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**DETERMINED
PLAN**

SHDC
Planning & Development

- 7 OCT 2008

Ref: 1067/08

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LOCATION PLAN

M2

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PROJECT
PROPOSED BARN CONVERSION AT WHITEHOUSE FARM
STATION ROAD GEDNEY HILL

DRAWN

DATE

SEPT 2008

SCALE

1:2500

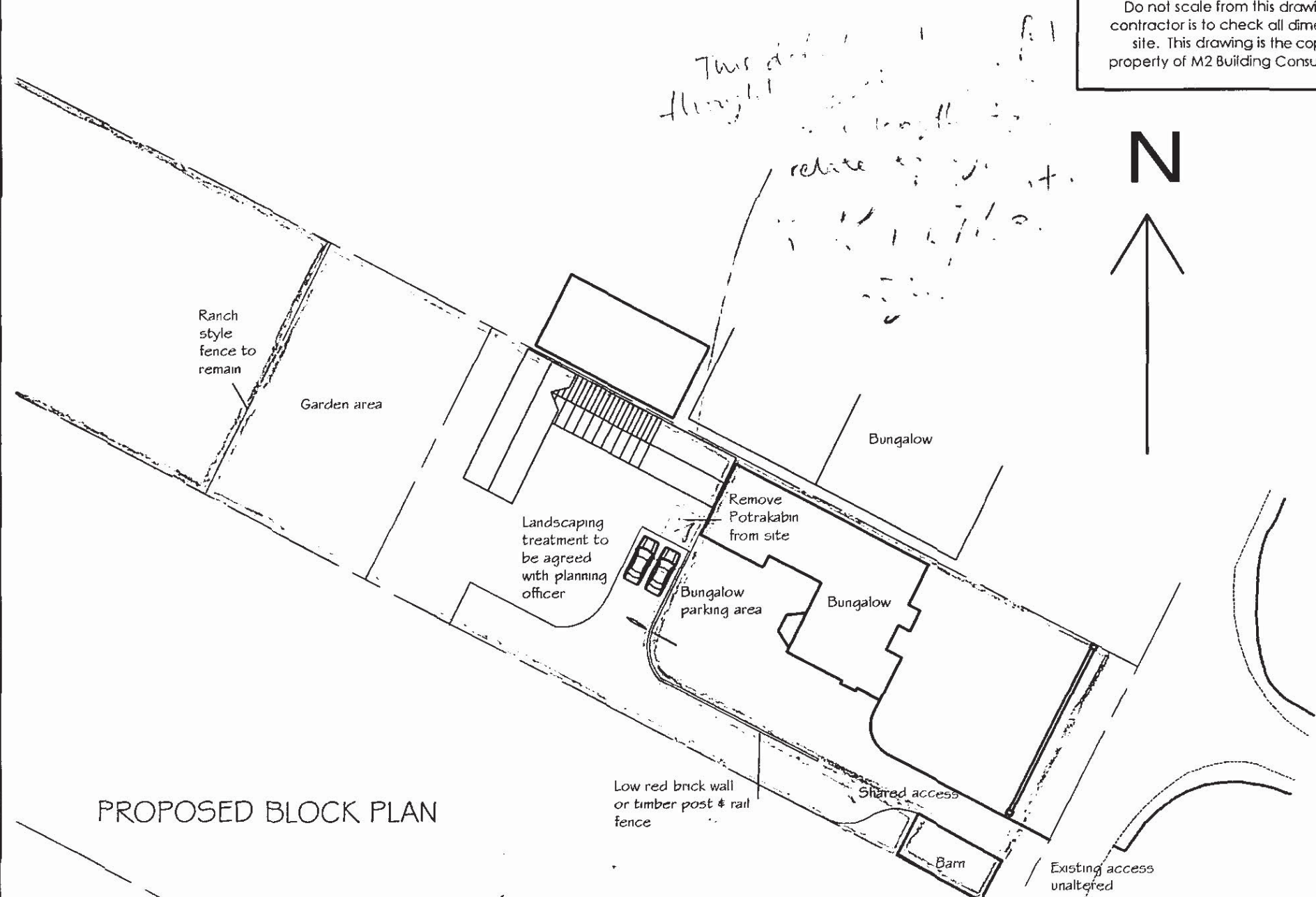
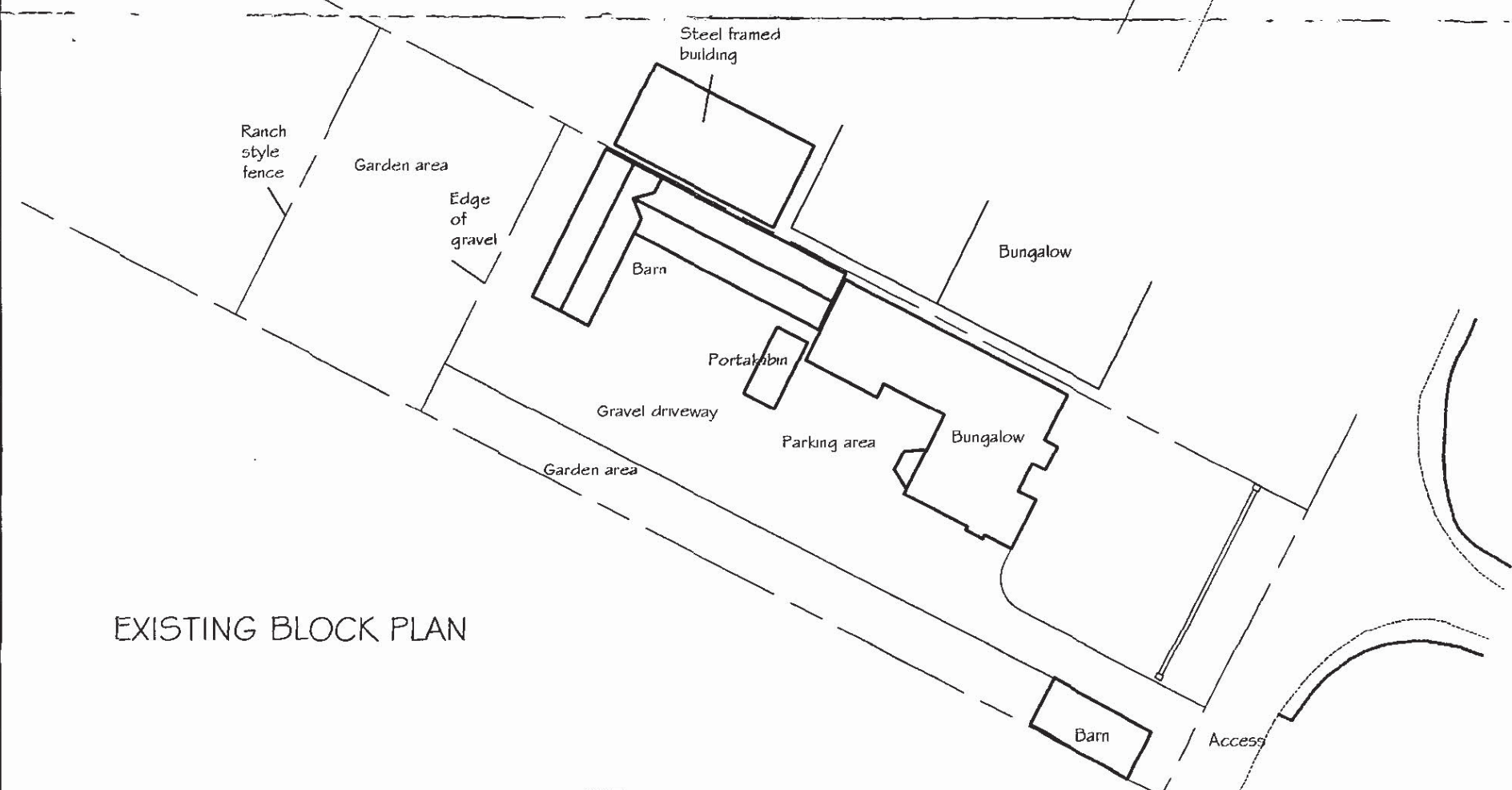
DRAWING TITLE

