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LUDLOW TOWN WALL
TO THE NORTH OF ST LAWRENCE CHURCH CHURCHYARD
LUDLOW
SHROPSHIRE

STRUCTURAL OPTIONS REPORT

Client: Ludlow Town Council
The Guildhall
Mill Street
Ludlow
Shropshire SY8 1AZ

Date: December 2021

Reference: EJM/CH/10384~Structural Report rev 0

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Revision	Date	Comments	Name
0	07/12/21	Issue to LTC for comments	EJM

1.0 Introduction

1.1 The Town Wall running along the north boundary of St Lawrence's Churchyard was presumed to have constructed in the 13th century but has seen significant levels of repairs over its life.

1.2 An Historic Environment Desk-Based Assessment has been undertaken by FAS Heritage, to a brief prepared by Dr Andy Wigley, the Historic Environment Manager at Shropshire Council. This in included as Appendix A and includes more detailed information in relation to the history and development of the wall. The section below is taken mainly from their conclusions.

1.3 The walls are constructed of locally sourced siltstone or sandstone rubble, roughly coursed and bonded with mortar and consistent with lengths of surviving wall elsewhere. The wall core construction could be seen at the position of the collapse and subsequently in cores. At the west end the wall can be seen to be built off a sandstone outcrop. The surviving length of wall between St Leonard's House and the collapsed area had up to seventeen courses of brickwork at the base.

1.4 Little diagnostic evidence survives to date the extant fabric of the wall, but historical sources indicate repairs in the 16th and 17th century, and the surviving fabric appears to represent various phases of repair, and in some areas, rebuilding.

1.5 Throughout the 19th century, and probably during earlier centuries, a series of outbuildings were constructed against the northern elevation of the retaining wall, and these relatively insubstantial structures are likely to have been altered and amended regularly. A length of wall to the immediate rear of The Compasses may represent a post-medieval building that was constructed against the town wall.

1.6 Within the churchyard, the GPR survey, see appendix B, suggests an earlier ground surface, identified at a depth of 4m below ground level in the northeast corner of the churchyard, would have sloped downwards from south to north towards the wall, and also downwards to the east.

1.7 In the post-medieval period, tenements encroached into the southern side of the medieval churchyard and would have increased demand for burial within this northern area. At some point, prior to the mid-19th century, the graveyard was raised and levelled with imported material. The retaining wall may have been raised or repaired at this point; associated brick seats and coping post-date this change. Burial continued within this area; a pathway and associated seats were laid out around the perimeter and avenue trees planted.

1.8 The collapse of 2013 has exposed the upper, thinner, part of the town wall that would formerly have been free-standing, and was not constructed to retain the level of material deposited behind it. The strata visible in the exposed section represents material imported to level the graveyard, rather than the former ground surface of the medieval churchyard, which will lie at greater depth in this area.

1.9 This section of town wall is designated as both a Scheduled Monument (NHLE ref. 1006278) and a Grade II listed building (NHLE ref. 1291658). It extends eastwards for approximately 65m from the rear of St. Leonard's House to the rear of The Compasses public house. For much of this length the walls form both a retaining wall and the northern boundary of the closed churchyard that surrounds St. Lawrence's Church.

1.10 The significance of the walls relates to its historic value of an important thirteenth century structure and one of the most complete surviving examples of a town wall. Its function may have been more controlling as opposed to defensive.

1.11 St Lawrence Church is principally of the fifteenth century, is Grade I Listed and sits within the churchyard which was closed in 1854 with the burial numbers likely to run into thousands.

1.12 The section of the town wall immediately to the east of the Western Power substation collapsed on 18 February 2013 after a prolonged period of wet weather. A further collapse took place two days later on the 20 February 2013, after which Shropshire Council undertook emergency stabilisation works to protect public safety and prevent any further falls.

1.13 The Morton Partnership Ltd have been appointed to review and assess collapse to try to understand the reasons behind it, and set our options for repairs. A scoping report was prepared in April 2018 setting out suggested investigation which have culminated in the current report.

2.0 Investigations

Measured Survey and Recording

2.1 A measured survey and rectified photographs have been prepared which assist in acting as the record of condition at the time of the survey, post collapse and is included as appendix D). We also include a selection of photographs taken by The Morton Partnership Ltd. over the course of the investigations and beforehand in appendix K.

Trees

2.2 Dougald Purce, Tree & Woodland Amenity Protection Officer for Ludlow from Shropshire Council kindly provided a preliminary arboricultural assessment particularly related to the trees in the churchyard in 2018. This is included in appendix E. The report will be used in relation to the full scope of repairs when agreed.

2.3 Further assessment work from an experienced arboriculturist will be required, and subject to the works proposed, potential for a tree protection plan, and arboricultural method statement to ensure contractors work within agreed prescribed limitations related to the trees, although the conclusions of the report need to be considered.

2.4 It should be noted that some tree roots have been seen growing into the core of the wall by the collapsed section or close to this (see photograph 17).

Ecology

2.5 A Preliminary Ecological Survey with a Bat and Bird survey was undertaken by Greenscape Environmental Ltd in 2019. The report is included in appendix F, and the results will need to be used for the permanent repairs, when agreed, along with any additional surveys required.

Wall Cores

2.6 Cores drilled through the wall were agreed and with the first stage investigations including 7 Nr. cores, which comprised 2 Nr. lines of three cores which required scaffold, and then 1 Nr additional core agreed due to the findings. These are shown on the rectified elevations included in appendix J.

2.7 The cores to the walls confirmed the matrix as mortar bonded siltstone with occasional blocks of sandstone. The western set showed the wall at lower levels to be circa 2.0m wide. The upper one at around churchyard ground level to be around 0.7m wide. To the eastern set, the wall was only around 0.8-0.9m wide at lower level and slightly wider above. A further core was taken (following agreement with Historic England) off set to check this was not an isolated change, but the thickness was the same.

2.8 The thickness of the wall to the eastern section was significantly less than required structurally, and we considered greater certainty was required to establish if the initial results were local to that area or widespread. By agreement a further set of four cores were taken. The positions are shown on the marked up elevations included in appendix J.

2.9 The results of these cores were recorded by FAS and whom have indicated that all cores produced reliable results with a clear change to clay soil to the rear of the mortar bonded siltstone. The most eastern core within the lean-to produced a wall thickness of only 0.70m to clay which was less than the 1.00-1.36m produced by P4, P5 and P6. The second core in the lean-to slightly to the west produced a wall thickness of 1.90m. The next core (P11), just to the west of the three cores at the bottom of the wall undertaken in the first session, produced a wall thickness of 0.80m.

2.10 To the base of the wall on the eastern side of the collapse generally ranges between 0.70m to 1.36m thick, with one core producing a much thicker result at 1.9m which is comparable to the base wall thickness recorded on the western side of the collapse during the first session.

2.11 The results at the eastern end indicate that the base of the wall shows significant variation in thickness, but is largely not as thick as the higher middle portion of the wall (P5 - 1.5m). It is possible that the very thick result of P10 may represent a thickening related to some local collapse of the soil behind during construction, rather than a dramatic variation in thickness of the base of the wall in this area.

2.12 The result of the single core on the western side of the collapse was more reassuring. We had to drill at a higher level to avoid drilling into bedrock. The core was taken at 2.2m above external ground level. The core produced a wall thickness of 1.5m, to clay, at this level which is not dissimilar to the result of the slightly higher adjacent core through the middle portion of the wall from the first session (P2 – 1.6m). Although we have fewer cores on the western side of the collapse, the results seem to indicate a more consistent picture with a stronger thicker base.

Ground Investigation

2.13 A ground investigation was undertaken by Listers Geo with the full report being included in appendix H. This comprised both a desk-based assessment, 4 Nr boreholes, 1 Nr rotary corehole and setting up of groundwater monitoring.

2.14 Initial results with the water monitoring suggest some ground water in the churchyard boreholes since drilled, but since drained away. So, this may suggest that groundwater rises during or after rainfall events but then dissipates with time. Further monitoring is ongoing.

2.15 The geotechnical investigation identified the approximate bedrock position within the churchyard and in the road below. There appears to be a gradual drop below the churchyard, then a significant drop down within the road. The profile between provided in the report is assumed. The burial horizon within the churchyard seems to be between 2.5m and 3.5m below ground level in the area tested. The top 0.8m-1.3m appears to be imported made ground to raise the ground level (which ties in with the DBA report by FAS).

Mortar Analysis

2.16 The Skillington Workshop were appointed to remove face stones at the core positions, take mortar samples and analyse and make good the core holes. They have produced a report which is included as appendix I.

2.17 It is suggested that the bedding and core mortar samples would appear to be contemporary with the original construction of the wall. There is a strong possibility that the mortars for the core and bedding of facing stones were using a ‘hot’ mix of some sort. This may have been as simple as digging up nearby aggregate, evidenced by the mismatch of field pebbles and stone fragments in the samples, and banking up with quicklime. Skillington Workshop believe that the slaking of quicklime in this location would have been an unnecessary and convoluted step for the, relatively, simple process of building the wall.

2.18 We noted that their report also indicated that during the extraction of the samples the one overriding similarity of all of the bedding core samples was how wet they were. The samples were not extracted as cohesive mortars but rather wet and incoherent.

3.0 Possible Causes of Collapse

3.1 The wall to the east of the collapse, is theoretically not thick enough to support the sub-soil it retains, where it is between 0.8 and 1.36m wide. The wall at the west end near St Leonards House is more substantial and approximately the thickness required to retain the churchyard behind.

3.2 Initial discussion with the archaeologists suggests that the thickness of the wall may simply be due to variations in the cut face of the clay soil/subsoil including soil collapse during construction. This is considered to be more likely than reverse buttresses.

3.3 Of course, when initially constructed the ground levels behind the wall appear to have been much lower and therefore the retaining function of the wall was significantly less than is the situation currently.

3.4 The wall has clearly survived for some time in its current form, albeit from the investigations undertaken we now consider this condition to be tenuous. Structures abutting this may have assisted acting as buttresses, past and present.

3.5 So, if we are looking for a trigger, the most likely candidate appears to be build-up of water in the sub-soil behind the wall which will add pressure and apply greater force to the wall.

3.6 It is speculated that climate change may have played a part, in relation to the more significant rainfall events which are occurring which 'charge' the ground with water which cannot naturally disperse quickly enough. We are aware of other instances of this possible causation, which may be responsible for the collapse of historic structures. Certainly, we are aware that the wall collapse occurred after a heavy period of rain, and the mortar is described as 'rather wet and incoherent' which suggests weaker.

3.7 So in conclusion based on evidence to date we consider the most likely cause of the collapse is a build-up of water pressure in the sub-soil behind the wall, linked with apparent degradation, from moisture saturation, of the wall mortar, and inadequate thickness of masonry to resist the retained churchyard sub-soil. Tree roots within the wall matrix may have aggravated the problem by root pressure through growth, or allowing further water into the wall core or indeed blocking pores reducing water leak paths.

3.8 Structures built against the wall, historically, may have provided a buttressing effect to the existing wall, so help resist the thrust from the retained sub-soils.

4.0 Options

4.1 A number options are considered below and included on drawings included in appendix J. Options A to F were discussed with Alex Evans, Principal Structural Engineer and Structural Engineering Team Leader at Historic England and Option G was added subsequently following the discussion.

4.2 The options are considered in relation to the wall to the east of the collapse area, where it is not particularly thick. It should be noted that all options will require the existing wall to be consolidated prior to works commencing. This will include grouting, removal of cement based mortars, and re-pointing, some deep.

4.3 Drawings of the options are included in Appendix J showing the options indicatively. Full design would need to be undertaken to verify all the details but the drawings are sufficient to set out the principals.

4.4 It should be noted that many of the buildings currently in front of the wall would be impacted by these options, either in terms of temporary works or indeed permanent works. It should be noted one of these buildings immediately to the west of the collapse is an electrical sub-station, so any works which impact this will need agreement and could have significant cost implications. Of course there are associated land ownership matters would need to be considered.

Option A (see drawing 10384/10)

4.5 This will involve the excavation of the churchyard behind the wall at around 45 degrees to create a working space to construct a new reinforced concrete retaining wall behind the scheduled wall.

4.6 The existing wall would need to be temporally propped in its free-standing state, to both sides, and the exposed rear face consolidated as it becomes exposed.

4.7 The new reinforced concrete wall will be designed to support the churchyard soil and thus relieve load from the scheduled wall. A toe is included to resist sliding action. A French drain is included behind the new wall to collect surface water run off from the churchyard, which would then be discharged through the wall to either existing of new drainage to the road side.

4.8 The gap between the new wall and the retaining wall will need to be backfilled with consolidated inert fill material in compacted layers. This creates a 'buffer' zone to help protect the historic fabric and to resist salt transfer from the concrete into the masonry. On completion of the works the excavated area will be re-filled with removed material in compacted layers.

4.9 These works will have a very significant effect on churchyard burials with the extent of cut required, although it may be possible to reduce the angle but using soil stabilisation to the cut with ground reinforcement mats etc. A large number of burials are likely to be impacted and with associated high costs. The trees will need to be removed.

4.10 Access to the churchyard is very limited for any plant with no direct route for access. Options may include either lifting plant into the Churchyard from the road to the north of the wall, but following temporary shoring to the face, to avoid surcharging the wall from above. Alternatively it may be possible to use College Street and lift plant up into the churchyard from this (possible with temporary removal of the railings), albeit it should be noted that the width of the road is restricted alongside St Leonards House. A final option may be to use the collapsed area to form a graded route up into the churchyard, although the height between the road and churchyard may require such a long ramp to make this unfeasible.

4.11 A significant area will be required for stockpiling the removed material, prior to re-use in backfilling, although an extent of material will need to be removed from site as well.

4.12 We consider this option has too great an impact on the churchyard, burials and with very high costs.

Option B (see drawing 10384/11)

4.13 This is a similar option in terms of the construction of a reinforced concrete wall with French drain, and backfill between this and the scheduled wall. Temporary propping will be required.

4.14 The main difference is that the working area behind the existing wall is formed by using trench sheeting and then flying shores between this and rear face of the existing wall. The thrust from this will then be transferred into the external raking shores constructed to the north face of the wall. The rear face of the existing wall will need to be consolidated as it becomes exposed through the sequential formation of the excavation.

4.15 Clearly the impact, and associated costs, of impacts on the churchyard are reduced reasonably significantly but similar issues for access for plant and stockpiling removed material is required. The flying shores clearly restrict the working access and thus are likely to increase costs for construction. These will extend in holes cast into the wall, which will then be infilled, on curing of the concrete, and removal of the temporary works.

Option C (see drawing 10384/12)

4.16 Again this has a reinforced concrete wall formed behind the existing wall, with the variation being that rather than trench sheeting and flying shores, the existing churchyard is retained by a temporary sheet piled wall. The sheet piling will need to be driven into the bedrock, as suggested in the Listers Geo report, although the existing structure will need to be temporary propped to help resists any vibration caused by the mechanical action of the piling, although statically-driven (pneumatic) systems may be possible to reduce these potential effects.

4.17 Similar issues for site access, stockpiling removed soils etc. exist as the preceding options.

Option D (see drawing 10384/13)

4.18 This is an option of retaining the existing wall in its entirety and using ground anchors to provide support to the wall to resist overturning or collapse due to the retaining effect. The anchors would be non-ferrous and with large pattress plates seen to the face of the wall. A significant quantity would be needed along the face of the wall and we suspect at no greater than 2.0m centres and in rows in the height of the wall of 2 or 3. The pattress plates would need to be large enough to ‘hold’ a good area of the face of the stonework.

4.19 One type of ground anchor is a duckbill anchor which is drilled into and then withdrawn slowly until the duckbill head rotates and then provides resistance to pull out. However the churchyard backfill soil is unlikely to provide sufficient strength for this.

4.20 An alternative would be to use long anchors extending down and drilled into the bedrock (https://aarsleff.co.uk/services/techniques/geotechnical/ground-anchors/). This would still impact on burials to an extent, and we would need to be confident that the wall is adequately supported with sufficient ties and associated plates. The addition of a French drain to the rear to say at least 2.0m depth, with new weep holes through the wall, would help reduce the water pressure build-up to the rear of the wall.

4.21 Temporary works will still be required to ensure stability whilst the works are undertaken, although where the wall is found to be thicker the works may be able to be modified to reduce the number of anchors required or omit completely. One benefit of this option is that the core drilling through the wall at such regular centres will 'prove' the wall thickness and allow proposals to be adjusted.

4.22 The practical aspects related to access, spoil storage etc. are much minimised, but the visual aesthetic of the wall will be changed, although the design of the exposed pattress plates can be designed to suit and varied from traditional cast iron 'off the shelf' options to purpose made and unique designed ones.

Option E (see drawing 10384/14)

4.23 This is a traditional option for strengthening retaining and freestanding walls by the addition of buttresses. We consider that these will need to be at no more than 3.0m centres, and probably closer to 2.5m related to the thickness of the wall and the quality of the construction of the existing wall seen.

4.24 The foundations for the buttresses will need to be taken to the bedrock, which will need to be proved next to the wall. The single borehole set in the road found bedrock at considerable depth, perhaps suggesting the wall was either built onto a natural escarpment, to improve its defensive qualities, or that a ditch was excavated.

4.25 The buttress's will be around 750mm wide and need to abut and be fixed into the existing wall with the stainless steel anchors. A French drain to the rear as Option D would assist in reducing water pressure build-up behind the wall.

4.26 The form of the buttress can be varied and if formed with a reinforced concrete core, faced with masonry, the size can be reduced. This would need to have fixity to the bedrock to avoid slipping.

4.27 The character of the wall will be changed by the buttresses although this a very tractional response to the problem and partly replicates possible previous buttressing effects through buildings built alongside. There will be clear reduction in land usage along the wall and existing buildings will be affected.

Option F (see drawing 10384/15)

4.28 This option essentially seeks to reduce the effect of the retained soil in the churchyard by removing this and grading up to the churchyard to the south. The soil bank can be assisted by ground mats or similar to ensure longer term stability and avoid slippage.

4.29 In addition to the above a French drain would be formed behind the wall to reduce the impact from water pressure build-up.

4.30 This clearly still has impact on the churchyard and burials but to a lesser extent than options A, B and C. As the wall to the rear would remain exposed then consideration of works to 'dress' this may be necessary. Some temporary works will still be necessary.

4.31 This is the least intervening option, but cannot be a guaranteed solution as the wall is theoretically not thick enough to support even a reduced ground level (assuming it may be dropped by 1.0 to 2.0m.). However, this should be assessed against the past satisfactory performance of the wall as well. Using some ground anchors (Option D) at low level would provide greater strength and certainty.

Option G (see drawing 10384/16)

4.32 This option seeks to support the existing wall by building a new structure in front. The options shown is formed of steel UC sections driven into bedrock, similar to the sheet piling in option C, but then used to support pre-cast concrete planks between. As these are inserted the gap behind would be backfilled with an inert compacted material. Temporary support of the wall may be required for the driving of the steel sections.

4.33 Once installed then the new construction can be faced up with new stone. The style and form of this can be varied to suit aesthetic preferences. Careful consideration for material for the steel sections will be necessary to ensure long term durability, balanced with cost.

4.34 Of course the historic wall will become completely encapsulated by the new wall construction, but will require minimal works and will be maintained insitu. Consideration will still need to be given to draining behind the wall or creating some weep holes through to relives water pressure in the churchyard.

4.35 A variation of this option would be to from a new foundation and build a masonry new wall in front, fixed back to the existing with stainless steel fixings to create a wider overall wall with sufficient strength to support the retained material. Drainage would need to be considered as above.

Collapsed Wall

4.36 A scheme will need to be developed of temporary support to churchyard and removal of the collapsed material to allow safe working room.

4.37 Once achieved, subject to the exposed, we anticipate a wider wall will need to be created. This will require a new section of foundation to the rear and then building up, we suggest a brick wall which will be faced with masonry to the front to replicate the current walling. The brick will be stepped to the rear to reduce thickness in height and with a French drain formed behind.

