

HERITAGE IMPACT ASSESSMENT PROPOSED REHABILITATION OF THE N7 BETWEEN OKIEP (KM 7.0) AND STEINKOPF (KM 47.2), NORTHERN CAPE

(In terms of Section 38(8) of the NHRA of 1999)

Prepared for

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EXECUTIVE SUMMARY

ACO Associates were appointed by SRK Consulting on behalf of the South African National Roads Agency Limited (SANRAL) to undertake a Heritage Impact Assessment (HIA) as part of the Environmental Impact Assessment (EIA) process. SANRAL proposes to rehabilitate the 40.2 km section of the N7 between Okiep (KM 7.0) and Steinkopf (KM 47.2), to the north of Springbok in the Northern Cape.

This assessment is conducted under Section 38 (8) of the National Heritage Resources Act (Act 25 of 1999). The proposal was submitted to the South African Heritage Resources Agency and they issued a response on the 21 February 2014 (Ref: 9/2/066/0001) asking for a Heritage Impact Assessment.

The Namaqualand Copper Mining Landscape, which incorporates the towns of Okiep, Concordia, Nababeep, Port Nolloth, Carolusberg and Springbok, is on the UNESCO Tentative List for a World Heritage Site (<http://whc.unesco.org/en/tentativelists/5460/>). There is unfortunately considerable uncertainty on the status of this listing (which dates to 2009) and formal proclamation has not occurred. There are no maps to show which specific areas are included in the listing. The historic narrow gauge railway line between Okiep and Port Nolloth, which was used to transport the copper to Port Nolloth, is clearly part of the listing as it is included in the site description. In the absence of formal grading, this report provisionally assigns a Grade II to the railway line.

Fieldwork was conducted on the 24 March 2014 by Lita Webley of ACO Associates cc.

- Limitations to photography resulted from unseasonably heavy rain during the survey, on the 24 March;
- We were not provided with plans indicating the positions and configuration of passing lanes at the time of the survey and so had to speculate where these would be based on local topography;
- The positions of construction camps or laydown areas were also not available at the time of the survey.

A total of five borrow pits were assessed in the field and an additional two borrow pits (as an alternative to Borrow Pit 3) were assessed at a desktop level. The field survey considered all the heritage resources in the road reserve between Okiep and Steinkopf.

The following heritage resources were identified:

- A scatter of ostrich eggshell and a stone cairn in Borrow Pit 2. The ostrich eggshell fragments are possibly not archaeological as there is no associated archaeological material. The stone cairn may indicate a possible grave but this seems unlikely in this specific context;
- The N7 crosses the route of the historic narrow gauge railway line on at least seven (7) occasions. However, there are only two sections (ACO2014LW/008; ACO2014LW/014-15) where intact portions of the raised railway embankment have been preserved within the road reserve;
- A white-washed stone cairn (ACO2014LW/001) was identified inside the road reserve. Its size and shape suggests it is more likely to be a marker/boundary stone than a grave;
- At least two road accident memorials (ACO2014LW/005; ACO2014LW/013) were identified inside the road reserve but these are not protected in terms of the NHRA.

A number of heritage resources (including stone structures) were identified immediately outside the road reserve and as no activity is proposed outside the reserve, these will not be impacted.

- However, a single stone base of a water tank (ACO2014LW/016) is located only a few metres outside the road reserve and directly opposite a well preserved section of the railway line which is inside the road reserve (ACO2014LW/014-15).

Borrow Pits 6 and 7 were assessed at a desktop level after the fieldwork was completed. The literature suggests heritage resources dating to the Boer War may occur in the vicinity of Borrow Pit 6.

Impacts to Heritage Resources:

- The likelihood of negative impact occurring on potential heritage resources in Borrow Pits 1-5 is very low. There is a small possibility that below-ground archaeological remains (most importantly archaeological human remains) may be uncovered during the gravel mining;
- While Borrow Pits 6 and 7 were not subject to a field assessment, an examination of aerial maps suggests that the likelihood of impacts to heritage resources is low;
- The likelihood of impacts to pre-colonial archaeological remains inside the road reserve is low;

- The construction of a passing lane at ACO2014LW/008 would probably result in the destruction of the raised earthen embankment of the historic narrow gauge rail track on either/both the west and east side of the N7;
- The construction of a passing lane at ACO2014LW/014-15 would probably result in the destruction of the raised earthen embankment of the historic narrow gauge rail track on the east side of the N7. In addition, any road-widening in this location could impact on the stone base of a water tower (ACO2014LW/016) which is located on the opposite side of the N7, immediately outside the road reserve;
- The construction of a passing lane at ACO2014LW/001 may result in the destruction of the white-washed stone cairn/beacon (use unknown);
- One of the two road accident memorials may be destroyed during construction of the 1m wide surfaced shoulder. These however enjoy no particular protections from the NHRA of 1999.

No Living Heritage resources (kraals, campsites etc.) were identified in proximity to locations for Borrow Pits 1 – 5. However, since the assessment of Borrow Pits 6 and 7 were made at a desktop level, it is not possible to be absolutely confident about impacts to living heritage with respect to them, although the likelihood is considered to be low.

Mitigation Recommendations

The likelihood of impacts to heritage resources in the proposed Borrow Pits is considered to be low and therefore it is recommended that:

- If Borrow Pit 6 and Borrow Pit 7 are considered as alternatives to Borrow Pit 3; then preference is expressed for Borrow Pit 7. This is because Borrow Pit 6 is located in an area which is known to have experienced more intensive Boer War activity during the siege of Okiep and historic material may be present. If Borrow Pit 6 is selected, then the ECO must be alerted to the possibility of disturbing historical material including stone structures and/or burials;
- If any pre-colonial or historical archaeological material (including stone structures) are uncovered during earth-moving operations, then work should stop in that area and the Environmental Control Officer (ECO) should contact SAHRA (Tel: 021 462 4502);
- If any graves or human remains are uncovered during construction, then work should stop in that area and the ECO should contact SAHRA (Tel: 021 462 4502).

With regard mitigation measures for heritage sites inside the road reserve:

- It may be necessary for short sections of the raised rail embankment inside the road reserve at ACO2014LW/008 to be demolished during the construction of Climbing Lane 4 (CL4). It is concluded that this can be justified because a significant loop of the line has been retained to the west of the N7 at this point. Technically, a permit from SAHRA will not be required as the demolition will be in terms of Section 38(10) of NHRA. However, SAHRA may request that a permit for demolition is applied for;
- It is recommended that the section of the raised embankment of the rail line inside the road reserve (ACO2014LW/014-15) should be conserved. Its significance is enhanced by its close proximity to the stone base of a water tank of historic significance. While no climbing lanes are proposed for this section of the N7, due care should be taken during the construction of the road shoulder and this area should not be used for a construction/laydown camp;
- If the white-washed cairn must be demolished to make way for the rehabilitation of the road, then care should be taken as there is a very small possibility that it may be a grave marker;
- Since road accident memorials are not protected by the NHRA, they may be removed if necessary during road rehabilitation. However, it is suggested that an empathetic solution to development in the road reserve would be to attach the crosses and flowers to the fence of the road reserve.

