PHASE TWO ARCHAEOLOGICAL ASSESSMENT: THE REMAINDER OF PORTION 46 OF THE FARM OLIFANTSFONTEIN 410 JR CENTURION GAUTENG PROVINCE

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List of Acronyms

Ekurhuleni Metropolitan Municipality (EMM)

Earlier Stone Age (ESA)

Middle Stone Age (MSA)

Later Stone Age (LSA)

Environmental Impact Assessment (EIA)

Heritage Impact Assessment (HIA)

National Heritage Resources Act (NHRA)

South African Heritage Resources Agency (SAHRA)

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1 Executive Summary

During a Phase 2 Heritage Assessment on the remainder of Portion 46 of the farm Olifantsfontein 410 JR, Ekurhuleni Metropolitan Municipality (EMM) in Gauteng Province several heritage resources were recorded, some of which have been previously identified during Phase 1 Assessments (Van Schalkwyk 1998, 2002; African Heritage Consultants 2012; Environomics 2012).

The heritage features recorded during the Phase 2 Assessment comprised three opencast mine quarries lime kilns, and the remains of associated infrastructure; the ephemeral remains of dwellings of workers west of the mine; two cemeteries north of the mine with approximately 400 graves, mostly unmarked); some foundations of a mine manager house and remains of garden date to the 1980s; and a water furrow that supplied water to the mine and farms lower down. The furrow was supplied from a dam in the Kaalspruit.

Following on the outcome of the Phase 2 the following mitigation measures are recommended for the heritage resources associated with Portion 46 of Olifantsfontein 410 JR:

The lime kilns and associated quarries must be protected and incorporated into the proposed development. It is suggested that an interpretative trail, viewpoints and picnic areas should be developed around these unique features. In this development special attention needs to be paid to public health and safety since there are significant vertical height differentials throughout the site. The lime kilns can potentially be incorporated into a public facility such as a restaurant, tea garden and/or small wine cellar but will require structural stabilisation and reinforcement that should form part of a Phase 3 restoration and re-use project. The status quo of the historical water furrow must also be retained and incorporated into the proposed development. Based on the proposed use and incorporation of these heritage resources into the development a detailed Heritage Management Plan must be drafted, implemented and periodically reviewed.

It is recommended that the cemeteries be treated similar to those in other parts of the Midstream Estate where they are fenced and incorporated into small-scale public spaces or gardens.

2 Background Information on the project

2.1 Introduction to the project

African Heritage Consultants were appointed in terms of the requirements of the National

Heritage Resources Act (NHRA) Act (Act No. 25 of 1999) to conduct a Phase 2 Heritage Assessment on the remainder of Portion 46 of the farm Olifantsfontein 410-JR, Ekurhuleni Metropolitan Municipality (EMM) in Gauteng Province.

The study area include contains a number of heritage sites previously identified during heritage surveys (Van Schalkwyk 1998, 2002; African Heritage Consultant (2012; Environomics 2012) on the entire portion 48 of the farm Olifantsfontein 410 JR. The heritage features recorded during the Phase 1 Assessments included the following:

- An opencast mine quarry: 25° 55’ 54.0”S; 28° 12’ 53.1E”
- Kilns: 25° 55’ 56.6”S; 28° 12’ 52.2”E. The kilns and associated structures were built with local stone as well as bricks and concrete. The remains of engine blocks were also visible. Note that Van Schalkwyk (1998: 24) identified these as the remains of a lime kiln and other works established by John Richard Holmes in the 1890s and provided the coordinates as 25°55'47.7"S; 28°12'53.2"E. This site was linked to the two cemeteries indicated below.
- Workers houses/offices west of the mine at 25° 55’ 54.1”S; 28° 12’ 47.4”E as well as at 25° 55’ 56.9”S; 28° 12’ 46.9”E.
- Two cemeteries (possible of mineworkers) north of the mine:
  Cemetery 1: 25° 55’ 47.0”S; 28° 12’ 54.5”E. There are some 130 or more graves; one is inscribed with a date of 1940.
  Cemetery 2: 25° 55’ 50.2”S; 28° 12’ 55.5”E. Approximately 140 graves, only one has a date of 1959.
- Foundations of mine manager house and remains of garden: 25° 55’ 59.5”S; 28° 12’ 59.0”E. The foundations were still visible. Note that it has been established in this Phase 2 Assessment that the foundations and remains of a garden date to the 1980s. No legislative protection is accordingly required.
- Furrow: The mine and farms lower down adjacent to the Kaalspruit were fed by the canal or furrow. The water came from a dam in the Kaalspruit 25° 56’ 10.2”S; 28° 12’ 13.7”E. Other coordinates for the canal are: 25° 55’ 58.5”S; 28° 12’ 56.1”E and 25° 55’ 59.5”S; 28° 13’ 04.2”E.

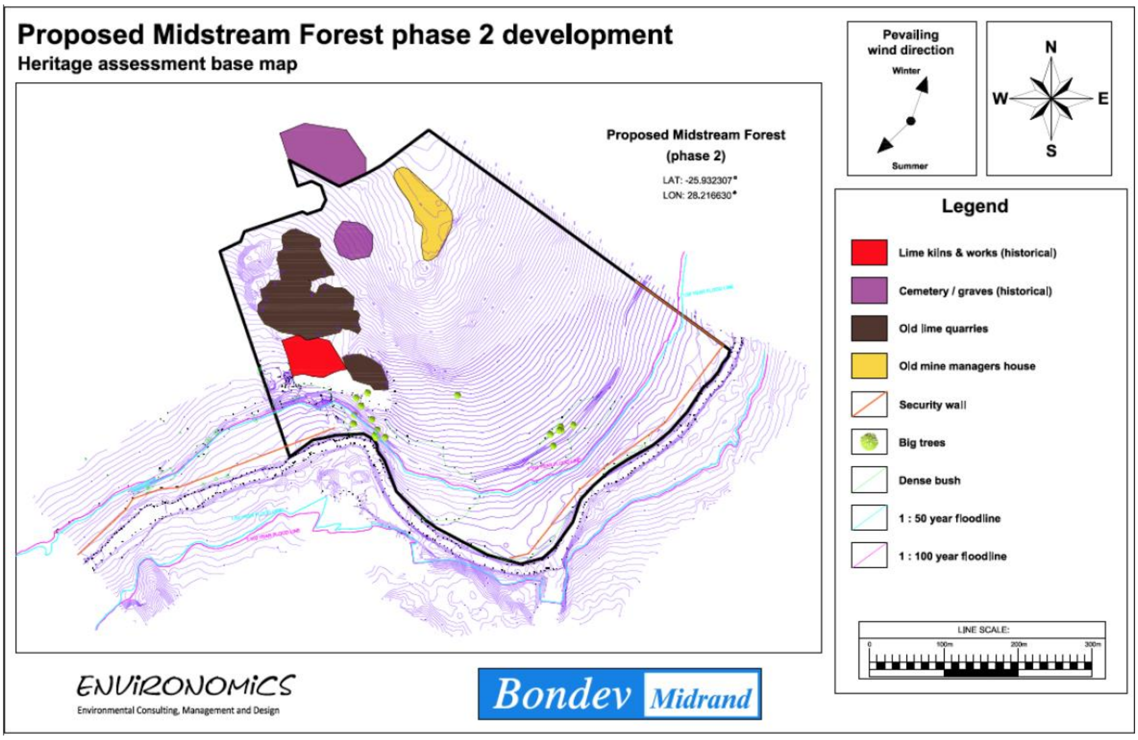

Figure 1. *Detail of the study area and heritage resources.*

A map of the first registration of the farm in the Chief Surveyor General's database (www.csg.dla.gov.za) dating to 1890 shows that Olifantsfontein 410 was first surveyed and mapped for F. Botha in 1889 (CSG Document 10324762).

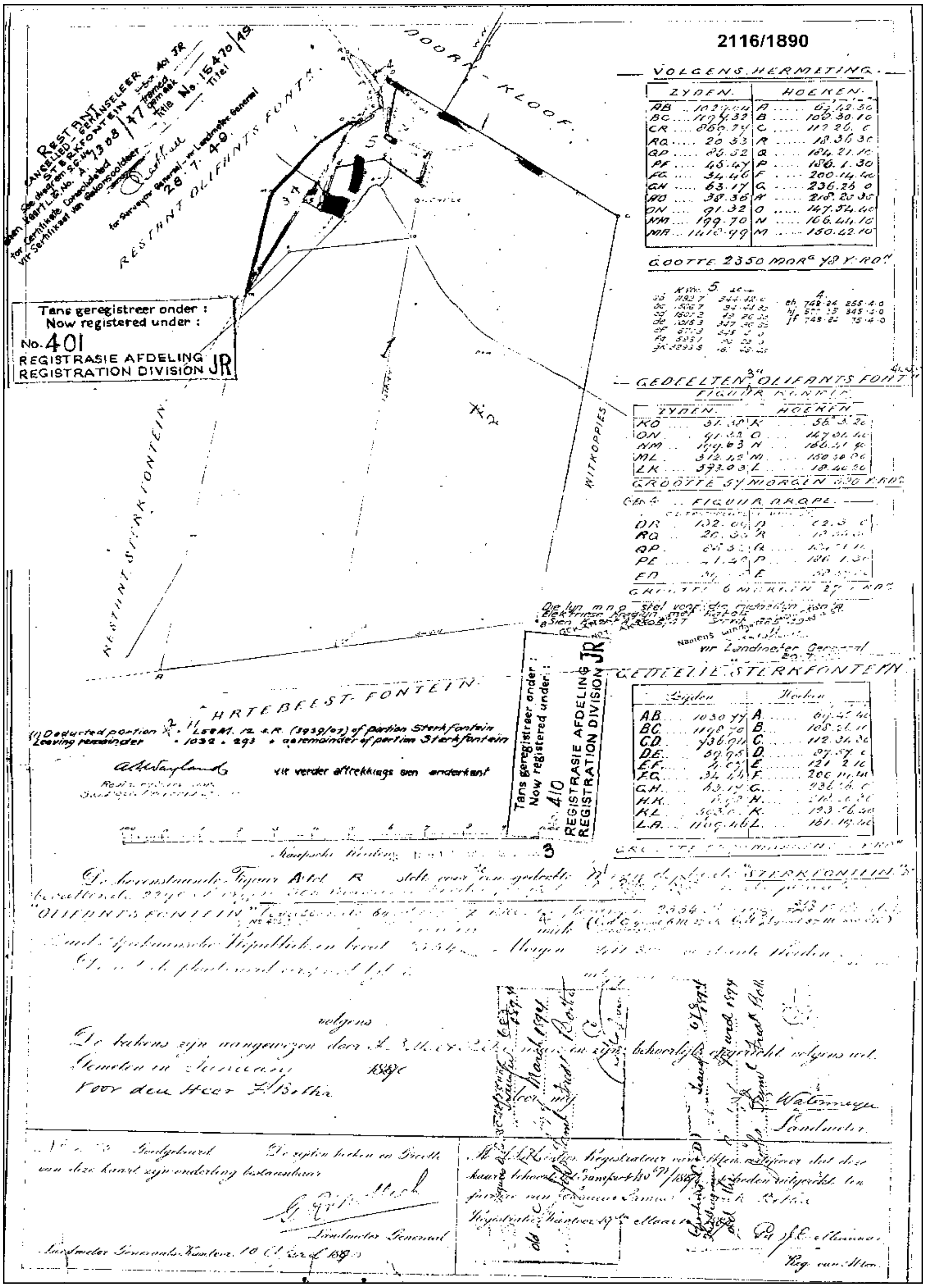

Figure 2. 1890 map of Olifantsfontein 410 JR (www.csg.dla.gov.za).

2.2 Whether rezoning and/or subdivision of land is involved

The developers will be required to follow the township establishment process for the proposed mixed residential development.

2.3 Property description

Phase 2 Heritage Assessment on remainder of portion 46 of the farm Olifantsfontein 410 JR.

2.4 Report compiled by

…………………………………

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2.6 Client details and consultant information

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2.7 Date of report

14 December 2017.

2.8 Heritage resources and legislative requirements of NHRA Act 25 of 1999

All sites, heritage resources and archaeological remains are protected in terms of the National Heritage Resources Act (NHRA) Act No. 25 of 1999:

All archaeological remains, artefactual features and structures older than 100 years and historic structures older than 60 years are protected by the National Heritage Resources Act (NHRA) (Act No. 25 of 1999, section 35). No archaeological artefact, assemblage or settlement (site) may be moved or destroyed without the necessary approval from the South African Heritage Resources Agency (SAHRA).

Human remains older than 60 years are protected by the National Heritage Resources Act Section 36. Human remains that are less than 60 years old are protected by the Human Tissue Act (Act 65 of 1983 as amended).

The following sections of the South African Heritage Resources Act, 1999 (Act 25 of 1999) must be noted:

Section 3(3) p. 14 of the South African Heritage Resources Act (Act No. 25 of 1999) specifically states the following with regard to significance:

" … a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

- *its importance in the community, or pattern of South Africa's history;*
- *its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;*
- *its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;*
- *its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;*

- *its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;*
- *its importance in demonstrating a high degree of creative or technical achievement at a particular period;*
- *its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;*
- *its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and*
- *sites of significance relating to the history of slavery in South Africa".*

In term of the South African Heritage Resources Act,1999 (Act 25 of 1999) the following applies:

Structures

34. (1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

Archaeology, palaeontology and meteorites

35.(4) No person may, without a permit issued by the responsible heritage resources authority—

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves

36.(3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

All sites and artefacts associated with the Anglo Boer War are sensitive. It is critical that this information be relayed to visitors, tour operators and private landowners. This message also needs to be reinforced through appropriate signage. From a tourism development and visitor management perspective there are a number of activities that can potentially trigger the need for a permit application or the submission of a Heritage Management Plan to the South African Heritage Resource Agency.

3 Historical overview of the larger study area

3.1 Existing heritage resources

The Midrand area is a typical Highveld landscape intersected by several relatively deep valleys carved out by the Kaalspruit, Olifantspruit, Jukskei River, Modderfonteinspruit and numerous smaller watercourses. The first human occupations were by Stone Age communities who left behind their characteristic stone tool assemblages from the Earlier (ESA), Middle (MSA) and Later (LSA) Stone Age periods. Most of their stone tools are recovered from open air settlements, but there are also sealed occupation deposits such as at Glenferness Cave on the Jukskei River and near the Waterval Quarry. Precolonial farming societies too moved into the region during the first millennium between AD 350 and 600. The more recent arrivals of Sotho-Tswana-speaking groups in the region date from the early 16th century and are documented by their numerous stone-walled settlements (http://www.glenaustin.co.za/history-of-glen-austin.html).

White trekker farmers moved into the region by the middle of the 19th century. Early farmers that settled on farms from the early 1840s onwards include Frederik Andries Strydom who established himself on Olifantsfontein and Johannes Elardus Erasmus of Randjesfontein respectively. Strydom was buried on his property in the farm cemetery and the structures of the farmstead have been restored by his descendants. The names of some of the early farm names evoke images of the environment at that time: Olifantsfontein, Blue Hills, Witbos, Kaalfontein, Waterval, Diepsloot, and others (http://www.glenaustin.co.za/history-of-glen-austin.html).

