



Conservation Engineer Report on Abbey Grounds

Project: Abbey Grounds, Wicklow Town
Client: Wicklow County Council
Reference: 21-19 Rev 1
Date: 5 October 2021

Revision Schedule

Conservation Engineer Report on Abbey Grounds

Rev	Date	Details	Prepared by	Reviewed by	Approved by
0	24.09.2021	Final	T.Wood	K.Smyth	T.Wood
1	05.10.2021	Additional commentary added	T.Wood	K.Smyth	T.Wood

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Trevor Wood Consulting Engineers Ltd 2021

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CONTENTS	PAGE NO.
1.0 INTRODUCTION	1
2.0 INSPECTION / COMMENTARY.....	1
2.1 THE FRIARY RUINS.....	1
2.2 THE COACH HOUSE.....	2
2.2.1 Internally	2
2.2.2 Externally	2
2.3 BOUNDARY WALL	5
2.3 EFFECTS OF STRUCTURAL REMEDIAL WORKS AND PROPOSED INTERVENTIONS FOR PUBLIC REALM SPACE	6
3.0 CONCLUSIONS AND RECOMMENDATIONS.....	8
APPENDIX A	
PHOTOGRAPHS	
APPENDIX B	
DTA SURVEY DRAWING	

1.0 INTRODUCTION

Trevor Wood, MEng CEng MICE MIEI, Conservation Accredited Engineer undertook a preliminary inspection of the Abbey Grounds on the 21st of July 2021.

Preliminary comments were made in a summary report issued on 22nd July 2021. From this preliminary report a more detailed inspection was undertaken on the 19th of September 2021 to investigate further the items noted in the earlier report.

The elements inspected in more detail were;

The 13th Century Franciscan Friary Ruins

The Coach House

Boundary stone wall to Wentworth Place and Abbey Street.

In addition to these elements due to the fact of the protected nature of the Abbey grounds comment will be made on the affects of any intervention work and those of proposed public realm works to improve the visitor experience of visiting the Abbey Grounds.

2.0 INSPECTION / COMMENTARY

2.1 The Friary Ruins

A significant amount of pinning and re pointing was completed approximately four years ago to all of the Friary ruins.

With regards to the Southern gable ended wall, some vegetation growth has re-established along the top of the remaining wall. See photograph 1. It is recommended that at the start of the proposed works the vegetation is carefully cut back and roots treated using eco plugs, as they die off the roots carefully removed and localised repointing in lime mortar.

The eastern wall has two arches within the wall, see photographs 2 and 3. There is vegetation starting to re-establish on this wall as well and the same treatment policy needs adopting as for the southern wall. The most northern of the two arches has minimal masonry cover over the crown of the arch and has displaced over time. See photograph 4. To the underside of this arch there are some stone voussoirs that are showing signs of starting to detach from the arch. See photograph 5. We recommend that underneath of this arch is cordoned off immediately due to the risk of stonework falling. The remedial work we would recommend is pinning of the stones that are loose on the underside of the arch using stainless steel dowels. The arch will require

propping during this work to reduce risks of any failure occurring during the pinning works. The holes formed from the pinning can be filled using a mixture of lime mixed with the stone dust collected from the drilling.

We would recommend that some additional masonry is added to the top of this arch to improve the arch action in terms of increasing compressive forces to help keep the arch together.

The middle wall traversing west to east and the northern most wall are in a reasonably good condition structurally but do require vegetation removal in the same way as the southern wall. See photographs 6 and 7.

The stump of wall that sits a small distance away from the main Friary ruins requires vegetation removal and repointing with lime mortar locally where any roots once killed off using 'eco plugs'

2.2 The Coach House

2.2.1 Internally

Internally the stone wall that is approximately at a third from the west gable end has detached from north and south walls to coach house. The cracking that was reported on previously in the external facades does occur internally at the same locations as well. See photographs 9-14. The couch house has been re-roofed with a modern truss rafter roof that is strapped to the walls. See photographs 15 and 16. Due to the strapping being visible we would propose that internally we would use galvanised strapping to tie the transverse internal wall to the north and south walls and the northeast corner of the eastern gable end. See photograph 17. For the cracks in the west gable wall and the north wall it is likely that a similar type of strapping will be required but this can only be undertaken once the results of some crack monitoring are known as there may be a need for more substantial structural works in terms of potential localised underpinning.

At the coach house entrance there is a section of brickwork that appears to have been possibly stuck and become dislodged. See photograph 18 This brickwork should be re set. The brickwork arch over springs from a point behind the dislodged brickwork so there is no structural issue with removing the affected brickwork and re-setting it.

2.2.2 Externally

From the external inspection it was noted that some of the original brickwork features have some areas where the face of the brickwork has 'blown' a dentil repair can be undertaken to these areas to prevent further damage and loss of material. See photograph 19

For the cracking highlighted in our previous report we placed a series of 'demec' stainless steel crack monitoring pips across them.

