



EXCAVATION OF 18TH-19TH CENTURY BRICK KILNS AT NORTON, NORTH YORKSHIRE

Philippa Cockburn and Chris Scott

In January 2013 Archaeological Research Services Ltd undertook an archaeological excavation on land at Westfield Nurseries, near Norton in North Yorkshire prior to the commencement of a new housing development. Excavations revealed a series of structures and features relating to a long history of brick and tile manufacture at the site. Despite the heavily truncated nature of many of the remains, it was possible to identify two main phases of industrial activity on the site with the first defined by a number of simple “clamp” kilns, and a later phase defined by more permanent kilns of ‘Scotch’ and ‘Newcastle’ type. The kilns were accompanied by probable clay extraction trenches and tempering pits suggesting that the raw materials for the brick industry were sourced on site.

INTRODUCTION AND BACKGROUND

The former Westfield Nurseries site covers an area of c.5.7 ha and is centred on NGR SE 8030 7185 some 750m north-east of the historic core of Norton and c.1km east of Malton. The site is situated on a solid geology of Jurassic Amptill Clay Formation and Kimmerridge Clay Formation overlain by a superficial geology of alluvial clay, silt, sand and gravel (BGS 2013).

The First Edition Ordnance Survey map of 1854 shows much of the development area as open land. However, the northern part of the site was occupied by Brick Garth House and an associated orchard. Extractive industry in the locality is illustrated by a Brick and Tile Yard to the east and a limestone quarry to the north (MAP 2010). By the time of the Third Edition Ordnance Survey Map of 1928 a long rectangular greenhouse had been constructed in the grounds of Westfield Nurseries (the former Brick Garth House).

Previous Work

Prior to the excavations, an archaeological evaluation had been undertaken by Malton Archaeological Practice (MAP) Ltd in 2009 (MAP 2010). The evaluation demonstrated that the southern part of the site had been truncated by clay extraction and subsequently used as a rubbish tip in the 20th century, though

evaluation of the northern portion of the site demonstrated evidence for clay or sand extraction pits, a brick structure, the bases of clamp kilns and dumps of kiln waste.

STRATIGRAPHIC DESCRIPTION

The topsoil was removed across the site in spits by a tracked excavator equipped with a toothless ditching bucket. The topsoil (001) consisted of a dark brown clay-silt soil overlying a silty clay subsoil (003) which was only observed in the south-west corner of the trench. Both of these deposits overlay the natural clay substrate (002), and all archaeological features were cut into either the subsoil or clay substrate. The majority of the site had been severely truncated by ploughing, and plough scars orientated from north to south and east to west were observed across the trench.

Linear Ditch Features

Features (004) and (016) were both linear ditches with (004) aligned east to west across the site and (016) running north-west to south-east. Both features contained a homogenous fill and no clear function could be ascribed, though it is possible that (016) represented a deep wheel rut or track mark. A small isolated stakehole (010) was cut into (004), but yielded no further information as to original form or function.

