



Cook's Kitchen, Pool, Cornwall  
Archaeological recording of a mine chimney

Cornwall Archaeological Unit



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<b>Client</b>	<b>Western United Mines Ltd</b>
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## **Acknowledgements**

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The views and recommendations expressed in this report are those of Cornwall Archaeological Unit and are presented in good faith on the basis of professional judgement and on information currently available.

## **Freedom of Information Act**

As Cornwall Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.



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## **Cover illustration:**

Adam Stanford of Aerial Cam launching his UAV to undertake the aerial survey of the Cook's Kitchen chimney.

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## Abbreviations

CAU	Cornwall Archaeological Unit
CIaA	Chartered Institute for Archaeologists
NGR	National Grid Reference
OD	Ordnance Datum – height above mean sea level at Newlyn
OS	Ordnance Survey
RIC	Royal Institution of Cornwall

## **1 Summary**

Following nearly two decades of closure, Western United Mines Ltd. has now secured the necessary financial backing to commence with the reopening of South Crofty mine, Pool, Cornwall. In order to achieve this, Western United Mines will need to construct some significant new surface infrastructure – in particular a modern minerals processing plant. This will be constructed over the former site of the Cook's Kitchen dressing floors, whose only currently visible element consists of a partly buried chimney of unknown function; this will be demolished in advance of the new mill construction.

UAV flown aerial photography of the chimney was undertaken in advance of this work, the record consisting of representative oblique images and 3D photogrammetry derived from structure-from-motion post-processing of a set of detailed images of the chimney taken from a series of passes around and over the chimney at a range of heights.

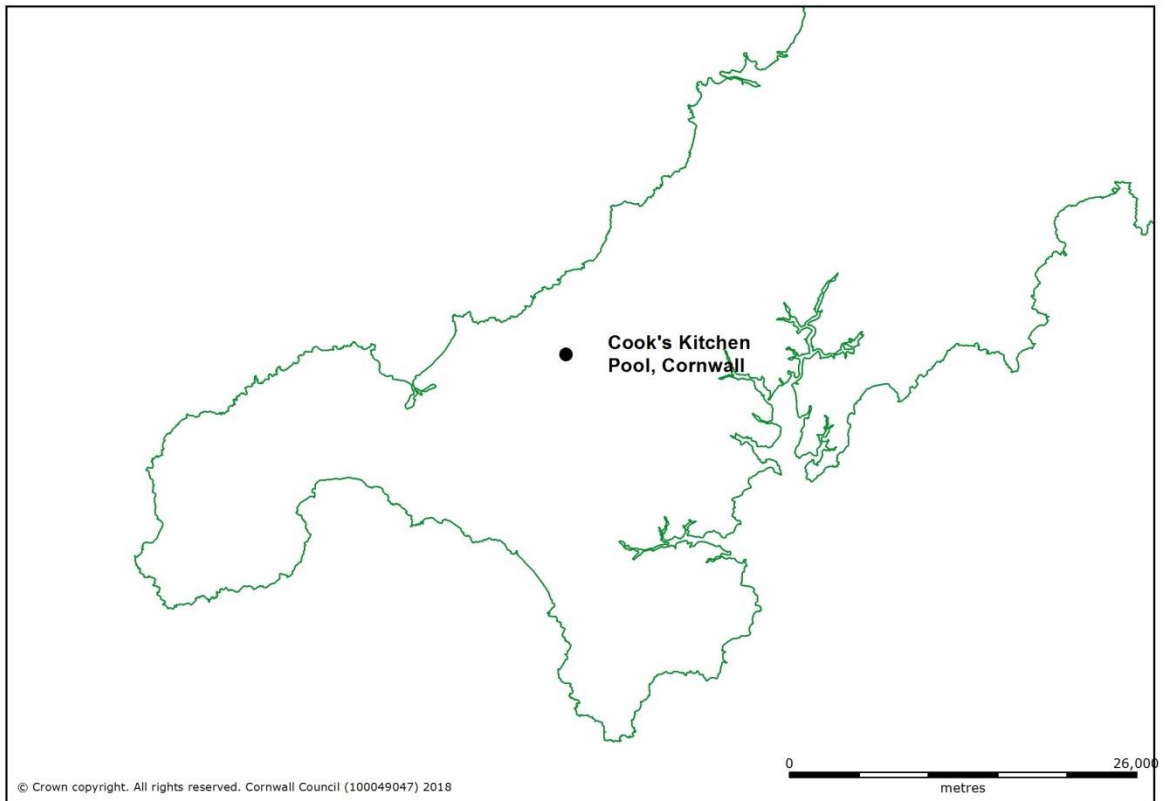


Fig 1. The location of Cook's Kitchen, Pool, Cornwall.

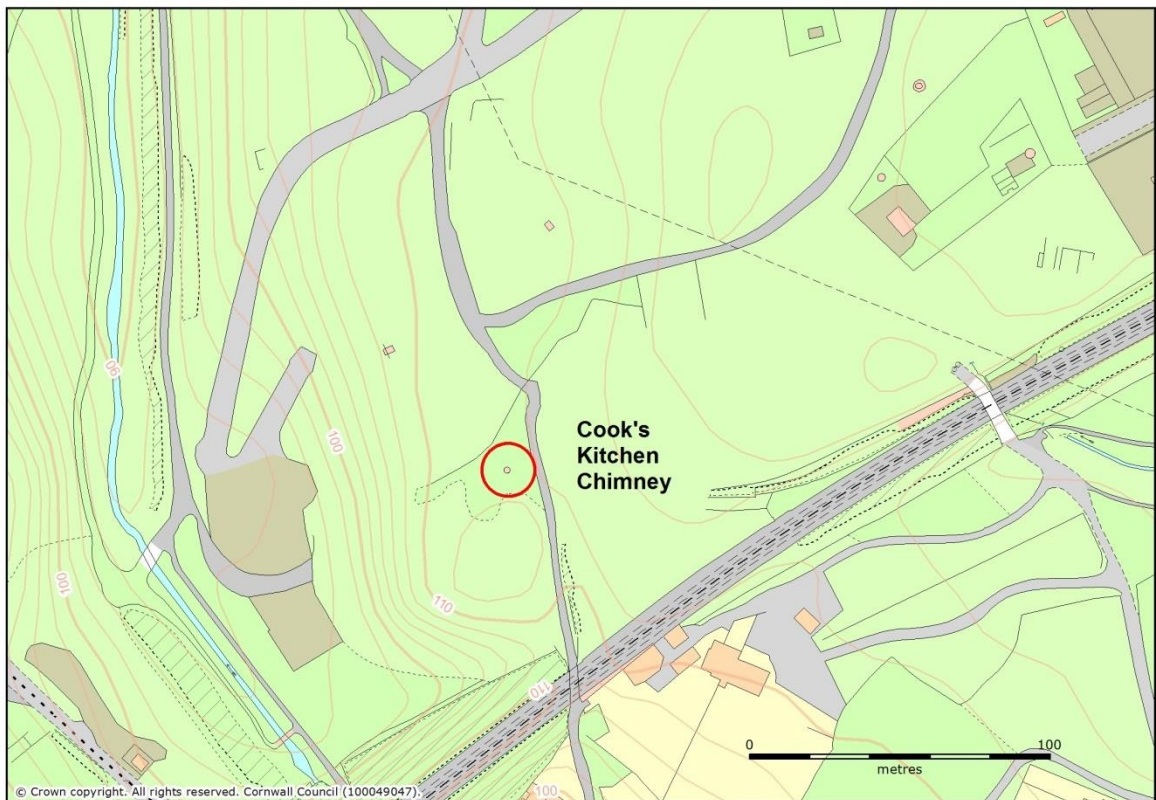


Fig 2. The location and topographical situation of the Cook's Kitchen dressing floor chimney.