4.38 The new section of wall will need to be designed to link in with the retained strengthened lengths both in terms of its alignment, with a new wall if built in front as option G, or visually.

Western Length of Wall

4.39 The current cores results suggest a much improved thickness to the wall. If this is proved for the remaining section up towards the collapse then we consider this section of wall can remain with minimal works. These would include forming a French drain to reduce the impact of water pressure, and through consolidation.

5.0 Conclusions

5.1 This report sets out the desk based assessment and intrusive investigation works, to both try and establish the cause of the collapse as well as set out options for reinstatement of the collapsed length and mitigation works to the length of wall which has been found to be of insufficient width to support the retained soil behind.

5.2 The wall has clearly survived for some time in its current form, albeit from the investigation we now consider this condition to be tenuous to the length of wall to the east of the collapse. Structures abutting the wall, past and present, may have assisted acting as buttresses.

5.3 It seems likely that the trigger for collapse was a build-up of water in the sub-soil behind the wall, following a long period of rainfall, which will add pressure and apply greater force to the wall. This may be linked to climate change with the more significant rainfall events we are now experiencing in short periods with the ground not being able to natural drain quickly. The groundwater monitoring will assist with this understanding.

5.4 The removed mortar is reported as being moisture saturated and non-cohesive. Tree roots within and behind the wall matrix may have aggravated the problem by root pressure through growth or allowing further water into the wall core or indeed blocking pores reducing water leak paths.

5.5 Seven options have been presented in the report for consideration. Options A, B and C have significant impacts on the churchyard and burials and to an extent where we suspect they are not viable, either from impacts, costs or practical buildability difficulties.

5.6 Option D for the ground anchors drilled down into the bedrock appear to be a viable solution, but would be subject to further assessment by a specialist designer and potentially some test anchors. There are visual impacts of the pattress plates which need consideration.

5.7 Option E, buttressing and Option G, a new structure built in front of the existing wall, are viable and reduce the works within the churchyard, although a French Drain to reduce water pressure behind is still required. They both have clear visual impacts with one completely concealing the wall. There are long term land ownership issues to be considered.

5.8 Option F is probably the least interventionist option to the wall itself, but has impacts on the churchyard with the part ground lowering. Some works to the rear face of the wall will be necessary and possibly including a facing to both protect and make it more aesthetic pleasing. The difficulty with this option is that it may be difficult to provide a complete guarantee for the retained wall, although this would be reviewed in greater detail if this option was taken forward. A single row of ground anchors taken into the rock at low level would provide this assurance.

5.9 We do consider that it would be beneficial for the long term good of the wall that the trees are removed. Options A, B and C would theoretically allow retention, however the temporary condition with the excavation is, subject to an arboricultural view, likely to make retention unviable.

5.10 In conclusion we recommend that the Council advise which of the options set out should be taken forward for more detailed consideration and advice on budget costs.

5.11 Options D (ground anchors) and F (hybrid ground lowering and French Drain) may be favoured, as they have the least impact on the wall, and reduced impacts on road/land to the north of the wall, although temporary works will still have some impacts.

5.12 We recommend that this report is forwarded to other appropriate parties for consideration and in particular the PCC of St Laurence's Church (and the DAC), Historic England and Shropshire Council for their views. A meeting between the parties may be advantageous.

5.13 Subject to the narrowed down options we suggest it may be helpful to have prepared a combined construction and heritage impact assessment. The construction impact assessment would review the buildability of the options including access and plant, the impacts on the neighbouring land, indication of construction programme etc. The heritage impact assessment would review the impact on the scheduled fabric as well as any archaeological impacts.

5.14 Budget costs of the options can be obtained from the Quantity Surveyor based on the information provided in this report, although these will need to be considered as high level costs with caveats on a number of aspects and until a reasonable degree of design development is undertaken. Some further investigations or testing (anchors) may be required to reduce risk for the options being considered.

5.0 Limitations

5.1 It should be stated that we have not inspected parts of the structure unless specifically detailed in the report, which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the structure is free from defect.

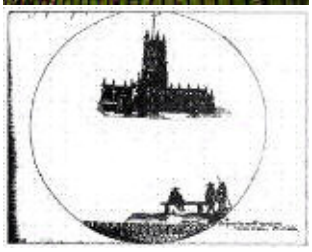
5.2 This report has been carried out to the Client's requirements and no liability is intended or will be accepted from any third party whatsoever.

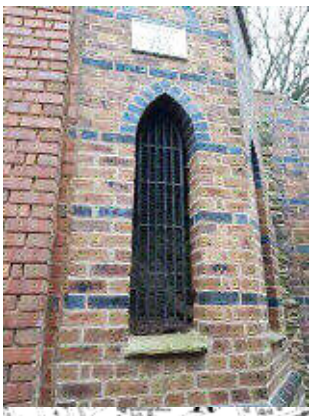
5.3 The limits of liability are restricted to the contents of this report. No opening up or investigation of foundations etc was carried out, the inspection being visual only, unless other set out in the report.

5.4 No checks on load bearing capabilities have been carried out.

APPENDIX A

Historic Environment Desk-Based Assessment
by
FAS Heritage





FAS HERITAGE

LUDLOW TOWN WALL

LUDLOW

SHROPSHIRE

HISTORIC ENVIRONMENT DESK-BASED ASSESSMENT

REPORT V.1

MARCH 2020

FAS HERITAGE

HISTORIC ENVIRONMENT DESK-BASED ASSESSMENT

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Summary

This document represents a Historic Environment Desk-Based Assessment (HEDBA) for a section of Ludlow Town Hall to the rear of St Lawrence's churchyard, Ludlow, Shropshire. The HEDBA has been prepared by FAS Heritage on behalf of The Morton Partnership for Ludlow Town Council, in response to a brief prepared by Dr Andy Wigley, Natural and Historic Environment Manager, Shropshire Council.

Archaeological and historical evidence has been collated and study of the fabric has been undertaken. This has shown that the town wall, as represented by the retaining wall along the northern edge of the churchyard, has seen significant levels of repair and alteration since construction, presumably in the 13th century. Exposed bedrock adjacent to St Leonard's House indicates that the natural topography was exploited in this area when the wall was constructed; it is not known whether there would also have been a defensive ditch flanking the wall at this point.

The wall is constructed from roughly coursed rubblestone, consistent with lengths of surviving wall elsewhere. Little diagnostic evidence survives to date the extant fabric of the wall, but historical sources indicate repairs in the 16th and 17th century, and the surviving fabric appears to represent various phases of repair and, in some areas, rebuilding. Throughout the 19th century, and probably during earlier centuries, a series of outbuildings were constructed against the northern elevation of the retaining wall, and these relatively insubstantial structures are likely to have been altered and amended regularly. A length of wall to the immediate rear of The Compasses may represent a post-medieval building that was constructed against the town wall.

Within the churchyard, evidence indicates that at least the upper parts of the wall would originally have been free-standing and possibly crenelated. GPR survey has indicated that an earlier ground surface, identified at a depth of 4m below ground level in the northeast corner of the churchyard, would have sloped downwards from south to north towards the wall, and also downwards to the east.

In the post-medieval period, tenements encroached into the southern side of the medieval churchyard and would have increased demand for burial within this northern area. At some point prior to the mid-19th century, the graveyard was raised and levelled with imported material. The retaining wall may have been raised or repaired at this point; associated brick seats and coping post-date this change. Burial continued within this area; a pathway and associated seats were laid out around the perimeter and avenue trees planted.

The collapse of 2013 has exposed the upper, thinner part of the town wall that would formerly have been free-standing and was not constructed to retain the level of material deposited behind it. The strata visible in the exposed section represents material imported to level the graveyard, rather than the former ground surface of the medieval churchyard, which will lie at greater depth in this area.

It is recommended that any repair work be the subject of archaeological and structural watching

brief, to ensure that any architectural details, or in situ archaeological deposits, are recorded.

Acknowledgements

FAS Heritage would like to thank Richard Cundall, Gina Wilding (Town Clerk, Ludlow Town Council), Andy Wigley and Giles Carey (Shropshire Council), James Brennan (James Brennan Associates) and staff at the Historic England Archives for providing advice, searches, reports and photographs towards the preparation of this report.

1.0 INTRODUCTION

This document represents a Historic Environment Desk-Based Assessment (HEDBA) for a section of Ludlow Town Hall to the rear of St Lawrence's churchyard, Ludlow, Shropshire. The HEDBA has been prepared by FAS Heritage on behalf of The Morton Partnership for Ludlow Town Council, in response to a brief prepared by Dr Andy Wigley, Natural and Historic Environment Manager, Shropshire Council. Research and report preparation were undertaken between June 2019 and March 2020.

1.1 LOCATION AND LAND USE

The HEDBA focuses on a 72m length of Ludlow Town Wall extending from the rear of St Leonard's House to the rear of The Compasses public house (Figure 1). The wall forms part of the northern boundary and retaining wall of St Lawrence's churchyard (Plate 1). To the north of the wall is a car park/yard area to the rear of the public house; St Leonard's House lies to the west, The Compasses public house to the east, and a series of brick garages and other buildings between. A length of the wall suffered significant collapse in 2013, and at the time of the reporting was fenced off for safety reasons, and the elevation netted and supported.

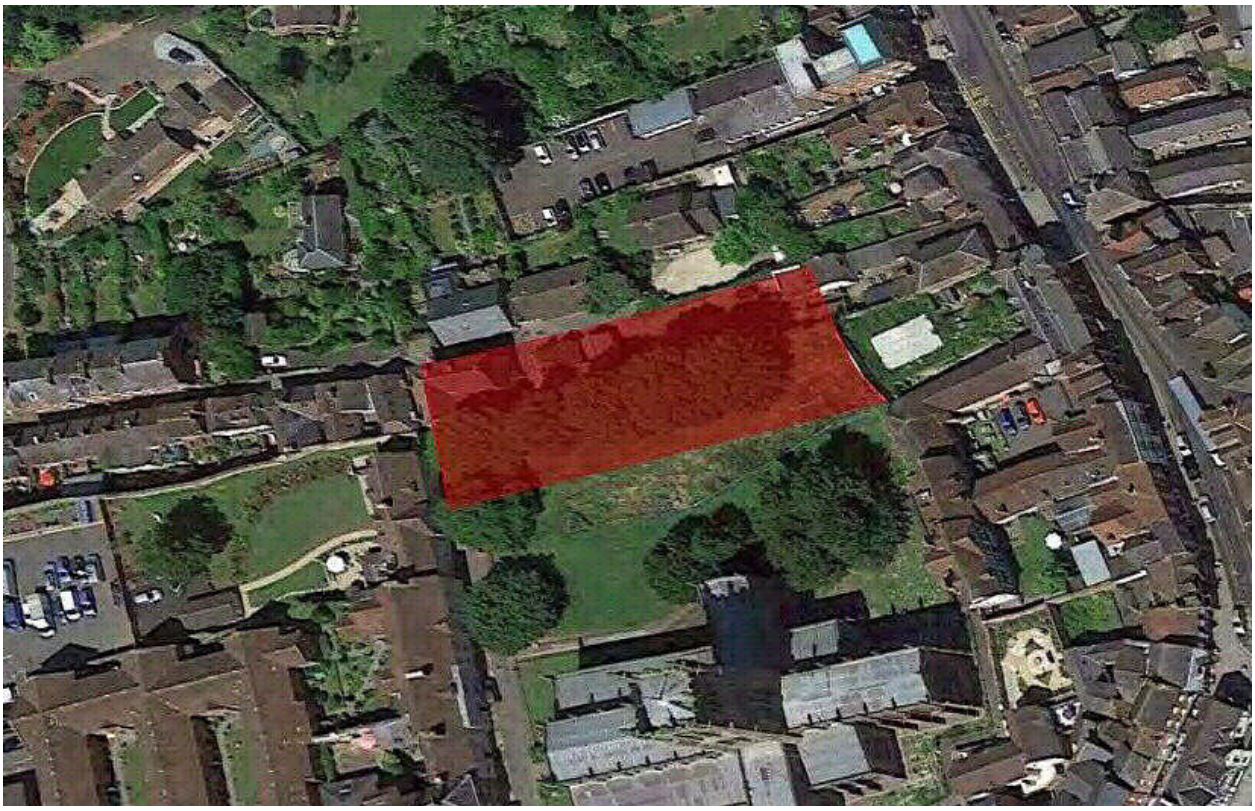
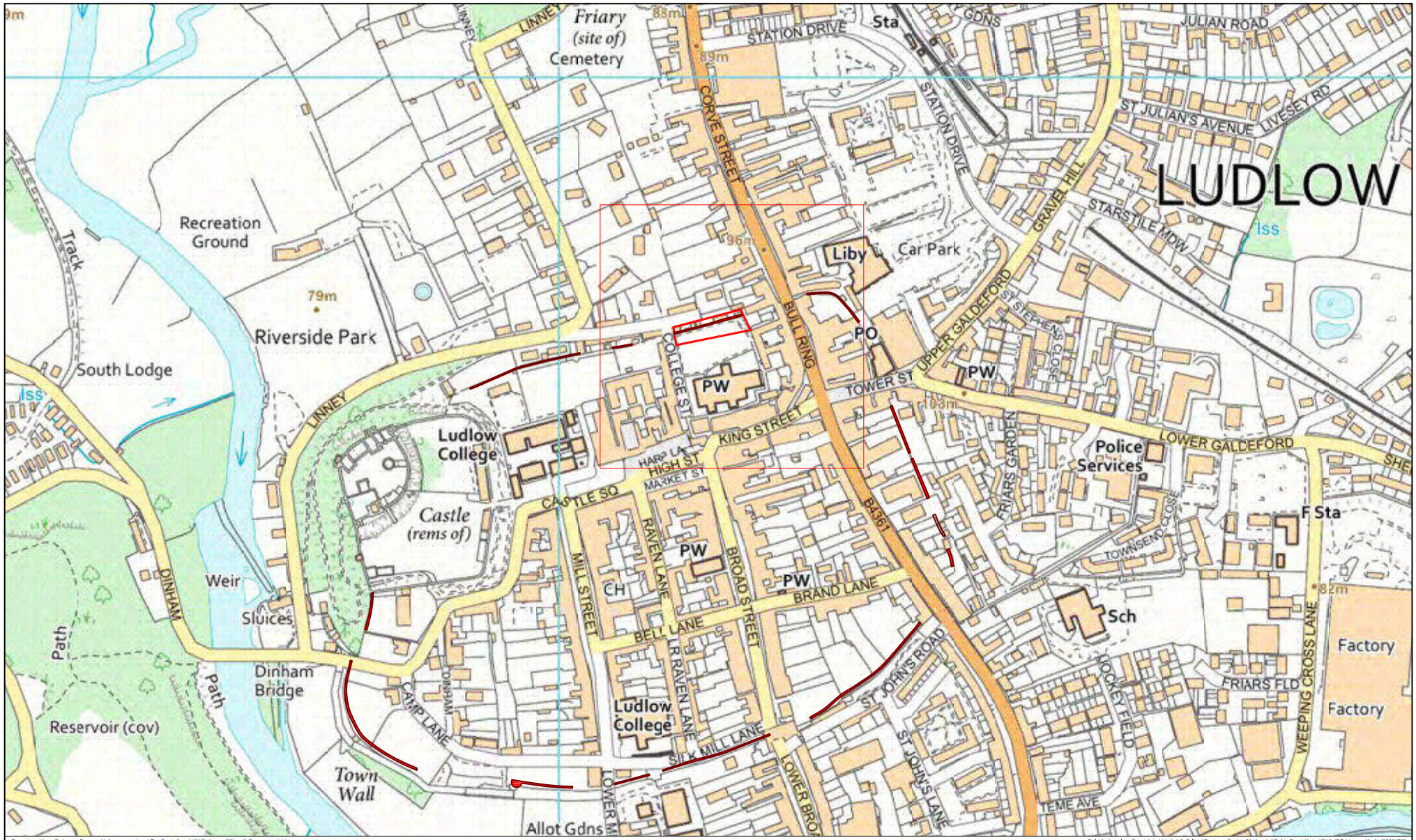


Plate 1 Aerial view of Ludlow showing the study area

1.2 AIMS AND OBJECTIVES

The wall to the rear of the churchyard collapsed in February 2013, and the overall aim of the HEDBA as set out in the brief is to provide an overview of the readily available archaeological, historical and conservation-status information of the town wall within the study area to inform design of a repair strategy.



Location and study area, with town wall

Scale 1:5000

Figure 1

In order to achieve this, two key objectives were set out:

- to assess the archaeological character of the town wall and its immediate surroundings within the study area;
- to assess the available information held by Ludlow Town Council and Historic England relating to the repair and maintenance of the town wall within the study area since the closure of the churchyard in 1854.

2.0 ASSESSMENT METHODOLOGY

The HEDBA was prepared in line with a WSI prepared by FAS Heritage and agreed by Dr Andy Wigley, Natural and Historic Environment Manager, Shropshire Council, and Dr Bill Klemperer, Historic England (Appendix A). A staged approach was taken, including:

- desk-based research, establishment of baseline;
- archival research;
- site visit and fabric inspection;
- reporting.

2.1 DESK-BASED ASSESSMENT

2.1.1 Study area

A detailed study area as defined in the brief is shown on Figure 1 and Plate 1, and forms the main focus for the HEDBA. A wider study area, also shown on Figure 1, was used for the purposes of documentary searches and establishing the wider context of this length of town wall.

2.1.2 Desk-based research

Information on statutory designations relating to the site and study area was obtained from the National Heritage List for England (NHLE), and information on known or potential heritage assets was collected through searches of the Historic England Archives, and Shropshire Historic Environment Record (SHER). Reports and photographs were provided by SHER, including reports made by Historic England (then English Heritage) inspectors. Historic England provided information on recent Scheduled Monument Consent applications, and Ludlow Town Council provided a series of records relating to the town wall.

Further information was obtained from Shropshire Archives, Shrewsbury (plans and documents). Historic Ordnance Survey maps were consulted online, and copies obtained as appropriate.

Copies of aerial photographs were obtained from Historic England Archives, Swindon, and aerial views were also consulted online (britainfromabove.org.uk).

A detailed publication, *The Walls and Gates of Ludlow: Their origins and early days* (Train 1999), has proved a valuable resource on the historical background to the town walls.

2.1.3 Gazetteer

On completion of data collection, a gazetteer was prepared, including each heritage asset identified within the study area (Appendix B). Appendix C includes summary information on events that have taken place within the study area. This information has been used to provide the archaeological and historical context for the relevant section of wall.

2.2 SITE VISIT AND FABRIC INSPECTION

A site visit was carried out in December 2019, to look at the immediate context of the wall and the churchyard.

On removal of the protective netting in February 2020, James Brennan Associates undertook detailed photography of the wall, which has provided close-up detail of areas that could not be safely accessed, and allowed the fabric to be considered in more detail.

3.0 HERITAGE BASELINE

3.1 STATUTORY AND NON-STATUTORY DESIGNATIONS

Heritage designations are shown on Figure 2.

3.1.1 Listed Building

The circuit of Ludlow Town Wall is designated as a sequence of ten Grade II Listed Buildings. The length of wall that forms the focus of this study is designated as the 'Town walls from site of Linney Gate, eastwards' (NHLE 1291658; HA1; see Appendix D for the Listing description).

