BARNS K, L, and M
Report on a Visual Inspection of Proposed Barn Conversions Under Permitted Development (Class Q) at Rose Farm, Shapwick Road Westhay, Glastonbury, BA6 9TU for the T W Willcox Will Trust

BASED ON A LIMITED VISUAL INSPECTION

- Version 2
- 26 September 2022

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1. Introduction

1.1 MBE Limited was instructed by the client Mr Alan Willcox on behalf of the T W Willcox Will Trust (by email dated 20/06/2022, to conduct a visual inspection of the existing agricultural barn properties (Barns K, L, and M) and to prepare a structural report on the nature of construction, suitability for incorporation within the conversion and general condition of the visible structure.

1.2 The inspection of a total of six barns (Barns K, L, M, N, Q, R and S) was undertaken. Refer to the Architect's drawings for the location of each barn and the proposed arrangements. This report concerns Barns K, L and M only.

1.3 It is proposed to convert the existing agricultural buildings into a domestic residence under Class Q of the Town and Country Planning (General Permitted Development) (England) Order 2015 (Amended).

1.4 This report relates to the proposed conversion of the existing agricultural buildings into residential accommodation based on visual inspection, from floor level, of Barns K, L, and M at Rose Farm, Shapwick Road, Westhay, Glastonbury, BA6 9TU.

1.5 An inspection was undertaken in order to understand the structural form that was visible at the property. Our inspection was undertaken from ground level only with the aid of binoculars and a camera where necessary.

1.6 The report is based on a visual inspection undertaken on 12/08/2022 from 10:00. A limited number of photographs were taken as shown in Appendix A and an approximate sketch of the existing arrangement is provided on Figure 1 in Appendix B.

1.7 This report should be read in conjunction with the Architect's drawings.

1.8 This report is written with reference to the published guidance notes relating to building operations allowed under the change to residential use:

Class Q part (b) covers the design and exterior of the building; as such this report does not consider the internal works. Internal alterations are deemed to be covered within the legislation which allows necessary works in order for the building to function as a dwelling. The updated guidance, issued in June 2018, confirms that some structural works are allowable and the internal works are not generally development. The government guidance states:

"The right permits building operations which are reasonably necessary to convert the building, which may include those which would affect the external appearance of the building and would otherwise require planning permission. This includes the installation or replacement of windows, doors, roofs, exterior walls, water, drainage, electricity, gas or other services to the extent reasonably necessary for the building to function as a dwelling house; and partial demolition to the extent reasonably necessary to carry out these building operations".
Source: https://www.gov.uk/guidance/when-is-permission-required

1.9 This report uses the guidance of BRE Digest 366 Part 2 in terms of assessing the general condition of the buildings in relation to the proposed future use as a dwelling.

2. Report Limitations

2.1 The report is based on a limited visual inspection from floor level of the visible elements of the existing general condition of the structure and a cursory inspection of the grounds from floor level.

2.2 It is a condition of this report that we have not inspected the foundations or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that such parts of the wall are free from defect.

2.3 Also, the inspection was restricted to a walk over of the grounds around and alongside the property from ground level. A full clear view of the structure was restricted in some places by vegetation that was established near to and across the facades of the buildings. Access to the foundations was not possible at the time of the visit and the roof was too high to access fully and safely, so no clear view of the entire roof structure could be obtained.

2.4 The report is confined to structural aspects only and should not be construed as a comprehensive building survey.

2.5 No non destructive or destructive tests or samples were taken at the time of the visit. No as built records were made available or known to exist and there was no means to inspect or review the right hand side elevation, since access was physically not possible at the time of the inspection.

2.6 Comments contained within this report are strictly limited to, and based solely on, the visual inspection, record drawings and record photographs, as well as our understanding of similar structures, built using similar materials and techniques of a similar age.

2.7 It is assumed that all the load bearing elements are supported off a similar foundation (based on the existing trial hole information) taken to the same formation level into competent materials.

2.8 Further investigations are recommended, as outlined in Section 6.0 of this report.

2.9 This report shall be for the private and confidential use of the client only and shall not be reproduced in whole or in part or relied upon by third parties for any use whatsoever without the expressed written authority of MBE Limited.

2.10 This report does not guarantee that any works carried out in the past have been executed in accordance with the statutory and mandatory regulations, British Standards, Codes of Practice or the like current at that time. Refer to Appendix C for a full explanation of the limitations of this report.

3. Observations

3.1 Weather Conditions and Survey Details

3.1.1 The inspection was conducted on 12th August 2022 from 10:00 am. The weather was extremely dry and sunny with clear skies. Visibility was very good.

3.1.2 The inspection was conducted by Matthew Andrew Bennett BEng (Hons) CEng MIStructE, Director in charge of MBE Limited Consulting Engineers.

3.1.3 Visible areas of the property were viewed from ground floor level and a limited digital photographic record is provided in Appendix A (Photos 1 - 32). The external elevations are shown in Photos 1 - 11 in Appendix A. The existing arrangement of the subject property is illustrated on plan in Figure 1 in Appendix B.

3.2 Description of the Property

3.2.1 The property is located at National Grid Reference: ST4333642369.

3.2.2 The subject barns (Barns K, L and M) comprise an original traditional solid random rubble stone barn (Barn L) with a relatively recent lean to addition to the east (Barn M) and original adjoining cattle pen to the south (Barn K) that has been adapted in the recent past to include extended blockwork walls and a roof covering. Furthermore, a later addition, Barn N adjoins Barn L to the north. Barn N is the subject of a separate report.

