Thornton Wood Limeworks, Fife

Industrial Archaeological Survey February 2017

Report for
Forestry Commission Scotland
by
John Pickin Archaeology and Heritage

Thornton Wood Limeworks, Fife

Industrial Archaeological Survey

Contents

.....

Report prepared by John Pickin Archaeology and Heritage

High Weirston House, Leswalt, Stranraer, Dumfries and Galloway DG9 0RQ

Email: info@johnpickinarchaeology.co.uk

Web: johnpickinarchaeology.co.uk

Thornton Wood Limeworks, Beath, Fife

NGR: NT 109 926

Canmore IDs: 79295-97

1 Introduction

In February 2017 Forestry Commission Scotland commissioned an industrial archaeological survey and assessment of Thornton Wood Limeworks, Fife. The aim of the survey was to provide descriptions of the principal features as well as information on their location, extent, condition and importance. The survey results will inform future operational and management plans for the site.

The survey was carried out over two days, 19 and 20 February 2017. A rapid walkover, aided by copies of historic maps, satellite imagery and information from an earlier pre-afforestation survey (Dalland and Carter 1998), established the extent of the site and the range and type of the archaeology. The site was then examined in more detail, all

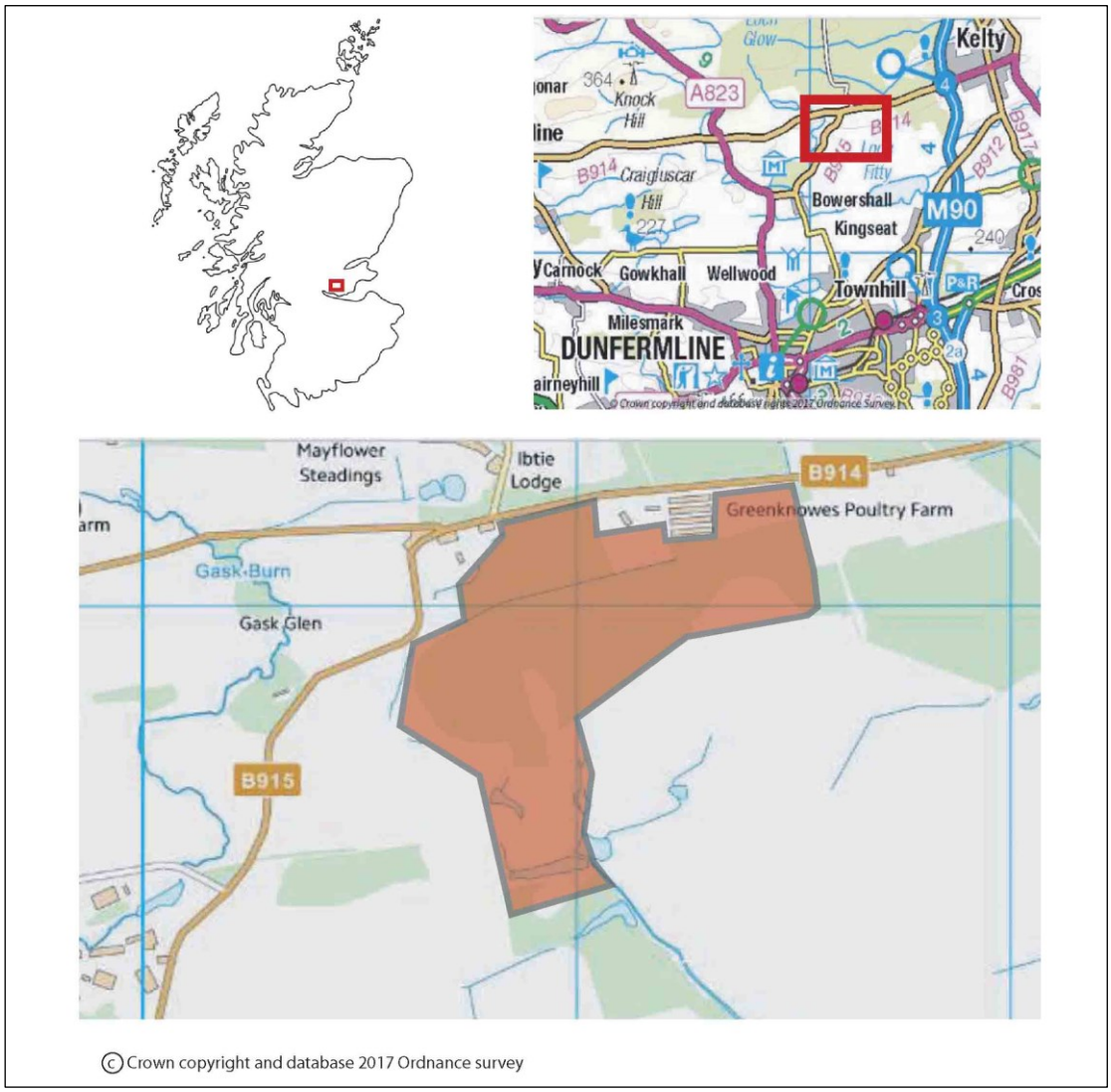

Fig.1. Site location and extent of survey area.

archaeological features were assigned an ID numbers, described and photographed; measured sketches were made of selected features. Details of the individual features are presented in the Site Gazetteer (Appendix 1).

2 **Location** (Figure 1)

The survey area, located 4 km north of Dunfermline and 3.5 km west of Kelty, is an L-shaped block of ground lying south of the B914 and east of the B915.

The northern part of the site parallel to the B915 is an area of comparatively flat, high ground which falls steeply to the south. To the south-west the site forms the eastern side of a broad valley. Much of the northern and central area is now a mature conifer plantation and the area to the south is open, ungrazed grassland with occasional small conifer plantations.

3 Site History

There is no published history of the site or its surrounding area but a review of historic maps suggests that the main episode of industrial activity was restricted to a comparatively short period in the nineteenth century. For survey purposes the site is referred to as Thornton Wood Limewoks but its original name, if any existed, is unknown.

The 1998 pre-afforestation survey of the area (Dalland and Carter 1998) identified a series of pre-industrial agricultural features which probably date to the 18th century or earlier. These include a linear dyke and enclosures in the northern section of the site and an area of rig cultivation in the south (see ID Nos 22-24 in Site Gazetteer, this report).

Lime-working is unlikely to have started before the end of the eighteenth century as *The Old Statistical Account* for Beath Parish, published in 1792, states: *'There is no lime here, but plenty of stone for building'* (Old Statistical Account 1792, Vol III: 234). *The New Statistical Account* for Beath parish, published in 1845 but compiled in 1833, states: *'Some years ago, lime rock was discovered in the west end of the parish and partially wrought*' (New Statistical Account of Scotland 1833, Vol IX: 175.). This reference is not site specific but as Thornton Wood Limeworks lies in the western part of the parish it might be the quarry referred to. It suggests that lime quarrying started in the early nineteenth century.

The First Edition Ordnance Survey (Fig. 2), surveyed in 1854 and published 1856, marks a large abandoned limestone quarry and old limekilns in the southern part of the survey area. The OS Name book, compiled at the same time, defines the general area as Blairathie with the comment: *'(Blairathie) Small farm name part of the nether portion of Lassodie and at one time belonging to Dumfermline Abbey. Formerly a farmhouse stood on the summit of this farm which has been wholly removed. Consequently the proprietor Mr Dewar recommends the name [Blairathie] to be written across the farm'* (OS Name books Fife and Kinross-shire: OS1/13/16/54). The proprietor, John Dewar, was the owner of the Lassodie Estate.

The Second Edition OS map (Fig. 3), surveyed 1895 and published 1896, shows two new but abandoned limestone quarries, the Kiln Row cottages and their associated garden plots and the route of an abandoned mineral line running runs across the southern part of the site.

Fig. 2. OS First Edition six inch (parts of Fife 30 and 35), published 1856.

