

Northamptonshire Archaeology

Archaeological excavation at Cotes Road Barrow upon Soar, Leicestershire



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Danny McAree Report 10/11 January 2010

SITE ADDRESS:	COTES ROAD
	BARROW UPON SOAR
	LEICESTERSHIRE

- SITE CODE: BOS 09
- ACCESSION NUMBER: X.A 181.2009

NGR: SK 5700 1850

ORIGINATING BODY: NORTHAMPTONSHIRE ARCHAEOLOGY, NORTHAMPTONSHIRE COUNTY COUNCIL

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QUALITY CONTROL

	Signed	Date
Checked by	Pat Chapman	25.1.2010
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Approved by	Andy Chapman	27.1.2010

OASIS REPORT FORM

PROJECT DETAILS			
Project title	Archaeological ex	xcavation at Cotes Road, Barrow	
5	upon Soar, Leices	stershire	
Short description	Archaeological excavation was carried out on 0.65ha of land off Cotes Road, Barrow upon Soar. The site had been extensively quarried for limestone, before being reinstated as farmland. Two brick -lined 'pot' kilns for the calcining of limestone were found. The kilns were circular, between <i>c</i> 2.5m-3.0m diameter at the top, tapering to 1.0m-1.3m at the base and up to 1.8m deep. Prior to abandonment, all the brickwork lining was removed down to the last few courses at the base of the kiln. An out- turned stoke hole was present in each kiln with an external working area and a sloping ramp up to the ground level. On typological grounds, these appear to date from the late 18th or 19th century		
Project type	Archaeological ex	cavation	
Site status	None		
Previous work	Desk Based Asses (Stratascan), Evalua	sments (JSAC), Geophysical Surveys ation Trenches (ULAS)	
Current land use	Open field, paddo	ck	
Future work	None		
Monument type/period			
Significant finds	Post-medieval lime quarry and two limekilns		
PROJECT LOCATION			
County	Leicestershire		
Site address	Land off Cotes roa	ad, Barrow upon Soar	
Study area	0.65ha		
OS Easting & Northing	SK 5700 1850		
Height OD	65m OD		
PROJECT CREATORS			
Organisation	CgMs Archaeological Consultants		
Project brief originator	Leicestershire County Council		
Project Design originator	CgMs Archaeological Consultants		
Director/Supervisor	Danny McAree		
Project Manager	lain Soden		
Sponsor or funding body	Davidsons Limited	b	
PROJECT DATE			
Start date	2nd November 20	09	
End date	13th November 20	009	
ARCHIVES	Accession No	Content	
Physical	X.A.181.2009 (BOS09)	Pottery, brick, clay pipe, animal bone	
Paper	X.A.181.2009	Drawings, records, photos, report	
Digital	X.A.181.2009	PDF copy of file on CD	
BIBLIOGRAPHY	\PHY Journal/monograph, published or forthcoming, or unpublished client report (NA report)		
Title	Archaeological excavation at Cotes Road, Barrow		
Serial title & volume	10/11		
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CONTENTS

1 INTRODUCTION

2 ARCHAEOLOGICAL BACKGROUND

- 2.1 Lime and limeburning
- 2.2 Barrow upon Soar
- 2.3 Barrow upon Soar lime working
- 2.4 Topography and geology

3 OBJECTIVES AND METHODOLOGY

- 3.1 Objectives
- 3.2 Methods statement

4 THE EXCAVATED EVIDENCE

4.1 Lime quarrying and brick built pot kilns

5 THE FINDS

5.1	The pottery	by lain Soden
5.2	The animal bone	by Karen Deighton
5.3	Ceramic building materials	by Pat Chapman

- 5.4 The other finds by Tora Hylton
- 6 CONCLUSION

BIBLIOGRAPHY

APPENDIX 1: Context descriptions

TABLES

Table 1: Brick dimensionsTable 2: Clay tobacco-pipe catalogueTable 3: Glass catalogue

Figures

- Fig 1 Site location
- Fig 2 Historic Environment Record (HER) information
- Fig 3 Ordnance Survey 1888 map
- Fig 4 Plan of 2009 and associated 2006 trench and kiln locations
- Fig 5 Trench 4, sondage exposing bedrock
- Fig 6 Ditch [105], looking north
- Fig 7 Trench 4, plan and section of kiln [403]
- Fig 8 Kiln [403], general view, looking west
- Fig 9 Kiln [403], section through firing chamber, looking east
- Fig 10 Trench 5, plan and section of kiln [503]
- Fig 11 Kiln [503], general view, looking west
- Fig 12 Kiln [503], section through fill, looking north
- Fig 13 Kiln [503], firing chamber, looking west
- Fig 14 Cart tracks and kiln [503], scales 2m and 1m, looking northwest

ARCHAEOLOGICAL EXCAVATION AT

COTES ROAD, BARROW UPON SOAR

NOVEMBER 2009

REPORT 10/11

Abstract

Archaeological excavation was carried out on 0.65ha of land off Cotes Road, Barrow upon Soar. The site had been extensively quarried for limestone, before being reinstated as farmland. Two brick-lined 'pot' kilns for the calcining of limestone were found. The kilns were circular, between c2.5m-3.0m diameter at the top, tapering to 1.0m-1.3m at the base and up to 1.8m deep. Prior to abandonment, all the brickwork was removed down to the last few courses at the base of the kiln. An out-turned stoke hole was present in each kiln with an external working area and a sloping ramp up to the ground level. On typological grounds, these appear to date from the late 18th or 19th century.

1 INTRODUCTION

Davidsons have been granted planning permission by Charnwood District Council for development of land to the north of Cotes Road, Barrow upon Soar, Leicestershire. The development comprises residential housing, new roads and access to main highways (Application Reference P/06/1846/2).