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GLOSSARY

Archaeology: *Remains resulting from human activity which is in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*

Cairn: *An artificially constructed heap of undressed stone which may be used as a marker (e.g. in surveys) or as a capping for a grave.*

Early Stone Age: *The archaeology of the Stone Age between 700 000 and 2500 000 years ago.*

Fossil: *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

Heritage: *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.*

Holocene: *The most recent geological time period which commenced 10 000 years ago.*

Late Stone Age: *The archaeology of the last 20 000 years associated with fully modern people.*

Middle Stone Age: *The archaeology of the Stone Age between 20-300 000 years ago associated with early modern humans.*

National Estate: *The collective heritage assets of the Nation.*

Palaeontology: *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

Pleistocene: *A geological time period (of 3 million – 20 000 years ago).*

SAHRA: *South African Heritage Resources Agency – the compliance authority which protects national heritage.*

Structure (historic) *Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.*

Acronyms

DEA	Department of Environmental Affairs
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency

1. INTRODUCTION

ACO Associates were appointed by SRK Consulting on behalf of the South African National Roads Agency Limited (SANRAL) to undertake a Heritage Impact Assessment (HIA) as part of the Environmental Impact Assessment (EIA) process. SANRAL proposes to rehabilitate the 40.2 km section of the N7 between Okiep (KM 7.0) and Steinkopf (KM 47.2), to the north of Springbok in the Northern Cape.

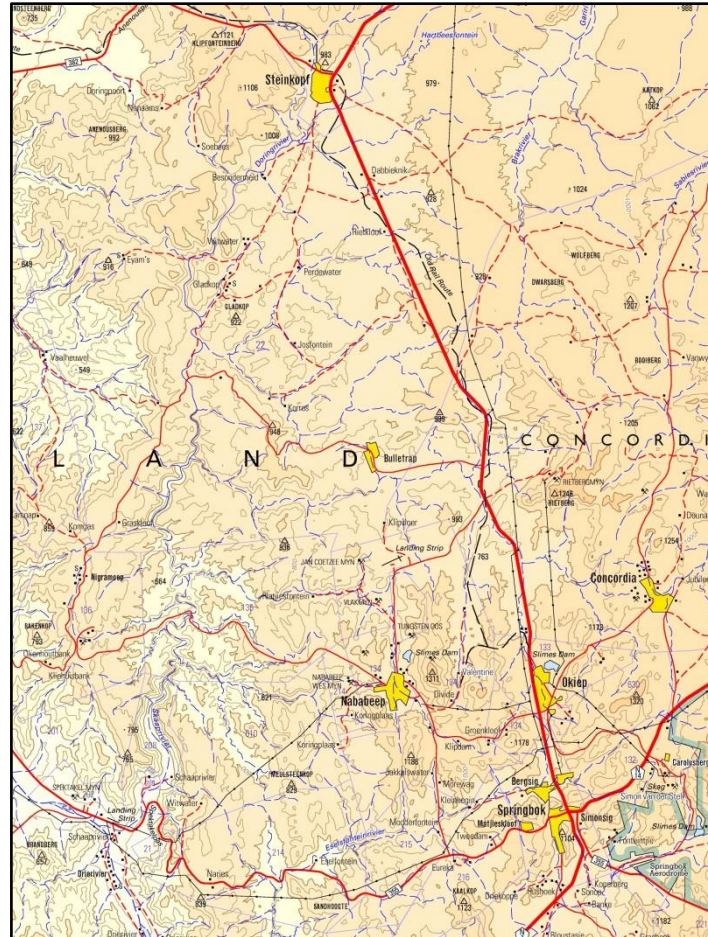


Figure 1: The 1:250 000 map of Springbok (2916) showing the N7 between Okiep and Steinkopf.

2. PROJECT DESCRIPTION

The section of road of the N7 that will be rehabilitated is located within the Nama Khoi Local Municipality and the Namakwa District Municipality between the towns of Okiep and Steinkopf. This portion of the N7 is a two lane single carriageway varying in width between 6.2 m and 7.1 m due to a deteriorating road edge.

The proposed rehabilitation of the N7 will involve:

- Limited widening of the existing two lane single carriageway to approximately 10.4 m to accommodate 3.7 m wide lane widths and 1 m wide surfaced shoulders;
- Construction of ten sections of climbing lane;
- Upgrading of two intersections of the N7 to provide turning lanes;
- Lengthening of up to 21 major culverts to accommodate the widened road prism; and
- Lengthening of numerous minor portal and pipe culverts to accommodate the widened road prism.

All road construction will be within the existing road reserve and expropriation will not be required.

Six borrow pits (or extensions to existing borrow pits) of less than 5 ha each at locations outside the road reserve, will be utilised for the procurement of fill and selected subgrade material for road construction. The borrow pits are located on municipal owned land.

3. HERITAGE LEGISLATION

This assessment is conducted under Section 38 (8) of the National Heritage Resources Act (NHRA) No. 25 of 1999.

The NHRA protects a variety of heritage resources including palaeontological, prehistoric and historical material (including ruins) more than 100 years old (section 35), human remains older than 60 years and located outside of a formal cemetery administered by a local authority (section 36) and non-ruined structures older than 60 years (section 34). Landscapes with cultural significance are also protected under the definition of the National Estate (section 3 (3.2d)). Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

The South African heritage resources management system is based on grading, which provides for assigning the appropriate level of management responsibility to a heritage resource.

Table 1: Grading of Heritage Resources

Grade	Level of significance	Description
I	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
II	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
IIIa	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3a heritage resources.
IIIb	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3b heritage resources.
IIIc	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3c heritage resources.

With respect to the grading of the area between Okiep and Steinkopf, it is important to take into consideration that the Namaqualand Copper Mining Landscape was placed on the UNESCO Tentative World Heritage Listing in 2009. The description of the listing is provided below. However, the status of this tentative listing at present is unknown and formal proclamation of the Namaqualand Copper Mining Landscape (NCML) has not taken place. If the NCML was a declared World Heritage site, then it would have Grade I significance. In the absence of formal proclamation, it is suggested that the NCML tentatively enjoys a Grade II significance.

3.1 UNESCO Tentative World Heritage Listing

The Namaqualand Copper Mining Landscape is on the UNESCO Tentative List (<http://whc.unesco.org/en/tentativelists/5460/>). The property names which are included under the tentative listing include:

- Okiep¹

¹ The historical 1902 spelling of O'Okiep and/or O'Kiep has now been replaced with Okiep.

- Concordia
- Nababeep
- Port Nolloth
- Carolusberg
- Springbok

The description for the listing is available on the webpage and is not repeated in detail here. However, it is important to note the following:

“The Namaqualand copper mines and their associated infrastructure and cultural landscape reflect the beginnings of the mining industry in South Africa in all the myriad ways in which that industry influenced and continues to influence society through the movement and housing of people, the development of transport and other infrastructure and industries and in the development of technological and scientific endeavour. It also reflects the very close links between the development of the Southern African mining industry and mining technology pioneered in Britain, particularly in the counties of Cornwall and Devon, and the landscapes and social structures that went with them”.

Land Ownership: This will be a serial nomination consisting of several sites the ownership of which is not yet certain, although it appears that much of it is on the communal lands of the Concordia and Steinkopf communities, or in the hands of the remnant copper mining company, or other private individuals”.

Justification of Outstanding Universal Value

The Namaqualand Copper Mining Landscape is the place of origin of the modern Southern African mining industry as well as the beginnings of an industrial society in Southern Africa. This development was possible due to close connections established at an early stage with copper mining interests in Cornwall and West Devon and the resultant transfer of skills and technology from there and the migration of Cornishmen to Namaqualand.

