w www.jcconsultancyltd.com
e info@jcconsultancyltd.com

Boston Office: 01205 317540
Morgan House, Gilbert Drive,
Boston, Lincolnshire, PE21 7TQ

j c consultancy ltd
consulting structural & civil engineers

STRUCTURAL APPRAISAL REPORT

Existing Barn;-
Red House Farm,
Wykes Lane,
Donington,
Lincolnshire.
PE11 4SE



Copyright: JC Consultancy Ltd (2023)

Property;-	**Existing Barn;-** Red House Farm, Wykes Lane, Donington, Lincolnshire. PE11 4SE	**Instructed**;- Sept 2023 **Survey & Report by**;- JC Consultancy Limited
Client:-	**Mr S Craven** c/o **G R Merchant Ltd**, 4 Wrights Mews, Holbeach Spalding Lincolnshire. PE12 7EE	**Checked by**;- J. Ellington BSc. CEng MIStructE, FRSA, MIoD **Authorised By;-** J. Hicks BEng(Hons) MSc. PgDipCHE.,MIoD
Reference:-	JC/22/08/7206	**Issued**:- Oct 2023

Directors
J L Hicks BEng(Hons) MSc. PgDipCHE.,MIoD
J C Ellington BSc. CEng MIStructE FRSA MIoD

J C Consultancy is a trading style of **J C Consultancy Limited**
Registered in England 05973101
Registered Office 75 High Street Boston Lincolnshire. PE21 8SX
VAT Reg. No. 895 1511 07

The Institution of Structural Engineers

STRUCTURAL APPRAISAL REPORT,

Existing Barn;-
Red House Farm,
Wykes Lane,
Donington,
Lincolnshire.
PE11 4SE

Our Ref;- JC/23/08/7206

CONTENTS

1.0 BRIEF

2.0 INTRODUCTION & SCOPE

3.0 GENERAL DESCRIPTION

4.0 OBSERVATIONS AND CONCLUSIONS

5.0 RECOMMENDATIONS TO CONSIDER AT PLANNING / DESIGN STAGE

6.0 PHOTOGRAPHS

1.0 BRIEF

1.1 JC Consultancy Limited was requested by Mr S Craven, to assess and comment on the structural condition of an existing barn, at Red House Farm, Wykes Lane, Donington, Lincolnshire. PE11 4SE.

2.0 INTRODUCTION & SCOPE

2.1 The building is located in a rural location within the Farm Yard of Red House Farm, near Donington in Lincolnshire. The barn is accessible via a farm track that leads off the highway known as Wykes Lane.

2.2 The client has instructed a structural appraisal report is to be carried out in order to assess possible options for future development, change of use and conversion. The enquiry was received from the client's agent, G.R.Merchant Ltd in September 2023. The instruction to carry out the structural appraisal was provided by the clients agent via email correspondence dated 14th September 2023.

2.3 This report is to be regarded as confidential to the party to whom it is addressed, and it is intended for the use of that party only. No responsibility will be accepted to any other party in respect of its contents in whole or in part. Prior to the report or any part of it being reproduced or referred to in any documents, our written approval as to its form and content must first be obtained.

2.4 JC Consultancy Limited visited the property on 13th October 2023, in order to carry out a structural appraisal survey.

2.5 The weather conditions at the time of the visit was overcast with periods of heavy rain.

2.6 The purpose of this report is limited to an opinion on the structural condition of the building. We have only reported upon those structural defects that materially affect the stability of the building and provided that these defects are reasonably detectable at the time of our inspection. Whilst we have used all reasonable skill and care in preparing this report it should be appreciated that we cannot offer any guarantee that the buildings will be free from future defects or that existing ones will not suffer from further deterioration. This report is limited to commenting on elements of the structural fabric only. No further assessment will be made to elements elsewhere in the property. Comments will relate to structural condition and performance of elements only.

2.7 This report does not contain observations, comments or recommendations to any non-structural items including, but not limited to drainage, electrical, heating and plumbing services, timber work and any decorative finishes / plasters.

2.8 Decay associated to damp, fungal attack, insect infestation or contamination (including the presence of asbestos materials or similar) is outside the scope of our appointment or report. Any reference to decay associated to damp, fungal attack, insect infestation or contamination to either structural or non-structural items are observations only. As such we recommend that further advice is sought from specialists in the fields of damp, fungal attack, insect infestation or contamination in order to guarantee peace of mind from these potential defects.