## 2 Introduction

### 2.1 Project background

Following nearly two decades of closure, Western United Mines Ltd. has now secured the necessary financial backing to commence with the reopening of South Crofty mine, Pool, Cornwall (Figs 1 and 2). In order to achieve this Western United Mines will need to construct some significant new surface infrastructure – in particular a mine water treatment facility and a modern minerals processing plant. The latter is to be constructed over the former site of the Cook's Kitchen dressing floors, these having been abandoned and largely demolished at the end of the 19<sup>th</sup> century when Cook's Kitchen was abandoned as a working entity. The area they occupied was wholly buried under many metres of landscaped waste material during the 20<sup>th</sup> century, though elements of these floors may well be uncovered and archaeologically recorded during the excavations required for the construction of the new mill. At present, the only visible element of the floors consists of a partly buried chimney of unknown function. This is to be demolished and its materials reused elsewhere on site. Given that this chimney is an historical feature dating to at least the middle part of the 19<sup>th</sup> century and stands within the boundaries of the Cornish Mining World Heritage Site, it is to be preserved by archaeological recording.

Planning decision PA10/04564 dated 03 November 2011 contained a number of archaeological recording conditions. Relevant to the recording of the chimney, Condition 8, stated:

*No demolition/development shall take place/commence until a programme of archaeological work including a Written Scheme of Investigation has been submitted to, and approved in writing by the MPA. The scheme shall include an assessment of significance and research questions and detail:-*

- (i) the programme and methodology of site investigation and recording;*
- (ii) the programme for post investigation assessment;*
- (iii) provision to be made for analysis of the site investigation and recording;*
- (iv) provision to be made for publication and dissemination of the analysis and records of the site investigation;*
- (v) provision to be made for archive deposition of the analysis and records of the site investigation;*
- (vi) nomination of a competent person or persons/organisation to undertake the works set out within the Written Scheme of Investigation.*

*No demolition/development shall take place other than in accordance with the Written Scheme of Investigation referred to above.*

*Reason: To protect areas of archaeological/ historical interest.*

Condition 15 states:

*'The development shall not be brought into use until the site investigation and post investigation assessment has been completed in accordance with the programme set out in the Written Scheme of Investigation and the provision made for analysis, publication and dissemination of results and archive deposition has been secured.*

*Reason: To protect areas of archaeological/historical interest'.*

A Written Scheme of Investigation was produced by Atkins Ltd for the site developer in September 2016. The stated aims of this approved document are to:

- *Establish the extent, degree of survival of the former horizontal engine winder house to Dunkin's shaft and to expose and record these remains prior to their consolidation.*
- *Establish the degree to which elements of the Cook's Kitchen mine (specifically the dressing floors and associated structures) survive within the footprint of the proposed processing building.*
- *Establish, where possible, the extent, date, character, condition and significance of archaeological structures, features, deposits and artefacts within the proposed development area.*
- *Define and archaeologically record these remains prior to their loss during construction.*
- *Place any identified archaeological remains within their historical context.*
- *Understand the presence/ absence/ significance of any archaeological features in terms of their relevance and contribution to the Outstanding Universal Value of the World Heritage Site (without prejudice to any remains of earlier or later periods).*
- *Provide a comprehensive and accurate record of the detached mine chimney (also associated with Cook's Kitchen mine) prior to its demolition.*
- *Produce an integrated and indexed archive of the results of the fieldwork for deposition in an appropriate repository.*
- *Produce an assessment report for the results of the archaeological fieldwork outlining the significance of the archaeological remains uncovered and if appropriate advancing proposals for the publication of the results of the archaeological work.*

In relation to the recording of the chimney, the WSI describes the proposed methodology for the archaeological recording as follows:

*It is proposed to undertake a Level 2 record, as defined in Understanding Historic Buildings (Historic England 2016), of the non-designated mine chimney proposed for demolition. The purpose being to provide a descriptive record of the chimney and any associated structures or remains. This record will comprise both a written record and a photographic survey. Given the difficulties and risks inherent in producing drawn elevations, these will be recorded photographically and drawings will be confined to plans and sketch elevations. The report will include, as a minimum, sections 1-3 and 6 as outlined in paragraph 4.5.2 of Understanding Historic Buildings*

*The photographic survey of the mine chimney will be undertaken using a drone-mounted camera, as a central element of a Level 2 survey, as defined in Understanding Historic Buildings. The survey will obtain both general and detailed photographs of the building, covering – where practicable - types 1-9 as outlined in paragraph 4.4.8 of Understanding Historic Buildings. External photographs will show the entire height of the chimney from all sides, and general shots will show the internal condition and features of the top of the chimney - such as through close-up vertical views. General views will also place the chimney within the wider historic landscape context of the mine. The drone used for the survey will comply fully with CAA regulations and permissions outlined in CAP 722.*

## **2.2 Methods**

### **2.2.1 Desk-based assessment**

During a rapid desk-based assessment historical databases and archives were consulted in order to obtain information about the history of the site and its surviving chimney. The main sources consulted were as follows:

- Cornwall HER;
- Early maps and photographs;
- Published histories;

- Web-based resources.

### 2.2.2 Fieldwork

Aerial photography was undertaken using a DJI Inspire 2 UAV operated by Adam Stanford of Aerial-Cam Ltd (Figs 11-18). Aerial Cam Ltd are licenced to conduct aerial work by the Civil Aviation Authority.

Adam Stanford is fully qualified to undertake the UAV recording:

- *Remote Pilot Qualification + CAA PfCO.*
- *Fellow of the Society of Antiquaries.*
- *Member - Chartered Institute for Archaeologists.*
- *Life Member - Council for British Archaeology.*
- *Hon. Research Fellow - School of Archaeology, Cardiff University.*
- *Member - ARPAS-UK and Drone Safe Register.*

The recording was undertaken on Monday 26<sup>th</sup> March 2018. The weather was initially bright and sunny with light winds, though became more overcast during the morning, providing the desired shadow-free recording conditions during which the 3D and oblique images could be recorded.

Pre-flight checks were undertaken before and during the survey to ensure safe operating procedures were adhered to at all times. Due care and consideration was given to the presence of any other aircraft in the air and also to people and property on the ground. The amount of the structure recorded was necessarily limited to that which is currently exposed above ground level and the extent of vegetation cover at the time of recording. The locations from which the chimney was recorded were limited to some degree by the presence of the main line railway less than 50m to the south of the location of the chimney.

The aerial photography methodology was as follows:

- A minimum of 8 oblique views of the site and surrounding landscape context were taken at a range of heights looking approximately north, north-east, east, south-east, south, south-west, west and northwest, where possible without overflying the railway adjacent to the survey area. Sample views are illustrated in Figures 17-18.
- Low-level aerial photography of the visible structure of the chimney was undertaken to allow the production of the 3D photogrammetry.

For this flight the DJI Inspire 2 UAV was equipped with an X7 (24mp) camera. Images were captured in RAW (DNG) format.

### 2.2.3 Post-fieldwork

JPG files were produced from the original RAW format files for the photogrammetry. A set of TIF files were also generated from the RAW image.

To enable the production of metrically accurate 3D photogrammetric models, Aerial Cam used a technique called structure-from-motion, which involved the capturing of overlapping images of the structure. Selected images of the structure were processed using Photoscan Pro software to produce fully rendered 3-dimensional models; these have been uploaded to an online viewing facility: Sketchfab. Two images are available to view – an unrendered version and a rendered version, as follows:

<https://sketchfab.com/models/920538e18de74b7c9db8dc7acb68f140>

<https://sketchfab.com/models/049cfea0907e4e51b1bd5d2fafbd32db>

### 3 Location and setting

The chimney recorded in 2018 is located at SW 66365 40521. It was constructed as part of the sprawling Cook's Kitchen dressing floors (Fig 3) (Sharpe 1993), though given that these have now been demolished and over-dumped, the chimney is now an isolated feature standing on a levelled dump of material at the intersection between an open section of the site and an area of peripheral scrubland (Figs 2 and 8). It is sited at 112m OD in an area which will be occupied by the central part of the new mill (see Fig 10). The site is located to the south of Tuckingmill and the core of South Crofty Mine overlooking the Red River valley.