Fig. 3. OS Second Edition six inch (parts of Fife and Kinross sheets XXXIV NW and SW), published 1896.

This indicates that the main phase of industrial activity within the survey area occurred between 1854 and 1896 (but see Section 5 for a more detailed analysis of site phasing).

Areas of straight rig cultivation are visible on aerial photography across much of the site and Dalland and Magnar (1998:2) suggest that these date to the late eighteenth and early nineteenth centuries. Some cultivation is also likely to have occurred after the limeworks closed (see especially ID 10 in the Site Gazeteer). Throughout most of the twentieth century the site area appears to have been improved pasture.

Much of the site was afforested in the early 2000s but the principal archaeological sites identified during the 1998 survey were protected and remain outwith the forestry plantations. During the subsequent development of the site as a community woodland a series of interpretation panels were erected highlighting the principal archaeological features. Two ponds were created in the southern section of the site at the same time.

4 Description

A total of 26 archaeological features were recorded during the survey; these are shown in Figure 4 and described in more detail in the Site Gazetteer (Appendix 1). The features include quarries, spoil tips, tramways, lime kilns, buildings, a railway line, a trackway, field banks and rig cultivation.

4.1 Quarries

The following types of quarries were identified: general stone quarries, trial pits and limestone quarries.

4.1.1 General stone quarries (ID Nos 1 and 21)

Two general stone quarries were recorded. Quarry (1) is not marked on any of the OS maps and may predate the 1854 survey. The First Edition OS map does however mark two small whinstone quarries in the same area close to Greenknowes (now afforested and unidentifiable) and it is likely that quarry (1) was also a whinstone working. Whinstone is a non-specific term for hard rock. Quarry (21) is shown as a working sandstone quarry on the First Edition OS map.

These minor quarries were dug to extract sandstone and whinstone for a range of general purposes including walling, building stone and road chippings and their comparatively small size suggests an occasional agricultural use rather than industrial production.

4.1.2 Trial pits (ID Nos 11 and 17)

Quarries (11) and (17) are both shallow circular excavations around 6m in diameter with external arcs of spoil. They might be general stone quarries but their location close to larger limestone quarries suggests they were probably trial pits excavated to establish the extent and relative depth of subsurface limestone beds. They represent an initial or prospecting stage in limestone quarrying.

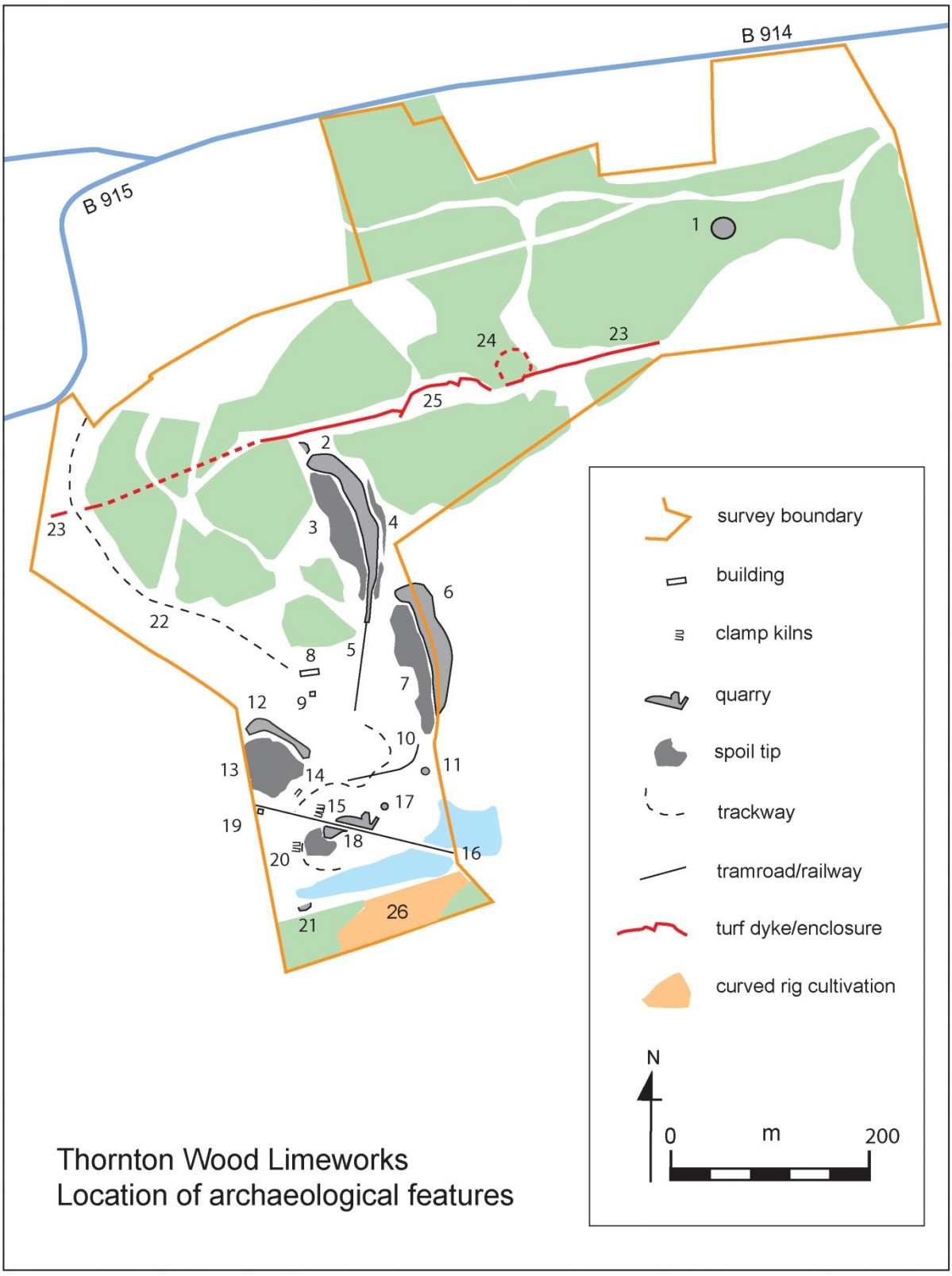
B 914
B 915
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
survey boundary
building
clamp kilns
quarry
spoil tip
trackway
tramroad/railway
turf dyke/enclosure
curved rig cultivation
N
0
m
200
Thornton Wood Limeworks
Location of archaeological features

Fig. 4

4.1.3 Limestone quarries (ID Nos 2, 6, 12 and 18)

Historic quarrying concentrated on two particular Carboniferous limestones, the Hurlet and Blackhall Limestones, which occur within the survey area as narrow, parallel beds with a general NW-SE alignment (Fig. 5). Quarry (12) worked the southern section of the Hurlet Limestone while quarries (2), (6) and (18) - and probably trial pits (11) and (17) - worked the Blackhall Limestone; the Blackhall Limestone is faulted and displace to the east just south of quarry (2). A third bed, the Second Hosie Limestone, runs through the eastern section of the survey area but does not appear to have been worked.

