Coober Pedy´s Opal Fields

- An authentic Cultural Landscape

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– An authentic Cultural Landscape

To assess Coober Pedy's cultural landscape heritage it's inevitably to describe and interpret its marginal environmental setting following the social and economic conditions in a place remote from urban sensibilities. This sparsely populated land, amid blistering arid plains, can best be described with a hint of human behaviour and sentimentality.

Its geographical location is in the heart of the South Australian outback, surrounded by jaw-dropping, desolated desert. Out here the sky is bluer and the dust redder than anywhere else. In this place you forge ahead along dangerous gravel roads, through vast empty spaces, endless horizons, and hostile distances, and barely have the chance to meet anybody on a sweating day drive. With Adelaide some 800 km south and Alice Springs some 700 km north, this place can be accessed by the sealed Stuart Highway or the utterly rewarding rough-and-ready gravel road along the Oodnadatta Track. Either way it's about the journey as much as destination.

Location of Coober Pedy, South Australia; Fig. 01

Mullock heaves beside Stuart Highway, 20 km north of Coober Pedy.; Fig. 02

Oodnadatta Road
to Coober Pedy; Fig. 03

On your way the 50°C heat haze shimmers on the desert. While you spot out for non-existing trees, swarms of flies tear you out of your day-dream. Back in the present time coming close to Coober Pedy the dry, barren desert Landscape changes. A variety of earth-like piles and riddled holes stretch along the highway or gravel roads, depending on which of the four winds you come.

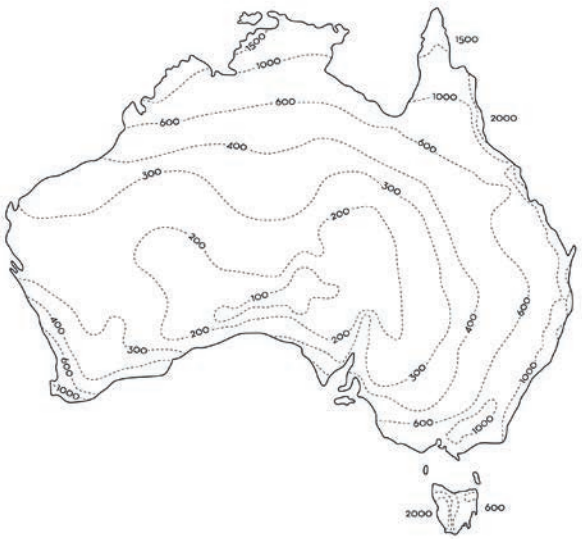
> In this place man is just another of god ′s creature . . .
>
> From: Walkabout,
> a Film by Nicolas Roeg, 1971

At first these piles are infrequent occurrences in a vast, mainly flat and harsh tableland. But then these heaves devour your attention after an absent-minded drive through the middle of nowhere. You instantly get distracted by these alien-like things, still able to manage your driving ability but prospecting for a further piece of information. Meanwhile, counting the piles is more and more pointless after it seems as if there are millions. So what the heck is it all about?

Australian maximum temperature; Fig. 04.

Australian mean temperature; Fig. 06.

Australian minimum temperature; Fig. 05.



Australian average rainfall; Fig. 07

The Opal Mania

1 + 4: Robertson, R.S.; and D.C. Scott; Geology of the Coober Pedy Precious Stones Field, 1981-86; No. 56; Geological Survey of South Australia

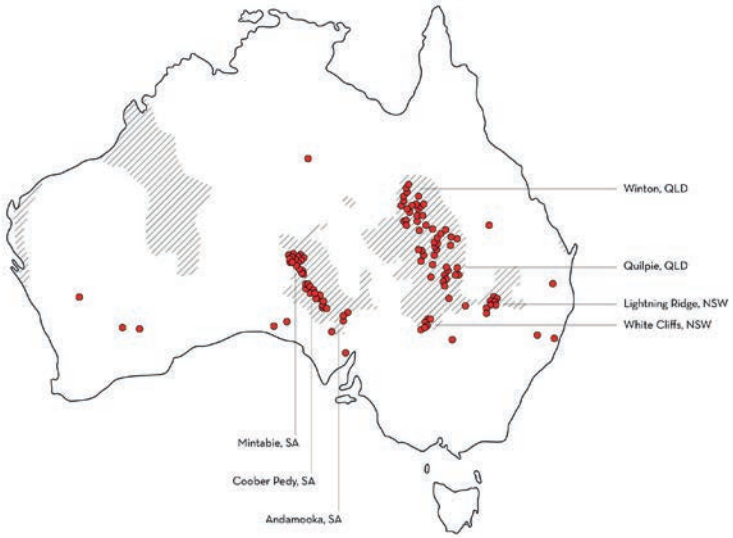
All the mania is caused by an amorphous non-crystalline gem mineral named 'opal'. The Australian 'sedimentary opal' is solidified from liquid silica deposited in tiny fractures and joints of the Mesozoic Great Artesian Basin.[1] The beautiful shift of spectral hues fascinates people and Australia currently produces around 95% of the world's opal. [2]

2 + 5 + 8: Australia Coober Pedy: White man's hole in the ground; 2007, Travel Trade Gazette; accessed 22 Sep 2015

The largest producer of opal in the world is Coober Pedy and makes up about 70% of the world's precious opal production.[3] Opals can be found between the east facing 50 metre escarpment and a gently west-sloping tableland known as the Stuart Range.[4] The area of 'Precious Stone Fields' covers 4,954 square kilometres, making it the biggest opal field in the world.[5] With over 30 separate fields dotted around the area it is estimated that approximately 10% of the total area has been worked. [6]