Pretoria and Johannesburg were connected by stage coach and post cart services in the 1880s. The brothers Gibson owned a large portion of the farm Waterval No. 34, now 5 JR, where they bred cattle and established plantations. The farm was named after rapids in the Jukskei River (Cultmatrix 2006). They established a stopover for stagecoach service on their farm that became known as the `Halfway House'. It gave rise to the establishment of a hotel and a post-office in 1889. President Kruger often stopped over at the Halfway House Hotel during trips between Johannesburg and Pretoria.

This area was proclaimed as the Waterfall Park Estate Township in 1889 and the first land was sold in 1890. Buccleugh, also on the farm Waterval, was established in 1938 by FC Gibson and named after the residence of his father at Kenilworth in the Western Cape. Descendants of the Gibsons sold their portions of the farm to the Witwatersrand Estates Ltd in June 1934. Indian families, including the Mia family, held the controlling interest in this company. The company leased the farm to SI Mia who had established a school and hostel in Market Street, Johannesburg. The exponential growth of the school required that a new site had to be found. Subsequently, in 1937 permission was granted by the authorities to establish a school for Indian children on the farm Waterval. Construction of this facility, known as the Waterval Islamic Institute, started in 1939 and the school opened in 1940. The Institute comprised a madrasah, boarding school and mosque. It was the first establishment of its kind in the former Transvaal Province.

The establishment of Mia's farm led to the revival of the Jamiatul Ulama Transvaal, originally created in 1923 as an organisation to which Indian religious leaders belong in the former Transvaal Province. The Jamiatul Ulama South Africa facilitates Islamic education through the Taalimi Board (https://www.jmtsa.co.za/services/taalimi-board/). Staff quarters were provided at the Waterval farmstead. African farm workers were housed in a separate compound on the farm, which included a school. On the 1938 aerial photo the remains of mud-brick houses occupied by African tenant farmers were still visible east of the N1 (Cultmatrix 2006).

A historical railway line from the 1890s opened up the area for more intensive agricultural and also industrial development. A year later, when it was predicted that the proposed railway line between the Witwatersrand and Pretoria would pass Halfway House, a township, known as `Waterval Mooigelegen', was surveyed, which made provision for a station, government offices, shops and a market. However, the railway bypassed Halfway House to the east, and thus Midrand's first railway station was opened on the farm Olifantsfontein in 1892.When the Johannesburg-Pretoria railway line was surveyed in the early 1890s, extensive limestone and fire clay deposits were discovered east of the Strydom farmstead on Olifantsfontein.

The Anglo-Boer War (1899 -1902) also affected Midrand when the British forces under Lord Roberts advanced through Midrand from Johannesburg en route to Pretoria, which was occupied on 5 June 1900. A few British military units were stationed in the Midrand area, for example on the site of the present Escom Training Centre, and at Bibury Grange. No major battles took place in Midrand, and the armed conflict was limited to Boer attempts at sabotaging the railway line, attacks on troop trains and other minor skirmishes. A notable event was the

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Boer demolition of the railway culvert near the present Pinedene Station, which had to be completely rebuilt by the Imperial Military Railways in 1901.

After the war Cullinan started a pottery factory in Olifantsfontein. It was not very successful and it closed down in 1914. In 1926 the business was revived when the Ceramic Studio was established, which became especially famous for the production of tile murals for decorating many government buildings erected in the 1930s, including the Halfway House post-office.

3.2 The Consolidated Rand Brick, Pottery and Lime Company Limited

3.2.1 Introduction: the role of Thomas Major Cullinan in early building construction at the Witwatersrand

Sir Thomas Cullinan established the Consolidated Rand Brick, Pottery and Lime Company that later became known as the Conrand Company. Cullinan (1862-1936) was born in the Eastern Cape. He became involved with the building trade, and also took part in the native wars during the 1870s. He subsequently entered the field of mining. He moved with his wife, Annie and eldest son, Thomas William, to the Witwatersrand in July 1887. From 1887 to 1898 Cullinan was active in the construction industry. He first became involved with the Fordsburg brickworks where he acquired a stake.

Several of the structures erected by him became landmark buildings in the rapidly expanding Johannesburg — unfortunately, none were preserved. He also built several houses for his family, which was also expanding. Ten children were born to him and Annie, of whom a son died in 1897. Each of the consecutive homes was larger and more elaborate. He entered into partnerships with other prominent building contractors, such as WS Royce with whom he tendered for the building of the second Rand Club. Cullinan expanded his investments, buying shares in companies, and in acquiring and selling land. He was actively involved in the further developments of the Fordsburg brickworks and also acquired another brickwork company in Boksburg. The Rand Brick and Tile Company Ltd was registered in July 1892. The company prospectus noted a range of proposed activities. In 1896 he founded a plant at Olifantsfontein for the production of brick and tiles. By 1897 Thomas Cullinan was the managing director of the Rand Brick and Tile Company Ltd. The industrial machinery imported by Cullinan to produce sanitary pipes, a revolving pub mill and a double brick press, positioned the company to produce superior goods and secured important contracts in the building industry of the Witwatersrand. Thomas Cullinan was now wealthy enough to indulge his passion for prospecting and in particular for diamonds, a venture that would result in the establishment of the Premier

Diamond Mine. (Helme 1974: 18-28).

3.2.2 The clay and lime deposits exploited by Thomas Cullinan and the establishment of Conrand

A concession was granted by the Transvaal Volksraad to the Nederlandsche Zuid-Afrikaansche Spoorweg Maatschappij (NZASM) to build railways from the then Portuguese border to Barberton, Pretoria, Johannesburg and the Vaal River (Helme 1974: 121). John Richard Holmes, who was contracted by Cullinan and a partner to survey the proposed Johannesburg-Pretoria link for the NZASM line, found high-grade clay deposits on three farms (Olifantsfontein, Kaalfontein en Sterkfontein (Heymans 1989: 31). He had already discovered extensive deposits of blue lime in 1894 (Heymans 1989: 31). With a partner, Niven, he established a lime-burning company, Holmes Lime Works Ltd in 1895 (Helme 1974: 122; Heymans 1989: 19).

The original quarry of Holms Lime Works is some two km north of where the Cullinan complex at Olifantsfontein developed (Helme 1974: 122). In November 1896 a lease, with the right of future purchase, was obtained from a farmer, P Schoeman, for around 1900 ha on farms around the quarry with the rights to prospect for and to mine clay. An excellent source of clay was discovered (Heymans 1989: 31). A brick-making firm soon followed with the establishment of the Kaal Spruit Fire Brick Co. In 1902, Holmes Lime Works and the Rand Brick and Tile Company, the latter established by Thomas Cullinan, amalgamated to form the Consolidated Rand Brick, Pottery and Lime Company. It was known as Conrand and would ultimately merge into the Cullinan Holdings complex.

Conrand was registered on 9 December 1902, and the Premier Mine Company on 1 December 1902. Thomas Cullinan was the first managing director of Conrand. Cullinan, Edmund Brayshaw and Charles Jerome were initially the three largest individual shareholders in Conrand. The first Prospectus was published in 1902. At its inception Conrand had two operating plants, a brick and pipe manufacturing plant in Boksburg, and a limeworks plant in Olifantsfontein (Helme 1974: 122). The clay deposits, discovered in the 1890s, occurred over an area of around 80 ha and to a depth of 16 m at Olifantsfontein (Helme 1974: 122). Brick- and pipe-making machinery were purchased and installed at Olifantsfontein over a period of two years. Cullinan himself loaned ₤20 000 at 8% interest to the company to purchase the 1900 ha of undeveloped land from Schoeman.

The architect firm of Aburrow and Treeby (who designed and built Cullinan's house, The View at Parktown in 1894) was appointed to construct a railway siding from the station at Olifantsfontein to the works. The discoverer of the deposits, JR Holmes, was actively involved in the development of the lime works. He, however, resigned in May 1903 following on disagreements in connection with his claims against the company. PE Treeby, an Australian who was a partner in Conrand and who served on the board, was appointed in June 1903as managing director for Conrand but for a one year-period only (Helme 1974: 123). The company would be plagued by various resignations and changes in the management and secretarial sections of the company over the following years, including that of Cullinan's brother, Henry as manager of the Boksburg works.

The newly formed company struggled financially, probably because the main interests of Cullinan were predominantly vested in the Premier (Transvaal) Diamond Mine that was hugely profitable, in particular after the discovery of the enormous Cullinan diamond on 5 January 1905. In March 1906 when Jerome handed over the managing directorship to JJ Lang the latter recommended that the Boksburg works should close down, and that the production of bricks at Olifantsfontein should cease but that the pipe making should continue. The Boksburg works closed down in August of that year.

When Jerome resigned as chairman on 3 December 1906, he was replaced by Cullinan's brother-in-law, Joseph Mitchell. While the board took note of the serious financial position of the company at a meeting on 6 December 1906, the decision was taken to establish the pottery works at Olifantsfontein where several skilled potters from Britain would be employed. At a board meeting held on 6 June 1907 it was resolved that a general meeting of shareholders should be called for the 1st of July where it was to be recommended that the company should be voluntarily liquidated (Helme 1974: 124). Cullinan was not present at the June board meeting and was clearly not in favour of the proposal. He also did not attend the shareholder meeting held in August. The meeting was informed that Cullinan wished to avoid the voluntary liquidation and he was therefore offering to buy out all existing shareholders at a price of 5/- per share. Cullinan bought out all shareholders with the exception of a brother-in-law, John Roy, and also RA Bettington and WH Lomas (Heymans 1989: 21). By March 1908 Cullinan held 87.6% of the shares (Helme 1974: 124). His personal loans to the company had also increased and he provided money to reduce the overdraft held by the National Bank (Helme 1974: 124, 129). A general recession in the country accounted for the drop in the sales of bricks and by the end of 1908 the company had an accumulated loss of almost ₤50 000 (Helme 1974: 129).

Cullinan had always envisaged a pottery factory, hence the inclusion of 'pottery' in the name of the company. Cullinan then appointed Harold Emery, of England, to produce a few experimental vessels from the Olifantsfontein clay. On his recommendations Cullinan decided to construct a ceramic production facility at Olifantsfontein. Emery had to go back to England to buy the necessary machines and to source ceramists (Heymans 1989: 21).

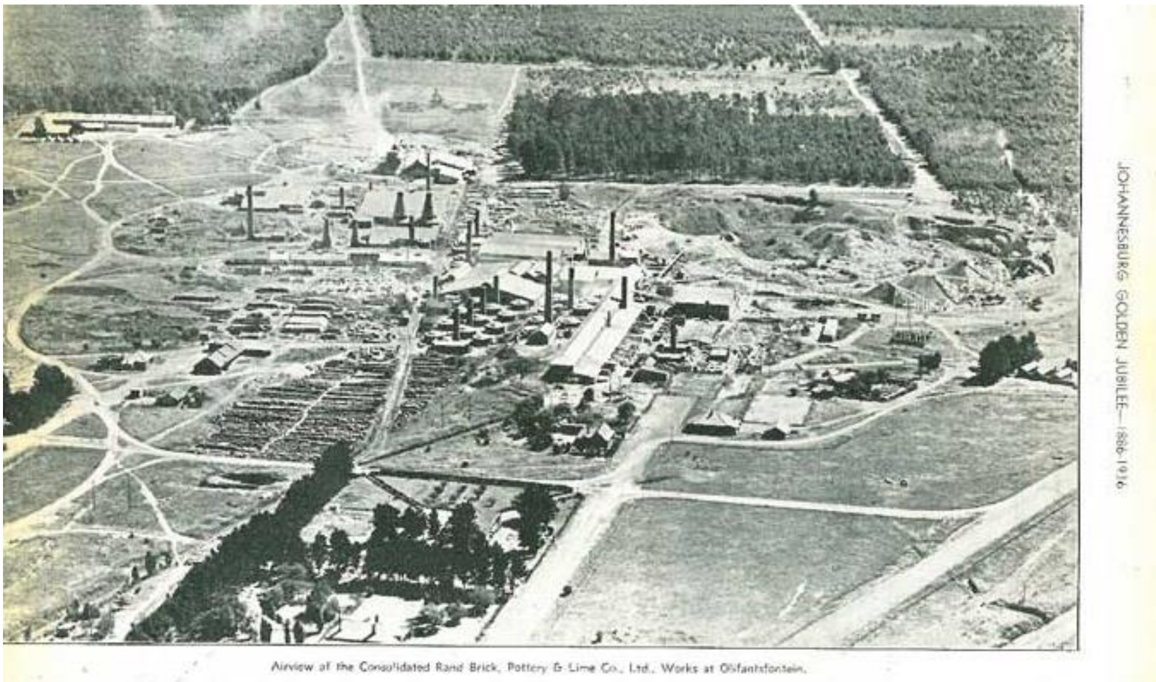

Figure 3. Aerial view of the Consolidated Rand Brick, Pottery and Lime Company Limited (http://www.artefacts.co.za/main/Buildings/image_slide.php?type=2&bldgid=9405&rank=1).

The architect Treeby was appointed in 1903 as director of Cullinan's Consolidated Rand Brick, Pottery and Lime Company (since 1902 known as the Conrand Company) at Olifantsfontein, laying out the brick and lime factory "A reporter who visited Olifantsfontein at that time, 1910, called it "the bleakest place in Africa". There were then very few trees, and when the Highveld wind blew, as it often did, the dust-laden atmosphere must indeed have presented a depressing picture. The thousands of eucalyptus trees planted by Sir Thomas have since then done much to improve living conditions near the works" (quoted from Landman at http://www.landmanwa.co.za/biografie/bio_02.htm).

The clay pit was opened up in 1903. The clay deposit on Olifantsfontein was reported by Treeby to be around 45 m in length and 17 m deep. Treeby commended as follows: "a Truly wonderful deposit of magnificent clay, which by the sinking already done, is proved to the extend (sic) of some millions of cubic feet" (as quoted by Heymans 1989: 31). During the period 1902 to 1907 the clay deposits were mainly used in the production of bricks, fire-clay bricks and pipes.

Figure 4. The Consolidated Rand Brick, Pottery and Lime Company at Olifantsfontein (http://www.landmanwa.co.za/biografie/bio_02.htm).

According to Van Schalkwyk (2016: 10) orphans from the Anglo-Boer War were accommodated in a special hostel while they were taught the craft of ceramic making and decorating.

The growth of Conrand and the Ceramic Studio led to residential and commercial developments in Olifantsfontein. Housing facilities for the brick-making and pottery companies were provided around 1930. Some of the original single quarters for unmarried men were later used as office space. Whereas most of the original houses were demolished in the 1980s, a few cottages, built from locally-made brick were still extant in 1998 (Van Schalkwyk 2016). The development subsequently became known as Clayville

Houses for senior management such as Spinney Green and Wenlock House were more elaborate. Spinney Green (Olifantsfontein 402 JR: 25°57'22.7"S; 28°13'43.1"E. Main Road, Olifantsfontein) was built around 1905 for Emery, the Conrand works manager at that stage. The house was later occupied by a son of Cullinan. It was redeveloped by Cullinan Holdings as a guest house and restaurant in the early 1980s. It currently functions as the Spinney Green Restaurant at 971 Premier Street, Olifantsfontein. This locality apparently contains examples of Ceramic Studio and Linn Ware pottery (www.glenaustin.co). Wenlock House was built around 1910 for a daughter of Thomas Cullinan. Wenlock House currently houses the Olifantsfontein library and clinic. (http://www.glenaustin.co.za/historical--sensitive-sites-in-and-around-glen-austin.html).