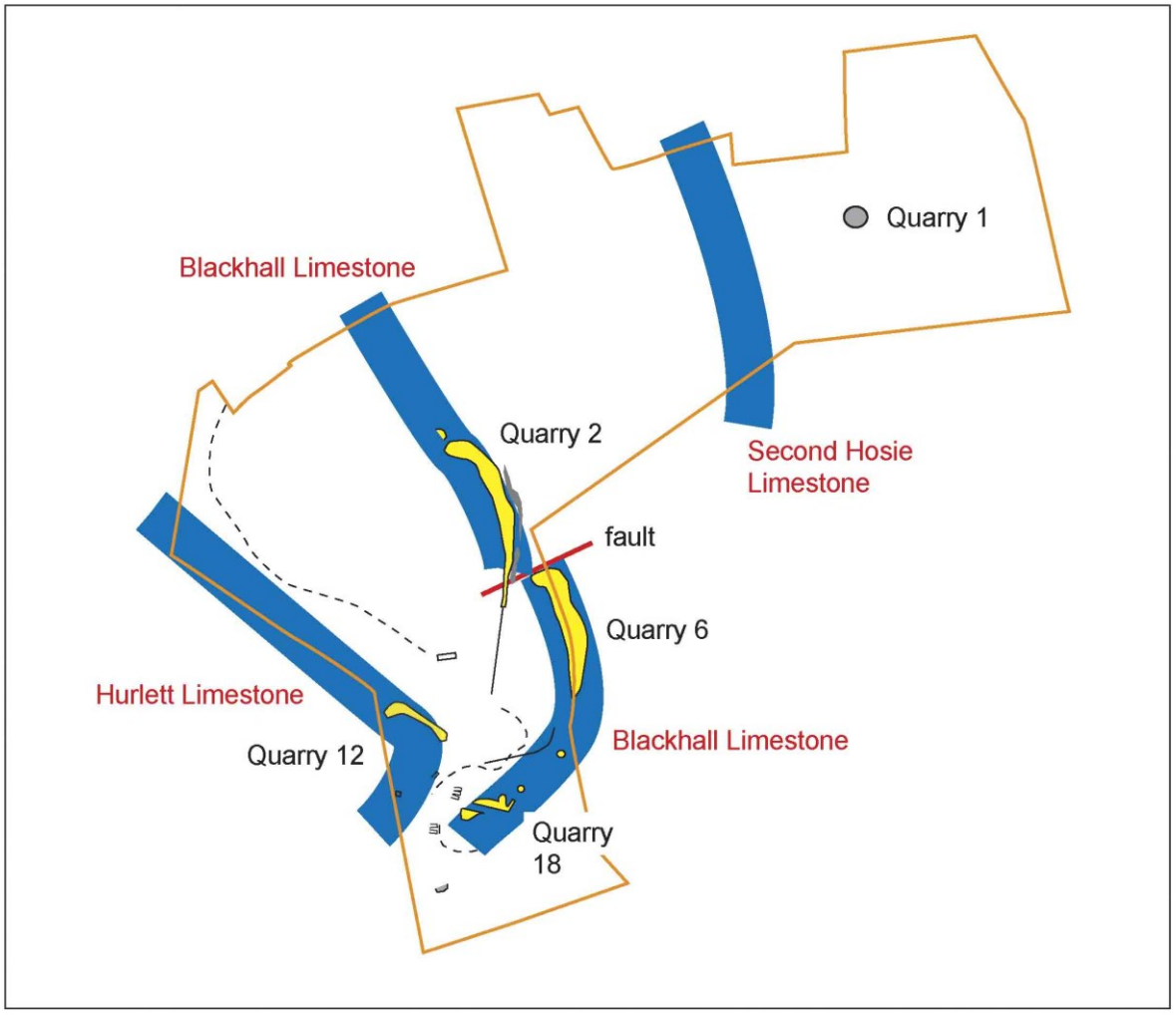

Fig.5. Sketch showing position of the Hurlett, Blackhall and Second Hosie limestone beds.
(Geological information: British Geological Survey: map.apps.bgs.ac.uk/geologyofbritain/home.html)

Quarry (12), which is shown abandoned on the First Edition and subsequent OS maps (Fig. 6), is the earliest of the large quarries and may have been opened up to work a natural outcrop of the Hurlet Limestone. The full width of the bed appears to have been exploited progressively in a north-easterly direction with spoil (ID No 13) being dumped to the south-west.

Quarry 18 is a complex of small intercutting excavations on the Blackhall Limestone which were later truncated by the construction of the mineral line (ID no 16). Three types of quarrying can be identified: shallow, sub surface workings (18a) in the top 1.5m of the

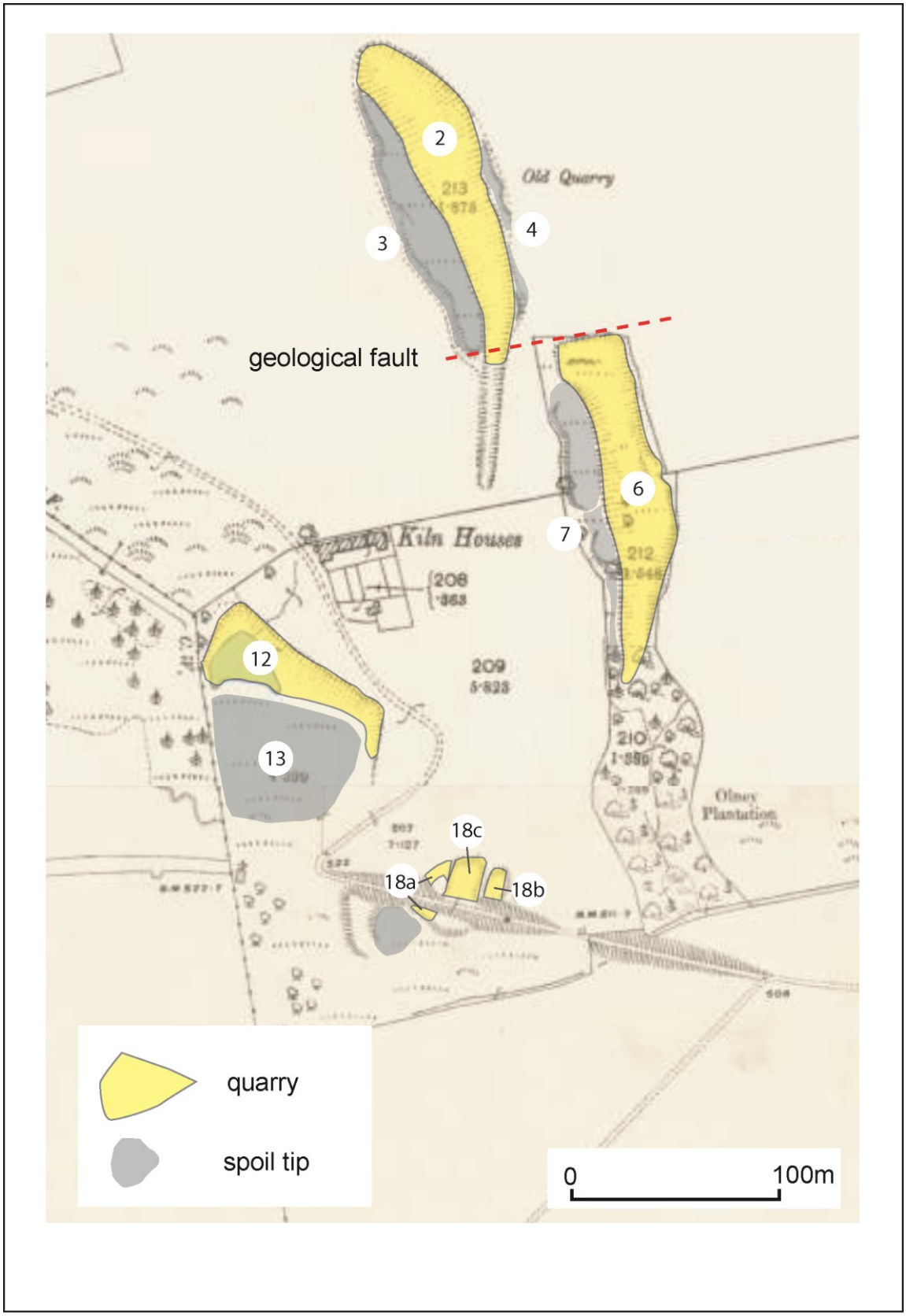

Fig. 6. Location of quarrying features (Second Edition OS map as base).

limestone bed, a broad trench excavation (18b) up to 3m deep and a much larger oval quarry (18c), some 5m deep, which cuts through and so must post-date quarry (18a). The spoil from these workings has been dumped to the south-west and may bury some earlier quarries and lime kilns which are depicted on the First Edition OS map but can no longer be identified. Quarries (2) and (6) are major workings on the Blackhall Limestone. Both appear to have been quarried in a northerly or upslope direction with most of the spoil (ID nos 3 and 7) being dumped on the western flanks. It is likely that the quarries exploited the full width of the bed and worked down to the base of the limestone; the gradual rise to the north in the bottom of both quarries reflects the angle or dip of the limestone beds. The current V-shape profile of the two quarries is probably the result of post-abandonment slumping in the softer shales and mud stones exposed in the sides of the excavations.