Criterion (ii): The development of industrialised mining in Namaqualand from the mid-19th Century, based on the technology and other systems used in Cornwall and West Devon, represents the first evidence of the evolution of an industrialised society in Southern Africa manifest in the transformation of the landscape through the creation of company towns and villages, a railway² and a port facility which laid the basis for the subsequent development of the Southern African mining complex through the use of the Cornish and West Devon model as its foundation.

Criterion (iii): The extent and scope of the remains of copper mining, and the associated development of urban areas in and its impact on the rural landscape of Namaqualand, presents a vivid and legible testimony to the success of the Namaqualand copper mines as a major successor to the mines of Cornwall and West Devon as a world leader in the production of copper.

Criterion (iv): The copper mining landscape of Namaqualand as a technological ensemble in a landscape, reflects the substantial contribution the area made to the establishment of a foundation for the industrial revolution in Southern Africa as part of the transfer of Cornish and West Devon mining practices around the world.

4. TERMS OF REFERENCE

The following generic terms of reference apply:

- Describe the existing baseline characteristics of the study area and place this in a regional context;
- Identify and assess potential impacts resulting from the project (including impacts associated with the construction and operation phases);

² Underscoring added for emphasis.

- Identify and describe potential cumulative impacts resulting from the proposed development in relation to the proposed and existing developments in the surrounding areas;
- Recommend mitigation measures to minimise impacts and/or to optimise benefits associated with the proposed project; and
- Recommend and draft a monitoring campaign, if applicable.

5. METHOD

5.1 Literature Survey

A survey of available literature was carried out to assess the general heritage context of the area. This literature included published material, unpublished Cultural Resource Management (CRM) reports, including those available on the South African Heritage Resources Information System (SAHRIS). There is a blogspot on the Steam Locomotives of South Africa which contains detailed information on the construction of the railway line between Okiep and Port Nolloth. The British Military Maps of 1907 provide accurate drawings of the route and locations of important stations and stops along the railway line.

5.2 Field Survey

The position of the Borrow Pits 1-5 was provided to ACO Associates in advance and these were loaded onto hand held GPS receivers. We also loaded the route of the railway line onto our GPS receivers in order to determine whether any remnant sections of the historic narrow gauge line remained inside the road reserve. The road from Okiep to Steinkopf was assessed by Dr Lita Webley and Mr Norman Schneider on the 24 March 2014. Our tracks are displayed in a series of figures associated with each heritage resource.

5.3 Limitations

The following limitations apply:

- The location of the ten climbing lanes was provided after completion of the field survey and was therefore assessed at a desktop level. This is not considered a major limitation as we were assured that all rehabilitation would take place within the road reserve;
- Similarly, the positions of the two intersections and the 21 culverts were not provided prior to the survey;
- No positions of construction camps or laydown areas were provided;
- Two additional borrow pits (Borrow Pits 6 and 7) were provided after the completion of the field survey as alternatives to BP3 and they were assessed at a desktop level;
- On the day of the field survey (24 March), the Northern Cape experienced unseasonably heavy rain and thick mist. While this did not prevent the survey, it did impact on the quality of the photographs taken;
- The road between Okiep and Steinkopf is 42 km in length and it was impossible to examine the road reserve in great detail. Spot checks were undertaken along the route, including all rocky koppies, river crossings and places where the N7 crossed the old narrow gauge railway line.

6. DESCRIPTION OF AFFECTED ENVIRONMENT

The landscape between Okiep and Steinkopf is relatively flat and arid. The most significant obstacle is that of the low ridge of hills some 18 km to the north of the town of Okiep and just beyond the local road to Bulletrap. This cutting is known as Ratelpoort and was an important obstacle to road and rail traffic in the past. We know that there was a blockhouse at Ratelpoort and the 1907 British Military Map shows that there was also a station and a water reservoir. These heritage resources are presumably located outside of the road reserve as they were not observed during the survey. The vegetation is limited to low scrub and “kokerbome” on the higher koppies.

6.1 Pre-colonial Archaeological Background

The archaeology of Namaqualand has been the focus of at least three PhD theses (Webley 1992; Dewar 2007 and Orton 2012). Most of the research however, has been conducted along the Namaqualand coast (Jerardino et al. 2013) with little work in the interior. No significant archaeological research programmes have been conducted in the area between Steinkopf and Okiep. A few CRM reports are on the SAHRIS database. Gaigher (2012) undertook an HIA for the O’Kiep 3 Photovoltaic Solar Facility immediately to the northeast of Okiep but his background discussion is of limited value and he failed to identify any archaeological remains. Kaplan (2010) undertook an archaeological assessment for a wind energy facility which extends from Springbok to Okiep and reported finding three Stone Age flakes. He also noted some faded rock art on a large boulder on the edge of one of the proposed construction camps. Smith (2013) undertook a survey to the southeast of Okiep and reported finding quartz chips, flakes and cores but these were not diagnostic and could not be assigned to a specific period. He did not regard them of high significance. A survey much further south, in the Namaqua National Park near Kamieskroon (Morris & Webley 2004) suggested that the full range of archaeological material, spanning the Early Stone Age, the Middle Stone Age and the Later Stone Age may be expected in Namaqualand but densities of archaeological material are not high and finding a significant archaeological site is quite unusual.

The only other relevant study to the present assessment is that of three proposed borrow pits on the DR2959 to Bulletrap undertaken by Kaplan in 2008. He recorded Middle Stone Age (MSA) flakes, quartz flakes and chunks and a lower elliptical grindstone in quartzite along this road.

Historic accounts refer to the Little Namaqua Khoekhoen, a pastoralist group who were spread out across the Namaqualand landscape in the 19th century but who seem to have concentrated in the Kamiesberg and along the Orange River. The identification of significant pastoralist sites around Okiep and Steinkopf would present the potential to contribute to our understanding of the origins and spread of the Khoekhoen into southern Africa.

6.2 Copper Mining History and Archaeology

The rise in the price of copper in the 1850s and the discovery of extensive quantities at Okiep, Concordia and Nababeep in Namaqualand in 1853 resulted in a select railway committee proposing in 1854 that a railway line be constructed to transport the material to the coast. Initially copper was transported by waggon to Hondeklip Bay. The roads were in poor condition and in 1854 the Surveyor General Charles Bell, recommended the construction of a railway from Port Nolloth. In 1862 the Cape of Good Hope Copper Mining Company appointed Richard Thomas Hill in charge of construction and the first rail was laid in 1869. The line was to be a tramway for animal-drawn traffic and was constructed on the 30-inch gauge with light rails to as to allow free passage to animals walking on the line (Plate 1). In order to reduce the cost of the earthworks, the line followed the ground level wherever this was possible, so that the line undulated. The train consisted of trucks in pairs pulled by four mules in tandem.

The tramway was a big success and in 1871 the first light locomotive engine (the “John King”) was tried. One of the major drawbacks of steam locomotives was the shortage of water. The light rail construction however, did not favour the use of steam and for many years the line remained a tramway. In 1871 the line was extended to Kookfontein (near the Steinkopf Mission) and the last section of the line, 52 kilometres to Okiep, was opened in 1876. From 1876 the entire line was operated by animal drawn traffic. In 1878, the light rails were replaced with 14.5 kg steel rails laid on cross sleepers in order to replace the animal drawn tram with a steam service. However, the mountain section remained mule-operated until the arrival of a specially built mountain engine in 1890. Steam traction was finally extended to Okiep in 1893.