3.2.3 Barn K is approximately 5 m wide by 5.75 m overall on plan. Barn K measures roughly 2.10 to 2.7 m high to the underside of the existing roof at the low and high eaves respectively. The internal arrangement of Barn K is shown on photos 12 – 16 in Appendix A.

3.2.4 Barn L is approximately 5 m wide by 10.1 m overall on plan. Barn L measures roughly 3.20 m from ground level to the underside of the existing roof truss chord and roughly 5.2m from ground level to the underside of the roof ridge. The internal arrangement of Barn L is shown on photos 17 – 24 in Appendix A.

3.2.5 Barn M is approximately 4.5 m wide by 9.50 m overall on plan. Barn M measures roughly 2.50 to 3.0 m high to the underside of the existing roof at the low and high eaves respectively. The internal arrangement of Barn M is shown on photos 25 – 32 in Appendix A.

3.2.6 The buildings are all single storey. Barns K and M are tagged onto Barn L and their rooves are covered with a corrugated asbestos cement profile deck that is supported by intermediate timber purlins (roughly 50 mm wide by 100 mm deep), which are in turn supported by primary rafters (of various sizes) that span from the external walls of Barn L to the perimeter wall to each of Barn K and M's "lean-to" roof slope.

3.2.7 In Barn K the roof is also propped by a central timber post supported of the internal sub-dividing blockwork wall. The post is notched over the wall at the base support.

3.2.8 Barn L has a traditional clay pantile roof, supported by a series of jack / common rafters that span to intermediate lines of timber purlins (comprising a mix of whole logs and sawn timbers of various sizes) between the ridge and the wall plate which is sat over the perimeter walls at the eaves. The roof purlins span from the north and south gable walls taking bearing off three pairs of principal rafters, which are part of three primary timber trusses. The trusses span from the east to the west perimeter walls of Barn L.

3.2.9 The fabric of the external envelope to Barn K comprises a mixture of the original random rubble stone plinth walls (that are raking to the east and west elevations) that have been built upon with relatively modern concrete blockwork to form an enclosed space. The envelope has no thermal value and will need to be upgraded by the inclusion of a suitable lining internally.

3.2.10 The fabric of the external envelope to Barn L comprises a c500-560mm original random rubble stone wall. The envelope has very little thermal value and will need to be upgraded by the inclusion of a suitable lining internally.

3.2.11 The fabric of the external envelope to Barn M comprises relatively modern concrete blockwork, stiffened with intermediate masonry piers around the perimeter wall which is generally one block thick. The external envelope has no thermal value and will need to be upgraded by the inclusion of a suitable lining internally.

3.2.12 The sub-diving dado wall in Barn K, carrying the intermediate roof prop, is constructed with concrete blockwork (see Photo 15 in Appendix A).

3.2.13 Barn L has a former cattle feed trough, built in blockwork, that traverses the width of the ground floor.

3.2.14 The main compartment of Barn M is open-plan.

3.2.15 Lateral stability across the collection of barns is provided by the rigidity of the external shear walls, which in the case of Barn L are particuarly massive.

3.2.16 The ground floor to Barn K appears to be a concrete slab that is cast upon the ground and is set on two levels, with a step located roughly midway across the floor, such that the northern end of the floor level to Barn K is about 140 – 160 mm higher than the southern side. The floor probably has no effective damp proof membrane.

3.2.17 The ground floor to Barn L also appears to be a concrete slab that is cast upon the ground and is set on one level, with a cattle feed trough located roughly midway across the floor. The floor probably has no effective damp proof membrane.

3.2.18 The ground floor to Barn M also appears to be a concrete slab that is cast upon the ground and is set on one level, though the floor was largely covered in mud and straw. The floor probably has no effective damp proof membrane.

3.3 Documents Reviewed, The Site and Use.

3.3.1 The following documents were reviewed:-

- The BGS website.
- Some photos of the property (see Appendix A).
- The Local Authority Planning Portal.
- Google Maps.
- National Library of Scotland - Ordnance Survey (OS) maps online www.maps.nls.uk

3.3.2 From a review of the historic OS maps available online it is evident that the land was developed and established as a working farm by the 1800's. Now there is a collection of approximately 21 buildings that form the property known as Rose Farm.

3.3.3 Shapwick Road is located to the south and the River Brue (and local drainage ditches / Rhynes) are located to the north.

3.3.4 The barns are bounded by fields to the north and dwellings to the west. The site is bounded to the south by a former camp site field.

3.3.5 The buildings are accessed via a narrow lane to the south from Shapwick Road that connects to the main concrete yard slab, from which the buildings are accessed.

3.3.6 The property is aligned such that the ridge line of Barn L is approximately in a north-south direction.

3.3.7 The general topography is such that finished ground levels around the subject barns vary between 7.97m to 7.50m adjacent the building facade and the surrounding ground levels appear to generally gently slope downwards from south to north.

3.3.8 To the west of the barn buildings there is a large hedgerow and series of trees that are within influencing distance.

3.3.9 The barn buildings were unoccupied at the time of the inspection.

3.3.10 The buildings appear to have been used as agricultural barns, cattle sheds and feed storage and are proposed to be converted to be used as a residential property.

3.4 Ground Conditions and Foundations

3.4.1 There is no original Site Investigation (SI) Report or "as built" records available to review.

3.4.2 The BGS website has no borehole records within 100m of the site. Borehole records in the area generally indicate that the underlying geology should be alluvium deposits overlying clays of the Blue Lias and Charmouth Mudstone Formations.

3.4.3 Weathered soils near the surface are likely to comprise a veneer of topsoil over soft to firm blue, grey or brown slity clays, possibly interbedded with bands of fibrous peat. The clays are likely to have some plasticity rendering them susceptible to changes in volume with changes in moisture content, with the potential to either shrink or swell. These soils can also soften when wet. The soils are expected to stiffen at some depth into weathered mudstones / shales.

