BRYNN MILL
ROCHE
CORNWALL

Historic Building Recording

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Brynn Mill, Roche, Cornwall

Historic Building Recording

For

K & R Services

On behalf of

Kate Mabley

By

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Summary

South West Archaeology Ltd. was instructed by K&R Services (the Agents) on behalf of Kate Mabley (the Client) to undertake detailed building recording and monitoring at Brynn Mill, Roche, Cornwall, with specific reference to the remaining elements of the historic mill.

The Mill proved to be a complex multi-phase building. Recording work determined the north (wheelpit) gable wall contained as many as eight phases of build, presumably reflecting the evolution of the mill from a predominantly timber structure to a stone one, as well as the evolution of milling technology itself. The later phases can be dated to the second half of the 19th century; while the older elements may all be 18th century in date, it is possible they are earlier. Perversely, the importance of the building – despite its ruinous state – lies in its humble origins: seemingly there was neither the money nor the imperative to completely rebuild the mill, and thus a record of its potted history survives in the standing fabric.

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Acknowledgements

Thanks for assistance are due to:

Kate Mabley, for access
Robin Karkeek and Stephen Richards of K&R Services
Martin and Sue Watts, undertaking the detailed survey of the mill machinery
Alan Stoyel, for his notes from 1988
Martin Bodman, for references to the Census, newspapers and information on Oatey & Co.
Phil Copleston, Senior Development Officer, Historic Environment, Cornwall Council

1.0 Introduction

Location: Brynn Mill
Parish: Roche
County: Cornwall

1.1 Project Background

South West Archaeology Ltd. (SWARCH) was commissioned by K&R Services (the Agents) on behalf of Kate Mabley (the Client) to undertake further building recording at Brynn Mill, Roche, Cornwall following the clearance of overgrowth and scrub, and during the dismantling of the *in situ* machinery. This survey would supplement an existing desk-based assessment and historic building survey already undertaken by SWARCH (Report 140422). The Written Scheme of Investigation (Appendix 1) and the schedule of work it proposes were drawn up in consultation with Phil Copleston, Senior Development Officer Historic Environment, Cornwall Council.

1.2 Topographical and Geological Background

The site is located in the base of valley next to one of the tributaries of the River Camel, at a height of c.80m AOD. The land rises steeply to the west to Belowda Beacon. The soils of this area are the well-drained fine loamy or fine silty soils over rock of the Manod Association (SSEW 1983), overlying the partly metamorphosed slates and sandstones of the Meadfoot Group (BGS 2014). On site, however, the soils were heavy and waterlogged.

1.3 Historical Background

The site lies at the extreme northern limit of the parish of Roche. Brynn Mill is surrounded by a series of small and slightly irregular enclosures, but most of the area was enclosed in the 19th century from open moorland. The fields immediately to the north of the Mill are listed as *upland rough ground*, others as *post-medieval* and *recently-enclosed land*, on the Cornwall and Scilly Historic Landscape Characterisation. To the north and south of the site there are extensive areas of medieval and post-medieval tin-streaming (Lestormer MCO42591; Little Brynn MCO42506).

The information on Brynn Mill is rather patchy and all dates to the 19th century. 'Brin Mill' is shown, though not in any detail, on the Ordnance Survey surveyor's draft map of 1808 (Sheet OSD 8). The will of William Liddicoat of Belovely (Belowda) Roche, dated 1827 and proved in 1840, refers to a dwelling house, mill, outhouses and fields at Brin Mill and tenement, which he left to his son George (CRO: AP/L/2400).

In the 1841 Roche Census returns 'Breen Mill' was occupied by Joseph Osborn, miller, aged 55, his wife, son and two servants. The Roche tithe map showed the layout of buildings, ponds and leats much as it was later in the 19th century, although the quality of the reproduction held by the Cornwall Record Office is very poor. In 1851 the mill was occupied by Joseph Hicks, miller, aged 31, his wife Jane and two male servants. Joseph is recorded as farmer and miller there in 1861, as well as one James Leverton, described as a widower, aged 63, and his occupation is also given as miller. In 1871 John Common, a widower aged 60, was recorded as miller, occupying Brynn Mill with his unmarried son John, a minor, and his 17 year old daughter, Mary, as housekeeper. In 1881 John Common, then aged 70, is still listed as miller, his grandson living with him. John Common died at Brynn Mill on 30 March 1882, aged 73 (*Royal Cornwall Gazette* 7 April 1882, 5). No miller is

specifically listed under Brynn in the 1891 census. However, Hart Hicks is recorded as 'miller (water)' at Brynn Mill in Kelly's *Directory* of 1893, 1902, 1906 and 1914.

Benney (1972, 99-100) cites the following (from title deeds to Demelza Mill): "George Hicks [son of John Hicks of Demelza Mill] was a miller in his own right and on the 26th of June 1867 the leasehold interest in neighbouring Little Brynn Mill was assigned to him by William Huddy in consideration of a payment of £500. Originally the property of the Earl of Falmouth, Little Brynn Mill was leased by him to a John Hicks on the 5th of November 1845, such lease to be determinable on the death of James Hicks, George Hicks and Carl Hicks. Eventually the mills at both Demelza and Little Brynn came into the possession of one Joseph Hicks on the 5th of July 1882, as he then purchased the freehold interest in Demelza and acquired an assignment of the leasehold interest in Little Brynn for the total payment of £760."

The 1st ed. OS 25" map, surveyed in 1880 and published in 1881, shows the plan of the building similar to that which survives today. It is marked as Brynn Mill with the qualifier 'Corn' in brackets and has associated outbuildings, sluice, pond, spring and trackway. From the trade directory entries given above it appears that the mill continued in use until at least the start of World War I.

Figure 1: Extract from the 1907 25" OS map (the mill is indicated).

1.4 Methodology

This report follows on from the existing SWARCH report on the site, with more detailed recording of the *in situ* mill machinery undertaken by Martin and Sue Watts following the clearance of scrub and fallen debris. Plans of the mill building and a stone-for-stone elevation drawing of the north elevation were also undertaken, as works permitted. These works were undertaken in October and November 2015 in accordance with the WSI and in line with appropriate Historic England and CIfA guidance.

The original building assessment was undertaken by Martin Watts on the 3rd April 2014, and was carried out in accordance with English Heritage and IfA guidelines on the recording of standing

buildings and structures. It was supplemented by notes and photographs taken by Martin Watts in January and March 1988 (exterior only) and notes of the internal working parts made by Alan Stoyel in April 1988. Historical and background information has been compiled from a variety of sources which are referenced and acknowledged, including: documentary sources held by the Cornwall Record Office, as well as the Historic Environment Record maintained by Cornwall Council. Relevant online sources were also consulted, and appropriate Internet databases investigated.

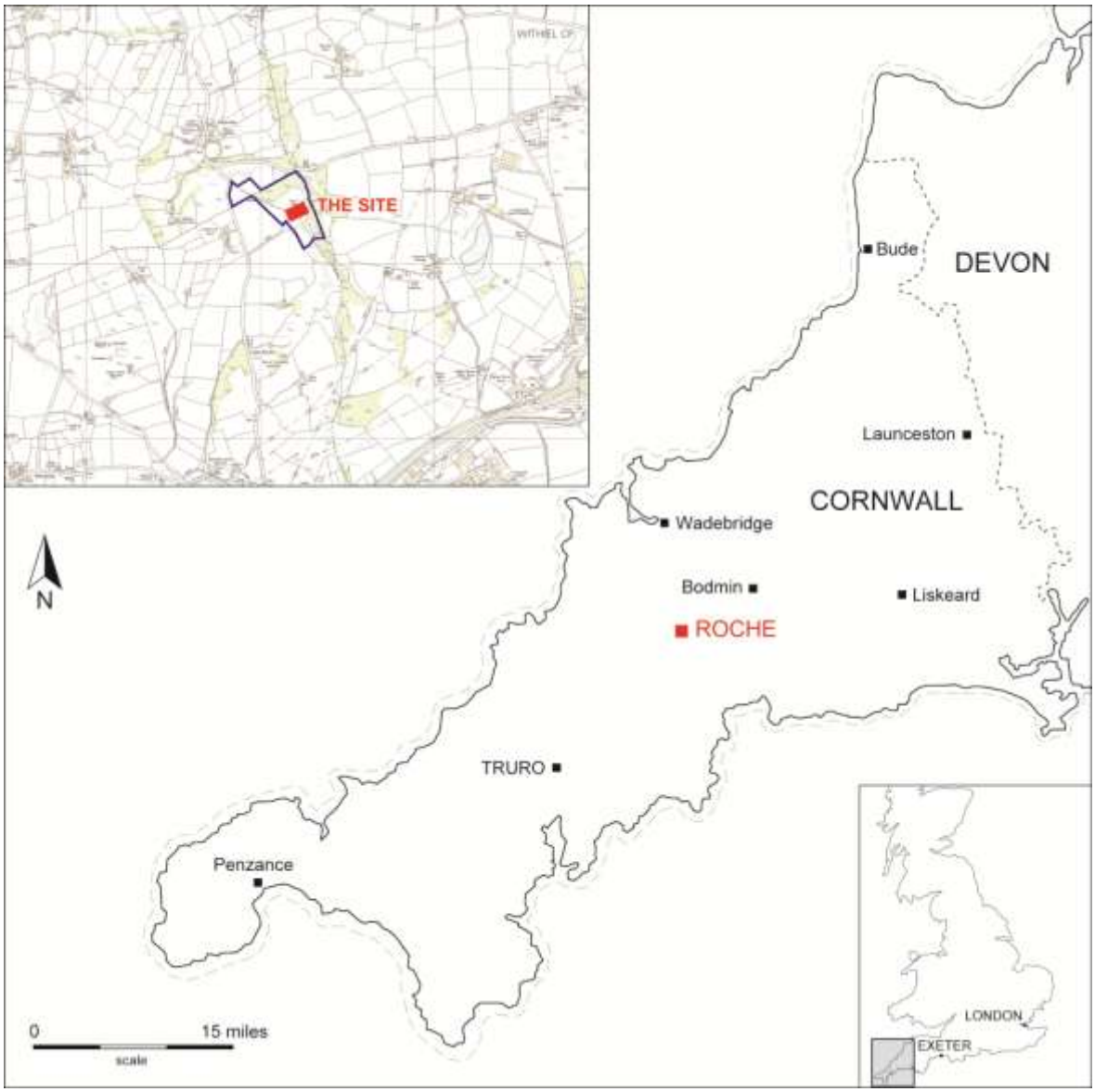

Figure 2: Site location.

2.0 Building and Machinery Recording

2.1 General Description of the Buildings

Martin Watts first visited Brynn Mill in January 1988, when the mill and adjoining cottage were unoccupied but relatively intact. No access was gained to the interior of either building at that time. The mill roof was then clad with large slates on both sides; the south-west pitch of the house roof was clad with smaller slates and the rear pitch with corrugated sheet. In 2014 the Mill and Cottage were in a parlous state; the roofs had gone and the interiors shrouded in vegetation and debris from the collapsed roofs/cob walls. Some of the slates found within the debris in the former cottage were from Delabole. Parts of the machinery (see below) remained *in situ*, but most was lost or concealed. The outbuildings were in a similar state of disrepair. By mid july 2015 most of the obscuring vegetation and debris had been cleared from the site and further observations, particularly regarding the machinery could be made.

The mill and adjoining dwelling house are orientated roughly south-east to north-west, with the mill at the north-west end. There is a corrugated iron lean-to extension adjoining the south-eastern end of the cottage, and a timber-framed corrugated iron shed with gable roof extending from the north-eastern side of the mill. To the south-east end, behind the cottage, is a free-standing concrete-block privy with a timber boarded door on its east side and a monopitch corrugated asbestos sheet roof.

The description of the building that follows is based on the original SWARCH report 140422, corrected and updated where appropriate; this account supersedes the description and discussion found in that report.

2.2 Building Descriptions

Note the cardinal points have been changed: north-west is north, south-west is west etc.

2.2.1 The Mill - Exterior

The roof of the mill has collapsed; no details of the roof structure survive, but it had a roof of large and irregular (scantle) slates. From survey drawings made in the 1980s, the pitch of the mill roof was about 30 degrees. The external walls of the mill stand to eaves level, but structural cracks are visible in the north and east elevations. The west (front) elevation, and the upper part of the north elevation, is of rubble stone bedded in lime mortar. The other walls are clay bonded and pointed with mortar. There are some massive stone blocks, mainly on the north (wheelpit) side. The south (internal) wall contains two large sub-rounded ‘orthostats’ that frame a blocked doorway. The walls are built of a highly heterogenuous mixture of local slatestone, sandstone, granite rubble and other fine-grained igneous rocks. Granite is used for lintels and some quoins.