Although the Namaqualand railway carried no paying passengers, it still made provision for people to travel on it. The line was still privately owned by the Cape of Good Hope Copper Mining Company until 1909. The line survived until 1945 when its new owners sold most of the line as scrap, since by that time the copper was transported by road to Bitterfontein from where it was transported by rail.

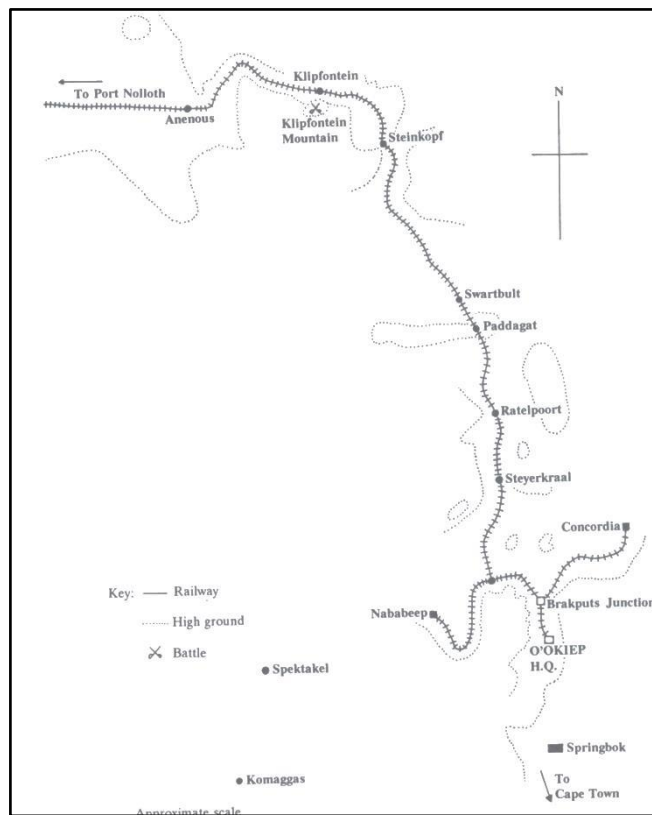


Figure 2: The route of the railway line between Okiep and Steinkopf at the time of the Boer War, showing the most important stops along the route. Note the Brakputs junction and Ratelpoort. Map from Burke (1995).



Plate 1: The Company's special mule-operated service

Although the railway tracks and sleepers have been removed, the position of the line is still indicated by a raised earthen packed ridge. The rail route is also clearly indicated on 1:50 000 maps of the area. Railway tracks are generally laid on a bed of stone ballast or a track bed which in turn is supported by prepared earthworks known as the track formation. There is no indication that the narrow gauge railway track had any ballast and none were observed during the survey.

Interestingly, Smith (2013) noted in his report for the proposed solar farm on the farm Klipdam to the south of Okiep that he was informed by the caretaker of the property "that there had existed a narrow gauge railway line in the northwest corner of the farm. The sleepers from the tracks have been collected, and are stacked on the stoep of the clubhouse".

6.3 Boer War History and Archaeology

In 1901 Colonel Shelton was made Commandant of Namaqualand. He was instructed to protect the important Copper Mining Towns of Okiep, Concordia and Nababeep from Boer incursions under General Smuts (Burke 1995). He based his headquarters in Okiep and he fortified the town with thirteen blockhouses (Figure 3). The North blockhouse was located closest to the railway line, on the northern approach to Steinkopf. As Smuts closed in on Shelton's forces at Okiep, he cut the telegraphic communications lines, so that Shelton's only means of communicating with the outside world was the railway line to Port Nolloth. Shelton began preparing the town for a siege by Boer forces. One of his greatest fears was that the Boers would cut the railway lines as the trains provided Okiep with its water. In addition, the copper companies were reported to store the dynamite which they used in mining work in magazines along the tracks. This could not be allowed to fall into Boer hands.

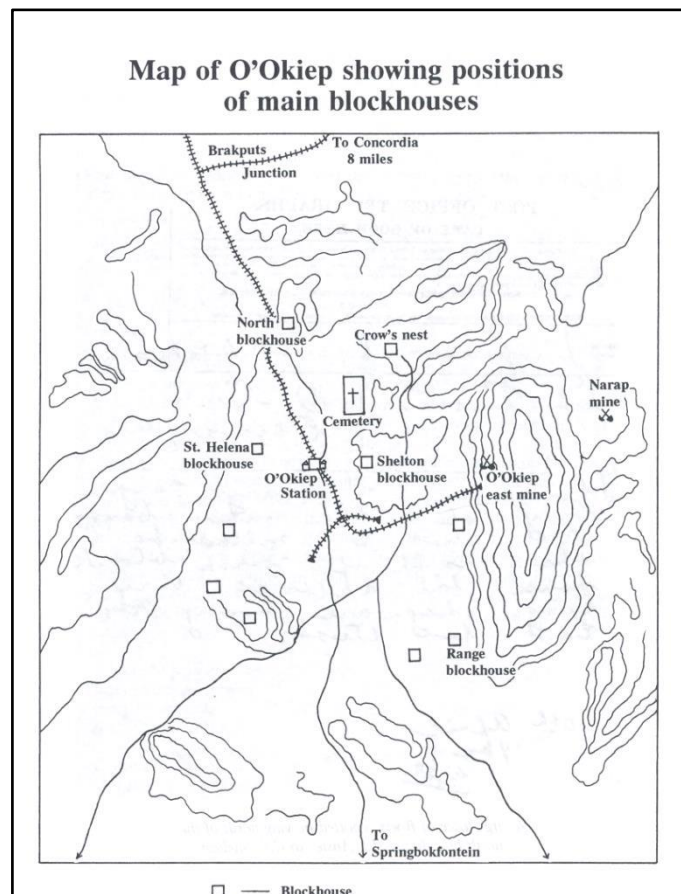


Figure 3: Map of blockhouses around Okiep (Burke 1995), a number to the west of Okiep. Unfortunately, the map is not to scale and does not allow identification of the position of the blockhouses.

General Smuts moved on Springbok on 1 April 1902, Concordia surrendered next and Okiep came under siege on the 4 April. The Boers started destroying sections of the railway line, the last train arriving in Okiep on the 4 April. Ratelport Blockhouse, to the north of the town and along the railway line, also came under Boer attack (Figure 2).

While Okiep remained in a state of siege, British reinforcements had arrived by sea at Port Nolloth on the 12 April. They proceeded slowly up the railway line to Okiep, re-taking the blockhouses along the route. On 26 April Smuts had to leave his men to attend the peace talks at Vereeniging. General Maritz was now in charge of the Boer forces. Maritz conceived of a plan to take Okiep. He planned to load a truck with dynamite and attach it to a Pioneer Engine and run it into town along the railway line, where it would explode. However, when the train loaded with 70 cases of dynamite, reached the

Braakputs junction (Figure 3), it ran off the rails and the dynamite failed to explode. The relief of Okiep occurred on the 4 May 1902. Throughout this period, the railway line played a key role.

6.4 Graves

Kaplan (2010) reported a number of graves after a survey to the northeast of Okiep, while Smith (2013) reported a graveyard as well as some scattered graves outside of a formal graveyard on the farm Klipdam 134 to the southeast of Okiep.