3 + 6: Annual Report 2013/2014; District Council of Coober Pedy; accessed via http://www.coober-pedy.sa.gov.au on 25 Oct 2015

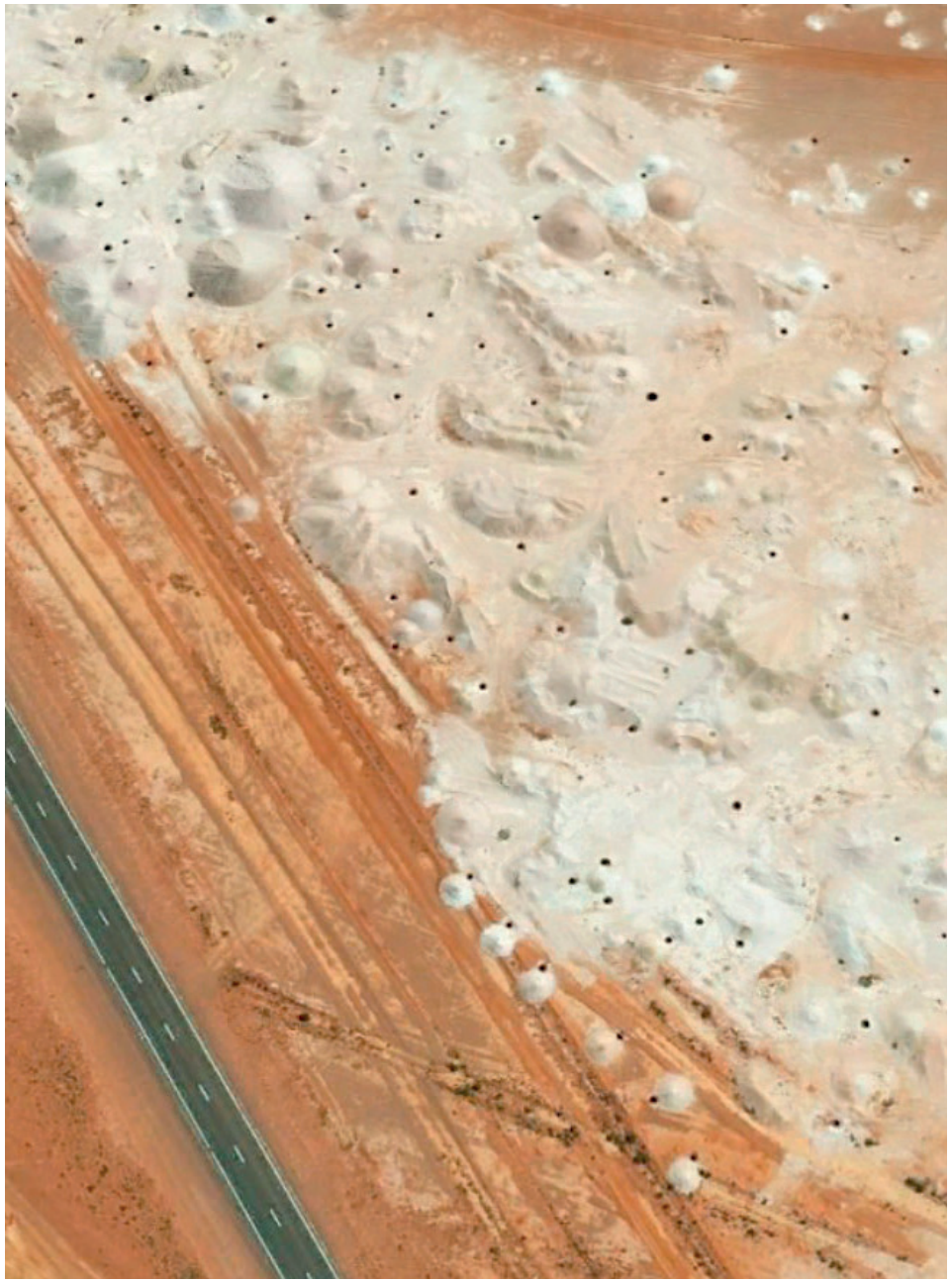
Extra fine Australian White Opal from Coober Pedy can reach prices up to 500 times the value of gold. So even the smallest chance to find opal will attract temporary settlers for their share of luck. But to track down precious opal is a very strenuous procedure.



Location of Australian opal findings and major mining towns; Fig. 08

The precious opal is found deep in weathered white to mauve Bulldog Shale created 100 million years ago in the Cretaceous age. In this porous host rock – incorrectly called 'sandstone' – opal may be found as veins horizontally (levels) or in steep dipping (verticals). As distribution is unpredictable, an up to 30 metre deep shaft doesn't cheer up the sluggish miner either. [7] It is because of this unpredictability that opal mining has never been taken over by big industry and makes handmade mining inevitable. [8]

7: Jingping Zhe and Brian J Morris; High resolution resistivity: a new opal exploration tool; MESA Journal 41 April 2006; p34-37



Opal mining beside Stuart Highway north of Coober Pedy; Fig. 09

As most shafts are worked privately by a handful of men, technological advantages were evolved gradually and made it necessary to control former disorganised mining. Today, for about $30 an annual prospecting permit comes along with four plastic tags to stake a claim. A further permit is required to mine the site. [9]

These human-scale mining shafts are dispersed all over the place. There are at least 300,000 holes of prospecting drills in Coober Pedy, but only about 12,000 registered mining shafts. [10] It only can be estimated how many other illegal holes and shafts are scattered across the landscape.

This human interaction with an unique landscape results in mounds of overburden everywhere and turned this part of the Australian outback into a cultural landscape.

