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O'BRIEN & PRICE
STROUD
CONSULTING
STRUCTURAL ENGINEERS

Boundary wall stability

At

The Leazes, Stroud

On behalf of

Stroud Town Council

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Contents:

1.0 Brief and orientation.

As instructed by Stroud Town Council, to undertake an inspection and report upon the structural condition of the boundary walls enclosing the recreation ground to the south of Far Leazes, Stroud. No intrusive investigations were undertaken during the inspection.

The recreation ground lies on an approximate E-W axis, with the north boundary formed by a wall fronting Far Leazes. To the east is a wall dividing the recreation ground from the allotments and car park. There are numerous boundaries to the south, adjoining the rear gardens of premises along Parliament Street and Summer Street. The boundary wall extends from the SE corner as a retaining structure along the rear gardens, as far as No 3 Summer Street, at which point ground levels align and there remains only the base of a long-collapsed wall. The remainder of the southern boundary comprises fencing or the rear of adjacent buildings (Playhouse). The western boundary is fenced, with a wall commencing again along the diagonal section of the NW boundary to Victoria Cottage. There are therefore five sections of wall that may be described individually as follows:

Section 'a'	Eastern boundary. Recreation ground to car park.
Section 'b'	Eastern boundary. Recreation ground to allotments.
Section 'c'	Southern boundary. SE corner to 3 Summer St.
Section 'd'	North-West boundary to Victoria Cottage.
Section 'e'	Northern boundary to Far Leazes.

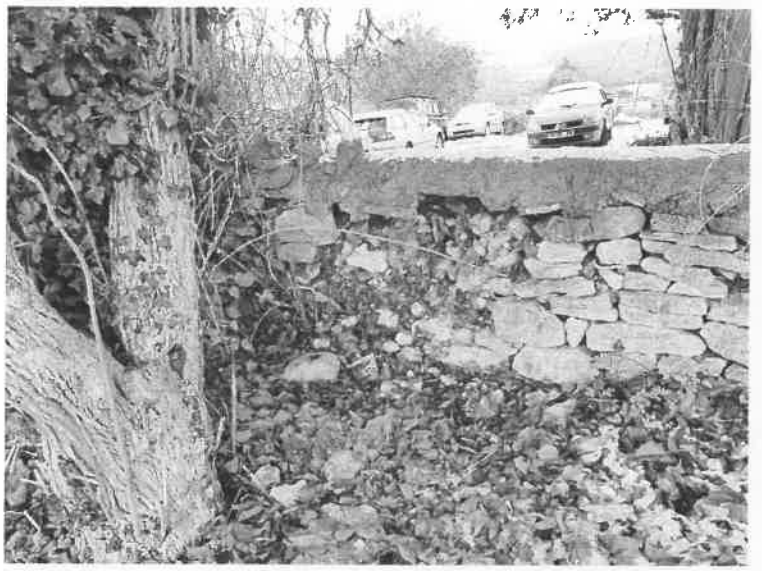
The inspection was undertaken by John Topp IEng AMIStructE AssocRICS on 7th December 2017, with a subsequent visit to take additional photographs on 12th December.

2.0 Observations

2.1 Section 'a'

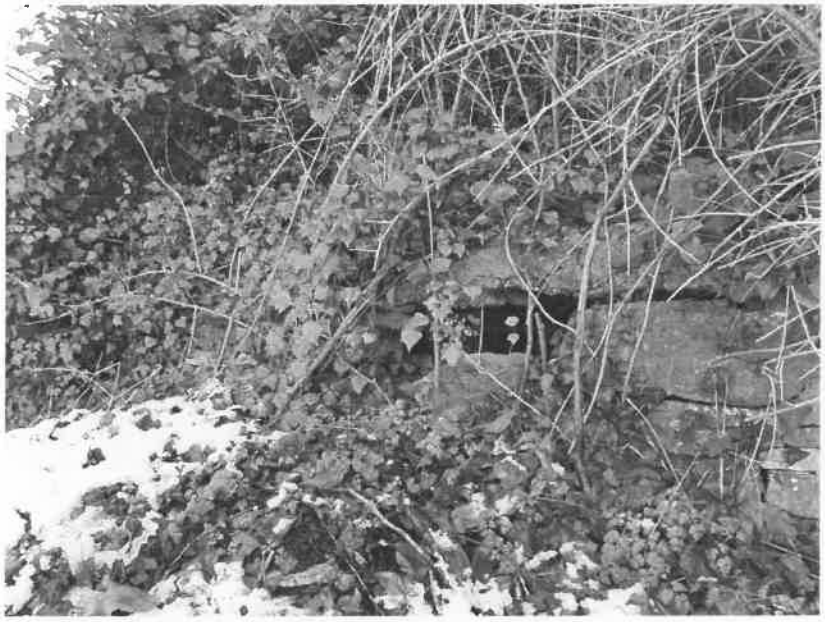
This wall is of dry-stone construction with an in-situ cementitious capping, approx. 500mm thick x 900mm high.