3.4.4 Presumed safe ground bearing pressures in the order of 50 - 75 kN/m^2 would be anticipated at 1.0m depth, to be confirmed by further ground investigations.

3.4.5 An intrusive site investigation is required to prove the prevalent ground conditions and aid in the design / specification of foundations / foundation repairs.

3.4.6 The water table is expected to be below the depth of conventional foundations but further investigations would be required to confirm the requirements for the management of ground water during construction (whether sump / pumping or similar would be needed).

3.5 Structural Movement, Damage and Other Possible Defects

3.5.1 The structural arrangement of the barns and primary damage is illustrated on Figure 1 in Appendix B.

Barn K

3.5.2 There is movement to the roof and the timber shows evidence of insect attack. The roof has lost support where an intermediate purlin abuts the east elevation.

3.5.3 Furthermore the roof seems to have dropped, leading to a splice joint opening up across the primary beam that spans from the west wall to the east wall, and is propped by the intermediate timber post.

3.5.4 The intermediate post is inadequately restrained at the base where it is supported off the dwarf blockwork wall.

3.5.5 Generally the timber lintels have suffered from decay and insect attack and have failed.

3.5.6 The masonry to the north east corner of the barn is a mixture of random rubble, brick and block which is poorly bonded.

3.5.7 A significant portion of the east elevation is overgrown with climbers that have established and damaged the roof and the masonry.

3.5.8 The envelope has no thermal value and will need to be upgraded by the inclusion of a suitable lining internally.

Barn L

3.5.9 The north west corner of the barn has evidently moved, with tapered cracks reflected through the northern wall and around the external wall to the north west corner.

3.5.10 However, the most onerous movement, that has affected the elevations, is located around the bearing of the northern most roof truss where is supported on the western elevation, adjacent the external door at the northern end. The masonry around the bearing of the truss is bulging and displaced and has locally failed.

3.5.11 There is also stepped tapered cracking occurring to the north west corner around the stone wall to track across the facade of the adjoining barn (Barn N), The movement is reflected internally and extends from ground level, with cracks generally being wider at the top.

3.5.12 Crack damage to the walls is a maximum of 20 mm width through the stones and brickwork lining to the window located on the northern gable at high level and taper towards ground level where they are narrower (see Photo 20 in Appendix A). The magnitude of the crack damage would be categorised as being Category 4 (severe) in accordance with Table 1, of the Building Research Establishment Digest 251[(1)], which describes the damage in buildings by crack width.

3.5.13 The crack widths to the external walls to the north west corner of the barn are no wider than 5-10 mm and are notably reflected externally (occurring in similar locations through the walls). The magnitude of the crack damage would be categorised as being Category 3 (serious) in accordance with Table 1, of the Building Research Establishment Digest 251[(1)], which describes the damage in buildings by crack width.

3.5.14 The roof timbers are generally showing signs of insect attack and timber decay. Some portions of the roof have collapsed where the lathings / battens carrying the roof tiles have decayed as shown on Photos 9 and 23 in Appendix A.

3.5.15 The north east corner of the external wall is missing stone quoins / units and the remnant masonry is loosely bonded.

3.5.16 A significant portion of the north gable and the west elevation is overgrown with climbers that have established and damaged the roof and the masonry.

3.5.17 Generally the timber lintels have suffered from decay and insect attack and have failed.

3.5.18 The envelope has no thermal value and will need to be upgraded by the inclusion of a suitable lining internally.

Barn M

3.5.19 A significant portion of the east elevation is overgrown with climbers that have established and damaged the roof and the masonry.

3.5.20 A c5mm wide vertical crack is evident in a blockwork pier located roughly midway along the west elevation. The damage may be reflected externally though the facade was cloaked with dense vegetation so it was not possible to confirm at the time of the inspection, as illustrated in Photos 11 and 31 in Appendix A.

3.5.21 The crack width to the wall to the west elevation of the barn is no wider than 5-10 mm and the magnitude of the crack damage would be categorised as being Category 3 (serious) in accordance with Table 1, of the Building Research Establishment Digest 251[(1)], which describes the damage in buildings by crack width.

3.5.22 The roof timbers are generally showing signs of insect attack and timber decay to the west elevation, near the north west corner. A lintel supporting a rafter over the northernmost window has locally failed. The fascia is rotten and almost completely decayed as shown on Photos 11 and 30 in Appendix A.

3.5.23 The envelope has no thermal value and will need to be upgraded by the inclusion of a suitable lining internally.

4. Discussion

4.1 Barn K

4.1.1 The roof structure has sagged and the primary beam splice has failed. The purlin that should take bearing midway along to the east elevation has failed. Generally the purlins and the rafters to the roof of this barn are inadequate and will require replacement entirely.

4.1.2 A timber prop is not adequately restrained at the base, where it is supported by the internal blockwork wall. Depending on the proposals for conversion going forward either the internal prop will need to be removed or strengthened.

4.1.3 Timber that is exposed to the elements is susceptible to decay and insect attack. The perimeter lintels and portions of the fascia carrying the gutter have decayed to the extent that they have failed and will require replacement.

4.1.4 The existing walls have no thermal value and it will be necessary to line the perimeter walls with an insulated panel or construction to conform to Approved Document L of the Building Regulations.

4.1.5 It is intended to form new openings for glazing as required to comply with the requirements for natural daylight for habitable rooms. These new openings should be located, as far as possible to avoid the loss of effective buttressing to the perimeter walls.