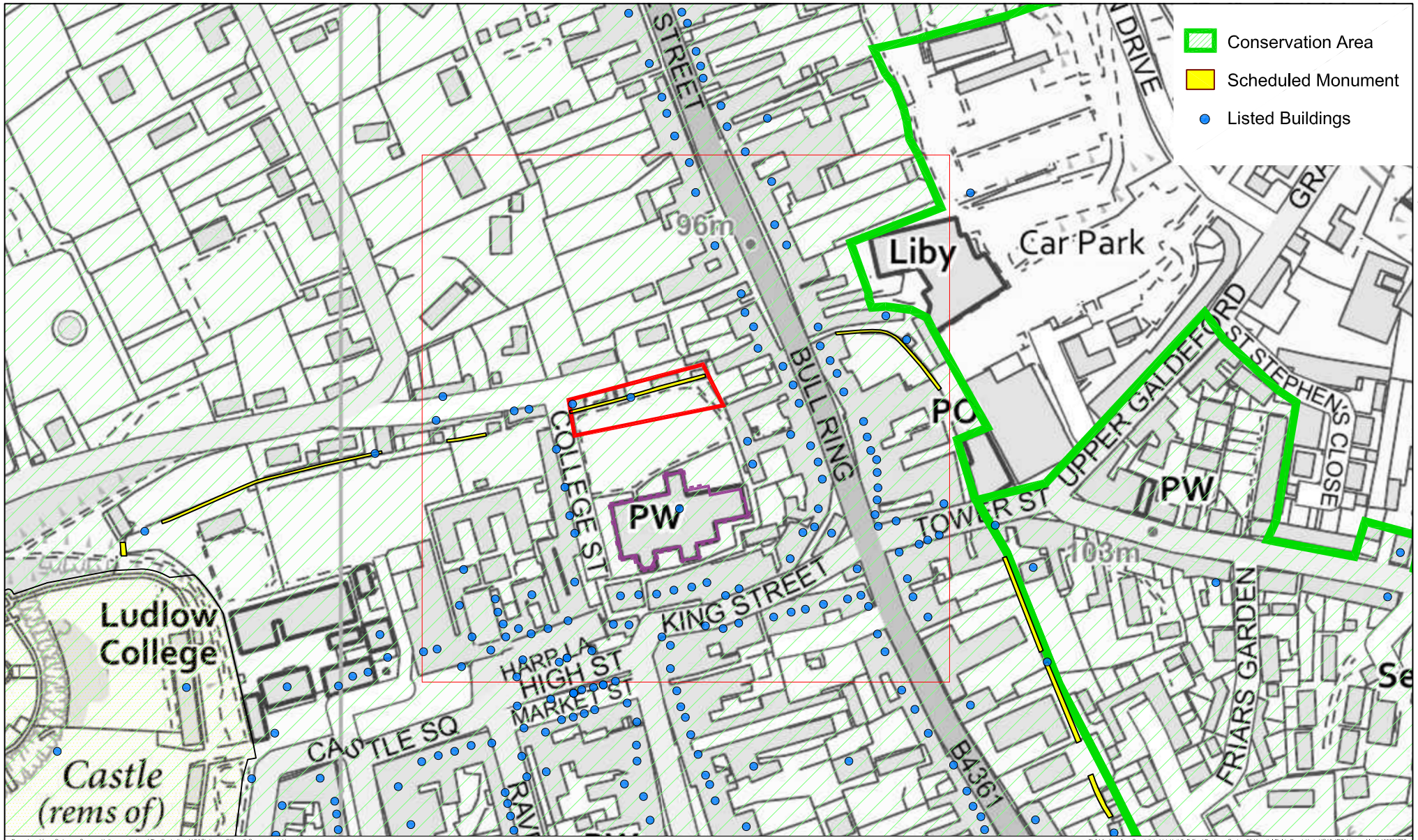
St Lawrence's Church, which lies to the immediate south of the collapsed length of wall, is a Grade I Listed Building (NHLE 1202794; HA2); the town wall acts as a retaining wall for the graveyard.

The Compasses, to the east, is Grade II Listed (NHLE 1202905; HA58), as is St Leonard's House/Linney Gate, to the west (NHLE 1202937; HA10).

A search of the wider study area identified a total of 112 Listed Buildings (see Appendix B, HA1-112). This highlights the strong historic character and heritage significance of the immediate area. As the proposed repair works would have no impact on the majority of these structures or their setting, they are not considered further in the report, unless cross-referenced to provide contextual information on the historical development of the town.

3.1.2 Scheduled Monument

The whole circuit of the Town Wall is designated as a single Scheduled Monument (NHLE 1006278; HA1 see Figure 2). Reports on the walls note the intention to divide the Scheduling into individual lengths, but this does not appear to have been undertaken to date.



Designated heritage assets

Scale 1:2500

Figure 2

3.1.3 Conservation Areas

The site lies within the Ludlow Conservation Area (HA113), which was designated in 1970 (revised 1994)(see Figure 2).

3.2 NON-DESIGNATED HERITAGE ASSETS

Appendix B presents information on known heritage assets within the wider study area. In addition to the 113 designated heritage assets, a further 49 entries for non-designated heritage assets or areas were identified (Figure 3). These range in date from the Bronze Age to the modern day, and are summarised in the archaeological and historical development below, cross-referenced by Heritage Asset (HA) number.

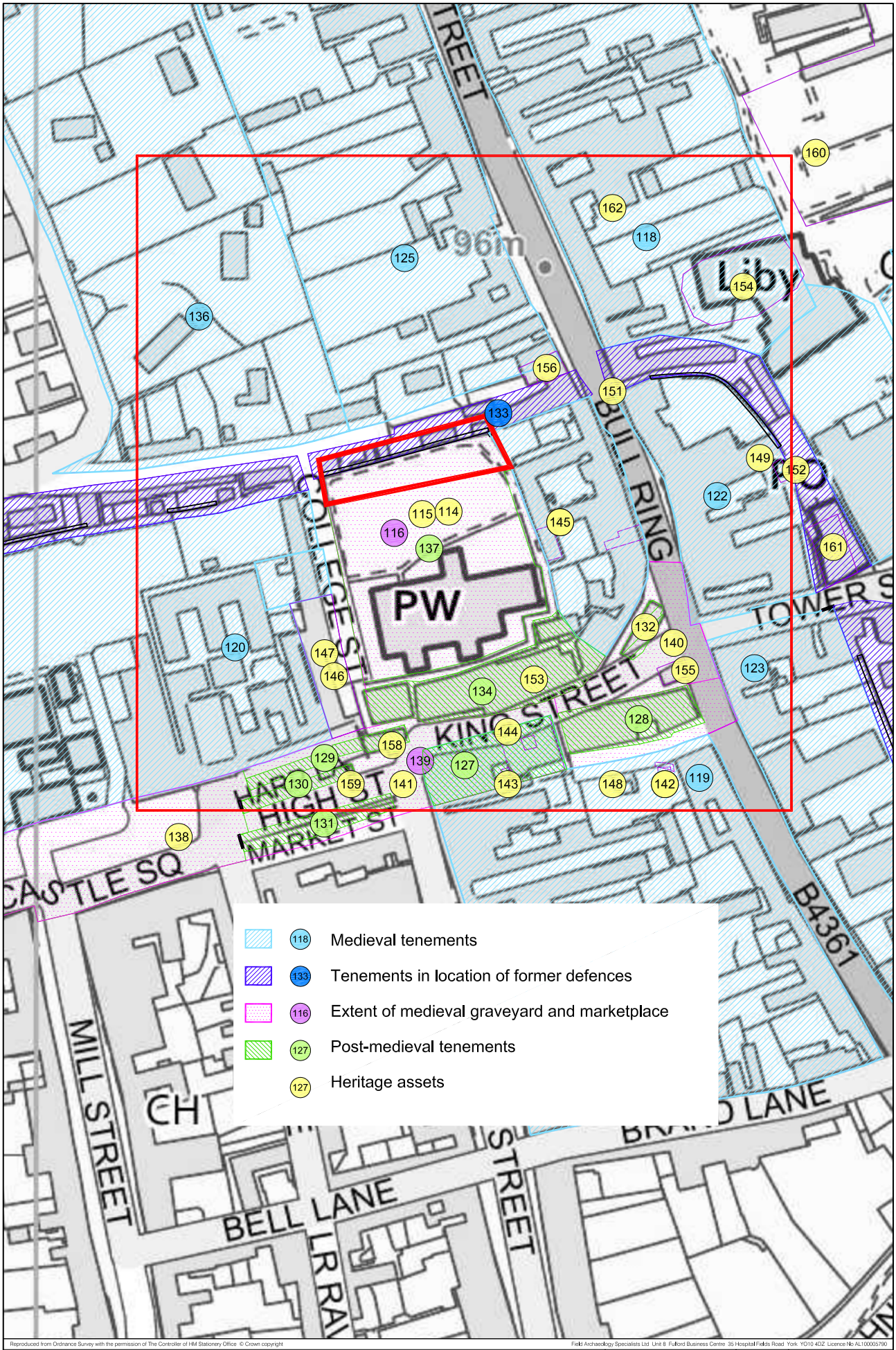
3.3 PREVIOUS ARCHAEOLOGICAL INTERVENTION AND INVESTIGATION

Figure 4 shows all of the archaeological events or surveys identified within the study area (see also Appendix B). Interventions and assessments relating to the walls include:

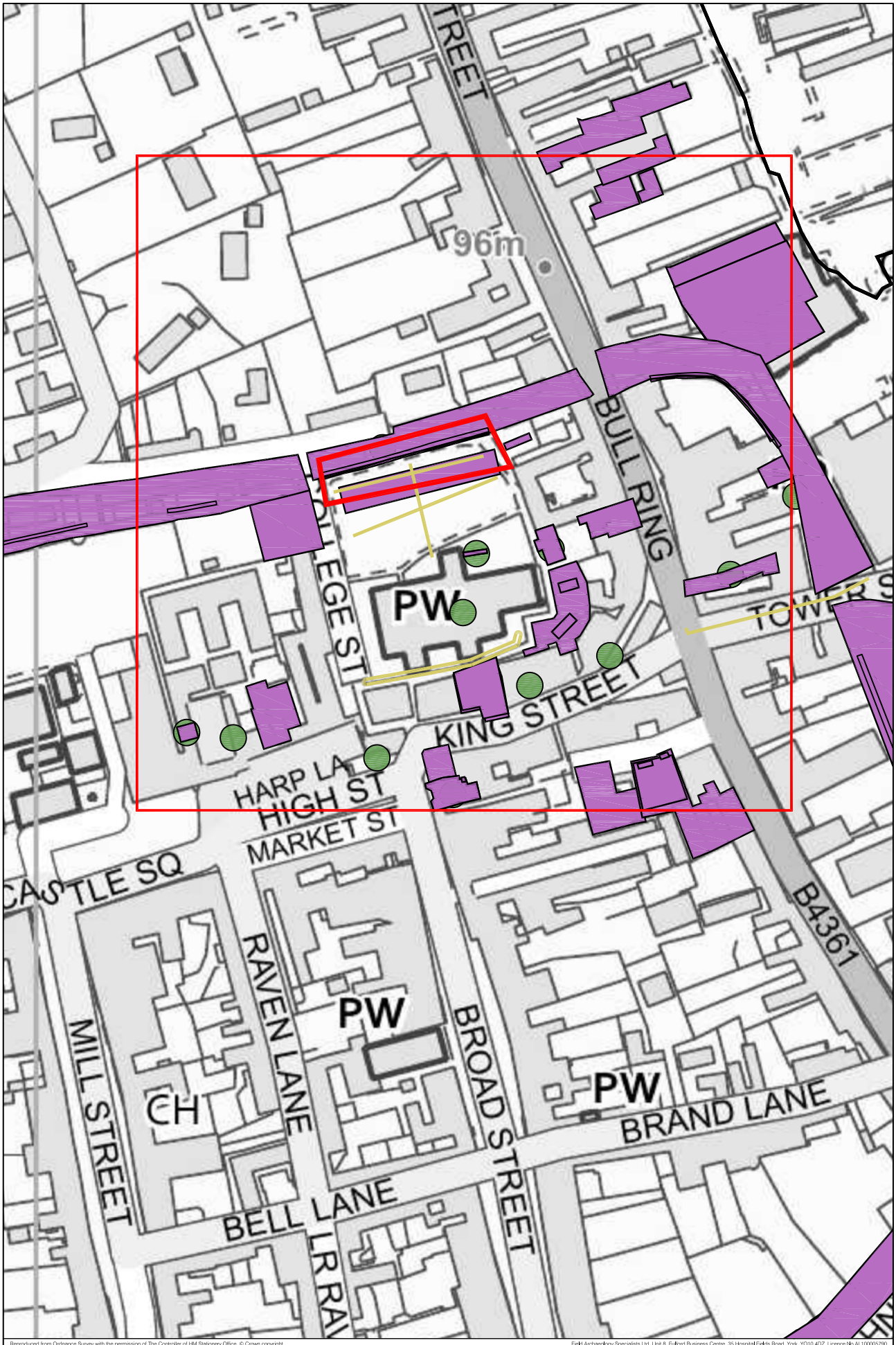
- 1996 English Heritage (now Historic England) report on the town walls (assumed to be by Judith Leigh)
- 2007 Baart Harris Newell and Entec UK *Town Wall Management Plan* (South Shropshire District Council 2007)
- 2016 ArchaeoPhysica – geophysical survey (GPR, tomography and resistance surveys) to the rear of the wall. This identified two distinct horizons, interpreted as an earlier medieval churchyard surface, levelled with a deposit of looser material which had been cut by several graves, interpreted as made ground to create a new burial ground in the 18th or 19th centuries.

Within the wider area, the following interventions have been undertaken in the vicinity of the town walls, providing an indication of fabric and make-up:

- 2004 Border Archaeology – recording undertaken during repairs to the town wall 500m from the study area, which revealed evidence for extensive historic maintenance and repair, including complete rebuilding in part. Some of the work was considered to be 19th-century in date.
- 2010 Shropshire Council's Archaeology Service – watching brief on three trial pits excavated to the rear of the wall (95m from the study area). All contained a possible rampart to the rear of the wall, with significant disturbance caused by the creation of a car park (Hannaford 2010)
- 2013 AerialCam prepared a rectified photographic survey of the town wall to the rear of 12-16 Upper Linney (30m from the study area).



Non-designated heritage assets | Scale 1:2000 | Figure 3



Events	Scale 1:2000	Figure 4

4.0 HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

Ludlow has a rich medieval history, and the form and development of the town has been studied in some detail. The following represents a summary narrative of the development of the town, sufficient to place the detailed study area into context. Where appropriate, the text has been cross-referenced with the gazetteer, using Heritage Asset (HA) numbers.

4.1 TOPOGRAPHY AND GEOLOGY

Ludlow Town Walls enclose a naturally high ridge of ground that extends westwards from the site of Ludlow Castle (Plate 2). This study focusses on a site on the northern scarp of this ridge, where the ground drops away steeply towards the floodplain to the north and northwest.

Plate 2 LiDAR data, showing the topography of the area, with the location of the collapsed wall circled in white

The underlying bedrock of the detailed study area is mudstone of the Temeside Mudstone formation; areas to the north and west are of the Ragland Mudstone formation and Downton Castle Sandstone formation respectively. The BGS maps show no information on superficial deposits in this area (bgs.ac.uk).

4.2 PREHISTORIC

The elevated location on which the medieval castle and town were established is likely to have been exploited during earlier periods, and there is a tantalising account of a possible Bronze Age barrow on the most elevated part of the churchyard of St Lawrence (HA114). This is identified from a document of 1199, which is reported to describe the levelling of a tumulus for the enlargement of the church; three burials in stone 'mausolea' (probably meaning stone cists) were

noted, and the remains reportedly reburied in the church (Kenyon 1892, cited in HER record 01263). Later, 12th-century tradition identified these burials as those of Irish saints. An iron spearhead found in the churchyard may also derive from a burial context (HA115; HA116), and together the evidence points towards funerary activity of prehistoric date in a prominent location in the landscape.

4.3 ROMAN

In 2015, excavations to the south of the study area encountered a ditch which yielded pottery of 1st to 2nd-century date. This has been noted as the first tangible evidence for Roman activity in the town, and suggests the potential for further archaeological remains of this date in the area (HA 117; HER record 31976).

4.4 MEDIEVAL

4.4.1 Ludlow planned town

Ludlow is known to have developed as a planned town in the 12th century, when burgage plots were laid out across the area to the east of the 11th-century de Lacy castle (Faraday 1991, 14; cited HER record 06293). Study of the townscape has identified medieval tenement plots, fossilised within the grain of the urban area (HA118-135); beyond the core of the town, areas of ridge and furrow have been identified (as to the east of the Linney, HA136). The tenement plots extend across most of the study area (see Figure 3). During the medieval period, the churchyard of St Lawrence's Church would have been larger, extending south to meet a larger medieval market place; these open spaces would have been focal points within the urban form (HA116, HA139). During the later medieval and post-medieval period, tenement plots encroached onto the larger market place, dividing the space into two smaller areas (HA129-132; HA138; HA140). The location of a medieval market cross is recorded (HA141).

Medieval settlement remains have also been encountered archaeologically, including the remains of a possible stone-built warehouse south of the former market place (HA142), medieval pits and stone-lined features (HA146), medieval cellars (HA144) and the location of medieval buildings known from documentary sources, including Ludlow School (HA145, HA146), and almshouses (HA147).

4.4.2 Town defences

The development of the town defences have been comprehensively discussed in *The Walls and Gates of Ludlow* (Train 1999), which should be consulted for more detail regarding the primary sources for the town walls as a whole.

The walls were constructed as a response to a period of unrest along the Welsh Borders during the 13th century, during which time numerous towns invested in new or refurbished defences (Train 1999, 15-19).

Although the castle was constructed from the 11th century by the de Lacy family, the walls enclosing the town were not constructed for some years to follow (HA1; Train 1999, 2). The town wall was eventually constructed around the upper, hilltop area of the town and so excluded areas that had already been established as part of the town, creating extramural suburbs.

Ludlow's town walls are believed to date to the 13th century, frequently assigned a date between 1233 and 1304. Ludlow was granted licence to build defences in 1233 (Calendar of Patent Rolls, 17th December 18 Henry III). Unusually, the licence was not renewed in the years immediately following, and the walls are not documented again until 1260, after which date grants of murage occur at regular intervals until the mid-15th century (CPR 1292-1301, 75, 415; CPR 1301-7, 230; set out in Appendix 3, Train 1999). 'Murage' granted towns the right to raise tax on goods coming in for sale, for the purposes of raising funds for building the walls. In the case of Ludlow, all but the grants of 1233 were to the Lord of Ludlow, rather than to the men of the town. After 1462, the right to take tax was included in the Town Charter.

Together, the murage grants to do not provide secure evidence for the date of construction of the walls. Discussion of other documentary sources, including the Muniments of Title of the Palmers' Gild of Ludlow, indicates that the gates and walls were in place no later than 1270, although possibly not in their finished state (Train 1999, 11).

The role of the walls of the town in the defence of the surrounding area is summarised in a 13th-century document, which also provides observations on their condition:

> 'as all the good people around the town of Ludelowe on all occasions that the Welsh have risen in War have been received and saved within the same town as well in their bodies and their [goods] and chattels. And the walls of the same town are broken down and decayed so that the gentry of the town cannot…be saved there as previously they had been; that he will, if it pleases, grant to the people of ludleow [murage] for five years so that they can repair the walls' (suggested to date to the 1290s; Rees *Petitions* E/859, 524 cited in Train 1999, 18-19)

Ludlow is referred to as a walled town by the 14th-century document, which stated that

> 'Lodelowe was a walled town and there is a castle there and the town belongs to the castle; all tenements in the town are burgages and the men of the town are burgesses; there is no arable land outside the town walls and all the men are merchants and hold a fair and market since time out of mind' (cited in Train 1999, 2)

4.4.3 Character of the defences

The town walls encircled the high ground to the east of the castle (see Plate 1), taking advantage of the natural topography. Where observed, the surviving lengths of walling are generally constructed from roughly coursed rubble of locally sourced sandstone or siltstone. In addition to the upstanding stretches of rubble masonry, stone foundations have been encountered to the rear of 25 Bull Ring (HA149).

In the vicinity of the study area, extending between the castle and Corve Gate, the northern defence was in part topographic, with a steep escarpment facing the river meadows; the town wall is described as little more than supplementing the existing cliff. In places, the scarp of the slope may have been exaggerated through quarrying.