There is significant 'voiding' where the face stone has collapsed, and is 'bridged' by the capping. There is also a section fully collapsed near the corner of the allotments. Reconstruction is required.



2.2 Section 'b'

This is a continuation of the dry-stone wall to section 'a', except this also acts as a retaining wall for a relatively modest change in ground levels (allotments lower). The difference in level was not accurately measured, and access to this section of wall, both visual and physical, was hampered by vegetation. Despite this, there are clear areas of collapse and distress, and it is likely that removal of attached vegetation will further disturb decayed masonry. Where visible, this wall has a 'cock and hen' coping. The SE end of the wall is inaccessible due to presence of brambles, but further voiding is visible.



2.3 Section 'c'

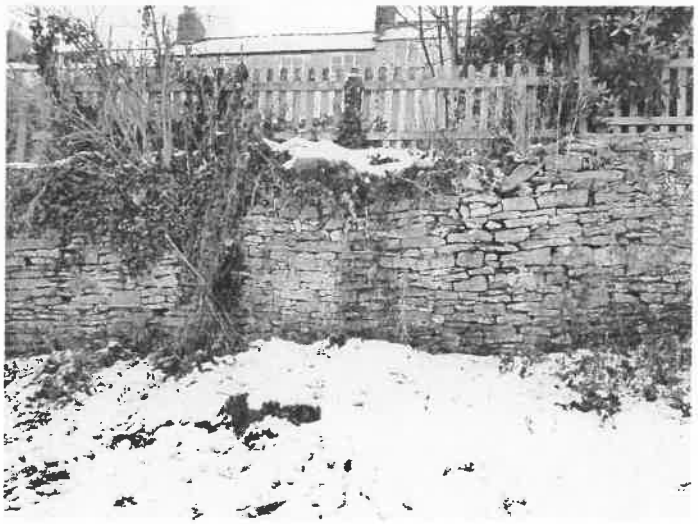
This wall is a significant retaining structure. It runs along the rear of the properties to Summer Street, and retains gardens to a height of approximately 1.5m. The current ground level on the recreation ground side of the wall may however be misleading, as the profile suggests that this may have been raised gradually over a considerable period of time, by deposition of waste vegetation. There may therefore be a 'mantle' of superficial matter with high organic content, which means the 'effective' height of the retaining structure could be closer to 2.0m.

Again, the SE end of the wall is concealed by brambles, and there is further vegetation across the face of the wall, but this is again of dry-stone appearance, and is significantly distorted. Some mortar 'pointing' has been added in the past as an attempted repair.

Wall distortions are apparent in both vertical and horizontal planes, indicating relative differential vertical movements, and lateral displacement/rotation. The capping to the wall is largely missing, and this appears to have been the case for a considerable period of time, exposing the body of the wall to substantial weathering.

At least two of the properties on Summer Street (thought to be Nos 3 and 12) have extant access arrangements onto the recreation ground in the form of timber steps.

There are some mature trees on the recreation ground, relatively close to the wall.



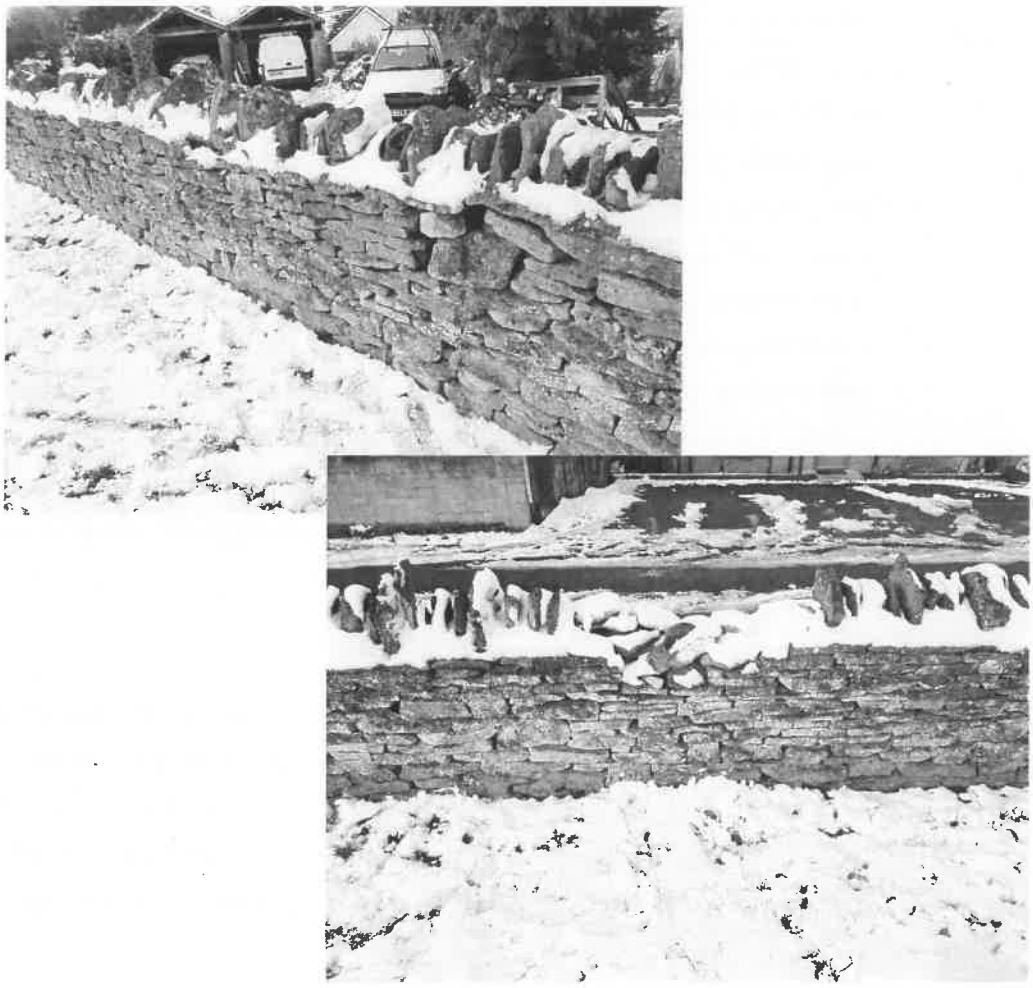
2.4 Section 'd'

