



Bank Station Capacity Upgrade

15 Abchurch Lane Heritage Statement

September 2014



Bank Station Capacity Upgrade

15 Abchurch Lane Heritage Statement

In support of London Underground's
Listed Building Consent Application
for protective works

September 2014

Bank Station Capacity Upgrade Project
5th Floor
10 King William Street
London EC4N 7TW

LUL Document Reference:
LUL-8798-STT-G-002114

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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken during May 2014 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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1 Introduction

- 1.1.1 This Statement has been prepared in support of an application for listed building consent made by London Underground Limited at 15 Abchurch Lane, London, EC4N 7BW. The application seeks consent for protective works to mitigate the effects of potential settlement caused by the Bank Station Capacity Upgrade (BSCU) tunnelling works.
- 1.1.2 The protective works described within this document have been guided by the current concept design stage of the BSCU project; the further details required by the condition suggested in Section 7 will be provided on completion of detailed design.
- 1.1.3 The work for which this application seeks to gain consent is:
- Consolidation and repair of existing cracked stonework and brickwork on the Abchurch Lane elevation.

The location plan and listed building description for the building are provided in Appendices 1 and 2.

- 1.1.4 This application (and similar applications) for listed building consent are being submitted concurrently with an application to the Secretary of State under the Transport and Works Act (TWA) 1992 for an Order, to be known as the Bank Station Capacity Upgrade (BSCU) Order, and with a request for a direction (of deemed planning permission) under section 90(2A) of the Town and Country Planning Act 1990. The purpose of this listed building consent application is to seek the necessary approval to enable works that may be necessary to mitigate predicted damage to this listed building caused by ground settlement related to the proposed BSCU tunnelling.
- 1.1.5 The BSCU project involves a major upgrade of the Bank Monument Station Complex to provide greatly improved passenger access, circulation and interchange. It includes provision of a new passenger entrance with lifts and escalator connections; a new Northern Line passenger concourse using the existing southbound platform tunnel; a new Northern Line southbound running and platform tunnel; and new internal passenger connections between the Northern Line, the Docklands Light Railway (DLR) and the Central Line.
- 1.1.6 The new Station Entrance will open on to Cannon Street at the junction with Nicholas Lane. An entrance hall will provide circulation space, as well as accommodating staff facilities, plant rooms and associated retail space. New passenger lifts will link the entrance hall directly with the Northern Line and DLR, providing step free access. Escalators will also connect the entrance hall with the Northern Line.

- 1.1.7 The existing southbound platform for the Northern Line will be converted into a new passenger concourse. A new southbound running and platform tunnel will be located to the west of the existing platform. New cross passages will connect the Northern Line concourses and platforms. New walkways and escalators will better connect the Northern Line, the DLR and the Central Line. In particular, a tunnelled passageway fitted with moving walkways and new escalators will greatly improve interchange between the Northern Line and the Central Line.
- 1.1.8 Works to divert and protect utilities and to protect listed and other buildings from ground settlement will also be undertaken. The compulsory purchase and temporary use of land, the temporary stopping up of streets, street works and ancillary works will also be required.
- 1.1.9 Appendix 3 of this document contains plans showing the proposed BSCU works.

2 Heritage Planning Policy Context

The Planning (Listed Buildings and Conservation Areas) Act 1990

- 2.1.1 Section 66 of the Act establishes a general duty for a planning authority, in considering whether to grant consent for a development which affects a listed building, to have special regard to the desirability of preserving a listed building or its setting or any features of special architectural or historical interest which it possesses. A building is listed by virtue of its special architectural or historical interest (Section 1(1)).
- 2.1.2 Section 72 of the Act establishes a duty in the exercise of any function under the Act to pay special attention to the desirability of preserving or enhancing the character or appearance of a conservation area. A conservation area is an area of local interest designated principally by the Local Planning Authority.

The National Planning Policy Framework 2012

- 2.1.3 Section 12 of the National Planning Policy Framework (NPPF) deals with the consideration of cultural heritage assets and sets out the importance of being able to assess the impact of a development on the significance of heritage assets. Significance is defined in Annex 2 as the value of an asset because of its heritage interest. This interest may be archaeological, architectural, artistic or historic and can extend to its setting. The setting of a heritage asset is defined in Annex 2 as the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. A designated heritage asset is recognised by the NPPF to be a World Heritage Site, Scheduled Monument, Listed Building, Protected

Wreck Site, Registered Park and Garden, Registered Battlefield or Conservation Area designated under the relevant legislation.

- 2.1.4 The NPPF recognises that a balance needs to be struck between the preservation of the significance of a heritage asset and delivering public benefit. With regard to designated assets, paragraph 132 states that the more important the asset, the greater the weight should be on its conservation. Distinction is drawn between those assets of highest significance and those of a lesser significance.
- 2.1.5 The NPPF identifies harm as being either substantial or less than substantial. Paragraph 133 states that where the proposal would lead to substantial harm to the significance of a designated asset consent should be refused unless the harm or loss is necessary to achieve substantial public benefit that outweighs that harm. In cases where less than substantial harm to the significance of a designated asset is anticipated, paragraph 134 requires that this harm should be weighed against the public benefits of the proposal. In respect of non-designated assets, paragraph 135 requires a balanced judgement having regard to the scale of any harm or loss and the significance of the asset.
- 2.1.6 In accordance with the NPPF, this heritage assessment sets out the significance of buildings likely to be affected by the BSCU works. The information provided in this assessment conforms to paragraph 128 of the NPPF, thus the level of detail provided is proportionate to the significance of the affected heritage assets and no more than is sufficient to understand the potential impact of the proposal on that significance.
- 2.1.7 Guidance on the application of heritage policy within the NPPF is provided within the PPS 5 Planning Practice Guide (English Heritage, 2010) and the on-line National Planning Policy Guidance (NPPG).

Regional Policy

The London Plan 2011

- 2.1.8 Policy 7.8 of the London Plan deals with heritage assets and archaeology and identifies the contribution that designated and non-designated heritage assets make to London's world class city status. The policy seeks to ensure the sensitive management and promotion of London's heritage assets through recognition of their positive role in place shaping.
- 2.1.9 "Draft Further Alterations to the London Plan" were published in July 2014. These proposed changes contain no update to policy 7.8 of the current London Plan.

Local Policy

The Unitary Development Plan 2002

- 2.1.10 Certain sections of the Unitary Development Plan (UDP) remain in force until the adoption of the Local Plan, which is anticipated to be in 2015, including Policies ENV10 and ENV11 which are of relevance to consideration of the BSCU works.
- 2.1.11 Policies ENV10 and ENV11 relate to conservation areas and listed buildings and recognise the contribution that historic buildings make to the character and ambience of the City of London. Policy ENV11 states that proposals to demolish buildings that make a positive contribution to the character or appearance of a conservation area will be resisted.

Core Strategy Development Plan 2011

- 2.1.12 One of the over-arching objectives of the Core Strategy as exemplified by Strategic Objective 3: City Culture and Heritage, is the promotion of a high quality of architecture and street scene appropriate to the City of London's position at the historic core of London.
- 2.1.13 Policy CS12 directly relates to cultural heritage, and aims to conserve or enhance the significance of the City's heritage assets and their settings, and provide an attractive environment for the City's communities and visitors, and sets out a number of ways in which this is to be achieved.