Figure 5. A Cullinan brick showing the manufacturer's mark or initials, in this case CRBP & L Co. Ltd) from paving bricks at the house of R Cullinan, Sunlawns, and an advertisement (http://www.artefacts.co.za/main/Buildings/style_det.php?styleid=789).

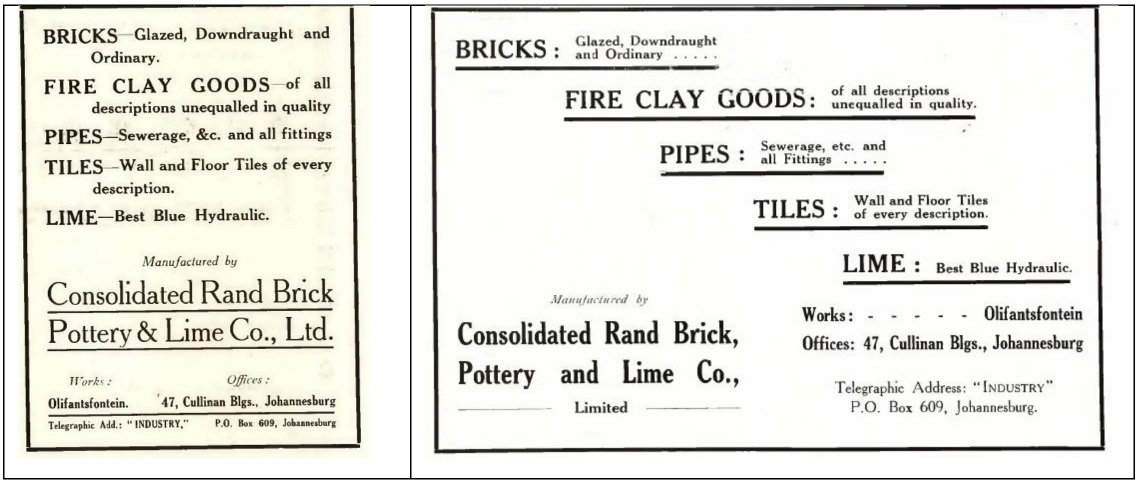

Figure 6. Advertisements for goods manufactured at Consolidated Rand Brick, Pottery and Lime Co Ltd (The African Architect 1911: 1(3) and 1(6).

In addition, Cullinan secured the right to the property of Willem Prinsloo on which the Premier Diamond Mine was established in 1902. He served as Chairman of the Premier Mine, Chairman and Director of the New Eland Diamonds Ltd, was director of several gold mining companies and owned the Consolidated Rand, Brick, Pottery & Lime Co, Ltd. He was knighted in 1910 for his "services to the diamond fields" (http://www.miningweekly.com/print-version/cullinan-house-up-for-sale-2015-11-13). Cullinan was one of the first Randlords. As a master builder, he was involved in the building of several of Johannesburg's earliest imposing constructions. A residential mansion in Houghton Estate, known as the Cullinan House was designed by Robert Howden, who later served as the first president of the Institute of South African Architects. The house that was destined for Cullinan's business partner and brother-in-law, Joseph Mitchell, was constructed with bricks and tiles manufactured by Cullinan's factory, the Consolidated Rand, Brick, Pottery & Lime Company and decorated with tiles produced at the pottery.

A house of the Cullinan family at Sunlawns, Olifantsfontein exhibits examples of work by the Ceramic Studio, including painted tiles in the bathrooms and kitchen, tiled staircase risers and ceramic light switch plates. There is also a relief panel over the fireplace and various other decorative elements.

Figure 7. The house built for Rowland, a son of Thomas Cullinan, at Sunlawns, Olifantsfontein with images of sailing boats made by the artists of the Ceramic Studio set into the sculpted circular panels (http://www.artefacts.co.za/main/Buildings/bldgframes.php?bldgid=6272).

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The Sunlawns Estate in Olifantsfontein belongs to the Rowland branch of the Cullinan family (Helme 1974: 210-211 Appendix II Family Trees). Some of the current family members, Pamela and her son Dominic, acquired a salvaged barn, the Big Red Barn, from a neighbouring farm. The structure was incorporated into a restoration project and family business that include a restaurant and function venue on Sunlawns Farm (https://www.humbletill.com/piece-by-piece/).

3.3 The Transvaal Potteries

Sir Thomas Cullinan was the director of the Consolidated Rand Brick, Pottery and Lime Company Ltd and also of the Premier (Transvaal) Diamond Exploration Company (Heymans 1989:20). Since Cullinan had a keen interest in ceramics he established a pottery at his Olifantsfontein Company that became known as the Transvaal Potteries (Basson 2006: 15). In view of the fine quality of the clay deposits Cullinan intended to produce fine china and brought skilled potters from England. Competing with overseas firms and the high railway tariffs made the pottery uneconomic and the works were closed in May 1914. The Ceramic Study had its origins in the studio of the Transvaal Potteries, and later on became known for its production of Linn Ware.

Figure 8. A brick downdraft kiln at Olifantfontein used in the production of ceramics by the Ceramic Studio (http://www.artefacts.co.za/).

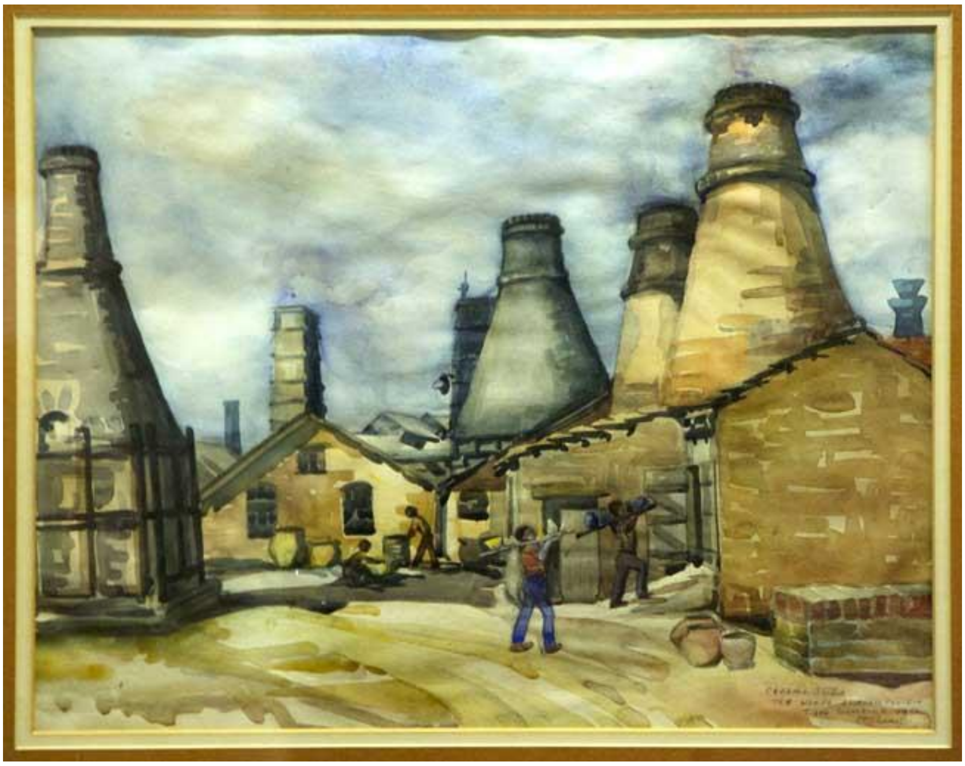

Figure 9. Painting by Thelma Newlands-Currie of the Olifantsfontein kilns and workshops (http://www.artefacts.co.za/).

Thelma Newlands-Currie (1903-1990) worked at the Ceramic Studio from 1928 to 1935 and part-time from 1935 to 1952. She trained at the Durban School of Art and the Royal College of Art.

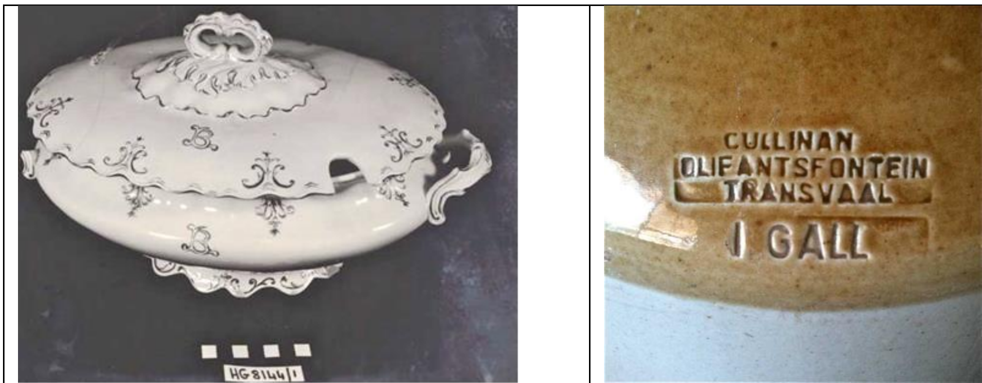

Figure 10. A soup tureen with L.B. monogram that was part of a dinner service made by the Transvaal Potteries, presented to General Louis Botha and trade mark on an earthenware vessel (http://www.artefacts.co.za/main/Buildings/style_det.php?styleid=789).

Figure 11. Marjorie Johnston at work at the Ceramic Studio (Van Eeden : 81).

After the end of WWI the Conrand Company continued to establish the lime works as a profitable entity. Rowland Cullinan, second son of Sir Thomas, joined the enterprise in 1910 and 1916. He became works director, and in the following year a profit was made. The Ceramic Studio was established in 1925 and produced ceramics up to 1942. It subsequently became known for the production of Linn Ware (Heymans 1989: 1).

The potteries produced high-quality ceramic tiles that were commissioned for several prominent government buildings after the chief architect of the Department of Public works, Mr Cleland, saw some of the artwork at an exhibition in 1926 (Heymans 1989: 5). These included the Johannesburg Station building, police stations, post office buildings and children hospitals. The outside walls of the Muizenberg, St James, Kalk Bay, and Noordhoek post offices/municipalities were decorated with ceramic installations that depicted events from the past. Five artists were involved in the production of tiles and ceramics at the Ceramic Studio, all of them having trained at the Durban Technical College under Mr John Adams. Three of them, namely Joan Methley, Thelma Newlands-Currie and Gladys Short had also received diplomas from the Royal College of Art, London (Heymans 1989: 1).

Over a relatively short period the Ceramic Studio produced an impressive output, there was a high demand for their work and it sold extremely well. The artists themselves were mainly responsible for designing the tiles but prominent artists such as Alfred Palmer, Jan Juta, Eric Byrd, Erich Mayer and Pierneef were also consulted from time to time (Heymans 1989: 5). Thousands of individual tiles were also made, depicting South African historical events, structures, well-known individuals, fauna and flora, and rock art images. The artists visited

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museums and zoos in order to study authentic material (Heymans 1989: 6).

Examples of tile panels produced for the decoration of government buildings:

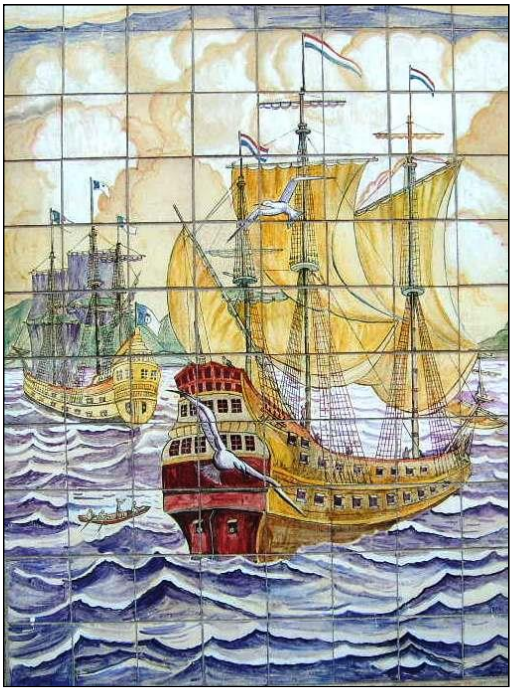

Figure 12. Early ships on the old Muizenberg Post Office that were once the offices of the Kalk Bay/Muizenberg Municipality (http://imaginemag.co.za/?p=627).

Figure 13. The outside of the former St James Post Office Building (http://imaginemag.co.za/?p=627).

Figure 14. The Noordhoek panel (http://imaginemag.co.za/wp-content/uploads/2015/03/NOORDHOEK).

The studio also made ceramic plates for light switches, knobs and handles for doors and cupboard furniture decorated with flower designs to accompany the decorative tiles (Heymans 1989: 69). Pots based on African designs were made at Kirkness in Pretoria in 1931, and specifically for an order destined for Native Affairs (Heymans 1989: 57). Diary inscriptions noted: “An order was placed recently for enormous pots of traditional Native shape and decoration. No one could give satisfactory information as to good Native pottery patterns. In the end Native women were called in and left entirely on their own to decorate. They brought their own tools, which consisted of pieces of calabash cut into the shape of combs, and most beautiful results were obtained” (Heymans 1989: 56-57).

The distinctive Linn Ware household wares, mainly with green and blue glazes, and decorative items, manufactured from 1942-1952 (Heymans 1989: iii) were particularly well-received and are now collector’s items. During this phase four Italian prisoners of war were involved with the manufacture (Heymans 1989: 131).

	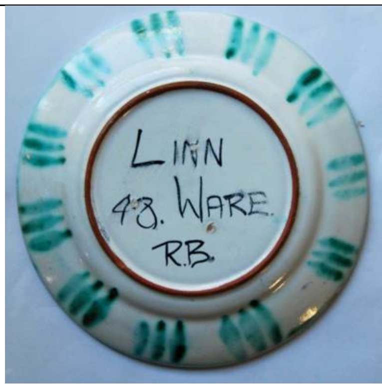
	
	A later marking (http://towerwateraandebreede.blogspot.co.za/2017/02/discovering-story-behind-linn-ware.html).

Figure 15. Examples of Linn Ware and markings (http://www.artefacts.co.za/main/Buildings/style_det.php?styleid=839).

3.3.1 Erich Mayer, Hendrik Pierneef, Gerhard Moerdyk and the Transvaal Potteries

The German born artist Erich Mayer (1876-1960) settled in South Africa in 1898. Not only did he develop an affinity with the Boer settlers in the rural areas and their vernacular architecture, but he similarly appreciated the crafts of the various ethnic groups in South Africa as well. He admired their weaving, basketry and pottery designs and also the rock art expressions of the hunting and gathering communities (Heymans 1989; Basson 2006). Mayer corresponded with Gladys Short and Joan Methley who held important positions at the Ceramic Studio of Sir Thomas Cullinan's company at Olifantsfontein. Mayer actively encouraged the incorporation of indigenous motifs into the ceramics produced at the Transvaal Potteries.

Both Pierneef and Mayer visited the Ceramic Studio in the late 1920s and early 1930s. Pierneef was involved with the designs for the Johannesburg Station tiles, and in particular the design of the blue and white tiles which were intended for the station building (Basson 2006: 16).