The 'diagonal' length of wall separating the recreation ground from Victoria Cottage is largely concealed by vegetation, but nevertheless appears to be is reasonable condition. This is nominally 900mm high, and does not appear to provide any significant retention of soil. The wall is of dry-stone form, with a 'cock and hen' coping.

2.5 Section 'e'

This long section of wall fronting Far Leazes, is similar to that of section 'd', and is generally in good order, with no significant deviations in alignment. The wall is perpendicular and stable.

As is typical of this form of wall, individual masonry units are vulnerable to frost damage/decay, and occasional maintenance is required to replace damaged/missing stones. In this case, there are a number of such localised problems. Most notably, there are a number of areas of disturbance, which are possibly historic repairs, in the section of wall opposite Rock Cottages, and local loss of coping further east.



3.0 Discussion

Extensive rebuilding will be required for the dry-stone wall to sections 'a' and 'b', being the eastern boundary with the car park and allotments, but this should be further exposed to determine the full extent. Even if full replacement is required, this is at least a straightforward element of work to quantify. Similarly, the modest repairs to the northern boundary with Far Leazes are easily quantifiable. Wall section 'c', retaining gardens to the south, is however far more significant and represents a serious cost risk. A long term repair for wall section 'c' would entail either reconstruction, or the addition of a further retaining element inside the boundary of the recreation ground. I will describe these options briefly as follows:

Reconstruction

Reconstruction of the retaining wall on its current alignment would inevitably involve excavation and temporary support works within each of the rear gardens currently supported by the wall (approximately 6 No premises). At least one garden shed is close to the wall, and there may be other garden features present which would also be disturbed. A modern replacement retaining wall to match the existing would be extremely costly, as for an effective retained height of 2.0m, the reinforced concrete foundation base would need to be approximately 1.25m wide. Because of the sloping ground, the base would be best situated 'behind' the wall, therefore I would anticipate excavation into the gardens extending approximately 2.5m at garden level. In addition to the construction cost, it would also be necessary to agree the proposals with each of the owners and make-good all damage and disturbance, including that created by temporary access during construction. It will of course be necessary to first establish ownership and liability for the wall, if this is not already clear. The legality and status of the extant access arrangements also needs to be resolved.

Supplementary work

As an alternative to the disturbance and complications of reconstruction, consideration could be given to forming an additional retaining structure in front of the existing wall, and effectively 'holding' the old wall in place. The least-cost means of achieving this would be to install a wall formed with 'gabion' baskets. These are the stone-filled wire cages, as depicted below.

Despite being a lower cost option, this would remain a significant cost, particularly bearing in mind the construction access constraints. A problem with this approach is that a gabion wall relies entirely upon the mass of the contained stone to resist the lateral force of the retained soil, and is therefore necessarily of large scale. A gabion wall in front of the existing wall, would extend approximately 1.5m further into the recreation ground, and would require the removal of the adjacent trees.

Although the physical problem with the wall would remain, consideration could be given to a land exchange, to extend the rear gardens of the affected properties into the recreation ground, on the basis that the property owners would then become responsible for the retaining wall. This is assuming that they do not already have a liability for a 'party' fence wall. Clearly, the additional garden area would need to be sufficient to offset the ongoing liability for the wall, and this would require agreement of all owners, therefore this is not considered a feasible option.

4.0 Conclusion

There are repairs and reconstruction of the northern and eastern boundary walls which are quantifiable, but the defects present in the southern retaining wall (section 'c') are of considerable importance. The remedial options are costly, and present numerous legal and procedural difficulties. It is extremely difficult to determine the liabilities associated with this problem, and I urge caution in acceptance of such.

I trust that the above information is of assistance, but please do not hesitate should you require further clarification.

Yours Sincerely

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