On the west gable end we placed 3 sets of pips and took initial readings of both the crack width and the distance between the pips. See photographs 20 - 23. On the north facing wall we placed another 3 sets of pips and took initial readings. See photographs 24 - 27. The initial readings are contained in table 2.2.2

These cracks require monitoring over a period of time to determine if the cracks are historic. If no significant movement is now occurring, then they can just have remedial tying details applied by using stainless steel 'helifix helibar' remedial crack stitching. If there is significant movement still occurring, then there may be the need for some localised underpinning.

It was noted that to the western end of the north facing external wall a rainwater down pipe is damaged at the bottom and is allowing water to exit onto the plinth for the wall. See photograph 28. This could be a potential issue in relation to the cracking in the walls and possible movement occurring as rainwater may be softening the ground locally especially with the downpipe currently broken at it's base. This needs additional downpipe added and ideally a gulley with underground storm drainage added to direct the rainwater from the back of the coach house into a soak pit. This would apply to both downpipes on this elevation.

Table 2.2.2 Crack Monitoring

No	Location	Survey Dates				
	Coach House, Abbey Grounds, Wicklow Town	19-09-21				
		Distance between pips set either side of cracking	Distance between pips set either side of cracking and movement since last measurement			
1	West Gable Wall ground level	109.03mm (crack width measured as 5.5mm)	mm (movement mm)			
2	West Gable Wall eaves level. Right hand side	127.84mm (crack width measured as 5mm)	mm (movement mm)			
3	West Gable Wall eaves level. Left hand side crack	105.68mm (crack width measured as 5mm)	mm (movement mm)			
4	North Wall at base of wall	99.33mm (crack width measured as 4.5mm)	mm (movement mm)			
5	North Wall below eaves level. Right hand side	110.41mm (crack width measured as 20mm)	mm (movement mm)			
6	North Wall below eaves. Left hand side	138.86mm (crack width measured as 2.5mm)	mm (movement mm)			

2.3 Boundary Wall

An inspection of the boundary wall from within the Abbey grounds was conducted followed by one from the car park area to AIB and Supervalu as well as along Wentworth Place and Abbey Street.

Just to the rear of the Abbey / Priest's house there is a masonry arch bridge that crosses the river that forms the Eastern boundary to the site. This masonry structure has stone parapets that require vegetation growth removal with pinning of loose stonework and repointing. See photographs 29 - 32. Any large roots should be treated with 'Eco Plugs' to kill them off rather than potentially damaging masonry further trying to remove them without killing them first.

The rest of the internal wall faces were mostly covered in vegetation and could not be fully inspected. See photographs 33 and 34. Significant vegetation growth requires removal and large roots into the wall treated with 'Eco Plugs'. Once the vegetation has been cut back, we recommend a further inspection to determine the locations where stone pinning is likely to be required and probable pointing.

From the carpark on the other side of the river a block wall topped with stonework has been constructed. We suspect some of the capping stonework is probably from an earlier wall. See photograph 35. On Wentworth Place part of the wall was reconstructed in recent times due to it collapsing during a localised flood event. See photograph 36.

At the end of Wentworth Place, where it meets up with Abby Street the wall has a significant lean out towards the road. See photograph 37. The lean coincides roughly with where two mature trees are found within the ground very close to the wall. With regard to the second of these trees away from the corner where Wentworth Place meets Abbey Street, the lean was found to be 100mm over 600mm. The lean of the wall where the tree is located inside the grounds nearly in the corner, the lean is 60mm over 600mm. Once we are onto Abbey Street, the lean is reduced to 20mm over 600mm and this reduces to virtually plumb further south along Abbey Street.

Along this section of wall, it was also noted there are two significant cracks. See photographs 38-41. From a recent survey it was found that the internal and external levels are very much the same, so the lean is not attributable to the wall acting as a retaining wall at this location. See level survey in Appendix B by DTA.

From the location of the lean and cracking with respect to two mature trees within the Abbey Grounds close to this section of wall it is apparent that the trees are the cause of the lean. We recommend that these two trees are removed otherwise the wall is likely to continue to lean and will fall onto the road. As it stands the reaction of the centre of gravity of the wall with its current lean is only just within the middle third, so it is very close to potential collapse.

Due to the severity of the lean and the space that is available within the Abbey Grounds we would recommend some concrete 'Kelly blocks' are placed approximately 2m from the wall a timber waler added below the stone capping level on the Wentworth place side fixed into mortar joints in the wall and tied back to the 'Kelly blocks' with cables. The long-term solution is to remove the trees. Allowing roots to die back naturally and to incrementally pull the wall back by building a timber framework around the wall that can be pulled back slowly. As the mortar joints open they are to be filled with lime mortar. This has been successfully used elsewhere in Ireland and the UK. The full lean will not need to be pulled back as with the root degradation this will also naturally allow the wall to have some restoration in plumbness.