2.9 The inspection was of a visual nature only. There has been no opening up works involved in this investigation.

2.10 Any part of the structures that were hidden, covered or otherwise inaccessible, have not been inspected or commented upon. We therefore cannot guarantee that any such parts are free from defect.

2.11 The performance of the existing ground strata, general ground conditions and foundations may be referred to within this report; however, the ground conditions and foundations have not been fully inspected or investigated as part of this survey. Therefore, comments made will be based on analysis sought from indicative desktop sources including but not limited to the 'British Geological Society'. These sources generally provide sound interpretation, however local anomalies can occur, and as such we cannot guarantee their accuracy.

2.12 The observations and defects noted within this report should not be read as a comprehensive inventory of each and every single item witnessed during our survey. Instead the records should be taken as an indication of the condition of the outbuildings in general and should demonstrate the likely defects that may be present elsewhere in areas of the fabric that have not been surveyed or recorded.

3.0 GENERAL DESCRIPTION

3.1 The property is a single storey, traditionally constructed, rectangular shaped building. The building has three masonry constructed external walls forming the gable ends and rear elevation. The front elevation is constructed in a timber post / beam and panel arrangement.

3.2 The building has been formerly used as agricultural use in the form of Stables / Storage.

3.3 The original construction date of the property is unknown, but it is likely to be late C19 – early C20. The property is understood to be generally in its original format.
To the best of our understanding and belief the property is not Listed.

3.4 The general construction of the building under consideration consists of; -

Roof

Tiled roof covering over a traditional timber hand cut roof, consisting of a collared purlin roof, with rafters over. A series of timber tie beams are present between wall plates at regular centres along the length of the barn.

Walls

The building has three masonry constructed external walls forming the gable ends and rear elevation. These walls are predominantly solid wall construction throughout consisting of clay masonry units laid English Garden Wall bond, in soft mortars. The North-West corner has a chamfered / angled detail.
The front elevation is constructed in a timber post / beam and panel arrangement.
There are no internal walls / cross walls present in the building.

Ground Floor

The ground floor consists of part brick sets over earth.

Foundations

Foundations consist of a continuation of the masonry wall below ground level approx. 900mm, with corbelled masonry foundation system bearing onto the ground strata below.

3.5 Published Geological records show the building to be within an area where the soil sequence consists of a solid formation of Oxford Clay Formation (Mudstone) at depth overlain by a considerable thickness of Tidal Flat Deposits (Clays & Silts).

4.0 OBSERVATIONS & CONCLUSIONS

4.1 The existing barn is in a reasonable structural condition considering its age and previous use, however the building has suffered from a degree of movement in the past. Whilst some movement may be related to foundation movement, its general arrangement, with no cross walls, only a partially tied roof structure and a front elevation consisting of a basic timber beam and post arrangement, does make it particularly susceptible to progressive movement over time.

Conversion of the building is possible, however it should be understood that in order for a conversion to be undertaken, structural repair and reinstatement works will be required and maybe exhaustive in parts.

4.2 The existing foundations, whilst of reasonable depth for a barn of this age, appear to have suffered from historic movement. The long, rear elevation has been subject to a degree of rotation, and an area of re-built gable wall on the South facing gable has accommodated a degree of vertical movement.

The cause of the movement to the foundations is likely to be a combination of ‘soft’ ground strata as a result of defective rainwater discharge from roof structures, eccentric loading from rotating / leaning walls and the general relaxation and deflection of the supported hand cut collared purlin roof structure, all of which are common defects in traditional, agricultural style barns.

In order for a conversion to be undertaken, remedial works to foundations and the addition of engineer designed ground floor slabs will be required in order to prevent the building from accommodating further, progressive foundation movement.

4.3 The existing roof structure was noted to accommodate several defects. Areas of tiles were missing, and timbers have been exposed to the elements for long periods of time. The ridge and purlins displayed predominant sags between gable walls and principal collared trusses and general dishing to roof slopes was noted. Guttering and rainwater discharge pipes were missing throughout. The predominant cause of any movement within the building wall fabric and any subsequent fractures present within the masonry is likely to be partly due to the general relaxation and deflection of the hand cut collared purlin roof structure.