Plate 3 Remains of Linney Gate, with a brick structure

Where the cliff face did not offer sufficient protection, the wall would have been flanked by an external ditch. The ditch itself is no longer extant, but the outlines of later plots within the town show where houses and gardens were constructed over the infilled defensive feature (HA133; Train 1999, 32-33). Drawing on comparison with other towns, it is suggested that the ditch would have been up to *c*.15m wide and up to *c*.4.5m deep.

Upper Linney, and the extension through to Corve Street via The Compasses, forms a thin linear plot alongside the town wall; it is possible that the height of the wall could have been exaggerated through excavation in this area, or a flanking ditch followed the wall in part.

The walls would have been punctuated by gates, many of which were demolished in the 18th century (Train 1999, 1). To the west of the study area, at the end of this stretch of wall, are the remains of Linney Gate (HA10), now enclosed in a late 19th-century brick-built structure to the rear of St Leonard's house (Plate 3). The site of Corve Gate lay to the east of the stretch of wall forming the focus of this study (HA151). A tower which may have been constructed to strengthen the town wall is recorded from the 19th century to the rear of the Feathers Hotel but is no longer extant (HA152).

4.4.4 Church of St Lawrence

St Lawrence (or Laurence), 'Cathedral of the Marches' is the largest parish church in Shropshire. The present church dates to the end of the 12th century, of which the base of the south aisle wall is all that remains. The north aisle was rebuilt in 1320, and the south transept in 1340, possibly contemporary with the construction of the porch. In the 15th century, the church was extensively rebuilt and the existing tower added. The interior is

Plate 4 Church of St Lawrence, from the southeast

notable for its 15th-century choir stalls and misericords, and windows. The medieval church was altered in the 18th century, and extensively restored in 1859-1860 by Gilbert Scott.

Archaeological and historical evidence has been used to suggest that the churchyard was originally more extensive, extending south to a larger, more open marketplace (see Figure 3). Evidence for human burials at No. 8 King Street (HA153) provides evidence that the churchyard continued to the frontage (Event 14). In a trial trench at 9-10 King Street in 2005, an early ground surface was encountered which is interpreted as the original ground level of the medieval graveyard, in addition to a substantial stone wall of 15th to 16th-century date that may have marked an earlier boundary (HA116; Event 40). A watching brief along Church Walk in 2015-2016 encountered clay subsoil within the churchyard, in addition to thirteen burials extending across a 75m length of service trench, confirming the continuation of the burial ground in this area (Event 30).

Archaeological evidence for bell-casting has been identified some distance to the northeast, potentially associated with the medieval church (HA154).

4.5 POST-MEDIEVAL TO MODERN

The post-medieval period saw the encroachment of tenements onto the southern side of the churchyard and the market place; this had taken place by the 17th to 18th century (HA134) and resulted in a retracted churchyard area set back from the main street, and the creation of two separate market areas (see Figure 3).

The post-medieval period also saw the infilling of the defensive ditch around much of the town; records indicate that the ditch was infilled by the 16th century, and studies of the town layout identify a small, linear, tenement plot component which represents the former defences. The linear plot faced by the wall within the study area may have been built over at this time, with the Upper Linney thoroughfare still leading through to Corve Street via the 18th-century or earlier Compasses building.

4.5.1 Repairs to the town wall

Some documentary evidence attests to work to the town wall in the vicinity of the churchyard in the post-medieval period. The Bailiff's Accounts for Ludlow record on two occasions the town wall in the churchyard being repaired. The earlier, in 1576/7, records payments which included

> '18s 9d. to Nixon for his owne work and his 2 men 4 days space in repeyring the towne wall in the Churche yard'.

As noted by Train (1999, 38), this would suggest that the wall was much more freestanding in the churchyard than today, as well as providing evidence that the wall was in a decayed state. Train suggests that the parapet, rather than the minimal elevation that exists within the churchyard today, would have been tall enough to protect a defender from shooting below. A second reference to repair of the town wall in the churchyard dates to 1624/5.

Further evidence for the town wall is provided by a sketch prepared by Thomas Dineley in 1684 (Plate 5). Although lacking in detail, the prospect from the north would appear to show the show the wall with a crenellated parapet.

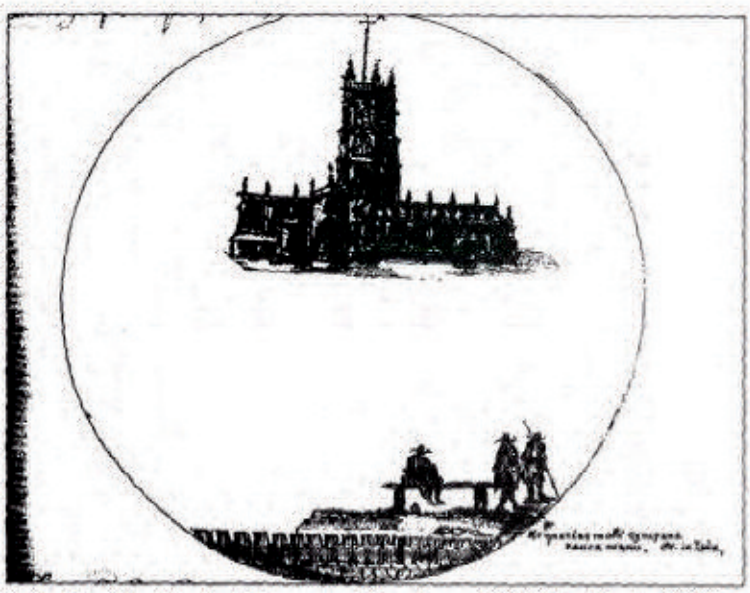


Plate 5 Sketch by Thomas Dineley, 1684 (in Train 1999, 39)

A study of views and panoramas of the remainder of the town wall also appear to depict crenellations. While acknowledging that the merlons may represent areas of collapsed walling, the weight of evidence suggests that much of the wall was originally crenellated.

Numerous post-medieval buildings survive within the wider study area; many of which are Listed (see Figure 2). In the immediate vicinity of the length of wall forming the focus of this study, Listed Buildings include The Compasses, which has an 18th-century or earlier core with later, 20th-century additions (HA58).

4.6 19TH CENTURY

Historic maps from the mid-19th-century onwards show the development of a series of small outbuildings to the rear of The Compasses. No photographs or documents have been identified which can provide detail on the function or construction of these buildings, but it is assumed that they would have served as outbuildings for storage, outhouses, or possibly animal housing as some have enclosed pens.

The best detail is provided on the 1:500 edition of 1884, which shows a range of buildings abutting the northern elevation of the wall, and fronting onto a yard to the rear of The Compasses (Plate 6). St Lawrence House has an enclosed yard with small set of buildings abutting the wall. Within the linear property to the rear of The Compasses, two structures exist on a similar footprint to what is now the site of the substation and adjacent garage, with two small buildings immediately adjacent, and a range of smaller pens and enclosures to the east, extending across the churchyard wall. The wall itself is shown as a battered stone wall; the battered section either steps out part way along (adjacent to the area of current collapse), or this depiction indicates that some of the buildings were of greater height and so stepped back further.

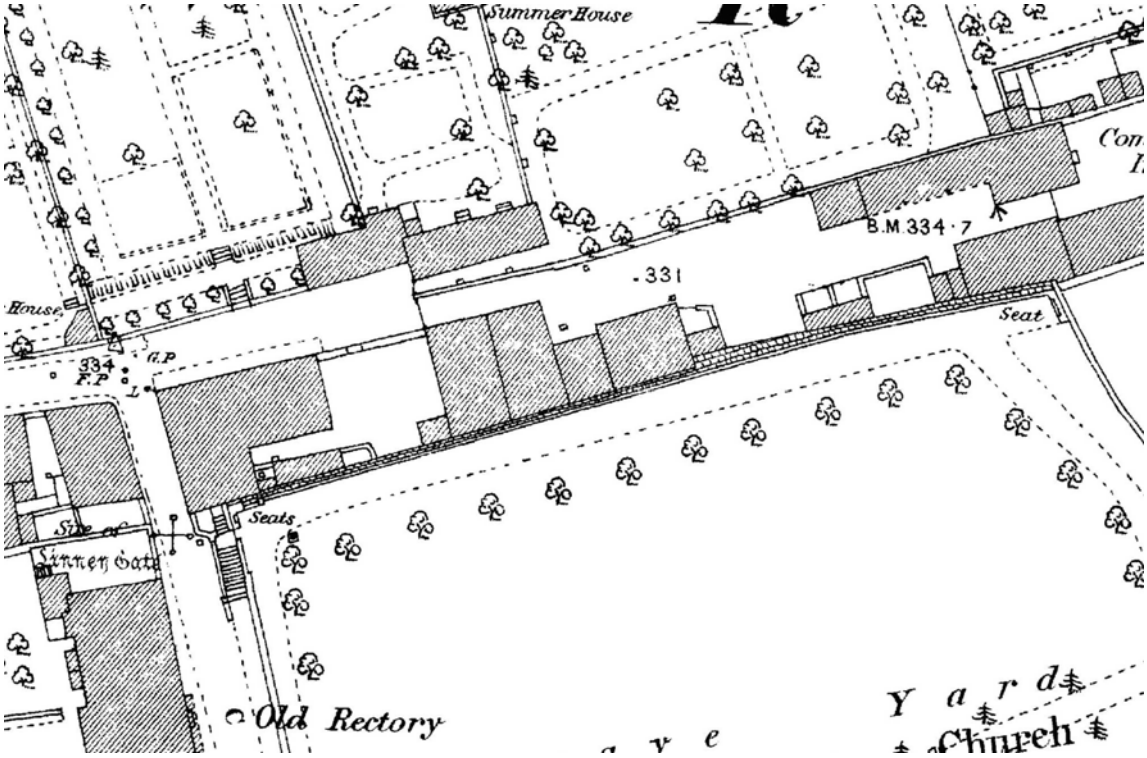


Plate 6 Extract from Ordnance Survey, 1884

Within the churchyard, a path is marked, encircling the outer boundary with a small spur extending to a 'seat' in the northeastern corner of the graveyard, and additional 'seats' in the northwestern corner. The 'seats' labelled presumably refer to brick-built recesses that exist today. An avenue of trees is shown along the interior of the path; no graves or monuments are depicted, but this would not be expected at this time.

Historic photographs dating to the 1890s show a busy graveyard, with ledger stones, table tombs and upstanding grave markers, in addition to the trees which line the pathway.

The Ordnance Survey edition of 1904 shows much the same arrangement as the 1885 edition, albeit in less detail. Early 20th-century postcards show the graveyard to be little altered, with the majority of monuments as shown in the 1890s, with a small number apparently removed (Plate 7).

Plate 7 Early 20th-century postcard showing the grave markers in situ (Shropshire Archives XMI2812/46)

By 1926, the Ordnance Survey plan shows some change, with the smaller structures and enclosures having been replaced with larger buildings, extending nearly the full range of the wall that is shared with the churchyard (Plate 9).

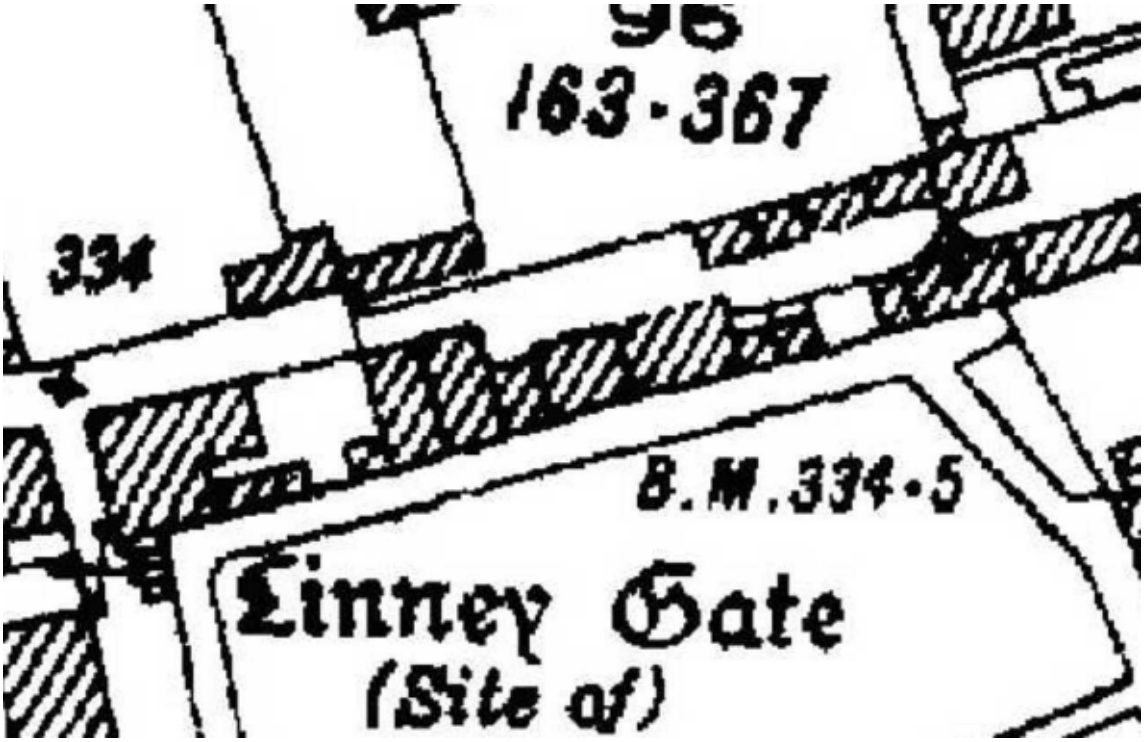


Plate 9 Extract from Ordnance Survey, 1926

Plate 8 Aerial photograph, looking east, dated to 1947 (Britain from Above, EAW010352)

An aerial view of the site dating to 1947 shows the character of the buildings, although not in great detail. Abutting the rear of The Compasses, a structure with a single-pitched roof extends to the corner of the graveyard, as shown on the plan of 1926. This is abutted by two further lean-to

structures with shallower pitched roofs; the area further west is concealed from view by the gable of St Leonard's House. By this time the graveyard (at least the northern part) appears to have been cleared of gravestones. The graveyard is described as having been levelled in 1955 (stLawrences.org.uk/contact-us/church-records). A plan by W G Lane (one time Borough Surveyor) dating to 1946 shows the churchyard, including a garden of remembrance, the central cross, rose beds and a series of seats; it is possible that this was a proposal map for this landscaping episode (Shropshire Archives XMI1013). No evidence that the garden features were created has been identified, but the cross is extant, and stances for benches are evident at intervals on the ground. Although four are shown on the plan, six benches were eventually installed, now represented by concrete plinths. By 1960, images of the churchyard show a closely mowed area devoid of any monuments.

By 1968, Ordnance Survey maps show that the building east of what is now the substation had been removed, leaving a gap in the otherwise continuous range of buildings flanking the northern elevation of the churchyard (see Plate 10). A rectangular structure appears to the west of the substation, but the next edition of the Ordnance Survey (1974-1988) shows this as unroofed, and it appears so until aerial imagery shows a roofed structure had been erected in this location (Plate 11). It is known from records that the substation was rebuilt in 1977. An indicative summary of the development of this area is shown on Plate 10; the collapsed walling location is marked in red.

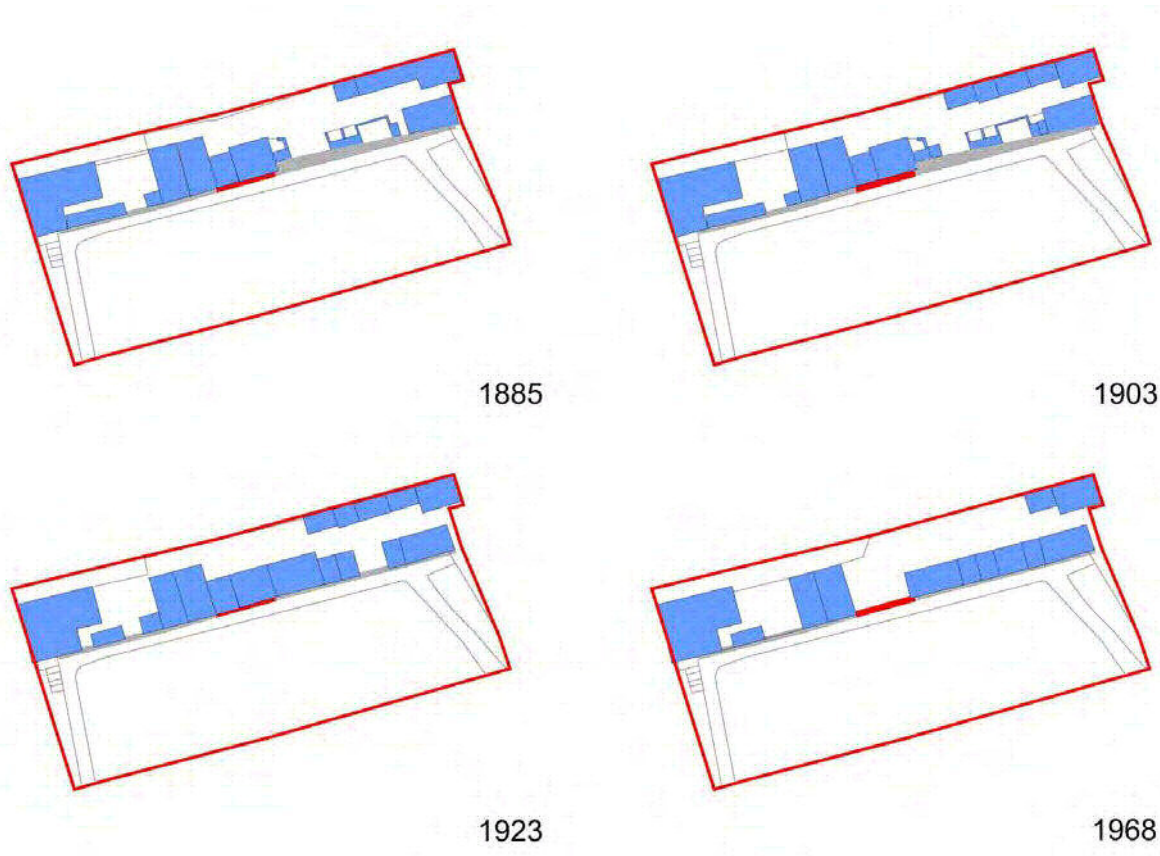


Plate 10 Summary map regression showing the northern edge of the graveyard and the area immediately north, as shown on Ordnance Survey editions

Within the churchyard, historic maps do not provide the same level of detail, and other than the removal of grave markers and the installation of benches along the paths, development appears to have been fairly limited. Comparison of Google Earth imagery between 2001 and 2006 indicates that the trees lining the path along the northern edge of the churchyard were thinned, from eight to five trees, as well as removal of a tree to the rear of the Compasses close to the northeast corner of the churchyard, presumably the sycamore mentioned in 1996. These also show the construction of the garage for St Leonard's House and removal of vegetation in this area.

Plate 11 Comparison of aerial views of 2001 and 2006, showing tree thinning © Google Earth

4.6.1 Modern observations and records

In 1977, a watching brief undertaken during the rebuilding of the electric substation on Upper Linney including observations of the town wall. At that time it was noted that the Town Wall to the rear of the substation showed a number of rebuilds. The ground surface into which groundworks cut was a 19th-century clay layer with ceramic and tile (Event 1).