OS SHEET EXTRACT

DWG NR.

LOC 154.19.07.01

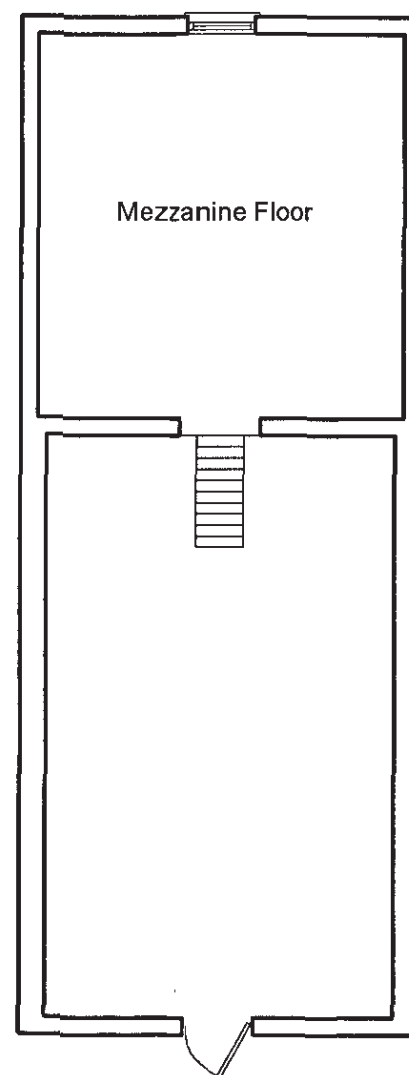
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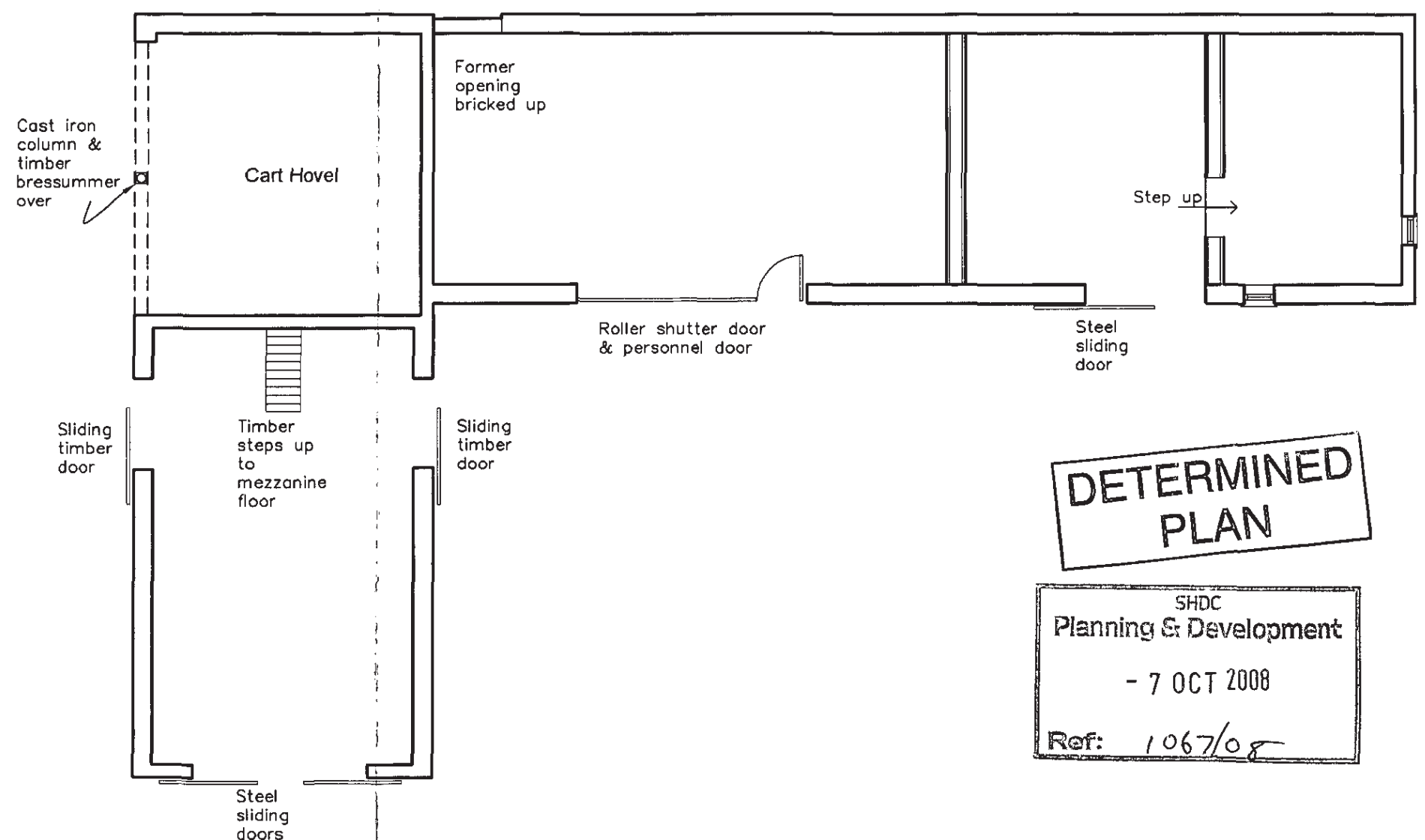
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M2 M2 BUILDING CONSULTANTS LLP 8 Teal Grove, Cowbit, Spalding, Lincs. PE12 6XG Tel: (01406) 380139 Email: info@m2-buildingconsultants.biz	PROJECT PROPOSED BARN CONVERSION AT WHITEHOUSE FARM STATION ROAD GEDNEY HILL			DRAWING TITLE BLOCK PLAN
	DRAWN GM	DATE SEPT 2008	SCALE 1: 500	DWG NR. LOC 154.19.07.02