From the inspection of the wall outside the Abbey Grounds it was noted that there are a few areas where some of the capping stonework is missing. See photograph 42. This should be reinstated along with any slate bed that may also be missing.

2.3 Effects of Structural Remedial Works and Proposed Interventions for Public Realm Space

The proposed remedial works noted for the Friary Ruins, The Coach House and the Boundary Wall are all essential remedial works to stabilise and prevent further structural damage.

The works to the Friary Ruins do not entail any removal of existing stonework and repointing, where required is in Lime mortars which would be commensurate with the original materials used for bedding and pointing.

The Coach house may require underpinning to a section of wall/s but this does not entail the removal of any original fabric. If found to be required, it will provide additional stability to the building and prevent further movement. The crack stitching proposed externally will not be visible once completed as the stainless steel rods will be embedded in horizontal joints in the stonework / brickwork and have a degree of flexibility that they can follow uneven courses generally found in this type of stonework construction. Internally the strapping proposed is visible if the walls are not plastered but does become hidden if the walls are to be plastered in a lime plaster at some stage in the future.

In relation to the boundary walls the remedial structural works are necessary to prevent further damage of structural fabric and potential collapse in relation to the part of the boundary wall that has a significant lean. The masonry arch bridge will actually be enhanced by the remedial works as stonework that will otherwise eventually be displaced on the parapet walls by the vegetation growth currently occurring will be arrested.

In relation to works to enhance the public space for the Abbey Grounds the only structural intervention that has an impact on the existing structures are works to the Coach House. The proposal to create two large openings for glazing to provide some view to the Abbey Ruins from Abbey Street does result in loss of fabric on both the front and external facades. Best practice when undertaking such interventions is to maintain some of the existing wall to allow where original doorways and windows are located to still be noted.

This can be achieved by keeping the window and door head masonry in place which allows the original story of the building to be interpreted visually. In addition, it is noted that the original floor exists with channels and slopes that relate to its previous use as a coach house. Careful consideration will need to be taken into how this is incorporated into the new works. Previous examples of using glass floors have worked successfully and should be considered here.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Trevor Wood, MEng CEng MICE MIEI, Conservation Accredited Engineer undertook a preliminary inspection of the Abbey Grounds on the 21st of July 2021 and a furthermore detailed inspection on the 19th of September 2021.

From the inspections the conclusions are;

The 13th Century Franciscan Friary Ruins,

The walls to the Friary Ruins even though they had significant remedial works undertaken in recent years, vegetation growth is again re-establishing itself especially along the tops of the remaining walls. All the vegetation requires cutting back and larger roots treating with 'Eco Plugs' to promote root die back. Once this have been completed some localised repointing will be required where roots have died and been removed.

On the eastern most wall there are two stone arches of which the one furthest north requires some structural intervention work. There is some misshaping of the arch from movement and some of the voussoirs to the underside have come loose and are now at risk of falling, possibly leading to the arch to potentially collapse. The area underneath requires cordoning off until such time as remedial works can be undertaken. The remedial works will consist of temporarily propping the arch but allowing such access to the loose stones that they can be pinned into stonework above by adding stainless steel pins that will then have the ends covered over with lime mortar mixed with stone dust from drilling for the pins. An additional course of stonework to match the stonework already in-situ should be added on top of the arch to increase the compressive load on the arch which will improve arch action and re stabilise this section of wall.

The Coach House,

This structure has had a new roof installed in the recent past strapped down to the existing solid external walls.

An internal masonry wall between the north and south external walls has become detached and needs to be strapped back to these walls using galvanised wall steps at 1m centres. Strapping will also be required to the northeast corner internally as some detachment of these two walls has also occurred. There is also some dislodged masonry around the main coach house double doors that needs to be reset.

On the west and north elevations significant cracking running from ground level to eaves was noted and crack monitoring devices were installed with preliminary readings taken.

The results from if any significant movement is still occurring will determine what remedial work is required. As a minimum this will entail crack stitching internally using galvanised straps and externally using 'Helifix Helibar' crack remedial bars buried in bedding joints. If significant movement is still occurring, then it is likely there will be the need for localised underpinning.

It was noted that rainwater downpipes on the north elevation discharge at the base of the wall which will not be helping the situation regarding the cracking identified. These rainwater outlets need to drain into gulley's and a storm sewer laid to a soak pit located a minimum of 5m from the Coach House.

Some feature brick work around window and door reveals has lost some of its facing material and dentil repairs should be undertaken to stop further loss of the softer inner part of the brick.

Boundary Stone Wall to Wentworth Place and Abbey Street.