The City of London Corporation Supplementary Planning Documents (SPDs)

- 2.1.14 The City of London Corporation has prepared a number of SPDs including those that have been prepared in respect of some of the City of London's conservation areas including that prepared for the *Bank Conservation Area* in 2012.
- 2.1.15 The document provides detailed analysis of the development and architectural character of the conservation area as well as highlighting significant streets and buildings that contribute to the character of the conservation area and the setting of specific heritage assets.

3 Consultation

- 3.1.1 Discussions and formal consultations with English Heritage and the City of London Corporation have taken place during the design process of the BSCU project. Both have been consulted as to the scope and process of heritage and Building Damage Assessments, which are relevant to the Listed Building Consent now being sought. The approach is based on established best practice and both bodies have responded positively to the methodology of assessment of settlement impacts.
- 3.1.2 The City of London Corporation's Assistant Director (Conservation) and the English Heritage Inspector were consulted on the proposed protective measures and a draft of this Statement. Both were generally content with the proposals subject to receipt of further detail at the appropriate stage. Their comments on the draft Statement and proposed conditions were incorporated and the list of proposed conditions refined and agreed.
- 3.1.3 The project team has been in consultation with the building owner since 2011 regarding the nature of the BSCU project and its potential interface with the building.

4 Summary Description and Statement of Significance

- 4.1.1 The statutory Listed Building Description is contained in Appendix 2 of this document.
- 4.1.2 This Grade II listed building is located within the Bank Conservation Area, which encompasses the heart of the City. The building is located on a constrained site adjoining other buildings on three sides with access from Abchurch Lane to the east (photo 1 in this document, location plan of photographs is included at Appendix 6).



Photo 1: General view of 15 Abchurch Lane

- 4.1.3 Designed by William Campbell Jones and constructed in 1914/1515, 15 Abchurch Lane is a private members club. The building was previously known as the Gresham Club, and has functioned as a private members club since it was constructed.
- 4.1.4 The building consists of five stories above ground level and two basement levels. It is constructed of a combination of brick and structural steel frame which supports a Portland masonry façade to ground, first and second floor level on Abchurch Lane, above which are two storeys of glazed brickwork (photo 2). The Abchurch Lane façade incorporates both tightly jointed ashlar masonry and stone dressings richly carved in a style partially adopted from the adjacent St Mary Abchurch. This façade shows some existing cracking through stone and brickwork, for example as seen in photos 2 and 3.



Photo 2: Damage to glazed brickwork on the upper levels of the Abchurch Lane façade



Photo 3: Detail of existing vertical cracks to the right hand side of the entrance foyer

- 4.1.5 The structure below street level is believed to be constructed of a combination of mass concrete, aerated concrete blocks and glazed brickwork. It is assumed to be founded on a structural steel grillage and concrete raft. St Mary Abchurch

(Grade I listed) adjoins the building to the south and 5 King William Street (Grade II listed) adjoins the building to the north.

- 4.1.6 15 Abchurch Lane has an asymmetrical plan. Member's stairs, member's lift, service lift and service stairs are located in the southern and western areas of the building providing access to each floor. In the basement are the main kitchens and stores which are supplemented by additional secondary kitchens on upper floors that serve specific dining rooms. The principle function and meeting rooms are located on each floor in the northern and eastern areas of the building. Within the south-west corner of the ground floor of the building is the Parish Room for St Mary Abchurch, which is accessed from St Mary Abchurch through a connecting door.
- 4.1.7 Throughout much of the building the ceilings are covered with moulded plaster detailing which is in good condition. Other internal details of note include extensive timber joinery, original stone and mosaic flooring (which shows signs of previous movement as indicated in photo 4) on the stair landings and in the toilets. The principal staircase is a reinforced concrete torsion staircase with stone treads and terrazzo landings. There are a number of high quality timber chimney surrounds within the principal rooms.

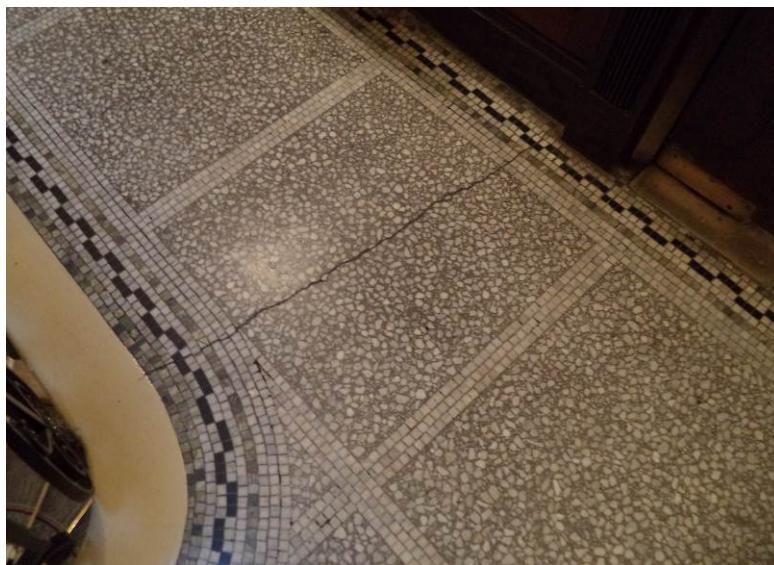


Photo 4: Example of internal historic floor finish showing signs of previous movement

- 4.1.8 Appendix 4 contains historic sections of 15 Abchurch Lane from 1914. This indicates the structural form of the building and its relationship to St Mary Abchurch immediately to the south.



Photo 5: View of decorative façade details to the ground floor

- 4.1.9 The significance of this building lies in its Abchurch Lane stone façade, which adopts some of the design features of St Mary Abchurch and the conservation area more generally (refer to photo 5 for details of the decorative façade elements), and in its retained internal features including moulded plaster ceilings, panelled meeting and reception rooms and surviving stone stairs and mosaic landings.
- 4.1.10 The setting of the building comprises the streetscape of Abchurch Lane, and to a lesser degree that of Sherborne Lane, as well as the surrounding buildings. The adjoining St Mary Abchurch forms an important component of this setting as the church's architectural style and detailing has been borrowed by the designers of 15 Abchurch Lane. This setting makes a positive contribution to the significance of 15 Abchurch Lane.

5 Predicted or possible impacts of the proposed BSCU works upon 15 Abchurch Lane

- 5.1.1 It is proposed that the new platform tunnel will be constructed directly beneath 15 Abchurch Lane from south-east to north-west. A plan showing the position of existing and proposed infrastructure in relation to 15 Abchurch Lane is located in Appendix 3.
- 5.1.2 At the current concept design stage, a conservative, reasonable worst case geotechnical assessment (Stage 2 Building Damage Assessment, contained within Appendix 5) has been made, indicating that there may be a maximum predicted settlement of 60mm to the building, with the greatest displacement occurring at both the south-east and the north-west corners of the building.