FIRST FLOOR PLAN



GROUND FLOOR PLAN

EXISTING FLOOR PLAN LAYOUTS

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STATION ROAD GEDNEY HILL

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DATE
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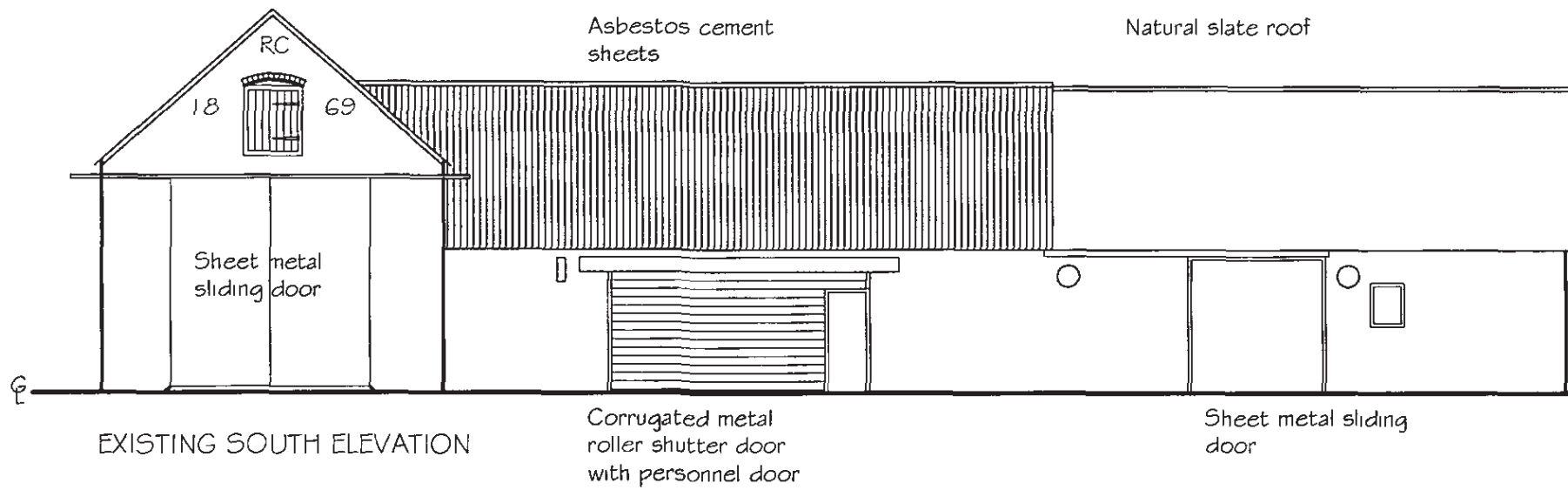
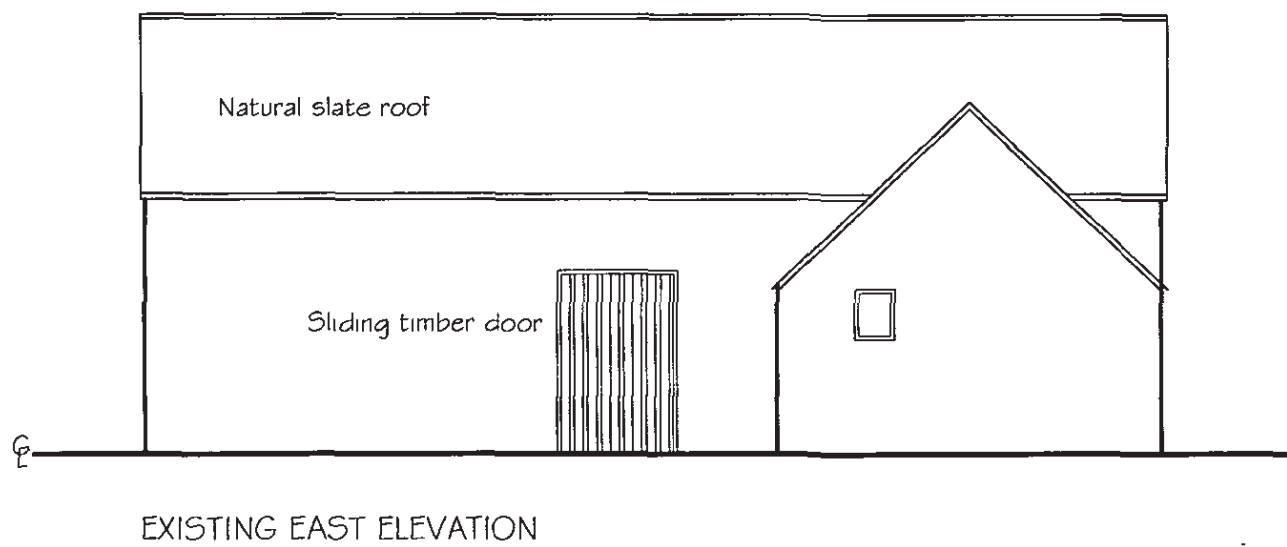
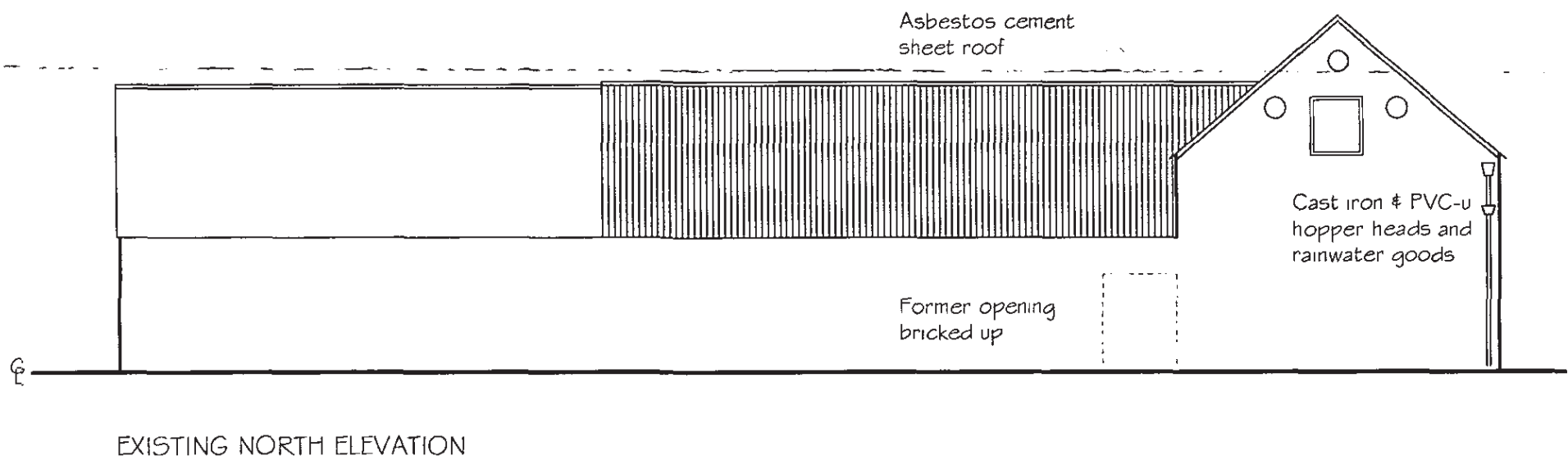
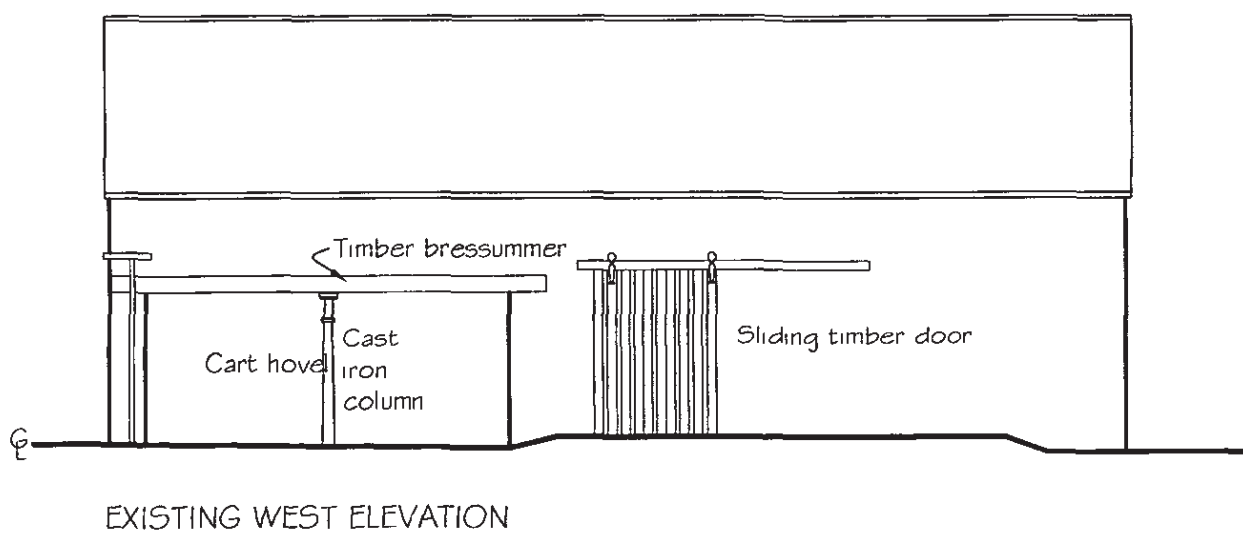
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DRAWING TITLE
EXISTING LAYOUT PLANS