9: South Australia Opal Mining Regulations 2012 under the Opal Mining Act 1995

10: Geological Digital Edition maps and drilling and sample data packages; South Australian Government; http://minerals.statedevelopment.sa.gov.au/online_tools/free_data_delivery_and_publication_downloads/digital_maps_and_data

The Coober Pedy township

The town itself seems to be a desolated human aberration. Heading into town, there are rusty car wrecks in front yards, composites of artefacts, piles of seemingly discarded material leaping to the eye and you might think you've arrived in a wasteland.

Unbelievably, Coober Pedy holds a cosmopolitan population of 3,500, including a 400 Aboriginal community. The residents are made up of 44 nationalities with mixed beliefs and represents a similar population structure since the 1980s. [11 + 12]

After spotting some Aborigines at the one and only roundabout this would be your rare chance to see some locals outside the commercial strip. Usually locals hide themselves underground in a reworked topography to escape the reality of climate extremes, either for working in their mines or in their cave dwellings called 'dugout'. Nevertheless, the name Coober Pedy is an Aboriginal expression for 'white man in a hole' and activity occurs predominantly underground.[13] It might be one of the places where it makes sense to live underground with comfortable subterranean temperatures of 23°C to escape the hostile summer heat and subzero winter nights. If you let your eyes wander across the landscape you might be able to spot the forest of air and exhaust chimneys.

Coober Pedy's underground dwelling called 'dugout'; Fig. 10

11: Annual Report 2013/2014; District Council of Coober Pedy; accessed via http://www.coober-pedy.sa.gov.au on 25 Oct 2015

12: Mineral Industry Quarterly, Number 12, December 1978, ISSN 0313-6086, south Australian Department of Mines and Energy

13: Coober Pedy was named by the local Progress and Miners Association in 1920 from the Aboriginal words "Kupa Piti", meaning white man's hole or waterhole. Source: Coober Pedy Community Plan, Collins Anderson Management, undated

One of Coober Pedy´s underground ´suburbs´ in south-east direction; Fig. 11

Although the first council was elected in 1987[14] – 72 years after the first opal finding – this unique and isolated outback town feels still like to be ´out council´. Still "the opal fields are portrayed as last frontiers where the law of the jungle still prevails." [15] The miners job is considered not to be the easiest, although rewards may just be buried on the way home. Small finds are spent on a few big nights out, kept hidden underground or in a fortress-surrounded cave-safe to keep the digger from being infected by this ´mining-disease´ called ´opalizm´. In this rugged outback environment locals step into numerous underground churches more frequently than elsewhere to renew their faith and hope before heading back onto the opal fields.

Although in a demographic view the population is considerably old and predominantly male[16], most of the locals are soul-imprinted by this one-of-place without ever intending to leave. It is more likely to bump into temporary settlers which are fascinated by the chance to get-rich-quick with the intention to move on to greater comfort elsewhere.[17] The elusive find is more likely to occur in after-life but the tenacious optimism of all mankind is present twenty-four-seven and turns Coober Pedy into the world's opal mining mecca.

14: Annual Report 2013/2014; District Council of Coober Pedy; accessed via http://www.coober-pedy.sa.gov.au on 25 Oct 2015

15: Haill, Robert G; 1995; Opals of the Never Never; Kenthurst, N.S.W.; Kangaroo Press, 1995, p14

16: Population Health Profile of the Coober Pedy Local Government Area to assist in the preparation of the Regional Public Health Plan; The Local Government Association of SA and the Public Health Information Development Unit of The University of Adelaide, Australia 2005

17: Lee, Gini; Three Scenarios for a Critical Architecture of Desert Mobility; in: Rendell, Jane; Critical architecture; Routledge, 2007; p279-287

Mining methods and technological advantages
– a historical overview

The remote and isolated area of Coober Pedy was always managed through improvisation. Vast distances make scarce materials more valuable and they are used and altered to suit a new practice.

As opals were first found in 1915, mining was done by hand and so-called opal 'floaters' were followed up on the surface. [18] A sensational opal find in 1946 resulted in a new rush to the fields with miners working in digging pits with pick and shovel. Due to the many European migrants during the 1960s mining expanded rapidly. As the 'easy' opal ran out, underground mining was introduced, explosives made readily available and discarded materials where transformed to fulfil new tasks of everyday pragmatics. These obvious examples of necessity resulted in mechanised mining methods which are a distinct cultural approach in Coober Pedy.

18: Robertson, R.S.; and D.C. Scott; Geology of the Coober Pedy Precious Stones Field, 1981-86; No. 56; Geological Survey of South Australia

In the beginning mullocks were manhandled along drives in buckets, yorke hoists and self-un-

Old time miners lifting buckets of mullock from underground; Fig. 12

A 'Blower' in the mullock fields north of Coober Pedy; Fig. 13

loaders. "As established engineering firms and fan cyclone manufacturers showed little or no interest [...] the miners, left to their own devices, have persisted in experimenting with fans, blowers, cyclones and ducting, and continued to modify their equipment." [19]

A pneumatic conveying system, which is called 'blower' – an industrialised vacuum cleaner with a series of metal pipes to collect mullock underground – was constructed out of available scrap materials. Soon it was the main feature on the opal fields with a four times larger capacity of 20 tonnes of mullock per day (no underground mechanical equipment) or up to 50 tonnes per day (with underground mining machines). After a technological improvement mining developed into a multi-million dollar industry and hand-dug workings have disappeared. Since 1972 shaft sinking is carried out by Calweld and exploratory drilling by Auger drill. If opal is found in shallower levels, open-cut methods are carried out by bulldozer. [20]