As a condition of the planning permission and in response to desk based assessments (JSAC 631/04/01), geophysical survey (Stratascan: Moorhead 2006), evaluation trial trenching (ULAS Report 2006/110) and excavations by Northamptonshire Archaeology on the adjoining development site (McAree 2007), a further phase of archaeological mitigation works was required.

The works entailed the excavation of five trenches, two of 15m by 1.6m and one of 10m by 1.6m. The remaining two trenches were 20m by 20m and 30m by 20m respectively. The proposed works were in accord with the specification prepared by CgMs Consultanting (CgMs 2009).

The site is situated on the south-eastern slope of Catsick Hill, on the north side of Cotes Road (NGR SK 570 185, Fig 1). The site is bounded by Cotes Road to the south, existing residential properties to the east and west and new build residential property to the north.

The work was carried out by Northamptonshire Archaeology between 2nd-13th November 2009.

2 HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

2.1 Barrow upon Soar

The village of Barrow-upon-Soar has medieval origins and the historic core is located to the south of the current site. (Sites and Monuments Records and Historic Environment Records in the immediate area are shown on Figure 2).

Early evidence for human activity at Catsick Hill is represented by a doubleditched, circular enclosure identified in the northern half of the site in 2003 (GSB 2003, SMR MLE15820).

Possible Bronze Age ring ditches (SMR MLE825, MLE462) have been identified from aerial photography either side of Cotes Road, *c*200-300m to the west and south-west of the development area. Two rectilinear enclosures in the same area may indicate Iron Age enclosures (SMR MLE 463). Metal detecting at this site between 1991 and 1998 has produced a collection of two Iron Age coins, thirty seven Roman coins, thirteen brooches and two early Anglo Saxon brooches. A medieval seal was also found in the same area (SMR MLE 9860-64).

Additional metal detecting finds reported in 2006 include two early Anglo Saxon brooches from the west of the development site immediately adjacent to the rear boundaries of properties facing Cotes Road. Subsequent archaeological watching brief as part of the current works found no evidence of occupation or other cut features.

To the south of the river at Pillings Lock, archaeological evaluation and excavation revealed Iron Age enclosures and structures (SMR MLE 9541).

At a greater distance, a Roman road, the 'Salt Way' lies 1.5km to the south of the development site (SMR 51NE/BN). There may be a Roman small town located along this road or adjacent to the crossing point on the River Soar in the adjoining Quorndon parish (SMR 51NE.CM).

The earliest reference to the place name Barrow is in the Domesday Survey of 1086 when it was recorded as *Barhou*. Barrow might derive from Old English (OE) *beorg* meaning 'hill' but is more likely to derive from *Bearhu* meaning 'grove, wood' linked with the (OE) name for the local river: thus 'Grove on the (river) Soar' (English Place Name Society).

Aerial photography has identified earthwork remains of former ridge and furrow cultivation across the two fields to the north-east of the site, indicating that it was under arable cultivation by the later medieval period. An earlier geophysical survey carried out on the area to the north and east of the site in 2000 recorded numerous anomalies indicative of industrial activity (GSB 2000, MLE16045).

2.2 Barrow upon Soar lime working

Barrow has probably been linked with lime quarrying and lime burning since Roman times. A limekiln producing lime for the construction of the Roman city wall at Leicester is believed to have used limestone quarried and transported from Barrow (Cooper 2004). The earliest certain evidence of limestone working is a reference to the extraction of limestone at Barrow in the reign of Henry II, 1154-1189 (Ball 1976). It seems highly likely that Barrow lime was used in the construction of nearby Mountsorrel castle, destroyed in 1217.

Medieval production of lime is attested from at least 1396. An account of 1474 records 55 lime pits at Barrow and 85 pits in 1481 (Farnham 1912).

Lime from Barrow was used extensively in the construction of Kirby Muxloe Castle, Leicestershire in 1481-1484 (Hamilton Thompson 1913).

In 1564 and again in 1615 references are made to '*lyme pitt holes*' and '*the common lyme pitts*' of Barrow (Farnham 1930). The lime pits are recorded increasingly into the modern era and in 1673 it is recorded that Barrow lime was well known for its binding qualities (Nichols 1800). The association with lime continued throughout the medieval period and beyond with additional references to quarrying and the burning of lime at Barrow between the 1500s to the 1750s.

The early 1" to 1 mile map of Leicester produced by J Prior in 1779 indicates at least three lime works to the north-east of the development site with quarries and other limeworks in the north-west and south-east of Barrow upon Soar. In 1790, the 2" to 1 mile map of the Navigation Canal indicates additional limeworks to the south-east of Barrow.

The opening of the Leicester Navigation Canal from Leicester through to Loughborough in 1794 and the later Midlands Counties Railway line opened up new markets for Barrow lime. Initially, both enterprises were users of Barrow lime in the construction of the canals and railways, and later, provided for the cheap transport of fuel to Barrow and the delivery of lime from Barrow to a wider market. The industry remained vigorous throughout the 19th century and survives to the present day but in a much-reduced form.

The early geological maps of the area surveyed in 1831 and 1835 respectively indicate the existence of many limeworks and quarries in the Barrow area although definitive locations of these are not made clear.

The 1831 census records indicate the number of workers employed in the quarries at Barrow was 92 (1831 Census Records, Barrow upon Soar).

Nichols includes a description of the limestone working at Barrow upon Soar in his 'History and Antiquities of the County of Leicestershire' (Vol III circa 1800). Limestone could be found between 2 feet (0.6m) and up to 10-12 feet (3-3.6m) below ground level. It was found in a series of distinct 'floors' separated by layers of shale and mudstone.

The upper layer of stone where present was called 'Bank Hurs', the next layer 'Rummel' was considered 'generally only fit for building walls'. Subsequent layers were 'First Floor', 'Second Floor', 'Hurs', 'First Hog', 'Second Hog', 'Bottom Floor', 'Good-for-nought' and 'Four-foot'. This deepest lime floor was to be found at depths of about 30 feet (9m) but diggings up to 40 feet (12m) were common where the overburden was deeper.