4.2 Spoil tips (ID Nos 3, 4, 7 and 13)

Substantial spoil tips are associated with quarries (2), (6) and (12). All the spoil is now grass covered but is likely to comprise superficial deposits of top soil and clay and any rock overlaying the top of the limestone beds. At quarries (2) and (6) there are continuous, overlapping spoil tips along the western flanks. These tips have stepped profiles, the result of sequential dumping as both quarries were worked progressively up slope. It is probable that individual tips were associated with temporary tramways which would have been relaid as the working face was extended. The earliest tips at both quarries are at the southern ends. Small, irregular dumps (4) along the west flank of quarry (2) are probably from initial surface stripping. At quarry (12) there is a single large, flat topped tip (13) which must have built up as the quarry extended to the north-east. This tip does not exhibit the sequential flank dumping observed at tips (3) and (7).

4.3 Tramways (ID Nos 5 and 10)

At the southern ends of quarries (2) and (6) are linear embankments that appear to run downhill towards kilns (14) and (15). These embankments were recorded during the 1998 survey as tramways. No evidence survives for how the tramways operated but given the comparatively long distance between the quarries and kilns it is likely that that the tramway waggons were horse drawn.

4.4 Lime kilns (ID Nos 15, 15a-c, 20a and 20b)

Five definite lime kilns (14, 15a-c and 20a) and one possible kiln (20b) were recorded and all are of the clamp or horse-shoe type (Fig. 7). They are of similar form, comprising a rectangular hollow dug against the natural slope with a comparatively flat loading area at the upslope end. The kilns have a U-shaped section with battered or angled flanking walls and single openings. There is a slight but probably insignificant variation in basic dimensions between the kilns:

ID No	Length	Width	Depth
14	10m	1.5m	1.5m
15a	8m	1m	1.5m
15b	11m	2m	1.8m
15c	8m	1m	1m
20a	8m	4m	1.5m

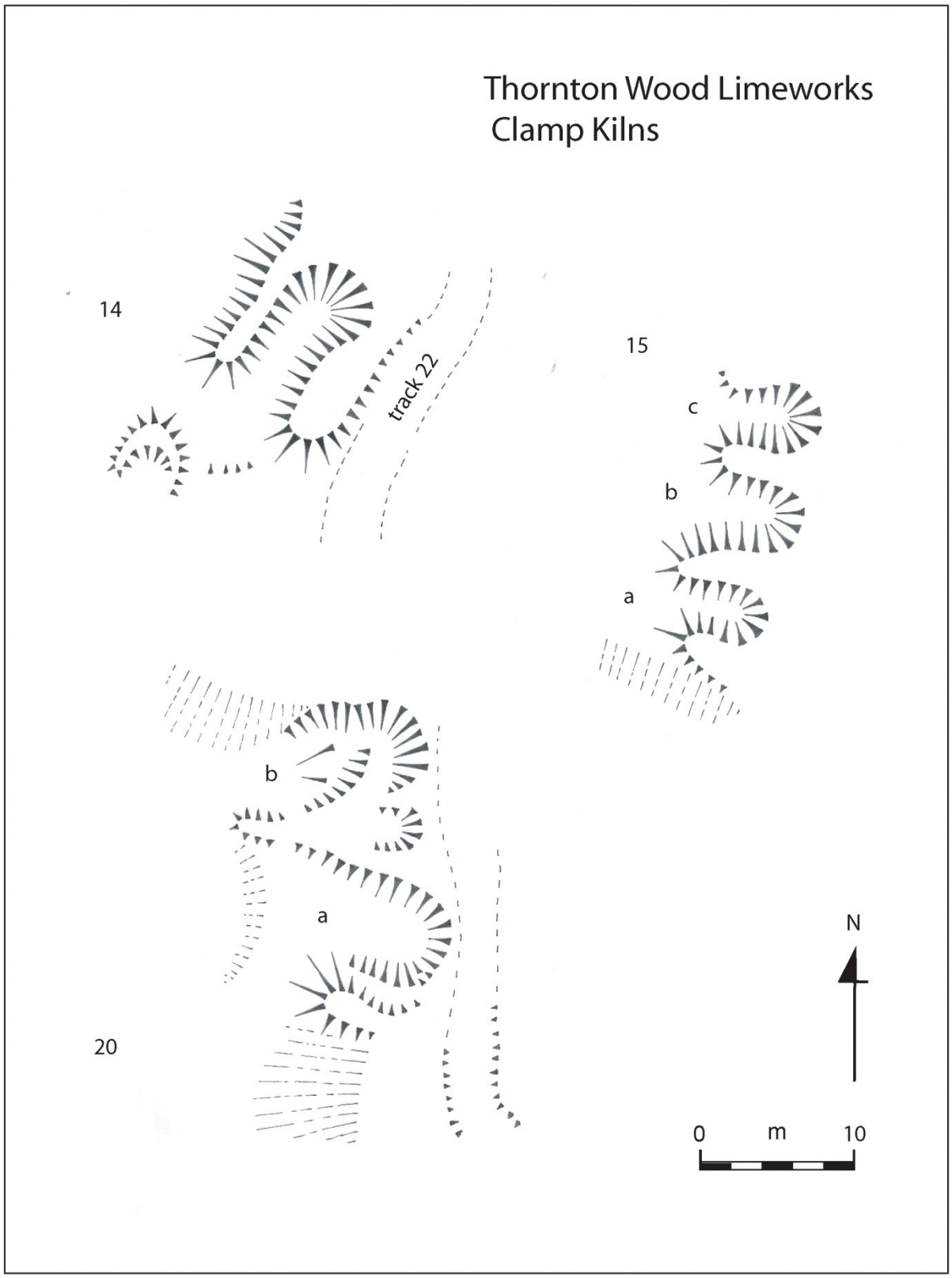

Fig. 7. Measured sketch plans of clamp kilns.

Kilns (15a-c) form a group with shared flanking walls while kiln (14) and probably kiln (20a) are single constructions. Feature (20b) was identified as a clamp kiln during the 1998 survey but on re-examination it is more likely that this actually is an area of disturbed ground, perhaps an episode of quarrying predating the construction of kiln (20a). Another group of kilns survives immediately outwith the survey area at NT 1078 9252; this group, comprising four or possibly five conjoined kilns built into a bank west of spoil tip (13), probably forms an additional part of the Thornton Wood Limeworks complex.

Clamp kilns were a type of intermittent limekiln. Fuel – normally coal – was laid along the floor of the kiln and then limestone and coal were built up in alternating layers, the top capped with turf and clay and a temporary stone wall constructed across the open end of the kiln pit. The kiln was allowed to burn for around 10 days after which the end wall was taken down and the lime removed. A clamp kiln could be reused on a number of occasions.

4.5 Buildings (ID nos 8, 9 and 11)

The largest and most significant building group within the survey is the row of probable cottages known as Kiln Houses (Fig. 8). Kiln Houses (ID No 8) is marked on the Second Edition OS map as a rectangular terrace with flanking wings and attached outshuts and to the south is an area of small enclosures, probably garden plots. Kiln Houses is marked as roofed - and presumably still occupied – on the 1943 OS map although by this time the wings are derelict, the terrace has been reduced to a four-celled structure and the garden plots have gone. The date of final abandonment is unknown.