On the face of the boundary wall within the Abbey Grounds, significant vegetation growth has occurred and this requires cutting back so a full inspection of the condition of this face of the wall can be completed.

To the south corner of the site there is an existing single span masonry arch bridge that as part of the proposals for the Abbey Grounds that will act as a route into the grounds from the East. The parapet walls to this bridge require vegetation removal with some stone pinning and the top section of capping stones re setting as well as repointing in lime mortar.

The boundary wall that runs from approximately where Wentworth Grove exits onto Wentworth Place up to the junction of Wentworth Place and Abbey Street is showing a serious lean towards the road. There is no real significant level difference between the two sides of the wall at this location. Two mature trees located in close proximity to the wall are the probable causes for the movement over time. These two trees require removal otherwise the wall will collapse. As it stands the wall is only just stable and any further movement is likely to result in a localised failure onto Wentworth Place. Some temporary bracing is required for the wall using concrete 'Kelly blocks' approximately 2m back from the wall that are then attached with wire ropes to a waler that needs to be placed on the wall on the roadside just below the capping stone level.

The long-term solution is to use a novel, but tried and tested method used both in Ireland and the UK of pulling the wall back to within 50% of its current lean. This will require encasing the wall and pulling the encasing back slowly. Any joints that open up will required filling with lime mortar. Once completed the two vertical cracks can be crack stitched. It is also likely that as the root systems die back that some of the remaining 50% of lean will also restore itself.

Intervention Works

The intervention works can be split into two categories. Those relating to remedial structural works identified: the Friary Ruins, the Coach House and the Boundary Walls and those as a result of the proposed public realm works to the Abbey Grounds.

With regards to the remedial structural works none of the proposed works remove any existing fabric and all the proposed remedial works are required to stabilise and prevent any further structural damage or potential for collapse. Materials proposed are all sympathetic to those originally used and do not pose a future threat to the structural integrity of where they are proposed to be used.

In relation to works to enhance the public space for the Abbey Grounds the only structural intervention that has an impact on the existing structures is the works to the Coach House. The proposal to create two large openings for glazing, to provide some view to the Abbey Ruins from Abbey Street does result in loss of fabric on both the front and external facades. Best practice when undertaking such interventions is to maintain some of the existing wall to allow where original doorways and windows are located to still be noted.

This can be achieved by keeping the window and door head masonry in place which allows the original story of the building to be interpreted visually. In addition, it is noted that the original floor exists with channels and slopes that relate to its previous use as a coach house. Careful consideration will need to be taken into how this is incorporated into the new works. Previous examples of using glass floors have worked successfully and should be considered here.

Client: Wicklow County Council
Project: Abbey Grounds, Wicklow Town
Project No. 21-19