The lime was extracted in the main from open quarries, the strip of land to be quarried was referred to as a 'delph' perhaps from 'delving' into the soil. It was generally dug in piece work or gang work sections 4 yards wide, 4 yards deep and 9 yards long and called a 'hade'. The lime workers contracted a set price for each yard of lime or each hade excavated. Nicholls records it cost 3d per cubic yard (0.76cu.m) for digging it and bringing it out in hand barrows.

The lime was rich in fossils, each layer being identifiable from the fossils found within it. In 1851, the first recorded Plesiosaurus skeleton was found in the lower Barrow lime beds and has since become the symbol of the town. Plesiosaur and Icthyosaur remains are found in two of the three lower lime beds at Barrow.

In 1877, the main quarries were all in the hands of Messrs John Ellis and Sons of Barrow upon Soar. Their pits extended along both side of the railway and focused in the south and east of the town.

The Ellis's had experience of underground mining from other business ventures and had introduced this expertise into their workings at Barrow. Underground workings were commenced from a drift in the area of the present Redlands works and the old Ellis quarry in the south-east of Barrow. The cost of recovering the lime rose with the depth of overburden to be removed. Ellis were contracted to supply thousands of tons of lime for the construction of the underground railways in London in the last decades of the 19th century. The move to underground extraction was an economic response to the need to produce vast quantities of lime to meet the expanding demand.

The 1888 First Edition Ordnance Survey map of the area records a complex of kilns just to the south Strancliffe Lane (SMR MLE 9914, Fig 3). An associated roadway and track linked this site to lime pits, at Tithe Farm, to the north (SMR MLE 9915).

Additional lime pits are shown to the east of the development area (SMR MLE 16294). A clay pit is shown to the south-east of the site adjacent to Willow Way (SMR MLE 9916).

The map data confirms the results of the desk based assessments (JSAC 631/04/01), geophysical survey (Moorhead 2006), evaluation trial trenching (ULAS Report 2006/110) and excavations by Northamptonshire Archaeology on the adjoining development site (McAree 2007) which show that extensive quarrying and limeburning had taken place across the development site and surrounding area (Fig 2, MLE15821, MLE15822, MLE16045, Fig 3).

2.3 Topography and geology

The site is situated on the south-eastern slope of Catsick Hill on the northern outskirts of Barrow-upon-Soar, to the north of Cotes Road and is centred on NGR SK 570 185 (Fig 1). It covers a total area of approximately 0.65 ha.

The development site is an open field retained as rough pasture. It is bounded to the east and west by existing residential properties.

The surface geology consists of Jurassic and Cretaceous clay and drift; the underlying bedrock is Permo-Triassic grey mudstone and reddish till. The development area is underlain by flat-bedded grey mudstones and interbedded thin limestones, which stratigraphically form part of the Upper Triassic and Lower Jurassic Periods. These rocks, varying in thickness, from 8 to 12 m, were formerly known as the Hydraulic Limestone beds because of their past importance for lime making.

The site is located at about 64.8m OD in the north, sloping down to about 63m OD along Cotes Road.

3 OBJECTIVES AND METHODOLOGY

3.1 Objectives

The main objective of the archaeological excavation was to excavate and record the archaeological remains in order to understand the nature, function and character of the site in its cultural and environmental setting. The specific aims of the project were to:

- Understand the industrial activity on the site as evidenced by the lime burning kilns and extraction pits recorded during evaluation.
- Understand the post-medieval activity on the site.
- Develop a chronological sequence for the human and industrial activity on the development site and place it within the context of the development of Barrow upon Soar and within their local, regional and national context.

The national framework for research is set out by English Heritage (1997) and the East Midlands Research Agenda (Cooper 2006); the research aims set out in these documents are addressed by the project.

The results of the project will be incorporated into an article on the Barrow Limeburning Industry 2006-9 in the proceedings of the Leicestershire Archaeological and History Society (TLAHS). A site specific report on the findings of this excavation will be included in the next available issue of East Midlands Archaeology (the annual report of the Council for British Archaeology (CBA) East Midlands).

3.2 Method statement

Mitigation Strategy

It was proposed to mitigate against the impact of the development on the archaeological deposits through preservation by record.

Fieldwork and Recording

All works were conducted in accordance with the *IFA Standards and Guidance for Archaeological Excavations* (1994, revised 2008) and the *Code of Conduct* of the Institute for Archaeologists (1985, revised 2008).

Monitoring of the programme of fieldwork was carried out by the Planning Archaeologist, Leicestershire County Council, on behalf of Charnwood District Council.

The topsoil and subsoil were removed by a 360[°] mechanical excavator, fitted with a toothless ditching bucket, to reveal significant archaeological remains or, where these were absent, the natural substrate or quarry backfill.

Spoil was transported by a dumper where appropriate. This work was carried out at all times under archaeological supervision.

The trenches and archaeological areas were located using a Leica GPS survey instrument and related to the Ordnance Survey National Grid. All levels have been related to Ordnance Survey Datum. The archaeological surfaces were cleaned by hand and planned at a scale of 1:100. Complex features were planned at 1:20.

Industrial features were fully excavated without recourse to dismantling of the structures. The character, composition and general depositional sequence of the site stratification were recorded on pro-forma sheets, with a unique context number being allocated to each distinct deposit and feature.

A full photographic record comprising both 35mm monochrome negatives, colour transparencies and digital images was maintained. All records completed during fieldwork have been compiled into a comprehensive and fully cross-referenced site archive.