A new roof structure will be required throughout, which should help to eliminate a principal catalyst of stress within the original wall fabric. In order to protect the original masonry fabric from long term stress, we recommend that the new roof structure is supported off a remedial inner leaf wall of loadbearing blockwork, which itself can be constructed off an engineered remedial ground floor slab. This is a typical proposed arrangement in conversions of agricultural buildings of this age and nature and is discussed further in Section 4.4

4.4 The original wall construction to the barn has suffered from movement. The rear elevation wall has rotated and is displaying a notable outward lean of approximately 100mm over its height. The main catalyst to the lean is the omission of any cross walls within the barn, resulting in a long, continuous, unrestrained masonry panel. Furthermore, the general relaxation and roof spread / deflection of the hand cut collared purlin roof structure, which in this instance will be exacerbated by the timber beam and post arrangement of the front elevation, which offers little resistance to the thrust stresses associated with roof relation, will have contributed to the walls becoming out of plumb over time. The previously discussed rotation of foundations will also have contributed to the distortion of the supported walls.

The South facing gable wall appears to have been partly reconstructed in the past, however it is displaying evidence of further, more recent movement, with cracking identified at approximate mid panel. The bed-joints of the re-built masonry suggest that the South West corner of the barn has dropped slightly, again presumably from slight movement of the foundation in this corner.

The original Timber beam / post arrangement forming the front elevation is suffering from timber decay and general material fatigue. In addition, the timber beam at eaves level has supported a masonry course which has exacerbated the decay. If a timber frame is to be re-incorporated into any conversion, allowance should be made for its replacement in full.

In order to protect the existing rear elevation wall from further distortion it will need to be enhanced with a series of remedial works, including an improvement in its overall restraint. Ideally any layout proposed at conversion stage should introduce some cross wall at regular centres that tie perpendicular into the rear elevation at regular centres, or alternatively a series of steel frames may be required if an open plan arrangement is desired. Either of these solutions can be complimented with a series of tie bars or that will enhance the stability of the existing rear wall. Notwithstanding the above, even after improvement to its lateral stability, we confirm the existing rear wall it should not be used to support the loading of a replacement roof structure. As an alternative we recommend new inner leaf blockwork walls are to be constructed off a reinforced ground floor slab to support all new roof structures. The remedial inner leaf wall can be constructed using standard 100mm blockwork units which can be set out to form a cavity between the original masonry. However, it needs to be appreciated that due to the extent of the lean of the wall, the new cavity width between new blockwork and the existing wall will be tapered, getting considerably wider at eaves level.

4.5 Following the improvement in overall restraint and the installation of a remedial floor slab and remedial internal blockwork leaf discussed in Section 4.4, the remedial works required to the remainder of original wall fabric of the barn is generally low key and will be limited to repair of localised areas of defective brickwork, general crack stitching, repointing, and replacement of any existing lintels / timbers over openings.

Some localised areas of re-build of the original masonry walls may be required following the removal of the roof structures, however it is envisaged that following improvements to the overall restraint of the walls, the percentage of loss of original fabric will be low.

4.6 Based on the appreciation and knowledge overriding ground conditions in this area, should any conversion be complimented with extensions or additions to the footprint of the original building, we recommend that all new elements are constructed off engineered, reinforced concrete raft style foundations.

4.7 In conclusion, having considered the existing structural arrangement, we are satisfied that conversion of the building is possible, however it should be understood that in order for a conversion to be undertaken, structural repair and reinstatement works will be required as described and maybe exhaustive in parts.

We confirm that subject to following the recommendations made within this report, together with a suitable specification prepared by an architect, the fabric of the building could demonstrate compliance with Part A (Structure) of the Building Regulations, and the repair of the original elements described will enhance the overall performance of the building.

5.0 RECOMMENDATIONS TO CONSIDER AT PLANNING / DESIGN STAGE

5.1 As discussed within this report, conversion of the building is possible, however it should be understood that in order for a conversion to be undertaken, structural repair and reinstatement works will be required and maybe exhaustive in parts. In order to enhance the performance of the principal elements and to avoid significant loss of original brickwork we have assumed the following recommendations would be incorporated into any proposed conversion scheme.

5.2 We recommend that the existing ground floor system is to be removed and replaced with a ground bearing, concrete ground floor slab as part of any conversion. The slab should be engineered to ensure that it is suitable to accommodate loadings from the proposed use, including a proposed inner leaf blockwork which supports the new roof structure. Once installed, the slab will act as an internal raft type slab system, which will minimise any additional loadings placed upon the existing foundations. This should assist in improving the overall structural performance of the building.

Whilst the new floor slabs will need to be placed upon a hardcore sub-base, we recommend care should be taken during any excavation and installation of sub-bases. The existing foundations should not be undermined or disturbed as part of the sub-base installation, however the slabs can be engineer designed in order to achieve suitable performance whilst keeping slab thickness and sub-base requirement to a minimum. We recommend that existing foundation levels to all walls are confirmed via trial pits prior to completing remedial slab designs.