Kiln Houses appears to be a three-cottage row, with the eastern cottage having a larger ground plan. The building's location suggests that it was built to house quarry workers and the difference in size between the three cottages may reflect social distinctions within the workforce. It is interesting to note, however, that there appears to have a been a second, and possibly quite large, entrance in the now demolished east wall of the larger cottage and this, together with the lack of windows in the north wall, may indicate that this was a work space – a smithy, perhaps - rather than a dwelling. The flanking wings shown on the Second Edition may also have served as work spaces or storage rooms.

South of Kiln Houses and set within the former garden area are the foundations of a rectangular building (ID No 9). It is not shown on any of the OS maps and may relate to the final, post 1943, occupation of the cottages. It was probably an outside lavatory.

The small rectangular structure (ID No 11) at the west end of the railway cutting is shown as roofed on both the Second Edition map and the 1913 revised sheet. It must have been constructed as a trackside structure when the railway was built.

4.6 Railway cutting and embankment (ID No 16)

The cutting and embankment at the south end of the site are part of the West of Fife Mineral Railway, a network of industrial lines constructed between 1856 and 1860 to serve the area's expanding coal industry.[1] This section formed a link between the major limeworks at

[1] *https://en.wikipedia.org/wiki/Mineral_railways_of_Dunfermline (accessed 5.3.2017)*

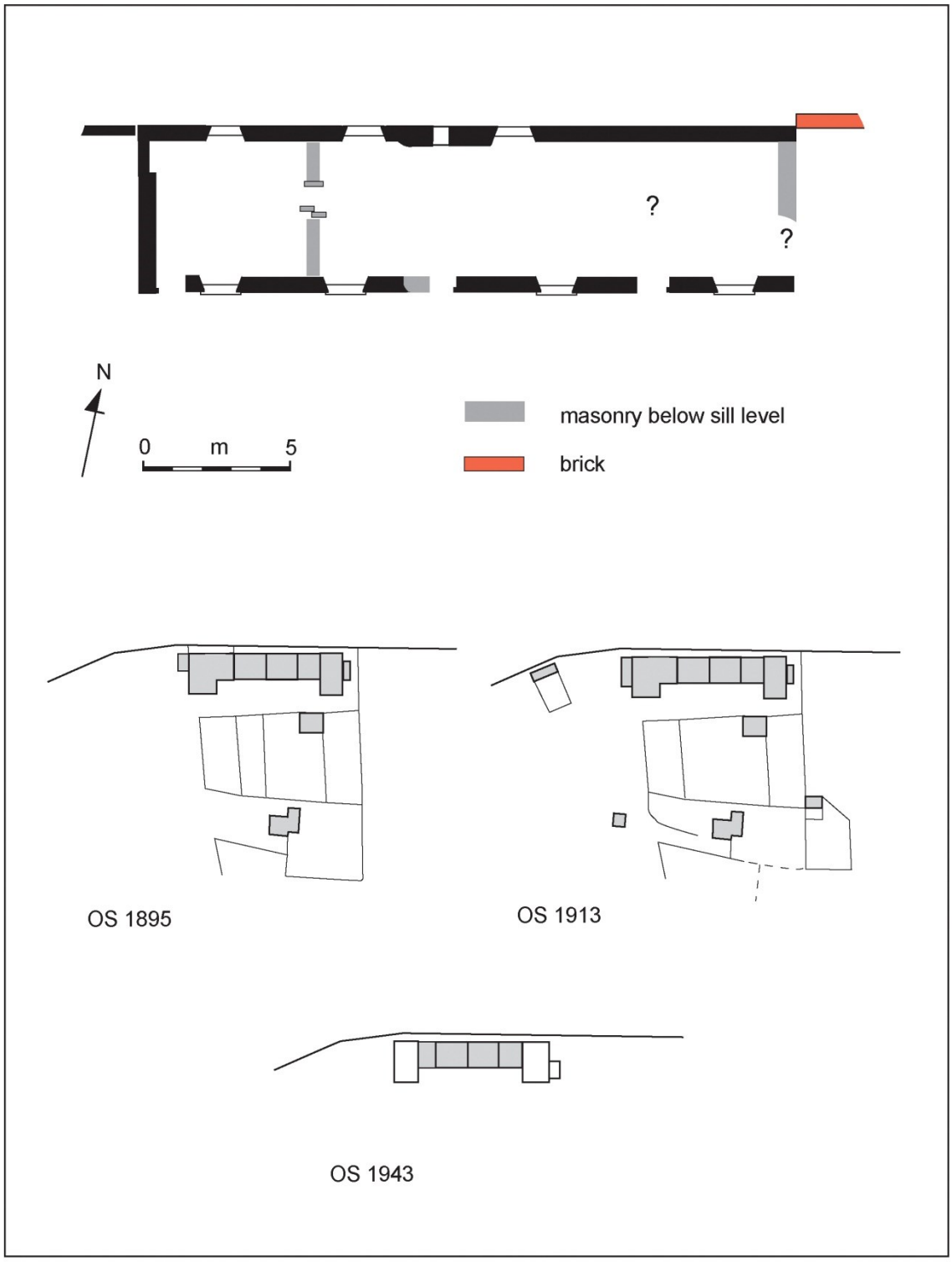

Fig.8. Measured sketch plan and OS map depictions of Kiln Houses.

Lathalmond and the Lassodie collieries. It is shown as operational on the OS one-inch map of 1867 but had been abandoned by the time of the Second Edition map.

4.8 Trackway (ID No 16)

The trackway in the south-west section of the survey area is marked on the First Edition map as a minor field route between Woodend and Lassodie. The route from Woodend to Kiln Houses is shown on the 1955 Seventh Edition one inch OS map but the route further south-east is marked as a footpath only.

4.7 Agricultural features

A series of agricultural features (field banks, enclosures and rig cultivation) were recorded during the 1998 survey. These were revisited but not assessed during the present survey and details are shown in the Site Gazetteer).

5 Dating and Phasing

The archaeological features identified during the survey can be placed within four broad activity phases.

Phase 1
A series of agricultural features including enclosures (23) and (24), dyke (25) and rig cultivation (26). These features are typically post-medieval, probably 18th century, although the area of curved rig could be somewhat earlier. None of these features are shown on the First Edition OS and so must have been abandoned before – possibly long before – 1854. Track (22) probably belongs to this Phase too.

Phase 2
A group of industrial features shown as abandoned on the First Edition OS map including limestone quarry (12), quarry tip (13) and sandstone quarry (21). The First Edition map also marks a group of disused limekilns in the southern part of the survey area close to clamp kiln (20); these kilns could not be identified in the field and may have been destroyed by the construction of kiln (20) and spoil dumping from quarries (18). The reference in the NSA (see Section 3 above) to limestone quarrying 'some years ago' suggests that Phase 2 began before 1833.

Phase 3
A period of comparatively intense industrial activity that began after the publication of the First Edition OS survey in 1854 and had finished before the publication of the Second Edition in 1897. Features relating to this Phase include quarries (2) and (6), spoil tips (3), (4) and (7), tramways (5) and (10), quarry (18), railway cutting (16) and railway building (19). Kiln Houses was also constructed during Phase 3 but continued in use to a later date.

Clamp kiln (14) has been constructed on ground which partly backfills Phase 2 quarry (12) and so is probably a Phase 3 feature. Kilns (15) and (21) and the kiln group just outwith the survey area at NT 1078 9252 are also likely to be Phase 2 features.

It is possible to further refine some activity episodes within Phase 3. At quarry (18) for instance the field evidence demonstrates that shallow workings (18a) are cut by, and so must predate, workings (18c). Shallow workings (18a) and trench quarry (18b) are also truncated by railway cutting (16) which had been constructed by 1860. The railway cutting also appears to cut through the south bank of clamp kiln 15a which confirms that both quarry workings (18a-b) and kiln group (15) were out of use by 1860.

Phase 4
This Phase covers the period from the late 1890s until afforestation in the late 1990s. The only feature that belongs to this Phase is building (9) although Kiln Houses may have continued in use or occupation into the 1950s. Some of the straight rig cultivation recorded during the 1998 survey might belong to Phase 4 as could the rig that respects and post-dates tramway (10).