- 5.1.3 The geotechnical assessment has been combined with a heritage and structural assessment, which has highlighted sensitivities in relation to the building. The differential settlement of 25mm across the building raises the potential for shear and strain across the Abchurch Lane façade (calculated maximum tensile strain is 0.015%). This worst case assessment, based on concept design, will be refined during the detailed design stage.
- 5.1.4 Further assessment will be undertaken at a Stage 3 Building Damage Assessment to be completed in February 2015, which is required to verify the results of previous assessment as the BSCU design develops (detailed design), and further establish protective works design. The Stage 3 Building Damage Assessment will take into account the detailed design and refined tunnel and construction details. The process for the Stage 3 Building Damage Assessment is well established, and will include, as necessary, the following measures:
- desk top review of all available survey and structural information including previously unseen reports and measured survey plans;
 - full, detailed visual structural survey to identify weaknesses, including existing cracking, and to inform detailed modelling and analysis;
 - modelling and analysis of soil structure interaction to refine assessment of settlements and building strains;
 - non-intrusive and intrusive surveys to better understand the building's sensitivities to predicted settlement and strains;
 - material sampling of interior finishes to facilitate informed repair;
 - recording of heritage features to facilitate informed repair;
 - consideration of the potential pros and cons of physical protective works;
 - protective works design; and
 - formulation of a Monitoring Response Action Plan, which will detail trigger levels and appropriate actions in the event of a trigger being breached.
- 5.1.5 Method statements, specifications and full plans of protective works as found to be required will be produced following the Stage 3 Building Damage Assessment.
- 5.1.6 The potential damage is expected to be confined to the external façade, with minimal impact on the internal structure or finishes.
- 5.1.7 There are existing cracks to the stonework and glazed brickwork of the Abchurch Lane façade (photo 2 and 3). If damage occurs it is expected to be concentrated in previously cracked areas, at joints between masonry elements

and/or at openings. Differential movement also has the potential to damage decorative details (photo 5). Additional cracking will affect the aesthetic significance of the building which is, in large part, displayed in the quality of the architectural masonry.

- 5.1.8 The Stage 2 Building Damage Assessment report concludes that predicted settlement is highest along the Abchurch Lane façade at the east of the building, with differential movements. It is likely that cracks will be concentrated in areas where damage is already apparent, and that additional cracking may cause a permanent impact to the historic fabric. This may damage the material and aesthetic significance of the building.

6 Proposed protective works and impacts of those works

- 6.1.1 The specific interventions requiring listed building consent are described below. The proposed protective works have been designed on the basis of information available at the present concept design stage and the Stage 2 Building Damage Assessment.
- 6.1.2 Whilst the proposals are currently at concept design stage, the need to protect listed buildings from the impacts of settlement resulting from the works has been recognised. Therefore, as a precautionary measure a ‘worst case’ approach has been taken in respect of assessment of the impact from the proposed works, based on the current scheme design stage.
- 6.1.3 The next design stage will include refined geotechnical modelling and building assessment as part of the Stage 3 Building Damage Assessment. This further work may reduce or remove the need for the proposed protective works. If the protective works are required, they will be designed in detail. The detailed information required by the condition in Section 7 will be provided for approval by the Local Planning Authority.

Works that require Listed Building Consent

- 6.1.4 Ground movement may cause existing cracks in the Abchurch Lane façade to open up and new cracks to develop. Example areas of cracked stone and their location on the façade are shown in Appendix 7. Subject to detailed investigation, the area displaying evidence of previous damage will be consolidated by enhancing façade fixings and by repairing damaged stone masonry and glazed brick elements. This may necessitate the removal of sections of façade stonework and glazed brickwork to facilitate investigation, repair and consolidation works. Photographs annotated to indicate the areas where works will be required are located at Appendix 8.

Impact of the works

- 6.1.5 The extent of repair and consolidation will be determined from the Stage 3 Building Damage Assessment, and may involve localised removal of stonework or glazed brickwork. Opening up will avoid carved finishes. The impact on the building will be temporary and minimal, as stonework or glazed brickwork will be repaired or replaced on a like for like basis. This will reduce the aesthetic impact, and the temporary removal of fabric will not have a long term effect on the heritage significance of the building.
- 6.1.6 The works will also have a permanent beneficial impact on the aesthetic significance of the building as the condition of the façade will be improved, reducing the risk of failure or damage for many years to come.
- 6.1.7 The protective works will cause a temporary impact on the Bank Conservation Area due to the need for temporary access that could impact views along Abchurch Lane, but this impact will be negligible and will not constitute substantial or permanent harm to the area as a whole.
- 6.1.8 Likewise the protective works will not adversely impact the significance of St Mary Abchurch as Abchurch Lane makes only a neutral contribution to the setting of the church, which is predominantly provided by Abchurch Yard.

In relation to the NPPF, the works will not have a significant effect on the significance of the building, and result in less than substantial harm to the heritage asset. In relation to local policy, the protective works will achieve the objective of conserving the City's heritage assets.

Justification for the works

- 6.1.9 The BSCU project involves a major upgrade of the Bank Monument Station Complex, which is currently one of the most congested on the London Underground network.
- 6.1.10 The overarching aim is that Transport for London continues to provide a fit-for-purpose public transport station complex to support the City of London. It shall do this by:
- increasing the capacity of Bank Underground Station so that it is able to handle present and forecast demand, thereby supporting the economic growth of the city;
 - minimising passenger journey time through the station, thereby reducing crowding;
 - improving the quality of access, interchange and ambience, including the provision of step-free access routes from street level to Northern Line trains and provide step-free interchange between Northern Line and Dockland Light Railway (DLR) trains; and

- improving emergency fire and evacuation protection measures.

6.1.11 The BSCU project is an important element of works planned as part of Transport for London's 10 year Investment Programme which will contribute to the achievement of the economic growth of London as set out in the Mayor's London Plan and Transport Strategy. The significant public and economic benefit of the BSCU works as described in section 1 and illustrated in Appendix 3 justifies the impacts outlined in this Statement.

6.1.12 The proposals contained within this document are intended to mitigate adverse impacts of the BSCU works at 15 Abchurch Lane. The protective works themselves will result in a change to the historic building fabric to a small extent. However, the repairs are intended to prevent damage to the listed building, and enable the building to retain its heritage significance.

It is considered that with the proposed protective works, the BSCU works will constitute less than substantial harm to the listed building. The NPPF states that "where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal". The public benefits of the BSCU are significant both locally and in the wider London context.

7 Proposed conditions

The following conditions have been agreed with City of London officers and the English Heritage Inspector:

Time Limit for Commencement of Development

1. The works shall commence not later than five years beginning with the date of this consent.

Reason: To comply with the requirements of section 18(1) of the Planning (Listed Buildings and Conservation Areas) Act 1990.

Approval of Details

2. The works shall not commence until the following details have been submitted to and approved in writing by the Local Planning Authority:
 - a) A report, including an engineering statement, detailing the results of structural assessment and investigations into the condition of the building to confirm the need for and suitability of the protective works;
 - b) Detailed survey drawings and/or photographs showing, by means of hatching and/or annotations, the areas to be affected by the protective works;

- c) Photographic/condition survey of the relevant parts of the building; and
- d) Details of the proposed protective works, including plans of locations and specification of methods.

Reason: To protect the listed structure and retain the aesthetic, architectural or historic significance of the listed building.

Temporary Works

- 3. Any temporary protective works shall be removed within six months of the monitoring data showing that ground movement has effectively ceased.

Reason: To protect the listed structure and retain the aesthetic, architectural or historic significance of the listed building and its setting.

Monitoring

- 4. A report summarising the ground movement effects in the vicinity of the building shall to be submitted to the Local Planning Authority within six months of the monitoring data showing that ground movement has effectively ceased.