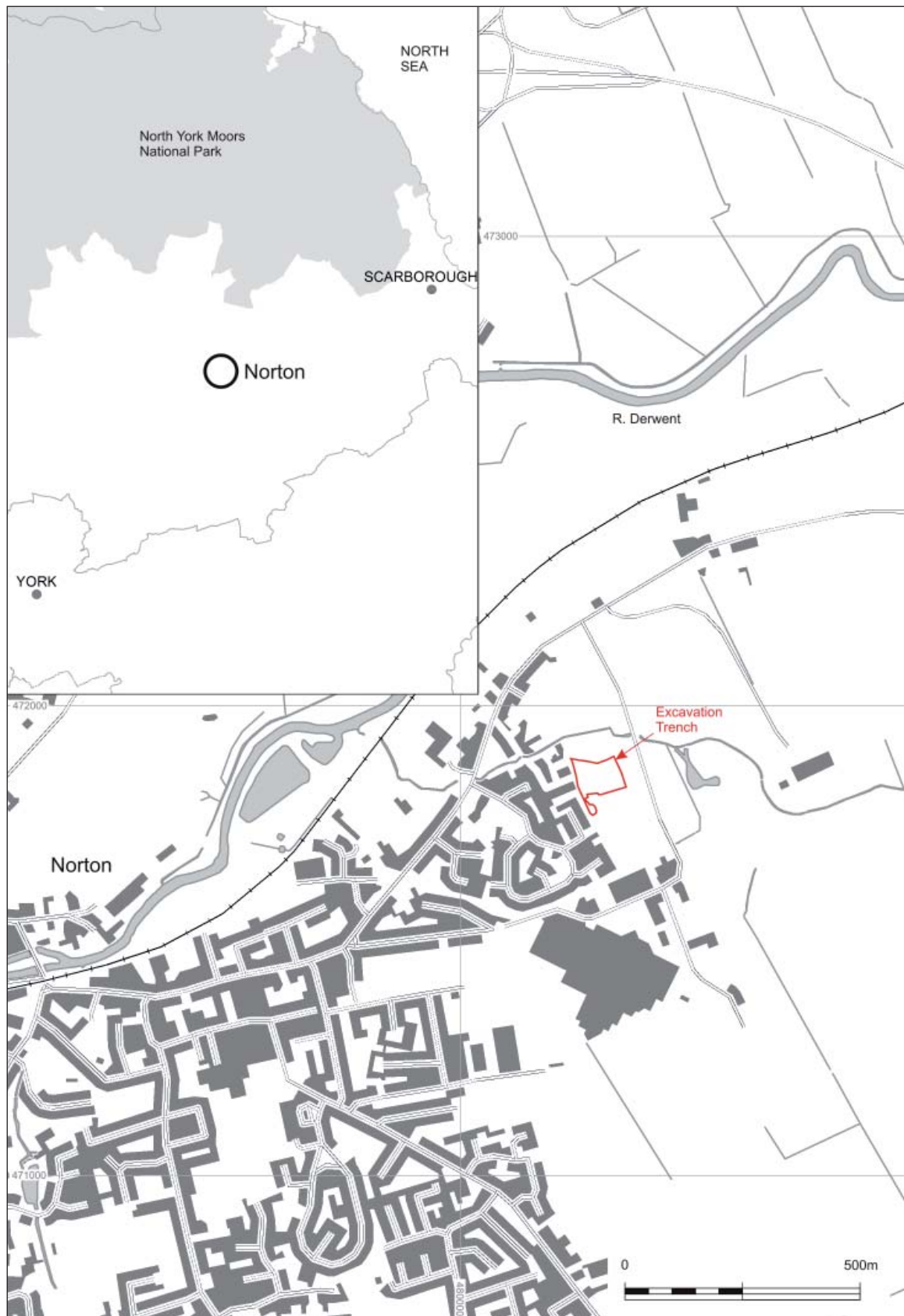


Figure 1 Location of the excavation trench on the east side of Norton.

Feature (042) was a linear ditch feature running from east to west through the central part of the trench. The feature appeared to terminate at ditch (082), but due to the disturbed nature of the ground it was not possible to definitively identify the relationship between the two features. Although heavily truncated, linear ditch (042) was more substantial than (004) and (016) and it is possible that it represents a clay extraction trench. Linear ditch feature (082) was orientated north to south running through the centre of the excavation area. It was of similar dimensions to (042) and it is possible that this feature also represents a clay extraction trench.

Linear trench (044) extended south to north for 26.5m before turning towards the east and continuing for a further 13m where it met a tempering pool (046) (discussed below). Due to unsuitable on-site conditions it was not possible to excavate (046) and therefore the relationship between these two features could not be determined. The fill of (044) contained soot, and comprised various mixed dumps of varying colours suggesting it was purposely backfilled, either by hand or by barrow. It is thought that this feature represents a clay extraction ditch but it may have originally been a drainage channel.