6 Condition and management

The majority of the archaeological features survive as grass-covered earthworks (kilns, quarries, tramways, etc.) and are in a comparatively stable condition.

Because there is no grazing within the site – and the northern, forested section is enclosed by a deer fence – the grass cover is thick and tussocky and this tends to mask the detail of some the features. Tussock grass completely hides the area of rig cultivation (26) at the south end of the site and also obscures the southern line of trackway (22). Other features are obscured by gorse – particularly quarries (6) and (18) – and thick brambles cover the east section of building (8). Future management options might include selective grass cutting, especially on kilns 14 and 15a-c, and clearing brambles from building (8).

The modern tree plantations were designed to avoid the known archaeological features. The only feature affected by forestry is enclosure (23) which is now within an area of conifer plantation; this feature should be located and its condition assessed in advance of any future felling.

The only standing structure, Kiln Houses, is in poor condition and may be at risk. There is a major structural crack in the west gable and both the north and south long walls are leaning out. The condition of the building should be monitored. Bramble and shrub clearance within the building would aid future recording and interpretation.

6 Significance

There has never been a resource assessment of Scotland's lime industries. This is in contrast to England where the lime industries formed part of the Monuments Protection Programme (Chitty 2001) and were included a recent archaeological research assessment of the country's extractive industries (Newman 2016). The absence of a Scottish assessment makes it difficult to evaluate the national and regional significance of Thornton Wood or to fully understand the relative importance of its individual features. The current development of regional research frameworks in Scotland will hopefully provide a background against which Thornton Wood and other limeworks can be better understood.

The industrial features at Thornton Wood Limeworks represent the remains of a small nineteenth century lime quarrying and burning operation. The principal elements – limestone quarry, spoil tip and clamp kiln – can be found at a number of other limeworks in the surrounding area. At at Greenknowes (NT 110932), immediately north of the survey area, the First Edition OS maps shows a linear quarry with a bank of four to five clamp kilns and a similar quarry was in operation south of the site at Wester Craigduckie which comprised a linear quarry working with a spoil dump on its west flank and a single clamp kiln by the quarry entrance (Canmore ID 79260). It is likely that quarry and kiln groups of this type – medium size and low capital ventures - were worked to provide agricultural lime for a very local market, probably operated by individual estates to meet the needs of their own farms. In the case of Thornton Wood the quarry and kilns may have been worked as part of the management of the Lassodie Estate.

In contrast to the medium size quarry and kiln groups like Thornton Wood are the large limeworks that began to appear in Fife from the mid nineteenth century onwards. The closest example to the survey area is the Roscobie Limeworks (NT 092 927) which at the time of the First Edition OS map was a 400m long linear quarry with a complex of tramways, clamp kilns and a smithy. Roscobie Limeworks was still working into the mid 20th century, by which time the limestone was mined underground and burnt in large masonry draw kilns. Other examples of big, capital-intensive limeworks in Fife are Lathalmond (NT 090919), Scaurhill (NT 051960) and, further to the east, Cults Hill near Pitlessie which was still working in the 1970s.

Thornton Hill is important as an industrial archaeological site because it retains all the elements of a medium sized Victorian limeworks. The significance of individual features is included in the Site Gazetteer (Appendix 1) and the relative value of the more important feature groups is discussed below.

6.1 The quarries.

These are of value because they demonstrate a range of quarrying techniques including trial pits, shallow surface workings and large, linear excavations with associated spoil dumping strategies. Quarrying was confined to particular limestone beds. This demonstrates a good knowledge during the early nineteenth century of practical or applied geology. There is no evidence for underground limestone mining.

6.2 The clamp kilns

The kilns are of value because they are in good condition, can be closely dated, are associated with a tramway system and represent examples of a regionally important kiln type. Clamp kilns were in widespread use in Fife and the Lothians by the mid eighteenth century and were gradually replaced by larger, continuous-operation draw kilns during the nineteenth century (Skinner 1975: 225). At sites like Thornton Wood, however, clamp kilns appear to have continued as the preferred kiln type into the second half of the nineteenth century and this raises questions relating to conservatism in local industrial practices and the speed and economics of technological change. In England, where the lime industry has been comparatively well studied, rectangular clamp kilns of the Scottish type are regionally restricted and are only found in large numbers in Derbyshire, the East Midlands and Yorkshire (Leach 1995: 155); clamp kilns were still being used in Nottinghamshire as late as the 1930s (Stanier 1995: 62). Regional preferences in kiln type may have occurred in

Scotland too. In Dumfries and Galloway for instance it appears that clamp kilns were never used (Clarke, 1987).

6.3 Workers housing

Kiln Houses, despite its poor condition, is important as a surviving example of quarry workers housing at a quarrying site. Its relative value may be increased by the the possible combined use as a workshop/smithy.

6.4 Geology

The association between individual quarries and specific limestone beds adds to the importance of the site and provides a valuable link between archaeology and earth sciences.

6.5 Pre-Improvement agriculture

The remains of earth field dykes and curved rig cultivation are typical of pre-Improvement farming and provide a landscape context for the later industrial archaeology.

7 References

Chitty, L. 2001. Monuments Protection Programme: Lime, Cement and Plaster Industries, Step 4 Report. English Heritage.

Clarke, R. J. 1987. The Closeburn Limeworks Scheme: A Dumfriesshire Waterpower Complex, *Industrial Archaeology Review*, 10:1, 5-22

Dalland, M. & Carter, S. 1998. *Pre-afforestation Survey: Greenbank, Kelty, Fife*. Unpublished report, Headland Archaeology.

Leach, J. T. 1995. Burning Lime in Derbyshire Pye Kilns*, Industrial Archaeology Review*, 17:2, 145-158.

Newman, P. 2016. *The Archaeology of Mining and Quarrying.* National Association of Mining History Organisations: Matlock.

Skinner, B. C. 1975. The archaeology of the lime industry in Scotland. *Post-Medieval Archaeology,* 9. 225-230

Stanier, P. 1995. *Quarries of England and Wales – a photographic record*. Truro.

APPENDIX 1: Site Gazetteer

ID No	Description	Image
1	**Quarry** NGR: NT 11320 93086 Description: Partly in-filled quarry pit excavated into shallow N facing slope. Survives as a circular hollow, approximately 20m in diameter and up to 1.5m deep. Not marked on First or Second edition OS six inch maps. Condition: Fair. In deciduous woodland. No threat. Significance: Moderate. Provides evidence for early industrial activity.	
2	**Quarry** NGR: 10893 92848 – 10939 92700 Description: Substantial linear limestone quarry, 150m x 30m and up to 8m deep, excavated into S facing hillside. The quarry has a V-shaped profile, the result of post-abandonment slumping and natural infill, and there are spoil tips (ID Nos 3 and 4) on the W and E flanks. Above the quarry at the N end is a shallow excavation, perhaps the result of initial ground stripping to extend the quarry. At the S end of the quarry is a tramway cutting (ID no 5). The quarry is not on the First Edition OS map but is shown as 'Old Quarry' on the Second. Condition: Good. Mostly grass covered with a single conifer on the NE side. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process. Also a key visual element.	

3	**Spoil tips** NGR: NT 10883 92827 – 10923 92715 Description: A series of stepped spoil tips up to 18m wide along the W flank of quarry (2). The tips overlie each other sequentially with the earliest being at the S or downslope end. Depicted on Second Edition OS map. Condition: Good. Mostly grass-covered. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process. Forms a linked element with quarry (02).	
4	**Spoil tips** NGR: NT 10954 92777 – 10951 92709 Description: a series of shallow spoil tips along the E flank of quarry (2). The tips do not have the stepped profiles observed on the W side of the quarry and may be the result of more intermittent dumping, perhaps initial soil stripping. Depicted on Second edition OS map. Condition: Good. Mostly grass-covered. No threat. Significance: Evidentially significant in in terms of understanding quarrying process. Forms a linked element with quarry (2).	