The architect Gerhard Moerdyk too commissioned tiles or the Pretoria University College and also a hostel in Potgietersrus. Gordon Leith and Partners worked with Moerdyk and Watson on the building and tiles for the Johannesburg station. Several other architect companies made use of the Ceramic Studio (Heymans 1989: 51). While Sir Herbert Baker never visited the studio he did place orders. The pottery diaries mentioned dates from 1927 and 1931 when samples and photographs were sent to Baker.

4 The Phase 2 Assessment

4.1 Methodology and limitations

Prior to conducting the site assessment, a desktop survey of existing literature on the wider region was conducted. Relatives of the Cullinan family as well as several local people with possible information on the study area were interviewed. Archival and other historical sources of information were searched for information on the historical background of the Cullinan enterprises at Olifantsfontein. The internet and SAHRIS data base were also accessed for documents and heritage reports that relate to the general region of the survey.

The relevant 2528CC 1:50 000 topographical map was consulted for indications of heritage resources or previous settlements. The aerial images available on Google were scrutinised for any evidence of structural remains, likely areas for archaeological features and heritage resources. A series of aerial photographic images of the region from 1937 up to 2008 were acquired and used to plot changes on the historical landscape over time.

The fieldwork component entailed a detailed assessment and survey of the land parcel and associated heritage resources. A photographic record was made of all identified heritage resources. The key heritage elements and structural remains were subsequently also surveyed by R Nel Surveyors. An annotated plan of the layout was made by Habitat Architects.

There were no limitations on access. The study area was visited and surveyed on several occasions between November and December 2017. Some environmental restrictions were encountered. Visibility of the survey area was good over most of the grassland areas but difficult in the densely forested sections of the quarry and riverine landscape.

5 Heritage sites

During the Phase 2 heritage survey several additional sites were found and documented. The heritage resources associated with this project can be broadly divided into those dating from the 1890s to the late 1960s and associated with the workings of the Olifantsfontein industries and, secondly, farm buildings constructed in the late 1970s or 1980s.

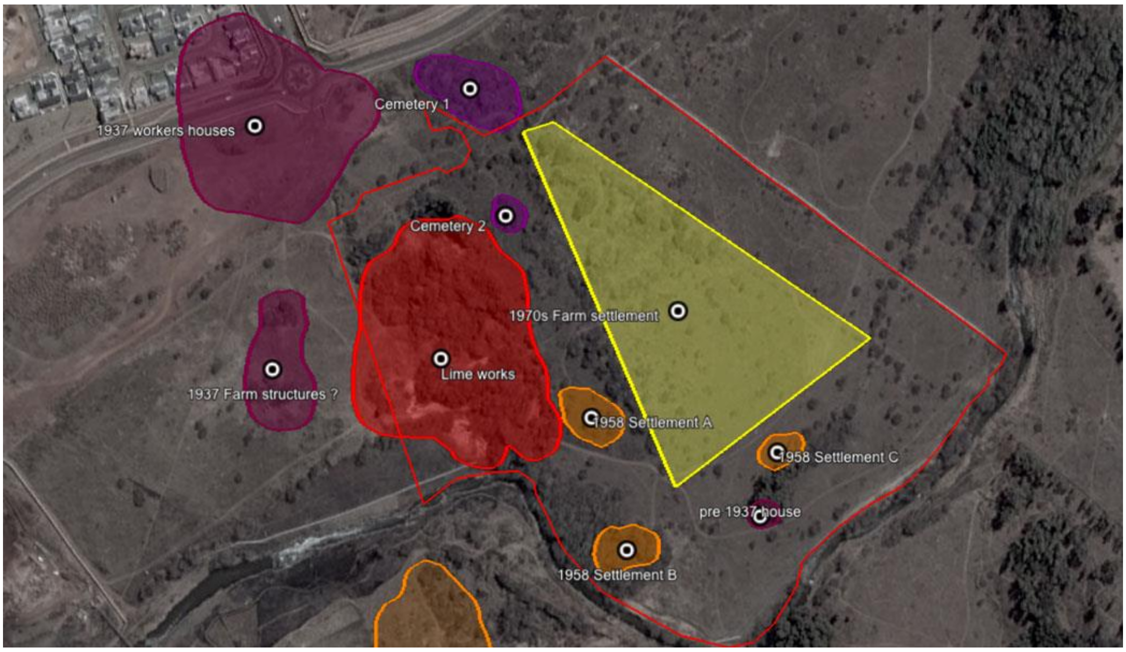

Figure 16. Heritage sites identified during the Phase 2.

6 The lime works

Lime is widely used in the construction, agricultural and industrial sectors. The lime works associated with the Olifantsfontein locality comprise a number of quarries, two lime kilns and the associated infrastructure. The larger lime quarry (No. 3) and the accompanying lime kilns are visually impressive. The depth of this quarry ranges between 15 and 22 m. The two kilns were built into an embankment. A conservative estimate puts the total volume extracted from the quarries at around 155 000 m^3 or 400 000 tonnes of material. Based on the geology and spoil material on dumps, between 60% and 70% of the quarried material was limestone amounting to between 240 000 and 280 000 tonnes. Total lime production is estimated to be between 134 400 and 156 800 tonnes. If packaged by the modern standard of 25 kg bags, this would amount to between 5.3 and 6.2 million bags of lime.

Figure 17. General view of the quarries showing the production area at the bottom left.

Figure 18. Oblique aerial photograph of the double kilns.

6.1 The geology

Limestone deposits formed through the precipitation of calcium carbonate from fresh or sea water or by marine deposition of shells and skeletons of plant and animal organisms. Vast deposits of limestones are present in South Africa (Douglas 1969: 14). Primary limestones are often metamorphosed whereas secondary limestone formed more recently from the weathering of limestone and dolomite and other lime-bearing rocks (Pretorius et al. 1975: 33).

Figure 19. Metamorphosed primary limestones (light grey) overlaid by dolomites with characteristic elephant skin weathering (dark grey).

Limestone is composed mainly of calcium carbonate ($CaC0_3$) but also contains variable amounts of magnesium carbonate, iron oxide, alumina and silica. The generic term limestone is used for most calcium carbonate rocks while rocks with a fine grain or good colour are known as marble. Rocks containing more than 96% calcium carbonate are termed calcium limestones. Dolomites are limestones with a magnesium carbonate content of more than 20%. Historically, dolomitic limestones were not suited to the production of lime due to the presence of magnesium carbonate. Today commercial lime is produced by the calcination of limestone or dolomite, with calcium oxide as the major component. Calcination is a thermal treatment process that result in a thermal decomposition.

Figure 20. Vertical wall of limestone in an area of the quarry mined pre-1936. Also note the horizontal chert layers. The spall marks are indicative of hand mining by hammer and chisel.

6.2 The lime manufacturing process

The manufacturing of lime involves the quarrying, crushing, screening, and burning or firing of limestone to produce unslacked lime. The unslacked lime is then hydrated or slacked packaged and distributed to markets and consumers. The production of lime requires quarrying, crushing, screening and grading of limestone, followed by the burning of the sized stone in kilns, of which there are several types (Douglas 1969: 13). The Olifantsfontein locality is marked by the presence of lime kilns and quarries, and there is evidence for buildings and historical features associated with the production plant, the kilns, work spaces, sorting, crushing areas, dumps of waste material, sheds for storage of the lime and for the coal used in the firing process, loading areas, and accommodation for workers.

The following descriptions of the mining and processing of lime are based on Douglas (1969), Pretorius et al. 1975; Reeks and Coetzee (2010) and the website http://geolancashire.org.uk/publications-and-interpretation/the-manufacture-of-quicklime-in-lime-kilns/ and the observations made on site during the Phase 2 Assessment.

Figure 21. Remains of the kilns and production area showing the remains of several structures, walls, discard piles and building foundations (scale: vehicle length 5 m).

6.2.1 Quarrying, crushing and screening at the Olifantsfontein lime works

The extraction of limestone in this locality was through an open pit quarry system. Overburden was stripped by hand. Scars caused by the removal of overburden are visible on the 1957 aerial photograph and are also present on the northern rim of the quarry. Small-scale stopes were dug, and soil and loose dolomite boulders removed by hand. This is usually done to avoid excessive dust and to prevent material ending up at the bottom of the pit after blasting.

Figure 22. Area where overburden has been excavated behind a large dolomite boulder on the edge of the quarry.

In some sections of the quarry that pre-date the 1936 aerial photograph, it appears that extraction was by hand as no evidence of drilling could be found. The spalling marks visible on the vertical rock faces are typical of hammer- and chisel-based quarrying. Throughout the quarry the limestones have been fractured and broken by metamorphic processes and are eminently suitable for this type of extraction. In some of the later quarry sections drill scars are present that indicate the use of pneumatic drills and jack hammers. This is especially the case on the western-most wall of the largest quarry (No. 3).

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Figure 23. Drill marks on a vertical wall of a quarry. Also see insert showing scar width.

Holes were drilled into the limestone and the stone was broken with the use of explosives. Some evidence of localised explosives holding areas remains along the northern edge of the quarry. These are normally 2 m x 3 m in size surrounded by a 1 m high wall and enclosed by a soil embankment to direct accidental blasts upwards. These are typical short-term holding areas designed to store only the daily charges.

Figure 24. Remains of an explosives-holding area along the northern edge of the quarry.

At each of the quarries the quarried limestone was transported to the crushing area and kilns by means of an inclined stope. In all likelihood a narrow gauge cocopan rail was constructed between the mining area and the crushing plant. This was the typical method employed during this era. During the field survey a single steel sleeper was observed on site.

Figure 25. Detail of the steel rail sleeper measuring 773 mm x 123 mm. Gauge width 600 mm, weight 3.740 kg. Note the white lime residue on the steel sleeper. The residue is present on both sides.

The recovered limestone was removed to a crushing and screening plant. Although no structural features that relate to the equipment and machinery remain, the locality of such a plant is indicated by the presence of large quantities of lime fines and discarded chert cobbles. The lime ores extracted from the quarries were turned into appropriate sizes (20-60 mm lumps) for firing at a crushing floor. The limestones were screened and graded. Any unsuitable material such as chert nodules were discarded at localised dumps.

6.2.2 Lime burning

Burning of limestones is the primary process to create lime. During lime burning heat is transferred from burning fuel and combustion gases to solids. While lime burning is a relatively simple process, other components in the limestone can complicate the process. The temperature in a kiln is crucial. Temperatures that are either too high or too low, and also the duration of the retention period, impact on the quality of the lime. The kiln has to be designed for optimum utilization of heat. A historical kiln was a vertical cylindrical structure constructed of stone or firebrick. The designs of kilns varied greatly and also depended on adjustments made in the process. A supporting ramp of soil around a kiln provided lateral strength and acted as an insulating medium. The earth structure moreover provided a sloping ramp to transport the limestones and coal to the top of the kiln.

Douglas (1969: 17) remarked on the complexities of lime production as follows:

> There are so many variables and different conditions encountered in lime burning that it is not surprising that a great deal of ingenuity has been used in the quest for higher efficiencies. Seldom is the design of two kilns exactly the same even in the same plant. Despite the advances which have been made it is still true to say that lime burning, in common with any other pyrometallurgical process, remains to some extent an art which only the more experienced lime burners seem to comprehend.

Carbon dioxide is driven off from the carbonate rock through heat to produce calcium oxide, i.e. limestone ($CaCO_3$) decomposes into quicklime/unslaked lime and carbon dioxide ($CaO + CO_2$) in the process of calcination.

$$CaCO_3 \rightarrow \text{Heated to } 900^{\circ}C \rightarrow CaO + CO_2$$

$$CaCO_3\ (100\%) \rightarrow \text{Heated to } 900^{\circ}C \rightarrow CaO\ (56\%) + CO_2\ (44\%)$$

The lumps of quicklime are approximately the same size as the original lumps of limestone but much less dense since the removal of carbon dioxide results in a loss of mass. The fuel used in the firing operation was coal, coke or wood. The temperature within the kiln and the retention period also affect the quality of the lime that is produced. The ideal temperature for firing was between 900°C and 1000°C. Higher temperatures resulted in a lime that was baked too hard and too low temperatures resulted in incomplete calcination.

Lime was historically calcined in a variety of kiln types. The older types of kiln relied on natural draught. An ore charge for firing was loaded onto a tilting cocopan, moved up a ramp and emptied into the kiln. Alternate layers of coal and limestone were built on top of a grid of bars until the ore and coal layers filled the kiln to the top rim. The kiln was ignited through access of a portal tunnel on the lowest part of the kiln.

The length of firing time varied greatly and ranged between 3 and 7-10 days. Once the kiln cooled down the calcined lime was removed from the top and bottom. The calcined lime was then taken to the finished product dump. Lime material that was poorly fired was dumped separately, and may have been re-used in later firings. At later kilns the burnt lime was drawn from the bottom of the shaft at regular intervals and additional stone and fuel were added from the top.

An increase in the sophistication of firing equipment generally has a corresponding decrease in the amounts of fuel and labour required, and also the ability to produce larger quantities of high quality limes. The kilns present in the study area were built for continued usage over considerable periods of time.

Permanent kilns are divided into two types: flare kilns and draw or running kilns. The two types have a very similar construction. There is generally a broad chimney, often set into the side of a hill. The kiln is loaded from the top (the hill side) and fired from the bottom. Flare kilns are loaded with a single charge of limestone and fuel. Firstly a vault of limestone blocks is built over the furnace, above which the rest of the limestone is stacked. The fire is lit and kept stoked for several days until all the limestone has been calcined. The kiln is then unloaded, the lime sent to the slaking pits, and the process repeated with the next batch of limestone.

Draw kilns have a permanent grate fixed over the furnace and the limestone is stacked above this in layers alternating with layers of fuel. As the fuel burns the limestone is calcined and the lime drops through the grate from where it is removed through the stoke hole. As the fuel/lime layers drop through the grate, further layers can be added at the top, allowing for a continuous process to be operated. Both types of kilns have their advantages and disadvantages. The obvious advantage of a draw kiln is that large amounts of lime can be produced, and it is more efficient in fuel use.