This mechanical improvement had a heavy impact on the landscape: mullock heaves, spring up all around the place and changed this remote landscape. Some of this technology is unique to Coober Pedy such as the 'blower' which is by far the most common method of mullock removal

19: Mineral Industry Quarterly, Number 12, December 1978, ISSN 0313-6086, south Australian Department of Mines and Energy

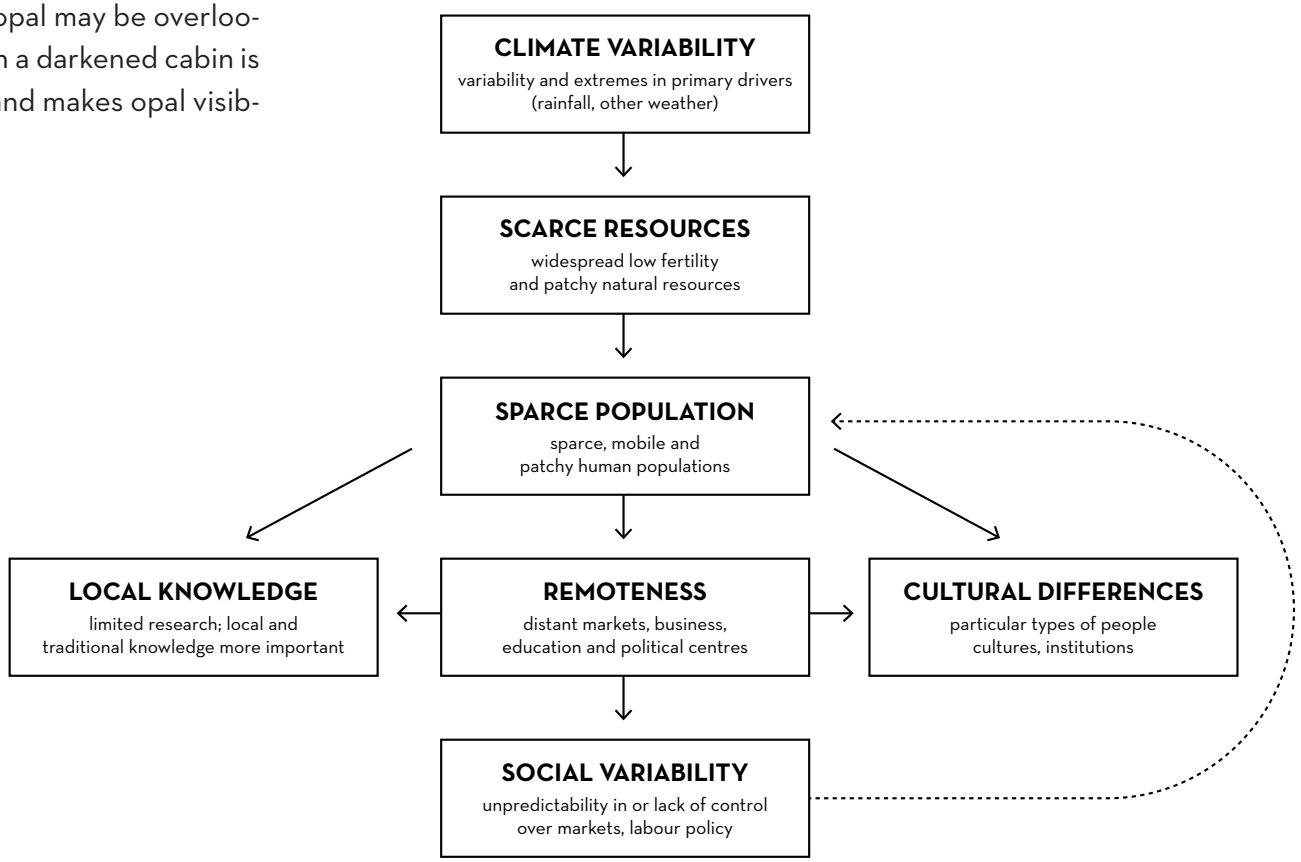
20: Mineral Industry Quarterly, Number 12, December 1978, ISSN 0313-6086, south Australian Department of Mines and Energy

21 + 23: Robertson, R.S.; and D.C. Scott; Geology of the Coober Pedy Precious Stones Field, 1981-86; No. 56; Geological Survey of South Australia

from underground. [21] Thus, this technology evolved later into a pressure 'plenum' system using the same method with reverse pressure and an equipment simply mounted on a light trailer. [22]

22: Mineral Industry Quarterly, Number 12, December 1978, ISSN 0313-6086, south Australian Department of Mines and Energy

With these evolved mechanical mining techniques and the sheer amount of mullock lifted, a significant amount of opal may be overlooked. A conveyor belt through a darkened cabin is called 'noodling machine' and makes opal visible under ultra-violet light. [23]



The 'Desert Syndrome'
Interrelated landscape and social factors; Fig. 14

In 1978 a mining equipment survey counted 185 blowers, 32 bulldozers, 28 Calwel drills, 26 auger drills, 13 bucket elevators, 15 front-end loaders, 65 generators, 11 self-dumper, 27 tunnelling machines and eight noodling machines. [24]