DWG NR.
LOC 154.19.07.03

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PROJECT
PROPOSED BARN CONVERSION AT WHITEHOUSE FARM
STATION ROAD GEDNEY HILL

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GM

DATE
SEPT 2007

SCALE
1: 100

DRAWING TITLE
EXISTING ELEVATIONS

DWG NR.
LOC 154.19.07.05

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Ref: 1067/08

Structural Inspection

DETERMINED
PLAN

Whitehouse Farm
Gedney Hill

November 2007



MK Design Associates
Consulting Structural and Civil Engineers

1.0 Introduction

- 1.01 Further to instructions received the Author visited Whitehouse Farm at Gedney Hill to carry out a structural inspection of an existing barn at the rear of the main property. The purpose of the inspection was to give a general report on the condition of the structural fabric to the barn and to comment on its suitability for conversion into a habitable building.
- 1.02 Vehicles stored and stored materials either inside the barn or directly against the walls of the barn prevented a full inspection of all of the internal/external walls.
- 1.03 The inspection is confined to the main barn itself no other part of the existing property or any other outbuildings or boundary walls have been inspected.

2.0 Property Description

- 2.01 The barn is accessed via a gravel driveway past the main house towards the rear of the site.
- 2.02 The site topography is generally flat. No significant vegetation is present in the vicinity of the barn. Small trees and shrubs are present on the other side of the driveway.
- 2.03 For the purposes of this report the South facing elevation is assumed to be the front elevation ie the elevation facing the driveway.
- 2.04 The barn is 'L' shaped and consists of three sections. The tallest section is at the West end and consists of a thin slate covered steeply pitched roof supported off collared rafters and with brickwork external and internal buttressing walls.
- 2.05 On the internal corner this barn has a mezzanine floor constructed in timber.
- 2.06 The adjacent section of the barn running from West to East is not as tall and is asbestos cement sheet covered steeply pitched roof supported off collared rafters with brickwork external walls. There are no internal walls.
- 2.07 The third section has again a steeply pitched roof the same pitch as section two covered with thin slate off collared rafters with brickwork external walls and a central buttressing brickwork internal wall.

3.0 Ground Conditions

- 3.01 Published ground conditions for the area indicate that the site is located on the Barroway Drove beds which are marine alluviums.
- 3.02 Whilst published geological information and local knowledge are useful in assessing any given site, the precise geotechnical/geological conditions cannot be determined without undertaking such laboratory testing, trial holes and boreholes as directed by The Engineer, as necessary.
- 3.03 Trial Pit No. 1 which is up against Unit 3 just to the right hand side of the door. The top of the foundation is approximately 225mm below ground. It is a stepped brick footing with two steps. The subsoil is a wet firm clay. We continued to auger down below the foundation on Unit 3 and we came across a very stiff grey brown moist clay with some sand content.
- 3.04 Trial Pit No. 2 was not fully excavated but it appears to be a similar type of foundation. The ground here was very wet.

4.0 Defects/Comments/Discussion

Unit 1

- 4.01 The South facing gable appears to indicate the date of the original construction of the barn 1869. This gable has a large sliding door at low level with a smaller opening in the gable at higher level.
- 4.02 The top of the gable leans inwards slightly this is common on long barns and is due to shrinkage along the length of the purlins and where the purlins sit on the gable wall there is a tendency to pull the brickwork in slightly.
- 4.03 Rotation has occurred at eaves and the bedjoint has opened up.
- 4.04 Generally the condition of the visible brickwork is quite good and there is no evidence of any significant cracking.
- 4.05 The ridge line to the West elevation undulates and appears to sag slightly between the internal buttressing wall and the gable end walls. The slate covered roof is reasonably intact but the odd slates are displaced or damaged.
- 4.06 At the right hand end of this elevation there is no evidence of any significant cracking. There is a central sliding doorway there is evidence of movement above the right hand side of this opening. The cracks have been filled in with a sand cement mortar and further movement has occurred since the repointing which is up to 3mm wide. This is evidence of possible ongoing movement.

- 4.07 Similar diagonal cracking is present above the left hand side of this door opening. Again it has been repointed with a sand cement mortar and has reopened again. The reopened crack is up to 10mm wide.
- 4.08 A metal gutter is present but has not been properly jointed. This turns around the left hand end of the gable into a new plastic downpipe.
- 4.09 At the left hand end of this elevation the bottom section underneath the mezzanine floor forms a cart hovel and on the front elevation a 225mm square timber lintel has intermediate support off a cast iron column. The timber beam is generally in quite poor condition and at the left hand end bearing has rotted through very badly.
- 4.10 In the brickwork above this end a very large diagonal crack is present. Again this has been repointed but has reopened again to approximately 12mm.
- 4.11 The main floor joists are 180mm x 65mm at 400 centres. These span front to back without intermediate support.
- 4.12 The joists generally appear to be in good condition and some of the joists are fixed back to the brickwork with iron straps at the front and the rear.
- 4.13 The floorboards are in slightly poorer condition. There is evidence of water ingress in localised areas and there is also evidence of beetle attack.
- 4.14 The gable wall to the cart hovel is very wet at low level and there is evidence of frost damage. The ground at the surface appears to be wet and moss covered.