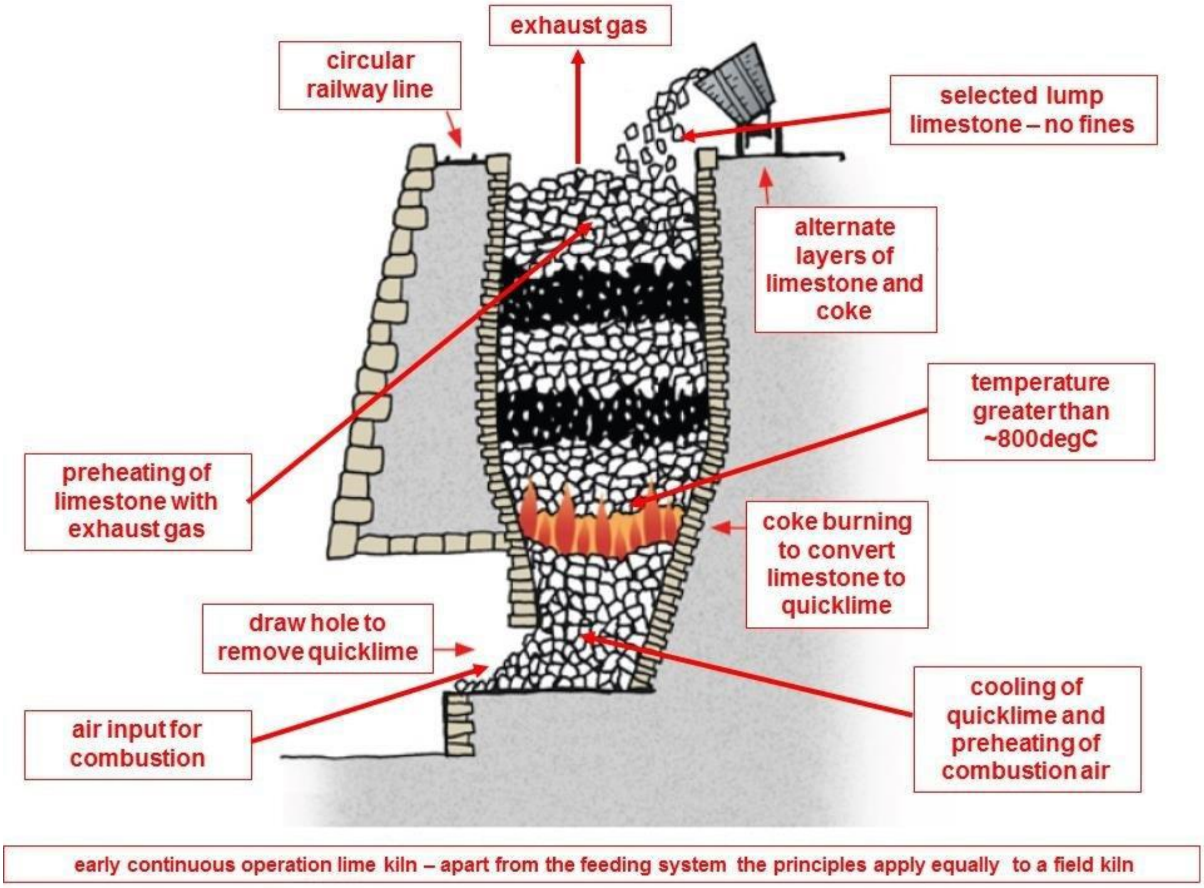

Figure 26. Drawing showing principles of operation at a continuous process lime kiln. Relatively early kilns would be filled with alternate layers of fuel and limestone as shown here. In this diagram the fuel is described as coke, but coal, wood and charcoal were also used (http://geolancashire.org.uk/publications-and-interpretation/the-manufacture-of-quicklime-in-lime-kilns/).

The draw kiln was further improved later on by introducing a side chute to feed the coal into the kiln. Coal typically contains between 20% and 30% by weight of volatile matter, consisting of methane and other combustible gases. Because the coal was heated slowly the volatile matter was evaporated before the temperature was high enough for it to burn. Consequently, much of the heat value of the coal was wasted. This made the kiln even more efficient as the volatile components of the coal were fired directly and not driven off in the heating process as was the case with the alternating layers of coal and limestone.

After the mid-19th century most designs incorporated fuel chutes into the hottest part of the kiln.

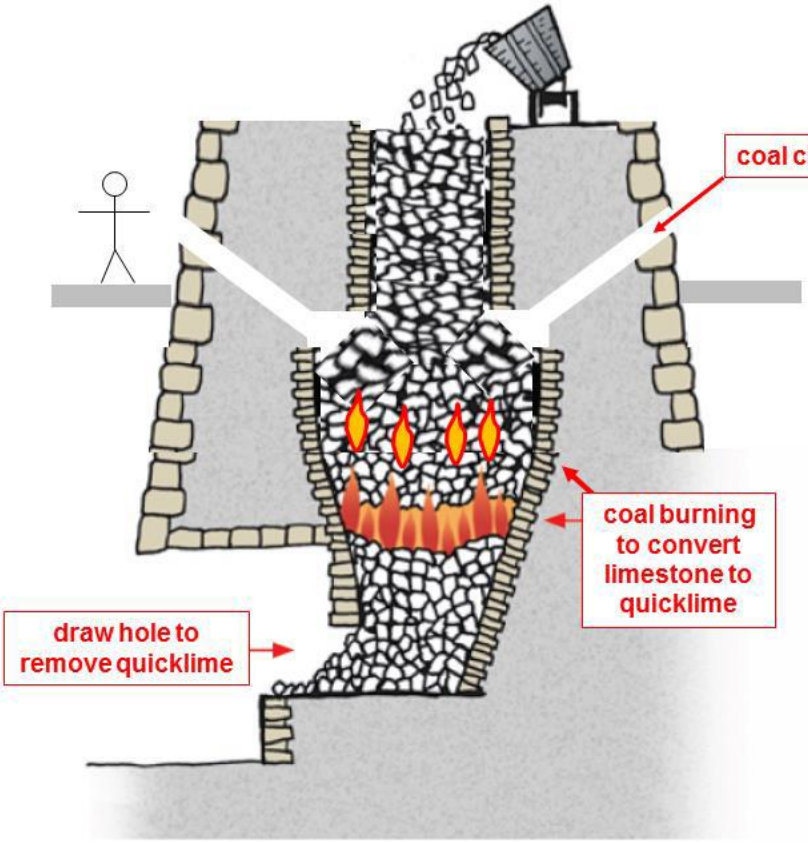

Figure 27. Diagrammatic representation of a lime kiln with coal chutes, designed to introduce coal into the calcining zone of the kiln and therefore to make more efficient use of the coal. All modern kilns operate on this principle or something very similar (http://geolancashire.org.uk/publications-and-interpretation/the-manufacture-of-quicklime-in-lime-kilns/).

6.2.3 Hydration

Hydration is a further step in the process. When a controlled amount of water is added to quicklime this produces a violent reaction accompanied by heat. In the chemical reaction with water the lumps of quicklime break down to a dry fine white powder, calcium hydroxide, known as hydrated lime or lime hydrate: Quicklime (CaO) + water (H_20) --> hydrated lime ($Ca(OH)_2$). When too much water is added a slurry of paste of hydrated lime, known as slaked lime, is produced re-carbonated by the carbon dioxide of the atmosphere (slaked lime is used for lime-washing walls). The Kritzer type of hydrator was generally used in South Africa. Hydrated lime can be packed in paper bags. Bulk tankers were later used for larger consumers. Lime mortar consists of a mixture of hydrated lime, sand (and/or other finegrained material such as coal ash)

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and enough water to make a workable paste. It hardens through the reaction of hydrated lime with atmospheric carbon dioxide to produce calcite. Air-slaked lime is less caustic than lime hydrated with water since with air-slaking some of the lime is re-carbonated by the carbon dioxide of the atmosphere (Douglas 1969: 17).

6.3 The Olifantsfontein lime kilns

The two lime kilns present on the site seem to have been in use since the late 1880s to around the early 1950s.

Figure 28. The kilns viewed from the southeast. The eastern wall is the most stable and intact while the southern wall (concealed by trees) had partially collapsed and was repaired at some stage.

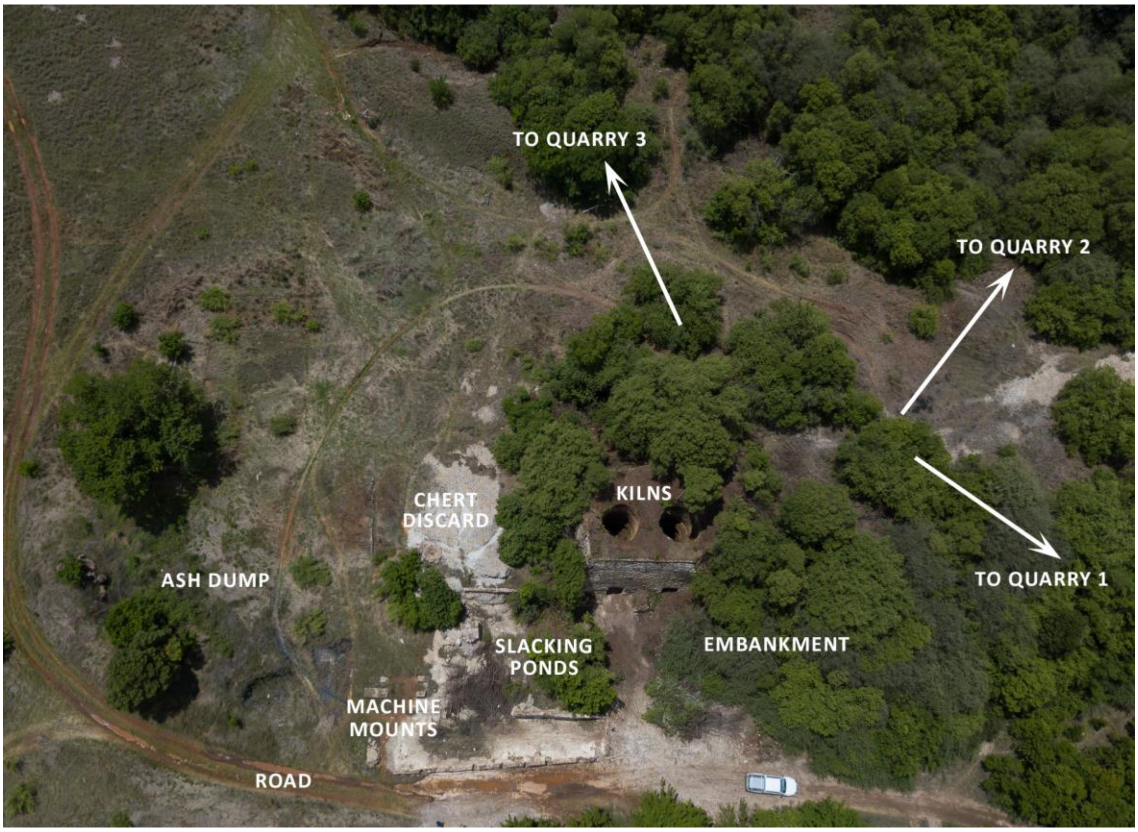

Figure 29. General view of the kilns and lime works area.

6.3.1 History of the Olifantsfontein lime kilns and associated works

John Richard Holmes, who was contracted by Cullinan and a partner to survey the proposed Johannesburg-Pretoria link for the rail line, found high-grade clay deposits on three farms (Olifantsfontein, Kaalfontein en Sterkfontein) (Heymans 1989: 31). He had also discovered extensive deposits of blue lime in 1894 (Heymans 1989: 31). With a partner, AY Niven, he established a lime-burning company in 1893 and Holmes Lime Works Ltd was registered in 1895 (Helme 1974: 122; Heymans 1989: 19). Note that despite an extensive search, no further information on the Holmes Lime works could be found. Holmes obtained a lease over the farms around the clay and lime deposits. In November 1896 a lease, with the right of future purchase, was obtained from a farmer P Schoeman, for around 1900 ha on farms around the quarry with the rights to prospect for and to mine clay. An excellent source of clay was discovered (Heymans 1989: 31). A brick-making firm soon followed with the establishment of the Kaal Spruit Fire Brick Company around 1896.

According to Helme the original quarry of Holms Lime Works is some two km north of where the Cullinan complex at Olifantsfontein developed (1974: 122). This is also consistent with the identification of this site by Van Schalkwyk (1998: 24) as the remains of the lime kiln and other works established by John Richard Holmes in the 1890s (25°55'47.7"S; 28°12'53.2"E).

Around the same time (1897) Thomas Cullinan became managing director of the Rand Brick and Tile Company in Boksburg.

In 1902 Holmes Lime Works and the Rand Brick and Tile Company, the latter established by Thomas Cullinan, amalgamated to form the Consolidated Rand Brick, Pottery and Lime Company. The two kilns at Olifantsfontein are very similar to British designs dating from around the 1880s – 1900s and were most likely constructed during this period.

The distinctive maker marks stamped on the fire bricks from inside the kilns provide the most reliable evidence for dating the kilns. During the life cycle of the kiln and the burning process the fire brick lining gets damaged and needs to be replaced. There is strong evidence for the repeated replacement of the lining both inside the kilns and in the waste or discard piles around the kilns. The firebricks in the top two thirds of the kilns are the most prone to fire damage and need to be replaced periodically.

Figure 30. Top view of the southernmost kiln. Note the double brick lining of the kiln and the extensive damage to the brick lining caused by the firing of the kiln. Most of the

undamaged bricks in the top layer are replacement bricks.

Figure 31. A similar condition is evident in the northern kiln. Note the repair work done in the 1940s with salt-glazed fire bricks (dark) and ordinary fire bricks (light). The mortar is lime based.

The figures above illustrate that sections of the brick lining had to be regularly replaced. This is, however, not the case throughout the whole of the kiln. The brick work in the lower third of the kiln exhibits low levels of exposure to fire and it is in this area that more of the earliest types of bricks remain intact. The four most distinct types consist of a fire brick manufactured by Schmidt & Son; Kaal Spruit Bricks; a pressed brick from the Rand Brick Company in Boksburg; and, lastly, bricks produced by the Consolidated Rand Brick Potteries and Lime Company.

The Schmidt & Son brick is an extruded brick that shows significant warping. This brick was manufactured through a wet extrusion process with the makers mark stamped into the clay by hand after extrusion. These bricks probable date to the 1890s. The Schmidt & Son bricks co-occur with the Kaal Spruit bricks.

Figure 32. A brick produced by Schmidt & Son Fire Brick Co. that likely dates to the 1890s. Note the horizontal extrusion marks and also warping of the brick.

The Kaal Spruit bricks were manufactured with clay extracted from the Olifantsfontein quarries at a brick plant founded by Holmes in 1896, known as the Kaal Spruit Fire Brick Company. Similar to the Schmidt & Son brick, the Kaal Spruit brick is also an extruded brick but with less warping evident. The application of the makers mark is also much more consistent. The Kaal Spruit bricks are the main bricks used in the bottom interior lining of the kilns, thereby confirming the construction of the kilns after 1896.

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Figure 33. Kaal Spruit brick manufactured between 1896 and 1902. Although extrusion marks are not clear the warping and cracking of the brick allude to the manufacturing process.

The third brick present in the kiln interior is a pressed brick type manufactured by Cullinan's Rand Brick and Tile Company based in Boksburg. Only a limited number of these were observed in and around the kilns. These bricks were produced from around 1896 up to 1906.

Figure 34. A clay brick from Cullinan's 1896 company

Consolidated Rand Brick, Pottery and Lime Company, founded in 1902, changed makers marks over time but most of the bricks present in the early discard heaps bear the initials CRBP & L Co.

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Ltd. These are probably the first maker marks used by the company from 1902 onwards.

Figure 35. Example of the CRBP & L Co. Ltd mark within the frog of a brick manufactured by the Consolidated Rand Brick, Pottery and Lime Company founded 1902. This brick is from the waste stockpile to the east of the water furrow.

Between the early 1900s and the 1940s the kilns and associated quarries were operated intermittently. This is based on records from the Olifantsfontein works and the available aerial photographs of 1937 and 1958.

6.3.2 Kiln construction at Olifantsfontein

The two kilns were most likely constructed simultaneously as they are virtually duplicates. The first phase of the kiln construction involved the building of a kiln base and the two arched entrances on the eastern side of the kilns. These were partially constructed of local stone up to a height of around 1 meter with the archway built of locally manufactured unmarked and low-fired bricks. These bricks have a typical home-made frog (a recessed area in moulded bricks) and are manufactured from a low-quality sand clay mixture. The brickwork associated with the draw holes extends 4200 mm deep below the kilns.