4.1.6 The existing ground floor construction would need to be improved or replaced with a suitable DPM and floor insulation.

4.1.7 Where the elevations are to be filled in the external cladding will either be detailed to be supported off the existing foundations or off the ground slab. The details will be undertaken at Building Regulations stage (technical design), but it is envisaged that a new cladding material (possibly a replacement to address the appearance of the blockwork built off the stone plinths) will be used, either new stone off the existing walls or additional skin either off the original footing (if it is wide enough and on competent material) or on a thickening set into the perimeter of the new ground bearing slab construction.

4.1.8 Solid stone walls to the barn are covered by some foliage and creepers. Whilst use of plants and creepers supply an aesthetic rural image, foliage damages and degrades buildings and structures, especially solid stone walls.

4.1.9 We recommend all the foliage is removed from all wall faces to prevent damage and moisture tracking into the structure. Stone walls need to breath and, by blocking natural air movement and drying process; this will increase moisture content to the walls, both externally and internally. The removal also provides more natural light

4.1.10 The disposal of surface water and roof rainwater around the barn is not via a conventional “positive” drainage system and all surface and roof water that is discharged around the building perimeter is allowed to infiltrate the ground. Under storm conditions, there is a risk that the flows could exceed the capacity of the ground to allow infiltration, which might lead to water pooling on the surface or in extreme conditions local flooding. Not only that but water is able to track across the solid walls and lead to dampness in the fabric.

4.2 Barn L

4.2.1 Lias Clays form a belt crossing England extending from Yorkshire to the Dorset coast. It also extends into South Wales. Usually blue, white or grey the Lias clays comprise a compact argillaceous (clayey) limestone or cement stone dating back to the Jurassic era. These clays are known to typically have medium to high shrinkage/swelling potential [(1/2)], and can be particularly problematic in the presence of vegetation.

4.2.2 The pattern of damage around the north west part of the barn is evident of foundation related movement that has resulted in cracking around the external walls, extending from ground level, which is broadly wider at the top and narrower at the bottom. This damage is indicative of foundation related movement around the north west side of the property, probably due to subsidence.

4.2.3 It is suspected that the clutch of trees and the substantial hedgerow that are located within influencing distance of the western elevation of the barn have adversely affected the moisture content of the suspected clayey sub-soils.

4.2.4 The tree / shrub roots have most likely taken moisture from the clays and consequently the clays have dried and shrunk causing the north west corner to drop.

4.2.5 It appears as though the cracking around the property is no wider than 5 – 20mm. The magnitude of the crack damage would be categorised as being Category 4 ("severe") in accordance with Table 1, of the Building Research Establishment Digest 251[3], which describes the damage in buildings by crack width.

Category 0	"negligible"	< 0.1mm
Category 1	"fine"	0.1 - 1mm
Category 2	"moderate"	>1 but < 5mm
Category 3	"serious"	>5 but < 15mm
Category 4	"severe"	>15 but < 25mm
Category 5	"very severe"	>25 mm

Extract from Table 1, B.R.E. Digest 251

Classification of damage based on crack widths.

4.2.6 There is a slight concern that ongoing movement can be triggered by tree roots from the significant trees located around the property. It was noted that the grounds were not maintained; with varied species of hedgerow and trees having established themselves and potentially within influencing distance. It is possible that the various trees and shrubs around the western elevations have now reached a point where they may be affecting the sub-soils too. Only further investigations and monitoring will prove that the movements to the west elevation have ceased or are progressive.

4.2.7 Judging by the general magnitude of the crack damage and the age of the property the movement is probably occurring at a very slow rate.

4.2.8 Related to the above issue it would appear as the movement in the foundations to the north west corner has contributed to the local failure of the wall supporting the northernmost rood truss, with the masonry evidently slumped and bulging outward.

4.2.9 At this time, the exact details of the existing footings are unknown, since no records have been provided nor trial pits opened up. However, given the age of the property it is likely the foundations are very shallow when compared to modern standards. In properties of this age it is often the case that the original foundations are constructed at relatively shallow depths on near surface materials (overlying soils containing plastic clays).

4.2.10 During very dry periods the soils around the property may shrink and cause movement but this is to be expected with older buildings with shallow foundations in plastic soils. The property is particularly vulnerable to this as it is flanked by various trees / shrubs which may be at risk of damaging the property further if left to unmanaged (that is not regularly maintained).

4.2.11 It would be prudent to carry out intrusive investigations and examine the foundations as well as the sub-soils, as well as monitor the property for a period of time in order to confirm the above hypothesis.

4.2.12 If trees are causing the movement then these will need to be managed (reduced or removed) and monitoring continued to establish that the movement had ceased; in other words the property has reached equilibrium. If movement is no longer taking place then a scheme of repairs may be implemented.

4.2.13 It is also therefore recommended that any new planting is restricted to low water demanding species at a reasonable distance (typically a height / distance relationship, e.g. a 5m tree at no closer than 5m). Vegetation should be carefully managed to reduce the effect it may have on the foundations

4.2.14 Solid stone walls to the barn are covered by some foliage and creepers. Whilst use of plants and creepers supply an aesthetic rural image, foliage damages and degrades buildings and structures, especially solid stone walls.

4.2.15 We recommend all the foliage is removed from all wall faces to prevent damage and moisture tracking into the structure. Stone walls need to breath and, by blocking natural air movement and drying process; this will increase moisture content to the walls, both externally and internally. The removal also provides more natural light

4.2.16 The disposal of surface water and roof rainwater around the barn is not via a conventional “positive” drainage system and all surface and roof water that is discharged around the building perimeter is allowed to infiltrate the ground. Under storm conditions, there is a risk that the flows could exceed the capacity of the ground to allow infiltration, which might lead to water pooling on the surface or in extreme conditions local flooding. Not only that but water is able to track across the solid walls and lead to dampness in the fabric.