Trackway

Feature (006) was a north-south aligned linear spread of brick rubble in the eastern corner of the trench, measuring 0.5m in width and 0.08m in thickness filling depressions in the clay substrate (002), potentially resulting from wheel ruts. It is most likely that a substantial dump of brick rubble was used to make a trackway for the brickworks and, as this deposit was truncated by later ploughing, only the remnants filling the wheel ruts have survived. This feature ran parallel to (008), which was very similar in form to (006), and the two probably represent a trackway serving the brickworks.

Brick Clamps

There were a total of five probable brick 'clamp' kilns excavated at Westfield Nurseries (F012, F 040, F052, F080 and F 086). These brick clamps were represented by roughly rectangular-shaped red and black stains that would have been left behind when the clamps were demolished after use. The clamps, on average, measured 6m by 4m and each was accompanied by an attendant spread of small brick rubble resulting from the demolition.

Brick clamp 1 (F012) was located towards the eastern side of the site and was cut by the trackway (F006 and

F008) that ran from north to south at the eastern side of the site. Brick clamp 1 was associated with a spread of rubble (F014) which lay directly to the south. This feature produced one copper alloy clothing button that is typical of the 18th -19th century. Brick clamp 2 (F040) was located towards the north-east part of the site. This feature had been truncated on its south-east and south-west sides causing it to lose its original rectangular shape. Brick clamp 3 (F052) was located towards the southern extent of the site and was observed as a black stain with impressions of individual bricks in it. This feature was also cut by linear F044 which truncated it diagonally from south-south-west to north-north-west. Brick clamp 4 (F080) was located in the north-west of the site, to the west of linear ditch F082. The feature had been truncated at its north-west corner and was associated with a spread of brick rubble extending to the west. Brick clamp 5 (F086) was located towards the south-west area of the site, to the north-west of brick clamp 3 (F052).

Tempering Pools

There were a total of three probable tempering pools observed. Due to severe flooding of the site, however, only one of these could be safely excavated. The unexcavated tempering pools F018 and F046 measured 3.25m by 3.59m and 4.8m by 3.18m respectively. Tempering pool F054, which was fully excavated, measured 1.9m by 2.27m and had a maximum depth of 0.6m. This pool had steep sides and a flat base, and was filled with a light brown, medium-fine silty sandy clay with beige lenses throughout. It is thought that these lenses represent a backfilling event, presumably undertaken by hand or barrow. The fill also contained small, limestone gravel.

Kilns

A total of four kilns were excavated on site. Two are probable Scotch kilns, with one of probable 'Newcastle'-type. The final may have been a Scotch kiln but was difficult to interpret due to its incomplete remains.

Kiln 1 was located towards the south-east corner of the site. The structure was presumably a horizontal draught brick kiln, probably derived from the 'Newcastle' type (Douglas and Oglethorpe 1993). The kiln wall foundations survived only as thin spreads of brick dust mixed with white mortar, with only partial elements of the brickwork surviving in two small areas, at the south-east and north-west. The walls defined a rectangular kiln structure measuring 11.3m by 4.8m externally. The internal space of the kiln, measuring



Figure 2 Trench plan showing location of all features.

9.5m by 3.1m, was defined by a thick spread of red sandy clay (024) butting up to the wall foundations (020 and 022) and covering two runs of sectional ceramic pipe, extending the full length of the kiln either side of a central flue structure. Deposit (024) produced one copper alloy clothing button that is typical of the 18th -19th century. The central flue consisted of a brick-built channel (036) in-filled with a demolition deposit of mixed brick, tile and mortar (066). As the channel was not covered by deposit (024), it seems likely that it originally consisted of a partially upstanding brick-built vault extending the length of the kiln interior. At the eastern extent of the kiln this central flue was connected by a brick-built return to

a square brick-based structure, which in plan appears to have been partially separated from the main body of the kiln.