5	**Tramway** NGR: NT 10939 92700 – 10926 92575 Description: A probable tramway running S from the S end of quarry (2). At the quarry it survives as a narrow earthwork cutting but to the S it is a low embankment approximately 1.5m wide and 0.3m high. The tramway is aligned on but stops N of clamp kilns (15a-c).. Condition: Fair. Grass-covered. Some small scale erosion from track which runs parallel with the embankment. Significance: High. Evidentially significant in terms of understanding how site transport systems operated.	
6	**Quarry** NGR: NT 10987 92704 – 11006 92531 Description: Substantial linear limestone quarry, 140m x 25m and up to 7m deep, excavated into S facing hillside. The quarry has a V-shaped profile, the result of post-abandonment slumping and natural infill, and there are spoil tips (ID No 7) on the W flank. A quarried limestone face is exposed at the NW end of the quarry. The quarry is not on the First Edition OS map but is shown on the Second. Condition: Good. Most of the quarry is grass covered with gorse bushes on the E slope and mature trees on the S flanks. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process. Also a key visual element.	

7	**Spoil tips** NGR: NT 10990 92626 – 10999 92534 Description: A series of linear spoil tips on the W flank of quarry (6). A dumping sequence can be identified with a narrow spoil tip at the S overlain to the N by a broader, angular section tip which in turn is covered further N by low tips up to 16m wide. Condition: Good. Mostly grass covered with occasional gorse bushes and, to the S, some mature trees. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process. Forms a linked element with quarry (06).	
8	**Building** (Fig) NGR: NT 10873 92617 Description: Ruins of a small terraced row known as 'Kiln Houses.' Constructed with coursed, pick-dressed sandstone blocks, the row measures 5.7m x 22m and the W gable stands to a height of 3.4m; the E gable is ruinous and survives only as a rubble spread. The two cottages at the W end are separated by a rubble party wall incorporating back-to-back fireplaces constructed from vertically set sandstone slabs; both cottages have a single door and window in the south wall. To the E is a larger space with a central door and flanking windows in the S wall. A vertical face at the S end of the E gable wall indicates another doorway and it is possible that this space may have been a workspace (possibly a smithy?) rather than a domestic dwelling. Condition: Poor. E end overgrown and inaccessible. Major structural crack at NW corner and both N and S long walls leaning out. Significance: High. Evidentially significant in terms of understanding social conditions of quarry workers. Visually important as the only surviving standing building.	

9	**Structure** NGR: NT 10858 92580 Description: The remains of a brick-built rectangular structure, 2.2m x 2.8m, with a 1.10m wide entrance in the SW wall. Fallen brickwork obscures the NE wall and a vertical face at the NE corner indicates another entrance. The structure, which is cement rendered internally, stands to a height of 0.7m and is constructed with mortar-set bricks stamped LOCHSIDE. The structure is not shown on any OS maps and may be comparatively recent, perhaps a lavatory block connected with the final occupation of Kiln Houses (ID No 8). Condition: Poor but stable. No threat. Significance: Medium. Potentially important in understanding later use of site and final occupation of Kiln Houses (08)	
10	**Tramway** NGR: NT 10923 92492 – 10943 92494 – 10951 92499 – 10981 92507 – 10984 92535 Description: Curving earthwork embankment, approximately 1.3 m wide, running WSW from the S end of quarry (6); probably a tramway. The embankment leads towards but appears to stop short of clamp kilns (15). Aerial photography shows rig cultivation immediately upslope of and apparently respecting the tramway embankment; this suggests that the embankment defined the southern end of an area of later rig cultivation. Condition: Good. Grass-covered. No threat. Significance: High. Evidentially significant in terms of understanding how site transport systems operated. Important to understanding site chronology because of association with later rig cultivation.	

11	**Quarry** NGR: NT 11002 92506 Description: Circular depression on SE slope. Approximately 6m diameter and up to 2m deep at N side; shallow bank (probably spoil) to the S. Condition: Fair. Grass covered. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process (trial or prospection pit on Blackhall Limestone).	
12	**Quarry** NGR: NT 10835 92549 Description: Substantial flooded limestone quarry excavated into the S facing hillside. The quarry has two joined working faces, the NW-SE face is 60m long and the SW-NE face is approximately 50m long (although the full extent of the latter may be obscured by dumping from spoil tip (13) and the construction of clamp kiln (14)). The quarry is about 30m wide and there is an associated spoil tip (13) to the S. Marked as 'Old Quarry' (Limestone) on the First Edition OS map. Condition: Fair. Partially flooded and the NW-SE face has tree and gorse cover. No bedrock is exposed. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process. Also a key visual element.	

13	**Spoil tip** NGR: NT 10839 92525 Description: Spoil tip associated with the working of limestone quarry (12). The tip, which measures approximately 45m x 60 x 4m high, has a flat top. There are suggestions of conjoined, linear tip lines on the S side. Condition: Fair. Much of the top of the tip has been planted with conifers and this masks the visual association between the tip and associated quarry. Significance: High. Evidentially significant in in terms of understanding quarrying process. Forms a linked element with quarry (12).	
14	**Clamp kiln** (Fig.) NGR: NT 10862 92484 Description: Earthworks of a rectangular clamp kiln constructed into the S facing slope. The interior measures 1.5m x 10m and the flanking banks are approximately 3m wide and 1.5m high. The bank on the NW side appears to have been constructed on the SW lip of quarry (12) and the SE bank runs parallel with trackway (22). To the SW of the kiln there is a probable spoil tip but it could not be ascertained if this was associated with the kiln or derived from quarrying. The kiln is not shown on any OS maps. Condition: Good. Grass covered. No threat. Significance: High. Evidentially significant in in terms of understanding lime burning technology. Chronologically important because of relationship with earlier quarry (12).	

15	**Clamp kilns** NGR: NT 10885 92472 Description: A group of three rectangular clamp kilns (IDs 15a-c) constructed into a shallow W facing slope with a flat activity or loading area immediately to the E. Kiln (15a), the most southerly of the group, measures 1m x 8m internally and is 1.5m deep; the flanking bank to the S may have been partially destroyed by the excavation of the railway cutting (ID 16). Kiln (15b) shares flanking banks with kilns (15a) and (15c) and measures 2m x 11m with a slightly flared entrance. Kiln (15c) is 1m x 8m and 1m deep. The kilns are not shown on the First or Second edition OS maps. Condition: Good. Grass covered. No threat. Significance: High. Evidentially significant in terms of understanding lime burning technology. Chronologically important because of relationship with later railway cutting (16).	
16	**Former railway and railway cutting** NGR: NT 10812 92467 - 10984 92430 Description: A 130m length of a branch line of the West of Fife Mineral Railway survives as a cutting and short embankment; at track level the line is approximately 1.8 wide. The cutting truncates quarry (18) and may also truncate part of kiln (15a). A causeway carrying the footpath between the two ponds at the SE corner of the survey area is a continuation of the mineral line. Not marked on the First Edition OS map and shown as abandoned on the Second Edition. Condition: Good. NW section somewhat overgrown. No threat. Significance: High. Evidential and chronological significance in terms of understanding relationship between railway and earlier quarrying (18) and lime burning (14,15) activities.	