TREVOR WOOD
CONSULTING ENGINEERS

APPENDIX A

PHOTOGRAPHS



Photograph 1: Southern Gable wall to Friary



Photograph 2: Eastern wall with two arches



Photograph 3: Vegetation growth



Photograph 4: Northern of two arches with misshaped barrel



Photograph 5: Loose stones to underside of arch



Photograph 6: Mid wall running east to west showing vegetation growth



Photograph 7: Northern Friary wall with vegetation growth



Photograph 8: Wall stump with vegetation growth



Photograph 9: Coach house internal wall separating from outer walls



Photograph 10: Crack at weakest point in wall



Photograph 11: Separating of internal wall from external wall



Photograph 12: Crack in north wall mirrored from outside



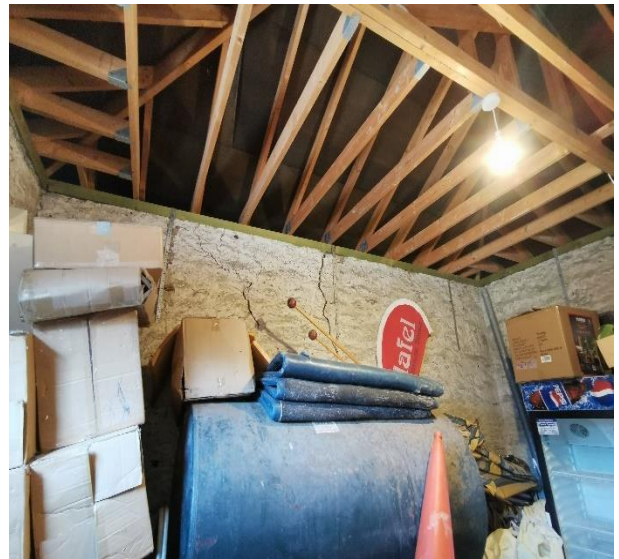
Photograph 13: Cracking to wall



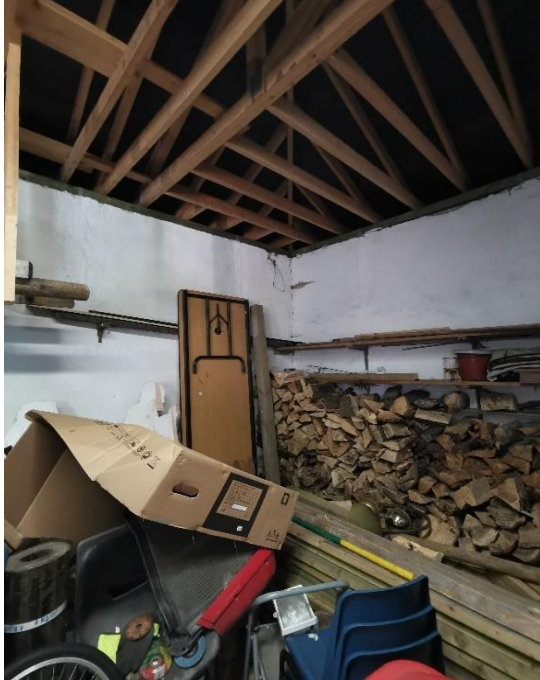
Photograph 14: Cracking to inside face of wall



Photograph 15: Modern truss rafter roof



Photograph 16: Wall plate strapping of truss rafter roof



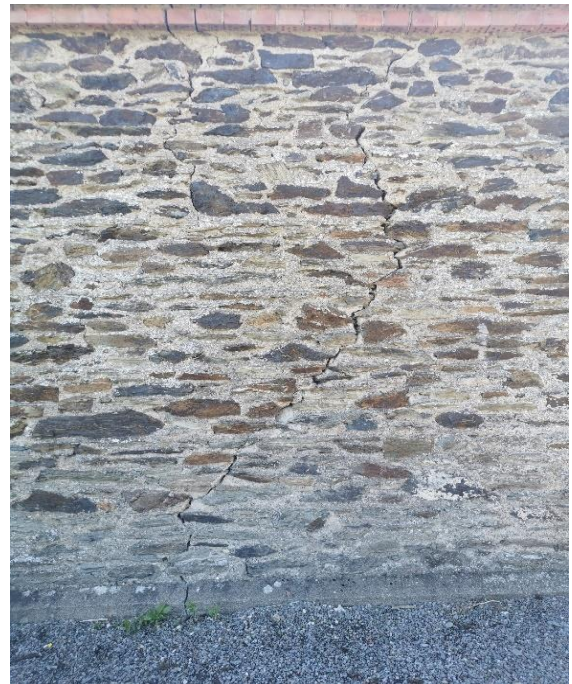
Photograph 17: Northeast corner of wall separating at corner from one another



Photograph 18: Masonry dislodged



Photograph 19: Feature brickwork with facing blown



Photograph 20: Vertical crack in west elevation to coach house



Photograph 21: Crack monitoring pips location 1



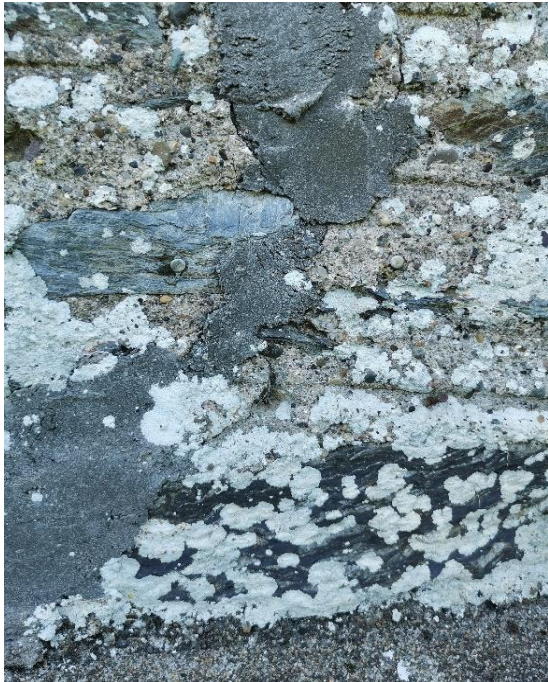
Photograph 22: Crack monitoring pips location 2