The west elevation is of rubble stonework with two openings. There is a wide ground-floor doorway under a granite lintel; all associated timberwork has been lost. The opening has dressed quoins, including a granite stone with a domed back to the right of the door. This appears to be reused and its shape suggests it may have been cut from a millstone blank. There is a first floor window opening to the north, but the window frame has gone. This may be a partly-blocked loading door. It has a slate cill, with brick incorporated into the blocking and reveals. Below the window at ground level the end of the upstream layshaft projects through a opening forced through the wall into a cast iron pedestal bolted to a granite sett.

The north gable end of the mill stands to full height; this is the wheelpit wall, and has a rectangular opening at a low level for the shaft of the waterwheel to enter the building. The granite lintel over

this opening is cracked. A secondary granite lintel has been incorporated into the wall a short distance above the shaft opening. Towards the western end of the wheelpit there is some decayed iron strapping, bolted into or through the wall to retain the masonry. Above the shaft opening is a small, square timber-framed four-light window with a slate cill under a timber lintel. To the west of this is a vertical opening through which a lever projected for controlling the flow of water in the launder onto the wheel. There is a vertical joint in the stonework to the right of this slot, and also to the eastern corner of the building, indicating the upper part of this elevation was originally open, or timber-framed. The build of this wall is complex with up to eight phases (see below).

The east elevation of the mill was obscured by ivy and a corrugated iron shed. The wall leaned out precariously to the east, and when the shed was removed this wall collapsed. The wall was of rubble stone, the two faces were not tied together and the core consisted of virtually-unbonded stone rubble. There was a doorway under a granite lintel; the opening had splayed reveals to left and right that indicate it was originally a window. The 1980s survey drawings show a first floor window in this wall, but this is no longer visible.

The internal dividing wall between the mill and the cottage consists of two parts: the section of wall to the west is later and still stands to eaves height (description as per the west elevation); the section of wall to the east survives to c.1.6m high. This wall is of rubble stone, which originally extended up to first floor level with lighter construction (cob?) above. The construction of this section of wall is highly unusual, with two large 'orthostats' flanking a blocked doorway, with stone rubble walling to either side. The section of the wall to the west of the blocked doorway is battered, with a thick coating of cob used for plaster. The eastern section of the wall is abutted by the east walls of the mill and the cottage, and appears truncated, as if it formerly continued to the east.

2.2.2 The Mill - Interior

The internal structural timbers of the mill had been lost by 2015, leaving some fragments of the west end of the hurst frame (the timber structure that encloses the driving gears and supports the millstones) remaining *in situ*, precariously supporting one pair of millstones. Following the clearence of scrub and fallen debris, a more detailed examination of the remains was undertaken (see Martin Watts' discussion, below) and all the elements of the machinery observed, removed and retained. The northern side of the floor contains a series of large granite stones with iron hold-down bolts and sockets. The south side of the floor is of concrete, with a nearly-complete worn granite millstone set just within the western threshold. Where the concrete was broken, an earlier compact floor of clay with cobbles was visible.

2.2.3 The Cottage - Exterior

The west elevation is of rubble stonework up to the first-floor window cill level, with cob above. However, most of the cob walling had been lost by 2015. There are two windows lighting ground floor rooms each side of a central doorway. The window frame on the north side of the door has gone, leaving an opening with some brickwork patching visible on its lower right side. The window to the south is modern and this area been repaired with concrete blockwork with a facing of brittle cement render; the render extends around the window and over the face of the wall to eaves level. The window cills are made from roofing slates. The upper part of the wall at the south end is two skins of concrete block with a gap between. One of the quoins in the south-west corner appears to be a re-used millstone blank. In the south-west corner of this elevation is a curved stone projection that enclosed a cloam oven (North Devon type), the fragments of which were collected when the room was cleared. This projection is roofed with mortared slates.

The south gable wall extends to full height, of well-built rubble stone to c.1.4m high and with cob above. This gable sports a fireplace and chimney stack, and the internal side of the cob gable had

collapsed, revealing the flue. The south-eastern external corner of the stack has been faced in yellow brick (from the nearby Carbis brickworks?), and cement render wraps around from the west wall across the western side of the southern elevation. A small mono-ptich corrugated iron shed abuts the gable wall.

2.2.4 The Cottage – Interior

Plans made in the 1980s indicated a two-room layout, with ground-floor fireplaces at both ends and a central stair to the first floor. The chimney serving the fireplace at the north end had been removed and roofed over before 1988. Following the clearance of the interior, the floor was revealed to be of concrete, with the remnants of linoleum adhering to the surface, with scars for narrow studwork walls defining the two small rooms. In the middle of the floor, and adjacent to the southern fireplace, parts of worn granite millstones had been set into the floor.

2.2.5 The Outbuildings

To the west of the mill and cottage are the overgrown remains of the rubble stone walls of some small outbuildings built into the slope. These were not closely investigated; they appear to have been ancillary buildings, probably for animals, forming an essential part of any smallholding. A photograph taken in 1988 shows some of these buildings in a more intact condition (Figure 7).

2.3 The Working Elements of the Mill *by Martin Watts*

2.3.1 Summary

Brynn Mill is a small water-powered rural corn mill which in its last working form had two pairs of millstones driven by an overshot waterwheel through timber and iron gearing. Both sets of stones were driven from layshafts, one on the upstream and one on the downstream side of the pitwheel. The downstream layout appears to be the earlier, with predominantly timber gearing and shafting; the upstream layshaft and gearing was probably introduced when the present waterwheel was installed which, from the maker's name cast on the shrouds, was between about 1850 and 1872. This appears to have resulted in extension of the mill building, in order to accommodate the additional machinery.

The following notes are based on site surveys carried out by Martin and Sue Watts on the 3rd April 2014 and the 14th July 2015 and notes made by Alan Stoyel in April 1988. They have been prepared as a supplement to SWARCH Report 140422.

2.3.2 The Waterwheel

The iron shroud rings and naves are collapsing into the wheelpit, the timber wheelshaft is broken and incomplete and the timber arms and buckets have rotted away. A break in the outer shroud ring was noted in 2014 and there has been marked deterioration since then, with further collapse and breaks in the shrouds.

The waterwheel was overshot, about 3.7m (12ft 3in) diameter by about 0.69m (2ft 3in) internal (effective) width, 0.74m wide over the outside faces of the shrouds. These dimensions are approximate because of breaks and distortions in the ironwork. It would have been fed from a timber launder that projected beyond the masonry wall at the upstream end of the wheelpit. Only the cast iron shrouds of the waterwheel remain. The outer shroud ring is broken at one point and has a short section missing, but otherwise the castings appear intact. Some of the cast-iron shroud sections have the inscription OATEY. & C^{o} WADEBRIDGE embossed on them in a bold sans serif face. The shrouds are in six sections each side, 20.5cm deep, joined midway between the arm positions with rectangular cast-iron plates which have the number '6' cast on them. These plates are fixed with four

bolts with round heads and square nuts on the inside. The inner faces of the shrouds have integrally-cast flanges to locate the ends of the buckets, each of which was formed with two timber boards. There would have been two sets of six timber arms, all of which have rotted away, as have the timber buckets and sole boards. There were formerly 42 timber buckets (7 per section), of conventional elbow shape, the outer boards being 2.5cm thick. There are double flanges around the inside circumference of the shrouds to locate the ends of 2.5cm thick captive sole boards. Between each 'pair' of shroud sections are three forged cross tie rods. These served to pull the shroud sections towards each other, to hold the bucket boards in place and maintain the integrity and shape of the wheel. The shrouds have integrally-cast projecting pockets in which the outer ends of the timber arms were located and held with two bolts. The inner ends of arms were 8cm by 14cm where they enter sockets in the heavy cast-iron naves, tapering to 6cm by 11cm section at the shrouds. The inner ends are held in the nave sockets with two bolts with backing plates and nuts. The naves are single castings, each about 0.76m diameter by 16.5cm wide, and the width of wheel over the naves is 0.75m. The nave castings have 12-sided centres which were wedged to the timber wheelshaft, which has now largely rotted away. The outer end of the shaft has a cast-iron cross-tail gudgeon let in, the timber being bound with two gudgeon rings which are approximately 35cm outside diameter. The outer bearing journal is 7cm diameter by 7.5cm long and ran in an open brass bearing which was set in a granite block on top of the wheelpit outer wall.

The wheelshaft has decayed and is broken where it passes through the pit wall. Its inner end is octagonal in section, at least from the pitwheel position to the inner gudgeon where it is about 31cm diameter (inside the gudgeon ring), with a cast-iron cross-tail gudgeon and two rings. The journal is approximately 4.5cm diameter by 10cm long and ran in a groove in a block of pinkish granite. This block has been reused and repositioned, a similar groove for a journal being visible in its vertical inner (south) face.

2.3.3 Pitwheel

The centre of the pitwheel is a single casting about 0.68cm diameter by 21.5cm wide, similar but larger than the waterwheel naves, with integral sockets for six radial timber arms of about 19cm by 7.5cm section, each of which was held with two bolts with square plate washers and square nuts on the waterwheel side. The octagonal centre of the casting is wedged to the timber wheelshaft with steel wedges. Damaged and fragmentary timber sections of the pitwheel remain, some *in situ* on the downstream side (and presumably buried in the debris in the cog pit), the remainder having been carefully removed and set aside. Sections of the timber cog ring also survive. This had a 17cm wide face and was 14.5cm thick, with a 1.2cm deep by 10cm wide notch cut into its back for locating the outer end of each arm. The cog ring was built up from curved timber sections bolted together and to the arm ends. The cog ring is mortised to take the shanks of the cogs. There was a total of about 54 timber cogs which have a 7.5cm face, 6cm projection and 10cm (4in) pitch. When complete the timber cog ring had a 10cm wide iron band around its circumference to bind it, its ends joined and tightened with an iron wedge.

2.3.4 Upstream Layshaft, Drive Pinion and Beltwheel

The layshaft that was driven off the upstream side of the pitwheel is of 7.5cm square section hammered iron, mounted in plain bearings (plummer blocks). The bearing at the downstream end is fixed down to a timber on the edge of the cog pit. The drive was taken from the pitwheel by cast-iron spur gear, approximately 0.79m overall diameter with a10cm face and 24 teeth of 10cm (4in) pitch and 5cm projection. The pattern from which this gear was cast was originally made to fit an octagonal timber shaft, and the gear has been modified with a 4- armed integrally-cast 'insert' in order to fit it to a smaller square iron shaft. Eight T-section arms radiate from the corners of the octagonal centre. The gear is keyed to the iron layshaft with iron or steel wedges.

Upstream of the drive pinion are the remains of a spur pinion, which was basically a solid timber nave or hub with circular iron plates on its upstream and downstream faces and circumferential bands. It is fixed on the layshaft with wooden wedges. It is 28cm diameter by 20cm wide, with the remains of 12 cogs, now mostly rotted away. The cogs were 9cm face, 4.5cm projection and about 9cm pitch. In 1988 Alan Stoyel noted this as 'a wooden beltwheel, 16” diameter x 7” wide. This drove the sackhoist, and the 2” belt is still in place.' This was obviously an adaptation of an earlier wooden gear (probably originally a stone nut) re-used to form a belt wheel or pulley.

Next upstream are the remains of another beltwheel, recorded in 1988 as 'a second wooden beltwheel, 29” diameter x 5” wide.' All that remains are two iron plates, each made up of two strips 6cm wide by 0.9cm thick by 32cm long, set 9cm apart, with decayed timber between them.

The drive to the upstream millstones was taken from a cast-iron bevel gear mounted on the layshaft. This is a single casting with 8 T-section arms; it has an overall diameter of about 1.27m, the gear face being 11.5 by 4cm, with 80 wooden cogs held in the casting with dovetailed wedges between the shanks. The cogs have 9cm face, 3cm projection and 4.5cm (1¾ in) pitch. This gear meshes with a cast-iron bevel stone nut, a single casting with a circular centre, 4 flat arms, a 9cm wide face and 21 teeth. This gear is wedged close to the foot of a forged iron millstone spindle, which is 6cm square from its lower end to about 70cm above the stone nut position, where it becomes circular. The footstep bearing in which the spindle ran is held in a square cast-iron bridging box which is bolted to the timber bridge tree, with four set screws on quarters to align and adjust the bearing bronze and spindle.