- 4.15 There is evidence of salts on the inside corner joining the gable to the return buttress. Again evidence of damp and in some cases at low level on the return buttress wall there is severe frost damage. There are also salts present on the internal dividing wall the other side of the wall to the cart hovel also at low level.
- 4.16 There are two rainwater pipes on the left hand corner of this elevation. They are both replacement plastic.
- 4.17 There is diagonal cracking emanating from the bearing of the cart hovel timber beam onto the internal dividing wall. This cracking is up to 4mm wide.
- 4.18 On the East elevation of Unit 1 the slate roof covering appears to generally be intact with the occasional damaged or dislodged slate.
- 4.19 The gutter is a metal gutter with simple overlapped joints. A central old cast iron rainwater pipe is present but this is broken and water now discharges down the wall causing frost damage and dampness to the masonry below.
- 4.20 This elevation is partially obscured at ground floor level by an old caravan. Cracking is evidence however at high level over the door opening. This is diagonal and has been repointed but has not reopened.
- 4.21 The rafters to the main roof are approximately 84mm x 35mm at 330 centres. The timbers generally appear to be in good condition.
- 4.22 The roof has been recovered and sarking felt has been laid over the rafters. In one area the sarking felt has been damaged near the valley gutter.

- 4.23 The mid height support purlins are only 70mm deep and 90mm wide. These are grossly inadequate to support the loads and in fact roof spread has occurred.
- 4.24 The purlins span between collared rafters which are approximately 2.5 metres apart. The rafter size of the collar position has been increased to 85mm x 65mm.
- 4.25 The front wall above the cart hovel leans out by up to 150mm and this is probably responsible for some of the cracking present at each end. The diagonal cracking internally is up to 15mm wide on the wall above the timber beams. At the junction of the gable wall and the internal wall movement up to 25mm has occurred at the top of the wall.
- 4.26 The wall thickness reduces to 200mm at high level gable where the purlins are strapped in. At eaves level there is a built in timber tie but this has suffered severe beetle attack and has rotted through.
- 4.27 There is evidence that water is getting through into the roof space through the valley gutter adjoining units 1 and 2 at the rear side and this has damaged the floor timbers. This area of the floor is not safe to walk on.
- 4.28 The internal wall which also has the rafters pushing outwards on it is relatively plumb.
- 4.29 The roof over the full height section of the barn is constructed in a similar way but collared trusses are present every fifth rafter which is probably why the wall does not have as big a bow in it. Some lateral movement has occurred however and the diagonal cracks over the openings on the West and East elevation are reflected internally. A single eaves tie is present centrally located. The floor to this section of the barn is the same level as the outside ground. This appears to be in good condition.

- 4.30 Generally the condition of the brickwork internally in this area of the barn is much better and the damage at low level much less except for the internal dividing wall which has salts present as on the other side.
- 4.31 The front and rear walls appear to be 330mm thick with the gable wall with the opening 225mm thick and the rear gable wall 330mm at low level and 215mm thick at high level.
- 4.32 A diagonal crack is present just inside on the left hand side opening where the left hand side of the opening joins the return wall.

Unit 2

- 4.33 The asbestos cement covering visible from the front elevation appears to be reasonably intact.
- 4.34 The junction between Units 1 and 2 is made via cement haunching which again appears to be reasonably intact.
- 4.35 The roofline is reasonably level with perhaps a slight dip towards the centre of the unit. The roof construction is similar to Unit 1 with ties with high level collars every fifth rafter. Eaves ties have been slung across on the left and right hand sides of these barns and used to store materials. These sections are woefully inadequate for the span.
- 4.36 The purlins have scarf joints which are just nailed and some lateral spread of the roof has occurred at these points.
- 4.37 The rear wall leans out by approximately 100mm due to roof spread.

- 4.38 At the left hand end of the rear wall a gap exists over a recessed area of masonry a gap of up to 25mm wide.
- 4.39 The rear wall has been rendered at low level for part of its length. The render appears to be intact.
- 4.40 Severe frost damage has occurred internally on the front wall to the left hand side of the door entrance as you look from the outside. This is obviously due to water getting into the roof and appears to be longstanding. It may have been that the ingress of water may have been prevented when the barn was re-roofed.
- 4.41 At the right hand end internally at the junction of the internal dividing wall and the rear wall a vertical crack exists up to 10mm wide. A similar crack is present at the junction of the front wall to this dividing wall running vertically at high level and extending diagonally on the internal dividing wall at low level.
- 4.42 The front elevation has no guttering present. The brickwork generally appears to be in reasonable condition. There is evidence of a previous cast iron rainwater pipe which has now disappeared.
- 4.43 The large span timber beam again appears to have suffered beetle attack and is quite rotten in places. Repair work has been done at the left hand end where the front wall of Unit 1 joins the side wall to Unit 2.