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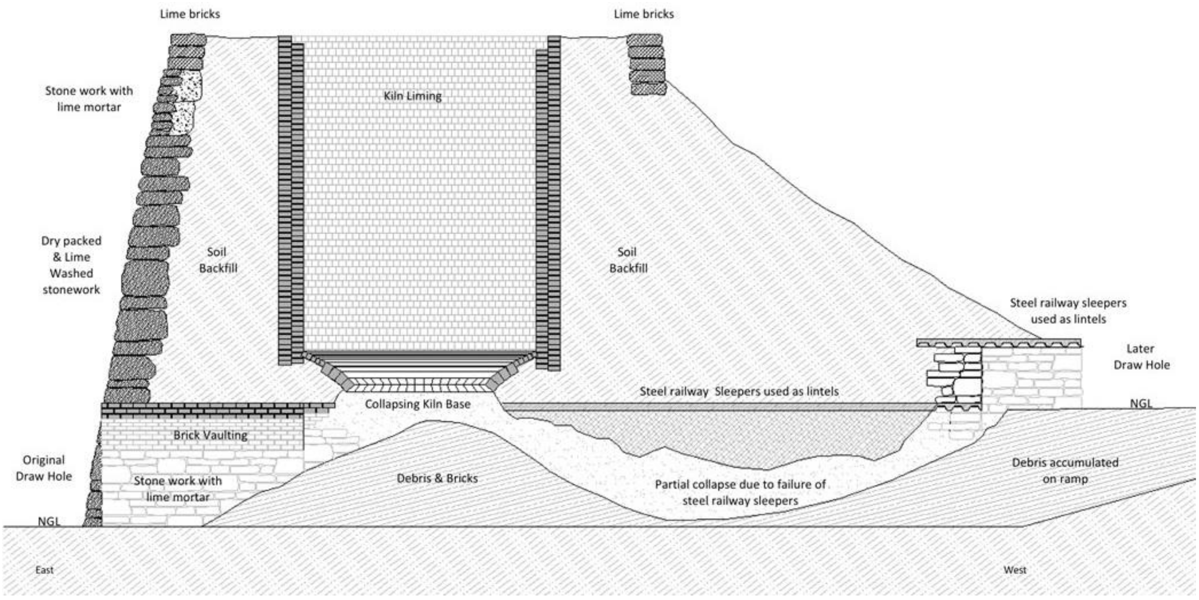

Figure 36. Detailed section through one of the kilns looking South .

Figure 37. Detail of the kiln entrance showing the rock and brick construction. Note the lime floor and debris that have accumulated in the interior of the kiln. The scale on the ranging rod on the left is demarcated in 500 mm sections with a total length of 2000 mm.

Figure 38. Interior view of the draw hole. Note how the bricks in the top of the arch were cut as key stones.

Figure 39. Detail of the exterior stone cladding and brick vault joint.

On the interior of the kilns there is a clear construction joint between the kiln base and brick vaulting and kiln floor. It appears that the kiln base may have been altered at some stage to change the kiln from a flare kiln to a draw kiln.

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Figure 40. Detail of the joint between the brick vaulting and the kiln base. Note the erosion of the low quality bricks and the frog imprint.

It is unclear how far down the brick lining of the kilns extends. It seems that the kiln base was built up with a combination of rock, bricks and soil fill material. The kiln base is approximately 400 mm above the brick vaulting, thereby allowing for sufficient space for upright walking to the base of the kiln. In both kilns the kiln bases have partially collapsed — it is inferred that this is due to the alteration of the kilns and the installation of the steel grate at the bottom of the kilns to alter the structures to draw kilns.

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Figure 41. Detail of the joint between the vertical kiln lining and the kiln base. Note the few lumps of unburnt limestone that remain on the kiln base.

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*Figure 42.	Detail of the brick coursing of the vertical lining of the kiln.*

*Figure 43.	Detail of the firebrick used at the centre of the kiln base. The first few rows were lined with ordinary fire bricks but the fire-bricks in the last two rows have different dimensions. The bricks are 160 x 140 x 200 mm in size.*

6.3.3 Changes to the kilns over time

There is clear evidence that the kilns were altered and changed over time as the mining operations and available technology changed. The first evidence of change is on the eastern wall where it is evident that the kiln height was raised at least three times. The first two raises were constructed with stone and the last with lime-based bricks that had been manufactured on site.

Figure 44. Consecutive raising of the kiln height. Note the original stonework quality versus the two later additions and the lime bricks at the top.

On the western side of the kilns extensive changes were made over time. The exact instant or timing of these changes are not known but it is apparent that the first of these was undertaken relatively early in the history of the kilns. In the last operational phase further changes were effected.

It seems that the western side of the kilns was originally only an embankment, which is typical for this British type of kilns. At some stage in the life cycle of the kilns two additional draw holes were constructed on this western side. These later draw holes differ from the original ones on the eastern side in that no brick vaulting is present. The stonework of both of the more recent draw holes is of a relatively good quality. On the 1936 aerial photograph there is evidence that these draw holes were already in existence as a large discard pile has formed on this side of the kilns.

The draw holes were originally covered with recycled steel railway sleepers and steel sheeting before allowing the soil embankment to partially cover the roof (see Fig. 36 of section drawing). The current surface level is approximately 1.5 m higher than the original work surface and there must have been an inclined ramp to access these draw holes.

Figure 45. Additional draw holes likely constructed at a later stage.

Figure 46. Note the remains of steel railway sleepers in the draw holes.

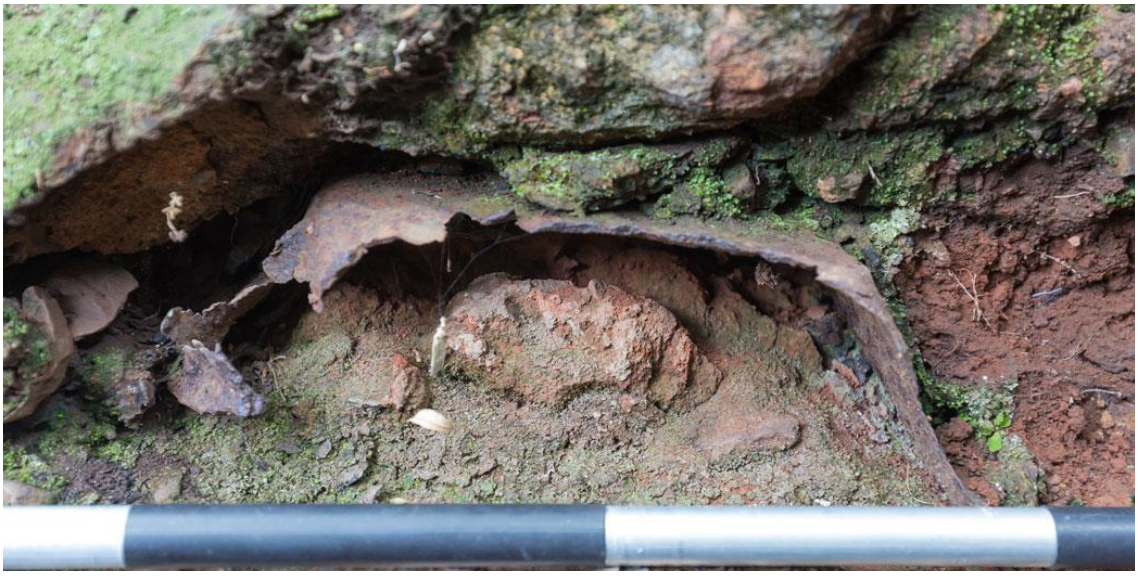

Figure 47. Remains of a steel railway sleeper used as a lintel.

The last phase of quarrying and lime burning took place before 1958. On the 1958 aerial photograph it is evident that the works are already abandoned. However, regrowth of vegetation is not yet evident. The ramp in the figure below is associated with this last phase of quarrying and lime burning.

Figure 48. *Retaining ramp constructed over the second draw hole.*

Extensive damage to the western embankment and southern retaining wall was likely caused by an attempt to install a coal chute in the southernmost kiln. The chute is an earthenware irrigation pipe from the Olifantsfontein works. The pipe and surrounding bricks show no sign of vitrification or burning. Kilns with coal chutes or ports have a recessed design that allows the coal to feed into the kiln automatically (see Fig. 27). In the absence of such a recess this modification likely failed.

Figure 49. Modification of the kiln by introduction of a coal chute. There is no vitrification of the brickwork or pipe and it is unlikely that the intervention ever worked.

Figure 50. Note the poor quality walling on the west section of the kiln close to where the coal chute was installed.

Figure 51. Due to thermal expansion, distortion and the installation of the coal chute the southern wall of the kiln buckled and broke in several places. Note the large section behind the surveyor that was subsequently repaired.

Figure 52. Another example where repairs were undertaken on the south-western corner of the kiln. Note the Cullinan brick in the wall.

6.3.4 The lime processing area and plant

Apart from isolated walls, machine foundations, building outlines and discards piles, very little evidence of the lime processing remains. The study area contains several limestone deposits. Over and above the three quarries on the remainder of Portion 46, an extensive lime quarry was in existence on the eastern side of the Kaalspruit not included in the area of survey. However, it is unclear whether lime burning actually occurred at or around the latter locality as there is currently no evidence for a lime kiln or associated infrastructure in the vicinity of this quarry. The lime extracted from the quarry on the opposite side of the Kaalspruit may have been transported to the existing kilns on Portion 46 for burning. Scrutiny of the 1937 aerial photograph reveals that there is only one area on Olifantsfontein where lime works were present, namely on the remainder of Portion 46 where the extant double kilns are located. The situation of the processing plant in this particular locality may be on account of the availability of water from the furrow since water is critical in the manufacturing of hydrated lime. See figure below.

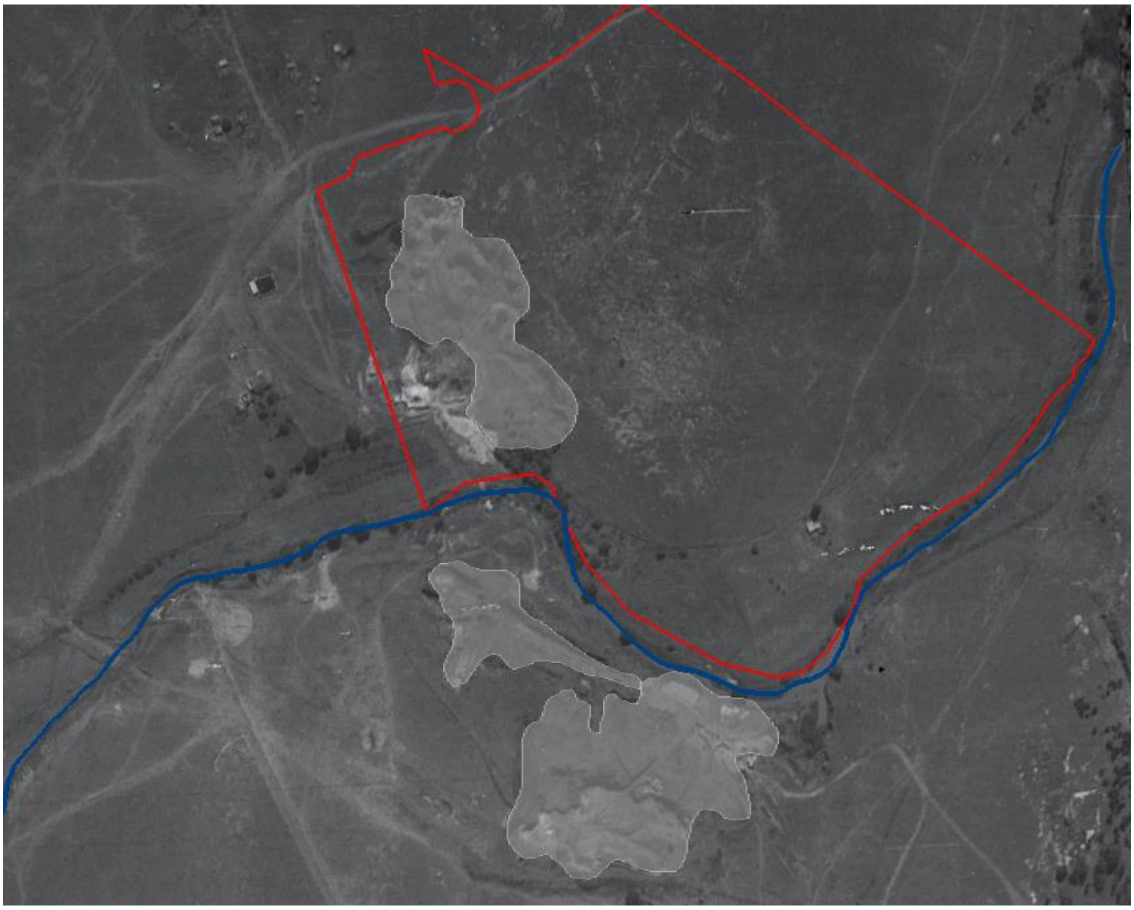

Figure 53. Historical limestone quarries at Olifantsfontein. The red line demarcates the study area, the blue indicates the Kaalspruit. The aerial image was extracted from the 1937 regional aerial photograph.

The lime processing plant typically comprised a crushing and screening area in a zone directly above the kilns to facilitate loading of the kilns. The only current evidence for such an area is the presence of screened and crushed unburnt limestone directly north of the kilns. Following on the calcination of the lime through burning, lime would be drawn from the draw holes and hydrated.

Over time the processing of the lime no doubt became more mechanized and advanced. It is highly likely that the plant area was adapted and changed during the life cycle of the works to make the operations more efficient. Thomas Cullinan was well-known for his early adoption of new technologies in manufacturing technology and the import of machinery to make his enterprises more profitable.

6.3.5 Early processing

At the original draw holes there is evidence for two slacking ponds directly south of the kiln

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draw holes. Ash and burnt coal were separated from calcinated lime and dumped on an ash discard pile. It is likely that some sort of screen or sieve was placed over the slacking ponds to allow only fully calcinated lime to be hydrated. The slacking ponds were filled with water and calcinated lime was then added for hydration. The discards were frequently handpicked to remove materials that retain an unburnt lime core, known as bullheads. The removal of bullheads ensured a better quality product. The hydrated lime was then further screened to remove impurities. Evidence of the former is clearly visible in the discard pile to the east of the water furrow. The discard piles reflect sizing and screening of lime prior to hydration to remove larger discards that ranged in size from 150 mm, 75 mm and 20 mm. There is also a second discard pile in this locality that contains much finer impurities ranging in size from 5 mm to 20 mm.

Following hydration of the lime the products would have been packaged in bags or transported in bulk. Some evidence of packaged lime remains in the form of lime bags that hardened or set. The lime in these specific examples was packed in hessian bags (see figure below). The loading and stacking floor is still clearly visible.

Figure 54. Imprints left by hessian bags.

Figure 55. Remains of a mounting block in plant area.

Figure 56. Unidentified structure in the lime production area. This could have been part of an aerial cable way that connected the quarry on the other side of the river (pers. Comm. D Cullinan).

Figure 57. Ramp-like structure made of lime-filled hessian bags. Note the cables imbedded in the structure on the right.