The upstream end of the layshaft runs in a plummer block fixed to a stone block on the upstream side of the bridge timbers. The shaft extends 15cm beyond the plummer block where there is a square metal sliding sleeve which is used to connect it to a lighter shaft which extends through the front wall of the mill. This extension can therefore be engaged or disengaged as required. The extension shaft is 5cm square and carries a cast-iron bevel gear with a circular centre packed out with timber packing off the shaft. The gear is a single casting with 6 T-section arms, a 10 by 3.5cm cog face, and carries 84 wooden cogs with 7.5cm face, 4.5cm projection and about 5cm (2in) pitch. The cog shanks are retained with wooden wedges. Although superficially similar, this is a lighter casting than the stone drive bevel. This gear drove a vertical shaft which rises to eaves level tight against the inside front wall of the mill. At the lower end of this shaft is a cast-iron bevel gear with 4 flat arms and 14 teeth of 8.5cm face. The vertical shaft is 4cm square section, with steady bearing at about the level of the former hurst floor. Some 2m above the pinion and about 23cm below the top of the shaft are the fragmentary remains of a belt wheel, recorded in 1988 as 'a 4-armed wooden horizontal beltwheel, 26” diameter x 5” wide.' The bottom bearing and its supporting timber are missing.

The upstream end of the horizontal layshaft passes through the front wall of the mill building, running in a cast-iron pedestal fixed to a granite block at ground level outside. The outer end of the square shaft, which projects beyond the bearing, is burred, possibly from having been hit with a hammer. It projects far enough to have carried an external drive wheel of some sort, although the width of the granite block to which the bearing pedestal is fixed might preclude this. Some local excavation would therefore be required to determine whether this was the case.

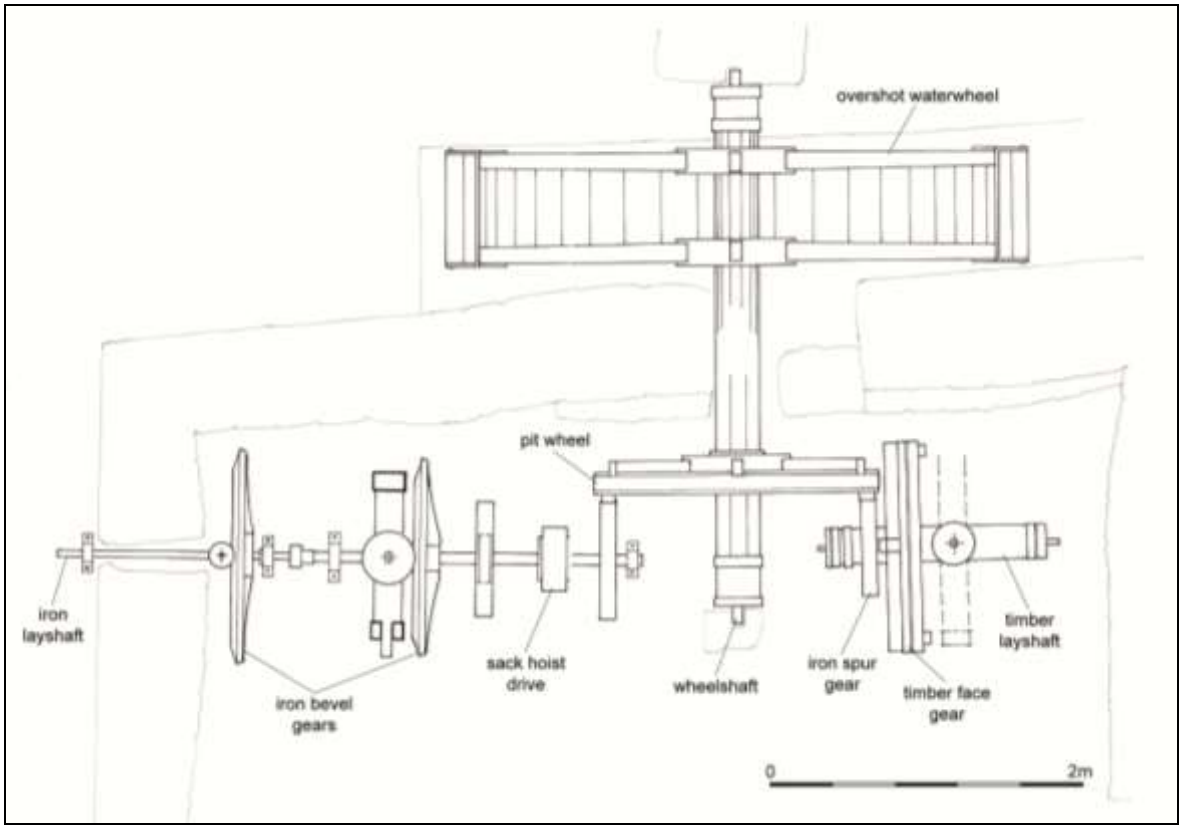

Figure 3: Double layshaft drives to two pairs of millstones: diagrammatic reconstruction of the layout at Brynn Mill based on measurements taken in 2014/2015.

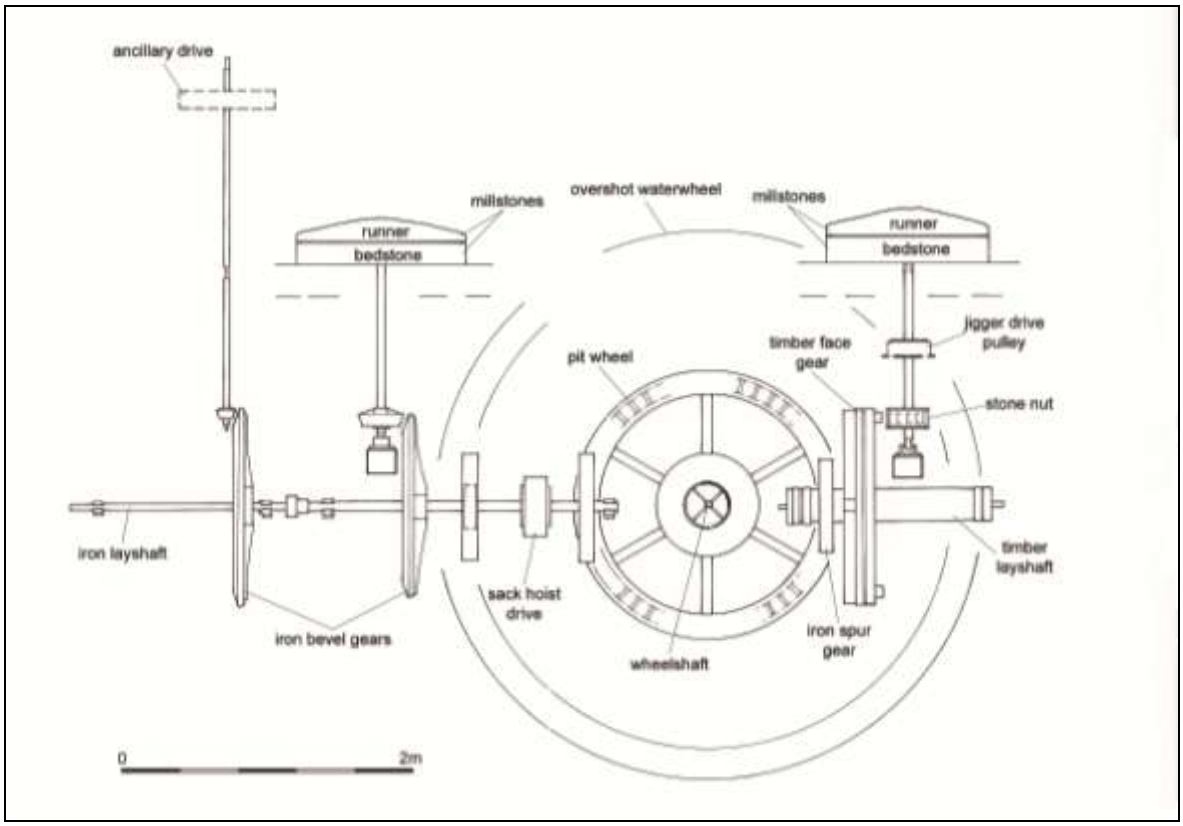

Figure 4: Double layshaft drives to two pairs of millstones: diagrammatic reconstruction of the layout at Brynn Mill based on measurements taken in 2014/2015.

2.3.5 The Hurst

Some remains of the hurst, the timber structure that supported the millstones, survives on the upstream side of the pitwheel and the upstream millstones are still in their working position, albeit precariously. The front bridge post (vertical) is 21 by 11.5cm and the rear bridge post 21.5 by 11.5cm, its back standing 30cm off the pit wall. This rear post has double mortises which have been blocked with timber, indicating an earlier bridge tree position above that of the present bridge tree. Both bridge posts sit on a granite block which is 25cm wide by at least 23cm deep. A horizontal bridge tree 18.5cm wide by 18cm deep, spans 0.83m between the bridge posts. There is a single tenon, 6.5cm wide by14cm deep, which passes through a long mortise in the front post and projects 11.5cm beyond the face of the post, with the tentering mechanism attached to its outer end. This is a vertical iron rod about 3cm diameter, with about 15cm of thread cut on its upper end. It was adjusted by a captive spanner, which sits on a square shoulder some 32.5cm down from the top of the rod.

2.3.6 Upstream millstones

In 2014 the upstream millstones were precariously balanced on the remains of the hurst, but were in about their original working position. Only a short section of the softwood front beam (bressummer) survived, to which the vertical front bridge post was notched and bolted. This post was of oak, sparingly converted from a small tree, 0.21m wide by 0.12m thick. The bridge tree, which spans horizontally between the front and rear bridge posts, carried the foot bearing of the millstone spindle. It was 0.15m wide by 0.17m deep, with a central tenon at its outer end which projected through a long mortise in the front bridge post, and to which the tentering adjuster was fixed. This is a vertical iron screw with a captive spanner. Alteration of the tentering screw adjusts the elevation of the millstone spindle, and thus the gap between the millstones whilst working, to control the texture of what is being milled.

The bedstone is a French burr stone with a decayed plaster back and a circular eye with a timber chuck wedged in to form the neck bearing for the millstone spindle. The milling face of this stone is worn down to the backing hoop, the bottoms of the furrows being below the edge of the hoop, so the stone has been well used. The backing hoop is a 14.5cm deep band, its ends riveted together to extend its working life. The runner stone is of granite, dome-backed, with a circular eye, worn to about 4.5cm thick at periphery. Both stones are about 1.2m in diameter, although difficult to measure precisely due to debris and their precarious position.

2.3.7 Downstream layshaft

On the downstream side of the pitwheel is the remains of a broken and decayed timber layshaft, its upstream end partly obscured by the millstones. This shaft was about 1.37m long, apparently tapering towards its downstream end. In 1988 it was described it as 'crudely circular' in section. At its upstream end the shaft carries a cast-iron spur pinion which meshed with the pitwheel. This is a single casting 0.64m overall diameter, with a circular centre and 4 radial arms which carry a 10cm gear face with 19 teeth of 10cm (4in) pitch. It is mounted 20cm from the upstream end of shaft and was bolted through the timber arms of the millstone drive gear. Details of upstream end bearing and disengaging mechanism (which were noted by Alan Stoyel in 1988) could not be seen, the timbers having rotted away. The shaft formerly carried a compass-arm gear [two arms crossing at right angles to each other, halved into each other within the thickness of the shaft and wedged in place], which has also rotted away. It is possible that some fragments of this gear may be found during further clearance of this area. In 1988 it was described as 'a wooden, compass-armed, contrate [i.e. unbevelled] wheel of approximately 54” diameter x 5” wide, with a 6” face. There are 4 arms. Cogs have 3½” pitch and 3” face.' The exact number of cogs was not recorded, but from the dimensions given would be of the order of 44. This gear had two circumferential iron bands binding it, one 5cm (upstream/west) and the other 7cm wide, similar to that on pitwheel. The gudgeon on the

downstream end of the layshaft is two winged, with a rounded end to the journal pintle, the shaft being bound with two gudgeon rings.