6.5 Living Heritage

The N7 passes through the Steinkopf Communal/Rural Area between Okiep and Steinkopf. The Namaqualand reserves originated as mission stations in the 19th century and were given formal recognition in the form of “tickets of occupation” by the Cape Colony towards the middle of the century. The inhabitants of the reserve are the descendants of the Namaqua Khoekhoen who, prior to the 19th century, occupied most of Namaqualand. Although the majority of the inhabitants are now settled in the village of Steinkopf, a number of small stock farmers practise a seasonal movement (Webley 1987). Traditionally they would have lived in small stockposts comprising a matjies house and associated cooking shelter and kraal. Today, the informal settlements consist of hessian sacking and corrugated iron sheets but the spatial layout of the settlement has remained unchanged. The stockposts which occur in the Steinkopf Reserve are a remnant of a much older land use pattern. This same lifestyle, further north in the Richtersveld, has been included in the Richtersveld World Heritage Site. Kaplan (2010) and Gaigher (2012) reported some “Living Heritage” resources during assessments for solar farms to the northeast of Okiep although Gaigher’s identification is incorrect.

7. FINDINGS

The borrow pits are considered separately from the road reserve below.

7.1 Borrow Pit 1 (S29.420340, E17.815912)

The area to the north of the borrow pit was examined as there are a number of prominent granite boulders (Plate 3) which could have attracted prehistoric settlement. However, there is no evidence for any archaeological material in the proposed extensions to the existing borrow pit.



Figure 4: Position of the proposed borrow pit in red with the field survey tracks in blue.



Plate 2: View of existing borrow pit. **Plate 3:** View of the landscape surrounding the existing borrow pit.

7.2 Borrow Pit 2 (S29.310763, E17.762041)

This is an extension of an existing borrow pit which is located 20 m to the west of the N7. There are two small rocky koppies in the southern area of the proposed extension. They were closely examined for any signs of archaeological material, as koppies often formed a focus for prehistoric settlement.



Figure 5: Position of the borrow pit with outline in red and field survey tracks in blue. Note the two koppies in the south.



Plate 4: View from the first koppie looking north across the existing borrow pit. **Plate 5:** View of second koppie.

The first koppie (Plate 4) contains a small scatter of broken ostrich eggshell pieces. None of the fragments have any sign of a flask mouth and the fragments do not appear to be archaeological.

There are no associated stone artefacts. The second koppie is in close proximity to the N7 and a small layby on the side of the road (Plate 5). It is clear that motorists have climbed over the fence and visited the koppie as it is covered in modern refuse, including empty bottles and pieces of clothing. There is no evidence of any archaeology around it.

On the plains, away from koppies, is a small cairn (see Glossary) approximately 1.5 m long and 0.8 m wide (Plate 6). It is possible that it could represent a grave although this seems unlikely in view of the absence of any other evidence for human settlement. The cairn could also represent a prospecting hole which has been covered with rock. This is quite common in Namaqualand.



Plate 6: View of a small cairn in the proposed borrow pit area.

7.3 Borrow Pit 3 (S29.287901, E17.753287)

Borrow pit 3 was considered during the survey of the 24 March but the site was subsequently omitted and Borrow Pit 6 and/or 7 have been proposed in its place. Reference to this site is included in this report for the sake of completeness.



Figure 6: The position of the borrow pit on the lower slopes of a small koppie to the east of the N7.

A single small quartzite flake was recovered from the soil surface. There is no indication of any concentrations of stone artefacts. There is no archaeological reason why this site cannot be used.

7.4 Borrow Pit 4 (S29.277065, E17.737513)

This will be an extension of an existing borrow pit located to the south of Steinkopf and to the west of the N7. The borrow pit is at least 600 m from the road and will not be visible to passing traffic. It is situated on the communal lands outside of the town, in an area which has been traditionally used for

grazing by small stock farmers. The area was therefore carefully examined for any evidence of traditional land use, including stockposts and graves. The existing borrow pit is partially filled with rubble (Plate 7), probably deposited by residents from Steinkopf.



Figure 7: Borrow Pit 4 with outline of proposed extension in red and field tracks in blue.



Plate 7: View of existing borrow pit 4. **Plate 8:** View of landscape around borrow pit 4.

No archaeological material was identified and there is no evidence that the area around the existing borrow pit is being used by livestock herders.

7.5 Borrow Pit 5 (S29.255745, E17.744910)

This will be an extension to an existing borrow pit located to the east of the town of Steinkopf and also immediately east of the intersection of the N7 with the road to Port Nolloth. The borrow pit is situated 200 m from the road and will be visible, although the general area around Steinkopf is already degraded with a number of commercial developments.



Figure 8: The borders of the extended borrow pit are shown in red and the tracks of the field survey in blue.

The borrow pit is already partially filled with residential refuse. There is some evidence of recent scraping of the ground surface, possibly to assess the soils for a gravel mine. The landscape is covered in ankle high scrub and is largely degraded. There is a flat large granite boulder (Plate 10) in the proposed extension which was examined for any evidence of grinding grooves which are common in Namaqualand. There is an abandoned modern house immediately outside the borders of the borrow pit. Its roof, windows and doors have been removed and it is not threatened by the mining.



Plate 9: View of the existing borrow pit looking Eastward. **Plate 10:** View of the extension looking west to Steinkopf.

No archaeological remains were identified and there is no evidence of any grinding grooves in the granite bedrock.

7.6 Borrow Pit 6 (S29.581058, E17.863237)

Borrow Pit 6 was proposed as an alternative to Borrow Pit 3, some two weeks after completion of the field survey and our assessment is therefore at a desktop level. The proposed borrow pit is located some 500 m to the west of Okiep. Burke's (1995) map of the blockhouses around Okiep (Figure 3) is unfortunately not to scale and cannot be used to ascertain if any Boer War remains will be impacted by the proposed borrow pit. It is likely that the blockhouses will be located on high lying koppies with a good view of the town, and therefore it seems unlikely that any may be damaged by the new borrow pit.



Figure 9: The location of Borrow Pit 6 to the west of Okiep.

7.7 Borrow Pit 7 (S29.469997, E17.828755)

Borrow Pit 7 was proposed as an alternative to Borrow Pit 3, some two weeks after completion of the field survey. This assessment is therefore a desktop assessment.



Figure 10: The location of proposed Borrow Pit 7 on the road to Bulletrap.

The proposed borrow pit is located some 800 m to the west of the N7 on the road to Bulletrap. It is in close proximity to three (3) borrow pits assessed by Kaplan (2008). He reported on MSA flakes, quartzite flakes and a lower grindstone – all of which he rated as having low significance. He also noted a well-constructed stone kraal which he concluded to be of low significance. The kraal is probably related to stockpost settlement in the vicinity of Bulletrap and is therefore of Living Heritage significance. It is unlikely that the proposed location of Borrow Pit 7 will impact on any heritage resources although Living Heritage resources are often of an intangible nature and difficult to identify.

7.8 Heritage Resources inside the Road Reserve

No pre-colonial archaeological material was identified in the road reserve although a detailed foot survey was clearly not possible. While it is possible that pre-colonial archaeological material may

occur, it is considered unlikely that any *in situ* remains will be found due to the levelling of the soil in the road reserve during road construction.

The historic narrow gauge railway line can still be traced on aerial photographs (Figure 11) and is clearly indicated on the 1:250 000 and 1:50 000 maps of the area. According to aerial photographs there are at least seven (7) points where the N7 crosses the railway line between Steinkopf and Okiep (Figure 11). The actual railway tracks and sleepers were removed more than 70 years ago, but the route is still indicated by raised earthen ridges. Large sections of the line were obliterated by the construction of the N7 and more recently, large sections have been destroyed by the excavations of trenches to bury the water pipeline between Okiep and Steinkopf. Remnant sections of the line still remain.