4 THE EXCAVATED EVIDENCE

4.1 Lime quarrying

The natural grey-yellow sandy clay subsoil (108) was exposed only at the southern end of Trench 1. It was cut by field ditch [105] 1m wide, with a V-shaped profile 0.5m deep. It was filled with brown sandy clay loam (106) mixed with redeposited yellow sandy clay and fragments of laminate mudstone up to 0.1m long (Figs 4 and 6). The ditch formed a clear boundary between the undisturbed subsoil to the south and quarry cut [107] immediately to the north. The quarry edge was only exposed in Trench 1 where it was parallel with the hedgerow that forms the southern boundary of the site. Excavation in 2006 to the north-east indicated that the quarry extended across the whole of the development area and into the new housing to the north (Fig 4).

Quarry backfill was exposed across the whole of the remainder of the development area. A sondage cut in the north-east corner of Trench 5 exposed bedrock at 1.2m below the modern ground surface (62.7m OD), a sondage in the south-east corner of the Trench 4 exposed bedrock at 1.75m below the ground surface (61.72m OD, Fig 5). The quarry fill was primarily redeposited yellow-grey sandy clay upcast (102) from its excavation, mixed with fragments of limestone and mudstone.

Excavation of Trenches 1-3 revealed quarry fill but no other archaeological features. Anomalies identified during evaluation could be related to variations in the quarry backfill, in particular concentrations of kiln waste, ash, coal and burnt lime that would show up as strong magnetic anomalies during geophysical survey.

Cut into the fills of both Trenches 4 and 5 was a single circular kiln [403] and [503], each with an oval working area extending up to 8m long and 3.5m wide. Both kilns were half sectioned to establish their build, size and profile (Figs 4, 7 and 10).

4.2 Brick-built pot kilns

The two excavated kilns comprised a firing chamber shaped like an inverted funnel, roughly circular and surviving up to 3.0m diameter. In each kiln, about two-thirds of the circumference of the kiln walls survived, the portion above the kiln entrance had been removed prior to abandonment and backfill. In Trench 5, kiln [503] had been truncated at about 0.65m deep, but in Trench 4, kiln [403] was much better preserved, up to 1.8m deep tapering to a base diameter of 1.0m-1.3m diameter. In each case the original construction cut was steeply sloping and the surrounding clay and mudstone quarry fill had been scorched bright red/orange by the heat of the kiln firing process.

This area of burnt quarry fill extended up to 0.2m wide all round the surviving edge of the kiln (kiln [403] Figs 7-9, kiln [503] Figs 10-13).

Occasional patches of hard white lime mortar adhered to the inner edge of the scorched quarry fill and carried the imprint of brickwork that had originally lined the walls of the kiln. The upper brickwork had all been stripped out before abandonment and backfill of each of the kilns. The compacted demolition debris, lime mortar and ash from the robbing of the internal kiln lining had buried up to seven courses of brickwork at the base of each kiln level preserving it *in situ*.

The cut for the kiln walls had originally been clad with a single layer of bricks laid as stretchers around the full circumference and the full height of the kilns. At the lower levels, the brick lining formed an out-turn terminating in two matched brick piers that flanked the sole access, the kiln [403] entrance facing east, and the kiln [503] entrance facing north-east. Both entrances were about 0.6m wide and surviving up to 0.6m high. This access would originally have supported a brick arch with the surviving piers acting as 'arch springers'.

The kiln wall above this arch would have been about 15 inches (0.375m) thick formed from a wall of bricks 1½ bricks wide laid as a single stretcher and a header in alternating courses. The additional thickness of the brickwork above the entrance was to provide strength and insulation to the structure as this was the only part of the kiln chamber not supported and insulated by being cut into and supported by quarry upcast. The kilns were floored with bricks laid on face and bonded with straight-line joints on hard white mortar.

The surviving brickwork had been exposed to extremely high temperatures, the bricks being burnt deep blue and purple and in places the brick surface had vitrified and distorted showing bubbles and ribbons of glassy glaze.

Where exposed, the entrances were each butted by a low dry-stone wall built of large slabs of broken limestone up to 0.6m high and extending up to 3m from the kiln and enclosing a roughly oval working space (Figs 8 and 11). In both cases, the working area appeared to be wider to the left when facing the kiln.

Immediately outside the kiln entrance the working area was floored with either a threshold of bricks laid flat or a layer of limestone slabs forming a flat surface adjacent to the kiln that would have allowed for ease of shovelling the lime into containers ready to be carried to waiting carts for transport off site. The remainder of each working area was covered in a hard layer of lime mortar and ash up to 40mm thick.

Along the base of the side retaining walls were small drifts of lime mortar, ash and burnt stone that had become concreted to the floor and walls of the working area (Figs 7 and 10).

The kiln access was relatively flat at first but then sloped steeply upwards tapering and narrowing away from the kiln entrance to ground level.

The interior working area and ramp access to each kiln had been filled with layers of broken brick, lime mortar, burnt clay and mudstone demolition debris from the destruction of the kiln, mixed with re-deposited clay and mudstone quarry fill. Mixed in with this material were fragments of both unburnt and burnt limestone up to 0.3m long and 0.1m thick.

Associated with both kilns and located within 2m of the access ramp in each case were parallel cart or wagon tracks cut into the soft surface of the site and associated with the working of the kilns. They were 1.1m-1.2m apart, up to 0.5m wide and 0.05m deep, suggesting repeated use to access the kilns (Fig 14). These were up to 5m long and either fading out or extending beyond the limit of excavation.

5 FINDS

5.1 The pottery

by Iain Soden

A total of three stratified sherds of pottery was recovered. These comprise two sherds from context 106, the fill of the former roadside boundary ditch in Trench 1. Both are small sherds of Blackware Pancheons of the 19th-century (Leics type EA).

In addition, from the quarry backfill of Trench 4 comes a single sherd of proto-Midland Purple of the 15th-17th centuries (Leics type MP). This suggests that the area around Trench 4, having been previously quarried for its limestone, was then made good during this period before the closest kiln was built.