The stone spindle and stone nut remain in place on the collapsed millstones. The stone nut has a solid timber centre (stock or hub) about 29cm in diameter, with circular iron plates top and bottom, and carried 12 cogs, all of which have rotted away. The timber centre is held together with bolts near the circumference between each cog, and each cog shank is retained by an iron pin with a loop on its upper end, to aid removal as and when a cog needed replacing. The timber centre is wedged onto a 6.5cm square iron spindle. Mounted on the spindle some 34cm above stone nut is the decayed remains of a wooden belt wheel with an 18.5cm square bottom plate and a 25cm diameter top plate, which was about 12cm wide. This wheel is held on the spindle with metal wedges. In 1988 this wheel was noted as being 12in diameter with a 4in wide face and a bottom flange. It drove (by belt) a light secondary vertical spindle (now displaced, see photographs), from which a reciprocating sieve ('jigger') was driven. The millstone spindle becomes octagonal towards the top, just below where it enters the neck box or chuck in the centre of the lower millstone.

2.3.8 Downstream millstones

These are lying at an angle over the upstream end of the downstream layshaft, the bridge posts and hurst timbers which supported them having completely rotted away. Both stones are of granite with domed backs; the bedstone is about 1.17m diameter and 18.5cm thick, with a flat back. The runner (top) stone is the same diameter with a 23cm circular eye; it is worn to 6cm thick at the periphery and is 18.5cm thick at eye. It has four holes bored into its back. These are set about 10cm in from periphery and just over 2.5cm diameter. Three are evenly spaced, on quarters, the fourth being slightly offset. These may have been for pegs used to locate a second stone, or disc of stone, to add weight to the worn runner stone, to increase its working life. The runner is mounted on a bridge rynd, which located in a circular iron mace. There is a square projection on the top of the rynd, on which the foot of the damsel was located.

Although the bridge posts have rotted away, the position of the inner or front post can be determined from a recess or mortise in a granite block to the south of the cog pit. The exact position of the rear post does not appear to have left any evidence. Part of the bridge tree survives and has been set aside. It is about 18cm wide and has a cast-iron bridging box bolted to it. The bearing block is still in the box, held by the remains of 4 set screws.

The tentering screw mechanism is now also displaced, the timber structure having rotted away. It appears to have been similar to that on the upstream stones (see above), but with a long horizontal 'stirrup' end to support the bridge tree, rather than an inverted U-shaped one as on the upstream side.

The millstone spindle, which together with the driving irons appears to be seized in place in the bedstone, is 0.065m square iron. Two metal discs that formed the top and bottom plates of the wooden stone nut are all that remain of this gear.

2.3.9 Other millstones

There is a complete granite stone leaning against the internal south mill wall. It is 1.07m diameter with a 23.5cm diameter eye and has a domed back, being 7.5cm thick at the periphery and 18cm thick at eye. On the grinding face are two generations of rynd chases, for a four-armed stiff rynd and a pair for a bridge rynd with a 43cm span. The grinding face has conventional harp and furrow dressing. In 2014 this runner was leaning against the south-east wall of the mill, just inside the doorway on the south-west side. Its milling face was against the wall, but it was dressed for clockwise

rotation and has chases cut in around the eye for a four-armed or stiff rynd, which suggests it is from an earlier configuration of machinery.

Set in the threshold of the west door into the mill is about three-quarters of a granite millstone, which has been squared off to fit the door width. It was 1.18m diameter, with a 29cm diameter eye. It is set with its working face upwards (presumably dome-backed) and has opposing chases for bridge rynd and harp and furrow dressing.

Outside the front door of the cottage is a fragment of a granite millstone with harp and furrow dressing. In the ground floor of the cottage, close to the foot of the former stairway, is section of granite millstone with 4 furrow/harp dressing and in front of fireplace at the south end of the cottage a 1.16m diameter granite bedstone, largely complete, with a 22cm diameter eye.

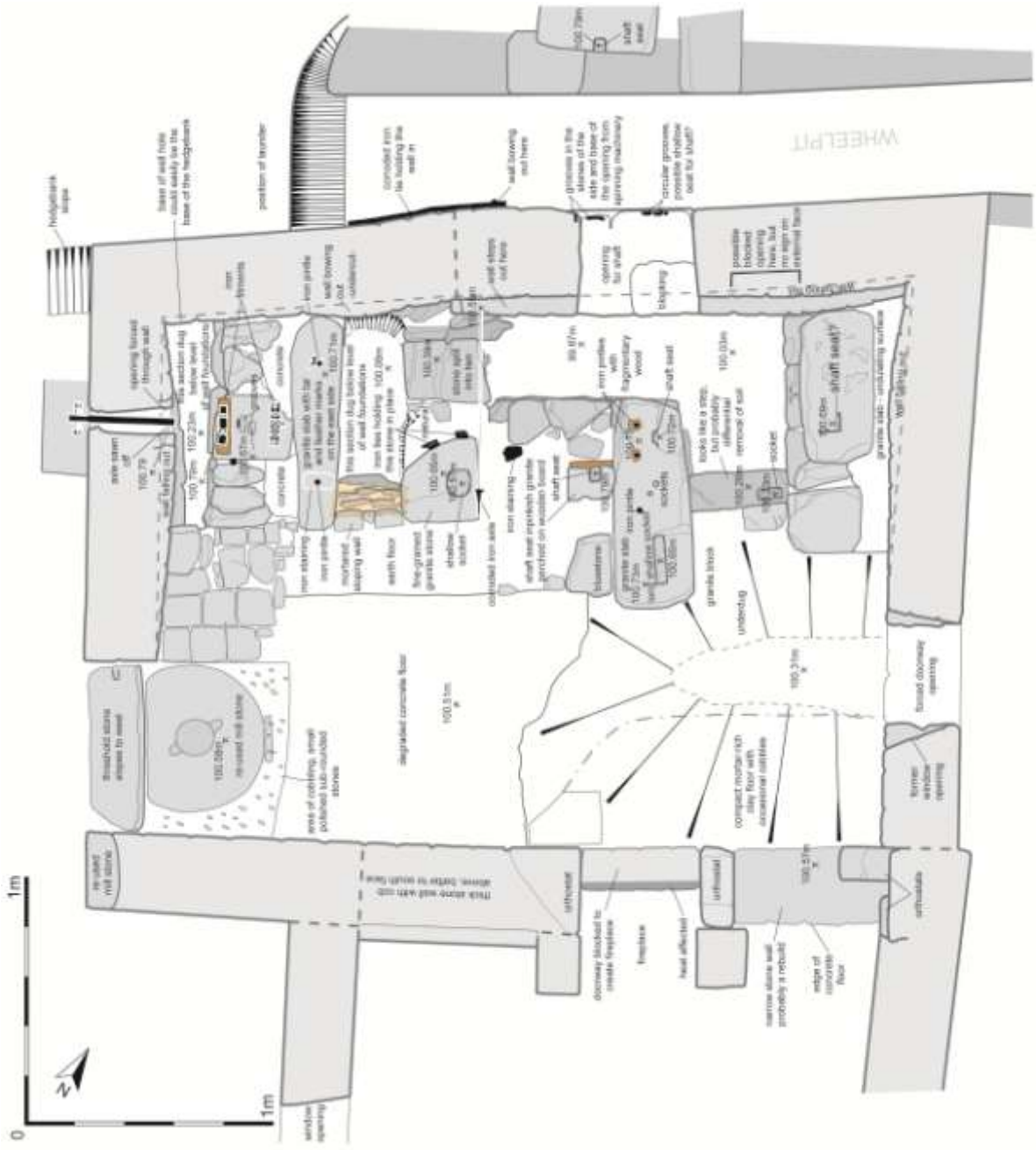

Figure 5: Plan of the mill.

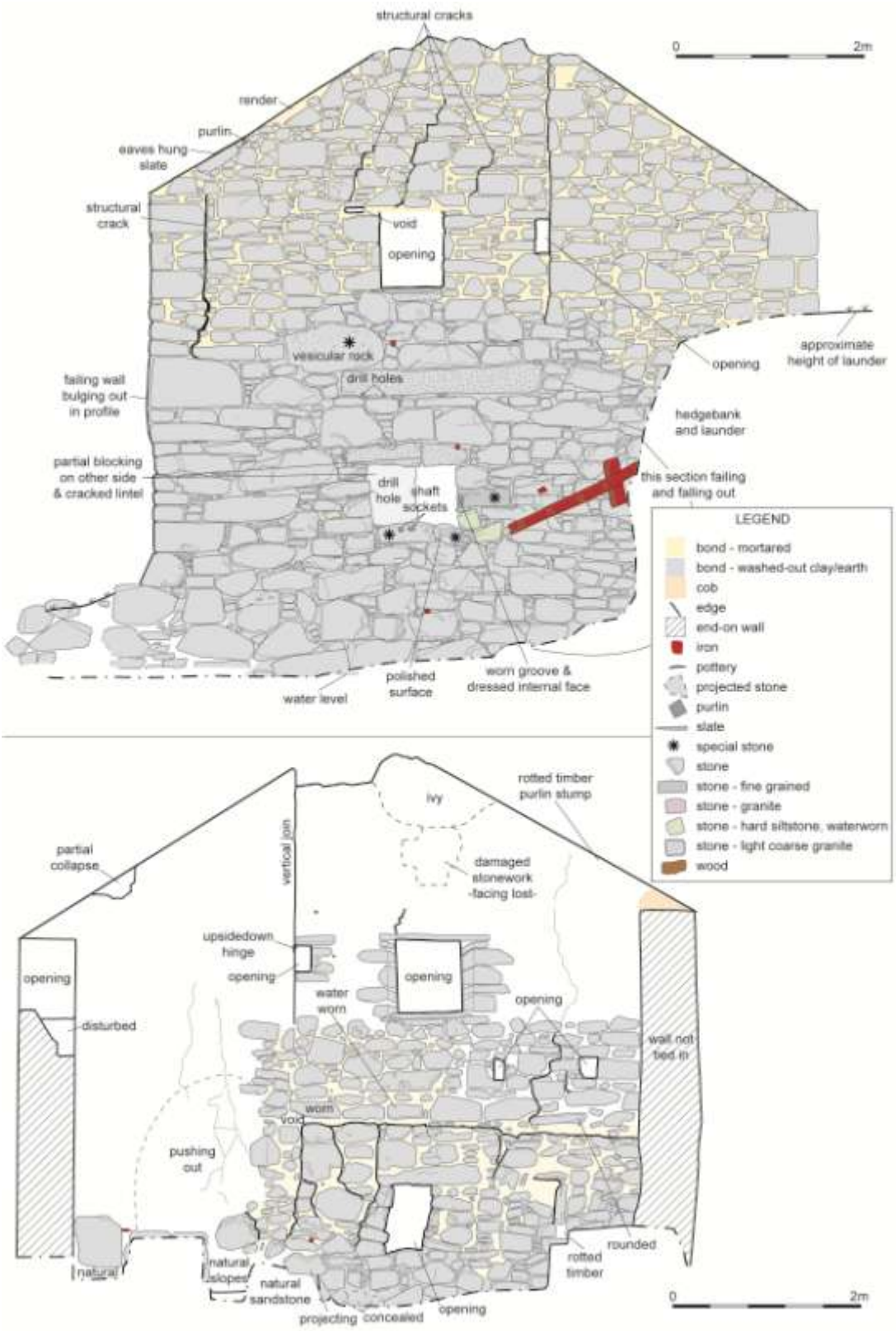

Figure 6: The internal and external elevations of the north gable wall.

2.3.10 Other milling equipment and artefacts

In the mill is a displaced cast-iron belt wheel in with 6 curved arms, 51cm diameter with a 9cm wide face, bored for a 3cm circular shaft. There is also a short square iron shaft with the remains of two wheels on it, which appears to have fallen through from an upper level. Its exact function is unknown.

A number of other items have been recovered from the mill and from debris clearance and have been carefully set aside. These include miscellaneous pieces of ironwork, including bolts and fixings, two forged damsels (for feeding grain into the millstones - one from each pair), part of a sack posser, an iron bridge and short pieces of light shafting with remains of pulleys. There are also remains of some timber components (including parts of gear wheels) and the bridge tree, complete with bridging box and bearing, for the downstream pair of millstones (see photographs).

In 2014 no remains of the millstone furniture noted by Alan Stoyel in 1988 were observed.

2.4 Excavation of Geotechnical Pits

Three geotechnical pits (GTP), each 0.60m wide and totalling 6m in length, were monitored during a site visit in 2015. GTP#1 (1.40m long) and GTP#2 (1.80m long) were located west of the cottage and GTP#3 was located to the east of the cottage.