4.2.17 Timber that is exposed to the elements is susceptible to decay and insect attack. The perimeter lintels and portions of the roof lathing carrying the tiles have decayed to the extent that they have failed and will require replacement. The timber trusses appear also to have suffered with some decay and insect attack and may require strengthening.

4.2.18 The existing walls have no thermal value and it will be necessary to line the perimeter walls with an insulated panel or construction to conform to Approved Document L of the Building Regulations.

4.2.19 It is intended to form new openings for glazing / doors as required to comply with the requirements for natural daylight for habitable rooms. These new openings should be located, as far as possible to avoid the loss of effective buttressing to the perimeter walls.

4.2.20 The existing ground floor construction would need to be improved or replaced with a suitable DPM and floor insulation.

4.3 Barn M

4.3.1 Solid blockwork walls to the barn are covered by some foliage and creepers. Whilst use of plants and creepers supply an aesthetic rural image, foliage damages and degrades buildings and structures, especially solid walls.

4.3.2 We recommend all the foliage is removed from all wall faces to prevent damage and moisture tracking into the structure. The removal also provides more natural light

4.3.3 The disposal of surface water and roof rainwater around the barn is not via a conventional “positive” drainage system and all surface and roof water that is discharged around the building perimeter is allowed to infiltrate the ground. Under storm conditions, there is a risk that the flows could exceed the capacity of the ground to allow infiltration, which might lead to water pooling on the surface or in extreme conditions local flooding. Not only that but water is able to track across the solid walls and lead to dampness in the fabric.

4.3.4 Timber that is exposed to the elements is susceptible to decay and insect attack. The perimeter lintels and portions of the roof lathing carrying the tiles have decayed to the extent that they have

failed and will require replacement. The timber rafters supported at the eaves appear also to have suffered with some decay and insect attack and will require strengthening / replacement.

4.3.5 The existing walls have no thermal value and it will be necessary to line the perimeter walls with an insulated panel or construction to conform to Approved Document L of the Building Regulations.

4.3.6 It is intended to form new openings for glazing / doors as required to comply with the requirements for natural daylight for habitable rooms. These new openings should be located, as far as possible to avoid the loss of effective buttressing to the perimeter walls.

4.3.7 The existing ground floor construction would need to be improved or replaced with a suitable DPM and floor insulation.

5. Conclusions

5.1 Conversion of Barn K

5.1.1 The superstructure of the property is generally regarded to be in the form of a load bearing masonry structure. The external walls are of a local solid random stone construction with modern blockwork walls built off the sloping stone wall plinths.

5.1.2 The roof is covered with a corrugated asbestos cement profile deck that is supported by intermediate timber purlins (roughly 50 mm wide by 100 mm deep), which are in turn supported by primary rafters (of various sizes) that span from the external walls of Barn L to the perimeter wall at the south end of the barn.

5.1.3 The roof structure has sagged and the primary beam splice has failed. The purlin that should take bearing midway along to the east elevation has failed. Generally the purlins and the rafters to the roof of this barn are inadequate and will require replacement entirely.

5.1.4 The building is tagged onto Barn L.

5.1.5 Whilst the barn is generally noted to be in need of some repairs, in the context of the conversion scheme that is proposed, by inspection of the primary structure, the general proportions, rigidity of the primary walls and from my practical experience, in my opinion, it is feasible to convert the existing barn and retain the load bearing walls for the support of the proposed single storey conversion, subject to lining the walls and replacing the roof structure.

5.1.6 It should be noted that the above reasoning is only based on the visible evidence and anecdotal evidence, available at the time of the initial inspection and is not supported by an intrusive site investigation and/or backed up by a reliable intrusive site investigation to support the above technical hypothesis.

5.2 Conversion of Barn L

5.2.1 The superstructure of the property is generally regarded to be in the form of a load bearing masonry structure. The external walls are of a local solid random stone construction.

5.2.2 The roof is a traditional cut timber roof comprising common rafters supported by purlins that span onto principal rafters which are part of primary roof trusses that are carried by the perimeter load bearing walls.

5.2.3 At the north west side of the barn, the cracking noted externally and internally is indicative of a slight downward / outward rotation and dip of the north west portion of the foundations toward the various trees / shrubs located to the west of the property. This movement has not been monitored so it is not proven that the movement is seasonal (cyclical) or not.

5.2.4 The most onerous damage, as categorised by the BRE, is generally noted to be Category 4, with the most onerous movement located around the north gable.

5.2.5 The external load bearing walls around the barn are probably founded onto shallow clayey soils which are being dried out by dominant vegetation, most likely resulting in foundation movement.

5.2.6 The roof profile generally does appear to be unaffected (from inspection of the outside elevations) by the movement, but there is some evidence of an ongoing or progressive movement mechanism at play to the northernmost end of the main roof, where the bearing to the truss near the northern gable has failed, possibly induced by the loss of support in the masonry due to foundation related movement at the north west corner.

5.2.7 The risk of future foundation related movement that might arise and affect the property is unknown but there will be some degree of risk if trees / shrubs are located at or near the foundations and these are allowed to grow unattended; assuming the sub-soils comprise plastic clays.

5.2.8 The exact foundation arrangement and soil conditions have not been inspected but based on the local geology the soils are expected to be competent and likely to comprise a clayey material with some plasticity, though this was unproven at the time of the inspection.

