1998:465]

Figure 3.02 Thermal Baths Vals, by Peter Zumthor [[www.presidentsmedals.com](http://www.presidentsmedals.com) accessed 29.09.2009]

Figure 3.03 The Fur-Lined Teacup Object by Meret Oppenheim [Ruhrberg, 1998:463]

### 04 PRECEDENT ANALYSIS

Figure 4.01 Path towards understanding Pavilion [[www.kalkriese-varusschlacht.de/index/getlang/en](http://www.kalkriese-varusschlacht.de/index/getlang/en) accessed 2009.08.11]

Figure 4.02 Museum tower [Davey, 2002:37]

Figure 4.03 Seeing pavilion [Davey, 2002:41]

Figure 4.04 Hearing pavilion interior [Davey, 2002:41]

Figure 4.05 The restored building [Finch, 2005: 46]

Figure 4.06 Inserting the new structure [Finch, 2005:47 ]

Figure 4.07 Exploded isometric projection [Finch, 2005: 47]

Figure 4.08 Captivating integration of the old and the new [Finch, 2005:47]

Figure 4.09 Ground floor plan [Finch, 2005:47]

Figure 4.10 Detail of the paving edge at the threshold between the entrance room and the sculpture gallery. A tiny cascade of levels formed from white Prun stone. [Murphy, 1999:49]

Figure 4.11 The Sacello seen from the first room of the gallery. The beam of sunlight moves around the space during the course of the day. [Murphy, 1999 :68]

Figure 4.13 Varieties of stone near Cangrande space [Murphy, 1999:184]

Figure 4.14 Detail of junction of steel support to steel edge; also shows the two adjacent floors separate from



each other and the walls [Murphy, 1999:68]

Figure 4.12 The fountain is detached to appear to float on the water [Murphy, 1999:29]

Figure 4.15 Section through visitor centre [Low, 2008:43]

Figure 4.16 Section through resource centre [Low, 2008:43]

Figure 4.17 View from visitor centre towards resource centre

Figure 4.18 View towards visitor centre and restaurant

Figure 4.19 New materials, doors and windows in conjunction with existing structure

Figure 4.20 Threshold between new and existing materials

Figure 4.21 Meeting between the old and the new

Figure 4.22 New exhibition design within previously existing structure

Figure 4.23 Architectural animation of CCAN [www.trentconcrete.co.uk]

Figure 4.24 Close-up of green scalloped concrete panel with intricate lace pattern imprinted [www.trentconcrete.co.uk]

Figure 4.25 The glass screens can be viewed as layers over each other. [March 2009]

## 05 SITE ANALYSIS

Figure 5.01 [On previous spread] Aerial photograph taken in 1939 [Chief Directorate: Land Surveys and Mapping]

Figure 5.02 A portion of the soda factory in 1921, [ by P.A Wagner] This photograph represents the only documented information available regarding the factory. [Reimold et al, 1999:124]

Figure 5.03 A plan of the crater area indicating boreholes, pipelines, the central pumping station, reservoir and the location of the soda and salt factory. [Reimold et al, 1999:123]

Figure 5.04 Existing storage tank, illustrating the effect of the high salt content in the water used during initial construction [August 2009]

Figure 5.05 Corroded reinforced concrete storage tank structure [March 2009]

Figure 5.06 Storage tank, filled with dead leaves [August 2009]

Figure 5.07 Corroded steel element on top of concrete storage tank [June 2009]

Figure 5.08 Corroded reinforced concrete element [June 2009]

Figure 5.09 Residue of corroded element on concrete surface [June 2009]

Figure 5.10 Cracked concrete surface [June 2009]

Figure 5.11 Dilapidated reinforced concrete storage tanks filled with rainwater

Figure 5.13 Storage tanks [March 2009]

Figure 5.14 Open storage tanks filled with dead leaves [August 2009]

Figure 5.12 Large storage rooms are located underneath the surface platform. [March 2009]

Figure 5.15 Storage tank in a more stable condition [August 2009]

Figure 5.16 Small stairs leading into open storage tank [March 2009]

Figure 5.17 Soda ash residue with left over bricks on southern edge of factory structures [August 2009]

Figure 5.18 Concrete floor with corroded pipe elements protruding [August 2009]



Figure 5.19 Site plan indicating existing structures

Figure 5.20 Possible foundations of corrugated structures [August 2009]

Figure 5.21 Reinforced concrete elements [March 2009]

Figure 5.22 Reinforced concrete storage tanks [March 2009]

Figure 5.23 Reinforced concrete column structure [March 2009]

Figure 5.24 Foundations of historic warming ponds [August 2009]

## 06 DESIGN DEVELOPMENT

Figure 6.01 Aerial photograph of the site, taken in 2007. [Adapted from photograph, Chief Directorate: Land Surveys and Mapping]

Figure 6.02 The selected site consists of the crater and surrounding area

Figure 6.03 The crater as the centre with the relating abstract paths as identified by Christian Norberg-Schulz [Norberg-Schulz, 1985:23]

Figure 6.04 The site represents a collective memory

Figure 6.05 The collective memory can be translated into a memorial

Figure 6.06 The identified focus area of the project that is located in the historic salt and soda factory ruins

Figure 6.07 Site analysis [March 2009]

Figure 6.08 Conceptual site analysis indicating energy levels ranging from the Pretoria CBD towards the centre of the TMC, the Crater. [March 2009]

Figure 6.10 Conceptual site layout plan [June 2009]

Figure 6.09 Conceptual site layout plan [April 2009]

Figure 6.11 Initial concept plan [April 2009]

Figure 6.12 Conceptual site layout plan [May 2009]

Figure 6.13 Conceptual site layout plan [August 2009]