Other than this the excavations produced only unstratified pottery from topsoil as follows:

Trench 1 topsoil (101) – 4 sherds of 19th century pottery

Trench 2 topsoil (201) – 6 sherds of 19th-20th century pottery

Trench 4 topsoil (401) – 17 sherds of 19th-20th century pottery

Trench 5 topsoil (501) – 100 sherds of 18th-20th century pottery

An additional three unstratified sherds were recovered from the backfill of a former ULAS trench where it was crossed by Trench 1 (104).

None of the unstratified pottery has any demonstrable association with the working of the site or the limestone-quarrying or lime-burning industries, but rather it relates either to the final remaking of the land for agricultural purposes after the kilns have been dispensed with or the agricultural use of that land thereafter. For this reason no further analysis has been undertaken.

5.2 The animal bone

by Karen Deighton

A total of 118g of animal bone was collected by hand from two contexts during the course of excavation. Preservation was reasonable with a low level of fragmentation and bone surface abrasion.

Context 402 produced a cattle (Bos) metacarpal, the distal epiphysis was absent apparently due to a combination of canid gnawing and excavation damage. A fragment of sheep/goat (Ovicaprid) pelvis was recovered from context 426. This consisted of the left acetabulum and ischium and the left half of the pubis. The lower part of the ilium appeared to have been chopped through. Obviously with such a small amount of bone little can be said with regards to the animal economy at the site.

5.3 Building material by Pat Chapman

Bricks

This is a sample of eight bricks from the two excavated pot kilns [403] and [503]. Three of these are complete, four survive by either a half or more and one is just a fragment (Table 1). Seven of the bricks are made from a sandy fabric with some gravel, flint and calcareous inclusions up to 8mm long, with occasional quartz pebbles up to 20mm in diameter and with no frog. They are typified by being overfired with the fabric heated to pale red, white and grey, and cindery to the touch.

Where the surfaces were exposed there has been a great deal of vitrification which is slaggy in appearance, and in one case like a glaze.

The two bricks from kiln fill (532) are identical in their dimensions, probably coming from one batch, and are vitrified along one stretcher. However, the four bricks from kiln [403] vary in width, thickness and appearance. The two from kiln fill (417) are similar in appearance and vitrified on the header only, although one brick also has a mauve-brown and shiny smooth header as if both headers may have been exposed to heat at one time. One brick, from quarry fill (402), has been barely touched by the heat.

It is still red-brown in colour and is also the broadest. The other brick from this context, by contrast, is almost completely black, with vitrification just starting on the broken header. These bricks are very similar to those that came from the previously excavated kilns (Chapman 2007).

An apparently anomalous brick from quarry fill (502) was made from fine silty sandy clay with, some shell and gravel up to 7mm. It is slightly reddish-brown with very smooth surfaces and a very broad frog 68mm wide, straight-sided and 5-8mm deep, but with no maker's name or initials on this fragment.

	Dimensions	Description
	mm (inches)	
402 / quarry backfill	120 x 60	Orange-brown
	(4 ³ / ₄ x 2 ³ / ₈)	
402 / quarry backfill	105 x 55	Almost all black, one red corner, broken
	(41/₃ x 21/₄)	end beginning to vitrify
417 / kiln fill layer	105 x 60	vitrified slaggy one end, mauve-brown
	(4¼ x 2⅔)	shiny smooth the other; red, pale red,
		white and grey body; mortar one surface
417 / kiln fill layer	215 x 110 x 70	sandy orange to red, grey mainly most
	(8½ x 4¼ x 2¾)	on one surface, black slaggy vitrified
		header; mortar on all surfaces
417 / kiln fill layer	120 x 60	overfired to reddish but not vitrified,
	(4 ³ / ₄ x 2 ³ / ₈)	blackening on one surface 50mm in
		from end with a bit on the sides, broken
		end white
502 / quarry backfill	110 x 65	Fine red-brown; very broad frog 68mm,
	(4 ³ / ₈ x 2)	straight-sided, 5-8mm deep
532 / kiln fill layer	235 x 105 x 70	red and white, cindery to touch, vitrified
	(9¼ x 4½ x 2¾)	on one stretcher to slaggy
532 / kiln fill layer	235 x 105 x 70	red and white, cindery to touch, vitrified
	(9¼ x 4½ x 2¾)	on one stretcher to slaggy; broken

Table 1: Brick dimensions

Tile

There are three sherds, one broken, of roof tile. The sherd from quarry fill (402) is slightly curved, 14mm thick, and made from a pink reddish- brown fabric and could be from a pantile. The flat roof tiles sherds comprise a machine-made broken tiles from topsoil (501), 10mm thick and red-brown with part of a stamp surviving ...OUGHT. The other sherd from this context is very similar.

Fired clay

This small assemblage comprises fragments from bricks and general fired clay. There is a lump of vitrified clay from a kiln brick from topsoil (101). From backfill of an earlier evaluation trench (104) and ditch fill 106) come small fragments of brick. The remaining fragments from the same two contexts (106) and (104) are small lumps of fired clay from the kilns.

Slate

Of the three small sherds of slate, one very thin fragment comes from quarry fill (402), and two slightly thicker pieces from topsoil (501). They are black and very fine and probably Welsh as their slate quarries supplied most of England during the 19th century and into the early 20th century.

5.4 The other finds by Tora Hylton

The excavations at Barrow on Soar produced a small collection of clay tobacco-pipes and vessel glass. With the exception of one abraded pipe stem from topsoil, which may be of 17th century date, the entire assemblage dates to the 19th century and later. With the exception of clay tobacco-pipe fragments recovered from ditch fill (106), the fill of the working area (422) in kiln [403] and from a kiln fill layer (504) in kiln [503], all the finds were recovered from topsoil deposits overlying Trenches 2, 4 and 5.

Glass

Ten fragments of glass were recovered from topsoil deposits overlying Trenches 4 and 5. Much of the assemblage comprises undiagnostic body sherds. Diagnostic pieces include a neck/rim sherd from a wine bottle dating to the late 19th century, stem and bowl fragments from wine glasses, and the neck and shoulder from a small bottle/flask. The assemblage dates to the late 19th century or later.