5.2.9 It should be noted that the above reasoning is only based on the visible evidence and anecdotal evidence, available at the time of the initial inspection. It is advised that insurers prepare an independent intrusive investigation and/or backed this work up by a reliable period of crack / level monitoring to support the above hypothesis.

5.2.10 The movement is such that the integrity of the walls is locally compromised and sections of the wall should have the joints raked out and cracks stitched together and some units locally replaced; especially where masonry is displaced and bulging.

5.2.11 The cracks to the walls should be stitched together with stainless steel helical masonry reinforcement to reinstate the structural integrity.

5.2.12 The soil state should be checked prior to repair. Recovery (reduction in crack widths) might occur, though heave can be a slow process; the ground conditions should therefore ideally be checked to see if there is a persistent moisture deficit in the soils below the foundations at locations around the left hand corner of the barn, prior to repair. Underpinning may be required.

5.2.13 Sections of the roof have collapsed where the timber lathing / battens are decayed and the tiles have lost their support. There is also evidence of insect attack and timber decay to the primary trusses and other elements of timber (such as lintels) embedded or supported by the perimeter walls.

5.2.14 Whilst the barn is generally noted to be in need of some repairs, in the context of the conversion scheme that is proposed, by inspection of the primary structure, the general proportions, rigidity of the primary walls and from my practical experience, in my opinion, it is feasible to convert the existing barn and retain the load bearing walls for the support of the proposed single storey conversion, subject to lining the walls and replacing the roof structure.

5.2.15 It should be noted that the above reasoning is only based on the visible evidence and anecdotal evidence, available at the time of the initial inspection and is not supported by an intrusive site

investigation and/or backed up by a reliable intrusive site investigation to support the above technical hypothesis.

5.3 Conversion of Barn M

5.3.1 The superstructure of the property is generally regarded to be in the form of a load bearing masonry structure. The external walls are of a modern blockwork with stiffening piers located around the three principal walls that are built against Barn L.

5.3.2 The roof is covered with a corrugated asbestos cement profile deck that is supported by intermediate timber purlins (roughly 50 mm wide by 100 mm deep), which are in turn supported by primary rafters (of various sizes) that span from the external walls of Barn L to the perimeter wall at the east elevation of the barn.

5.3.3 Whilst the barn is generally noted to be in need of some repairs, in the context of the conversion scheme that is proposed, by inspection of the primary structure, the general proportions, rigidity of the primary walls and from my practical experience, in my opinion, it is feasible to convert the existing barn and retain the load bearing walls for the support of the proposed single storey conversion, subject to lining the walls, inserting new wind posts internally and either replacing or strengthening the existing roof structure.

5.3.4 It should be noted that the above reasoning is only based on the visible evidence and anecdotal evidence, available at the time of the initial inspection and is not supported by an intrusive site investigation and/or backed up by a reliable intrusive site investigation to support the above technical hypothesis.

6. Recommendations for Further Works

6.1 Trees, Vegetation

6.1.1 Remove the nearby trees and hedgerows. Maintain the vegetation and restrict planting / use low water demanding species of shrubs / trees that will be outside the influencing distance of the property. That is keep trees away by at least a distance equivalent or greater than their height (e.g. 3m tree greater than 3m from the dwelling).

6.2 Drainage

6.2.1 The site will require a drainage strategy / flood risk assessment commensurate with the flood risk attributed to this site.

6.2.2 A drainage / infrastructure engineer should be engaged to investigate sustainable methods to provide drainage to the site to meet current standards and local planning policy guidelines.

6.3 Site Investigation / Further Surveys

6.3.1 The timbers in some areas are exposed to dampness and appear to be under attack from wood boring insects. A specialist timber survey should be undertaken to investigate the timbers prior to converting the building. The specialist should also assess the loss of section and timber strength of the existing roof trusses to Barn L to inform a scheme of repair / strengthening. In the alternative the trusses should be assumed to be inadequate to support additional loads (due to plastered finishes or other superimposed dead loads) and either strengthened (with flitch plates and the like) or replaced with new trusses.

6.3.2 In order to successfully develop the site and reduce risks in the ground a professional site investigation should be undertaken in order to determine the ground profiles at depth, assess the degree of contamination present (if any) and define geotechnical and environmental parameters for the site going forward.

6.3.3 The existing foundations should be further investigated to verify their actual construction (type / detail /depth / thickness) and condition of the substructure masonry and foundation should be inspected prior to construction.

6.3.4 The fabric may contain Asbestos containing materials which should be checked / identified as part of a specialist survey (e.g. refurbishment/demolition survey). All asbestos waste is subject to Schedule 2 of The Control of Asbestos Regulations 2012. More information on handling potentially asbestos containing sheets can be found on the Health and Safety Executive's website.

6.3.5 Underground utilities should ideally be located / surveyed and mapped on the topographical survey for the site.

6.4 Superstructure Repairs Barn K

6.4.1 The damage in the main barn (Barn K) is generally restricted to the roof, which has sagged and lost support in some areas, and the embedded timbers (such as the lintels) which have decayed

6.4.2 Where the walls are loosely bonded it is recommended that the loose units are removed and the section of wall in the north east corner of the barn is locally rebuilt.

6.4.3 The existing failed lintels should be removed and new lintels will be required to suit the conversion proposals.

6.4.4 The roof should be entirely replaced with a new system of structural support off the primary load bearing walls and ideally the roof should drain to gutters that feed into down pipes that should discharge into a dedicated drain and not release water onto the ground near the outside walls of the barn.

6.5 Superstructure Repairs Barn L

6.5.1 The damage in the main barn (Barn L) is generally no more onerous than Category 4 (cracks less than 25 mm width). However, the external walls are observed to be fractured such that external damage is broadly reflected internally and the cracking will be, more than likely, through the whole section.