Figure 6.16 An experiment with the effect of light and atmosphere in submerged structures [July 2009]

Figure 6.14 Underground structure with opening for natural sunlight [March 2009]

Figure 6.15 Underground exhibition area within existing salt and soda mine ruins [April 2009]

Figure 6.18 Depressed base plane [Ching, :99]

Figure 6.20 Depressed base plane, direct contact with surrounding landscape remain [Ching, 1996:109]

Figure 6.21 Depressed base plane: the structure is semi-submerged in the ground, the degree of exposure to the surrounding landscape becomes limited [Ching, 1996:109]

Figure 6.22 Depressed base plane: the structure is fully submerged in the ground, isolating the interior from the surrounding landscape [Ching, 1996:109]

Figure 6.17 Underground structure [March 2009]

Figure 6.19 Depressed base plane in the landscape [Ching, 1996:99]

Figure 6.23 Existing storage tank with a depth of approximately 3m [August 2009]

Figure 6.24 Concept sketch, indicating opening for natural light and ventilation, service shaft and green roof [June 2009]

Figure 6.25 Experiment with light and atmosphere [July 2009]

Figure 6.26 Ruins decaying over time

Figure 6.27 Texture of decaying structures

Figure 6.28 Experiments with light [March 2009]

Figure 6.30 New structures within existing structure; green roofs; natural light as design element [August 2009]

Figure 6.29 Natural light as design element [July 2009]

Figure 6.31 Conceptual layout of the route through the site, representing a succession of wanderings through which the visitor experiences the site. [March 2009]

Figure 6.32 Initial concept plan with the existing structures as core of concept with radial routes dispersing in different directions with different exhibitions representing the radial effect of the meteor impact [March 2009]

Figure 6.33 Conceptual planning of the route with the horizontal axis as path [March 2009]

Figure 6.34 Enclosed route [March 2009]

Figure 6.35 Allocation of accommodation schedule [July 2009]

Figure 6.36 Circulation diagram [July 2009]

Figure 6.37 Concept plan [July 2009]

Figure 6.38 Concept plan [July 2009]

Figure 6.39 Concept plan [July 2009]

Figure 6.40 Concept plan [August 2009]

Figure 6.41 Concept plan [August 2009]

Figure 6.42 Design development plan [August 2009]

Figure 6.44 Design development plan [August 2009]

Figure 6.43 Design development Parti Diagrams [August 2009]

Figure 6.45 Design development plan [August 2009]

Figure 6.46 Mies van der Rohe's Country House in Brick, 1923 [[www.aainter3.net/kevin/](http://www.aainter3.net/kevin/) accessed 01.09.2009]

Figure 6.47 Parti diagram of final design proposal inspired by Mies van der Rohe's Country House in Brick [September 2009]

Figure 6.48 View towards North over the interpretation centre

Figure 6.49 Program allocation

Figure 6.51 Site plan

Figure 6.50 Circulation diagram

Figure 6.52 Interior view of exhibition walk.

Figure 6.53 View from entrance ramp, with the reception platform on the left towards the exhibition area

Figure 6.54 Schedule of accommodation illustration

Figure 6.55 Threshold concept

Figure 6.56 Threshold concept emphasising movement from one room to the next

Figure 6.57 Independent floor surfaces with shadow lines, creating a floating effect

Figure 6.58 Selected plan of exhibition walk illustrating the different floor patterns.

Figure 6.59 Service allocation diagram

Figure 6.60 Movement of water over different textured surfaces influence the visual and auditory effect. Diana

memorial, London [June 2009]

Figure 6.61 Falling water at the Barbican in London [June 2009]

Figure 6.62 Cascading water. Chatsworth, England [June 2009]

Figure 6.63 Conceptual solution to working within the existing structure [August 2009]

Figure 6.64 Illustration of existing structures

Figure 6.65 View from exterior towards exhibition walk

Figure 6.66 Interior of exhibition walk

## 07 TECHNICAL INVESTIGATION

Figure 7.01 Illustration of existing structures in relation with the proposed intervention

Figure 7.02 Existing corroding reinforced concrete structures. It is suspected that these structures were used as storage tanks for the water and brine that was pumped from the crater floor. [August 2009]

Figure 7.03 The key plan with the selected area illustrated in the plan below.

Figure 7.04 Selected plan, indicating the intervention of new structures within the existing structure.

Figure 7.05 The new concrete structures in relation to the existing structures.

Figure 7.06 Materiality of existing concrete structures

Figure 7.07 Materiality of existing concrete structures

Figure 7.08 Texture of existing concrete structures

Figure 7.09 Local veld grass [August 2009]

Figure 7.10 Thermal Baths, Vals - View of roof detail [Arte France, 2003]

Figure 7.11 Thermal Baths, Vals - View of roof detail [Arte France, 2003]

Figure 7.12 Thermal Baths, Vals - Interior view of roof detail [Arte France, 2003]

Figure 7.13 Green roof detail of Peter Zumthor's Thermal Baths [Arte France, 2003]

Figure 7.14 View of the design proposal indicating green roof areas.

Figure 7.15 Sustainability graph indicating the different levels of sustainability of the design proposal according to the SBAT assessment tool [October 2009]

Figure 7.16 Illustration of ramps throughout the design

Figure 7.17 Plan indicating natural cross ventilation throughout the structures.

Figure 7.18 Diagrammatic illustration of a roof light

Figure 7.19 Diagrammatic illustration of a light shelf

Figure 7.20 Diagrammatic illustration of a window opening

Figure 7.21 Diagrammatic illustration of reflective blinds

Figure 7.22 Typical section through the research office, illustrating the concept of natural ventilation and natural sunlight as employed throughout the design