During excavation, 20 individual pieces of iron were recovered from the demolition deposit filling the kiln (066). The presence of these iron fragments, along with the positioning and form of this structure, would suggest that it housed the firebox for the kiln (cf. Douglas and Oglethorpe 1993 for similar example of this type of kiln construction at Tarrasfoot Tileworks, Dumfriesshire). The fact that it was structurally removed from the kiln, with a probable air gap between the rear west wall of the firebox and the eastern end wall of the kiln, would further suggest that the struc-

ture was a firebox, most likely located to avoid adverse overheating of the bricks in the south-east part of the kiln. The sectional ceramic pipes were probably made on site, as were the pantiles used at points to overlay and cover gaps between the sections of pipe. The location of these pipes indicate they were intentionally placed roughly midway between the central flue and the outer wall of the kiln in order to draw heat from the area of the central flue to more uniformly heat the green bricks across the whole kiln. A draw would have been created by the connection of the pipe runs at the western end of the kiln through a 'Y'-piece flanged ceramic drainpipe, and then exhaust through the west wall of the kiln. There was no evidence to suggest that a chimney was attached to the kiln here or elsewhere, as is often the case with other 'Newcastle' kilns (Douglas and Oglethorpe 1993; Pevsner *et al.* 2001, 239). It is possible that this exhaust could have been used to warm nearby drying sheds, although no evidence was discovered for any such structures.

Abutting Kiln 1 on its northern side were two further probable wall foundation deposits, (056) and (058), which comprised thin spreads of mixed white mortar that measured 20m x 0.6m x 0.18m and 20.5m x 0.9m x 0.18m respectively. These two deposits produced no

finds during excavation and presumably represent an open-ended structure abutting the brick kiln, possibly a small drying shed or fuel store.

Kiln 2 was located towards the centre of the site, adjacent to linear F044. At the time of excavation all that remained of the kiln were stains in the natural clay. The kiln was visible as a series of alternating black and red rectangular stains forming a central rectangular space. The kiln measured 10m x 3.6m and was aligned north-east to south-west and each stain measured approximately 0.6m x 0.4m. The stains were harder to distinguish towards the northern end of the kiln where they had been more severely truncated by ploughing. Sixteen red and black stains were recorded on the eastern side while nineteen stains were recorded on the western side. This kiln is interpreted as a probable Scotch kiln. If this is the case, the black stains (048) that consisted of black soot, represented the firing holes where fuel would have been set alight in order to heat the green bricks within. The red stains (084) consisted of brick dust and sand and represented the kiln wall between the firing holes. A firing floor may have existed to both the eastern and western sides of the kiln; however, this was not observed during excavation. A narrow slot was dug through the



Figure 3 Kiln 1 after excavation (scales = 2m).



Figure 4 Plan of Kiln 1 and all associated features.

centre of the kiln and revealed that the red sandy deposit existed to a depth of 0.2m and directly overlay heat affected natural clay.

Kiln 3 was located at the far west side of the excavation area and solely comprised a rectangular-shaped red and black stain in the natural clay substrate. What could be seen of the feature measured 10.45m x 5.8m and was orientated north-west to south-east. The black stains (090) consisted of black soot and formed the imprints of bricks. These deposits overlay the red stains (088), which consisted of red brick dust and sand. While the red and black stains, representing the firing holes and fired bricks of Kiln 2, were reasonably clear on the ground, the stains forming Kiln 3 had sustained considerably more damage. Kiln 3 is most likely to represent another Scotch kiln.

Kiln 4 represents a possible Scotch kiln and was located in the extreme south-west of the excavation area. This structure was identified by red and black stains in the natural clay substrate, along with a series of ceramic flue pipes orientated north-west to south-east. The kiln measured 10m x 7.6m and was aligned north-east to south-west and had been severely truncated by two other features: a clay deposit (F112) of unknown

function, a large area of root disturbance (F114), and a field drain which cut both Kiln 4 and F112.



Figure 5 Kiln 3

SPECIALIST ANALYSES

Ceramic Building Material

Ian Miller

In total, 13 samples of bricks and tiles were recovered comprising fragments of bricks, roof tiles, and ceramic drain pipes. The bricks occurred in three recognisable forms: common bricks; and purpose-shaped bricks, which included perforated examples and a coping brick. In addition, several fragments clearly represented production waste, providing good evidence for brick-manufacturing having been carried out in close proximity to the excavated site.