In 1996, English Heritage (now Historic England) surveyed the town wall. The report describes this length of wall (Section 31: N Sector E side section by Linney Gate) as follows:

> Owner: Parish of St Lawrence Ludlow
>
> Inner face: fronting graveyard. Stone poorly pointed with thick mortar now failing; much mortar loose or cracked, much lost. A few areas where extent of loss would threaten stability were the height greater than 1m, thus reasonably stable. A few ferns and wallplants. Ivy spreads over from outer face towards the W end. A small area of recent pointing at W end too thick and smeary.
>
> Outer face: fronts lane Upper Linney
>
> A very high section. Area E of St Leonard's House relatively recently repointed though some scrub at lower levels. To W of MEB substation ivy growth and hazel rooted in wall, both need cutting back. No recent repointing, many open joints. To E of MEB wall provides a habitat for a cascade of wall vegetation, not harmful, except for one sapling rooted which is potentially very damaging. Some open joints but pointing of masonry mainly fair though brick courses at base are loose and shifting. Behind garages, pointing mostly recent and

> goof [sic; good?], again some saplings and some scrub; sycamore by 2 Compasses Cottage too close for safety. Towards E becomes more overgrown with ivy and more open joints; wall apparently unscheduled here.

It would seem, therefore, that the area of the wall that subsequently collapsed was heavily vegetated at this time (including a rooted sapling), with some open joints and 'fair' pointing, with loose brick courses at the base.

A photograph taken as part of the Images of England project in 2004 by Mr John Cousens, shows this length of wall prior to the collapse (Plate 12). Distinct areas of repointing can be noted, and the brickwork forming the lower part of the wall appears to have been repointed, suggesting that these observations were acted on.

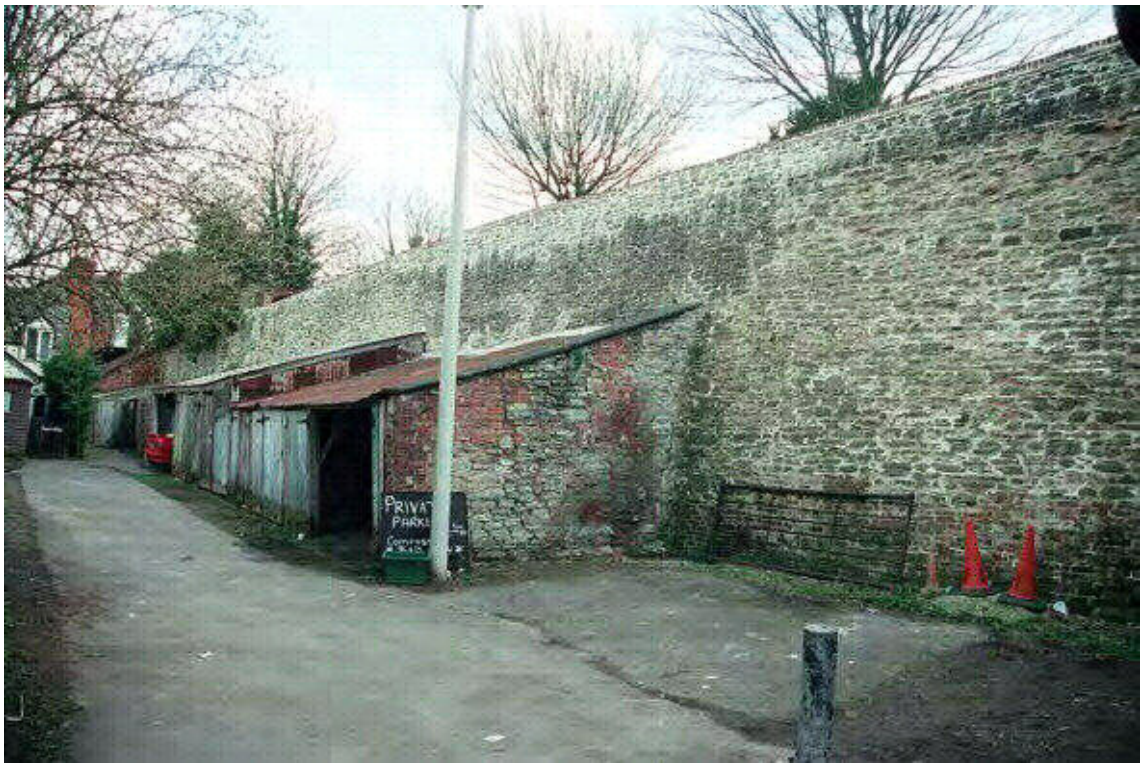


Plate 12 View of the yard in 2004; area of subsequent collapse to the right of the photograph © Images of England Mr John Cousens; Historic England Archive

In 2007, the wall was described in the records of the Baart Harris Newell and Entec UK Conservation plan as:

> 6-7m high stone wall with sparse vegetation. Brickwork repair to lower 1m. Generally good condition. Ramshackled garages built against the walls almost derelict. Open joints in wall inside garages, deteriorating towards the E end

Within the churchyard, the wall is described as

> 0.8m high stone parapet with brick on edge coping. Gravel path along parapet. Generally good condition

The wall described as ‘rear yard of The Compasses public house’ (extending further east than the churchyard) is described as

> 6-7m high wall with open joints and a few missing stones. Looks too regular to be original wall. Lots of dead creeper.

In a general discussion of condition, the wall within the study area is referenced specifically:

> In some cases, the presence of lean-to structures appears to contribute to a deterioration of wall condition. An example of this is within the car park of The Compass public house, where derelict lean-to garages are alongside a section of the wall containing open and deteriorating joints…

4.7 COLLAPSE IN 2013

On two successive occasions in February 2013, the section of wall to the rear of the churchyard collapsed, following a prolonged period of wet weather. A photograph published by the BBC shows an earlier state of collapse, where a large articulated area of masonry has slumped, along with the southern, brick and masonry wall of the lean-to garage structure (Plate 13). Subsequently, further collapse occurred at the eastern side of this breach, resulting in the removal of the corrugated roof that had previously remained, and that of the adjacent lean-to (Plate 14).

Emergency stabilisation works were undertaken by Shropshire Council. From 2014, Scheduled Monument Consents were issued for repairs to the collapsed wall sections (April, August and November 2016), and later repairs to the brickwork and gate structure of Linney Gate (August 2018)(information provided by Historic England).

Plate 13 View of the yard in 2013 (Heather Bradley, BBC website)

Plate 14 Collapsed wall in 2013 (Shropshire Star)

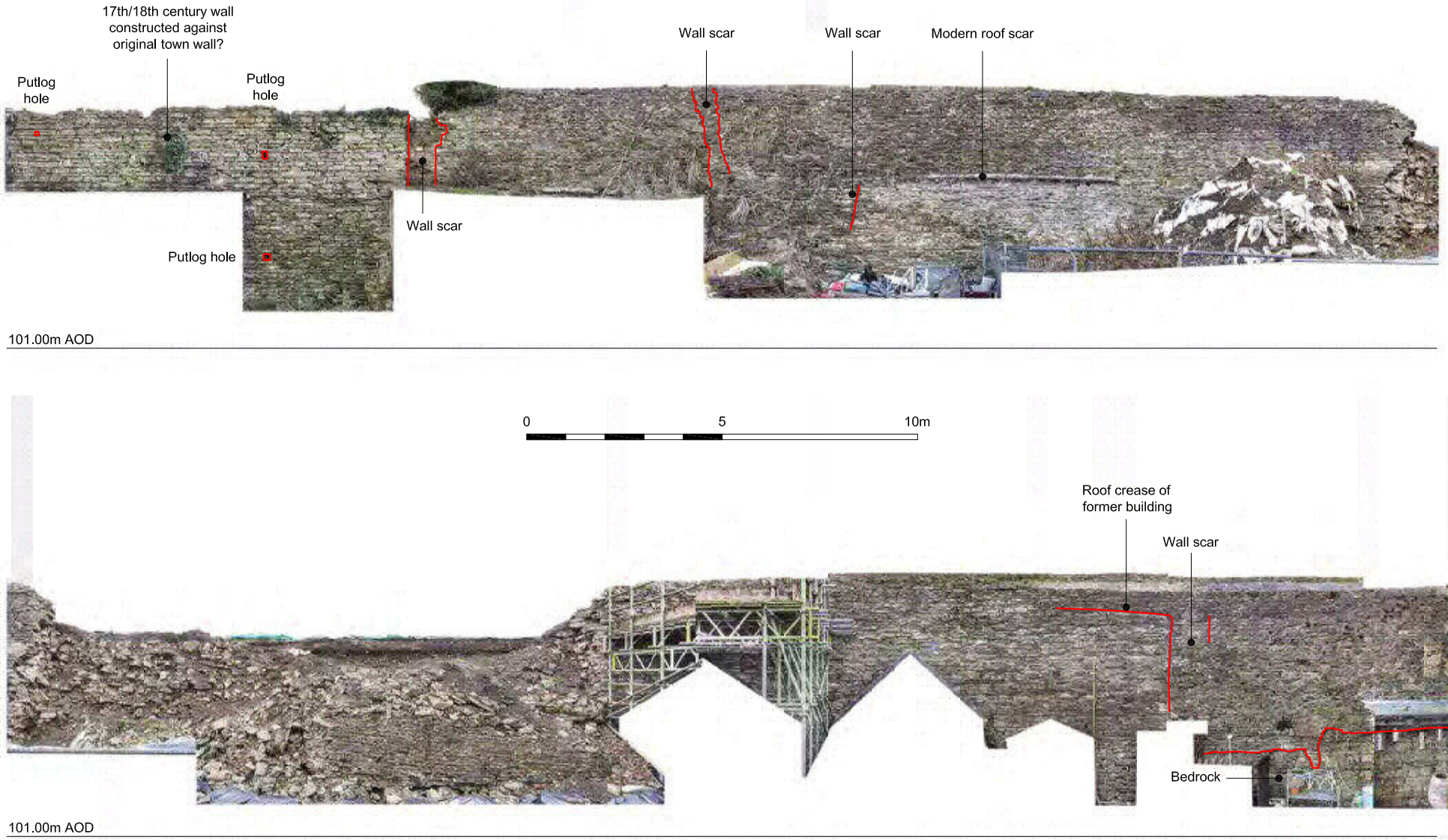
5.0 ARCHAEOLOGICAL ASSESSMENT

5.1 BUILT FABRIC OF THE WALL

The following provides a summary description of the built fabric of the wall. Issues of safety and access limited detailed on-site study, but observations and descriptions have been facilitated by a set of high-resolution photographs and survey drawings provided by James Brennan Associates on which much of the following is based. Pre-collapse photographs have also been consulted where appropriate. Observations have been annotated onto a drawing provided by James Brennan Associates (Figure 5).

As recorded elsewhere across the town, the wall is constructed from locally sourced siltstone or sandstone rubble, roughly coursed and bonded with mortar. The surviving length of wall between St Leonard's House and the collapsed area had up to seventeen courses of brickwork at the base. The following describes the wall from east to west:

Immediately to the rear of the Compasses (Plate 15)
This length of wall lies east of the churchyard and just outside the study area. Here the wall is characterised by more regular, squared blocks that contrast with the coarser rubblestone of the retaining wall of the churchyard. A series of regular putlog holes are visible, and at the junction with the churchyard retaining wall, a vertical break extending the full height of the wall represents the scar of the return wall (see Figure 5). This length of walling corresponds with a building constructed to the rear of the Public House sometime before the late 19th century; this may have been a 17th or 18th-century building constructed against the upstanding town wall. This building is



North-facing elevation of the town wall - after James Brennan Associates, with annotations by FAS

Figure 5

visible on 1947 aerial views and is known to have had a single-pitch roof; historic maps show a structure in this location into the late 20th century, but it was evidently removed before the erection of a modern wooden structure shed that abuts the wall at lower level today.

Plate 15 Rear of the Compasses and east end of churchyard retaining wall (James Brennan Associates)

Churchyard retaining wall; east end (Plate 15 and Plate 16)

The eastern end of the churchyard retaining wall is visible above a lean-to garage constructed from brick and corrugated metal. A building of similar footprint to the extant garage has been shown on historic maps from the late 19th century onwards; a wall scar extending the full height of the wall represents a building of greater height to that which survives today, and which stood here until at least 1947 (see the aerial view, Plate 9). Where visible, the wall is constructed in roughly coursed, thin rubblestone; some vegetation is visible. The wall shows evidence for piecemeal repair work, and the upper courses towards the western part of this section may represent a phase of rebuilding, constructed in slightly larger, more irregular blocks, beneath the (possibly later) brick coping. This irregularity of the upper courses extends across the upstanding length of churchyard retaining wall, but is poorly defined.

Immediately west of the lean-to garage is the former location of two additional lean-to structures that were demolished following the wall collapse; cartographic evidence suggests construction in the early to mid-20th century, replacing smaller yards or outhouses (see Plate 10). The remnants of the easternmost wall of one of these structures survives, as a rubblestone wall abutting the churchyard retaining wall and the adjacent lean-to; the northern butt end has been rebuilt in brick, possibly indicating a 20th-century adaptation of a pre-existing structure (see Plate 16).

The lower part of the retaining wall is now concealed by debris and gabions, but the remainder of is seen again to have been constructed in roughly coursed rubblestone with evidence for upper

courses have been repaired or rebuilt (Plate 17). The scar of the former roofline is clear; generally, evidence for repair work is more evident in the area above the scar of the former buildings. A possible vertical joint is visible, possibly representing division or edge of the lean-to structures.

Plate 16 East end of churchyard retaining wall (James Brennan Associates)

Plate 17 Central part of churchyard retaining wall (James Brennan Associates)

Collapsed area:

Although now collapsed, some observations can be made regarding the areas of articulated masonry. As with the remainder of the wall, this length formerly consisted of roughly coursed, mortar-bonded rubblestone. In the 2004 photograph, an area of distinct repointing was evident; this can be loosely correlated with the large fragment articulated masonry that has collapsed, which in turn appears to relate to the scar of a building that stood in this location through the 19th century and had been removed between 1926 and 1968.

Plate 18 Section of the wall exposed to the west of the collapse (James Brennan Associates)

The collapsed wall has revealed the wall in section, in particular to the west of the breach (Plate 18). The wall can be seen, as elsewhere, to comprise roughly coursed rubblestone with a rubble core. Significantly, the presence of bond stones through the width of the wall, and indications of a south-facing elevation, confirms that the upper part of the wall at least was not constructed as a retaining wall, but would have been free-standing (Plate 18). The relatively thin width of the wall would also be consistent with construction as an upstanding parapet rather than a revetment. Towards the base of the exposed area, there is some indication that the masonry extends into the churchyard soils, and so may represent the height of the wall walk or parapet. This in turn may correspond with a soil horizon visible in the exposed free section of the churchyard deposits. Further investigation would be required to confirm this.

To the east, evidence for construction is less clear, as the full width of the wall is not exposed in section. Rubble appearing in the collapsed section may represent core work that has remained in place (or slipped only slightly) when the facing stones collapsed – this is part of the secondary collapse (Plate 19)

The lower courses, beneath the collapsed area, had been repaired in brickwork, now concealed by gabions and supporting material.

Plate 19 Area of collapsed walling, looking east (James Brennan Associates)

Plate 20 Retaining wall within yard of St Leonard's House (James Brennan Associates)

*Within St Leonard's House enclosed yar*d

With the St Leonard's House yard, and over the substation and garage, the wall continues to be roughly coursed, mortared rubblestone, with brick coping. There is less evidence for the upper part of the wall having been repaired or heightened, which might suggest different levels of maintenance within this particular property. The wall has evidence for patchwork in brick, and the lower courses appear to be constructed in part on exposed bedrock (Plate 20). Some change in fabric is evident where the small structure stood at the corner of the yard previously, and the walls are constructed in larger, shaped blocks. This may represent vestiges of earlier fabric that were masked by later buildings and therefore subject to less alteration.

5.1.1 Comparison with observations elsewhere

The make-up of the wall as observed in this area – roughly coursed rubblestone with rubble core – is consistent with observations made elsewhere on the length of the town wall. Observations prior to repair works adjacent to Camp Lane recorded a wall of siltstone and sandstone rubble, laid in rough courses with rubble infill. Bonding material has been recorded as a friable, light pinkish-orange sand with occasional snail shell inclusions and moderate amounts of sandstone gravel, or rough, darkish-grey, lime-ash mortar bonding with occasional snail shell inclusions. Evidence of restoration and repair was noted, and attributed to maintenance through the medieval period, and possibly in the 1640s in connection with the Civil War. Evidence of 19th-century repairs was also noted (Cruse et al, 2005).

5.2 APPRAISAL OF ADJACENT ARCHAEOLOGICAL DEPOSITS

Key questions relating to the collapsed wall and its condition are the degree to which the churchyard has been artificially levelled and raised against the wall, and at what point this occurred.

Consideration of the topography of the churchyard suggests that the churchyard has been levelled, with ground level raised to the immediate rear of the retaining wall. LiDAR data of the immediate area illustrates that the level plateau of the churchyard does not reflect the surrounding topography, which slopes south to north along the gradient of College Street (west/left of the churchyard)(also discussed by ArchaeoPhysica 2016)(Plate 21).

An archaeological evaluation undertaken prior to an extension to the churchyard, close to St John's Vestry, encountered no archaeological remains within 1.3m of current ground level, suggesting that the upper levels of soil had been imported.

Comparison of the historic photographs of the graveyard, historic maps and the current topography suggests that the churchyard topography has not changed significantly since the 19th century. It would seem that clearance of monuments in the mid-20th-century was not followed by raising the ground level, and that the levelling had occurred, at least in part, before that date.

Within the churchyard, more detail on the changing levels has been provided by a GPR survey undertaken in 2016 (ArchaeoPhysica 2016; Plate 22), which has provided valuable results relating to the layout and levels within the churchyard. The survey identified two principal layers, which overlay bedrock in the western part of the churchyard. The upper layer could be further subdivided into an upper, more disturbed 0.40m.

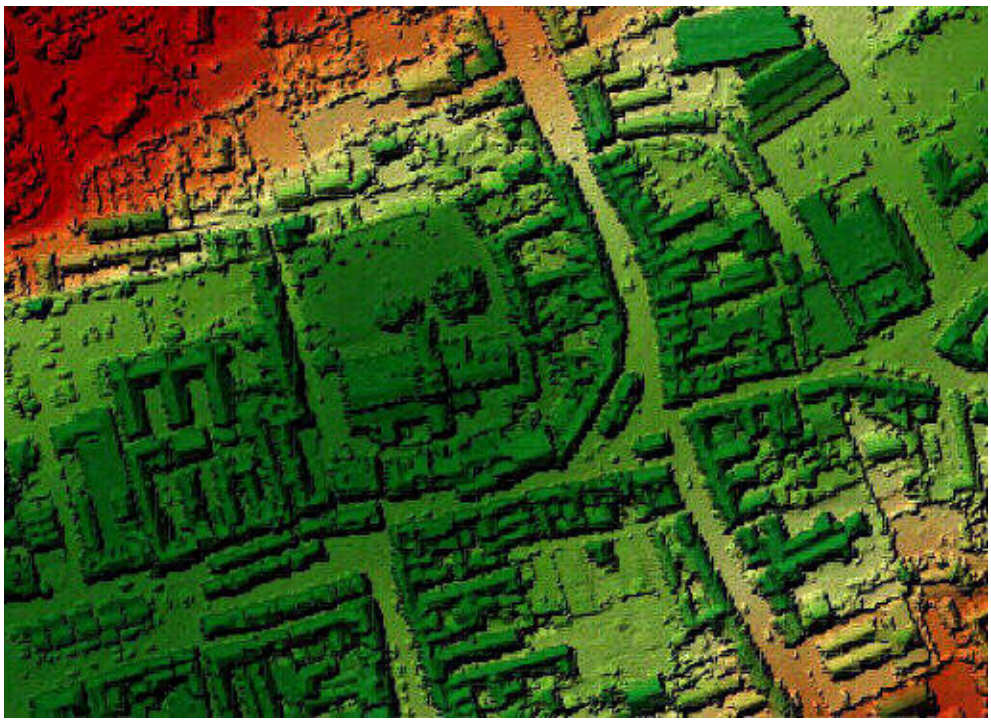


Plate 21 LiDAR data showing the churchyard as a level area in an area with a general downward sloping gradient.