Reason: To protect the listed structure and retain the aesthetic, architectural or historic significance of the listed building.

Making Good

- 5. All work of making good shall match the existing adjacent work with regard to the methods used and materials, colour, texture and profile, unless shown otherwise on the drawings or other documentation hereby approved or required by any conditions(s) attached to this permission.

Reason: To ensure a satisfactory appearance and finish to retain the aesthetic, architectural or historic significance of the listed building.

Approved Drawings

- 6. The works shall not be carried out other than in accordance with the approved drawings and particulars as set out in the Heritage Statement September 2014 including Appendices or as approved under conditions of this Listed Building Consent.

Reason: To ensure that the development is in compliance with details and particulars which have been approved by the Secretary of State for Transport and the Local Planning Authority.

8 Conclusion

- 8.1.1 Modelling of likely horizontal and vertical strains on the basis of the concept design stage to date, combined with assessment of 15 Abchurch Lane, predicts potential settlement of up to 60mm to the south-east and north-west of the building (and the calculated maximum tensile strain is 0.015%), as a result of the new infrastructure being constructed directly below the building.
- 8.1.2 It is considered that the stone façade and glazed brickwork may be sensitive to the predicted settlement, and therefore protective works are proposed to provide additional support to this area. The detailed design of these works will be informed by Stage 3 Building Damage Assessment.
- 8.1.3 It is acknowledged that these protective works will lead to a temporary adverse impact on the significance of the listed building but that this impact will be outweighed by the benefits of the protective works in preventing substantial damage to the fine historic elements of the building.
- 8.1.4 All works affecting the external appearance of the building will follow the principle of like for like repair, and there will be no long term impact to the building beyond a small material change to the façade which will not devalue its aesthetic significance. There will be an overall beneficial impact due to the improvement in the condition and appearance of the façade. The impact of the works will constitute 'less than substantial harm' as defined by the NPPF.

References

English Heritage National Heritage List

The Buildings of England, London 1: The City of London, Bradley and Pevsner, (1997) p413

Building Damage Assessment Report 'A13' (2014)

Alan Baxter Associates 'Gazetteer' (2012)

Appendices

Appendix 1: Location Plan



Appendix 2: Listed Building Description

List entry Number: 1064771

Location: 15, ABCHURCH LANE EC4

Grade: II

Date first listed: 10-Nov-1977

UID: 199268

ABCHURCH LANE EC4 1. 5002 (West Side) No 15 TQ 3280 NE 16/N/1

II GV

1914 by Campbell Jones. Stone-faced. 3 storeys, with basement and later glazed brick attic. 3 bays with projecting 2 bay wing to left. Windows throughout segment-headed with console keystones, those to the ground floor with blocked surrounds and set in rusticated wall-face terminated by a plain 1st floor cill band. 1st and 2nd floor windows separated by aprons decorated with swags and urns. Plain crossing cornice. Segment-headed front door with consoled hood over, in projecting wing.

Listing NGR: TQ3276380941

National Grid Reference: TQ 32763 80941

Appendix 3: Extent of proposed BSCU works

CITY OF LONDON

- Key:**
- Listed Building
 - Existing Infrastructure
 - Proposed Infrastructure

Notes:

For clarity, drawing shows existing infrastructure at Northern line level and Central line level affected by the works. Not all existing below ground infrastructure is shown.

Temporary works are not shown.



PROJECT	BANK STATION CAPACITY UPGRADE PROJECT
PURPOSE OF ISSUE	FOR INFORMATION
TITLE	15 ABCHURCH LANE EXISTING AND PROPOSED INFRASTRUCTURE

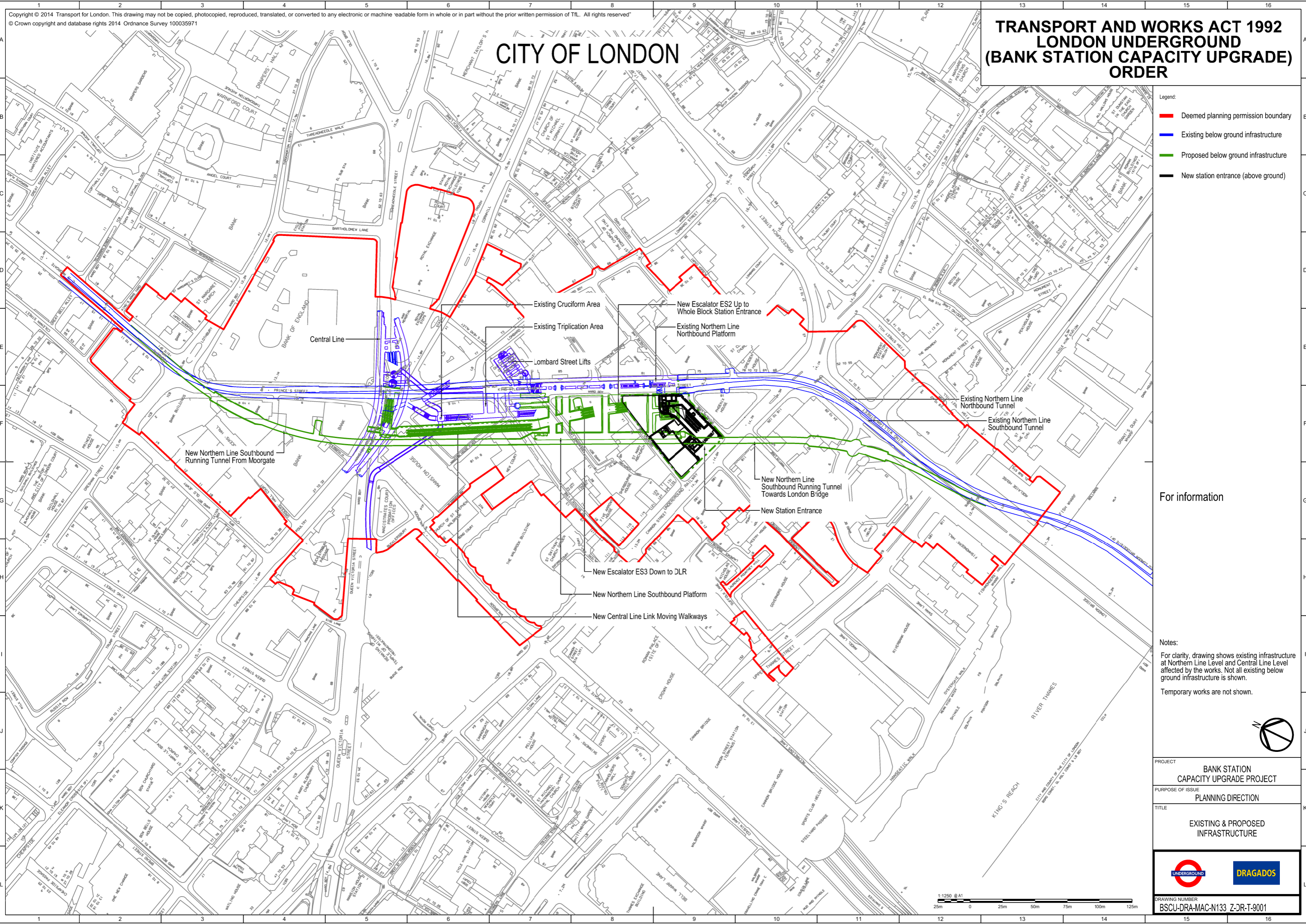
DRAWING NUMBER
BSCU-DRA-MAC-N133_Z-DR-T-0315



TRANSPORT AND WORKS ACT 1992 LONDON UNDERGROUND (BANK STATION CAPACITY UPGRADE) ORDER

CITY OF LONDON

- Legend:
- Deemed planning permission boundary
 - Existing below ground infrastructure
 - Proposed below ground infrastructure
 - New station entrance (above ground)



For information

Notes:
 For clarity, drawing shows existing infrastructure at Northern Line Level and Central Line Level affected by the works. Not all existing below ground infrastructure is shown.
 Temporary works are not shown.