Common Bricks

Five 'common bricks' were recovered from the excavation (F020, F022, F036 (x2), and F062). These bricks were all of a low quality, and had probably been manufactured using the local natural clay resource. The size of the common bricks varied slightly, reflecting that they were hand made. The larger examples, measuring 235 x 112 x 72mm, are slightly bigger than typical nineteenth-century bricks. This suggests tentatively that they were produced following the introduction of the Brick Tax in 1784, which encouraged larger bricks to be made; the legislation was not repealed until 1850, when bricks of slightly smaller dimensions became standard.

All of the bricks were relatively heavy and had a dense clay matrix, with at least one example incorporating large pebble inclusions; the cross-section of this brick displayed variation in its colouration that almost certainly derived from different oxidising conditions during the firing process, which hints at the use of a relatively simple kiln.

Several of the bricks incorporated a crude 'frog' on one face. The use of a recess, or frog, on one face of a brick was introduced in the late seventeenth century and was intended primarily to provide a key for mortar. The earliest frogs were created by the brick maker scooping a slot across one face of a brick using a finger after the brick had been moulded (Harley 1974, 80). The shape of the frogs in the bricks recovered from the excavation, and the variation in their size, indicates that they had been created in this manner. A slightly more advanced technique that employed a projecting piece of wood attached to the top of the mould stock appears to have come into use during the eighteenth century. However, this method tended to produce a frog that was deeper than those on the excavated examples.

Some of the common bricks were imperfectly made, displaying distortion on at least one plane. Whilst these bricks may have been considered for discarding once they had been fired, traces of lime-based mortar on the surfaces indicate that they had been used, although this may have been within the brickworks as their quality was too poor for them to be sold.

Purpose-shaped Bricks

The assemblage contained three purpose-shaped bricks, which occurred in two different forms. Two examples of purpose-shaped bricks with perforations were recovered from F006 and F008. This technique was introduced in the nineteenth century, and was intended to reduce the weight of the brick, and also to provide a mortar key. The varying sizes of the perforations suggest that these had been made by hand, rather than using a machine. One of the perforated bricks (F006) also incorporated a rounded, or bull-nosed, corner.

The second form of purpose-made bricks comprised a probable wall coping block, which incorporated rounded edges on two sides that were almost certainly intended for decorative purposes. The end sections of the brick contained three circular perforations, which passed along the entire length of the brick, with those exiting from the rounded face having been plugged with clay prior to firing. These perforations may have been intended to reduce its weight, or were for allowing bricks to be fixed together using dowels rather than mortar. This is perhaps supported by the rubbed finish that was applied to the end face of the brick, which will have facilitated a closely-fitted joint with an adjacent brick. The upper surface and rounded sides of the brick had similarly received a rubbed finish.

The visible damage to the upper surface area of the brick is consistent with the brick having failed during firing; larger inclusions of chalk or limestone that have not been extracted from the clay can burn into caustic lime whilst the brick is being fired, and subsequent absorption of moisture and carbonic acid cause the lime to swell and burst the brick (Dobson 1911, 26). When coupled with the lack of mortar or other indications of the brick having been used, it seems likely that this example was a production waster.

Wasters

In addition to those fragments that appear to have been distorted during the firing process, the assemblage also contained clear examples of production wasters. A good example was recovered from F008, and comprised a vitrified fragment of common brick

that had been heavily over-fired.

Roof Tiles

Small fragments of two roof tiles were recovered from F034. These appeared to be pantiles, which may have been moulded flat and then bent subsequently to their required form on a mould. The roof tiles are likely to have been hand-made.

Drain Pipes

The assemblage contained 43 fragments of ceramic drain pipes, which were recovered from two contexts (F032 and F034); just one example of a complete drain pipe was present. The complete pipe was 315mm long, and had an internal diameter of c.97mm, although the bore was imperfectly circular. The pipe did not incorporate any firm indication for it having been used. Many of the fragments from F032 appeared to be of a similar diameter to the complete example. However, several examples from the same context were clearly pipe of a narrow diameter. None of these could be identified firmly as production wasters, although this possibility cannot be discounted.