The lower layer has been interpreted as natural soil modified through burial, the upper interface of which represents the earlier, medieval ground surface within the graveyard (see Plate 21). In contrast to the level profile today, this was seen to extend with a relatively level profile northwards from the church, before sloping downwards towards the rear of the town wall/churchyard retaining wall, c.8 to 9m from the wall. The upper soil is identified as a well-drained sandy material that, given the contrast with the underlying deposits, is likely to have been imported.

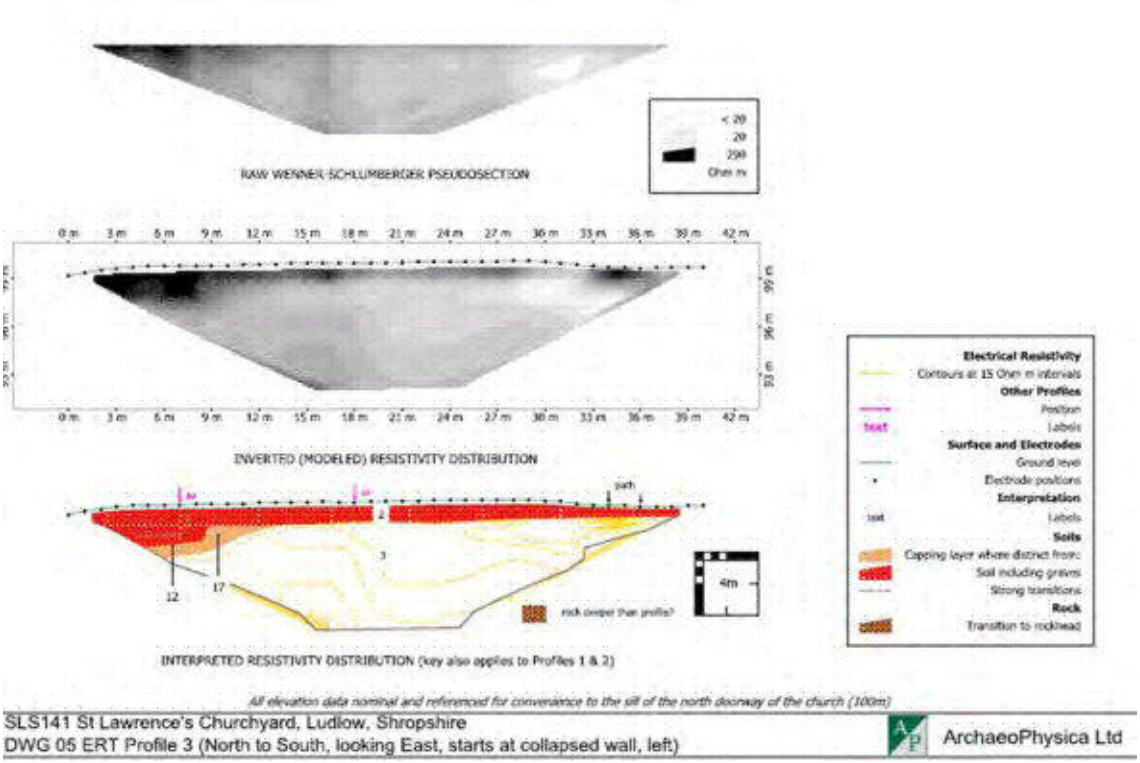


Plate 22 Extract from ArchaeoPhysica report 2016, showing the north-south profile through the site. (not to scale, consult report for full details)

Given the identification of graves within the upper layers, and the evidence of historic photographs which show the presence of ledger stones and memorials across this upper level, it is assumed that the upper deposit would have sealed earlier phase of burials and provided a depth of soil for continued burial in the 19th century. The presence of seats at this level at either end of the path along the parapet is also consistent with the current level being close to the 19th-century ground level. The report notes that in places the upper 0.40m represents a subdivision of the upper layer; this may relate to the landscaping that occurred in the mid-20th century.

6.0 ASSESSMENT OF SIGNIFICANCE AND RECOMMENDATIONS

6.1 SUMMARY

Archaeological and historical evidence, and study of the fabric, has indicated that the town wall, as represented by the retaining wall along the northern edge of the churchyard, has seen significant levels of repair and alteration since construction, presumably in 13th century.

Exposed bedrock adjacent to St Leonard's House shows that the natural topography was exploited when the wall was constructed; it is not known whether there would also have been a defensive ditch flanking the wall at this point.

Little diagnostic evidence survives to date the extant fabric of the wall, but historical sources indicate repairs in the 16th and 17th century, and the surviving fabric appears to represent various phases of repair and, in some areas, rebuilding. To the rear of The Compasses, a building may have been constructed against the town wall in the post-medieval period.

Throughout the 19th century, and probably during earlier centuries, a series of outbuildings were constructed against the northern elevation of the retaining wall, and these relatively insubstantial structures are likely to have been altered and amended regularly.

Within the churchyard, evidence indicates that at least the upper parts of the wall would have been free-standing (and possibly crenelated), with the ground level of the graveyard sloping downwards from a point *c*.8/9m to the south of the wall, and also deepening to the east. In the northeastern corner, these deposits extend to a depth of 4m BGL.

In the post-medieval period, tenements encroached on the southern side of the medieval churchyard and would have increased demand for burial within this northern area. At some point prior to the mid-19th century, the gradient of the graveyard was raised and levelled with imported material, after which time burial continued; a pathway and associated seats were established around the perimeter and avenue trees planted. The retaining wall may have been raised or repaired at this point; the brick seats and coping post-date this change.

The collapse of 2013 has exposed the upper, thinner part of the town wall that would formerly have been free-standing and was not constructed to retain the level of material deposited behind it. The strata visible in the exposed section represents material imported to level the graveyard, rather than the former ground surface of the medieval churchyard, which lies at greater depth in this area.

7.0 RECOMMENDATIONS

The surviving fabric of the wall has been the subject of comprehensive photographic record by James Brennan Associates which preserves by record its current state, and will provide the basis for a record of any observations made during ongoing repairs. Opportunities to safely record the mortar and make-up of the core should be exploited where they arise.

The material embanked behind the wall may contain graves of 19th-century date, and possibly redeposited material of earlier date. Prior to any intrusive works, an appropriate scheme of archaeological intervention should be designed, and a strategy to deal with any in situ burials agreed beforehand.

8.0 REFERENCES

Faraday, M. 1991. Ludlow 1085-1660: a Social, Economic and Political History (Ludlow)

Hannaford, H.R. 2010. 'A watching brief at the Castle Street Car Park, Ludlow, Shropshire' (unpublished report, Shropshire Council Archaeology Service No. 281)

Roseveare, M.J. and Lewis, D. 2016 'St Lawrences Church, Ludlow, Shropshire: Geophtsical Survey Report Radar OFCOM Licence 11025379/1 (unpublished report, ArchaeoPhysica)

South Shropshire District Council 2007. *Ludlow Conservation Area and Town Walls: Town Walls Management Plan* (South Shropshire District Council, Baart Harris Newell and Entec UK Ltd)

Train, C.J. 1999. The walls and gates of Ludlow: Their origin and early days (Ludlow Historical Research Group)

APPENDIX C

Ground Probing Radar Report
by
ArchaeoPhysica Ltd.

APPENDIX D

Measured Survey and Recording
by
Brennan Associates

APPENDIX E

Preliminary Arboricultural Assessment
by
Dougald Purce
Tree & Woodland Amenity Protection Officer for Ludlow from Shropshire Council

APPENDIX F

Ecological Survey with Bat ad Bird Survey
by
Greenscape Environmental Ltd.

APPENDIX G

Wall Core Position
by
The Morton Partnership Ltd.

APPENDIX H

Ground Investigation
by
Listers Geo

APPENDIX I

Mortar Analysis
by
Skillington Conservation

APPENDIX J

Drawings
by
The Morton Partnership Ltd.

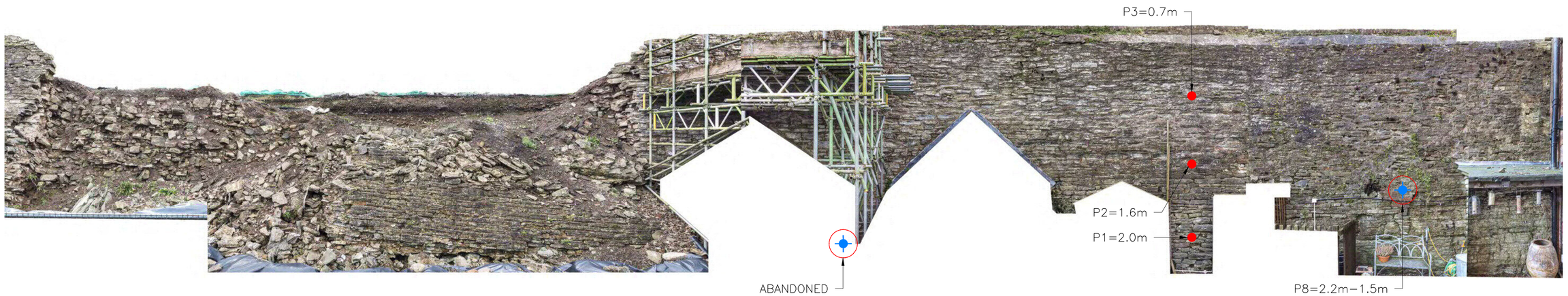
CORE DRILL INVESTIGATION LOCATIONS

TMP MARK UP
11/10/2021 DRAFT FOR COMMENT
07/12/2021 REPORT ISSUE

KEY:
- PREVIOUSLY COMPLETED CORE DRILL HOLES.
- ADDITIONAL COMPLETED CORE DRILL HOLES.

5No. ADDITIONAL MAX. 75mm DIAMETER CORE DRILL HOLES. LOCATE BEHIND 1No. FACING STONE WHERE POSSIBLE. CAREFULLY REMOVE FACING STONE, AND CORE DRILL FULL WALL DEPTH BEHIND. AFTER CORE DRILL COMPLETE REFILL WITH SUITABLE LIME MORTAR AND RUBBLE AND REINSTATE FACING STONE IN LIME MORTAR. MIX TBC.

101.00m Above Ordnance GPS Datum



101.00m Above Ordnance GPS Datum

Legend:
- Stair/ slope arrows point up
- Direction of floor boards
- Direction of roof slope (up)
- (2.06) Floor to Ceiling Height

Notes:

THIS SURVEY HAS BEEN CARRIED OUT WITH AN ACCURACY CONSISTENT WITH A SCALE OF 1:100.
INTERROGATED DIMENSIONS WILL BE WITHIN THE TOLERANCE ASSOCIATED WITH THIS AND SMALLER SCALES ONLY.

ALL LEVELS ARE IN METRES, RELATED TO OS GPS DATUM.

PLEASE CHECK ALL DIMENSIONS MEASURED OFF THIS PLAN ON SITE.

UNITS ARE MILLIMETRES.

Key:

AL	Arch height
BL	Beam level
CL	Ceiling level
EGS	Electrical Switch Gear
H	Window head level
RWP	Rain Water Pipe
SH	Arch spring height
S	Window sill level
sh	Sill to window head height

LUDLOW TOWN WALLS
RECTIFIED ELEVATIONS

0.00 1.00 2.00 3.00 4.00 5.00 10.00 metres

SURVEYED & DRAWN BY:
James Brennan Associates
Chartered Surveyors
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ASHFORD RD, BAKEWELL DE45 1GT
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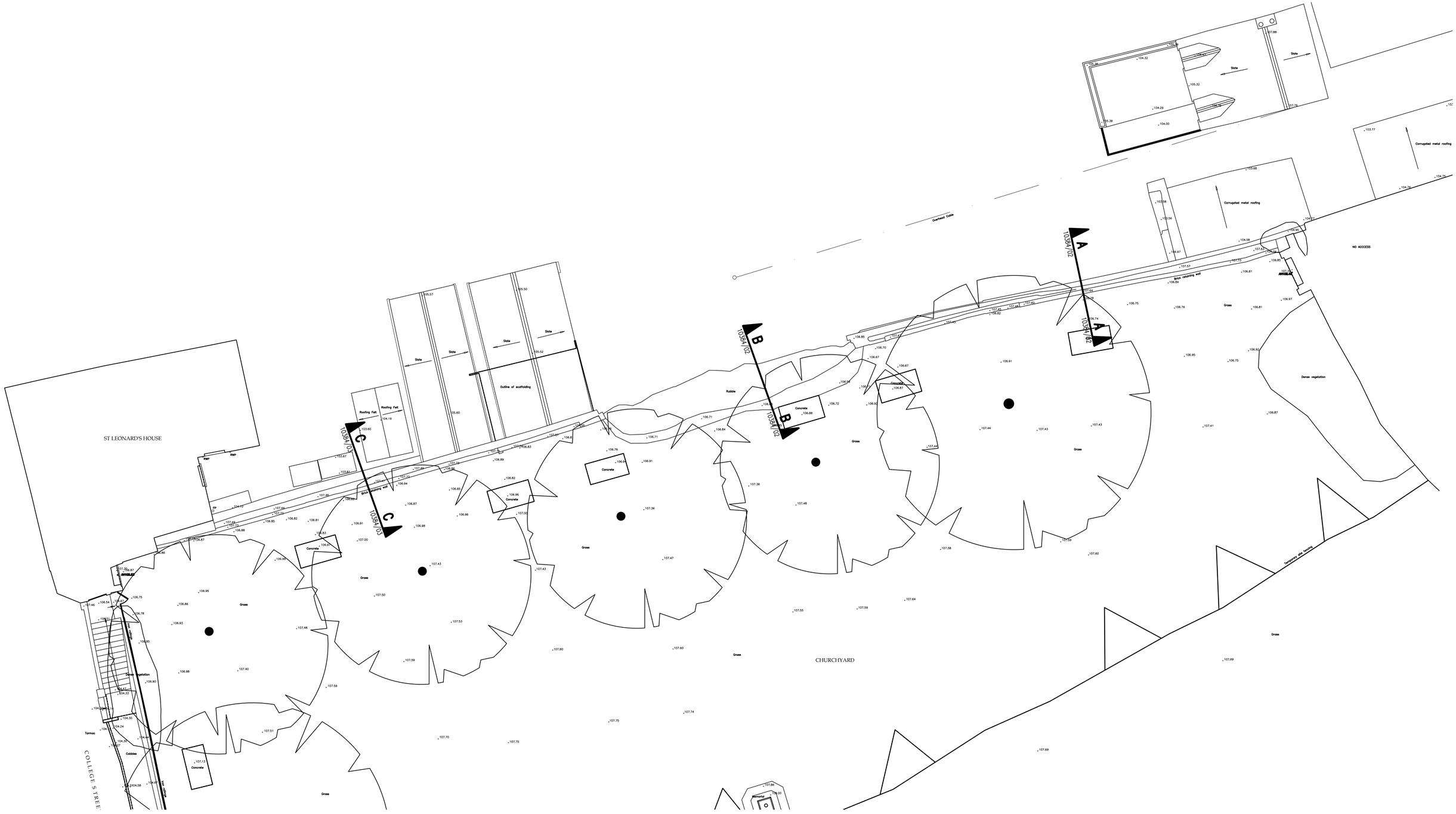
Client:
Ludlow Town Council
The Guildhall
Mill Street
Ludlow
SY8 1AZ

Drawing no.	19-060-RECT-1
Issue date	FEB 2020
Issue status	A
Scale	1:50 @ A1



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3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND SERVICE ENGINEER'S DRAWINGS AND SPECIFICATIONS.

REPORT ISSUE

REV	AMENDMENT	CHK	DATE
–	REPORT ISSUE	EJM	07.12.21

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PROJECT:
LUDLOW TOWN WALLS
UPPER LINNEY
LUDLOW

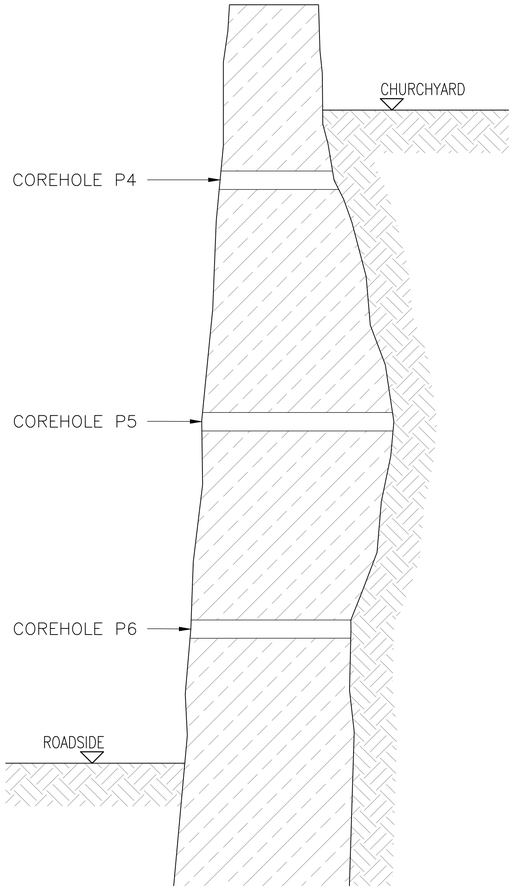
LABC Registered Partner Authority Scheme

TITLE:
SITE PLAN

SCALE: 1:100 (A1) DRAWN BY: MM

DATE: DECEMBER 2021 CHECKED BY: EJM

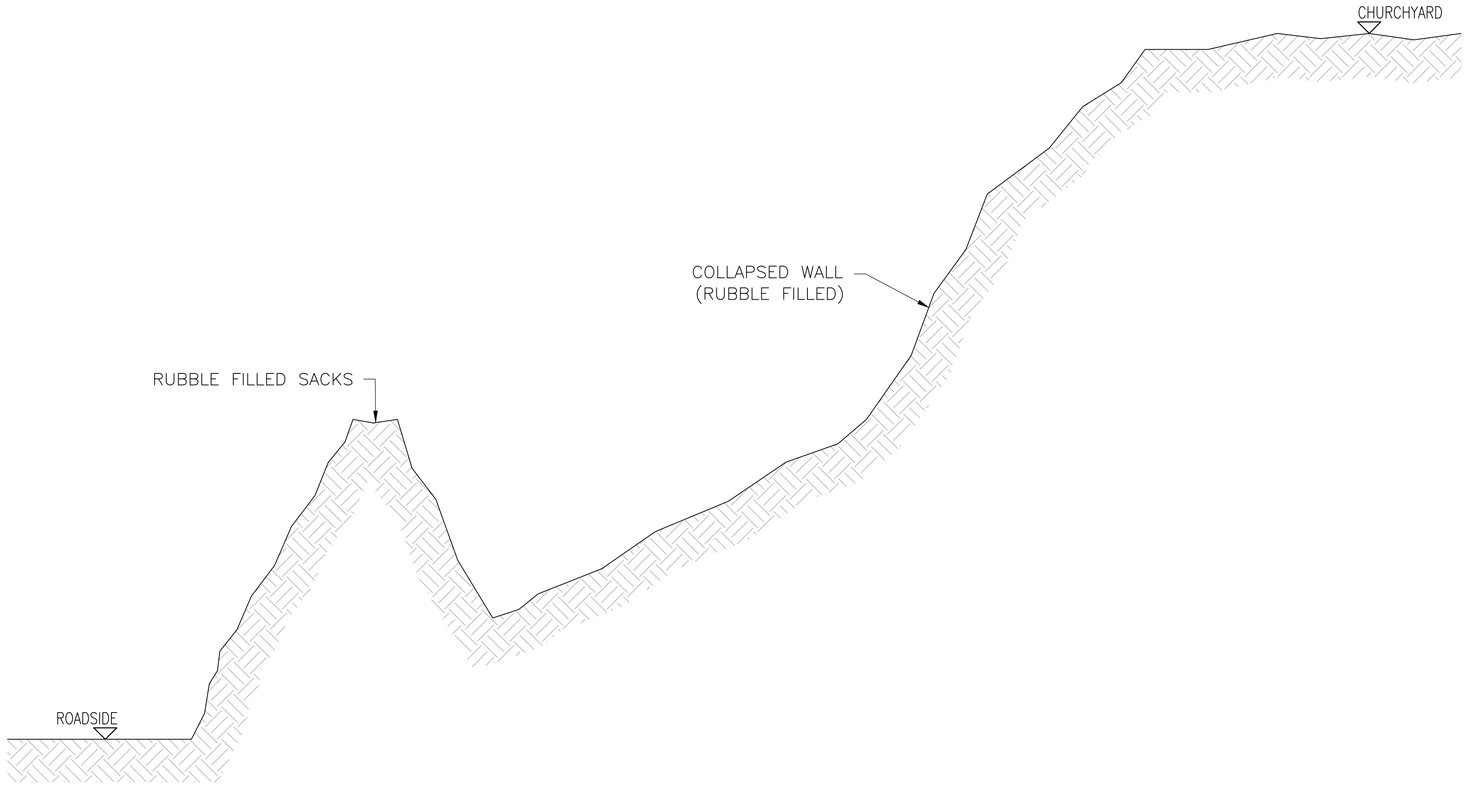
DRG No.
10384/01 (REV –)



EAST SECTION OF WALL
AT POSITION OF CORES P4,P5 & P6

SECTION A–A

SCALE 1:25



CENTRAL SECTION OF WALL (COLLAPSED)

SECTION B–B

SCALE 1:25

NOTES:–

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NOTE:
WALL INTERPRETED FROM COREHOLES, BUT MAY VARY.