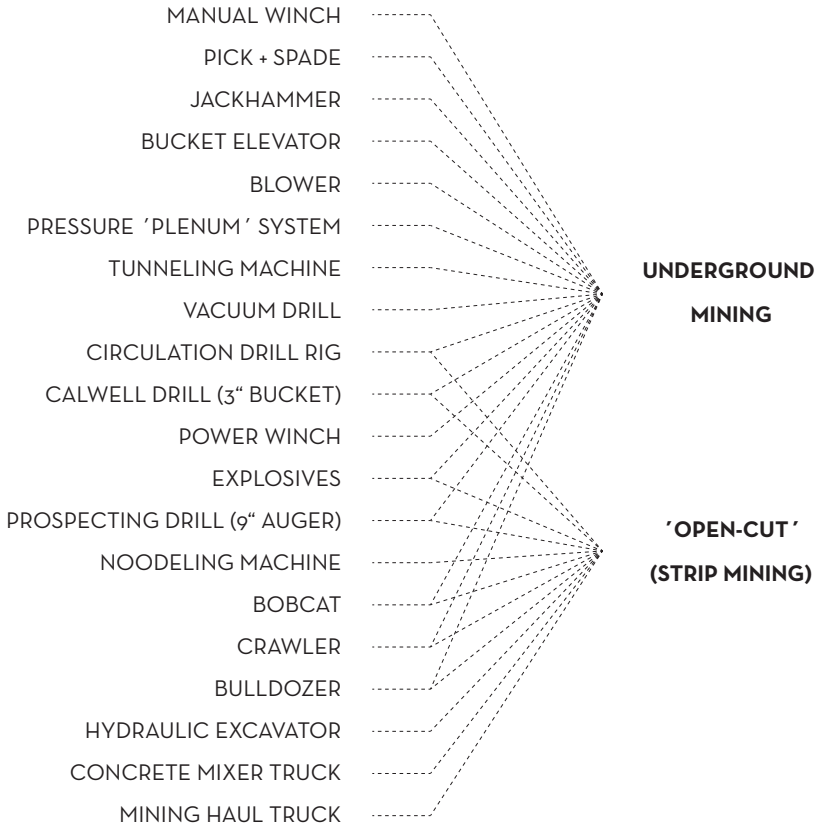
24: Mineral Industry Quarterly, Number 12, December 1978, ISSN 0313-6086, south Australian Department of Mines and Energy

As technology evolved, so did the expansiveness of working fields. Residual mining activity can be found as far as 50 km north of town. The pattern of Coober Pedy's earthworks are summarized in chronological order in the following map drawn together from various sources.

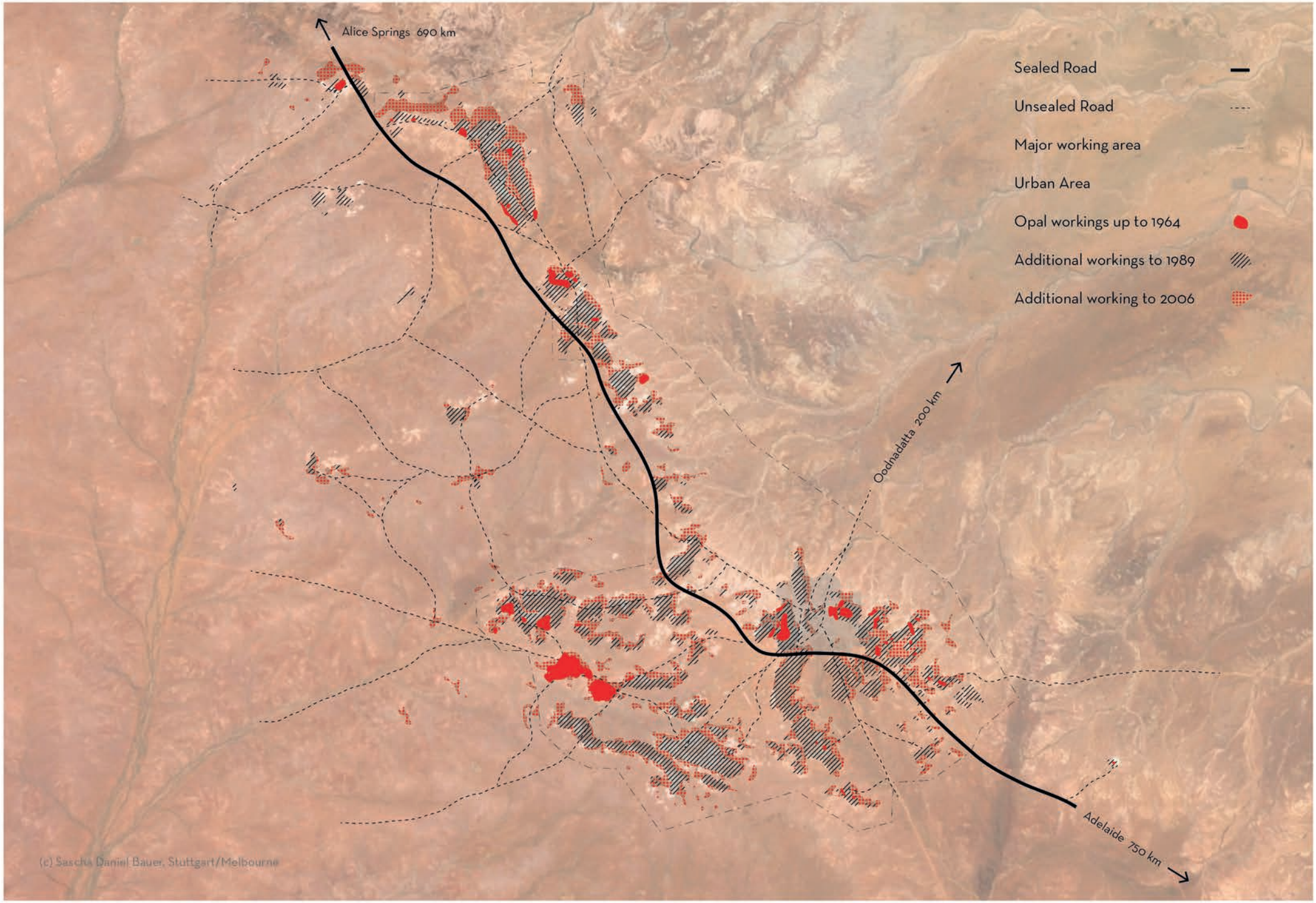
Until today nothing is discarded as all these machines need maintenance and spare-parts. Thus, technology is still evolving and accumulated by those rusting, discarded machinery scattered in 'garden of dreams and aspiration' around town. Or how Gini Lee describes it: "in these places, waste and rubbish piles are material 'commons' available for picking over, and not an affront to the city beautiful." [25]