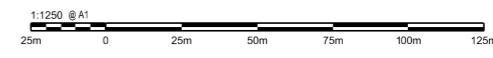
PROJECT
**BANK STATION
 CAPACITY UPGRADE PROJECT**

PURPOSE OF ISSUE
PLANNING DIRECTION

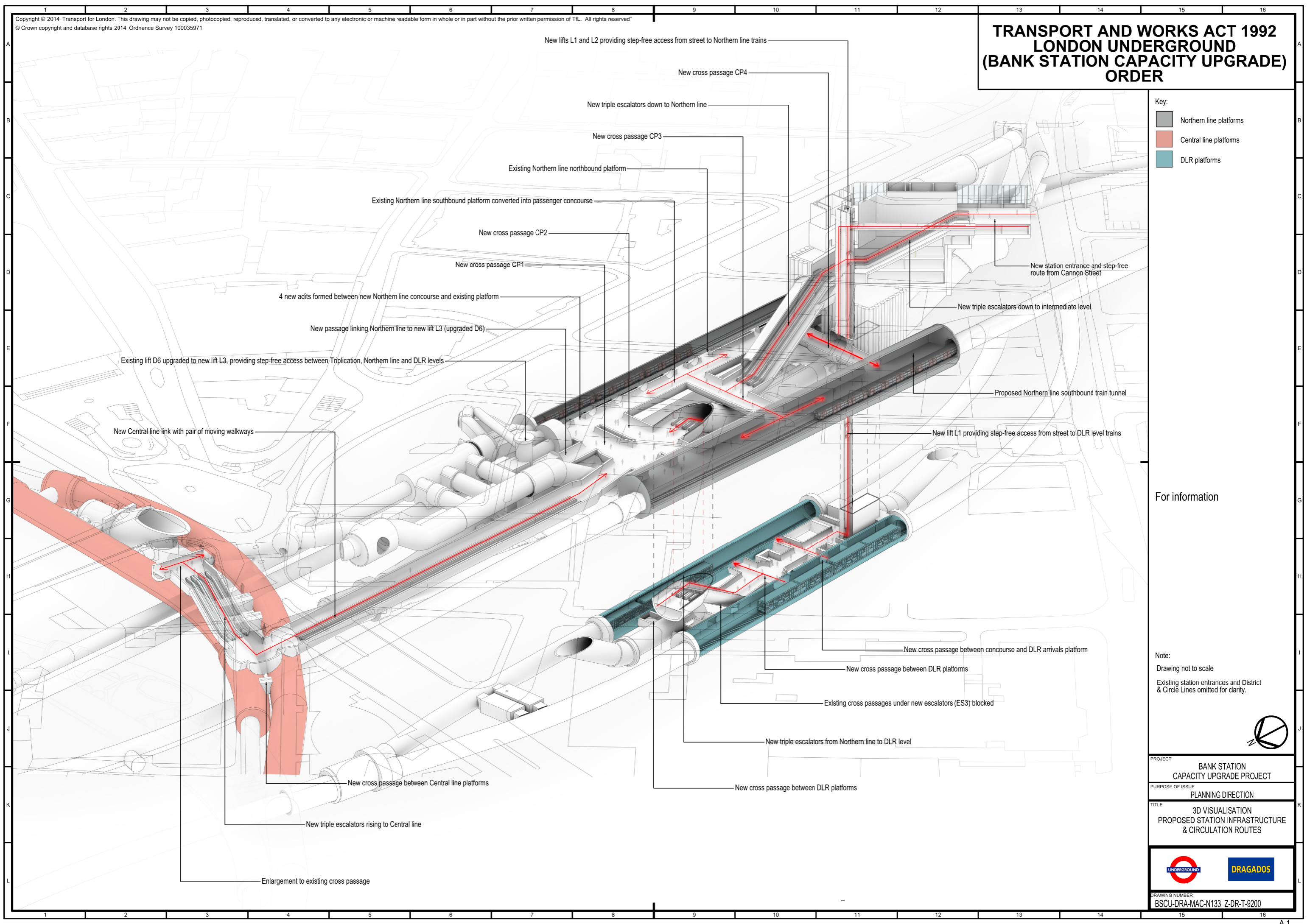
TITLE
**EXISTING & PROPOSED
 INFRASTRUCTURE**



DRAWING NUMBER
BSCU-DRA-MAC-N133 Z-JR-T-9001



TRANSPORT AND WORKS ACT 1992 LONDON UNDERGROUND (BANK STATION CAPACITY UPGRADE) ORDER



- Key:
- Northern line platforms
 - Central line platforms
 - DLR platforms

For information

Note:
 Drawing not to scale
 Existing station entrances and District & Circle Lines omitted for clarity.



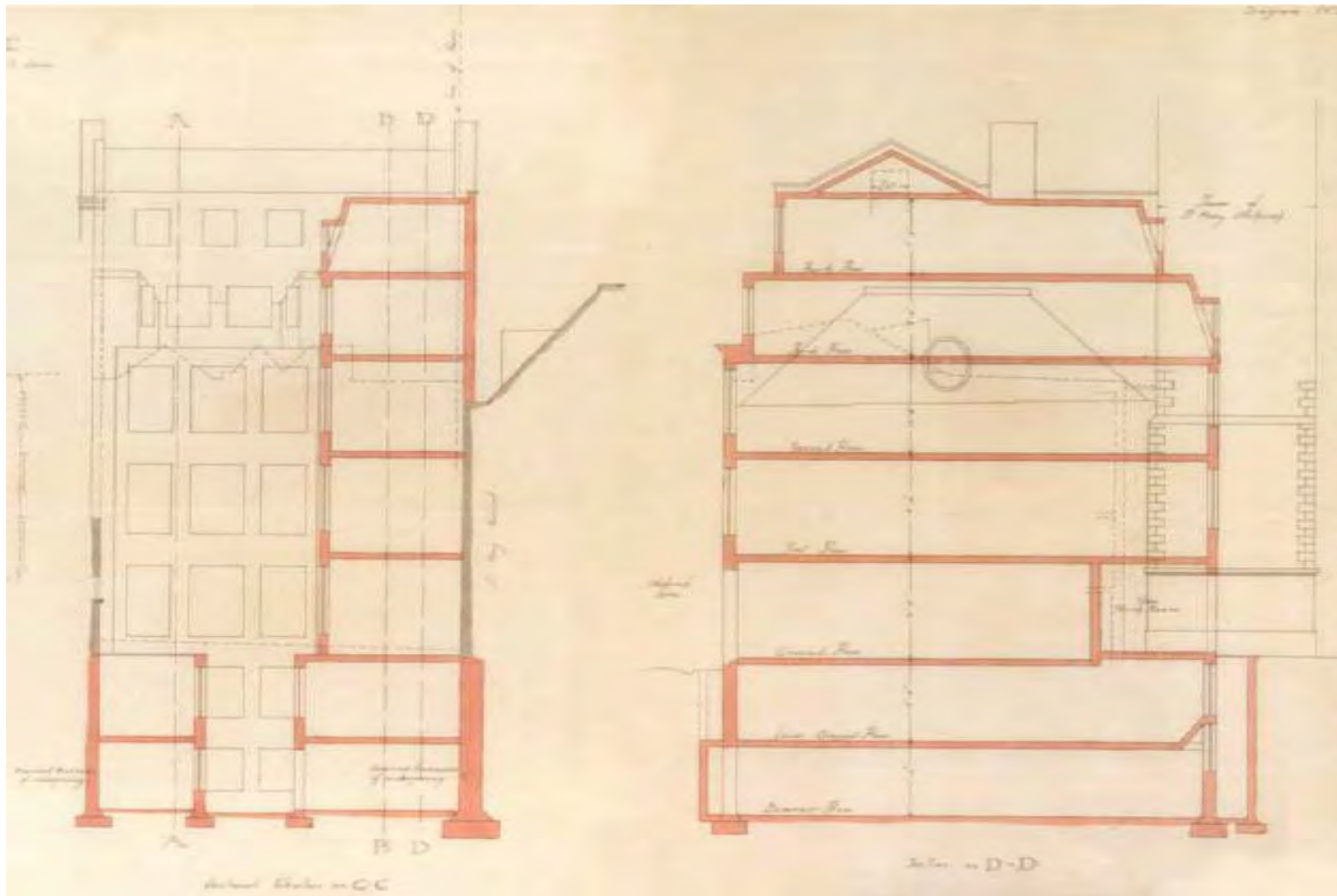
PROJECT	BANK STATION CAPACITY UPGRADE PROJECT
PURPOSE OF ISSUE	PLANNING DIRECTION
TITLE	3D VISUALISATION PROPOSED STATION INFRASTRUCTURE & CIRCULATION ROUTES