REPORT ISSUE

REV	AMENDMENT	CHK	DATE
–	REPORT ISSUE	EJM	07.12.21

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PROJECT:
LUDLOW TOWN WALLS
UPPER LINNEY
LUDLOW

LABC Registered Partner Authority Scheme

TITLE:
INDICATIVE SECTIONS
EXISTING
SHEET 1 OF 2

SCALE: 1:25 (A1) DRAWN BY: MM
DATE: DECEMBER 2021 CHECKED BY: EJM

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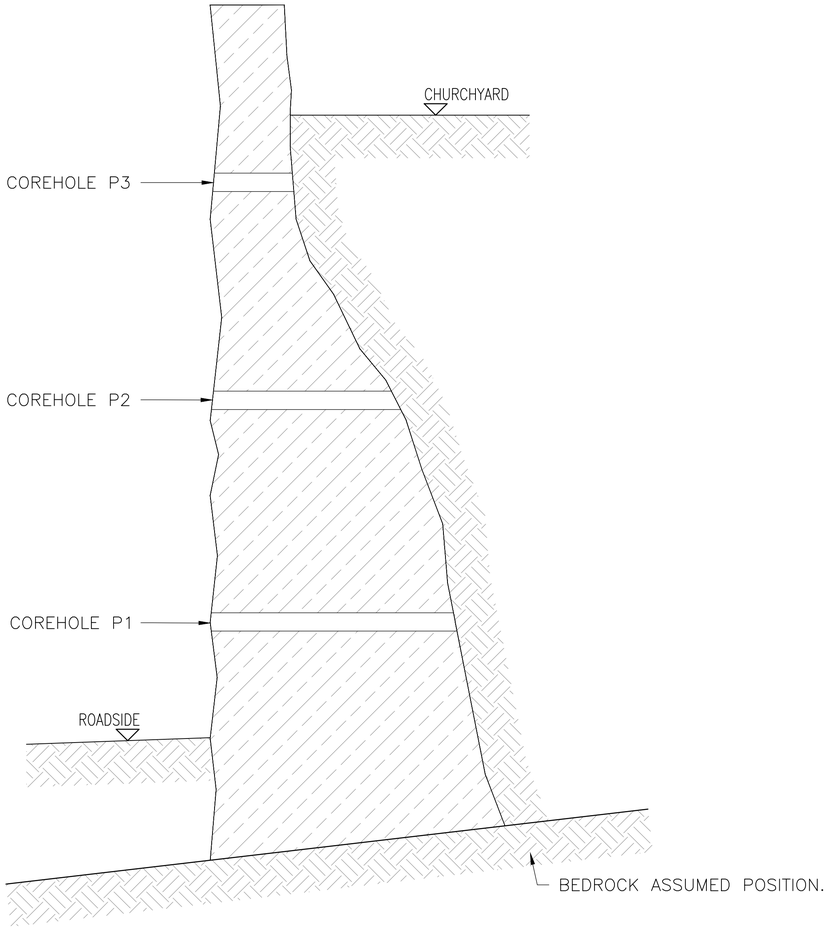

WEST SECTION OF WALL
AT POSITION OF CORES P1, P2 & P3

SECTION C–C

SCALE 1:25

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NOTE:
WALL INTERPRETED FROM COREHOLES, BUT MAY VARY.

REPORT ISSUE

REV	AMENDMENT	CHK	DATE
–	REPORT ISSUE	EJM	07.12.21

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PROJECT:
LUDLOW TOWN WALLS
UPPER LINNEY
LUDLOW

LABC Registered Partner Authority Scheme

TITLE:
INDICATIVE SECTIONS
EXISTING
SHEET 2 OF 2

SCALE: 1:25 (A1) DRAWN BY: MM
DATE: DECEMBER 2021 CHECKED BY: EJM

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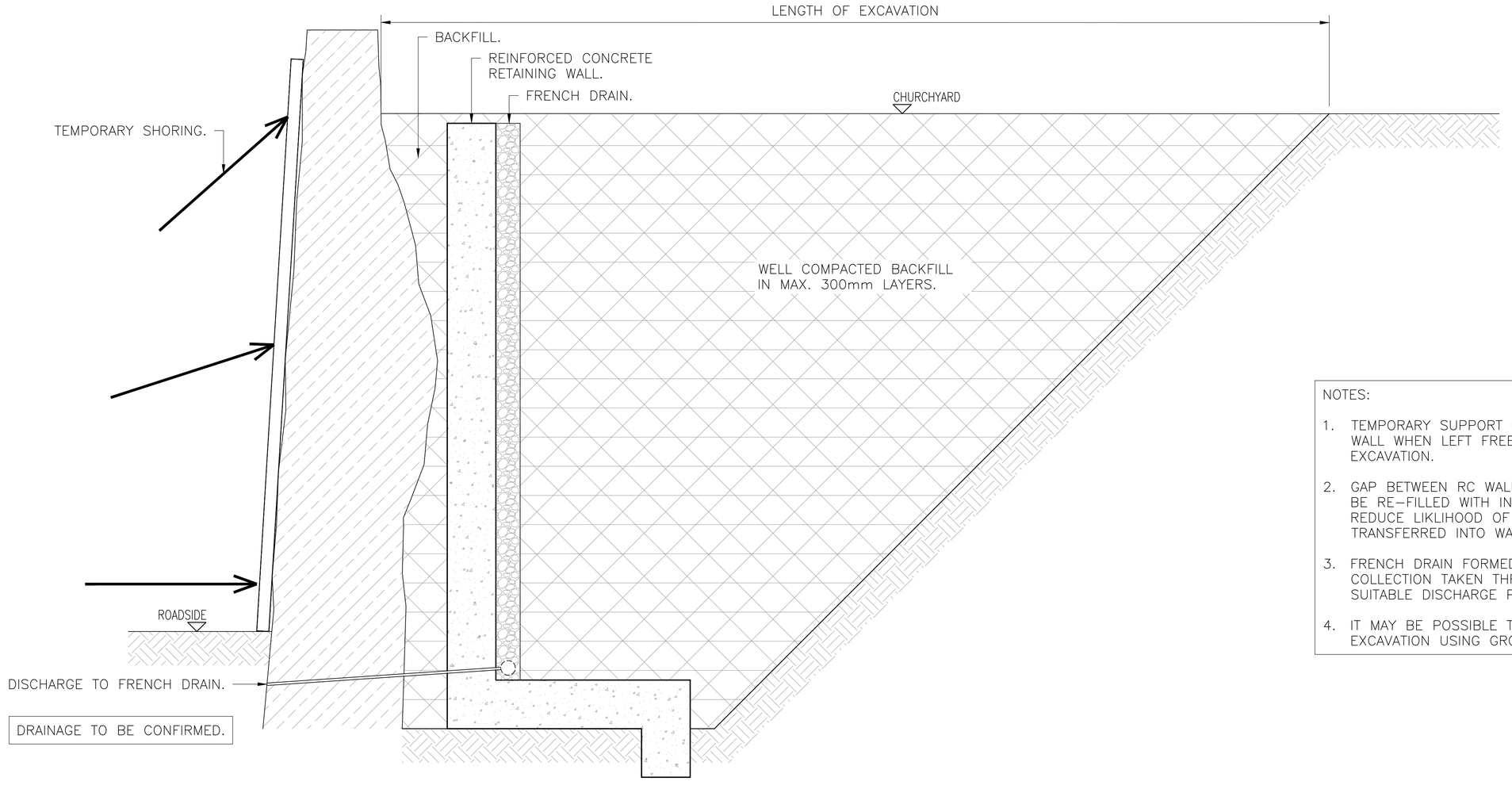

OPTION A

SCALE 1:25

NOTES:

1. TEMPORARY SUPPORT REQUIRED FOR EXISTING WALL WHEN LEFT FREESTANDING POST EXCAVATION.
2. GAP BETWEEN RC WALL AND EXISTING WALL TO BE RE-FILLED WITH INERT MATERIAL TO REDUCE LIKLIHOOD OF SALTS BEING TRANSFERRED INTO WALL.
3. FRENCH DRAIN FORMED BEHIND RC WALL WITH COLLECTION TAKEN THROUGH EXISTING WALL TO SUITABLE DISCHARGE POINTS.
4. IT MAY BE POSSIBLE TO REDUCE EXTENT OF EXCAVATION USING GROUND STABILISATION.

NOTES:-

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2. IN CASE OF ANY DISCREPANCY THE ENGINEERS ARE TO BE NOTIFIED IMMEDIATELY.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND SERVICE ENGINEER'S DRAWINGS AND SPECIFICATIONS.

REPORT ISSUE

REV	AMENDMENT	CHK	DATE
–	REPORT ISSUE	EJM	07.12.21

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PROJECT:
LUDLOW TOWN WALLS
UPPER LINNEY
LUDLOW

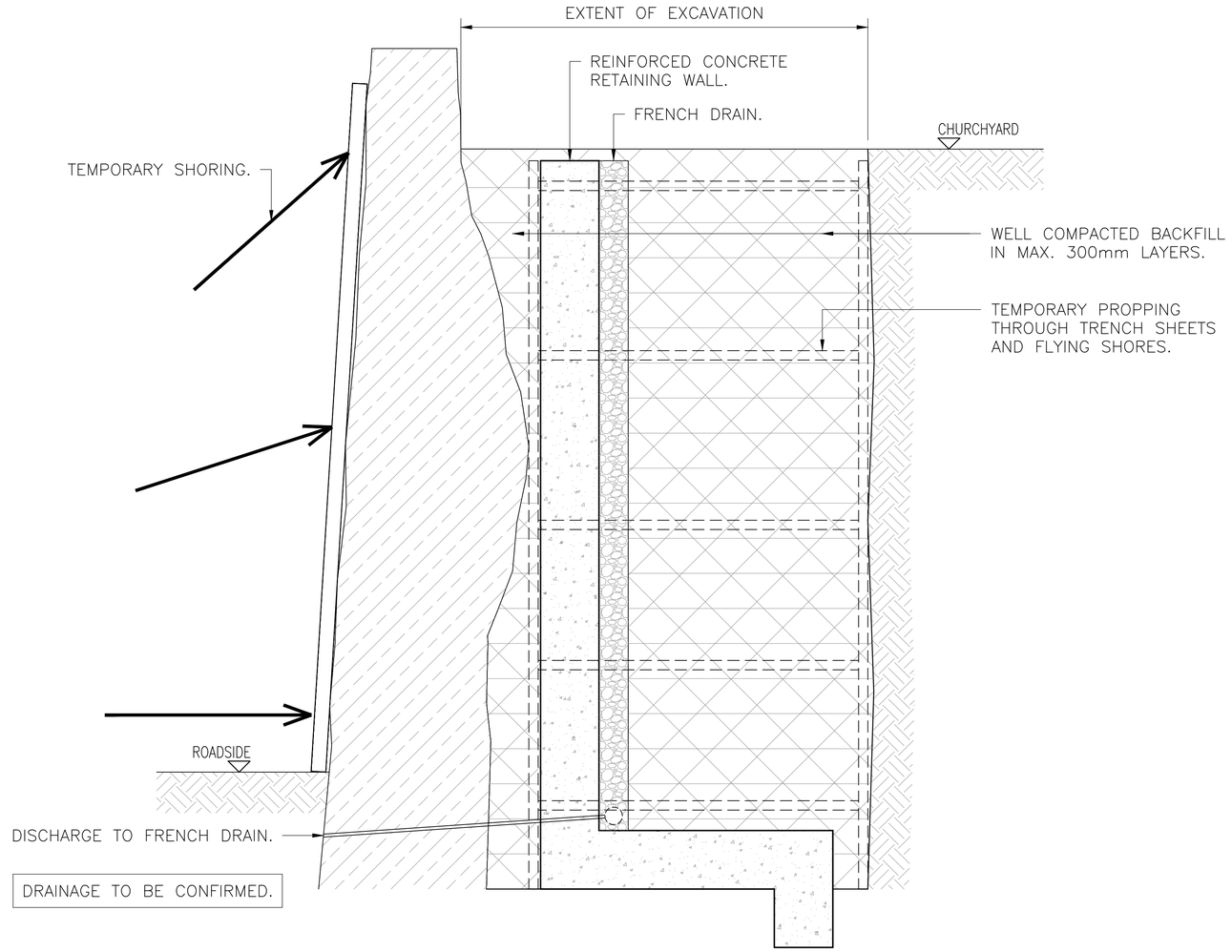
LABC Registered Partner Authority Scheme

TITLE:
PROPOSED REPAIR OPTIONS
OPTION A

SCALE: 1:25 (A1) DRAWN BY: MM

DATE: DECEMBER 2021 CHECKED BY: EJM

DRG No.
10384/10 (REV –)



OPTION B

SCALE 1:25

NOTES:

1. TEMPORARY SUPPORT REQUIRED WITH RAKING SHORE TO EXTERNAL FACE.
2. DEAD SHORING AND TRENCH SHEETING TO BE FORMED AS EXCAVATION IS UNDERTAKEN.
3. FLYING SHORES SET IN VOIDS IN RC WALL WHEN CAST, REMOVED AND CONCRETE MADE GOOD.
4. GAP BETWEEN RC WALL AND EXISTING WALL TO BE RE-FILLED WITH INERT MATERIAL TO REDUCE LIKLIHOOD OF SALTS BEING TRANSFERRED INTO WALL.
5. FRENCH DRAIN FORMED BEHIND RC WALL WITH COLLECTION TAKEN THROUGH EXISTING WALL TO SUITABLE DISCHARGE POINTS.

NOTES:-

1. ALL DIMENSIONS TO BE CHECKED ON SITE AND NO MEASUREMENTS TO BE SCALED OFF THIS DRAWING.
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PROJECT:
LUDLOW TOWN WALLS
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LUDLOW

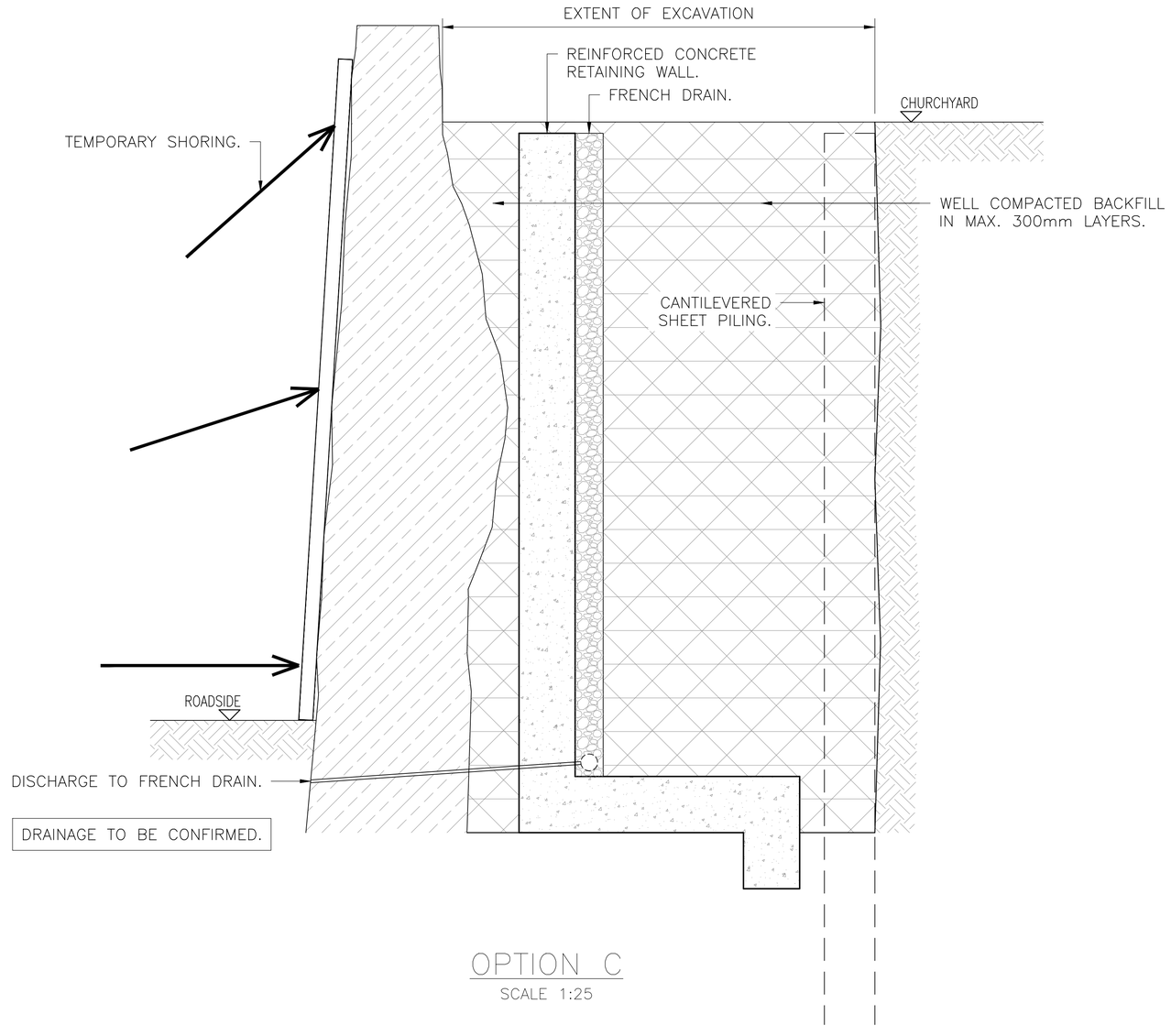
LABC Registered Partner Authority Scheme

TITLE:
PROPOSED REPAIR OPTIONS
OPTION B

SCALE: 1:25 (A1) DRAWN BY: MM

DATE: DECEMBER 2021 CHECKED BY: EJM

DRG No. **10384/11 (REV –)**



OPTION C

SCALE 1:25

NOTES:

1. TEMPORARY SUPPORT REQUIRED FOR EXISTING WALL WHEN LEFT FREESTANDING FOR EXCAVATION.
2. GAP BETWEEN RC WALL AND EXISTING WALL TO BE RE-FILLED WITH INERT MATERIAL TO REDUCE LIKLIHOOD OF SALTS BEING TRANSFERRED INTO WALL.
3. FRENCH DRAIN FORMED BEHIND RC WALL WITH COLLECTION TAKEN THROUGH EXISTING WALL TO SUITABLE DISCHARGE POINTS.