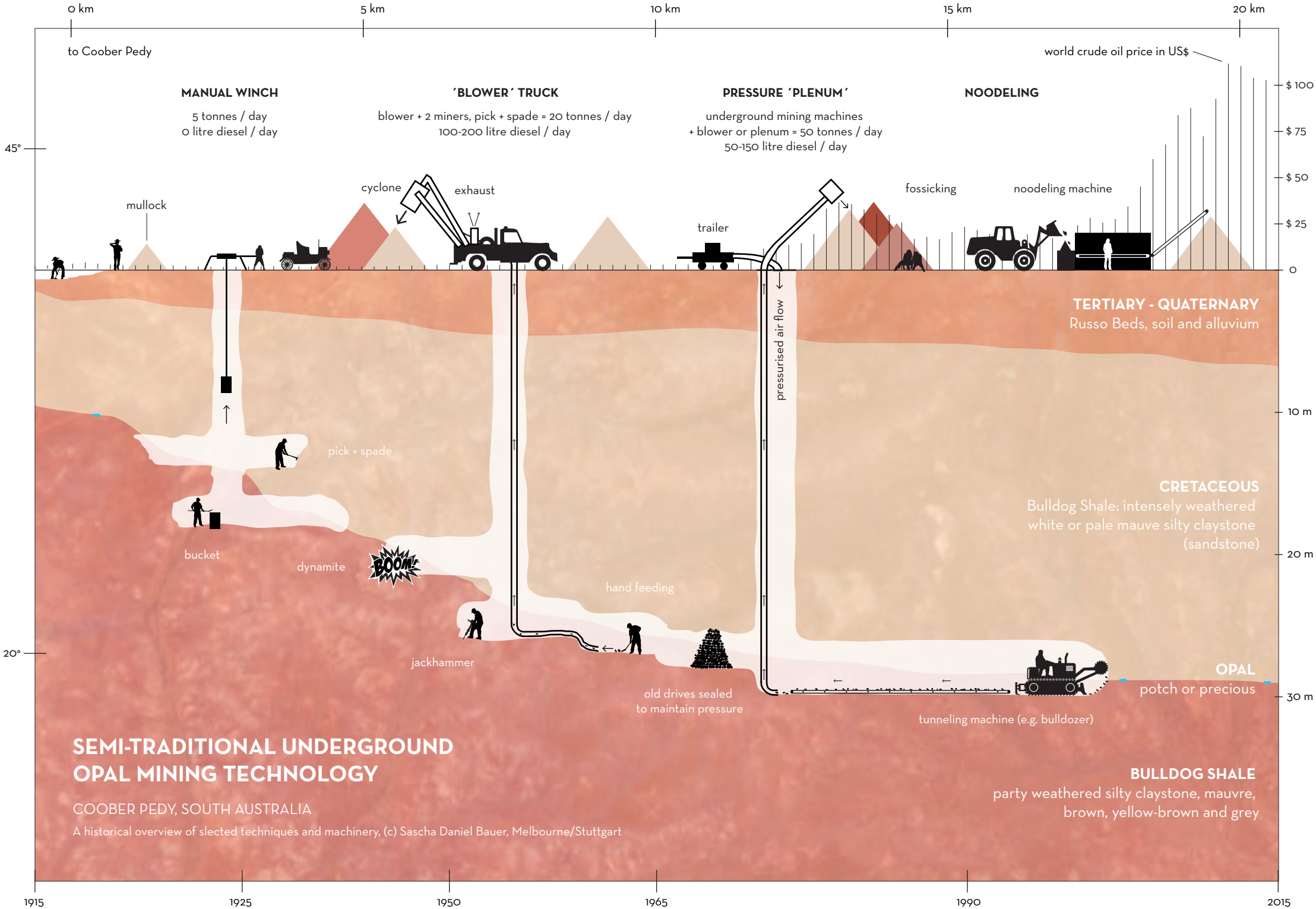
25: Lee, Gini; Three Scenarios for a Critical Architecture of Desert Mobility; in: Rendell, Jane; Critical architecture; Routledge, 2007; p279-287

As mining is already abandoned from town and modern mining techniques are taking over, this Australian heritage is under threat. Nevertheless 'open-cut' methods significantly destroy the tangible mullock monuments of a miner's life-threatening intangible work.