However, very few intact sections have been preserved within the road reserve. There are at least two sections of the railway track which are clearly visible within the road reserve. These are at ACO2014LW/008 and at ACO2014LW/014-15 (Figure 11).



Figure 11: The N7 closely follows the route of the narrow gauge railway line, crossing it on a number of occasions.

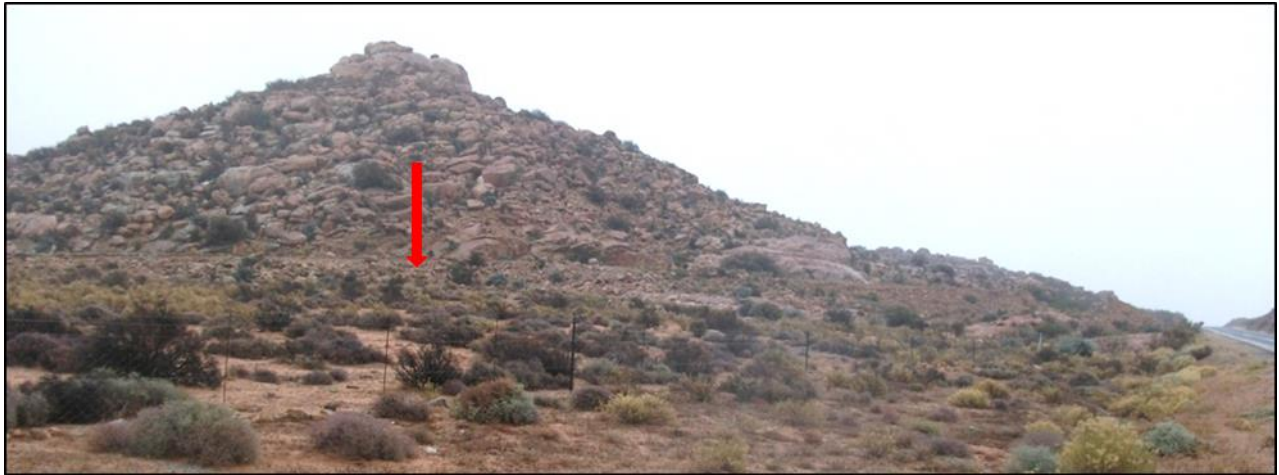


Plate 11: View of the remains of the railway line, running below the koppie (red arrow), and then crossing the N7 at Vrieskloofhoogte.

The route of the railway line (Plate 11) can clearly be seen as it winds around the hill. It then crosses the N7 at GPS16 or ACO2014LW/008. This section on the track is at risk as it is located in a narrow valley between two hills and on a slight rise. This section of the road through the kloof falls in Climbing Lane 4 (CL4). This may require the raised rail embankment (Plate 12) to be removed inside the road reserve. However, Plate 11 shows that a considerable section of the tracks remains outside the road reserve (see red arrow).



Figure 12: The railway line indicated in green and the N7 in blue. **Plate 12:** The raised earthen embankment of the rail line.

Both the N7 and the railway line pass through the narrow neck of Ratelpoort and here both the road and the excavations for the underground water pipeline have impacted significantly on the remnants of the track, but these are all outside the road reserve.

The only other sensitive location is at GPS25-26 or ACO2014LW/014-15 in Figure 13. Here the raised railway line runs inside the road reserve for a distance of about 40 m and is clearly visible (Plate 13) from the N7. This particular location is interesting as it is directly opposite a stone base for a water tank at GPS 27 or (ACO2014LW/016) further described below. The combination of the railway track and the water tank in this locality makes it significant in terms of the concentration of heritage resources.



Figure 13: The position of a short section of the railway track between 25 and 26. **Plate 13:** shows the section of track inside the road reserve, running parallel to the N7. Note the fence on the left.

The N7 again crosses the railway track just to the north of Okiep, but no evidence for it could be found inside the road reserve. The expansion of Okiep suggests that it is unlikely that any intact portions of the track may still be found within the perimeter of the current town.



Plate 14: A whitewashed stone cairn in the road reserve at GPS 5.

There is a single white-washed stone cairn in the road reserve next to a bridge. It is unclear whether this has any heritage significance. It does not appear to resemble a cairn over a grave and it seems more likely that it is a marker related to the road construction.

7.9 Heritage Resources outside the Road Reserve

A number of stone structures were recorded outside the road reserve. They were recorded (Table 2) and photographed. Both rectangular buildings are approximately 10 m outside of the road reserve and will not be impacted (Plates 15 and 16). They are probably associated with the railway line but since they were outside the road reserve, they were not investigated further.



Plate 15: View of stone structure ACO2014LW/01. **Plate 16:** Stone structure ACO2014LW/012.

Of significance, is the circular stone base of a water tank (for filling steam locomotives) (Plate 17) which is located only about 3 m outside the road reserve (Table 2) and opposite ACO2014LW/014-15.



Plate 17: The base of the water tank immediately outside the road reserve.

The water tank, which is of high significance in terms of the railway line, is very close to the boundary of the road reserve (Plate 17). There is the potential for the structure to be damaged during the widening of the road. It is particularly vulnerable to the activities of construction workers.

The water tank is directly opposite a well preserved section of the raised railway track and this makes this particular location of greater heritage significance.

7.10 Roadside Memorials

A few recent memorials to individuals killed in road accidents were recorded (Table 2). These memorials have no specific heritage protection.



Plate 18: Roadside accident memorial in the road reserve.

8. ASSESSMENT OF IMPACTS

The impact assessment methodology is attached as Appendix 1. Portions of the landscape between Steinkopf and Okiep fall into the Namaqualand Copper Mining Landscape (NCML) which is on the UNESCO Tentative Listing for a World Heritage Site (<http://whc.unesco.org/en/tentativelists/5460/>). Specific localities and maps are not included in this tentative listing so it is not possible to see how the area between Okiep and Steinkopf is protected. The railway line, which is included in the NCML, forms part of this listing. Any potential impacts on the NCML would therefore be considered negative impacts of long term duration and high intensity.

8.1 Expansion of Borrow Pits

The expansion of six borrow pits has the potential to impact negatively on pre-colonial and historical archaeological material as well as graves. A single stone cairn and a scatter of fragmented ostrich eggshell were found in Borrow Pit 2. While the cairn could represent a grave, this seems unlikely in view of the absence of any other associated archaeological material in the vicinity. The ostrich eggshell is also not associated with any archaeological material.

The likelihood of negative impact occurring on heritage resources in the borrow pits is very low. Nevertheless, there is a small possibility that below-ground archaeological remains (most importantly archaeological human remains) may be uncovered during the road works, and for this reason the Environmental Control Officer needs to be informed and to be alert to this.

Borrow Pits 6 and 7 have only been assessed on a desktop level and therefore the confidence rating with regard to potential impacts is medium rather than high (Table 3). Borrow Pit 6 is located to the west of Okiep in an area which contained at least three blockhouses dating to the Boer War. It is likely that the blockhouses (if they still exist) will have been built on high-lying koppies and it is unlikely that they will be damaged by gravel mining. It is recommended that Borrow Pit 7 is preferable to Borrow Pit 6 if they are considered alternatives to Borrow Pit 3. If Borrow Pit 6 is selected, then the ECO must be alerted to the possibility of disturbing historical material including stone structures and/or burials.