Below the topsoil to the west of the cottage the GTPs revealed a coarse stony yard surface c.0.2m thick (contexts (101) and (201)). In GPT#2 this overlay a thick (c.056m) deposit of redeposited natural clayey-shillet. Beneath this, and also in GTP#1, a thick wet deposit (at least 0.8m) of mid-grey sticky silty-clay was revealed (contexts (102) and (203)). The physical properties and smell of this material would suggest deposition in the base of a pond or perhaps a stagnant watercourse. That feature would be located between the cottage and the outbuilding, as only the leading edge was clipped in GTP#1. It is worth noting that the historic OS maps show a small pond located to the south of the Mill and its curtilage, and it is possible an earlier pool with a leat(s) lay in this direction. The sides of GTP#2 collapsed almost immediately and it proved very difficult to record.

Below the topsoil and subsoil in GTP#3 was a very thick (2.5m+) deposit of head, derived from material washed down from the sides of the valley. This GTP quickly filled with water.

No artefacts were observed during these works, but sherds of 19th and 20th century industrial wares were commonly observed in areas with exposed topsoil.

3.0 Dating and Discussion

3.1 Dating

From its location and the somewhat elaborate arrangement of its water supply, it is considered that Brynn Mill is a post-medieval foundation, rather than having a medieval or manorial origin. There were several other watermills in the vicinity, so the mill at Brynn is likely to have been established for local trade, serving the immediate agricultural community and perhaps the tin workers at the nearby streamworks and mine.

The recording work that has taken place following the clearence of the interior of the Mill and Cottage has revealed the Mill to be far more complex than originally envisaged. The stone-for-stone recording of the north (wheelpit) gable would suggest up to eight phases of build. These are discussed in more detail below, but to summarise: the mill was originally a small building, almost square on plan, with a ground-floor area occupying about 18m². Due to the lack of any obvious dating evidence, this phase should probably be dated to the 18th century, but may be earlier. The earliest recoverable mechanical layout appears to have been an overshot wheel driving a single pair of millstones, either by direct drive from the pitwheel or more probably by treble gearing. This layout is well-documented and examples have been found in Cornwall and Devon which date from the post-medieval period (Watts 2002, 120-1; 135; Unwin calls this 'double gear', 1987, 47). It had an advantage over direct drive as it increased the relatively slow rotation of the waterwheel through two sets of gears, to drive the upper millstone at a higher speed and thus increase throughput. The small granite millstone leaning against the wall inside the mill may be a relic of this phase.

At some time in mid/late 19th century the mill building was extended to the west (Phase 6) and an additional layshaft and gearing installed. From present evidence, this would appear to be most likely when the present waterwheel was installed by Oatey & Co. during the second half of the 19th century. The iron gearing is likely to be contemporary with this. The hurst bressummer would also have been replaced at this time, a longer timber being required to span the full length of the building. The sack hoist below the hurst floor and the secondary drives noted in 1988 are also considered to date from this phase. This structure would have featured a timber gable above the wheelpit, which was subsequently infilled in stone (Phase 7).

The original mill building predated the construction of the cottage which, considering the lack of clear dating evidence, probably occurred in the earlier 19th century. The door in the southern wall of the mill was blocked and converted into a fireplace, and this was presumably the date at which the door was forced through the east wall of the mill.

With regard to the dating of the waterwheel and other iron machinery more precisely, William Oatey established an iron foundry at Wadebridge in *c*.1833. The earliest known waterwheels cast by him which have been found in Cornwall are signed W. OATEY WADEBRIDGE and dated to 1839 and 1840. This inscription and a similar one without the initial W is also found on waterwheels dated up to 1849. In Slater's *Directory of Cornwall* of 1852-3 W. Oatey & Sons are listed, although this name does not appear to have been used as an inscription on any of the waterwheels thusfar identified. The inscription OATEY & C^{o} has been recorded on several waterwheels, but these are undated. The name of the company was changed to Oatey & Martyn in October 1872 (Bodman 2009, 7) and William Oatey died in 1874. The foundry continued trading as Oatey & Martyn until 1958 and the premises were subsequently demolished. This evidence suggests that the Oatey & Co period may be bracketed between *c*.1850 and 1872 and that the waterwheel at Brynn Mill is therefore most likely to have been installed during the third quarter of the 19th century.

The millstones that remain in the mill are all of granite, apart from the upstream bedstone, which is French burr. Those that were *in situ* in the final working phase are well used, the bedstone of the upstream pair having been hooped and backed with plaster to prolong its working life. Although there were several belt wheels or pulleys for taking power off to drive ancillary machinery, none but the sack hoist remained in the mill in 1988. A further feature noted then was the half loft floor on the upstream (west) side of the mill, where sacks of grain could be stored. This suggests a reasonably active trade in meal and flour and, perhaps latterly, animal feed. The mill appears to have continued in use until at least the start of World War I, Hart Hicks being recorded as water miller there in the county trade directory of 1914.

3.2 Phasing

The stone-for-stone recording of the exterior (complete) and interior (partial) of the northern gable (wheelpit) wall of the mill, and observations within the mill more generally, indicate the evolution of this structure was very complex. It is clear that during Phase 6 the upper part of the wheelpit wall was timber framed (see also Figure 11), and it is probable that a substantial proportion of the building was built of timber during earlier phases.

The stonework of Phase 1 is characterised by large irregular stone blocks with much smaller interstitial stones set into the wide gaps between them. This build appears to extend beyond the footprint of the current mill, and may represent the wall of an original tailrace. Alternatively, it may relate to the south wall of the mill.

Phase 2 consists of a clear low platform of roughly-coursed roughly-rectangular stone blocks 2.74m long and 0.8m high. This may have been the platform upon which the original wheel assembly would have rotated.

Phase 3 consists of a short section of very large sub-rectangular blocky stones that 'step up' to the later opening. Smaller stones have been fitted into the interstitial spaces. This phase may be coterminuous with Phase 4, but has been distinguished here as the character of the stonework is very different to that of Phase 4.

Phase 4 brings the Mill up to first-floor height, in roughly-coursed small, sometimes sub-rounded, rectangular stones. The stones used are generally much smaller, and more tightly-fitting, than that of preceeding phases, indicating a different source and/or more care. On the interior, this phase brings the wall up to a pronounced ledge, with a blocked and partly-effaced opening close to the east wall of the mill.

In Phase 5 a large new opening was punched through the Phase 3-4 wall and the reveals rebuilt. The stones of this phase are similar to those of Phases 3-4 and are presumably re-used. The small granite lintel has cracked and is failing. Three of the stones on the exterior feature polished surfaces or grooves, and at least two of these appear to have been reset from the earlier Mill.

The walls of Phases 1-5 are all bonded with clay with occasional mortar pointing. A significant proportion of the clay bonding has washed out, particularly towards the base of the exterior wall. The use of large stone blocks with much smaller interstitial stones is an 18th century technique, but could well be earlier. In terms of height and build, this early mill is quite similar to the ruinous outbuilding to the south-west (Figure 7). Phases 6-9 relate to the expansion of the mill and the Oatey & Co. period (i.e. third quarter of the 19th century).

Phase 6 saw the construction of the front (west) wall and a raise to the upper part of the east wall. Part of the north and south gable remained in timber. The Phase 5 opening was partly-closed and the wheel shaft moved up until it was almost touching the western wall of the original opening. A very large pale granite slab was placed over the opening, and is similar in character and size to a pale granite slab utilised below the upstream layshaft and iron spur gears. This may be a lintel, intended to help stabilise the failing lintel over the opening below, or possibly the threshold of a doorway above the wheelpit.

Phase 7 saw the timber opening closed in stone, and Phase 8 represents the blocking of a possible window.

Phases 6-8 are bonded or extensively pointed with a hard brittle cream mortar.

Figure 7: The outbuildings south-west of the Mill, as photographed in 1988, viewed from the north-east. In its clear mix of styles and materials, this structure is probably very similar to the earlier phases of the Mill (photo: courtesy of M. Watts).

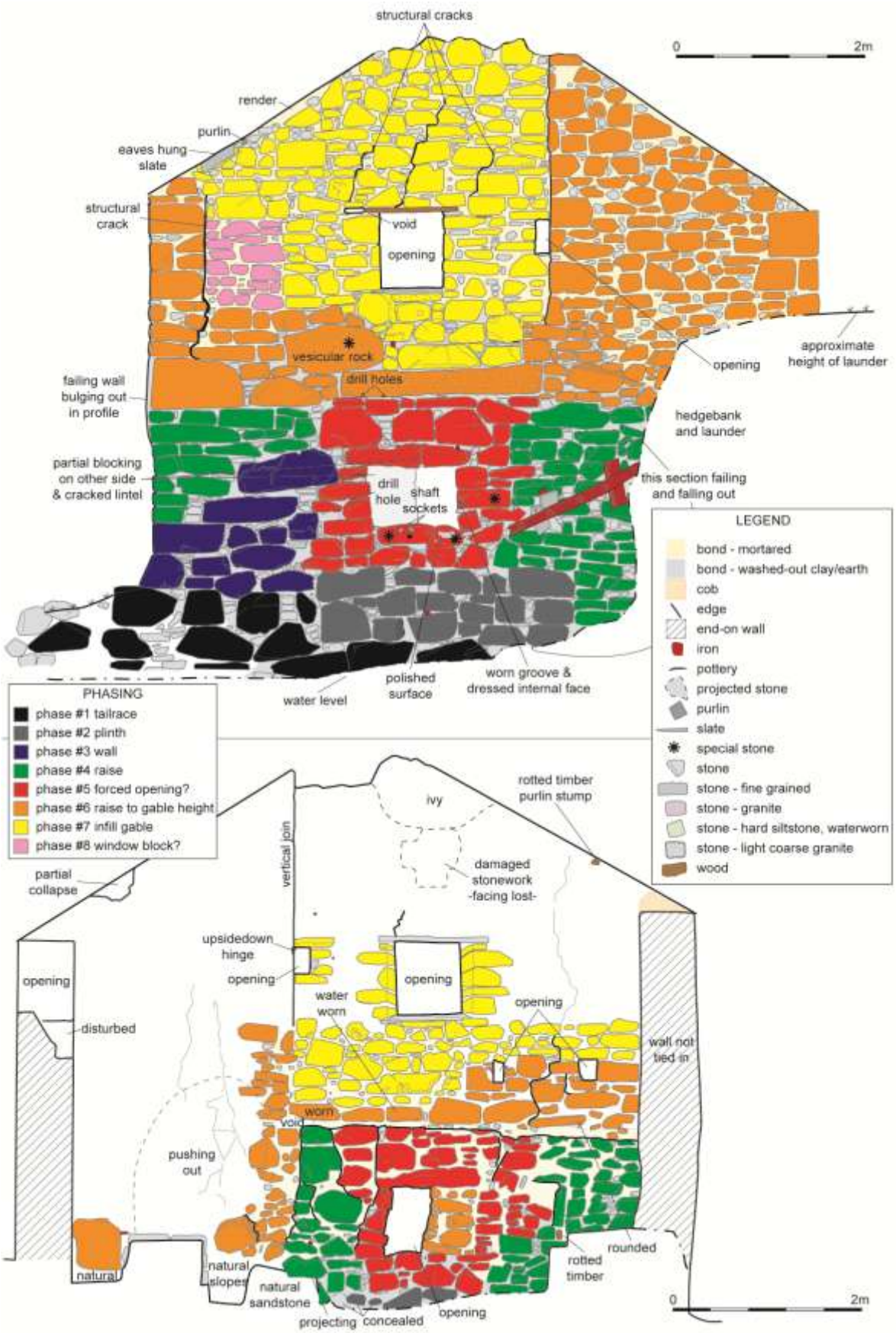

Figure 8: Detailed recording of the exterior (top) and interior (bottom) elevations of the north wall of the Mill building, showing the phasing. Original scale 1:20.