Context	Туре	Number	Comment
401	Wine glass	1	Fragment of stem, abraded
	Bottle glass	1	Brown (beer bottle) body sherd
	Jar	1	Clear glass jar body sherd and
			part of base
501	Wine bottle neck	1	Green glass (c. Late 19th)
	Body sherd from bottle	1	Green glass, laminating
			surfaces
	Body sherd	1	Clear cut-glass wine glass
	Body sherds	3	Clear glass –undiagnostic
	Bottle.flask	1	Part neck and shoulder pale
			blue glass bottle

Table 3: Glass catalogue

Clay tobacco-pipes

A small group of 30 clay tobacco-pipe fragments were recovered, comprising five complete or fragmented bowls and 25 stem fragments. Chronologically the earliest fragment appears to be an abraded stem fragment which has a much larger stem bore (8/64 inch) than the other examples (5/64), suggesting that it dates to the 17th century; the remainder date to the 19th century.

Two bowls are sufficiently complete to enable dating, following Oswald's simplified typology using bowl and foot/spur forms (Oswald 1975, 37-41).

The forms include a plain spurred bowl Oswald Type G23, which dates to c1760-1800, and a bowl ornamented with vertical ribbing in relief, Oswald type G15 (c1840-1880). In addition there are two bowl fragments decorated with different styles of foliate relief moulding, one with a single leaf covered the entire front seam (cf. Oswald 1975, fig 17, 10) and one with a line of crudely executed leaves running the length of the seam, the latter a common motif in the 19th century. All the bowl fragments are unmarked therefore cannot be attributed to an individual maker.

The stem fragments measure up to 83mm in length and two examples retain their mouthpieces. One stem fragment is decorated with an ornate pelleted motif.

Context	Stems	Bowls	Comments
106	1		
201	1		
401	5 (1of 83mm)		
422		1	Not complete – upright spurred bowl , poss. Oswald type 23 (1760-1800
501	15 (2 with mouth pieces)	1 complete 3 fragments	Complete bowl with vertical ribbing in relief (19 th c)- Oswald type 15 (1840-80). Fragment from 2 plain bowls with relief decorated seams – one with single leaf covering entire seam cf. Oswald 1975, fig 17,10) and one with a line of crudely executed leaves running the length of the seam. (19 th century)
504	3		1 ornately decorated with a finely executed pelleted motif in relief.

Table 2: Clay Tobacco-pipe catalogue

6 CONCLUSION

On the present development site, the excavated evidence is unequivocal. The whole of the area had been quarried for limestone and then reinstated. Only a narrow strip of land to the west along the Cotes Road boundary had been left intact. This was separated from the quarry edge by a field ditch, no doubt flanked along the edge of the road by an earthen bank and hedge.

Exactly this type of boundary arrangement was found in the earlier excavations immediately to the north-east of the site and again in the area to the south-east backing onto Willow Way (McAree 2007).

It seems probable that as each area of the site was systematically quarried and backfilled, the area quickly reverted to agriculture with either ploughing or pasture taking place on the reinstated topsoil ground surface.

The two kilns excavated on the development site were both of a type known as 'pot' kilns comprising an open topped combustion chamber usually tapering to a narrower base. If free standing, they had thick stone or brick walls to retain the charge of fuel and stone and to act as insulation to maintain the heat of the calcining process. In Barrow upon Soar, the archaeological evidence to date is that the lime workers preferred to construct their kilns below the ground surface. The advantage of digging kilns into the ground was to save on the cost of building substantial brick or stone structures and to use the surrounding soil as insulation. In addition, further layers of fuel or stone could be loaded directly from carts at ground level, whereas free-standing kilns would require a ramp or some access to the top of the kiln to load the charge. For this reason, in many parts of the country, kilns of this type were built into hill slopes where the upper slope provided access to the top of the kiln.

Each 'pot' kiln would normally have one or more draw holes or 'eyes' at the base. Through these, the fire was lit, ashes were raked and the burnt product eventually removed (Williams 2004). Pot kilns are often referred to as 'flare' kilns using wood, peat or coal as fuel in direct contact with the stone to be processed. Inside the firing chamber, a variety of firing techniques were used, the load of alternating layers of fuel and stone might be initially supported on a network of timbers or occasionally on metal firebars forming an arch (sometimes known as an '*iron horse*'). In other instances, it was normal for an arch or dome of large lumps of limestone to be built, often supported on a ledge designed for this purpose, thus creating a hollow in which the fire could be built. It was not a particularly economical method of production but produced excellent lime.

The initial firing was kept contained in order to set or fuse the load of limestone above the fire. More extreme heat was then built up until calcining was complete within 24-36 hours. There would have been a lengthy cooling down period and the full process probably took up to a week to complete. Kilns of this type have been recognised from all parts of the country with numerous examples documented in Sussex, Surrey, Warwickshire, Staffordshire, Derbyshire and Yorkshire as well as Scotland and Ireland (Skinner 1969, Palmer *et al* 1992, Truman 1992, Dix 1995, Leach 1995, Nisbet 1999, Johnson, 2002, Hurst 2003, Williams, J 2004, Williams, R 2004, Hampshire County Council 2007).

Where large quantities of lime were needed, multiple kilns might be used. Alternatively, each kiln could be loaded and fired, the ash and calcined lime then being raked out from the access at the base of the kiln.

As the fuel burnt away and lower layers of calcined lime were removed, additional layers of fuel and limestone could be loaded directly into the chamber from the top allowing for a continuous process of lime calcining. Eventually, the weight of material would overcome the ability of the kiln to support the firing process and the final load would be allowed to burn out and cool before being emptied, the kiln recharged and the process repeated again.