### 4 Designations

#### 4.1 International

The chimney falls within Area 5 (Redruth and Camborne) of the Cornwall and West Devon Mining Landscapes World Heritage Site (Fig 9). This area represent the core heartland of the Cornish mining landscape, and the site of many of its most significant mines.

#### 4.2 Regional/county

None apply. The nearby and associated Chapple's Shaft pumping engine house and its associated chimney and its winding engine house are all Grade II Listed Buildings (National References 1328162, 1160769 and 1142629 respectively). The southern boundary of the Tuckingmill Conservation Area is 530m to the north of the site.

### 5 Site history

Cook's Kitchen, centred at SW 66470 40586, lay immediately to the east of Dolcoath, its workings separated from its neighbour more or less along the line of the Red River Valley by the Great Cross Course which dislocated the strikes of the lodes. Very great things were expected of this undertaking and Cook's Kitchen was, during its heyday, the second deepest mine in Cornwall. The sett spans the line of the present railway - extending under Brea village (where the lodes pitch steeply downwards). The lodes are essentially continuations of those in Dolcoath, and were developed in a similar (though singular and ultimately, uneconomic) fashion. The first recorded working of the mine date from about 1740, though there was almost certainly some previous activity on these lodes. Mining was mentioned at Penherrick in the 1590s and again in the 1680s.

Like Dolcoath, Cook's Kitchen was initially successful for copper, and was described in 1796 by Hatchett as "*...one of the most remarkable mines for copper perhaps in the world...*". Water-wheels were initially used for pumping, but by 1794 there was a Boulton and Watt engine on Engine Shaft lifting water to 58fm from adit; a water wheel pumped the water the remaining distance. Though not all the copper ore found here was of the highest grade, it was abundant, and records indicate that a substantial proportion of the money eventually used by the Bassets to rebuild Tehidy House came from the dues accumulated from the working of this mine. The pitch of the lode and the shape of the sett forced the mine to develop in depth, but by the 1820s the richer grades of copper were already running out, and sales of tin began to supplement those of copper, but no dues were paid by the mine between 1809 until 1854. A new pumping engine was erected in the early 1830s together with much other surface plant, when the mine was re-started for tin, but the diminishing production of copper from the lodes again briefly closed the mine in 1848.

The following year, emboldened by the discoveries of rich tin below the copper in Dolcoath to the west and in Tincroft and Carn Brea to the east, the mine was taken up

again. It was found to be in a poor state, even after only eighteen months of disuse. Although new steam-powered dressing floors were installed, most of the effort was directed at deepening Chapple's Engine Shaft - the principal (indeed virtually the only developed) shaft on the mine. A man-engine powered by a large underground water-wheel was installed in 1859, and over the following years the surface plant was radically re-structured and enlarged.

In 1865 Thomas Spargo reported as follows on the mine:

*'in Illogan, in 2,450 shares, is under the management of Captain Charles Thomas. Pursers Messrs R.H. Pike an Son. Lord: J.F. Basset, Esq. Dues 1/24<sup>th</sup>. 213 men, 86 females and 71 boys employed: total 370. Depth of adit 28 fathoms; depth below: 258 fathoms. Steam power employed: one 55" pumping engine, one 26" stamping engine and one 26" and one 18" winding engine. A 50 feet by 3 feet water wheel works a man engine. Water wheels lifting stamp heads viz: one 50 ft by 2 ½ ft, two 40 feet by 4 ½ feet and three 27 feet by 4 feet.*

Minerals sold in 1864

*Copper ore 4 tons, 1 cwt 2 qrs 0 lbs for £20 1s 0d*

*Black tin 240 tons, 213 cwt, 2 qrs, 11 lbs for £15,303 3s 11d*

*Total £15,323, 4s 11d.*

*The mine is one of the very ancient works so frequently met with in this county. No records exist of its origin. It has been at work without intermission beyond the memory of man, with varying success. It is said, however, that on the whole a profit of some hundreds of thousands has been made. There has been no 'call', I believe, since the year 1802. The loss of £1,225 in 1864 was occasioned principally by the purchase and erection of additional machinery. With a good price for tin, dividends may be expected for many years to come.*

In 1859, a 52 feet diameter by 3 feet six inch breast water wheel was installed in an underground chamber to operate a man engine. The water was supplied to it along the Cook's Kitchen shallow adit, whilst its tail race was carried away along a lower adit. The rods extended to the 190 fathom level at the time. In 1869, with the mine becoming ever deeper, the decision was taken to relocate the man-engine to a more central shaft (Dunkin's) and to extend it to the 140 fathom level. The water wheel was abandoned, and a new Harvey-built 26" cylinder horizontal engine was purchased to operate the man-engine. This was commissioned in 1871 when the bottom of the mine had reached the 320 fathom level

In 1872 the mine was divided into two - New Cook's Kitchen taking over the northern part of the sett. Slumping tin prices through the later decades of the 19th century brought little profit to the mine, and the last dividend was paid in 1873. Two rock drills worked by a 12" cylinder compressor were introduced in 1879 to improve production, and the main shaft continued to be deepened. By 1886, the man-engine extended down to the 234 fathom level (460m from surface), but this represented only half the depth of the mine at the time, and the man engine was subsequently extended to the 270 fathom level. By 1882 the bottom of the mine had reached the 345 fathom level and not long after Dunkin's Shaft was deepened to the 420 fathom level (Collins 1912).

However, the mine was still essentially worked from a single principal shaft (Chapple's) - this being used for both pumping (by an engine installed half a century before) and for winding, extraordinarily still at that date using a single kibble, which factor alone should have crippled the mine.

A new skip road was installed in 1888, but this was an expensive undertaking, and in the following years there were breakages to both the main rod and the bob, weak ground requiring heavy timbering was encountered and the east and south parts of the mine were found not worth development in depth. The mine sett was not a particularly extensive one and the ground between Dolcoath and Cook's Kitchen had to be left un-

worked because of an agreement between the two mines, so the only option was to continue to follow the lodes downwards at increasing expense.

In 1893, a severe fall in tin prices proved the final straw. The mine was in a poor state, despite the richness of its lodes: most of the pumping engine was over sixty years old and was working enormous lengths of pitwork in a narrow crooked shaft which was also used for winding, the dressing floors had not been remodelled since the 1860s, the man-engine reached only two thirds of the way down the mine and the heat in the lower working levels was said to be stupefying.

In 1895 the mine was amalgamated with neighbouring Tincroft though this was found to be in a worse state than Cook's Kitchen, if this was possible. Most of the shafts were abandoned; the pumping engine was "...*simply a wreck, for the bob was broken, the nozzle patched in at least a dozen places, the cylinder was full of holes, and he (the inspector) could not describe it as worse than it really was. Directly the engine was stopped and cooled down, the principal part of the engine almost dropped off.*" (Morrison 1980). In 1896, Tincroft (with Cook's Kitchen) was amalgamated with the Carn Brea Mines, but the Cook's Kitchen sett was little worked. The lower section of Cook's Kitchen below the 345 fathom level was allowed to flood in 1902 and exploration in depth was concentrated within the Tincroft section (Collins 1912). A surface panorama showing the local mines was photographed around this date by J.C. Burrows (Burrows and Thomas 1893). A further famous image of the mine was taken at 1.30pm on 25 September 1904 by D.A. MacAlister and T.C. Hall on behalf of the Geological Survey. The scene, looking east from Dolcoath, includes the group of engine houses around Chapple's Shaft, including those used for pumping, winding and stamping, as well as the man engine chimney and parts of its engine house and boiler houses. Two other whim engine houses can be seen a little further to the east in this view.

Carn Brea was abandoned in 1913-14, Tincroft (presumably with Cook's Kitchen) in 1921. The sett was subsequently incorporated into that of the expanding South Crofty, which closed in 1999, though which is now preparing to reopen.