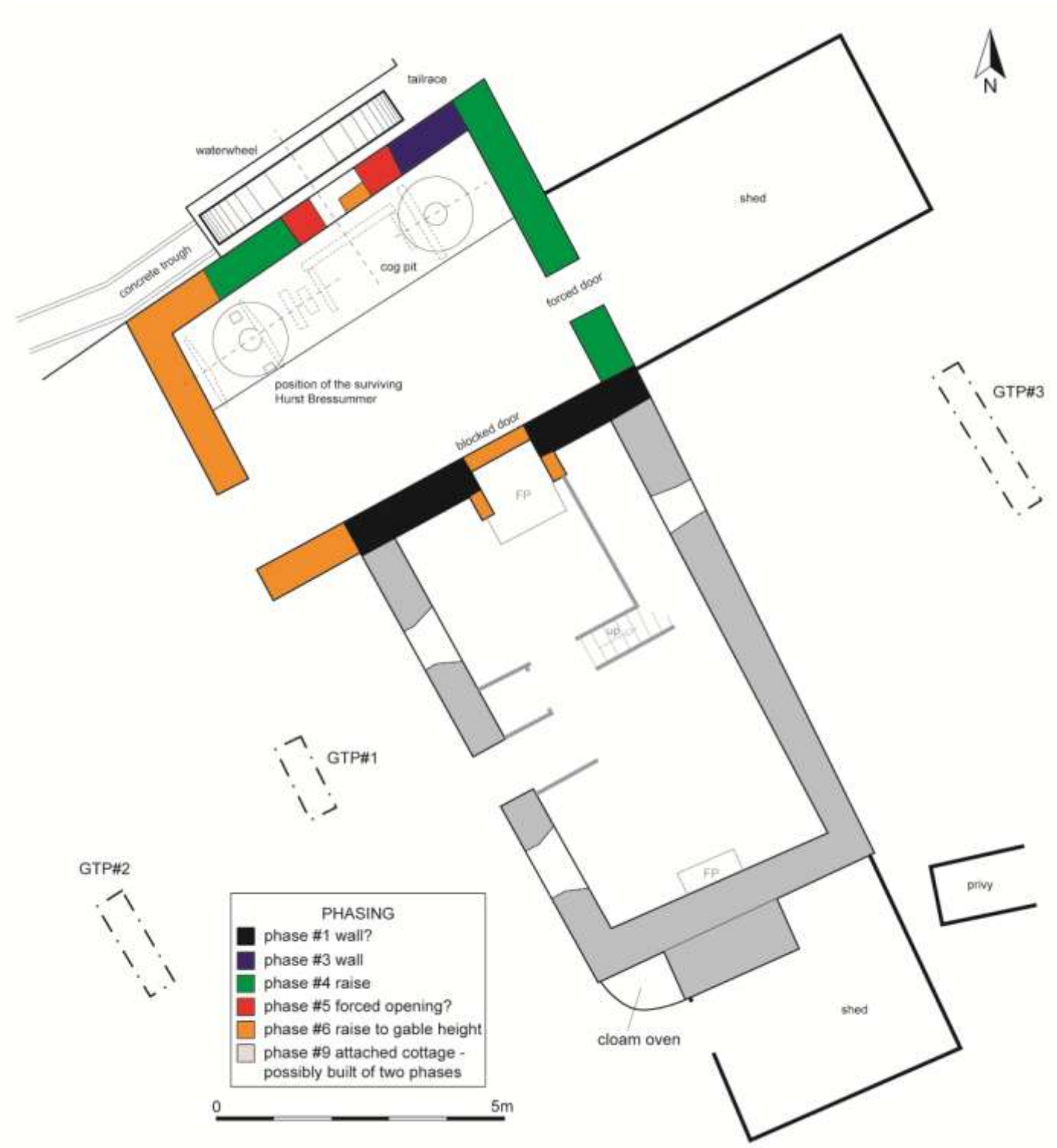

Figure 9: Phased ground-floor plan showing a reconstruction of the mill machinery. Schematic plan based on existing architect's drawings.

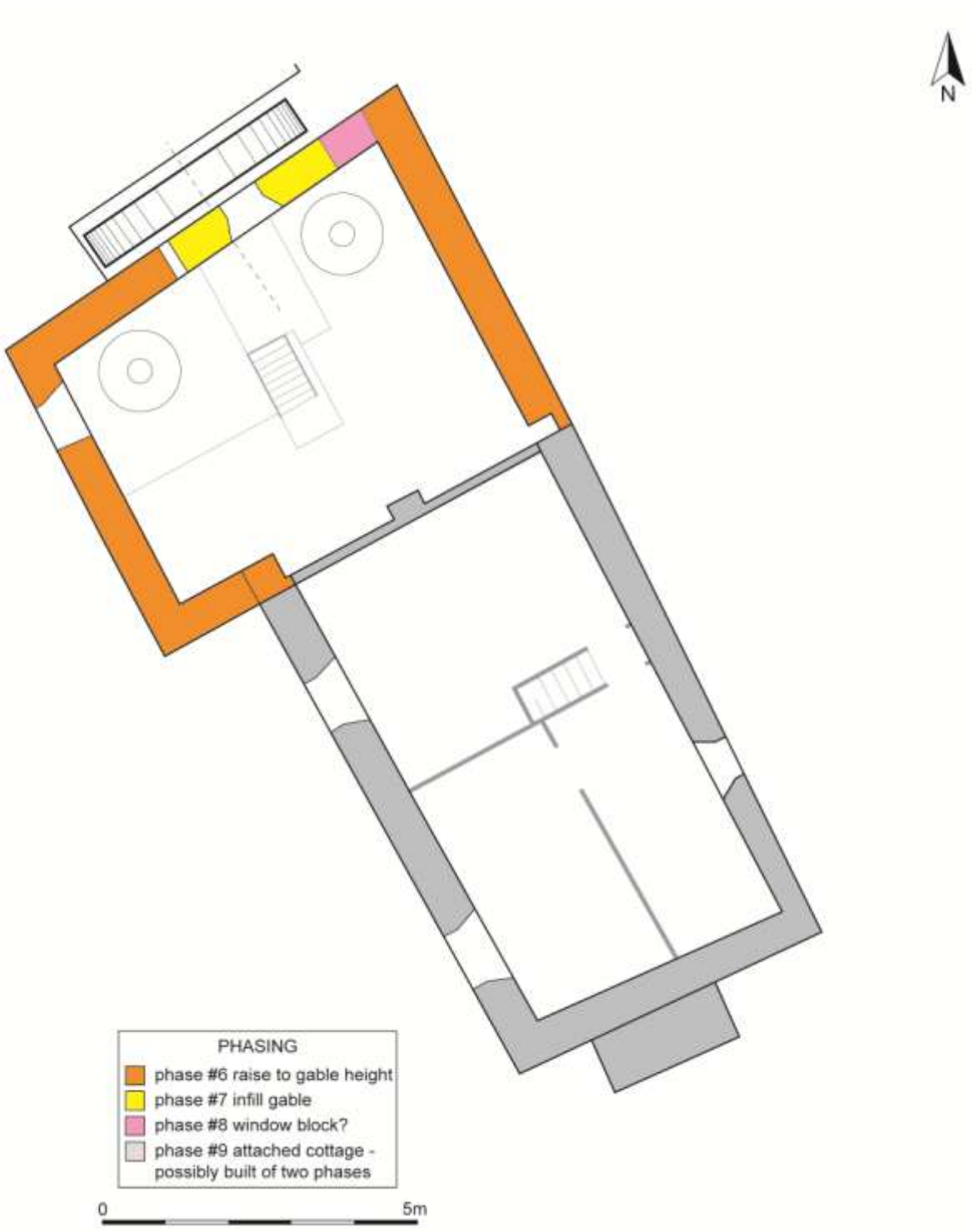

Figure 10: Phased first-floor plan, schematic plan based on existing architect's drawings.

4.0 Conclusion

The recording work that has taken place at the mill indicates it is a complex if ramshackle structure. The north (wheelpit) gable wall contains evidence for up to eight phases of build, presumably reflecting the progressive replacement of a timber mill with a stone one. In terms of date, the later phases can be dated by the mill machinery to the later 19th century. The earlier phases could conceivably all date to the 18th century, but it seems probable given its complexity that the mill has earlier origins. While far from structurally sound, the building incorporates a number of interesting features, relating to both the machinery and the building. In particular, the (presumed) lowly status of this mill means it was only ever repaired or extended and never wholly rebuilt, and to find such clear evidence for phasing in such a structure appears relatively rare, although detailed recording of this kind is itself rare.

The value of Brynn Mill has, however, been much diminished by its treatment over the last 30 years. The loss of the roofs and upper floors of the mill and the adjoining cottage has resulted in the almost complete reduction of these buildings to ground-floor level. The walls of the mill stand to eaves level and it would appear feasible to repair, rebuild and re-roof the mill and cottage to their earlier appearance, and it should be possible to reinstate the waterwheel. However, the structural reports on the property (MBA 2015) have indicated that the east and north walls of the Mill have to be dismantled to effect stable repairs. The east wall, already in a parlous state, collapsed when the corrugated iron shed adjacent was removed, and over the course of subsquent weeks other structural cracks appeared or widened, necessitating careful but prompt attention. It is the intention of the architects to rebuild these walls, and reset the larger and more significant stones of the north gable to mimic its earlier appearence.

Figure 11: Detail from a painting by the Rev. John Swete entitled 'Mill at Torquay' dated Nov.1793. This image shows weatherboarding above the wheelpit (Gray & Rowe 1997, 172-3; DHC 564M/F4/58).

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Appendix 1: Written Scheme of Investigation

WRITTEN SCHEME OF INVESTIGATION FOR HISTORIC BUILDING RECORDING, BRYNN MILL, ROCHE, CORNWALL

Location: Brynn Mill, Roche, St. Austell, Cornwall, PL26 8NL
Parish: Roche
County: Cornwall
NGR: SW 98245 63322
Planning Application No: PA13/07736 and PA13/07737
Proposal: Restoration of Brynn Mill together with erection of a dwelling
Date: 28th March 2014

1.0 INTRODUCTION

1.1 This document forms a Written Scheme of Investigation (WSI) which has been produced by South West Archaeology Ltd (SWARCH) at the request of Peter Wonnacott (the Agent) on behalf of Kate Mabley (the Client). It sets out the methodology for historic building recording to be undertaken of the Listed Mill and adjacent house at Brynn Mill, Roche, and for related off-site analysis and reporting, prior to the restoration of the Mill and construction of a dwelling. The WSI and the schedule of work it proposes were drawn up in consultation with Dan Ratcliffe of Cornwall County Historic Environment Service (CCHES). This WSI covers only the building recording aspect of the work, any further monitoring and recording will be covered by a separate document.

1.2 Consent for the development has been granted conditional on a programme of archaeological work. The planning condition (No. 6) states that:

No development shall take place within the site until the applicant has secured and implemented a programme of archaeological work in accordance with a written scheme of investigation to be submitted by the applicant and approved in writing by the Local Planning Authority in consultation with the County Archaeologist.

Reason: In the interests of the historic environment in accordance with the provisions of the NPPF 2012, with particular reference to parts 7 and 12.

2.0 ARCHAEOLOGICAL & HISTORIC BACKGROUND

2.1 Brynn Mill was a corn mill that is 1st recorded on the 1st edition OS one inch map (1810-1813), then later on the c. 1840 tithe map and the c. 1880 1st and c.1907 2nd edition 1:2500 OS maps (below). In 1971 it was recorded as being complete with machinery.

The building was Grade II Listed in 1987 and is described as:

House with attached corn mill. Early C19 with few later alterations. House in granite rubble, with upper storey in cob, some brick; slurried slate roof with ridge coping tiles and gable ends, gable end stack to left removed, gable end to right rebuilt with external stack in brick. Rear slope of roof in corrugated asbestos. The mill is in granite rubble with slate roof, with ridge coping tiles and gable ends. Plan: the house is of 2-room plan, with central entrance kitchen to right heated by gable end stack and room to left also heated by gable end stack. The mill is attached to the left side, of 2 storeys and one-room plan, with loft at upper level. The leat runs towards the front of the mill, at right angles to it, and drives an overshot wheel, which remains in situ. House of 2 storeys, 2 window range, at first floor has two C19 2-light casements of 2 panes each light; at ground floor a blocked window to left and right, central 4- panelled door with pitched slate hood. The right side of the house has external brick stack and curved oven at the base to front. Single storey corrugated iron lean-to attached to right. The rear of the house has a single 9-pane light at ground floor to right and 9-pane sash under eaves to left. The mill is attached to the left side of the house, and has a higher roof level; it projects beyond the front of the house. Door with granite lintel to right and small window opening under eaves to left. The left side of the mill has the wheel pit, with cast iron wheel; the leat runs away from the mill to the rear. Rear of the mill has attached corrugated iron shed.

Interior: Not accessible at time of survey (July 1986) but is believed to contain the rest of the mill machinery.