Conclusions

The size and form of the common bricks is consistent with a broad date range, spanning the late seventeenth to the nineteenth centuries. The roof tiles and the drain pipes similarly cannot be dated with precision, although a nineteenth-century production date seems likely. The perforated and coping bricks almost certainly date to the nineteenth century. Elements of the assemblage indicate that they were manufactured (and discarded as waste) in the immediate vicinity of the excavated site, which is unsurprising in the light of the available documentary evidence.

The precise date at which the production of bricks and tiles commenced in the area is uncertain, although the trade is not listed in a Baines' comprehensive *Gazetteer of the County of York* of 1823. However, a John Adamson is listed as a brick maker in Norton in a trade directory for 1834 (Pigot & Co.), whilst White's directory for 1840 lists John Adamson and Jonathan Booth & Co as brick and tile makers in Norton. A George Adamson is listed as a brick and tile maker in the *Post Office Directory of Yorkshire* for 1857, and a brick and tile yard is shown on the Ordnance Survey map of 1854. However, there are no brick makers listed in White's directory for 1867, suggesting that manufacturing may have ceased by that date.

Whilst the purpose-shaped bricks present in the assemblage were finished carefully, the common bricks

were crudely made. This may reflect to some degree the suitability of the local clay resource for brick-making, although the employment of simple technology was also a likely factor. The material appears to have been largely hand-made, and there is little indication that production was on a large scale.

Metal Small Finds

Chris Scott

Twenty iron object fragments, weighing 12.6kg in total, were recovered from the demolition deposit (066) filling the central flue of Kiln 1. The metal fragments are all heavily corroded and none appear to be complete. All of the metalwork was found at the eastern end of this deposit, in the area where the kiln must have been fired.

The metalwork recovered consists of one iron strap with two square boltholes, three iron fragments of probable fire grate and 16 smaller fragments of undifferentiated flat iron bar, likely to be pieces of fire grate/ fire bar. The curved iron strap measures 320mm x 40mm x 10mm and is forged from a piece of flat iron bar. The three fragments of probable fire grate all appear to have been cast and are probably three fragments of a single fire grate, with the most complete section measuring 260mm by 90mm by 70mm. The 16 fragments of flat iron bar typically measure c. 160mm by 75mm by 7mm and due to the level of corrosion it is not possible to ascertain whether they have been cast or forged. None of the metalwork displays any trace of a maker's stamp or other decoration.

The fragmentary condition of the metalwork accords well with its location within a demolition deposit and is likely to indicate the breaking up of a metal structure, probably a firing hole for the kiln, with a cast fire grate and brick-arched firebox. The curved iron strap is likely to be a structural tie, probably used in supporting a firebrick arch within a firebox structure. Such metal strapwork is common in Victorian lime kilns and other industrial structures where heating is likely to be applied to brickwork elements.

The metalwork is considered to date to the late 19th to early 20th centuries. A date towards the earlier part of this range is considered most likely based on the context in which the metalwork was recovered as well as its form.

DISCUSSION

Despite the heavily truncated nature of many of the archaeological deposits, it has been possible to gain a good understanding of the history of brick and tile manufacturing industry on the site. From the structures excavated, this small-scale industrial activity appears to have been undertaken in two main phases, evidenced by a number of simple clamp kilns and a probable later phase of more permanent 'Scotch' and 'Newcastle' type kilns, along with clay extraction and preparation in the form of trenches and tempering pits.

The brick clamps all survived only as poorly defined spreads of burnt clinker and ash, defining the size of the clamp, with attendant spreads of small brick rubble presumably left over from the removal of the clamp and the bricks inside. The five clamp kilns appear to have all measured approximately 6m by 4m and are therefore likely to illustrate a single phase of the use of the site, with roughly similar sized clamps being constructed and used sporadically. The use of clamp kilns would indicate that this production was seasonal or intermittent rather than continuous or large-scale. Potential supporting evidence for an early phase of production based around the clamp kilns is provided by the probable trackway which appeared to respect the later Kiln 1, but cut through one of the clamp kilns.