DRAWING NUMBER
 BSCU-DRA-MAC-N133 Z-DR-T-9200

Appendix 4: Historic Sections

Sections through the building at 15 Abchurch Lane, 1914



Appendix 5: Building Damage Assessment Report

Bank Station Capacity Upgrade

Building Damage Assessment Report

Building A13

15 Abchurch Lane

URS-8798-RPT-G-001177

Prepared by: Lisa Perkins
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Checked by: Annaliza Khoo
Principal Geotechnical Engineer *Annaliza Khoo* 18/07/14

Approved by: John Chantler
Technical Director *John Chantler* 18/07/14

Document Owner	
Company:	URS
Role:	Designer

Document History

Revision	Date	Summary of changes
1.0	March 2014	Issue to Heritage
2.0	March 2014	Final for approval
3.0	July 2014	TWAO Issue

For the status of this document, please refer to the Building Damage Assessment Report Register (URS-8798-RGT-001229)

Consultation:

- Ela Palmer URS Heritage
- Brian Lyons Dr.Sauer
- Keith Bowers/Neil Moss/Paul Dryden London Underground
- Olly Newman Dragados

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Safely Together

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1 Introduction

This report summarises the results of a Stage 2 damage assessment for 15 Abchurch Lane.

Stage 2 damage assessments are undertaken for all buildings within the Stage 1 Greenfield ground surface 1mm settlement contour induced by the construction of the Bank Station Capacity Upgrade (BSCU).

The purpose of the assessment is to determine the potential effect the works will have on the building. This report describes the engineering and heritage assessments undertaken for the building and concludes whether mitigation is likely to be needed and if a further (Stage 3) assessment is recommended in order to verify this.

2 The Building

2.1 General Information

No. 15 Abchurch Lane is within close proximity to the new station box of the BSCU works. Situated adjacent to St Mary Abchurch the building is accessed from Abchurch Lane between Cannon Street and King William Street. The building is a five storey structure with two basement levels. The structure is cited by Alan Baxter's as likely to be steel framed ^[7]. The foundation has been assumed as a shallow raft. General building information for A13 used in the assessment has been acquired as part of the structural desktop appraisal. This information is presented in Table 1.

Category	Building Information
BSCU Reference	A13
Location	Abchurch Lane
Address	15 Abchurch Lane
Building Type	Steel framed with concrete external basement walls
Construction Age	1914
No. of Storeys	5
Basements	2
Eaves Level (mATD)	133.6
Foundation Type	Assumed Raft
Ground Level (mATD)	115.4
Listed Grade	II

Note: Levels given are in metres above Tunnel Datum, mATD.
Tunnel Datum is 100m below Ordnance Survey Datum at Newlyn.

Table 1: General building information

A general view of the building exterior is shown in Plate 1. A location plan showing the building in relation to the proposed BSCU works is presented in Figure 2.



Plate 1: General view

2.2 Building Description

Designed by William Campbell Jones and constructed in 1914/1515, 15 Abchurch Lane is a private members club accessed from Abchurch Lane.

The building, which is generally rectangular in plan, consists of 5 stories above ground level and 2 basement levels and is constructed of a combination of brick and structural steel frame which supports a Portland masonry façade fronting Abchurch Lane. The structure below street level is constructed of a combination of massed concrete, aerated concrete blocks and glazed brickwork. It is assumed to be founded

on a structural steel grillage and concrete raft. The mortar used is cementitious. St. Mary Abchurch adjoins the building to the south and 13 Abchurch Lane adjoins the building to the north.

Internally the building has functioned as a private members club since it was constructed. It has been designed with an asymmetrical plan, with stairs, client lift, service lift and stairs and kitchens to the south and west of the building (adjoining St. Mary Abchurch and to the rear) and function and meeting rooms to the north and east of the building. In general the ceilings are coved with moulded plaster detailing. Other internal details of note include extensive timber joinery, original stone and terrazzo flooring on the stair landings and in the toilets, a reinforced concrete torsion staircase with stone tread finish and terrazzo landings for patrons' use, and a number of high quality chimney surrounds.

3 Methodology

This building damage assessment is undertaken in accordance with LU Works Information WI2300^[1] and LU Civil Engineering - Common Requirements S1050^[2].

The analysis methodology applies to ground-bearing buildings which will be affected by ground movements resulting from the construction of the BSCU. The engineering assessment calculates the potential impact of ground movements and assigns a damage category to the building based on a numeric scale. Additionally, for listed buildings, a heritage assessment is carried out which considers the sensitivity of the structure and the sensitivity of its particular features; a heritage sensitivity score is assigned. The heritage sensitivity score is added to the damage category to obtain the total score. If the total score is 3 or more, a more detailed Stage 3 assessment is triggered.

Oasys Xdisp is used to analyse the Greenfield ground movement in terms of settlement and horizontal displacement. Subsurface tunnelling induced ground movement profiles are determined in accordance with the methodology described by Mair et al^[3 & 4].

In order to investigate the relative movements between this building and the neighbour to the south, St Mary Abchurch (A14), a displacement line (line 3) was drawn to represent the rear of the two buildings as shown in Figure 3. It was analysed at A13's founding level. This is not a strictly accurate model since building A14 is founded approximately 3.4m higher than A13 but will give an understanding of the behaviour in this area.