With the exception of the engine houses serving Chapple's Shaft at the southern end of the site, almost no surface evidence for Cooks Kitchen and New Cooks Kitchen mines survives at surface. This reflects the demolition of most of its standing buildings following the closure of the mine, extensive landscaping associated with the redevelopment of parts of its former surface for light industry and other uses, the recovery of economic minerals from spoil heaps, and the cloaking of much of the western part of the site (including the extensive dressing floors) with spoil partly derived from the excavation of the new Decline Shaft and partly with mill rejects.

A photograph taken by J.C. Burrows, the famous Cornish mine photographer, showing the view looking east across the Red River Valley in about around 1895 looking east across the Red River Valley (reproduced in Trounson and Bullen 1999, page 56 but not in this report owing to copyright issues) shows this chimney in the core area of the mill, set amongst a series of substantial timber-clad buildings. At the time that the photograph was taken the top third of the chimney was made up in coursed brickwork, as was common on almost all Cornish mine chimneys.

The *circa* 1880 OS 25" mapping (Fig 3) shows the building to which the chimney was originally attached located at the head of the upper section of the buddle floors. The building measured 16m by 106m in plan and a water wheel was mapped on its southern side. It is unclear what it function it served. Whilst it is possible that it provided motive power for the buddles and other machinery sited on the lower section of the dressing floor, it might also have served a drying furnace. It seems unlikely that the chimney was intended to vent arsenic flues, as the nearest calcining plant was mapped 135m away to the west of the chimney at this date (this complex is likely to have been part of the eastern section of the Dolcoath dressing floors).

The MacAlister and Hill 1904 Geological Survey photograph (reproduced in Trounson and Bullen 1999 and in Stanier 1998, but again not reproduced in this report owing to

copyright issues) clearly shows that the majority of the Cook's Kitchen dressing floor structures had been cleared away by the turn of the century. The chimney was by this time a free-standing feature and had lost its upper brick superstructure. The *circa* 1908 OS 25" mapping (Fig 5) shows the majority of the surviving buildings on the dressing floor to have been roofless by this date, but provides no further clues as to the former function of the building.

By 1946, when this area was photographed from the air by the RAF (Fig 6), the majority of the buildings making up the Cook's Kitchen dressing floors had been demolished completely (as can be seen from the earlier archive photograph, many had been of timber construction) or survived only as footings, though a few of the more substantial structures were at the time still several metres high. The chimney is not clearly visible on this image, though evidently survived.

By the late 1980s (as can be seen on CAU aerial photograph ABP F7/135 dating to 1986, Fig 7 and a CCC aerial photograph dating to 2005, Fig 8), the development of South Crofty's new decline shaft had produced vast amounts of waste material, much of which had been dumped on the hillside formerly occupied by the Cook's Kitchen dressing floors, the material being extensively landscaped. The chimney survived this process, though its lower section had become buried by the fill material.

## 6 Archaeological results

See Figures 12-18 for sample images.

266 still images were taken of the chimney. 70 of these were taken from close up and at low level to provide the images to be used in the photogrammetry, with a further 32 taken from an intermediate height, some of these being used to supplement the photogrammetric survey. 32 images of the chimney and its immediate context were taken from medium heights relatively close to the chimney, whilst 69 were taken of the chimney in its wider landscape context, this including the conserved engine houses at Chapple's Shaft and the nearby site where the man engine house was being excavated by CAU at the time. Each image is accompanied by its full 3D location and other EXIF data.

The chimney like almost all other Cornish examples, takes the form of a tapered cylinder. It was is constructed of lime-mortared randomly-coursed killas mixed with rocky mine waste, measures 7.5m high (up to a third of its lower section currently being buried) and has a basal diameter at current ground level of 2.3m. Two layers of galvanised steel mesh have been fastened over the chimney top opening (Figs 14 and 15), probably to deter nesting birds, and the mortar work on the top of the chimney bears the name 'COLIN DOUCH' (presumably the mason who did this work). Its upper brick section (depicted in archive photographs) has been lost to demolition.

No original openings or features are visible, but one course of remnant red bricks survives at the head of the chimney, some of these having been re-set in cement mortar to secure the covering mesh. Ivy covers the whole of the chimney's southern and south-western elevations.

## 7 Conclusions

This chimney of unidentified original function, though part of the former Cook's Kitchen dressing floors, represents one of a vast number of mine structures recorded at the end of the heyday of mining in Cornwall in an iconic view of the mining landscape to the north of Carn Brea. Anyone looking at the 1904 MacAlister and Hall image can have no doubt of the formerly huge importance of the Camborne-Redruth Mining District and how much had changed in the local economy during the final years of the 19<sup>th</sup> century.

More beam engine houses are shown in this image than could be recorded in such a view taken anywhere else in Cornwall; however almost all had become disused.

Within a few years of the 1904 image being taken virtually all the beam engines in this mining district had been scrapped and almost every engine house and chimney depicted in the photograph had been demolished.

This chimney, modest though it may be, is one of the last survivors from that mining landscape. It too, will soon be gone, but will be replaced by a building whose design will visually symbolise a long hoped-for revival in Cornwall's mining economy.



## 8 References

### 8.1 Primary sources

Ordnance Survey, c1880. 25 Inch Map First Edition (licensed digital copy at CAU)

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Ordnance Survey, MasterMap Topography

Tithe Map and Apportionment, c1840. Parish of Illogan (licensed digital copy at CRO)

### 8.2 Publications

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Stanier, P. 1998, *Mines of Cornwall and Devon*, Truro

Trounson, J.H. and Bullen, L.J. 1999, *Mining in Cornwall: Volume 1, The Central District*, Stroud

### 8.3 Websites

<http://www.heritagegateway.org.uk/gateway/> Online database of Sites and Monuments Records, and Listed Buildings

## **9 Project archive**

The CAU project number is **146755**

The project's documentary, digital, photographic and drawn archive is maintained by Cornwall Archaeological Unit

Electronic data is stored in the following location:

\\CAU\Archive\Sites S\South Crofty Cook's Kitchen dressing floor chimney recording  
146755

Historic England/ADS OASIS online reference: cornwall2-313710

## 10 Appendix: Relevant sections of the Atkins WSI

A WSI was produced by Atkins on behalf of Western United Mines in September 2016 as part of the planning submission for the overall South Crofty redevelopment. This included aims, objectives and methodological statements for the following:

- The recording of a chimney on the former Cook's Kitchen dressing floors.
- The excavation and recording of the Cook's Kitchen man-engine house and allied structures.
- A watching brief to be undertaken on the site of the new South Crofty mill and its associated structures where these fall within the boundary of the Cornish Mining World Heritage Site.

The following text reproduces sections of the WSI relevant to the archaeological recording undertaken on the South Crofty MWTP site.

### Introduction

Planning permission for the relocation and modernisation of mineral processing of South Crofty Mine was proposed in 2010, including the erection of buildings for ore processing and ancillary activities. Conditional Planning Permission was granted by Cornwall Council in 2011 (permission number: PA10/04564). Four conditions were placed upon the proposed development which relate to the protection of areas of archaeological and historical interest:

- **Condition 8:** No demolition/development shall take place/commence until a programme of archaeological work including a Written Scheme of Investigation has been submitted to, and approved in writing by the MPA. The scheme shall include an assessment of significance

and research questions and detail:-

- (i) the programme and methodology of site investigation and recording;
- (ii) the programme for post investigation assessment;
- (iii) provision to be made for analysis of the site investigation and recording;
- (iv) provision to be made for publication and dissemination of the analysis and records of the site investigation;
- (v) provision to be made for archive deposition of the analysis and records of the site investigation;
- (vi) nomination of a competent person or persons/organisation to undertake the works set out within the Written Scheme of Investigation.
- (vii) No demolition/development shall take place other than in accordance with the Written Scheme of Investigation referred to above.

**Condition 15:** The development shall not be brought into use until the site investigation and post investigation assessment has been completed in accordance with the programme set out in the Written Scheme of Investigation and the provision made for analysis, publication and dissemination of results and archive deposition has been secured.