6.5.2 External wall panels have to resist both vertical load and lateral load. On this basis the structurally integrity should be fully restored using masonry reinforcement (Helifix bars or equivalent) in accordance with paragraphs 6.5.3 to 6.5.6.

6.5.3 Where cracks have occurred across the elevations, sufficient masonry units should be removed to allow examination of the wall for the full height of the crack. Where cracking is detected to the inner face of the solid wall (either in alignment with the external cracking or to the left or the right of the crack), then the crack should be fully exposed for its' full height and repaired from the inside.

6.5.4 Cracked joints should be chased out to depths of c50mm and c 6 – 8 mm diameter stainless steel threaded bars (Helifix or similar) inserted with at least 225 mm of the bar placed either side of the crack (450 mm long bars). The joints should then be re-pointed with "Helibond" mortar or equivalent.

6.5.5 Loose fragments of masonry in the wall should be appropriately cut out and new sections sensitively inserted and fixed to the parent masonry in order to maintain the bond. Any cracked joints shall be raked out and re-pointed with "Helibond" mortar or equivalent (grade III, hydraulic lime based mortar).

6.5.6 Where the masonry has bulged and displaced at the bearing of the roof truss (near the north gable) the wall should be locally taken down and reconstructed.

6.5.7 Decayed timber should be removed and replaced. It is likely that the existing rafters, purlins and trusses will require strengthening (insertion of new sections alongside the existing) or replacement (due to the extent of insect attack).

6.5.8 The roof should ideally drain to gutters that feed into down pipes that should discharge into a dedicated drain and not release water onto the ground near the outside walls of the barn.

6.6 Superstructure Repairs Barn M

6.6.1 The damage in the barn is generally no more onerous than Category 3 (cracks less than 15 mm width).

6.6.2 However, the external walls are observed to be fractured such that external damage is broadly reflected internally and the cracking will be, more than likely, through the whole section. External wall panels have to resist both vertical load and lateral load. On this basis the structurally integrity should be fully restored using masonry reinforcement (Helifix bars or equivalent) in accordance with paragraphs 6.5.3 to 6.5.6.

6.6.3 The roof should be entirely replaced with a new system of structural support off the primary load bearing walls and ideally the roof should drain to gutters that feed into down pipes that should discharge into a dedicated drain and not release water onto the ground near the outside walls of the barn.

References

[1] Ddriscoll R. (1983) "Influence of Vegetation on Clays" Geotechnique. Vol. 33.
[2] Table 1, Chapter 4.2, Para. 2.3 of N.H.B.C. Standards, 1986.
[3] BRE. Assessment of damage in low-rise buildings. BRE Digest 251. Garston, IHS BRE Press, 1995.

Appendix A Photographic Record

Photo 1 – Barns K, L and M – Looking north-west

Photo 2 – Barn L west elevation – Looking east

Photo 3 – Barn K / L south aspect – Looking north

Photo 4 – Barn K – South elevation viewed looking east – Barn J to right hand side

Photo 5 – Barns K and L west elevation – Viewed from south west corner Barn K looking north

Photo 6 – Barn K / L – South west elevation - Looking south

Photo 7 – Barn M north gable – Looking south

Photo 8 – Barn L north gable – Looking south

Photo 9 – Barn L / M roof – Viewed from east elevation of Barn M looking west

Photo 10 – Barn L / M roof – Viewed from east elevation of Barn M looking west (cont'd)

Photo 11 – Barn M east elevation – Viewed from yard looking west

Photo 12 – Barn K interior – Looking to south gable of Barn L

Photo 13 – Barn K interior – Looking to north east corner of Barn K

Photo 14 – Barn K interior – Looking to east elevation of Barn K

Photo 15 – Barn K interior – Looking to south west corner of Barn K

Photo 16 – Barn K interior – Looking to south east corner of Barn K

Photo 17 – Barn L interior – Looking to north east corner of Barn L

Photo 18 – Barn L interior – Looking to north west corner of Barn L

Photo 19 – Barn L interior – General view of roof trusses in Barn L

Photo 20 – Barn L interior – North gable of Barn L – Suspected foundation related movement

Photo 21 – Barn L interior – Looking to south east corner of Barn L

Photo 22 – Barn L interior – Looking to south west corner of Barn L

Photo 23 – Looking to north west corner of Barn L – Suspected foundation related movement

Photo 24 – Barn L – Truss bearing adjacent north west corner – Masonry displaced

Photo 25 – Barn M interior – Viewed toward south gable

Photo 26 – Barn M interior – Viewed toward north gable

Photo 27 – Barn M interior – Viewed toward Barn L east wall at south west corner of Barn M

Photo 28 – Barn M interior – Viewed toward Barn L east wall (cont'd)

Photo 29 – Barn M interior – Viewed toward Barn L east wall at north west end of Barn M

Photo 30 – Barn M interior – Viewed toward Barn M east elevation at north east corner

For enlarged image of crack damage see below

Photo 31 – Barn M interior – Viewed toward Barn M east elevation (cont'd)

Photo 32 – Barn M interior – Viewed toward Barn M east elevation at south east corner