The mill was powered by a waterwheel fed via a millrace from a small millpond to the west, a second larger millpond also exists further to the south. The mill races are still extant. The mill race from the large pond to the smaller pond crosses under the access lane immediately to the south of the smaller pond. This area is framed by several large mature oak trees. The mill race from the smaller pond fed an overshot waterwheel on the north side of the mill. The water then discharged back into a stream to the east of the site. Behind the mill building and cottage a historic orchard survives. Between the mill and small millpond, to the south of the mill race there was an L-shaped range of outbuildings and small detached outbuilding, there was also a small pond fed by a spring. It is not known to what extent the remains of these features survive, this part of the site is rather obscured by vegetation, caravans and block structures.

The mill and cottage are roofless and overgrown, the rear wall has suffered the most loss. The front mill stable door survives and inside there are collapsed timbers and 2 granite mill stones. The front 6-panel door to the cottage survives and to the right of this a modern top hung window. All other windows have been lost. Some of the collapsed cob is probably inside and to the rear of the cottage. There are some very large slates hanging off the eaves of mill which could be rags, or could be the eaves courses of a former scantle slate roof. The waterwheel survives with few timbers surviving and is broken.

The mill and cottage with its mill races, ponds, orchard, oak trees and outbuildings would have comprised a very picturesque rural setting.

3.0 AIMS

3.1 To make a record of the historic buildings prior to the commencement of the restoration and construction works;

3.2 To analyse and report on the results of the project as appropriate.

4.0 PROGRAMME OF ARCHAEOLOGICAL WORKS

4.1 Desk-based appraisal:

The programme of work shall include a desk-based *appraisal* of the site to place the development area into its historic and archaeological context. This will include examination of cartographic sources; *Ordnance Survey maps and the Tithe Map(s) and Apportionments and information held by the Cornwall and Scilly Historic Environment record (HER), the Cornwall Records Office at Truro and the Cornwall Centre at Redruth as appropriate.*

This information will be presented as part of the final report along with the results of the fieldwork.

4.2 Historic building recording:

A record shall be made of the historic fabric of the buildings affected by the development. This work shall conform to an appropriate level (Level 3/4) of recording as set in Understanding Historic Buildings: A guide to good recording practice - English Heritage 2006 (available on-line at the English Heritage website). Previously prepared architect's plans will be used as the basis of any historic building fabric recording, provided they are of adequate scale and accuracy.

4.3 A photographic record of the historic buildings recording work will be prepared. This will include photographs illustrating the principal architectural features and any finds discovered, in detail and in context. The photographic record will also include working shots to illustrate more generally the nature of the archaeological operation mounted. All photographs of archaeological detail will feature an appropriately-sized scale. The drawn and written record will be on an appropriately archivable medium.

4.4 Health and Safety requirements will be observed at all times by any archaeological staff working on site, particularly when working with machinery. As a minimum: high-visibility jackets, safety helmets and protective footwear will be worn.

4.4.1 Appropriate PPE will be employed at all times.

4.4.2 The site archaeologist will undertake any site safety induction course provided by the Client.

5.0 REPORTING

5.1 A report will be produced, including the following elements:

5.1.1 A report number, date and the OASIS record number;

5.1.2 A copy of this WSI;

5.1.3 A summary of the project's background;

5.1.4 A description and illustration of the buildings location;

5.1.5 A methodology of the works undertaken;

5.1.6 Plans and reports of all documentary and other research undertaken;

5.1.7 A summary of the project's results;

5.1.8 An interpretation of the results in the appropriate context;

5.1.9 A summary of the contents of the project archive and its location (including summary catalogues of finds and samples);

5.1.10 A site location plan at an appropriate scale on an Ordnance Survey, or equivalent, base-map;

5.1.11 A plan showing the layout of the building subject to this programme of work in relation to identifiable landscape features and other buildings;

5.1.12 The results of the historic building recording that shall include a written description and analysis of the historic fabric of the building and associated mill machinery, appropriately;

5.1.13 Photographs showing the general site layout and exposed significant features of historic or architectural significance that are referred to in the text. All photographs will contain appropriate scales, the size of which will be noted in the illustration's caption;

5.1.14 A consideration of evidence within its wider context;

5.1.15 Any specialist assessment or analysis reports that where undertaken;

5.2 CCHES will receive the report within three months of completion of fieldwork, dependant on the provision of specialist reports, radiocarbon dating results etc, the production of which may exceed this period. If a substantial delay is anticipated then an interim report will be produced and a revised submission date for the final report agreed with the HES.

5.3 On completion of the final report, in addition to copies required by the Client, hard copies of the report shall be supplied to the HES on the understanding that one of these copies will be deposited for public reference in the HER. In addition to the hard copies of the report, one copy shall be provided to the County Historic Environment Service in digital format - in a format to be agreed in advance with the HES - on the understanding that it may in future be made available to researchers via a web-based version of the Historic Environment Record.

5.4 A copy of the report detailing the results of these investigations will be submitted to the OASIS (*Online AccesS to the Index of archaeological investigations*) database under reference southwes1-176019 within 6 months of completion of fieldwork.

6.0 PUBLICATION

Where the exposure of architectural or historic building fabric is limited or of little significance reporting will follow on directly from the field work - see section 5 above. Should particularly significant architectural, archaeological or palaeoenvironmental remains, finds and/or deposits be encountered, then these, because of their importance, are likely to merit wider publication in line with government planning guidance (paragraph 141 of the *National Planning Policy Framework* (2012). If such remains are encountered, the publication requirements – including any further analysis that may be necessary – will be confirmed with the HES.

7.0 MONITORING

7.1.1 SWARCH shall agree monitoring arrangements with the HES and give two weeks notice, unless a shorter period is agreed, of commencement of the fieldwork. Details will be agreed of any monitoring points where decisions on options within the programme are to be made.

7.1.2 Monitoring will continue until the deposition of the site archive and finds, and the satisfactory completion of an OASIS report - see 8.0 below.

7.1.3 SWARCH will notify the HES upon completion of the fieldwork stage of these works.

8.0 ARCHIVE

8.1 On completion of the project an ordered and integrated site archive will be prepared in accordance with section 9 of the Brief prepared by the Cornwall County Historic Environment Service and Management of Research Projects in the Historic Environment (MoRPHE) (http://www.english-heritage.org.uk/publications/morphe-project-managers-guide/). The digital element of the archive will be transferred to the Archaeology Data Service (ADS) for long-term curation.

8.2 The archive will consist of two elements, the digital archive and the material archive.

8.2.1 The digital archive, including digital copies of all relevant written and drawn records and photographs, will be deposited with the Archaeology Data Service (ADS) and in compliance with their standards and requirements.

8.2.2 The material archive, comprising the retained artefacts/samples and the hardcopy paper record (if requested) will be cleaned (or otherwise treated), ordered, recorded, packed and boxed in accordance with the deposition standards of the Royal Cornwall Museum (RCM)/Cornwall records Office, and in a timely fashion.

8.2.3 If the RCM wishes to retain the hardcopy paper archive, it will be deposited with the rest of the material archive under an accession number. Should the RCM decline the hardcopy paper archive, that archive will be offered to other appropriate museum bodies or the Devon Heritage Centre. If a suitable third party cannot be found, the hardcopy paper archive will be retained by SWARCH for 3 years and then destroyed.

8.3 SWARCH will, on behalf of the RCM, obtain a written agreement from the landowner to transfer title to all items in the material archive to the receiving museum.

8.4 If ownership of all or any of the finds is to remain with the landowner, provision and agreement must be made for the time-limited retention of the material and its full analysis and recording, by appropriate specialists.

8.5 SWARCH will notify the HES upon the completion of:
i) deposition of the digital archive with the ADS, and
ii) deposition of the material (finds) archive with the museum.

8.6 The condition placed upon this development will not be regarded as discharged until the report has been produced and submitted to the HES and the LPA, the site archive deposited and the OASIS form completed.

8.7 The archive will be completed within 6 months of the completion of the final report.

9.0 CONFLICT WITH OTHER CONDITIONS AND STATUTORY PROTECTED SPECIES

9.1 Even where groundworks are being undertaken under the direct control and supervision of SWARCH personnel, it remains the responsibility of the Client - in consultation with SWARCH, the applicant or agent - to ensure that the required archaeological works do not conflict with any other conditions that have been imposed upon the consent granted and should also consider any biodiversity issues as covered by the NERC Act 2006. In particular, such conflicts may arise where archaeological investigations/excavations have the potential to have an impact upon protected species and/or natural habitats e.g. SSSIs, National Nature Reserves, Special Protection Areas, Special Areas of Conservation, Ramsar sites, County Wildlife Sites etc.

10.0 PERSONNEL & MONITORING

10.1 The project will be managed by Colin Humphreys; the archaeological monitoring and building recording will be undertaken by SWARCH personnel with appropriate expertise and experience. Where necessary, appropriate specialist advice will be sought (see list of consultant specialists in Appendix 1 below).

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List of specialists

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Conservation

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Richard and Helena Jaeschke 2 Bydown Cottages, Swimbridge, Barnstaple EX32 0QD mrshjaeschke@email.msn,com
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Palaeoenvironmental/Organic

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Plant macro-fossils Julie Jones juliedjones@blueyonder.co.uk
Pollen analysis Ralph Fyfe Room 211, 8 Kirkby Place, Drake Circus, Plymouth, Devon, PL4 8AA

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Prehistoric Henrietta Quinnell 39D Polsloe Road, Exeter EX1 2DN Tel: 01392 433214
Roman Alex Croom, Keeper of Archaeology Tyne & Wear Archives & Museums, Arbeia Roman Fort and Museum, Baring Street, South Shields, Tyne and Wear NE332BB Tel: (0191) 454 4093 alex.croom@twmuseums.org.uk
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Appendix 2: Survey notes of Brynn Mill made by Alan Stoyel, April 1988

Waterwheel: Exterior overshot wheel. The buckets and sole-boards are all missing, as is the trough which fed the wheel. One shroud has a break in it. Overall size of waterwheel 12'0" × 2'5"; width between shrouds 2'4". Two sets of 6 wooden arms, 5⅛" wide × 2¾" radiating from circular cast-iron naves, *c*.30" diameter × 6½" wide. Overall width at naves 2'5½". Each cast-iron shroud is in 6 segments, joined by rectangular cast-iron plates, each of which is carrying a "6" inscription and is fixed with 4 bolts – round-headed on the outside, and with square nuts on the inside. Shroud is 8" wide, including sole-boards, and is inscribed "OATEY & Co. WADEBRIDGE". 42 wooden buckets, the bucket [outer board] of 1" timber; the riser was held by only one flange, so its timber thickness cannot be measured. Captive sole of 1" timber. Wooden wheelshaft has a cross-tailed gudgeon with a pintle of 2¾" diameter × 3" long, resting in an open brass bearing set in a stone block of 34" × 22" × 8+". The two gudgeon rings on the outer end of the wheelshaft are 14" diameter.

Pitwheel: Wooden compass-armed, contrate wheel,[1] approximately 6'0" diameter. The oak wheelshaft is octagonal, approximately 11½" across the flats. Mounted on the shaft is a cast-iron nave, 28" diameter × 8½" wide, carrying 6 radial wooden arms. The wheel has a width of 5½" and a face of c.7¼". Approximately 54 wooden cogs of 4" pitch, 3" face and 2¼" projection.