Figure 58. Mounting block for machine showing a flywheel imprint and hydrated line residue. This was presumably a mechanical screen with an offset flywheel to vibrate the screens.

Figure 59. General view of the lime stacking and loading area with the kilns in the background. This area was probably covered with a roof structure.

Figure 60. Detail of lime residue that accrued next to the loading area. Note the horizontal accumulation of lime on top of the floor level. There is also a clear vehicle track imprint next to the photographic scale.

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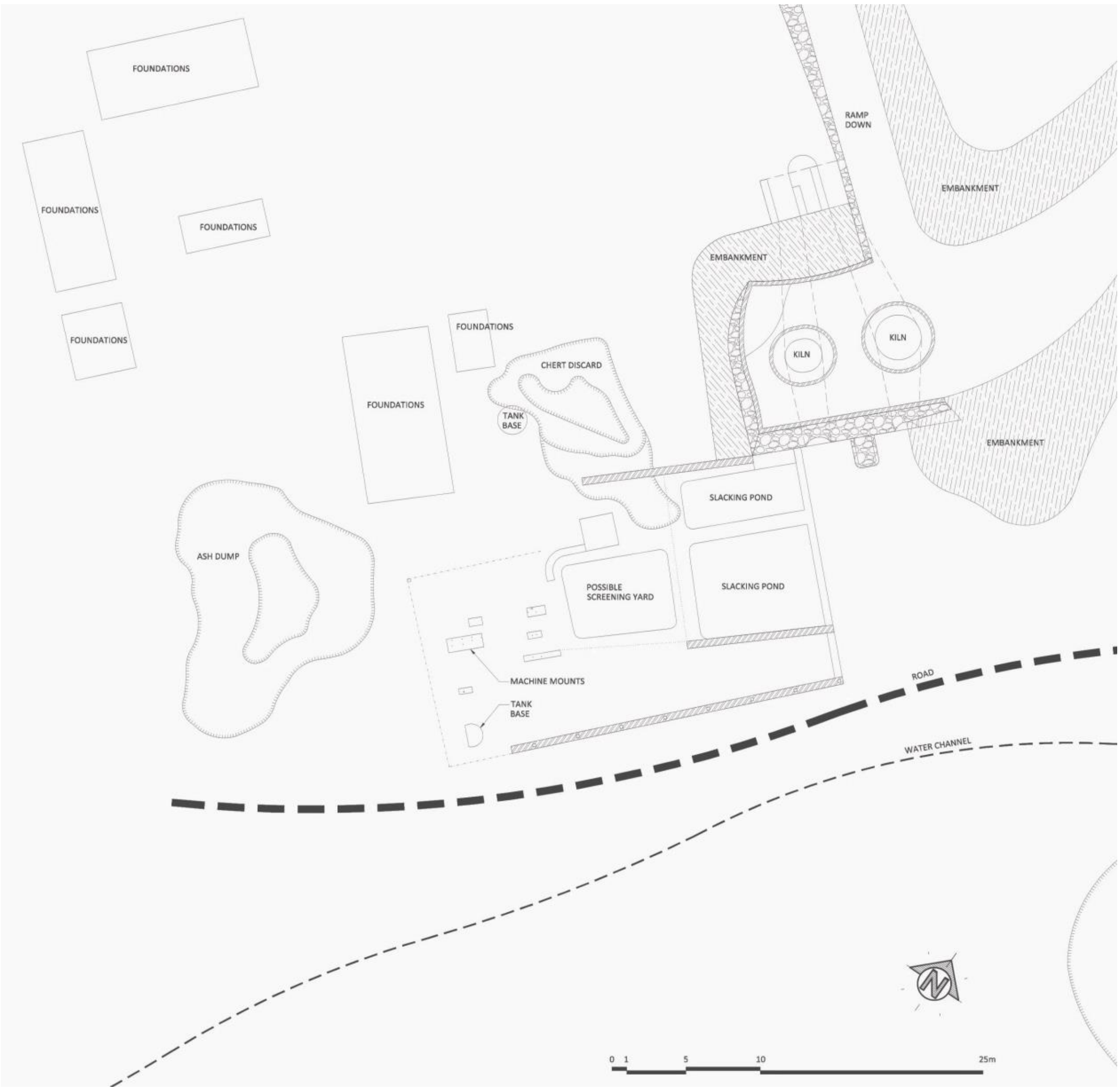

Figure 61. General layout of plan of the lime processing area.

Figure 62. Vitrified bricks from the kiln lining dumped in a discard area

Figure 63. General view of the discard pile to the east of the furrow. Note the alternating diagonal layers of dumped material.

Figure 64. Coarse screened material ranging in size from 150 mm, 75 mm, 50 mm and 20 mm.

Figure 65. Fine screened material ranging in size from 5 mm to 20 mm.

6.3.6 Later stages in the life history of the processing plant

From the 1958 aerial photograph it is evident that significant changes and addition to the plant area has been made and that there are several new buildings and structures at the Olifantsfontein lime works. The location of slacking ponds for the eastern draw holes remains unknown. The presence of a discard pile at these draw holes indicates that processing likely occurred in close proximity. One of the buildings in this locality may have contained a mechanized hydrator such as the Kritzer hydrator that was generally used in South Africa.

Figure 66. Detail of the plant area on the 1958 aerial photograph.

From the early 1920s extensive prospection for lime deposits resulted in the development of several new lime processing plants throughout the country. Of these large-scale operations such as the Marble Hall and Taungs/Buxton operations were more economical, causing a significant reduction in the price of lime. In 1954 the Silver Streams Northern Cape lime processing plant with a rotary kiln began production with an output of 400 tons of lime per day. Ultimately the development of major lime producers with more advanced mechanized equipment, large-scale easily extracted deposits and more efficient processing plants impacted significantly on the economics of small-scale operations such as at Olifantsfontein, and most likely triggered the closing of this facility.

The product advertisements of the Consolidated Rand Brick, Pottery and Lime Company Ltd document changes in the products available from the company. In the early 1920s best blue hydraulic lime is included in the product range of Conrand. By 1931 the Cullinan Trust owned all shares in the company and the maker's marks, wording and associated frogs on the bricks changed to reflect Cullinan only. Advertisements under the Cullinan label no longer included mention of blue hydraulic lime. Lime, however, remained a key ingredient in the clay industry and the factories no doubt still consumed significant quantities of this mineral. It is likely that by the mid-1950s the lime was sourced from more economical large-scale commercial operations.

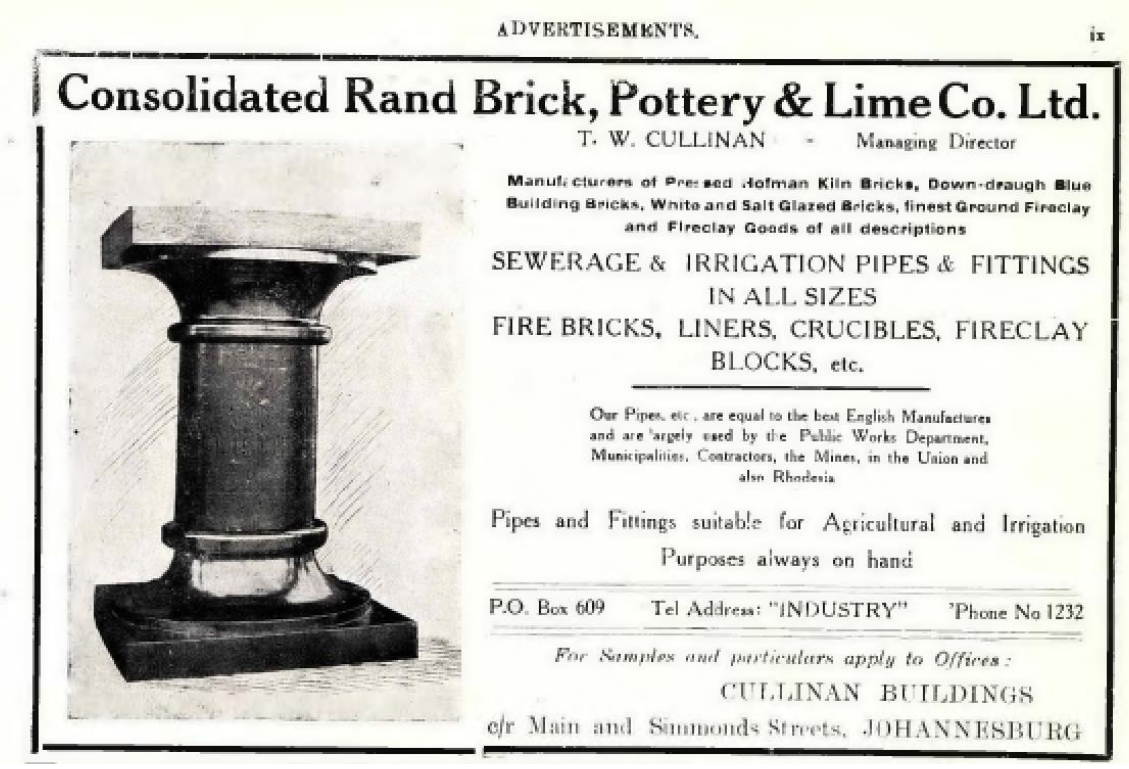

Figure 67. 1918 advertisement.

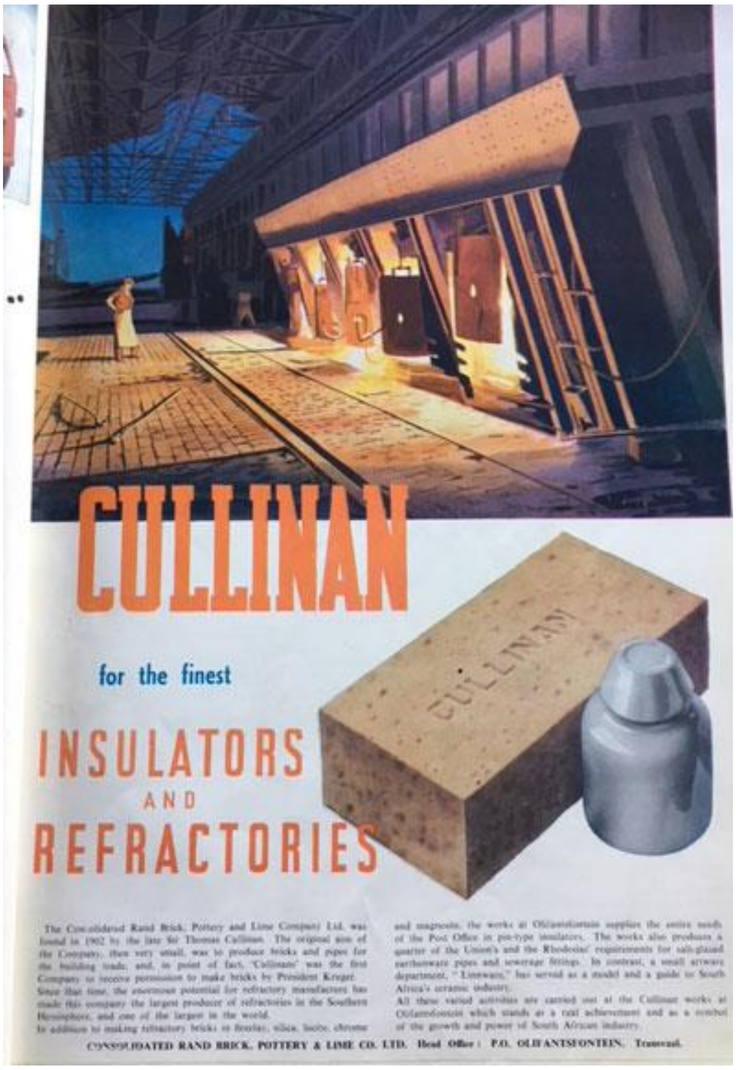

Figure 68. 1955 advertisement.

6.4 Quarrying operations

Three quarries are present on the remainder of Olifantsfontein Portion 46. The chronology of the quarries is difficult to discern. Based on the presence of spall marks on quarry faces the easternmost quarry (No. 1) is deemed the oldest. The earliest photographic record of the quarries is the 1937 aerial image. In this image the quarries are already partially overgrown and several large trees have been established inside. The trees and vegetation in all of three early quarries are approximately of the same size. A comparison of tree growth between the 1937 and 1958 aerial photographs allows for a relative dating of the suspension of the lime works. A conservation age approximation for the trees that established themselves in the quarries in the 1937 photograph is around ten years. This would imply that the operations at the lime works ceased temporarily at some stage in the late 1920s before operations resumed at some time in the 1940s. This is further substantiated by the dates on headstones in the nearby cemeteries (see section 7). At some time around the late 1950s all lime working had terminated.

The oldest easternmost quarry (No. 1) has been partially backfilled in the recent past. The initial quarrying for limestone was most likely by hand as no evidence of drilling or blasting is evident on the early quarry faces (see Fig. 20).

The second quarry (No. 2) directly west of the first is approximately 15 m deep. On the northern edge of this quarry at least one explosives holding structures is present. Due to the overgrown nature of the quarry and quarry faces no drill or blast marks could be located.

The third quarry (No. 3) was in existence pre-1937 but was extensively further worked at some stage between 1937 and 1958. This quarry is approximately 22 m deep.

Figure 69. Quarry expansions in the final phase.

7 Other sites

A number of other sites have been recorded within the remainder of Portion 46. These include building foundations, cemeteries, waste dumps or middens, and other farming-related infrastructure.

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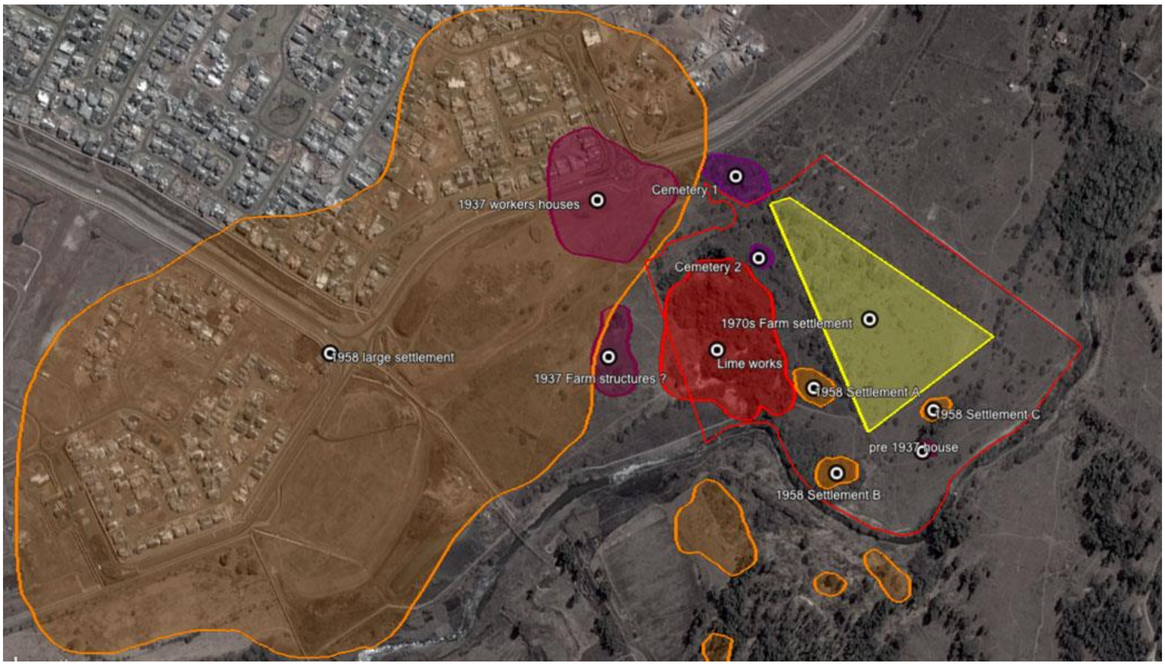

Figure 70. Distribution of sites in the wider area.