NOTES:-

1. ALL DIMENSIONS TO BE CHECKED ON SITE AND NO MEASUREMENTS TO BE SCALED OFF THIS DRAWING.
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UPPER LINNEY
LUDLOW

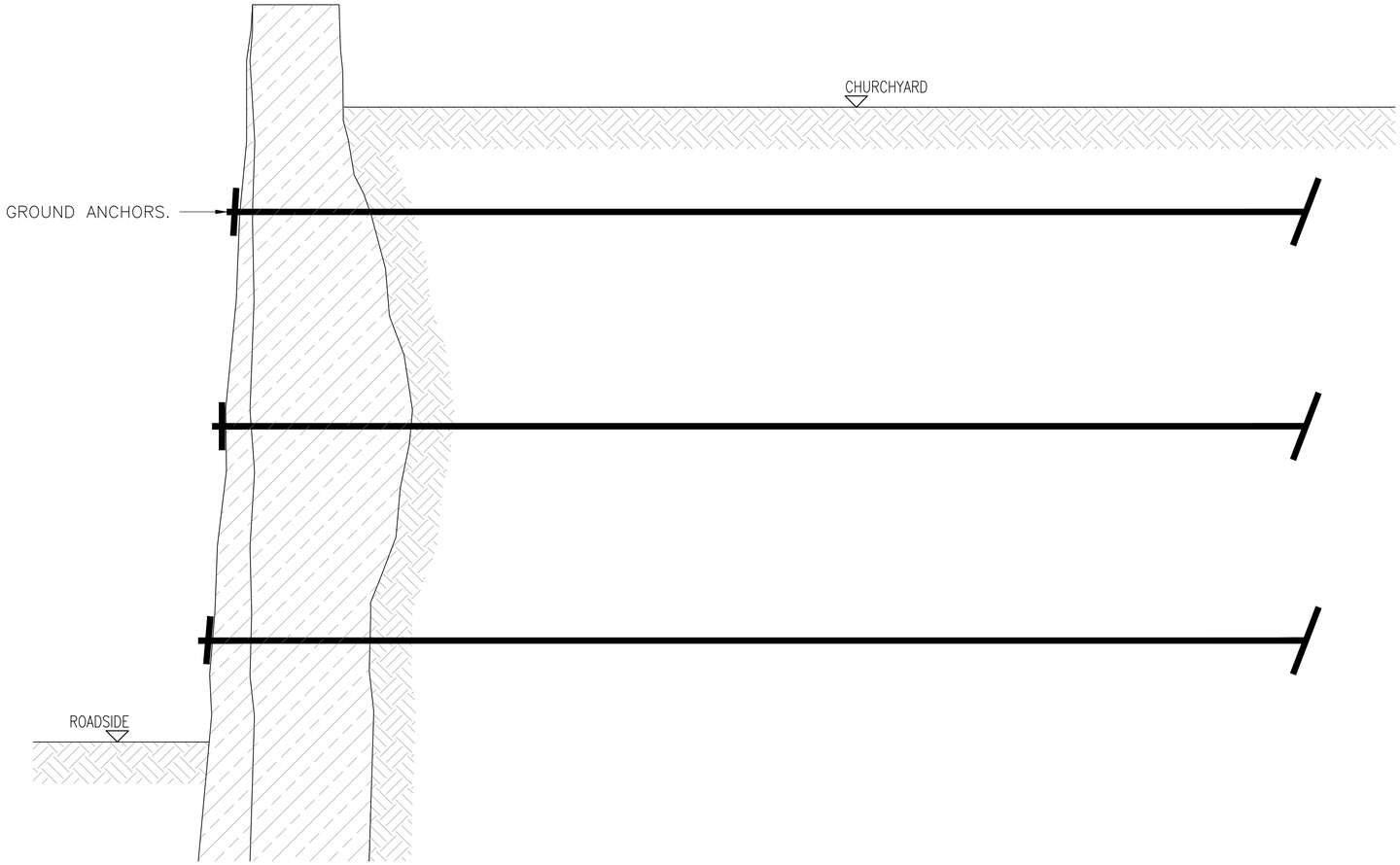
LABC Registered Partner Authority Scheme

TITLE:
PROPOSED REPAIR OPTIONS
OPTION C

SCALE: 1:25 (A1) DRAWN BY: MM

DATE: DECEMBER 2021 CHECKED BY: EJM

DRG No.
10384/12 (REV –)



NOTES:

1. GROUND ANCHORS SUBJECT TO TEST ANCHORS.
2. NUMBER OF ANCHORS AND SIZE OF PATTRESS PLATE TO BE DETERMINED FOLLOWING TEST BUT LIKELY TO BE NUMEROUS.

OPTION D

SCALE 1:25

NOTES:–

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UPPER LINNEY
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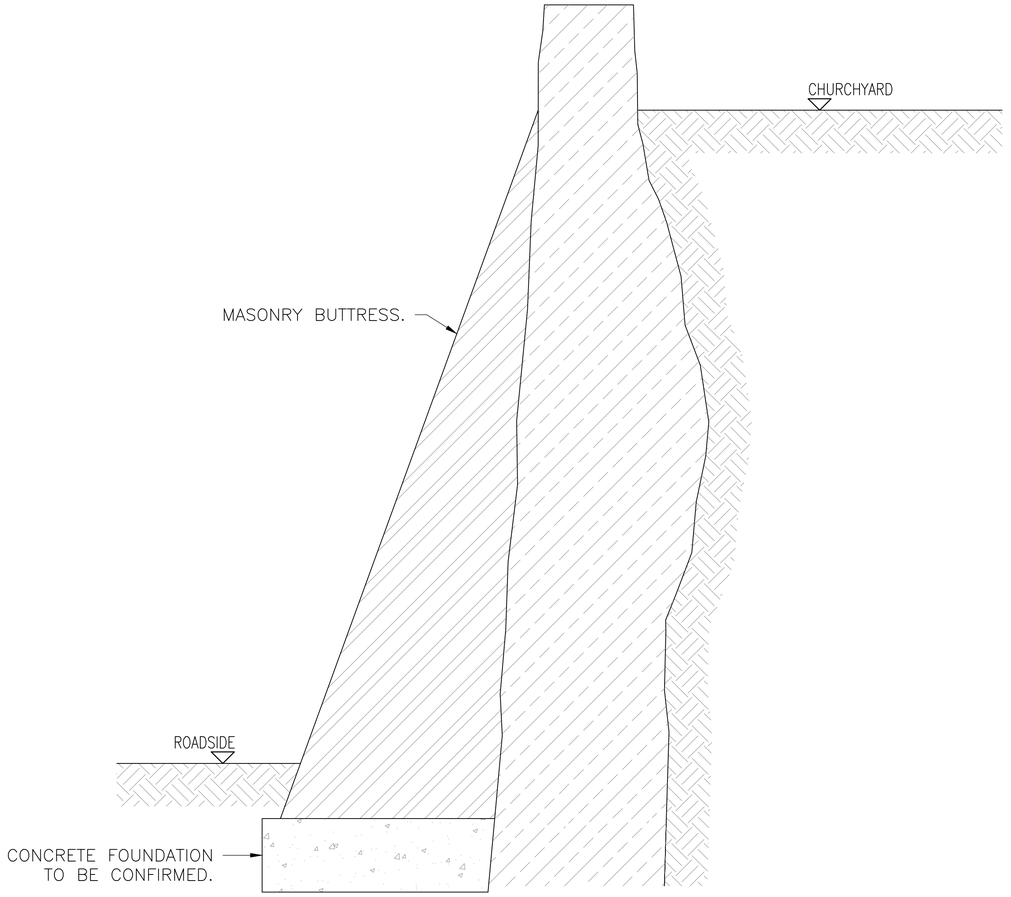
LABC Registered Partner Authority Scheme

TITLE:
PROPOSED REPAIR OPTIONS
OPTION D

SCALE: 1:25 (A1) DRAWN BY: MM
DATE: DECEMBER 2021 CHECKED BY: EJM
DRG No. **10384/13 (REV –)**



NOTES:

1. DEPTH OF FOUNDATIONS TO BUTTRESSES TO BE DETERMINED BUT MAY BE DEEP.
2. BUTTRESSES AT SAY 3.0m CENTRES BUT SUBJECT TO DETAILED DESIGN.
3. MAY BE POSSIBLE TO REPLACE BUTTRESS SIZE BY USING REINFORCED CONCRETE CLAD IN MASONRY.

OPTION E

SCALE 1:25

NOTES:–

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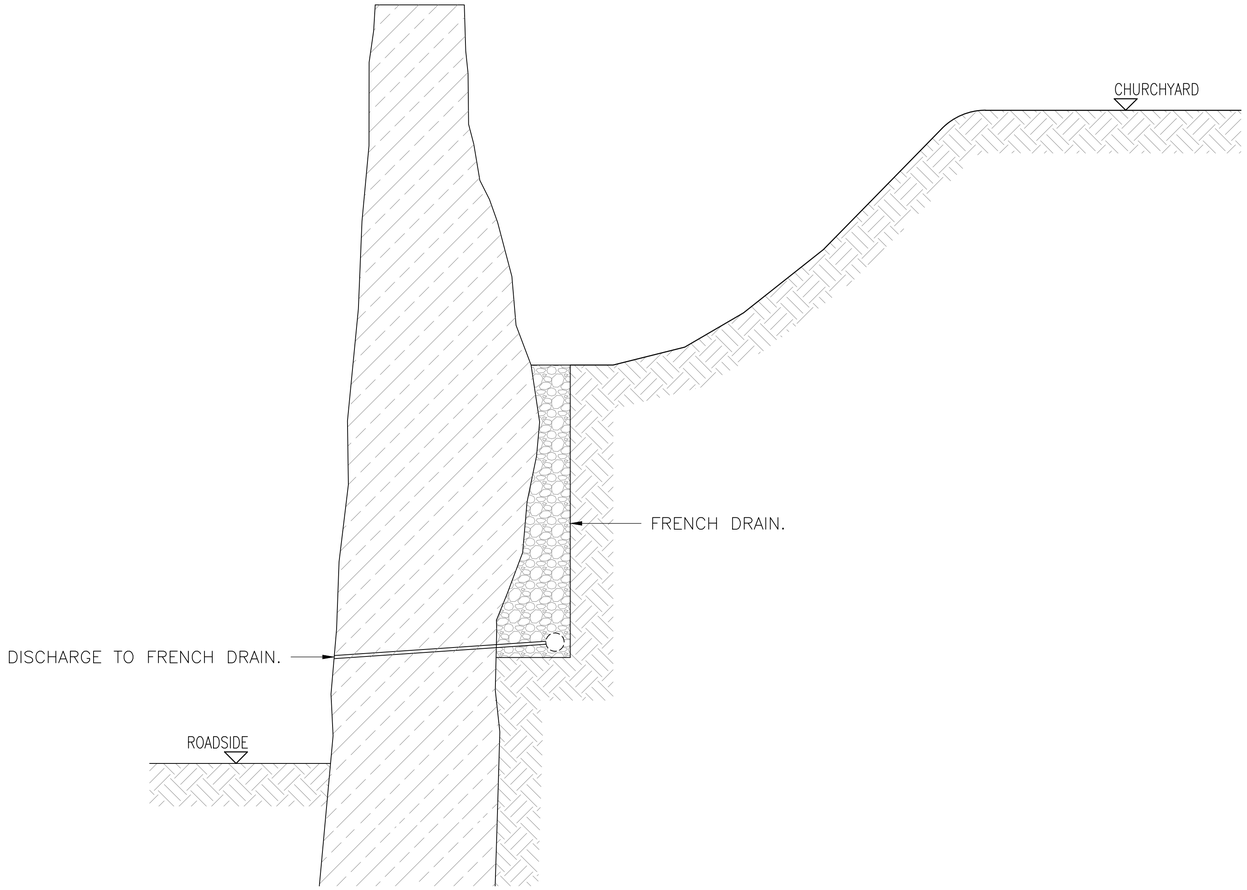
TITLE:
PROPOSED REPAIR OPTIONS
OPTION E

SCALE: 1:25 (A1) DRAWN BY: MM
DATE: DECEMBER 2021 CHECKED BY: EJM
DRG No.
10384/14 (REV –)



NOTES:

1. GROUND LOWERED WITHIN CHURCHYARD AND SLOPE STABILISED.
2. FRENCH DRAIN TO RELIEVE WATER PRESSURE.
3. WALL CONSOLIDATED.
4. FINAL EXTENT OF GROUND LOWERING TO BE AGREED.

OPTION F

SCALE 1:25

NOTES:–

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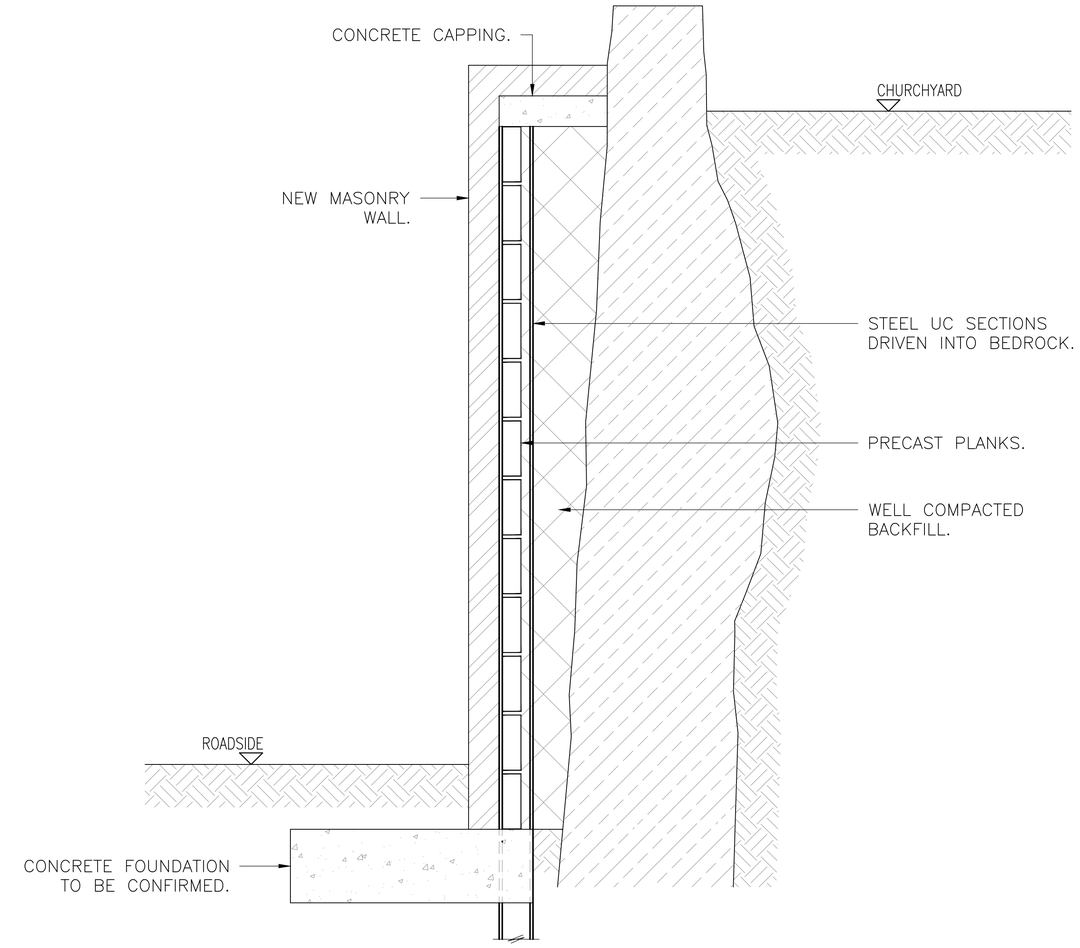
TITLE:
PROPOSED REPAIR OPTIONS
OPTION F

SCALE: 1:25 (A1) DRAWN BY: MM

DATE: DECEMBER 2021 CHECKED BY: EJM

DRG No.
10384/15 (REV –)



OPTION G

SCALE 1:25

NOTES:

1. FEASIBILITY OF DRIVING KING POST INTO BEDROCK TO BE REVIEWED.
2.
3. VIBRATION TO BE CONSIDERED.

NOTES:–

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TITLE:
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OPTION G

SCALE: 1:25 (A1) DRAWN BY: MM

DATE: DECEMBER 2021 CHECKED BY: EJM

DRG No.
10384/16 (REV –)

APPENDIX K

Photographs

Photograph 1: Extent of boundary of Churchyard north wall (red) and private garden (yellow) (2018)

Photograph 2: Soon after collapse in February 2013

Photograph 3: View towards north churchyard wall (2018)

Photograph 4: Trees to south of churchyard north wall (2018)

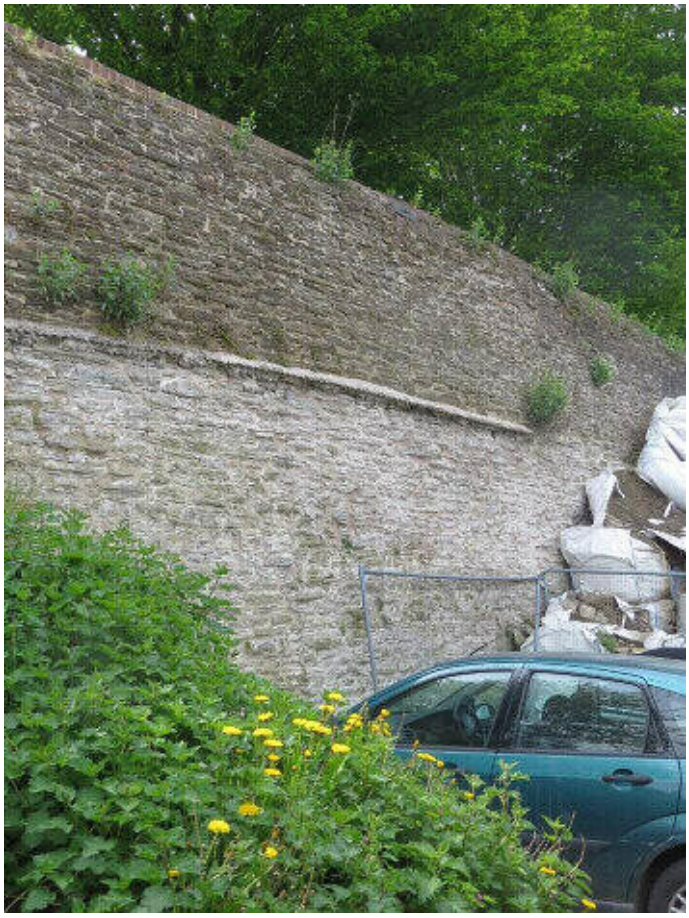
Photograph 5: Wall above churchyard ground level with brick on edge copping (2018)

Photograph 6: View of end of existing wall with rubble core matrix apparent (2018)

Photograph 7: Wall with two garages to St Leonard's House acting as buttresses (2018)

Photograph 8: Area of collapse with protection over and ballast bags as barrier (2018)

Photograph 9: Ballast bag buttress to east end of collapsed section (2018)



Photograph 10: Typical view of wall with line of previous lean-to's apparent (2018)

Photograph 11: Stone buttress at junction with Compasses courtyard area (2018)

Photograph 13: Lean to against wall (2018)

Photograph 13: Shed against wall in Compasses courtyard area (2018)

Photograph 14: Open nature of wall within Compasses lean-to (2018)

Photograph 15: Open nature of jointing within Compasses courtyard area (2018

Photograph 16: Wall outside courtyard better consolidated but may be cement based mortars. Plant growth still obvious suggesting water paths within the walling.(2018)

Photograph 17: Roots seen in wall width (2018)

Photograph 18: Site investigation within Churchyard (2021)

Photograph 22: Borehole in road to north of wall

Photograph 23: Scaffold erected for west set of wall cores

Photograph 24: Additional core hole P7 from initial investigations

Photograph 25: Core P1 removed and laid out

Photograph 26: Close up of core through wall to west end

Photograph 27: Close up of core through wall to west end

Photograph 28: Material removed from churchyard site investigation borehole

Photograph 29: View looking down on road to north of wall during investigations