The floors should also incorporate insulation and damp-proof systems as specified by the architect to meet current regulations. Damp proof membranes should be applied underneath the floor slab which should be continuous with any damp-proof systems that are applied to the walls.

5.3 We recommend new inner leaf blockwork walls are to be constructed off the reinforced ground floor slab using standard 100mm blockwork units and can be set out to form a cavity between the original masonry. However, it needs to be appreciated that due to the extent of the lean of the existing rear elevation wall, the new cavity width between new blockwork and the existing wall will be tapered, getting considerably wider at eaves level.
In order to protect the existing rear elevation wall from further distortion it will need to be enhanced with a series of remedial works, including an improvement in its overall restraint. Ideally any layout proposed at conversion stage should introduce some cross wall at regular centres that tie perpendicular into the rear elevation at regular centres, or alternatively a series of steel frames may be required if an open plan arrangement is desired. Either of these solutions can be complimented with a series of tie bars or that will enhance the stability of the existing rear wall.

5.4 The existing roof structure will need to be replaced. We recommend that the roof structure is of cut roof construction to an Engineers design, or alternatively a prefabricated roof truss system by specialist supplier could be adopted. The new roof structures should be supported onto the new inner leaf blockwork and may need to incorporate extended rafters to achieve the required fascia detail over the original masonry wall at eaves.

5.5 The original Timber beam / post arrangement forming the front elevation should be replaced with a new arrangement.

5.6 Elsewhere the performance of all walls that accommodate minor fractures can be improved by low key stitching using the 'Helifix' masonry repair system, which involves installing remedial 'Heli-bar' rods into the bed joint of the masonry at regular vertical centres over any open cracks. Similar Helifix systems can be used to improve the tie between any new cross walls and junctions with the front and rear elevation walls. Any areas of hard cement re-pointing previously carried out on any brickwork that is to be retained should be carefully removed and replaced with a sympathetic soft lime based mortar. Other areas of weathered masonry joints should be repointed in a similar fashion. Any timber lintels / backing timbers that are present over any openings should be replaced throughout.

5.7 Whilst reference to damp is outside the scope of this report it can be seen that the structure has suffered from a degree of water penetration over the years.
As such it is essential that advice and any required treatment from specialists in the field of damp and decay should be carried out in conjunction with the conversion, in order to ensure that damp and timber decay are not trapped within the fabric post completion.

5.8 There is a lack of suitable rainwater discharge downpipes throughout the barn which has resulted in the localised wetting of masonry. Rainwater goods should be repaired / installed to any conversion to allow reliable discharge of rain water.

5.9 Any extensions or additions to the footprint of the original building should be constructed off engineered, reinforced concrete raft style foundations.

Finally, we confirm that this report is for advice and guidance only, and that consideration of any conversion, alteration and extension proposals should be done only following liaison with the Architect, and guidance / Approval from the Local Authority Planning and Building Control Departments.

JC Consultancy Limited
Consulting Structural & Civil Engineers

Oct 2023

6.0 PHOTOGRAPHS



Photograph # 1 (Front, East Facing Elevation)



Photograph # 2 (North Facing Gable Elevation)



Photograph # 3 (North Facing Gable Elevation)



Photograph # 3 (Rear, West Facing Elevation)



Photograph # 5 (Rear, West Facing Elevation / South Facing Gable Elevation)



Photograph # 6 (South Facing Gable Elevation)



Photograph # 7 (Typical Roof)



Photograph # 8 (Typical Roof)



Photograph # 9 (Typical Internal Brickwork)



Photograph # 10 (Typical Internal Brickwork)



Photograph # 11 (Typical Internal Brickwork – Rear Elevation – Leaning Wall)



Photograph # 12 (Typical Internal Brickwork –South facing Gable)



Photograph # 13 (Typical Internal Brickwork – Rear Elevation – Leaning Wall)



Photograph # 14 (Timber Beam – Post - Front Elevation)



Photograph # 15 (Timber Post - Front Elevation)



Photograph # 16 (Eaves Brickwork built off Timber Beam / Post Arrangement - Front Elevation)



Photograph # 17 (Eaves Brickwork built off Timber Beam / Post Arrangement - Front Elevation)



Photograph # 18 (Typical Ground Floor)



Photograph # 19 (Previously re-built wall - South Facing Gable Elevation)



Photograph # 20 (Cracking to Previously re-built wall - South Facing Gable Elevation)



Photograph # 21 (Previously re-built wall - South Facing Gable Elevation)

**************************************END OF REPORT***********************************