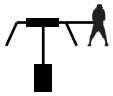


Selection of mining technologies used on Coober Pedy's opal fields in relation to mining-type; Fig. 15


Alice Springs 690 km
Sealed Road
Unsealed Road
Major working area
Urban Area
Opal workings up to 1964
Additional workings to 1989
Additional working to 2006
Oodnadatta 200 km
Adelaide 750 km
(c) Sascha Daniel Bauer, Stuttgart/Melbourne


0 km
5 km
10 km
15 km
20 km
to Coober Pedy
world crude oil price in US$
$ 100
$ 75
$ 50
$ 25
0
45°
20°
MANUAL WINCH
5 tonnes / day
0 litre diesel / day
'BLOWER' TRUCK
blower + 2 miners, pick + spade = 20 tonnes / day
100-200 litre diesel / day
PRESSURE 'PLENUM'
underground mining machines
+ blower or plenum = 50 tonnes / day
50-150 litre diesel / day
NOODELING
mullock
cyclone
exhaust
trailer
fossicking
noodeling machine
pressurised air flow
TERTIARY - QUATERNARY
Russo Beds, soil and alluvium
10 m
pick + spade
CRETACEOUS
Bulldog Shale: intensely weathered
white or pale mauve silty claystone
(sandstone)
bucket
dynamite
BOOM!
20 m
hand feeding
jackhammer
OPAL
potch or precious
old drives sealed
to maintain pressure
30 m
tunneling machine (e.g. bulldozer)
SEMI-TRADITIONAL UNDERGROUND
OPAL MINING TECHNOLOGY
COOBER PEDY, SOUTH AUSTRALIA
A historical overview of slected techniques and machinery, (c) Sascha Daniel Bauer, Melbourne/Stuttgart
BULLDOG SHALE
party weathered silty claystone, mauvre,
brown, yellow-brown and grey
1915
1925
1950
1965
1990
2015

The ´BLOWER´ in the context of other mining equipment used in Coober Pedy

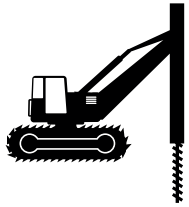


MANUAL /POWER WINCH

equiped with a bucket to lift debris
and miners before/after shift
capacity: 5 tonnes / day

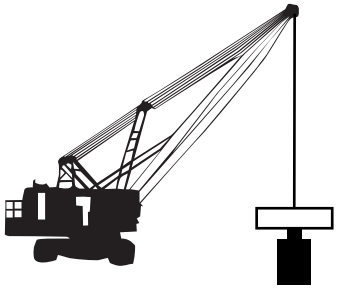
´BLOWER´ TRUCK

industrialized vacuum cleaner
mounted on a truck or big car
blower + 2 miners = 20 tonnes / day



DRILLING RIG

Machine for prospecting,
creates holes for sampling
sub-surface mineral deposits

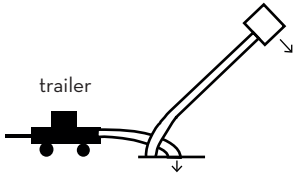


CALWELL DRILL

Machine for drilling vertical shafts
also prospecting and material sampling
usually under sub-contract

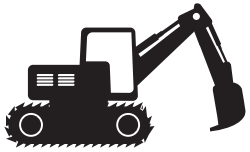
PICK + SPADE + JACKHAMMER

above and underground hand tools
small-scale excavation and prospecting
other equpment such as hammer, shovel...



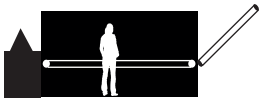
PRESSURE ´PLENUM´ SYSTEM

industrialized vacuum cleaner on trailer
underground mining machines
+ blower or plenum = 50 tonnes / day



HYDRAULIC EXCAVATOR

Heavy constuction equipment
boom, stick, bucket, house
For excavating in ´open-cut´method



NOODELING MACHINE

Discarded mullock heaps passed by conveyor
under a ultraviolet light in a darkended
enclosure, causes the opal to fluoresce

EXPLOSIVES

e.g. dynamite, cost-effective
to blow up rock material,
readily available in Coober Pedy

TUNNELING MACHINE

e.g. bulldozer with tracks
scraping rock material to create tunnel
others: circular tunneling machine

BULLDOZER / CRAWLER

Tractor with blade for pushing earth
coarse preliminary surface grading
ripper in the back to loosen materials

MINING HAUL TRUCK

Dump truck for high-production mining
heavy-duty construction environment
30 - 400 tonnes

Assessing and safeguarding the heritage

The heritage of Coober Pedy can best be assessed where the distinction between architecture, art and landscape collapse. Through many types of earthwork this landscape organically evolved along mining and turned into an associative landscape along its geological value and the inherent optimism of its habitants. Assessing its cultural significance is broad and ticks all the boxes in terms of its aesthetic, archaeological, architectural, historical, scientific, and social values. [26]

26: Lothian, Andrew; Landscape Quality Assessment of South Australia; PhD Thesis, University of Adelaide, 2000

Although mining has a long history in Australia, the current scale is unprecedented. This small, historic part of the mining industry is vanishing as the mining boom roars on. It is the main outback driver and transforming landscapes and communities. Today mining is of contrasting scale, history, profitability, regulatory context and environmental impact. [27]

27: The Modern Outback – Nature, people and the future of remote Australia; The PEW Charitable Trusts, October 2014; accessed via pewtrusts.org.au/outback on 15 October 2015

Less people taking up this hostile opal mining trade and long for guaranteed payment from large mine companies, so this iconic piece of Australian history is being killed off soon. Young people are no longer attracted and over-regulation, fees and associated paperwork forcing out established miners as they are compared with the big mining industries and regarded as 'environmental vandals'. [28]

28: Anderson, Brigid; Australia's historic opal industry dying off; ABC News; Article; accessed via www.abc.net.com.au on 25 October 2015

Apart from that, Coober Pedy's unique opal mining is regarded as resilient, inventive and fiercely independent. Its histories are cumulated by its remoteness, transport difficulties and hostile living environment. Over time a unique industrial and cultural heritage evolved along spatial and material coincidences, small-scale