Photograph 23: Crack monitoring pips location 3



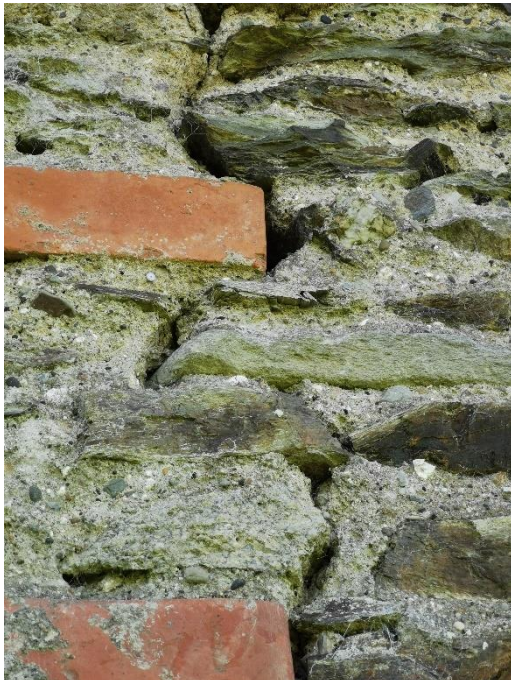
Photograph 24: Cracking in north elevation to coach house



Photograph 25: Crack monitoring pip location 4



Photograph 26: Crack monitoring pip location 5



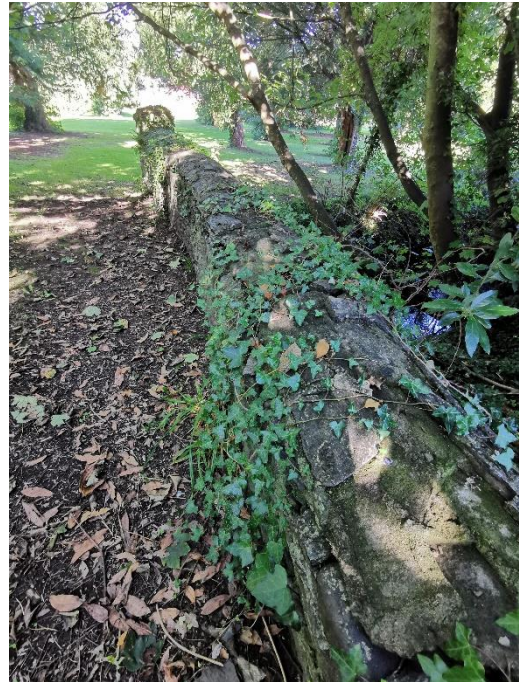
Photograph 29: Crack monitoring pip location 6



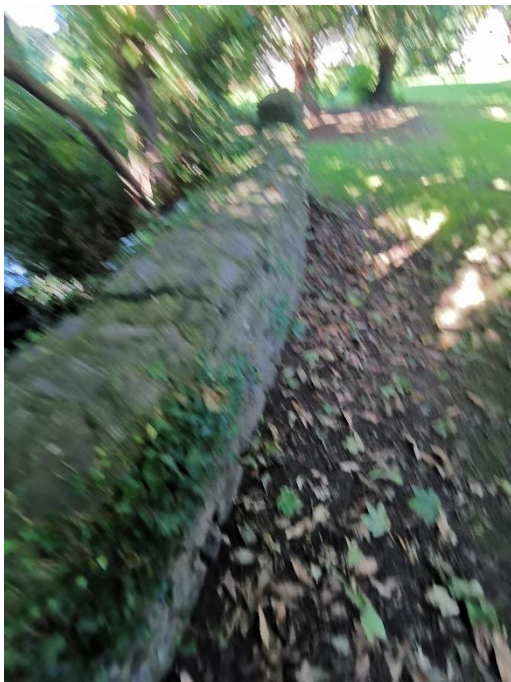
Photograph 28: Rainwater pipe missing end piece and allowing water to exist directly onto plinth to North elevation of coach house



Photograph 29: Stone arch bridge with stone parapets



Photograph 30: Vegetation growth on parapet



Photograph 31: Vegetation on parapet



Photograph 32: Stone arch bridge



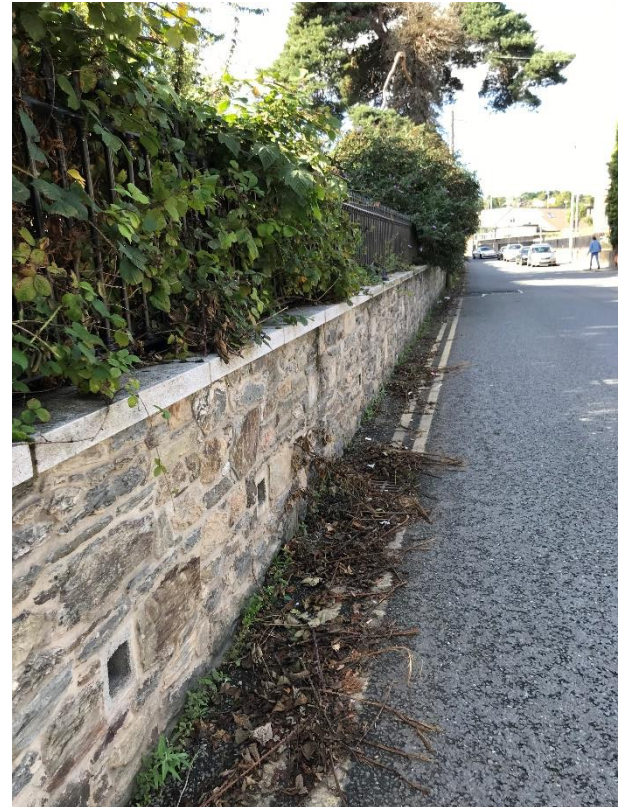
Photograph 33: Overgrown vegetation to boundary wall