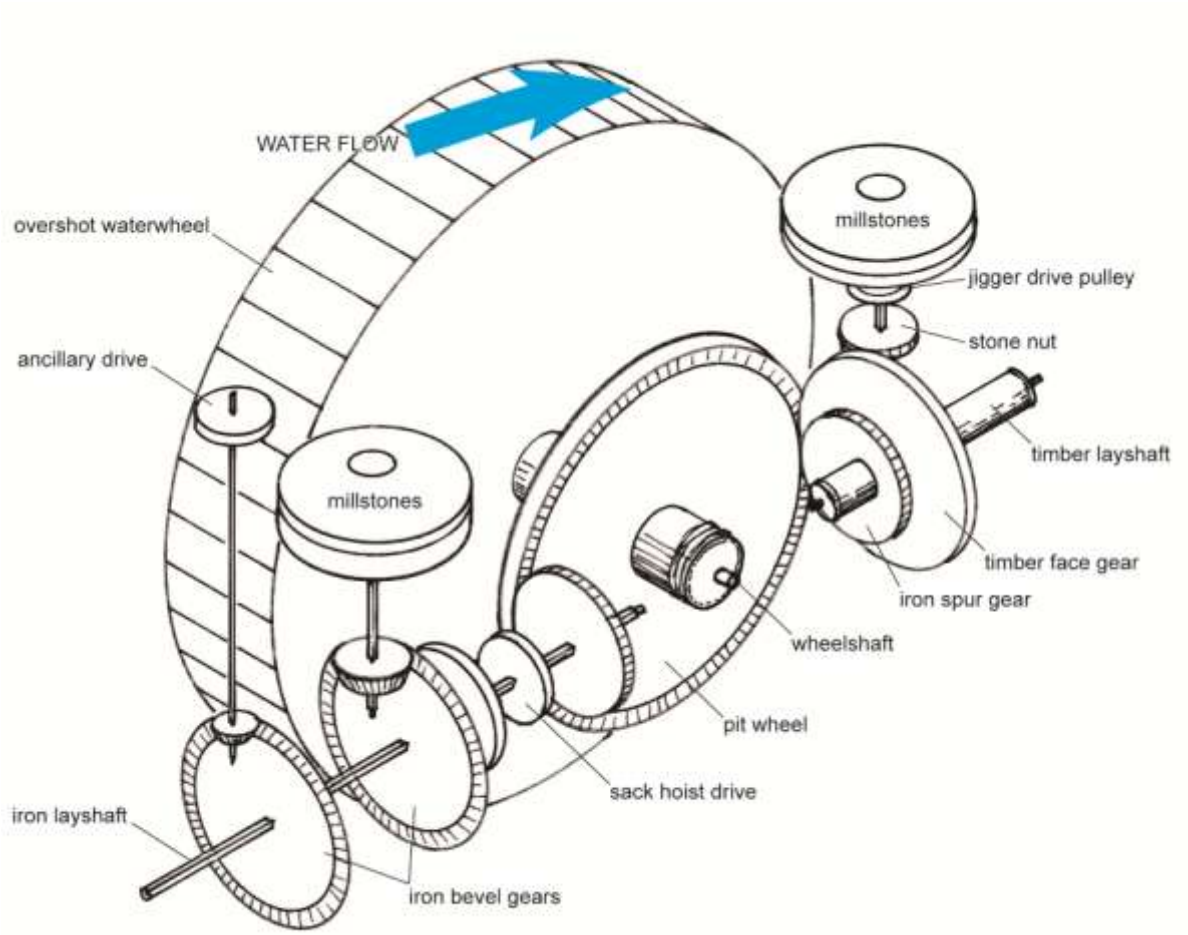
Downstream layshaft: Crudely circular, *c*.9" diameter, wooden. Driven from pitwheel by a cast-iron spur pinion, *c*.24" diameter × 4" wide, cast as unit with 4 arms. Mounted on shaft is a wooden, compass-armed, contrate wheel of approximately 54" diameter × 5" wide, with a 6" face. There are 4 arms. Cogs have 3½" pitch and 3" face. This wheel engages a wooden, spur-geared stone nut with iron plates, top and bottom; mounted on a 2½" square spindle. There are 12 cogs of 2" projection and 3¼" face. Each cog is held by a pin with a loop, for easy disengagement. The whole layshaft can be disengaged by sliding the upstream end so the pinion is not meshing with the pitwheel. Above the stone nut is a wooden beltwheel of 12" diameter × 4" wide plus a wooden flange at bottom. A vertical iron rod, c.⅞" square is on waterwheel side of, and slightly downstream from, the spindle and is belt-driven from the spindle. It carries a wooden belt pulley of 4¾" length × 4" diameter and, at the lower end, is a 4" throw produced by a crank – presumably to drive a jog scry[2] below the meal spout. Tentering[3] is by a captive square spanner onto a threaded rod above the end of the bridge-tree. Granite bedstone.

Upstream layshaft: A 3" square iron layshaft is driven off the upstream side of the pitwheel through a cast-iron spur pinion, 30" diameter × 4" wide, with 8 arms and 23 teeth of 4" pitch. The shaft extends through the upstream wall of the mill, emerging just above ground level. The next wheel on the shaft is a wooden beltwheel, 16" diameter × 7" wide. This drove the sackhoist, and the 2" belt is still in place. The sackhoist is tucked beneath the stone floor, inside the hurst. The windlass is wooden, 18" long × 4¼" diameter, with a wooden pulley of 13" diameter × 6½" wide at the downstream end. The next wheel on the shaft is a second wooden beltwheel, 29" diameter × 5" wide. The next is a cast-iron bevelled mortice wheel of approximately 4'3" overall diameter, cast as a unit, with 8 arms and a 4⅜" bevelled face. There are about 80 wooden cogs of 1¾" pitch and 3½" face, with wedged shanks. This mortice wheel engages a bevelled, cast-iron stone nut with 4 arms, of 13" overall diameter, with 3⅜" face and 21 teeth. The spindle is of wrought-iron, and it does not carry a beltwheel. The bedstone is ?French burr[4] with a wooden eye. The tentering arrangement is the same as for the other pair of stones. On the upstream side of the mortice wheel, between it and the upstream wall of the mill, is another bevelled cast-iron mortice wheel of 4'6" diameter, cast as a unit, with 6 arms. Approximately 84 wooden cogs of 2" pitch with wedged shanks. This engages a small cast-iron bevel pinion with 14 teeth on a 1½" square shaft running up to the stone floor close to the mill wall.

Stone floor: At the upstream end is the top of the light iron upright shaft, carrying a 4-armed wooden horizontal beltwheel, 26" diameter × 5" wide. Two octagonal wooden tuns are complete and in place, with wooden horses, hoppers and shoes. Nut-ended damsels.[5]

Loft: Half loft on upstream side of mill. No bins, but low vertical boards fixed along edges of loft with wooden roller along one edge – for ease of raising sacks of corn. All timber, including structural timbers and floorboards, appear to be of hand-sawn softwood – including the bressummer beam of the hurst frame. The bressummer beam, however, is a replacement, running the full length of the present mill.

[1] Contrate = unbevelled; in other words a right-angle gear drive.
[2] A jog scry is a reciprocating sieve used to remove coarse parts from the meal produced by the millstones; sometimes referred to as a jigger in Cornwall (Unwin 2002).
[3] Tentering is the action of raising/lowering the upper millstone whilst working, to alter and control the texture of what is being milled.
[4] The bedstone appears to be granite, backed with plaster to prolong its working life - see main text.
[5] Damsels are metal raps for feeding grain evenly into the millstones.



Reconstruction of the working parts of Brynn Mill, based on measurements taken in 1988 and surviving site evidence, with naming of parts.

Appendix 3: Baseline Photographs

The western elevation of the mill; viewed from the west (scale 2m).

As above (scale 2m).

The western elevation of the cottage; viewed from the west (scale 2m).

As above, showing projecting mill and bread oven (scale 2m).

The bread oven in the angle of the southern chimney stack; viewed from the west (scale 2m).

The base of the stack in the southern gable wall; viewed from the south (scale 2m).

The remains of the east elevation of the cottage; viewed from the east (scale 2m).

The southern end of the east wall of the cottage; viewed from the east (scale 2m).

The northern end of the east wall of the cottage; viewed from the east (scale 2m).

The door in the east elevation of the mill; viewed from the east (scale 2m).

The wheelpit, showing the collapsed wheel *in situ*; viewed from the north.

As above, viewed from the east.

The interior of the cottage, showing the southern gable stack and flue; viewed from the north (scale 2m).

As above, showing the fireplace (scale 2m).

As above, showing the breach through to the bread oven, with elements of the cloam oven *in situ* (scale 2m).

The internal elevation of the west wall of the cottage; viewed from the south-east (scale 2m).

The internal elevation of the north wall of the cottage; viewed from the south (scale 2m).

As above, showing detail of the fireplace inserted into a blocked doorway (scale 2m).

The internal elevation of the east wall of the cottage; viewed from the north-west (scale 2m).

The north-eastern corner of the cottage; viewed from the south-west (scale 2m).

The internal elevation of the west wall of the mill; viewed from the east (scale 2m).

Detail of the point where the layshaft breaches the west wall of the Mill; viewed from the south-east.

The upstream layshaft, driving gears and millstones; viewed from the south-east (scale 2m).

As above.

The downstream layshaft and millstones; viewed from the south-west (scale 2m).

The north-east corner of the Mill, showing structural cracks; viewed from the south-west (scale 2m).

The east wall of the Mill; viewed from the west (scale 2m).

The collapsed downstream iron spur gear and millstones; viewed from the south-east (scale 2m).

The south-east corner of the mill; viewed from the north-west (scale 2m).

The south wall of the mill, showing the blocked orthostat doorway; viewed from the north-east (scale 2m).

The worn millstone set into the floor just inside the western doorway into the mill; viewed from the east (scale 2m).

The upstream layshaft protruding from the front (west) wall of the mill; viewed from the south-west (scale 2m).

The worn millstone set into the concrete floor of the cottage, in front of the southern fireplace; viewed from the north (scale 2m).

General view of the concrete floor of the cottage; viewed from the north (scale 2m).

The irregular scantile slates recovered during the clearance of the debris inside the Mill.

Geotechnical pit #2, viewed from the south (scale 2m); note the dark grey humic silty-clay in the partly-collapsed pit.

Geotechnical pit #1, viewed from the south-east (scale 2m); this pit just clips the edge of the feature containing the dark grey humic silty-clay.

The removal of one of the millstones (photo: R Karkeek).

The removal of the mill machinery (photo: R Karkeek).

The mill machinery *ex situ* (photo: R Karkeek).

The mill machinery *ex situ* (photo: R Karkeek).

Displaced artefacts set aside, including two damsels and bridge (left) (scale 0.5m) (photo: M Watts).

Displaced artefacts set aside, including sack posser end (above scale) and bridge tree from downstream millstones (right). To the left of the bridge tree is a light shaft with a small pulley and a crank at one end. This was driven by belt from the downstream stone spindle to activate a reciprocating sieve (jigger) (scale 0.5m) (photo: M Watts).

The interior of the north wall of the mill after the machinery was removed; viewed from the south-east (scale 2m).

The stone blocks and iron mounts for the upstream layshaft and driving gears; viewed from the south (scale 2m).

As above.

The stone blocks and iron mounts for the downstream layshaft and driving gears, viewed from the south-west (scale 2m).

The ‘step down’ into the eastern cog pit, showing the re-used stone with socket; viewed from the west (scale 2m)

The floor of the mill following the removal of the mill machinery; viewed from the south-east (scale 2m).

As above, viewed from the south-west (scale 2m).

The exterior of the north wall of the mill, following the removal of the wheel; viewed from the north-east (scale 2m).

As above, showing the XXXX; viewed from the west (scale 2m).

Stone trough located on the top of the leat (scale 1m).

The leat leading to the mill; viewed from the west.

The mill building viewed from the top of the leat; viewed from the north-east (scale 1m).

The eastern elevation of the collapsed building to the west of the mill and cottage; viewed from the north-east (scale 1m).

As above, the north elevation (scale 1m).

Looking across the collapsed building south-west of the mill and cottage; viewed from the south-west.

The east elevation of the collapsed building south-west of the mill and cottage; viewed from the east (scale 1m).

The mill pond to the east of the mill; viewed from the north (scale 1m).

As above, showing the stone walling (rebuild?) where the culvert leading to the leat is located; viewed from the north-west (scale 1m).

Pitwheel centre and inner end of waterwheel shaft (photo: M Watts).

Spur pinion driven from pitwheel and east end of upstream layshaft (photo: M Watts).

Upstream layshaft, driving gears and millstones, looking north-west (photo: M Watts).

Bevel gear drive to upstream millstones (photo: M Watts).

Bridge posts and drive to upstream millstones (photo: M Watts).

Sliding sleeve to connect the upstream extension to main layshaft; short displaced shaft to right, presumably fallen through from a higher level (photo: M Watts).

Bevel gear on western extension of layshaft, for driving vertical spindle (photo: M Watts).

Pinion on foot of vertical spindle (photo: M Watts).

External end of upstream layshaft (photo: M Watts).

Remains of downstream layshaft and iron spur gear under collapsed millstones (photo: M Watts).

Remains of downstream layshaft, with iron spur pinion (driven by pitwheel) and bolts for securing it to arms of stone drive gear (rotted away) (photo: M Watts).

Detail of forged connection to iron band with wedge to tighten it around circumference of stone drive gear (photo: M Watts).

Displaced granite millstone with two generations of rynd chase (photo: M Watts).

LEFT: Stone spindle to downstream millstones with remains of stone nut and jigger drive pulley. The two iron bands bound the circumference of the timber/stone drive wheel (photo: M Watts).
RIGHT: Collapsed remains of waterwheel (photo: M Watts).

North gable of the Mill, with wheelpit and waterwheel (photo: M Watts).

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