Unit 3

- 4.44 The roof covering viewed from the front elevation appears to be reasonably intact with the odd dislodged damaged slate. The roof undulates between the internal support walls and the right hand gable.

- 4.45 There is no gutter present to this roof slope. Pattress plates are present to the left hand end and towards the centre of the front elevation. The front elevation brickwork on the left hand side has clearly dropped with respect to Unit 2 with extensive diagonal cracking up to 8mm wide. The masonry to the right hand side of this opening is in better condition but is quite damp at low level. A diagonal crack is present over the window up to 10mm wide.
- 4.46 Internally the roof is constructed in the same way as the other units. There is no sarking felt under the slates here and it is obvious that there has been water ingress here as some of the rafters appear to have been damaged. There is no sarking felt on the rear face and some of the rafters in this space have been damaged.
- 4.47 The rear wall is in reasonable condition but has suffered some frost damage at high level due to water ingress through the roof but there is no significant cracking.
- 4.48 It is clear that the major cause of the cracking to the brickwork at the left hand side of this opening is lateral spread as the wall immediately adjacent to the opening on the left hand side is leaning outwards.
- 4.49 The internal buttressing wall is 330mm thick. Access into the room beyond this was restricted however the brickwork walls that were visible appear to be in reasonable condition. The cracking over the window is reflected internally and there has been up to 25-30mm of movement in this area.
- 4.50 Again in this room the back slope has not been felted. There are numerous missing slates and water is getting into the building both at low levels and high levels.
- 4.51 A large vertical crack up to 15mm wide is present in the rear wall to Unit 3 when viewed from the neighbours property.

5.0 Summary of Conclusions & Recommendations

- 5.01 We can conclude that the property has suffered severe structural damage which may be classified as Category 4 in accordance with BRE Digest 251.
- 5.02 The Category 4 damage is localised and confined to the following areas.
- 5.03 There has been very significant roof spread above the first floor on Unit 1. This is because the purlins are grossly undersized and the collared ties are too far apart. The wall over the cart hovel beams leans out by up to 150mm and is therefore unstable. The gable above eaves level is also unstable as the timber embedded in it is rotten. The large timbers supporting the front wall to the cart hovel are also rotten. The area inside the cart hovel we understand is a low point and water ponds in this area after a heavy rainfall. Rainwater pipes also discharge directly into the ground at this end of the building. The brickwork at low level is saturated and it is this that is causing the salts to form. The first floor joists span 4.6m clear.
- 5.04 We recommend that the roof structure at this end of Unit 1 is removed together with the North gable wall above eaves and the cart hovel beams and wall over. The floor beams will require intermediate support if they are to be used in part of the conversion. A drainage channel run will be required along the front of the cart hovel to intercept any run off. The rainwater pipes on this corner and the drainage channel must be connected to an underground system that discharges rainwater at least 5 metres away from the property walls. The walls can be rebuilt using reclaimed masonry after replacing the cart hovel beams. The roof can be rebuilt using trusses or larger purlins designed to limit future roof spread. Great care will be needed with the demolition above the cart hovel as the walls are potentially unstable. A competent demolition contractor is required and they must carry out a risk assessment and prepare a method statement for the demolition. This work should be carried out as soon as possible and until this happens the area in front of the cart hovel should be sectioned off with a dangerous structure notice posted. Access to the mezzanine floor should also be prevented.

- 5.05 The other Category 4 damage is present on the front elevation to Units 2 and 3. The openings in this wall have rendered it less resistant to roof spread. In addition in the absence of a rainwater pipe water has been cascading down this wall and softening the soil under the footings. The roofs to Units 2 and 3 are not adequate to resist roof spread and they would need to be replaced. The front wall will need to be reconstructed on new foundations using the original bricks where possible.
- 5.06 The barn walls are substantial (330mm thick brickwork) and the buildings generally are suitable for conversion to dwellings provided the measures described in 5.04 and 5.05 are carried out. Once roof spread has been eliminated by the provision of a new roof structure and a new above and below ground drainage system is installed to discharge rainwater away from the building then the structure should stabilise.
- 5.07 The existing barn foundations are shallow and seasonal cyclical movement is possible as the clay near the surface dries out in summer and rewets in winter. This is not a problem structurally and the effects can best be minimised by dry lining internally and by using an impermeable surface (eg paving) immediately outside of the external walls.
- 5.08 The remedial works required are summarised on a sketch in the Appendix of this report.

Signed:



Mike Kirkham BSc (Hons.), C.Eng.M.I.Struct.E.

Date: 31st October 2007