Photograph 34: Vegetation growth on boundary wall



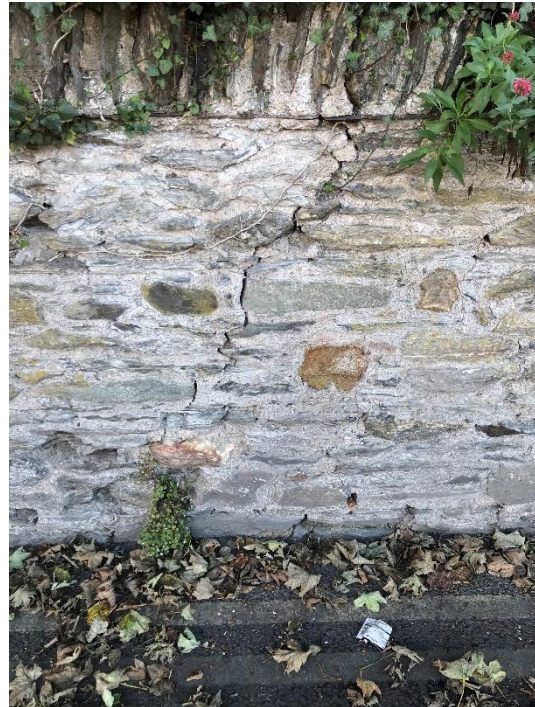
Photograph 35: Blockwork boundary wall with stone capping within car park



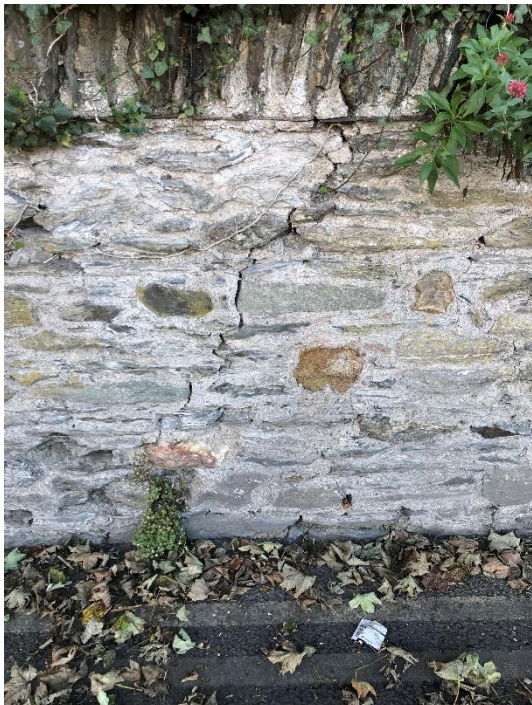
Photograph 36: Reconstructed section of boundary wall to Wentworth Place



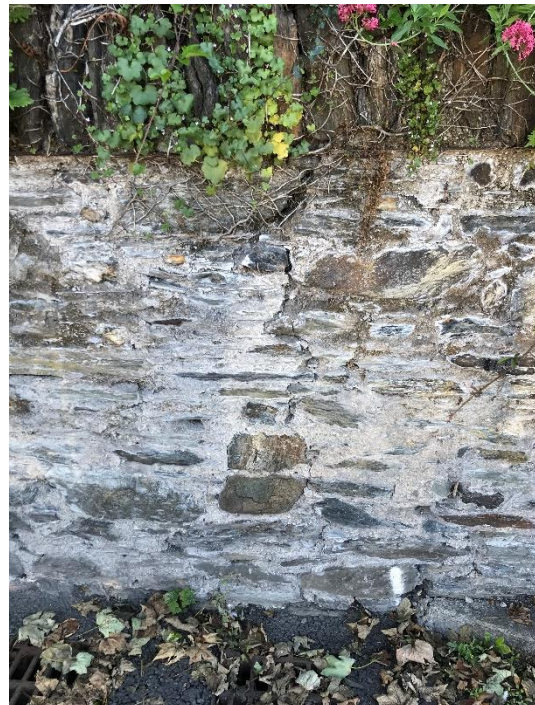
Photograph 37: Boundary wall looking up Wentworth Place towards Abbey Street



Photograph 38: Crack in boundary wall opposite Wentworth Grove



Photograph 39: Second Crack in boundary wall close to Wentworth Place Abbey Street junction