One of many 'destroyed' mullock heave pattern by open-cut mining; Fig. 19

operations and the characteristic of opal resources. Through harsh outback conditions and the ingenuity of human interaction with the surrounding landscape this serious culture of making-do created a place unique to Australia and possibly the world. [29]

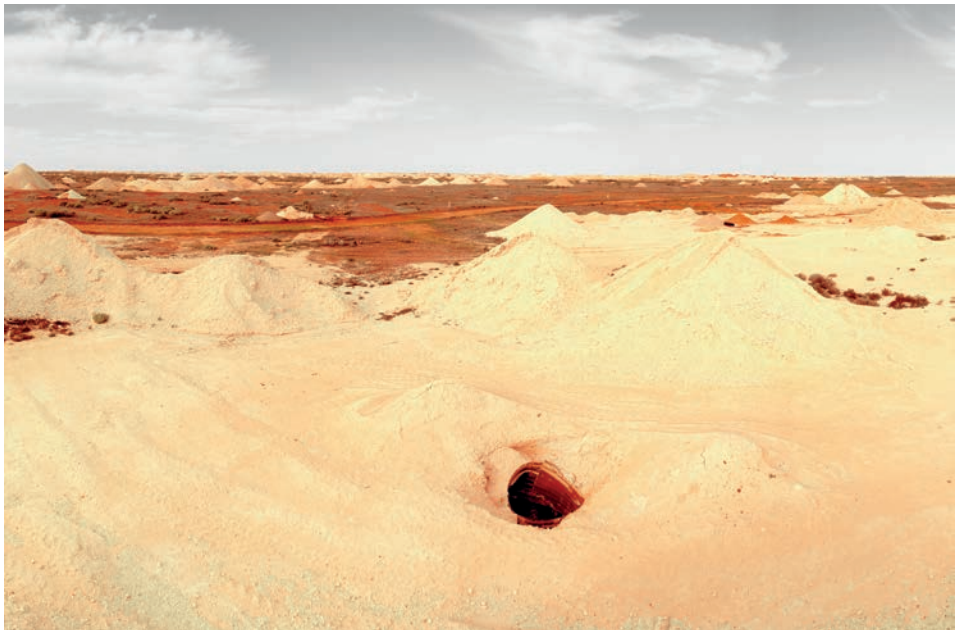
Emblematic to the technical skill and inventiveness of local miners is the particular equipment, hand-built machinery and unique mining methods which respond to the landscape by earthwork and the passing of time. Also this 'lifestyle of hope' and courage created forging narratives and free spirits culturally distinct from other places, enforcing its authenticity and a deep attachment to this place.

As in other parts of South Australia, mining contributed greatly to the state's economic development which reflects this long, rich and fascinating mining heritage. [30] The declining financial support and lack of coordination effort to preserve and promote this heritage adequately will be a great loss in Australia's history. [31]

29: Opal mining heritage; Australian Opal Centre; accessed via http://australianopalcentre.com/opal-mining-heritage on 27 October 2015

30: Australian Council of National Trust and Australian Heritage Commission, Mining Heritage Places Assessment Manual, 2000

31: Johns, Keith R.; Recognition of Mining Heritage in South Australia; Bulletin; September/October 2002



On Coober Pedy's opal fields north of town; Fig. 20

Conclusion and Recommendations

Although the local council is enforcing Coober Pedy as a 'globally unique tourist destination' to 'offer a satisfying outback experience' this can be a danger and more attention should be applied on its significant past. [32]

By preserving heritage, character and identity, this uniqueness can be protected along its national, state and local significance. Although tourism is one of the major economic drivers, the town's local economic tradition is based on opal mining and should be planned effectively. [33]

Not only for the locals, these machines, mineshafts, corner posts, dwellings and earthworks are an intimate part of this cultural landscape. This bestows upon meaning, cultural linkage and is part of the cycle of creativity and rebirth. Through a 'living' heritage the knowledge about the value of materials and skills required to build and transport machinery can be retained. [34]

The best way to do so is to allow further mining with less restrictions a possible, managing the use of heritage tools and machinery without staging it for the sake of tourism and allow further evolvement to reflect the spirit and ingenuity in a living cultural heritage landscape. [35]

This is a sympathetic engagement with the visual, historic, and built character and will enforce recreation of this 'living' cultural landscape and its spacial experience between those countless mullock heaves under a 50°C heat haze. The much-loved tapestry can be changed in thousand ways by human activity day by day, as it has been the last 100 years. All human beings passing through this jaw-dropping desolated desert will be treated with a continuing and unique cultural experience at the world known destination of Coober Pedy.

32: District Council of Coober Pedy Strategic Plan 2013/14 – 2017/18, March 2013

33: Coober Pedy Community Plan, undated; accessed online

34: Opal mining heritage; Australian Opal Centre; accessed via http://australianopalcentre.com/opal-mining-heritage on 27 October 2015

35: Mineral Industry Quarterly, Number 12, December 1978, ISSN 0313-6086, south Australian Department of Mines and Energy

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VERBAL AND E-MAIL REPORTS

Course Coordinator, Urban and Landscape Heritage 2015, Gini Lee

Course Lecturer, Urban and Landscape Heritage 2015, Jane Lennon

Course Lecturer, Urban and Landscape Heritage 2015, Ron Jones

Coober Pedy Historical Society Inc., Jennifer Davison

Coober Pedy Visitor Information Centre, Duncan McLaren

Coober Pedy Regional Times, M. Mackay

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- Peter Lane, Program Leader, Opal Fields, Coober Pedy
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- Brian Morris, Principal Geologist, South Australia
- Peter Waring, Senior GIS/Information Officer, SAw

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Illustrations