- **Condition 16:** Unless otherwise agreed in writing by the MPA, the developer shall not bring any building or buildings constructed pursuant to the development into use until the repairs and consolidation works to the winder engine house, pumping engine house and detached chimney have been completed. The works to be set out in a specification and timetabled programme to be submitted, and agreed in writing, by the MPA.

- **Condition 17:** Unless otherwise agreed in writing by the MPA, the developer shall not bring any building or buildings constructed pursuant to the development into use, until the archaeological remains of the horizontal winder are exposed and where necessary consolidated, in accordance with a specification and timetabled programme to be submitted, and agreed in writing by the MPA.

The implementation of the proposed development has been divided into three phased areas. This Written Scheme of Investigation (WSI) relates to the first two and the last of these conditions (Condition 8, Condition 15 and Condition 17). Condition 16 has already been addressed.

### **Scope of document**

This WSI sets out the methodologies and standards that will be employed in order to address these planning conditions. In format and content, it conforms with current best practice and to the guidance outlined in Management of Research Projects in the Historic Environment (MoRPHE, Historic England 2015).

This document will be submitted to the Development Officer (Historic Environment) for Cornwall Council (the Curator) for approval prior to the commencement of any ground works. The Cultural Heritage Chapter within the Environmental Statement prepared for the planning application for the project identified a number of potential impacts and opportunities for improvement works and mitigation both outside and within the World Heritage Site.

In the area outside the World Heritage Site these include:

- The retention and stabilisation of the listed buildings at Chappel's Shaft to ensure their long term conservation. There may also be an opportunity to excavate the horizontal whim beddings adjacent to them.
- The retention of all significant historic surface remains, with design of buildings stockpiles, lagoons, bunds and lay down areas ensuring that any impact on surface remains is minimised.
- Design works intended to enable and enhance views of the Chappel's Shaft Engine House and associated features.
- The retention of Eastern Valley Shaft, Middle Engine Shaft, Valley Shaft, Chappel's Shaft, and Hard and Old East shafts, with renovation works proposed on Middle Engine and Valley shafts, whilst Blights and Miah's shafts would be made safe.

The proposed new ore processing building and associated infrastructure lie partially within the boundary of the World Heritage Site. Limited impacts were anticipated, including:

- The loss of a single dressing floor chimney
- The proposed mill building lies on the site of the dressing floors of the former Cook's Kitchen mine, and has a potential to impact on these remains.

Proposed mitigation measures for these impacts in the Environmental Statement comprised:

- An archaeological watching brief on all ground works to confirm and record deposits of waste rock and processing rejects
- Sensitive design of new ancillary buildings to reflect the historic character of the area
- The retention, conservation and display of currently extant but derelict industrial features and the provision of public access.

In response to this Environmental Statement, the Historic Environment Planning Team for Cornwall proposed a programme of more detailed archaeological mitigation which was reflected in the planning conditions placed upon the planning permission.

The purpose of this WSI is to specifically address the planning conditions relating to the recording of the chimney stack proposed for demolition and the archaeological mitigation of the impacts of the construction works through a programme of archaeological work.

### **Aims and Objectives**

The Archaeological potential of mining has been highlighted in the regional research agenda for the south-west, with mining remains having the potential to provide stratified and well dated deposits contributing to our understanding of technological change within the industry (Webster 2007, 288). In view of the long history of mining at South Crofty, identifying phases of technological change would potentially provide an important contribution to the understanding of development of the Site and non-ferrous metal mining within the World Heritage Site.

The period 1700-1914 is considered the period of the most significant industrial development with the technology and infrastructure developed at the Cornwall and West Devon Mines influencing both the industrial revolution of Britain and internationally - and contributes to the Outstanding Universal Value of the World Heritage Site (Cornish Mining World Heritage 2013, 19). Any archaeological remains, deposits and features from this period would, therefore, have the potential to contribute to the understanding of the development of the Site and its context within the Cornwall and West Devon mining landscape and more broadly within national and international industrial development.

The engine houses and beam engines characterising the mining landscape 'reflect the substantial contribution the area made to the industrial revolution' (ibid. 21). The importance of such mining structures therefore emphasises the need for records to be made where planning proposals for their removal are accepted.

In particular, consultation has emphasised the importance of obtaining an accurate archaeological record of the site of the dressing floors and associated structures of Cook's Kitchen mine, extensive areas of which may survive beneath the site proposed for the processing building.

The aims and objectives of these archaeological works are to:

- Establish the extent, degree of survival of the former horizontal engine winder house to Dunkins Shaft and to expose and record these remains prior to their consolidation.

- Establish the degree to which elements of the Cook's Kitchen mine (specifically the dressing floors and associated structures) survive within the footprint of the proposed processing building.
- Establish, where possible, the extent, date, character, condition and significance of archaeological structures, features, deposits and artefacts within the proposed development area.
- Define and archaeologically record these remains prior to their loss during construction.
- Place any identified archaeological remains within their historical context.
- Understand the presence/ absence/ significance of any archaeological features in terms of their relevance and contribution to the Outstanding Universal Value of the World Heritage Site (without prejudice to any remains of earlier or later periods).
- Provide a comprehensive and accurate record of the detached mine chimney (also associated with Cook's Kitchen mine) prior to its demolition.
- Produce an integrated and indexed archive of the results of the fieldwork for deposition in an appropriate repository.
- Produce an assessment report for the results of the archaeological fieldwork outlining the significance of the archaeological remains uncovered and if appropriate advancing proposals for the publication of the results of the archaeological work.

### **Scope of archaeological works**

The following phases of archaeological work are proposed within the Site:

- The targeted archaeological excavation of the former horizontal winding engine house to expose the remains of the building and any associated machinery or fittings, record the remains and present them in a suitable condition for consolidation works.
- A targeted archaeological recording exercise to investigate the extent of the survival of the dressing floors and associated structures within the footprint of the proposed processing building.
- Recording of the extant non-designated mine chimney at the south west part of the Site.
- Intermittent watching brief during construction groundworks (Phases 1, 2 and 3), within the World Heritage Site focussed on recording any structural elements encountered during the work.
- Assessment and analysis (as appropriate) of any remains encountered and publication in a regional journal, or relevant national journal where significant archaeological remains are encountered.

### **Archaeological Recording Exercise**

A targeted archaeological recording exercise is proposed to record any elements of the dressing floors and associated structures which lie within the footprint of the proposed processing building. The extent of these dressing floors and associated structures are known from historic mapping, but it is unclear to what degree they have survived later truncation and landscaping. It is proposed that the known extent of these structures will be explored where they lie within the footprint of the proposed building.

The overburden (primarily mining debris and 'rejects' deposited as part of the Tuckingmill Decline works) will be removed by tracked excavators equipped with bladed ditching buckets under the supervision of a suitably experienced archaeologist. Machining will continue in spits until either archaeological remains or the upper surface of the underlying geology are encountered, or the required formation levels for the development are reached, whichever is the soonest.

Once machining is complete, hand cleaning will be undertaken - sufficient to ensure that any archaeological features or remains are clearly defined and to allow for production of a base plan. Plans will be produced at an appropriate scale and tied into the Ordnance Survey National Grid. Any additional recording of discrete archaeological features will be drawn to scale using drafting film, at an appropriate scale (e.g. 1:10 for sections and 1:20 or 1:50 for plans). Any archaeological structures encountered should be recorded both in plan and elevation where possible. Should extensive structural remains be encountered, these will also be recorded photogrammetrically. Discrete archaeological features will be half-sectioned, and a section through linear features of not less than 1m will be excavated, where safe to do so. Finds will be collected from topsoil and archaeological contexts, and recorded by context.

Archaeological recording will be undertaken in accordance with current best practice, using proforma context sheets. Relationships between structures, features and deposits will be recorded using a Harris matrix system. All photographs, drawings, finds and samples will be recorded upon pro-forma sheets using a numeric identification sequence. A photographic register will include details of individual photographs and the orientation taken. The photographic record will include black and white print and digital photography, and will include both detailed photographs of archaeological structures, features and deposits and wider shots of the Site as a whole.