Photograph 40: Lean of wall and vegetation growth



Photograph 41: Crack close up



Photograph 42: Missing parapet perpend stones

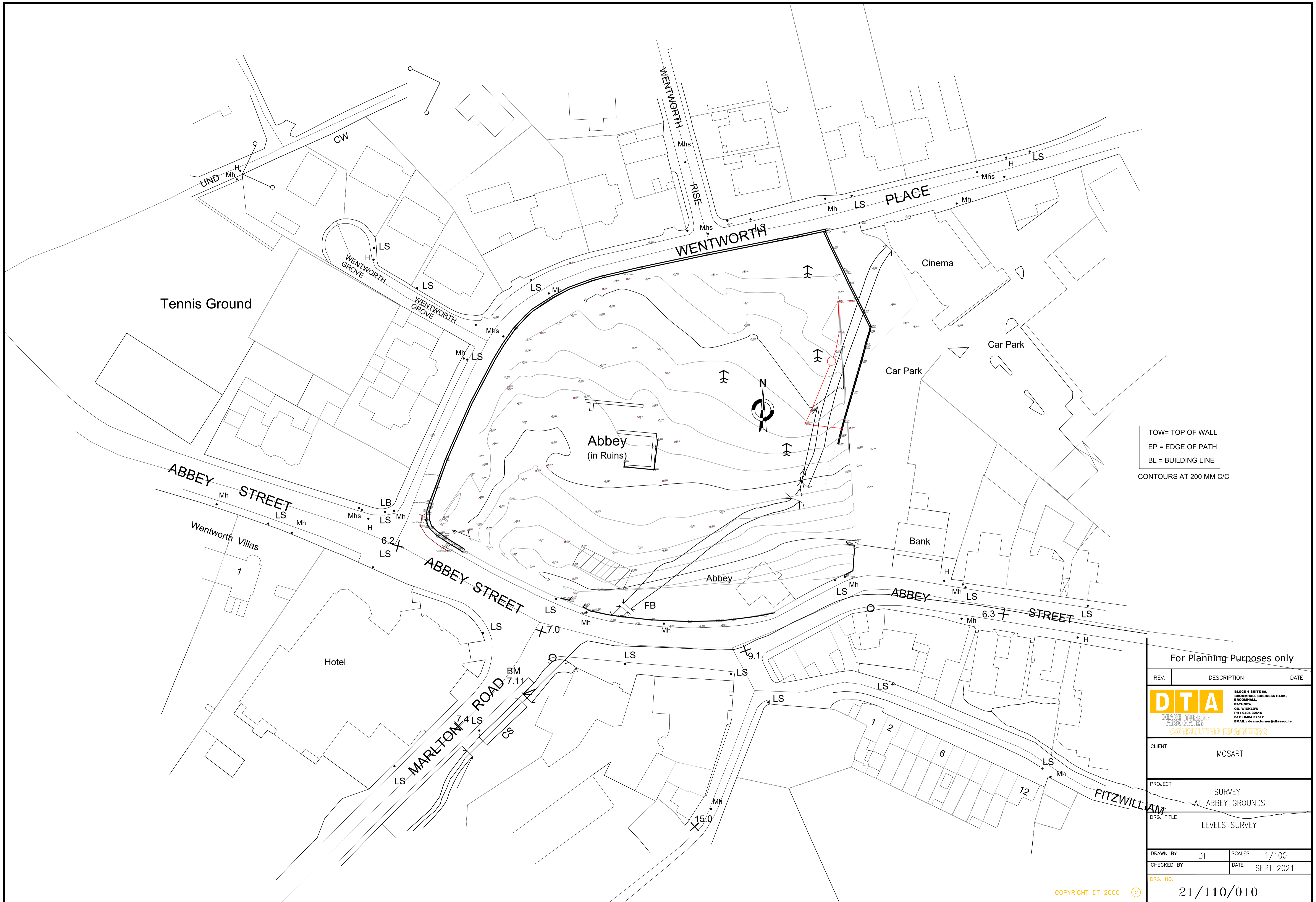
Client: Wicklow County Council
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Project No. 21-19



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APPENDIX B

DTA Survey Drawing



TOW= TOP OF WALL
 EP = EDGE OF PATH
 BL = BUILDING LINE
 CONTOURS AT 200 MM C/C

For Planning Purposes only

REV.	DESCRIPTION	DATE
 <p>DTA <small>DEANE TURNER ASSOCIATES</small> <small>CONSULTING ENGINEERS</small></p>		
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CLIENT	MOSART	
PROJECT	SURVEY AT ABBEY GROUNDS	
DRG. TITLE	LEVELS SURVEY	
DRAWN BY	DT	SCALES 1/100
CHECKED BY		DATE SEPT 2021
DRG. NO.	21/110/010	