7.1 The 1940s settlements and cemeteries

The 1937 aerial photograph shows several isolated structures due west of the quarry. These small dwellings were probably associated with farming activities. By 1958 an extensive settlement had developed east and south of the remainder of Portion 46. This settlement included houses (approximately 150), shops and a church. The settlement was located on the farm Olifantsfontein owned by the Conrand Company. The footpaths that radiate from this settlement suggest that a significant proportion of the people associated with the settlement walked to and probably worked at the Olifantsfontein industries.

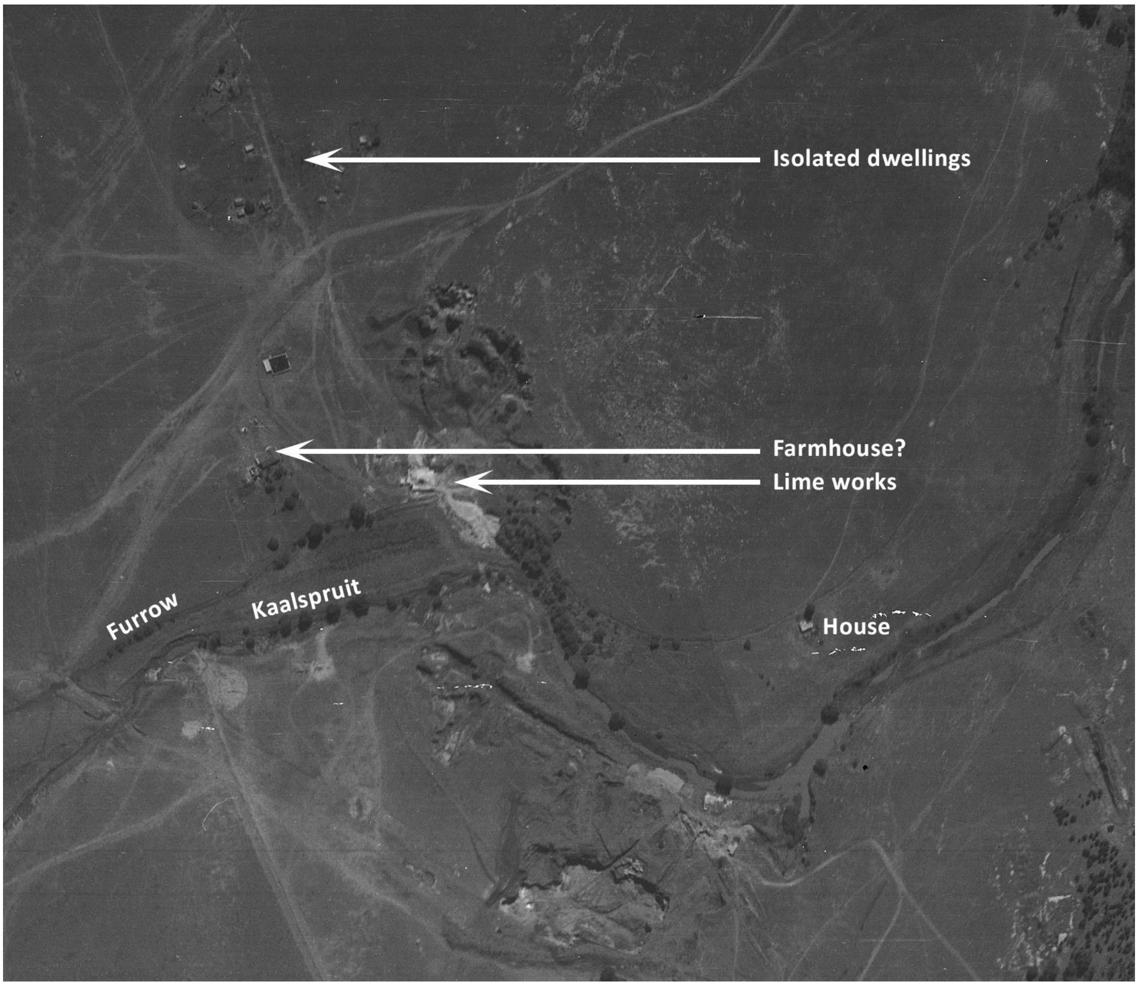

Figure 71. *Excerpt from the 1937 aerial image.*

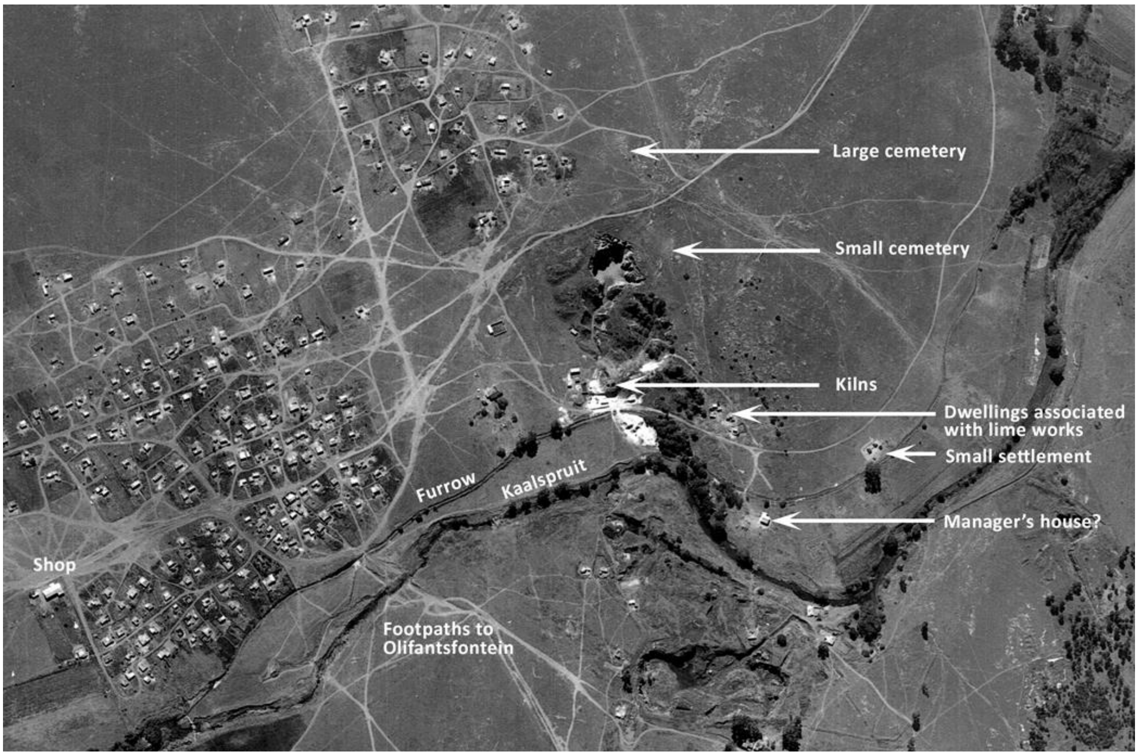

Figure 72. *Detail of the 1958 settlements around Olifantsfontein.*

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The remains of a small settlement that had approximately eight houses occur directly northeast of the lime works. These structures also appear on the 1958 aerial photograph and seem to relate to the last phase of the lime works. In view of the low levels of structural remains and the low significance accordingly ascribed, no mitigation measures are recommended.

A larger house, possibly that of a mine manager, was located northeast of the quarries between the Kaalspruit and the water furrow. At present this area is heavily vegetated and virtually no structural remains are visible.

The remains of another isolated settlement comprising three houses have been recorded further north and close to the furrow. The dwellings in the settlement were constructed with earthen building materials. The occupation also seems to have been short-lived. The structures collapsed and disintegrated after they had been abandoned. No mitigation measures are recommended.

The two cemeteries that have been recorded on the remainder of Olifantsfontein Portion 46 are also clearly visible on the 1958 aerial photograph. Collectively the two cemeteries contain more than 400 graves. Most of the graves are unmarked. The oldest grave with a headstone dates to 1940. The most recent burial dates to 1958, which is also the date of the aerial photograph. A new township, Tembisa, was established in 1957 when people were resettled from Midrand, Alexandra, Kempton Park and Germiston. Ceramics that can be linked to the Olifantsfontein industries have been placed on several of the graves. Some of the graves show evidence of having been recently cleaned and are clearly attended to by relatives and/or close friends.

Note that the cemeteries will have to be incorporated into the proposed development.

Figure 73. One of the earliest grave stones in the larger of the two cemeteries

Figure 74. *Example of grave goods.*

Figure 75. *Earthenware vessel on grave.*

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7.2 Infrastructure of the 1970s

The 1980 aerial photograph documents extensive rural residential and farm-related infrastructure on a major portion of the land. These structures fall outside the ambit of the Heritage Act. No significant building remains, burials or other heritage artefacts are associated with these and subsequently no further recording has been undertaken. These do not have legislative protection and do not require a permit issued by SAHRA before demolition is undertaken.

Figure 76. Detail from the 1980 aerial photograph. Note the farm infrastructure that has developed to the north and east of the quarries during the 1970s.

8 Findings

From a heritage perspective based on the observations made on site as well as the desk top research the lime kilns and associated quarries are deemed the most important heritage resources on the remainder of Portion 46 of Olifantsfontein 410 JR. The kilns are unique and of special interest and heritage value. Accordingly, the kilns will have to be incorporated into the proposed development in a meaningful way.

With the removal of people that occupied the land in the late 1950s most traces of their settlements and associated cultural material were destroyed as is evident from the 1980s aerial photograph. The cemeteries associated with these settlements remain intact and must be protected.

The various other structures that were formerly erected across the study area have all been historically destroyed or demolished. The remains mainly comprise vestiges of foundations or vague outlines. None of these are deemed to be of heritage value since a great many structures from this period remain elsewhere.

9 Statement of significance

Section 3(3) p. 14 of the South African Heritage Resources Act (Act No. 25 of 1999) specifically states the following with regard to significance:

- *" … a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—*
- *its importance in the community, or pattern of South Africa's history;*
- *its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;*
- *its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;*
- *its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;*
- *its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;*
- *its importance in demonstrating a high degree of creative or technical achievement at a particular period;*
- *its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;*
- *its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and*
- *sites of significance relating to the history of slavery in South Africa".*

For the purposes of this Phase 2 Assessment the significance of identified heritage resources was considered by investigating and rating (Assigning a value of High, Medium or Low) to each of the following attributes:

- **Cultural value:** the value that a site holds for the community or a section thereof;
- **Social value:** refers to the qualities of the locality which make it a place that has become a focus of spiritual, cultural, local, provincial or national identity;
- **Historic value:** recognising the contribution a place makes to the achievements and our

knowledge of the past;

- **Scientific/Research or Archaeological value:** refers to the potential of a site to contribute unique knowledge that is not obtainable elsewhere.
- **Site integrity:** Elements to consider can include the extent of preservation as based on a surface survey and any observable disturbances that may impact on the integrity (cultural/non-cultural/environmental degradation).
- **Richness:** This can refer the range of features present, depth of deposit and/or quantities of artefactual objects, e.g. Stone Age, Iron Age and Historical occupations.
- **Proximity or accessibility**. This can be either positive or negative depending on the specific future site-use, proposed developments or the impact on local communities. For instance a site that is easily accessible and in close proximity to an existing community provides various opportunities for either future development or conservation that can also contribute to economic upliftment and growth. Such a site should accordingly be assigned a higher value
- **Aesthetic value: R**efers to the inherent beauty, sense of place, design, form, style and artistic expression that a specific place holds.
- **Hierarchal significance rating:** In terms of the NHRA Act (Act No. 25 of 1999:55, par. 8) sites may have local, provincial or national significance. We also have to recognise the limitations of existing knowledge or the political paradigm and, moreover, that changes in these may impact on future significance. Hardesty & Little (2009:12) take this one step further and recognize sites of worldwide importance.

Value	Rating	Lime kilns	Quarries	Cemeteries
Cultural value	High Medium Low	**High** The site has high cultural value in the present state since the structures are widely regarded as unique and significant by the surrounding communities.	**High** The site has high cultural value in the present state since the structures are widely regarded as unique and significant by the surrounding communities.	**High** The site has high cultural value in the present state since the structures are widely regarded as unique and significant by the surrounding communities.
Social value	High Medium Low	**Medium** The lime kilns are deemed important by the surrounding community.	**Medium** The lime kilns are deemed important by the surrounding community.	**High** Evidence for current visitation to graves within the cemeteries demonstrates that the social value contributes to the spiritual and local identity of descendants of the past community.
Historic value	High Medium	**High** The lime kilns are of	**Medium** Most of the other	**High** The cemeteries are of

	Low	high historical significance since they represent an important phase of the early industrialization of the country. They exhibit unique architectural and technological features and advancements.	quarries within the immediate region have been filled in. Collectively the quarries document the changes in extraction technology over time.	high historical value on account of the forced removals of people from this area. They represent a good local example of the impact of governmental policies on local communities.
Scientific/ Research or Archaeolo-gical value	High Medium Low	**High** The site holds a high archaeological significance since very few of these early industrial kilns are extant. During the recommended restoration process more light will be shed on the design and functioning of these kilns.	**Low**	**High**
Aesthetic value	High Medium Low	**High** .	**High**	**High**
Hierarchal significance rating	National Provincial Local	**Provincial** The site is deemed to be of provincial importance as it expresses and conserves aspects of the regional and local history.	**Local**	**Local**

10 Conclusions

This Phase 2 Assessment concurs with the findings and key recommendations of the Phase 1 Assessment conducted in 2012 (African Heritage Consultants 2012: 4-5). In the current report the most significant heritage resources were identified as the lime kilns and associated quarries as well as the two cemeteries.

From the current Phase 2 Assessment it is evident that the lime kilns can be regarded as the most significant heritage resource associated with the remainder of Portion 46 of Olifantsfontein 410 JR.

11 Recommendations for mitigation and future use

The heritage resources associated with Portion 46 of Olifantsfontein 410 JR must be meaningfully incorporated into the proposed development.

The lime kilns and associated quarries must be protected and incorporated into the proposed development. It is suggested that an interpretative trail, viewpoints and picnic areas should be established around these unique features that hold high heritage importance. In this development special attention needs to be paid to public health and safety since there are significant vertical height differentials throughout the site. The lime kilns can potentially be incorporated into a public facility such as a restaurant, tea garden and/or small wine cellar but will require structural stabilisation and reinforcement that should form part of a Phase 3 restoration and reuse project. Based on the recommended use and incorporation of these heritage resources into the proposed development, a detailed Heritage Management Plan must be drafted, implemented and periodically reviewed.

It is recommended that the cemeteries be treated similar to those in other parts of the Midstream Estate where they are fenced and incorporated into small-scale public spaces or gardens.

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