All excavation and recording undertaken as part of this exercise will conform to the Standard and Guidance for Archaeological Excavation (CIfA 2014a)

### **Artefacts**

All finds should be treated in accordance with current best practice (UKIC 2001, MGc 1991, HE 2005, 2006) and the requirements of the receiving museum. All artefacts from excavated contexts should be retained except for unstratified modern material. Any artefacts requiring conservation will be treated in line with First Aid for Finds (Watkinson and Neal 1998). In the event of the discovery of artefacts covered or potentially covered by the Treasure Act 1996, the contractor will contact the Client and the Curator. Excavation and removal of the artefacts will only take place once this has been undertaken. Any such discoveries will be reported to the Curator within 14 days. On completion of the archaeological post-excavation programme, and with the permission of the landowner, it is anticipated that any artefacts will be deposited with the relevant museum.

### **Environmental sampling**

Potentially significant archaeological deposits and fills will be bulk sampled for palaeoenvironmental material or other finds. Bulk environmental soil samples will be taken from sealed contexts where there is an expectation that there is a potential for the survival of charred plant materials, charcoal, waterlogged material, dating evidence or the presence of small artefacts. Bulk samples would normally be taken as 40L bulk samples, or,

if less, the whole of the deposit concerned. Samples should only be taken from dated deposits or if there is a potential for the sample itself to provide a scientific date. Other samples (dendrochronology, soil micromorphology, monolith samples, C14 dating etc.) should only be taken following discussion with the Curator and, if appropriate, with the relevant Historic England Regional Science Advisor or other specialist.

### **Human remains**

In the event of discovery of human remains, work will stop and they will be left in situ, covered and protected. The Curator will be informed and a burial licence will be obtained from the Ministry of Justice. If necessary, the trench will be widened to expose the full extent of the feature containing human bone, and then the human remains will be fully excavated, recorded and removed from the Site. All excavation and reporting of human remains will be in line with current best practice, and will follow the standards set out in CIfA Technical Paper 13 Excavation and post-excavation treatment of cremated and inhumed remains (McKinley and Roberts 1993).

### **Treasure**

Finds of treasure, as defined by the Treasure Act 1996, will be reported in accordance with that Act and the guidelines contained in the Treasure Act 1996 Code of Practice (DCMS 2000). Finds will be removed and reported to the District Coroner within 14 days of discovery. Suitable security measures will be put in place to protect finds from theft if they are left in situ. Finds will be reported to the regional Portable Antiquities Scheme Finds Liaison Officer.

### **Archaeological Watching Brief**

An intermittent archaeological Watching Brief will be undertaken in the remaining areas of the World Heritage Site to be subject to construction groundworks. This will comprise a periodic visit to the Site by a suitably experienced archaeologist (initially on a weekly basis) to monitor the progress of the works, and to record any structural remains encountered. The purpose of this Watching Brief will be to allow, within the resources available, the preservation by record of archaeological structures, features and deposits exposed during the course of the construction groundworks. Should archaeological remains be encountered, the developer will allow sufficient time for basic archaeological investigation and recording. Where significant or extensive archaeological deposits are encountered which cannot be satisfactorily recorded as part of the Watching Brief, Cornwall Council's Planning Archaeologist will be notified and an appropriate mitigation strategy will be agreed between all parties. Any archaeological mitigation strategy will be subject to a revised WSI - to be approved in advance by Cornwall Council's Planning Archaeologist. The Watching Brief will be undertaken in accordance with CIFA guidelines (CIFA 2014b) and the Management of Research Projects in the Historic Environment: The MoRPHE Project Managers Guide (Historic England 2015), by a Registered Archaeological Organisation (RAO) of the CIFA.

### **Post-excavation**

At the end of each phase of fieldwork a site archive will be produced in line with the MoRPHE specification, including all specialist assessments of excavated material. The archive will be assessed for its potential for further analysis. If appropriate, an updated Project Design will be prepared, outlining a programme of post-excavation assessment and



analysis leading to publication of the results. The updated Project Design will be completed within 6 months of the end of fieldwork (unless the updated Project Design sets out a revised timetable).

Should the results of the fieldwork be of insufficient scale to merit post-excavation assessment and an updated Project Design, a standard technical (grey literature) report will be produced within 6 months of fieldwork completion. This will be submitted to the Cornwall Council Planning Archaeologist for approval. A summary of the results will be submitted to a relevant regional journal. If appropriate, proposals will be advanced for detailed analysis of the results of the fieldwork and for publication of the results of this analysis.

### **Reporting**

It is anticipated that individual assessment reports will be required for each of the four separate phases of investigation. These will be written in accordance with the current best practice as outlined in the relevant standards and guidance of the Chartered Institute for Archaeologists.

They will include as a minimum:

- An executive summary of the work undertaken and the results obtained;
- A background to the project and circumstances of work;
- The aims and methods adopted in the course of the programme of archaeological works;
- The nature, location, extent, date, significance and quality of any archaeological deposits and material uncovered;
- The nature and location of the features and deposits encountered;
- An interpretive discussion of the results, placing them in a local and regional context
- The results of assessments and/or analyses of artefacts, ecofacts and industrial remains carried out by suitable specialists;
- Appropriate illustrative material such as maps, plans, sections, drawings and photographs;
- An assessment of the potential for further analysis of the results of the archaeological works and recommendations as to the requirement for a full publication report in an appropriate format. If this is deemed appropriate, it will also include an updated project design and detailed costings for the analysis and publication works;

A summary of results; and

- A description of the archive contents and details of its location for long-term storage.

A draft copy of the report will be issued for approval by the Curator, prior to its final acceptance.

The final report should be submitted as a .pdf document.

A summary of information from the project should be entered into the OASIS online database of archaeological projects in Britain.

Should a programme of analysis and publication be considered appropriate, this will be subject to a separate programme of works to be agreed in advance with Western Union

Mines Limited, and in accordance with an updated project design approved by the archaeological advisor to Cornwall Council.

### **Archiving**

The complete project archive, which will include paper records, artefacts, ecofacts and digital data including photographs, will be prepared in accordance with guidelines for the preparation of excavation archives for long-term storage following nationally recommended guidelines (UKIC 2001, Cifa 2014c SMA 1995; Brown 2011; ADS 2013).

The archive will be deposited with a suitable repository, and will be prepared in accordance with its requirements and guidelines. It will be marked with the corresponding accession number (as required). If necessary, the paper records of the site archive will be security microfilmed prior to deposition. Archive deposition will be arranged in consultation with an appropriate repository following the completion of fieldwork.

### **Archaeological Contractor**

The archaeological works will be undertaken by an appropriately qualified archaeological contractor. Prior to undertaking the work, the archaeological contractor will submit cvs for key staff to the Curator for approval. This will include, as a minimum, the Project Manager, lead member of the fieldwork team and key post-excavation specialists. The contractor will also be expected to demonstrate that it has access to expert advice on Industrial Archaeology, and specifically to mines and mining.

The archaeological contractor will also be expected to submit a generic company Health and Safety Plan as well as job-specific Risk Assessments and Method Statements for the work, and to provide evidence of both public liability insurance cover (£10,000,000) and professional indemnity insurance cover (£5,000,000).

### **Monitoring**

The work will be monitored on behalf of Cornwall Council by the Cornwall Council Planning Archaeologist. Provision will be made for monitoring progress and standards throughout the fieldwork. Any changes to the approved WSI or methodology will be agreed in writing with the Curator.