This building is understood to adjoin to its neighbour St Mary Abchurch (A14). The behaviour along this line was investigated as displacement (line 2). The results are shown in Table 6 and Table 8.

Movements resulting from the Whole Block Scheme (WBS) and shaft excavations have been calculated using LU Guidance Document G0058^[5].

The building is modelled as a simple elastic beam which is conservatively assumed to follow the Greenfield ground displacements. The beam is divided into hogging and sagging segments. The tensile strains within each segment are calculated based on the distortion associated with differential settlement (which is characterised by deflection ratio) and the distortion associated with differential horizontal displacement (characterised by horizontal strain).

Xdisp provides a method for calculating the maximum tensile strain within the building superstructure associated with these movements, in accordance with the

assessment methodology described by Mair et al^[4]. This strain is used to determine the damage category based on the classification system proposed by Burland^[6] and in accordance with LU Civil Engineering - Common Requirements S1050^[2]. The categories are presented in Table 2.

Damage category	Description of degree of damage	Description of typical damage and likely forms of repair for typical masonry buildings.	Approx. crack width (mm)	Max. tensile strain %
0	Negligible	Hairline cracks.		< 0.05
1	Very slight	Fine cracks easily treated during normal redecoration. Perhaps isolated slight fracture in building. Cracks in exterior visible upon close inspection.	0.1 to 1.0	0.05 to 0.075
2	Slight	Cracks easily filled. Redecoration probably required. Several slight fractures inside building. Exterior cracks visible; some repainting may be required for weather-tightness. Doors and windows may stick slightly.	1 to 5	0.075 to 0.15
3	Moderate	Cracks may require cutting out and patching. Recurrent cracks can be masked by suitable linings. Tuck pointing and possible replacement of a small amount of exterior brickwork may be required. Doors and windows sticking. Utility services may be interrupted. Weather tightness often impaired.	5 to 15 or a number of cracks ≥ 3	0.15 to 0.3
4	Severe	Extensive repair required involving removal and replacement of walls especially over doors and windows. Window and door frames distorted. Floor slopes noticeably. Walls lean or bulge noticeably. Some loss of bearing in beams. Utility services disrupted.	15 to 25 but also depends on number of cracks	> 0.3
5	Very severe	Major repair required involving partial or complete reconstruction. Beams lose bearing, walls lean badly and require shoring. Windows broken by distortion. Danger of instability.	Usually > 25 but depends on number of cracks	

Note: Please refer LU Civil Engineering - Common Requirements S1050^[2].

Table 2: Building damage classification

4 Input Data

The magnitude and distribution of ground movements and degree of building damage is calculated based on the following input data:

- The Xdisp model coordinates and levels are based on the 3D model (20130212DSPITT Scheme R09);
- Four construction stages are considered in accordance with the proposed programme (November 2013) as illustrated in Figure 1;
- Trough width parameter constant, $K=0.5$ is used in accordance with WI2300^[1]

The input data for the building, tunnels and shaft excavation are summarised in Table 3, Table 4 and Table 5 respectively.

Location	Foundation level (mATD)	Building Height above foundation level (m)	E/G
15 Abchurch Lane	107.4*	26.2	12.5
<p>Note: Where E / G is the ratio of Young's modulus to shear modulus of the deep beam that is to represent the building.</p> <p>* Assumed level, 1.5m thick slab beneath floor level.</p>			

Table 3: Building data

Tunnel Item	Level of axis (mATD)	External diameter (m)	Volume Loss (%)
Running tunnels	83.5	5.4	1.5
Square works adits	75.8 to 95.3	4.1 to 7.8	2.5
Platform enlargement	85.6	9.64	1.5
Escalator barrels	Inclined	8.3 to 8.4	1.5
Central Line Connection	Inclined (87.6 to 89.2)	8.6	1.5

Table 4: Tunnel data

Excavation	Excavation Base Level (mATD)
Grout Shaft at King William Street	97
Whole Block Scheme Box excavation	73
Arthur Street Shaft	81

Table 5: Excavation data

The eastern side of the building on Abchurch Lane is located close to the ticket hall lift shaft excavation (~15m).

Sewer 05BS is located below Abchurch lane, which is a brick structure with an invert level of ~99.9mATD and will be close to the WBS excavation and well above the crown level of the new tunnel.

The Xdisp models used to undertake this assessment are:

- A13- Stage 4
- A13- Stage 3
- A13- Stage 2
- A13- Stage 1

5 Results

5.1 Engineering Assessment

The sections through the building which have been analysed are shown on plan in Figure 3.

Assessment has been undertaken at three intermediate construction stages and at the end of construction when all major elements of the works including shaft and tunnels have been completed. The damage category assigned to the building is based on the construction stage at which the potential impact on the building is most severe.

The maximum settlement and maximum strain calculated for each of the analysis sections at the most onerous intermediate construction stage and at the end of construction are presented in Table 6 and Table 7.

Section	Maximum Settlement (mm)	Maximum Tensile Strains (%)
A13 (line 1)	45	0.015
A13 (line 2)	45	0.004
A13 (line 3)	42	0.037

Note: Line 3 represents two buildings. The strains are not therefore applicable to building A13

Table 6: Building response at most onerous intermediate stage - Construction Stage 2

Section	Maximum Settlement (mm)	Maximum Tensile Strains (%)
A13 (line 1)	60	0.004
A13 (line 2)	52	0.005
A13 (line 3)	55	0.048

Note: Line 3 represents two buildings. The strains are not therefore applicable to building A13

Table 7: Building response at end of construction stage

The results of the assessment show that the intermediate construction Stage 2 is the critical stage for this building where line 1 experiences the most onerous combined tensile strain. The orientation is shown in Figure 3. The vertical and horizontal Greenfield ground movements along the section of the building are shown in Figure 4. The relative position of the building and tunnels along section (line 1) is shown in

Figure 5. The junction with the adjoining building (A14) is in sagging mode but the curvature is small. Separation between the two buildings is not anticipated. The calculated strains are summarised in Table 8.

Line #	Strains in section (Curvature)	Position from start (m)	Length (m)	Average* Horizontal Strain (%)	Maximum Tensile Strains (%)	Damage Category
(line 1) (Stage 2)	Sagging	0.0	13.8	-0.042	0.015	Negligible
(line 2) (Stage 4)	Sagging	0.0	17.6	-0.13	0.005	Negligible
	Sagging	17.9	2.5	0.002	0.002	Negligible
(line 3) (Stage 4)	Sagging	0.0	11.7	-0.021	0.006	Negligible
	Hogging	11.8	20.2	0.030	0.048	Negligible

Note: * Tensile horizontal strains are +ve. Compressive horizontal strains are -ve.

Table 8: Section analysed, results for worst case tensile strain

The Stage 2 engineering assessment has predicted that the maximum tensile strain falls within damage category 0 for 15 Abchurch Lane (A13). This corresponds to Negligible damage in accordance with Table 2.

A13 (line 2) shows the movements for the adjoining wall between 15 Abchurch Lane (A13) and St Mary Abchurch (A14), see Figure 5. The displacement line between the bell tower and A13-A14 is in a sagging mode. The tensile strains are very small (Negligible) as shown in Table 8.