Previous excavation immediately to the north-east of the development site uncovered four similar brick lined kilns, each with an oval working area extending up to 6m long and 3.5m wide. One kiln was fully excavated, two were halfsectioned and the fourth was excavated sufficiently to establish its size and profile (McAree 2007, Fig 4)

It was noted on excavation of similar kilns on the adjoining site and in the current excavations that there was a wider curve to the working area on the left of the kiln arch than that to the right.

This may indicate deliberate design and construction for the positioning of a worker with a dominant right hand grip to stand and rake out the hot caustic lime from the kiln base onto the floor of the working area.

A shallower curve would place a right handed worker in front of the kiln arch and in a position of danger when hot caustic lime was being pulled out onto the working area floor. Once on the working floor, the hard stone surface would have allowed for ease of shovelling the lime into containers ready to be carried to waiting carts for transport off site.

Analysis of archaeomagnetic samples taken from the burnt brick lining of two of the kilns immediately to the north-east of the development site gave the dates of last firing in the range 1795-1840 and 1825-1860 respectively. Analysis from other kilns of similar size and build located further east produced archaeomagnetic dates from 1700-1750 AD, *c*1750 and 1825-1870 AD (McAree 2007).

If it were not for the modern artificial demarcation of a property boundary between the excavation area to the north and the development area just excavated, it would be clear that the same quarry extends under both areas and that the kilns in both areas are virtually identical in size, build and methods of construction and destruction.

Given their spatial proximity and similarity it seems certain that both excavations have uncovered kilns built and used in a single phase of contemporary quarrying and limeburning activity.

There were no floor or working surfaces associated with the kilns on the development area but the presence of cart or wagon tracks in close proximity to both excavated kilns indicates the use of transport contemporary with the operation of the kilns.

It was normal for fuel and stone to be loaded from the top of the kiln directly into the firing chamber. Only ash and the hot, calcined lime were drawn from the kiln firing arch at the base of the access ramp. As all the cart tracks are in close proximity to the end of the access ramp, it is much more likely that these tracks represent the removal of calcined lime from the kilns rather than the delivery of raw materials, limestone or fuel, for use in the firing chamber at the opposite end of the structure.

There is clear evidence that the heavy carts had sunk into the soft quarry fill and efforts had been made to consolidate the ground by spreading ash, scorched clay and mudstone and fragments of burnt limestone into the cart/wagon ruts to facilitate movement of the vehicle.

This also gives good evidence that the quarry backfill as excavated must be at or just below the level of original re-instatement. The original ground surface when the kilns were in operation is probably not that different from that exposed when the topsoil was stripped from the site prior to excavation.

In the case of Trench 5, the ramp access lies at the same level as the cart tracks. Given the recorded depth of the kiln in Trench 4 and those excavated to the north-east, it would be expected that the Trench 5 kiln would also have been about 3.0m diameter and 2.0m-2.5m deep from the top of the kiln structure to the base of the firing chamber.

The excavated evidence clearly shows this kiln survived only 0.6m deep. Since the land surface appears to have been at or about the machined excavation level, it seems certain that this kiln was not fully cut into the quarry fill as were the other excavated examples of these kilns, but was built at least partially into a mound above the reinstated quarry fill.

This would seem to be supported by the recorded differences in the backfill of this kiln compared to other excavated examples. Most kilns of this type present as a pen-annular halo of scorched red earth enclosing redeposited fill of the kiln. This kiln presented as an elongated oval of scorched red clay, bounded to the west by the normal halo plan of the kiln chamber, but filled with desiccated scorched red clay and stone.

In a fully earthfast kiln, the scorched material would, for the most part, remain *in situ* around the circumference of the kiln chamber. The brick lining would be stripped away and while some slippage of scorched earth into the chamber cavity would be inevitable, the majority of the fill would be of redeposited quarry upcast. In this instance, when the brickwork was stripped, debris collected in the base of the kiln chamber. It was then filled with mixed layers of scorched red clay and quarry upcast, almost certainly the destruction and levelling of the raised mound supporting the upper structure of this kiln.

In both these and other kilns of this type excavated in the surrounding area, the only fuel recovered was coal. Examination of the residual ash and fuel in the bases of these two excavated kilns revealed only coal fragments.

The evidence of pottery and bone recovered from the excavations is indicative of manuring scatters and land reinstatement rather than activity at or around the kilns. The pottery fragments are strictly utilitarian domestic wares with no evidence of industrial activity.

Bone recovered on the site is generally discarded domestic food waste but in such small numbers that it cannot indicate anything more than a random scatter.

Analysis of the bricks used in the construction of both the pot kilns has proved fairly inconclusive. All the bricks appear to have been of local manufacture, probably purely for use within the kilns.

There are no well-dated examples for comparison in the area. Many of the surviving bricks were heavily burnt and vitrified, often on opposing faces indicating that they were re-used, either within the same kiln as part of ongoing maintenance and repair, or perhaps more likely, they were stripped from each kiln as it was abandoned and backfilled and possibly re-used to line a new kiln elsewhere on the vicinity.

It remains equally possible that given the evidence for reinstatement at roughly modern day levels, the removal of kiln brickwork, much in extremely poor condition, may have been as much a response to prevent damage to the ploughs used on the reinstated fields as to provide re-usable materials for new kilns.

Excavations at Cotes Road continue to demonstrate the wealth of surviving archaeological evidence for the extensive limestone industry at Barrow upon Soar. The potential for further extensive finds relating to the limeburning industry at Barrow upon Soar can reasonably be expected in all areas where there is, or has been, underlying limestone geology.