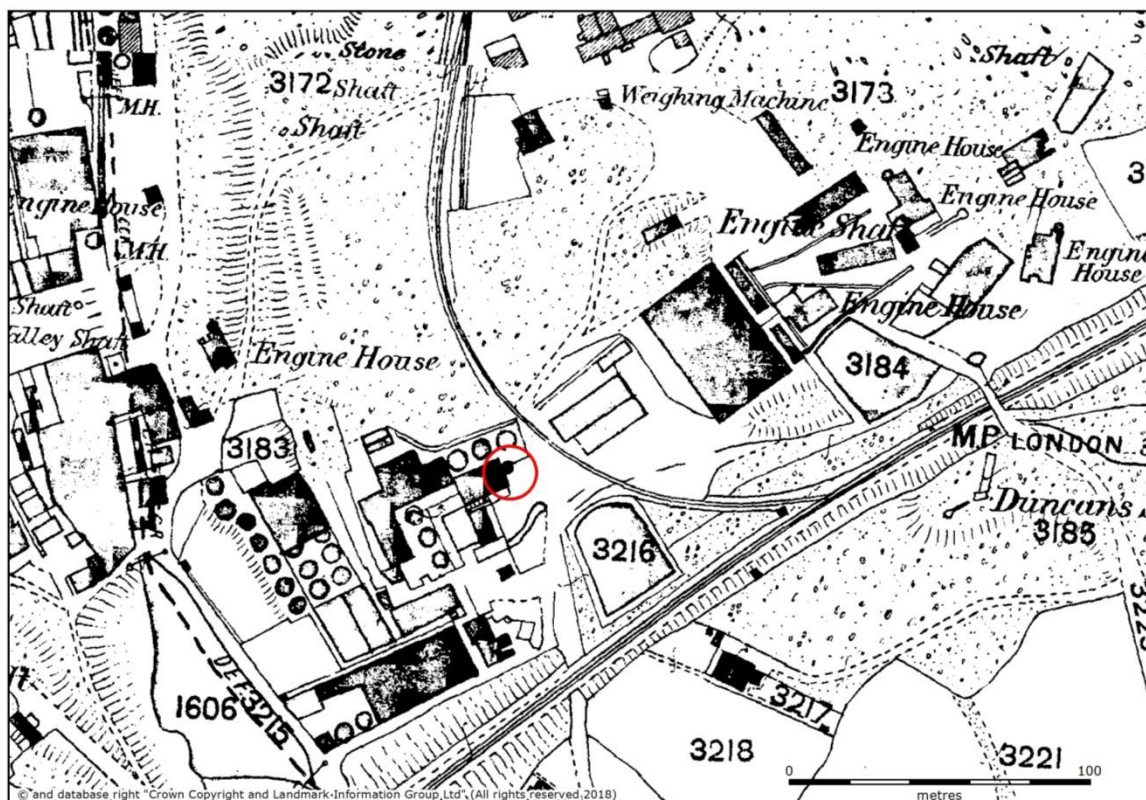


Fig 3. The location of the chimney circa 1878, when it was attached to a building in the core area of the Cook's Kitchen dressing floors.

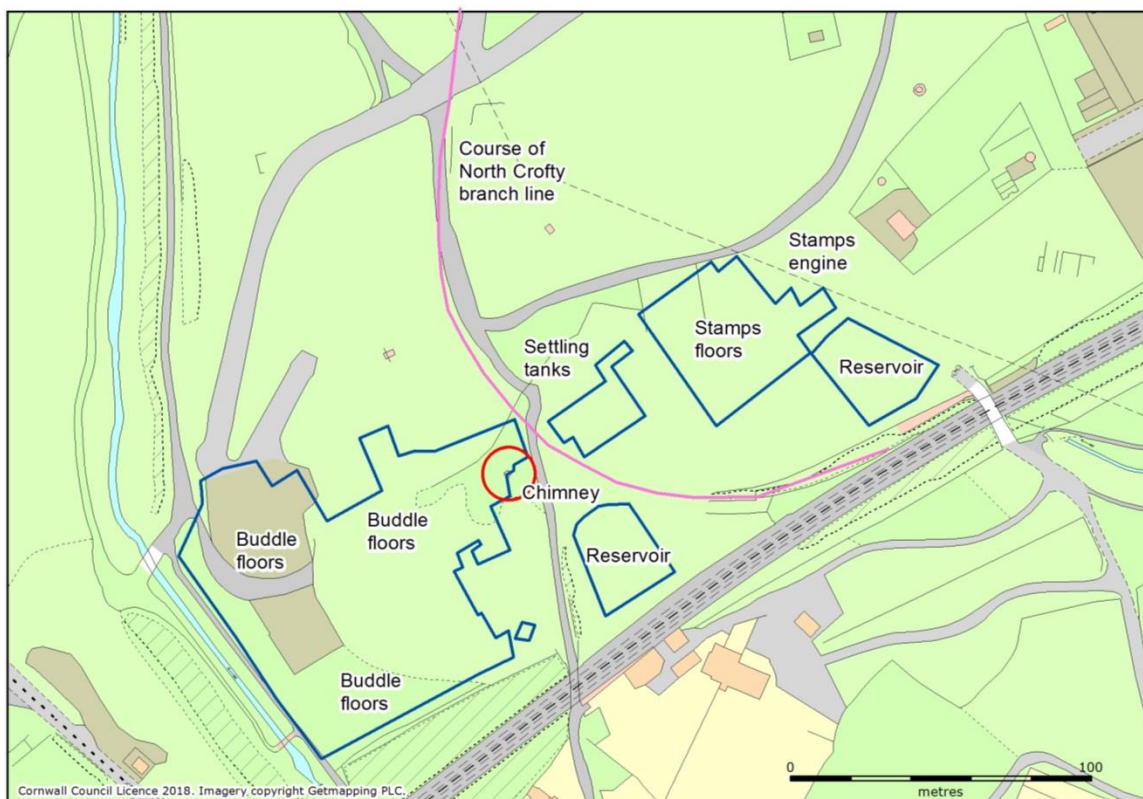


Fig 4. The principal component areas of the Cook's Kitchen dressing floors circa 1878.

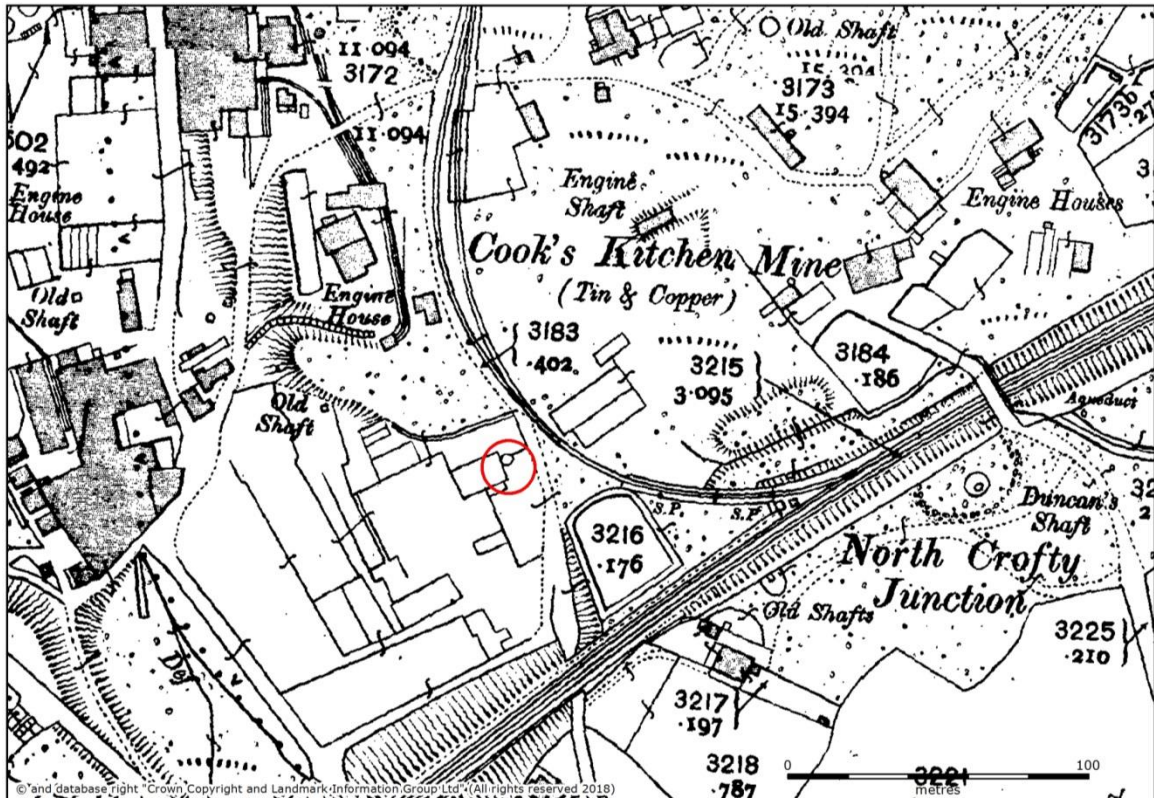


Fig 5. The situation of the chimney circa 1907, by when most of the Cook's Kitchen dressing floor structures had been partly demolished.