Appendix B Figure 1

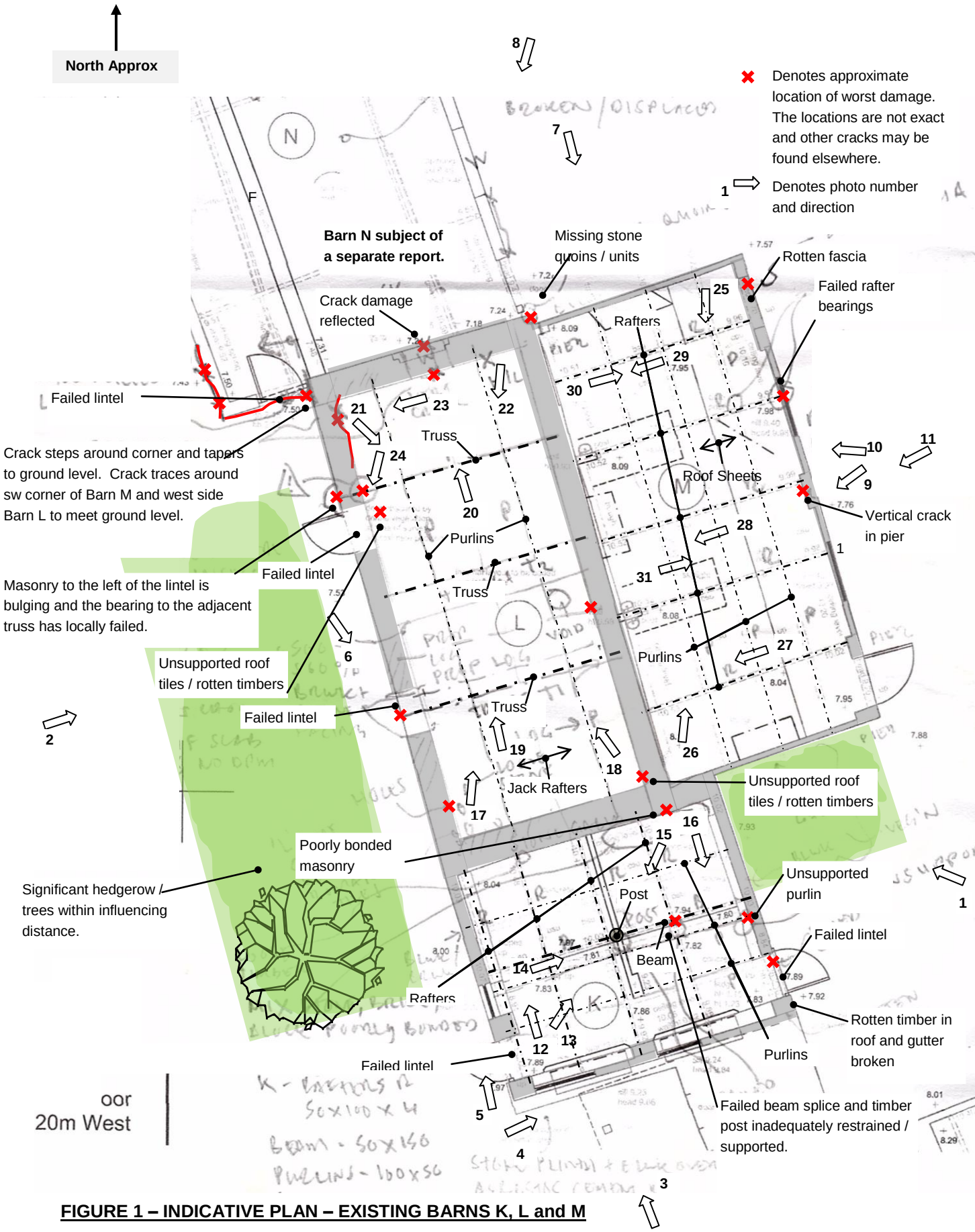

FIGURE 1 – INDICATIVE PLAN – EXISTING BARNS K, L and M

Appendix C Limitations

1. The purpose of the report is to apprise the client of the feasibility of converting the existing barn buildings into a dwelling, from a structural engineering perspective.

2. In accomplishing this purpose, a visual inspection of the barn was done. The inspection was limited because no uncovering or physical testing or intrusive ground investigation had been undertaken and the structural fabric was not fully exposed.

3. The diagnosis of the movement or damage is subject to further investigation(s) where required.

4. Reference in this report to the left and the right-hand means the follow:-

   a) Reference to the whole property when facing the front.
   b) References to individual walls or elements, when facing the appropriate side of the wall or element.

5. We were authorised to confine our attention to structural matters and this document should not be construed as a comprehensive survey or cost / budget report. Special reference is made to the following:-

   a) It was not possible to observe the foundations. The foundations to the main property were not inspected and we have referred to the work of others.

   b) No opening up was done.

   c) No non destructive or destructive tests or samples were taken at the time of the visit. As such the fabric was not tested or assessed (e.g. steel for loss of section due to corrosion).

   d) Existing records were not made available to show the layout of the building so all information is based on approximate measurements and what was visible. A limited photographic record was made.

   e) At the time of the visual inspection, vegetation was growing against the wall which prevented inspection of some areas of the fabric.

   f) Non-structural elements, such as windows, door joinery, fascias and soffits and the like were not inspected.

   g) The main property has not been inspected for building faults related to roof coverings, rainwater systems (gutters and rwps), gulleys/sumps/pumps, drains or other defects. No CCTV survey was done.

   h) In particular, we have not inspected or carried out physical testing on electrical, heating or plumbing installations, below ground drainage runs, or above ground drainage runs, either internally or externally.

   i) Fences were not inspected.

   j) We have not inspected timber nor any other part of the structural fabric that was covered, concealed, or inaccessible, and we are therefore unable to report that any such part of the property is free from defect.

6. Comments contained within this report therefore are strictly limited to, and based solely on, the visual evidence that is documented and our understanding of similar structures, built using similar materials and techniques of a similar age.

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