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APPENDIX 1: Context descriptions

Trench	Context	Context type	Description
1	101	Topsoil	Brown sandy clay loam
	102	Quarry fill	Yellow grey sandy clay, mudstone,
		_	limestone, ash, burnt clay
	103	Cut of trench	Archaeological evaluation trench
	104	Fill of trench [103]	Orange/grey sandy clay
	105	Cut of ditch	Boundary for quarry
	106	Fill of ditch [105]	Brown sandy clay, yellow clay, laminate
			mudstone, limestone
	107	Quarry cut	Edge of quarry excavation
	108	Natural	Yellow grey sandy clay
2	201	Topsoil	Brown sandy clay loam
	202	Quarry fill	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay
	203	Cut of trench	Archaeological evaluation trench
	204	Fill of trench [203]	Orange/grey sandy clay
	205	Quarry fill	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay
	206	Quarry fill	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay
	207	Quarry fill	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay
3	301	Topsoil	Brown sandy clay loam
	301	Quarry fill	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay
	303	Quarry fill	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay
	304	Quarry fill	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay
	305	Cut of trench	Archaeological evaluation trench
	306	Fill of trench [305]	Yellow grey sandy clay, mudstone,
			limestone, ash, burnt clay Orange/grey
	207	Quern (fill	Vellow grov condy clove frogmonto of
	307	Quarry III	limestone
4	401	Topooil	Rown condy clay loom
4	401	Querry fill	Vollow grov condy clay mudatono
	402		limostono, ash, burnt clay, muusione,
	403	Cut of kiln chamber	Circular tapering in to base
	403	Scorched clay	Heat 'halo' around firing chamber
	404	Kilp wall	Red brick burnt and vitrified
	405	Kiln base	Brick laid 'on face' bonded in lime
	400	Kiln threshold	Brick laid 'on face' bonded in lime
	407	Kiln firing arch wall	South arch springer
	400	Kiln firing arch wall	North arch springer
	409	Cut of kilp working	Oval cut sloping steeply down to base of
	410	area and access ramp	kiln
	111	Working area floor	Limestone blocks bonded on lime
	412	Retaining wall	Dry-stone limestone block wall
	412		Lime mortar and ash surface
	413	Primary kiln fill laver	Charcoal and ash
	415	Rurnt lime laver	Residual lime from last kiln firing
	416	Kiln fill laver	Inder-fired limestone fragments
	417	Kiln fill laver	Red/brown brick clay mortar
	-+17		Tread of the second sec
	418	Kiln fill layer	Red/orange scorched earth

Trench	Context	Context type	Description
	419	Kiln fill layer	Yellow grey sandy clay, limestone
	420	Kiln fill layer	Red/orange scorched earth
	421	Kiln fill layer	Yellow grey sandy clay, scorched orange
	422	Working area fill lavor	Part fired limestone ash
	422	Working area fill layer	Yollow grov sandy clay, scorehod grange
	423		clay and limestone
	424	Working area fill layer	Brown sandy clay lens
	425	Access ramp fill layer	Brown grey sandy clay
	426	Kiln fill layer	Mixed brown and yellow grey clay
	427	Access ramp fill layer	Yellow brown sandy clay
	428	Kiln fill layer	Under-fired limestone fragments
	429	Cart tracks	Parallel wheel ruts
_	430	Cart tracks	Parallel wheel ruts
5	501	lopsoil	Brown sandy clay loam
	502	Quarry fill	Yellow grey sandy clay, mudstone, limestone, ash, burnt clay
	503	Cut of kiln chamber	Circular, tapering in to base
	504	Kiln fill layer	Brick, mortar, scorched clay, ash
	505	Scorched clay	Heat 'halo' around firing chamber
	506	Retaining wall	Dry-stone limestone block wall
	507	Working area floor	Limestone blocks bonded on lime
	508	Access ramp floor	Lime mortar and ash surface
	509	Trampled ash layer	Loading area for cart/wagon
	510	Ramp fill layer	Redeposited quarry upcast
	511	Ramp fill layer	Redeposited quarry upcast
	512	Ramp fill layer	Grey brown sandy clay
	513	Kiln fill layer	Mixed quarry fill/ scorched clays
	514	Kiln fill layer	Demolition debris, brick, mortar, scorched clay kiln packing
	515	Kiln fill layer	Demolition debris, brick, mortar, scorched clay kiln packing
	516	Kiln fill layer	Lens of clean brown sandy clay
	517	Kiln fill layer	Demolition debris, brick, mortar, scorched clay kiln packing
	518	Kiln fill layer	Mixed guarry fill/ burnt red clay
	519	Kiln fill layer	Demolition debris, brick, mortar, scorched
	520	Kiln fill laver	Demolition debris lime mortar burnt
	020		lime/mudstone, ash
	521	Kiln fill layer	Demolition debris, brick, mortar, scorched clay kiln packing
	522	Kiln fill layer	Lens of clean brown sandy clay, some
	523	Kiln fill laver	Yellow brown sandy clay, ash
	524	Kiln fill laver	Demolition debris, brick, mortar, scorched
			clay kiln packing
	525	Kiln fill layer	Redeposited quarry upcast
	526	Kiln fill layer	Lens of topsoil in slump of kiln fill
	527	Kiln threshold	Brick laid 'on face', bonded in lime
	528	Kiln wall	Red brick, burnt and vitrified
	529	Primary kiln fill layer	Burnt line, charcoal and ash
	530	Kiln fill layer	Demolition debris, brick, mortar, scorched clay kiln packing
	531	Kiln fill layer	Demolition debris, brick, mortar, scorched clay kiln packing, ash

Trench	Context	Context type	Description
	532	Kiln fill layer	Demolition debris, brick, mortar, scorched
			clay kiln packing
	533	Kiln floor	Brick laid 'on face', bonded in lime
	534	Kiln firing arch wall	South arch springer
	535	Cart tracks	Parallel wheel ruts

















Trench 4, sondage exposing bedrock Fig 5



Trench 1, section through ditch [105] Fig 6





Kiln [403], general view, looking south Fig 8



Kiln [403], section through firing chamber, looking east Fig 9





Kiln [506], general view, looking north-west Fig 11



Kiln [503], section through fill, looking north Fig 12



Kiln [503], firing chamber, looking north-west Fig 13



Cart tracks and kiln [503], scales 2m and 1m, looking north-west Fig 14



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