Table 3: Assessment of Impacts on Borrow Pit Localities

	Extent	Intensity	Duration	Consequences	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Low 1	Long-term 3	Low 5	Improbable	Very Low	Negative	High ³

Essential mitigation measures:

- If any pre-colonial or historical archaeological material (including stone structures) are uncovered during earth-

³ The confidence for Borrow Pits 1-5 is high but medium for Borrow Pits 6-7.

<p>moving operations, then work should stop in that area and the Environmental Control Officer (ECO) should contact SAHRA (Tel: 021 462 4502)</p> <ul style="list-style-type: none"> If any graves or human remains are uncovered during construction, then work should stop in that area and the ECO should contact SAHRA (Tel: 021 462 4502). <p>Best practice mitigation measures:</p> <ul style="list-style-type: none"> Archaeological remains are best left <i>in situ</i>, and conserved for the future. If this is not possible then mitigation in the form of excavation with a permit will be required. 								
With mitigation	Low 1	Low 1	Long-term 3	Low 5	Improbable	Very Low	Negative	High

8.2 Widening of the N7

The widening of the N7 to accommodate extra passing lanes has the potential to impact on heritage resources inside the road reserve. These include pre-colonial and historical archaeological material as well as graves. No pre-colonial archaeological remains were identified inside the road reserve and it is improbable that negative impacts will occur.

A single white-washed stone cairn was identified in the road reserve but it is difficult to assign significance. The cairn may indicate a grave, but in view of the size of the cairn it is more likely that it represents a road marker. While it is preferable that the cairn is avoided, it may be necessary to destroy it during the road rehabilitation.

Of particular significance is the narrow gauge railway line which is part of the listing of the Namaqualand Copper Mining Landscape on the UNESCO World Heritage listing. As previously mentioned, this tentative World Heritage listing dates to 2009 and formal proclamation has not occurred. The significance of the listing is therefore not clear. World Heritage sites are of international significance and protection usually includes a detailed management plan. In the absence of any formal protection, the railway track and associated infrastructure is treated as a potential Grade 2 site (of Provincial significance) in this report. Negative impacts to a potential Grade 2 site would therefore be considered to be of regional extent.

The N7 crosses the railway line (which consists of a raised ridge of packed earth and clay) on at least seven occasions between Okiep and Steinkopf. There are only two sections where there are clearly visible sections of the railway track inside the road reserve and where negative impact may occur.

One section is on a narrow poort at Vrieskloofhoogte between two hills at GPS16 or ACO2014LW/008. Large mounds of earth, representing the railway track, are located to the west and east of the road in the road reserve. Widening the road at this juncture (Climbing Lane 4) will mean removing the raised “embankment” in order to accommodate a shoulder or passing lanes.

The second section at GPS25 and 26 or ACO2014LW/014-15 is situated on a level section of road, opposite a circular stone base of a water tank used by steam locomotives. There are no plans to widen the road at this section. The proximity of the stone base of the water tank to the raised railway line inside the road reserve makes this a particularly sensitive heritage location. It is recommended that no construction yards are placed here to avoid impacts to heritage.

Table 4: Assessment of Impacts on Road Reserve

	Extent	Intensity	Duration	Consequences	Probability	Significance	Status	Confidence
Without Mitigation	2 Regional ⁴	2 Medium	3 Long-term	7 High	Probable	High	Negative	High
Essential Mitigation Measures:								
<ul style="list-style-type: none"> The white-washed stone cairn (ACO2014LW/001) should be avoided if possible, but if this is not possible then it may be destroyed during road rehabilitation. No further mitigation is required; The two short sections of the raised rail embankment inside the road reserve (ACO2014LW/008) should be avoided during construction of Climbing Lane 4. If this is not possible, no further mitigation is proposed. SAHRA may 								

⁴ The Regional extent assigned to the archaeological resources is because the sites are potentially of Grade 2 or Provincial significance.

request a permit for the destruction of this feature; <ul style="list-style-type: none"> • The section of the raised embankment of the rail line inside the road reserve (ACO2014LW/014-15) should be conserved. Its significance is enhanced by its close proximity to the stone base of a water tank of historic significance; • If any graves or human remains are uncovered during construction, then work should stop in that area and the ECO should contact SAHRA (Tel: 021 462 4502) Best practice mitigation measures: <ul style="list-style-type: none"> • Archaeological remains are best left <i>in situ</i>, and conserved for the future. If this is not possible then mitigation in the form of excavation with a permit will be required. 								
With Mitigation	1 Local	1 Low	3 Long-term	5 Low	Possible	Very Low	Negative	High

A number of stone structures were identified immediately outside the N7 road reserve. Some of these structures are probably associated with the historic railway line and/or the defence of the line during the Boer War. It is recommended that no construction camps/laydown areas are established in close proximity to these structures.

8.3 Living Heritage

No Living Heritage resources were identified in proximity to locations for Borrow Pits 1 – 5. However, since the assessment of Borrow Pits 6 and 7 were made at a desktop level, it is not possible to be confident about impacts to living heritage.

8.4 Roadside Accident Memorials

Since roadside accident memorials are not protected by the NHRA, they may be removed if necessary during road rehabilitation. However, it is suggested that an empathetic solution to development in the road reserve would be to attach the crosses and flowers to the road reserve fence.

9. CONCLUSIONS AND RECOMMENDATIONS

The likelihood of impacts to heritage resources in the proposed Borrow Pits is considered to be low and therefore it is recommended that:

- If any pre-colonial or historical archaeological material (including stone structures) are uncovered during earth-moving operations, then work should stop in that area and the Environmental Control Officer (ECO) should contact SAHRA (Tel: 021 462 4502);
- If any graves or human remains are uncovered during construction, then work should stop in that area and the ECO should contact SAHRA (Tel: 021 462 4502);
- If Borrow Pit 6 and Borrow Pit 7 are identified as alternatives to Borrow Pit 3; then preference is expressed for Borrow Pit 7. This is because Borrow Pit 6 is located in an area which is known to have experienced more intensive Boer War activity during the siege of Okiep. If Borrow Pit 6 is selected, then the ECO must be alerted to the possibility of disturbing historical material including stone structures and/or burials.

With regard to the heritage resources inside the road reserve, the following recommendations are made:

- It may be necessary for short sections of the raised rail embankment inside the road reserve at ACO2014LW/008 to be demolished during the construction of Climbing Lane 4 (CL4). It is concluded that this can be justified because a significant loop of the line has been retained to the west of the N7 at this point. Technically, a permit from SAHRA will not be required as the demolition will be in terms of Section 38(10) of NHRA. However, SAHRA may request a demolition permit;

- It is recommended that the section of the raised embankment of the rail line inside the road reserve (ACO2014LW/014-15) should be conserved. Its significance is enhanced by its close proximity to the stone base of a water tank of historic significance. While no climbing lanes are proposed for this section of the N7, due care should be taken during the construction of the road shoulder and this area should not be used for a construction/laydown camp;
- The white-washed cairn may be demolished to make way for the rehabilitation of the road. It is unlikely that it represents a grave;
- Since roadside memorials are not protected by the NHRA, they may be removed if necessary during road rehabilitation. However, it is suggested that an empathetic solution to development in the road reserve would be to attach the crosses and flowers to the road reserve fence.