Fig 6. The Cook's Kitchen dressing floors in 1946, showing the location of the chimney (circled). © Historic England (NMR) RAF Photography.



Fig 7. The situation of the Cook's Kitchen chimney in the late 1980s. HER image F7/135.



Fig 8. The situation of the Cook's Kitchen chimney in 2005.

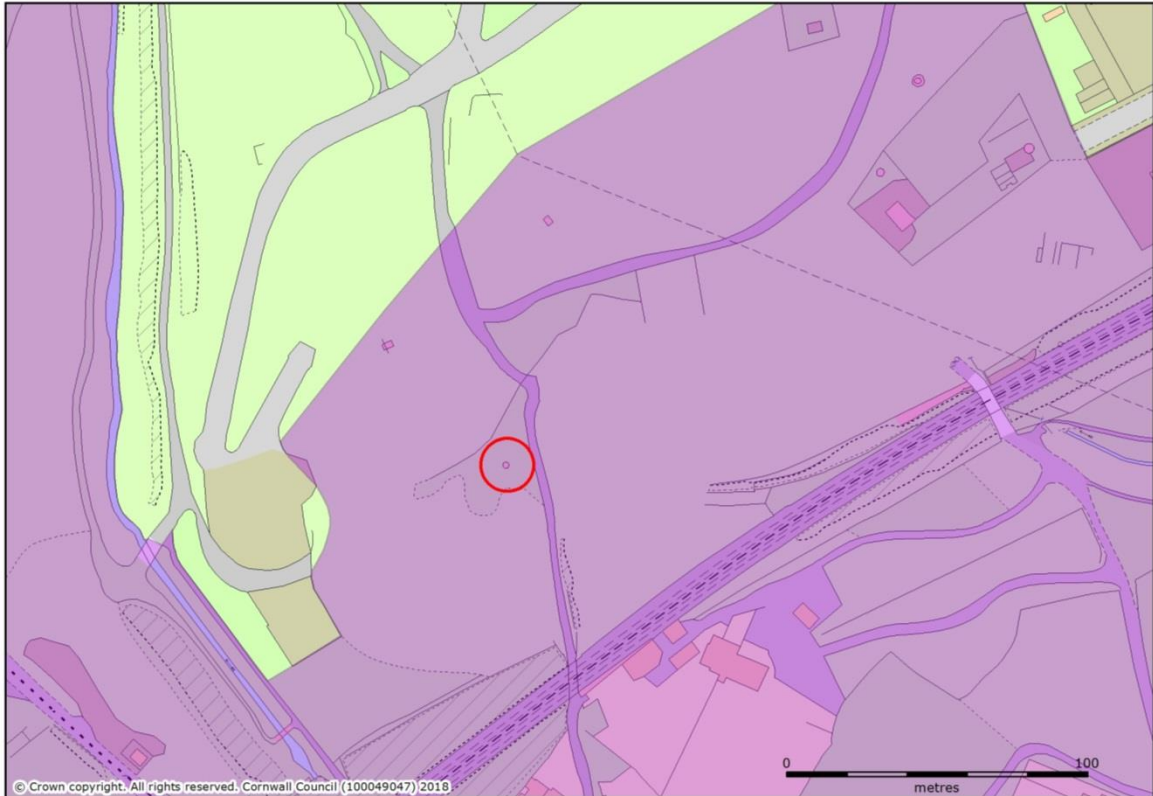


Fig 9. The extent of the Cornish Mining World Heritage Site at Cook's Kitchen.

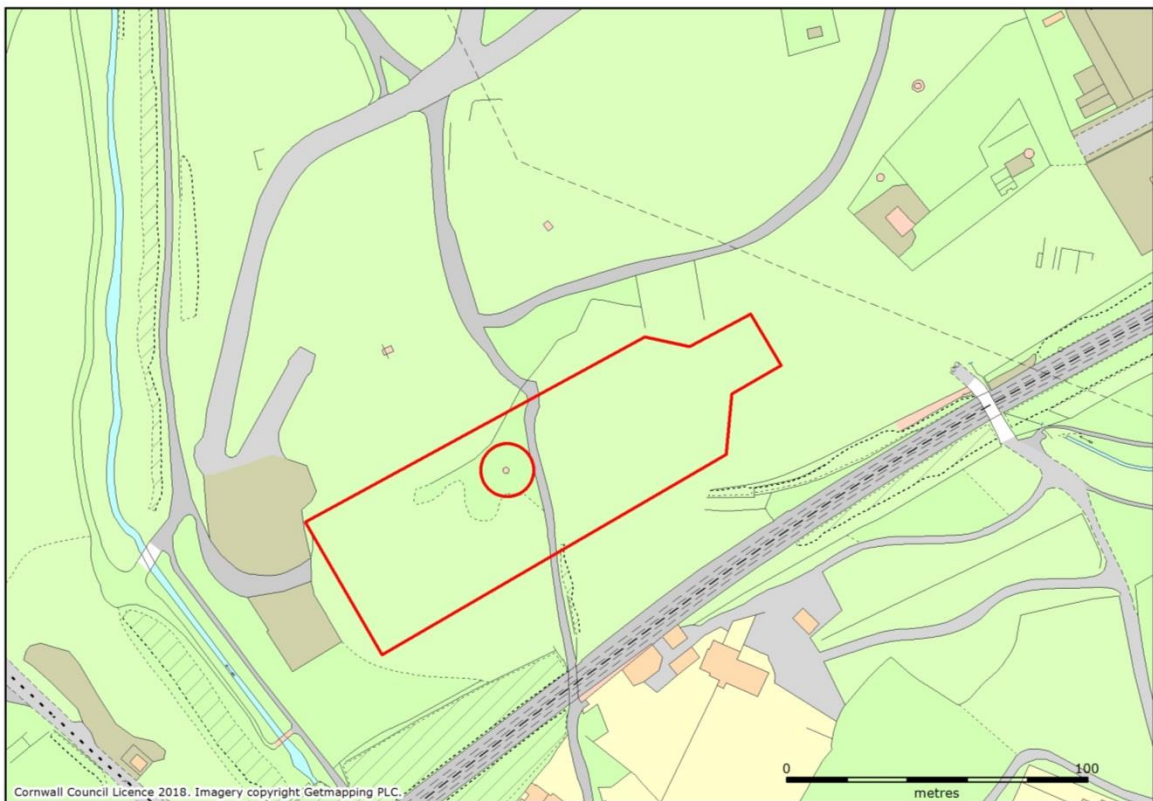


Fig 10. The approximate footprint of the new South Crofty mill building.



*Fig 11. Adam Stanford of Aerial Cam flying his DJI Inspire 2 at the site of the dressing floor chimney.*



*Fig 12. An example of one of the close-up images used in the subsequent production of the photogrammetric image of the chimney.*



*Fig 13. One of the medium height, medium distance record images of the chimney.*



*Fig 14. One of the sequence of images used in the structure-from-motion photogrammetry.*





*Fig 15. A vertical view of the chimney, showing the layers of galvanised mesh closing off its opening.*



*Fig 16. One of the more distant images showing the chimney in its landscape context, in this case the Red River Valley.*



Fig 17. A screenshot from the Sketchfab photomontage image of the chimney.



Fig 18. A further screenshot of the chimney photomontage.



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