17	**Quarry pit** NGR: NT 10951 92476 Description: Arc-shaped hollow, approximately 6m x 2m x 1.4m deep; low spoil bank to E and S. Probably a trial excavation to test the position of the limestone outcrop. Not shown on any OS maps. Condition: Fair. Grass-covered. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process (trial or prospection pit on Blackhall Limestone).	
18	**Quarries** NGR: NT 10923 92449 Description: A group of small limestone quarries. In the W section is an area of shallow quarrying (18a) some 1.7m deep which has been truncated by the construction of the railway cutting (ID 16) and has also been cut by quarry (18c); SW of quarry 18a is an area of spread spoil that may mask other quarrying features. In the E section is a narrow linear quarry (18b) approximately 7m x 15m and 3m deep which has been truncated to the S by railway cutting (16). Between these two quarries is another quarry (18c) measuring 11m x 20m and 5m deep; its base is at the same level as the railway and the relationship between the two cannot be established. Not shown on the First Edition OS map and shown as probably abandoned on the Second Edition. Condition: fair, stable. Obscured by gorse to NE. No threat. Significance: High. Evidentially significant in in terms of understanding quarrying process. Important in terms of understanding site chronology (evidence for phases of quarry working and relationship with later railway (16)).	

19	**Building** NGR: NT 10818 92457 Description: On the S side of the former railway (ID 16) are the foundations of rectangular brick-built rectangular structure measuring 2.9m x 4.7m internally. There is a central entrance, 1.3m wide, in the N face. The foundations are 0.25m (3 brick courses) high in a combination of red and refractory bricks. The refractory bricks are stamped ORD. ADAMS – HILL OF BEATH – CROSSGATE). Shown as a roofed structure on Second Edition OS map. Condition: Poor. Foundations are grass-covered and the interior is overgrown with brambles. No threat. Significance: Medium. Of value in terms of understanding operation of railway (16).	
20	**Clamp kiln(s)** NGR: NT 10852 92423 Description: A rectangular kiln (20a), 5.5m x 4m and 1.5 deep, excavated into a shallow E facing slope; the kiln has a flanking bank to the S some 5m wide. Immediately N is an area of disturbed ground (20b) comprising a group of interlinked hollows excavated into the E and S facing slope; this may be a damaged kiln but is more likely to be surface quarrying. Adjoining the kiln(s) to the E is a short section of possible trackway. Not shown on any OS maps although the First Edition marks a group of clamp kilns to the NNE which may be hidden by spoil dumped from quarry (18). Condition: Fair. Quarry (20a) is covered by a fallen tree and there is thick gorse cover to the N. No threat. Significance: High. Evidentially significant in in terms of understanding lime burning technology.	

21	**Quarry** NGR: NT 10877 92363 Description: Rectangular quarry, 6m x 14.5m and 2.5m deep, excavated into N facing slope below modern conifer plantation. No evidence for a spoil tip but this might have been to the N and is now flooded. Small area of exposed bedrock on S side. Marked 'Sandstone Quarry' on first Edition OS map and not shown on subsequent editions. Condition: good. Grass covered. No threat. Significance: Medium. Provides evidence for quarrying for materials other than limestone. Of value as an example of associated rural industry.	
22	**Track** NGR: NT 10625 92882 – 10855 92618 and 10862 92477 Description: A trackway from Woodend Cottage running NW-SE across the survey area and passing Kiln Houses (ID 8). Shown on the First Edition OS map and, with slight variations in course, on subsequent editions. Condition: Fair to poor. The NW section between Woodend Cottage and Kiln houses can still be traced and survives in places as a earthwork. Further SE it is discontinuous although a short section survives by kiln (14). Significance: High. Evidentially significant in in terms of understanding access routes across the site. Chronologically important as it continues in use as a post-industrial feature.	

23	**Enclosure** NGR: NT 11115 92842 (approx.) Description: nothing survives of a rounded enclosure recorded during the 1998 survey. The site is now within a mature conifer plantation. Condition: Presumed destroyed.	No image
24	**Turf dyke/enclosure** NGR: NT 11006 92916 Description: A series of irregular field banks, possibly associated with linear dyke (25). Condition: Poor. Grass covered and within a clearing. No threat. Significance: High. Evidentially significant in in terms of understanding pre-industrial use of the site.	

25	**Turf dyke** NGR: NT 10598 92791 – 10649 92804 and 10831 92868 – 11261 92956 Description: A turf and stone bank running E along the ridge for some 680m. Condition: Fair. The dyke survives in good condition between the N end of quarry (2) and NT 11261 92956. The W section is less well preserved and lies within a conifer plantation and is also cut by track (22). The extreme W end is in better condition. Possibly at risk during future felling. Significance: High. Evidentially significant in in terms of understanding pre-industrial use of the site.	
26	**Rig cultivation** NGR: NT 10958 92354 Description: An area of curved rig cultivation recorded during the 1998 pre-afforestation survey. Condition: Poor. No rig cultivation was observed but it may well be masked by thick, tussocky grass. Significance: Medium - High. Evidentially significant in in terms of understanding pre-industrial use of the site. Chronologically important as the earliest archaeological feature within the site.	

APPENDIX 2 - Digital photographs (on CD)

Photo No	Site ID No	Description	From
1	1	General view	S
2.1	2	General view	N
2.2	2	Shallow excavation at N end of quarry	W
2.3	2	General view	S
2.4	2	General view	S
2.5	2	General view of S end of quarry	NE
2.6	2	General view of S end of quarry	NE
2.7	2	General view of N end of quarry	S
2.9	2	General view of s end of quarry	NE
2.10	2	General view	N
3.1	3	General view of spoil tips	S
3.2	3	General view of spoil tips	SE
4.1	4	General view of spoil tips	N
5.1	5	General view	N
5.2	5	General view	S
6.1	6	Worked face, N end of quarry	S
6.2	6	Worked face, N end of quarry	S
6.3	6	General view	N
6.4	6	General view	N
6.5	6	General view	N
7.1	7	General view of N tips	N
7.2	7	View of S tips	S
7.3	7	Central tips	N
8.1	8	W gable	W
8.2	8	S facing frontage	SE
8.3	8	Detail of fire place/hearth	W
8.4	8	General view	SW
9.1	9	General view	N
9.2	9	General view	SW
10	10	General view	E
11	11	General view	SW
12	12	General view	E
13	13	General view	E
14.1	14	General view of opening	SE
14.2	14	General view of interior	S
15.1	15a	General view	W
15.2	15a	General view	W
15.3	15c	General view	W
15.4	15a-c	General view	W
15.5	15a-c	General view	W
15.6	15b	General view	W
16	16	View along cutting	SE
17	17	General view	NE
18.1	18	General view, quarry (18c) centre	SW
18.2	18a	General view of 18a, S of railway cutting	S
19.1	19	General view	N

19.2	19	Detail of brick (ORD ADAM-HILL OF BEATH)	-
20.1	20a	General view of kiln	W
20.2	20a	General view	NW
20.3	20b	General view	W
20.4	20a and b	General view	W
21	21	General view of quarry	W
22	22	Line of trackway by kiln (14)	W
23	24	General view of W edge of enclosure	W
24.1	25	E end of turf dyke	E
24.2	25	W end of dyke	N
25	26	General view – rig cultivation hidden by tussocky grass	W

APPENDIX 3 - Discovery & Excavation in Scotland 2017 report

Local authority: Fife

Parish: Beath

Site name: Thornton Wood Limeworks

Name of contributor: John Pickin

Type of project: survey

Name of organisation:

NGR: NT 109 926

Report: A survey was carried out to record and asses the remains associated with the Thornton Wood Limeworks (also known as Gaskie Hill Quarries). A series of trial pits, surface quarries and major linear quarry workings were identified together with associated spoil mounds, two tramways and five clamp kilns. A row of workers' housing known as Kiln Houses was also recorded. Field evidence and historic mapping suggest that there were two major phases of industrial activity. The first phase dates from around 1830-40 and was confined to small scale quarrying and lime burning in the southern section of the site. The second phase, which began around 1850 and finished before the 1890s, saw the development of two substantial limestone quarries on the hillside above Kiln Houses. The comparatively small scale nature of quarrying and lime burning suggests that Thornton Wood Limeworks served a local agricultural market, possibly the farms on the Lassodie Estate.

Location of report: Forestry Commission Scotland; Fife HER; NMRS (intended)

Funder: Forestry Commission Scotland

Contact details of organisation: High Weirston House, Leswalt, Stranraer DG9 0RQ