The identified later intermittent kilns at the site comprise at least two probable 'Scotch' kilns and a probable 'Newcastle' kiln, as well as another possible 'Scotch' kiln. Although no evidence could be found to link these kilns stratigraphically, it seems probable that they were all broadly contemporary based on their level of preservation and structural form. This, therefore, may represent an intensification of production at the site from the second half of the 19th century into the early 20th century, based on the size and number of the kilns, and their likely capacity. Hammond (1977) states that the largest Scotch kiln at S Reid and Sons brickyard at Sandleheath, near Fordingbridge, had a capacity of c.50000 bricks. This measured 34ft 3ins x 11ft 5ins which is broadly similar in size to the three 'Scotch' kilns discovered at Norton. This gives some measure of the scale of production at this site.

As well as the trackway discovered at the site, three possible clay extraction trenches were found, all with evidence of later backfilling. As these trenches were linked to one of the probable tempering pits it is equally possible that they may have functioned as drainage/water channels for the management of water in the tempering process.

Overall the site represents a fascinating small-scale brick and tile production site likely to have been operational between the late 18th century and the second half of the 19th century. The production can be split broadly into two phases; the first being a small-scale operation utilising simple brick clamps; and the second being a larger-scale operation utilising 'Scotch' and 'Newcastle'-type kilns.

ACKNOWLEDGEMENTS

The authors would like to thank all those who contributed to this excavation, in particular John Birkin of Persimmon Homes. The authors would also like to express their gratitude to the staff who excavated in trying weather conditions, and in particular to Scott Williams who supervised much of the fieldwork.

REFERENCES

- Baines, E. 1823. *History, Directory and Gazetteer of the County of York: Volume 2*. Leeds, The Leeds Mercury.
- Celoria, F. 1971. Edward Dobson's 'A Rudimentary Treatise on the Manufacture of Bricks and Tiles' (1850). *Journal of Ceramic History* 5. Stafford. George Street.
- Dobson, E. and Searle, A.B. 1911. *A Rudimentary Treatise on the Manufacture of Bricks and Tiles*. London, C. Lockwood and Son.
- Douglas, G. and Oglethorpe, M. 1993. *Brick, Tile and Fireclay Industries in Scotland*. Edinburgh. RCAHMS.
- Hammond, M.D.P. 1977. Brick Kilns: An illustrated survey. *Industrial Archaeology Review* 1: 171-192.
- Harley, L.S. 1974. A Typology of Brick. *Journal of the British Archaeological Association Ser. 3* (37): 64-87.
- Hinde, T. 1985. *The Domesday Book: England's Heritage, Then and Now*. London, Guild Publishing.
- MAP Archaeological Consultancy Ltd. 2010. *Westfield Nurseries: Archaeological Evaluation by Trial Trenching*. Unpublished report prepared for Persimmon Homes by MAP Archaeological Consultancy Ltd.
- Pearson, T. 2005. *The Archaeology of Medieval Scarborough: Excavation and Research 1987-2004*. Scarborough, Scarborough and District Archaeological Society Research Report 12.
- Pevsner, N., Richmond, I., Grundy, J., McCombie, G., Ryder, P. and Welfare, H. 2001. *The Buildings of England: Northumberland*. London, Penguin Books.
- Pigot and Co. 1834. *National Commercial Directory*. Lon-

don. Published privately by author.

Robinson, J. F. 1978. *The Archaeology of Malton and Norton*. Leeds, Yorkshire Archaeological Society.

Simco, A. 1998. *Monument Protection Programme: The Clay Industries. Step 1 Report*. London, English Heritage.

Simco, A. 1999. *Monument Protection Programme: The Clay Industries. Report on Public Consultation Exercise for Step 1 Report*. London, English Heritage.

Simco, A. 2000. *Monument Protection Programme: The Clay Industries. Step 2 Shortlist*. London, English Heritage.

White, W. 1840. *Gazetteer of East & North Ridings of Yorkshire*. Sheffield, W. White.

White, W. 1867. *Directory of Boroughs in North & East Riding of Yorkshire*. York, W. White.