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Table 2: List of heritage sites recorded during the survey

Field Name	Unique Site No	GPS Co-ordinates	Description	Significance	Mitigation
5	ACO2014LW/001	-29.538327° 17.862972°	Stone cairn (whitewashed) inside the road reserve	Low	No
7	ACO2014LW/002	-29.526925° 17.860378°	Stone cairn at the side of the road, outside the road reserve	Low	No
11	ACO2014LW/003	-29.311741° 17.761903°	Scatter of ostrich eggshell fragments on a little koppie in Burrow Pit 2.	Low	No
12	ACO2014LW/004	-29.310680° 17.761829°	Stone Cairn in Borrow Pit 2. Possibility it is a grave although unlikely	High if grave	No
13	ACO2014LW/005	-29.318307° 17.767011°	Grave memorial in the road reserve.	Not protected by the NHRA	No
14	ACO2014LW/006	-29.342433° 17.779556°	N7 crosses the railway line embankment, with sections visible to the east but not the west. Sections of the embankment within the road reserve are badly degraded.	Low	No
15	ACO2014LW/007	-29.421155° 17.816052°	Stone cairn representing the corner of Borrow Pit 1	Low	No
16	ACO2014LW/008	-29.424564° 17.821833°	Railway line crossing the N7, with high embankments left on both the east and west inside the road reserve.	Medium	Destroy with permit
17	ACO2014LW/009	-29.428520° 17.824356°	Section of the railway line embankment, running parallel to the road, outside the road reserve. With rough stone work exposed by erosion	Low	No
18	ACO2014LW/010	-29.429968° 17.825276°	Small stone rectangular building, about 10 m outside the road reserve, to the west of the road	Medium but not threatened	No, avoid with construction camps
19	ACO2014LW/011	-29.439536° 17.835373°	Railway line crossing N7. No sections of the raised track in the road reserve	Low	No
20	ACO2014LW/012	-29.441938° 17.837934°	Ruined stone house, and a short section of rail embankment, outside the road reserve (about 10 m) to the east of the N7	Medium but not threatened	No, avoid with construction camps
21	ACO2014LW/013	-29.444117° 17.839275°	Memorial of individual who died in road accident in 2011, inside the road reserve	Not protected by the NHRA	No
25	ACO2014LW/014	-29.485521° 17.836570°	Short section of rail embankment between GPS25 and GPS26 within the road reserve, to the east of the N7. Opposite the water tank (GPS27)	Grade II	Yes
26	ACO2014LW/015	-29.485958° 17.836702°			
27	ACO2014LW/016	-29.490084° 17.838360°	Historic stone base of a water tank, probably related to the railway line. About 3 m outside the road reserve on west side of N7.	Grade II	Yes



ANNEXURE A

Impact Assessment Methodology

Impact Assessment Methodology for EIAs - Instructions to Specialists

The significance of all potential impacts that would result from the proposed project is determined in order to assist decision-makers. The significance rating of impacts is considered by decision-makers, as shown below.

- **INSIGNIFICANT:** the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity.
- **VERY LOW:** the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity.
- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity.
- **MEDIUM:** the potential impact **should** influence the decision regarding the proposed activity.
- **HIGH:** the potential impact **will** affect a decision regarding the proposed activity.
- **VERY HIGH:** The proposed activity should only be approved under special circumstances.

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The significance of each identified impact¹ must be rated according to the methodology set out below:

Step 1 – Determine the **consequence** rating for the impact by determining the score for each of the three criteria (A-C) listed below and then **adding** them². The rationale for assigning a specific rating, and comments on the degree to which the impact may cause irreplaceable loss of resources and be irreversible, must be included in the narrative accompanying the impact rating:

Rating	Definition of Rating	Score
A. Extent – the area over which the impact will be experienced		
Local	Confined to project or study area or part thereof (e.g. site)	1
Regional	The region, which may be defined in various ways, e.g. cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. Intensity – the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration – the timeframe over which the impact will be experienced and its reversibility		
Short-term	Up to 2 years (i.e. reversible impact)	1
Medium-term	2 to 15 years (i.e. reversible impact)	2
Long-term	More than 15 years (state whether impact is irreversible)	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Combined Score (A+B+C)	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

¹ This does not apply to minor impacts which can be logically grouped into a single assessment.

² Please note that specialists are welcome to discuss the rating definitions as they apply to their study with the EIA team.

Example 1:

Extent	Intensity	Duration	Consequence
Regional 2	Medium 2	Long-term 3	High 7

Step 2 – Assess the **probability** of the impact occurring according to the following definitions:

Probability– the likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

Example 2:

Extent	Intensity	Duration	Consequence	Probability
Regional 2	Medium 2	Long-term 3	High 7	Probable

Step 3 – Determine the overall **significance** of the impact as a combination of the **consequence** and **probability** ratings, as set out below:

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	INSIGNIFICANT	INSIGNIFICANT	VERY LOW	VERY LOW
	Low	VERY LOW	VERY LOW	LOW	LOW
	Medium	LOW	LOW	MEDIUM	MEDIUM
	High	MEDIUM	MEDIUM	HIGH	HIGH
	Very High	HIGH	HIGH	VERY HIGH	VERY HIGH

Example 3:

Extent	Intensity	Duration	Consequence	Probability	Significance
Regional 2	Medium 2	Long-term 3	High 7	Probable	HIGH

Step 4 – Note the **status** of the impact (i.e. will the effect of the impact be negative or positive?)

Example 4:

Extent	Intensity	Duration	Consequence	Probability	Significance	Status
Regional 2	Medium 2	Long-term 3	High 7	Probable	HIGH	- ve

Step 5 – State your level of **confidence** in the assessment of the impact (high, medium or low).

Depending on the data available, you may feel more confident in the assessment of some impact than others. For example, if you are basing your assessment on extrapolated data, you may reduce the confidence level to low, noting that further groundtruthing is required to improve this.

Example 5:

Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Regional 2	Medium 2	Long-term 3	High 7	Probable	HIGH	- ve	High

Step 6 – Identify and describe practical **mitigation** and **optimisation** measures that can be implemented effectively to reduce or enhance the significance of the impact. Mitigation and optimisation measures must be described as either:

- **Essential:** best practice measures which must be implemented and are non-negotiable; and.
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented.

Essential mitigation and optimisation measures must be inserted into the completed impact assessment table. The impact should be re-assessed with mitigation, by following Steps 1-5 again to demonstrate how the extent, intensity, duration and/or probability change after implementation of the proposed mitigation measures. *Best practice* measures must also be inserted into the impact assessment table, but not considered in the "with mitigation" impact significance rating.

Example 6: A completed impact assessment table

	<i>Extent</i>	<i>Intensity</i>	<i>Duration</i>	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Status</i>	<i>Confidence</i>
Without mitigation	Regional 2	Medium 2	Long-term 3	High 7	Probable	HIGH	- ve	High
Essential mitigation measures: <ul style="list-style-type: none"> • Xxx1 • Xxx2 • Xxx3 Best practice mitigation measures: <ul style="list-style-type: none"> • Yyy1 • Yyy2 								
With mitigation	Local 1	Low 1	Long-term 3	Low 5	Improbable	VERY LOW	- ve	High

Step 7 – Summarise all impact significance ratings as follows in your executive summary:

Impact	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Status</i>	<i>Confidence</i>
Impact 1: XXXX	Medium	Improbable	LOW	-ve	High
With Mitigation	Low	Improbable	VERY LOW		High
Impact 2: XXXX	Very Low	Definite	VERY LOW	-ve	Medium
With Mitigation:	<i>Not applicable</i>				