A13 (line 3) examines the differential movements between 15 Abchurch Lane (A13) and St Mary Abchurch (A14). It is a simplified line that represents both building's rear façades. The results along (line 3) can be seen in Figure 6 and show that the area between A13 and the bell tower is in a hogging mode. These movements, given the unknown foundation level of the bell tower and the existing condition of the building, could induce cracking at high level. The maximum tensile strains in this area result in a very slight damage category. Similarly, it is likely cracks could occur on the joints between the bell tower and the adjacent building A14. The settlement trough at the critical construction stage is shown diagrammatically in Figure 6.

The maximum settlement of the building at foundation level occurs at the end of construction and is 57mm.

5.2 Heritage and Structural Assessment

Following site inspection, assessment has been made using the following scoring methodology set out in Table 9.

Score	STRUCTURE Sensitivity of the structure to ground movements and interaction with adjacent buildings	HERITAGE FEATURES Sensitivity to calculated movement of particular features within the building	CONDITION Factors which may affect the sensitivity of structural or heritage features
0	Masonry buildings with lime mortar and regular openings, not abutted by other buildings, and therefore similar to the buildings on which the original Burland assessment was based.	No particular sensitive features	Good/Fair - not affecting the sensitivity of structural or heritage features
1	Buildings not complying with categories 0 or 2, but still with some sensitive structural features in the zone of settlement e.g.: cantilever stone staircases, long walls without joints or openings, existing cracks where further movements are likely to concentrate, mixed foundations	Brittle finishes, e.g. faience or tight-jointed stonework, which are susceptible to small structural movements and difficult to repair invisibly.	Poor - may change the behaviour of a building in cases of movement. Poor condition of heritage features and finishes. Evidence of previous movement.
2	Buildings which, by their structural form, will tend to concentrate all their movements in one location (e.g.: a long wall without joints and with a single opening).	Finishes which if damaged will have a significant effect on the heritage value of the building, e.g. Delicate frescos, ornate plasterwork ceilings.	Very poor – parlous condition of heritage features and finishes, severe existing damage to structure including evidence of ongoing movement. Essentially buildings where even very small movements could lead to significant damage.

Table 9: Heritage and structural scoring methodology

The results of the heritage assessment carried out for the building are summarised in Table 10.

SENSITIVITY OF THE STRUCTURE

The structure appears to be generally steel framed with some masonry load-bearing elements, in particular to the rear where the mansard elements set back as the building rises. Perimeter retaining walls enclose the two basement levels and are most likely to be mass concrete. Construction of the floors is unknown but the staircases appear to be reinforced concrete therefore it is likely that the floors are similarly constructed in concrete, possibly filler joist. While the rear elevation is red brick and Portland stone for the lower storey, the upper levels are white glazed brickwork, similar to all of the light wells, with the front elevation on Abchurch Lane faced with Portland stone. Foundations construction is unknown, but it is most likely to be formed from a structural steel grillage and concrete raft.

It would appear that there is no party wall between the building and St Mary Abchurch to the south, but separate walls, which can be seen from both the rear at street level and from the church roof, where the building abuts the church bell tower. A clear gap can be seen between the buildings in both of these locations, although it is probable that they both share a common foundation resulting from the formation of the later basement construction for 15 Abchurch Lane. Variable settlement across the two buildings is likely to cause differential movement between the two, effecting opening up of the junctions, water ingress, and general damage to structures.

A similar situation could be possible at the juncture with 5 King William Street to the north, with similar damage occurring, in particular to the facing stonework of both buildings.

Score: 1 - While the building should tend to move as a whole if on a grillage raft foundation, therefore not setting up internal strains from differential elemental movements, the main concern should be damage caused by differential movements between 15 Abchurch Lane and its adjoining properties.

SENSITIVITY OF THE HERITAGE

Externally the Abchurch Lane façade is a successful combination of classical and modern detailing. A series of large segmented arched windows are similar to those found on the neighbouring St. Mary Abchurch with glazing designed in an early modern style. Masonry corbels, keystones and aprons are decorated with baroque style relief carving, also reflecting the design of the historically significant Grinling Gibbons reredos in St. Mary Abchurch. The design quality of Abchurch Lane façade which compliments the architecture of St. Mary Abchurch is an important element of the aesthetic and architectural significance of the building. The Joints between masonry blocks are between 3mm and 5mm and therefore susceptible to damage resulting from structural movement.

Internally there is extensive use of hard-wood wainscoting in all function rooms and communal areas, as well as high quality unpainted and moulded joinery utilised in window frames, doors and door surrounds. This use of hard-wood and its design is typical of the early 20th century, contributing to the aesthetic significance of interior and functional significance of the building as a members club. All of the ceilings are formed of coved and moulded plaster, including a segmental arched ceiling in the 4th floor boardroom. A reinforced concrete staircase rises from ground to 4th floor.

Score: 1 - The English Heritage listing description indicates that the building was designated due the quality of its external fabric and the contribution this makes to the character of Abchurch Lane and setting of other buildings. Damage to the exterior form and decoration therefore will undermine the heritage significance of the building. Damage to the internal features of the building, many of which are original and still in use as the building designed, will also adversely impact the significance of the building, but to a lesser degree. The north-east corner of the building, in which is located the club's member and function rooms, is predicted to be subject to the greatest amount of settlement which may result in damage to high quality internal finishes.

SENSITIVITY OF THE CONDITION

Generally the building is in good condition, being regularly maintained and redecorated. Examination of the exterior identified minor cracking to window cills and more significantly, vertical cracking running the full height of the Abchurch Lane façade at the northern external corner of the projecting entrance porch. At high level an area of masonry in this area appears to have moved outwards indicating some previous rotational force. This could be caused by rust-jacking of iron cramps.

Internally the stone mosaic and terrazzo decorated landings are cracked indicating minor movement but is not cause for concern. The condition of timber joinery and chimney pieces is very good with no signs of previous damage due to movement. Plaster ceilings have been over painted many times and therefore the detailing is heavily clogged but no obvious areas of deformation were observed.

Score: 1 - The building is generally in good condition. However the condition of some areas of the Abchurch Lane façade is poor due to the cracking and movement already apparent. This may exacerbate the heritage sensitivities of the façade, and the high predicted settlement could cause further damage.

Table 10: Heritage and structural assessment

5.3 Total Score

The total score is the summation of the damage category, structural sensitivity, heritage sensitivity and condition sensitivity scores:

The damage category is 0

The structural sensitivity score is 1

The heritage sensitivity score is 1

The condition sensitivity score is 1

The total score for this building is 3

6 Conclusion

The Stage 2 engineering assessment has predicted that the maximum tensile strain falls within damage category 0 for 15 Abchurch Lane. However, specific heritage and structural assessment taking into account the location and extent of settlement and tensile strains highlights that the building has particular sensitivities related to its façade and connections with St Mary Abchurch (A14). In addition, potential sensitivities due to poor condition have been identified. This assessment has determined that the building has a total score of 3 including a score of 1 for condition.

According to the methodology presented within LU Standard S1050, which does not take in to account condition scoring, a Stage 3 assessment is not required. However, considering the structural relationship of the building with St.Mary Abchurch, a Stage 3 assessment is recommended.

The BSCU Environmental Statement considers the mitigation that could be needed.

7 References

- [1] LU Works Information WI 2300 Ground Movement version 3, 19-07-13.
- [2] LU Category 1 Standard: S1050 Civil Engineering - Common Requirements, Issue No. A7, Nov. 2013.
- [3] Mair R J, Taylor R N and Bracegirdle A (1993). Subsurface settlement profiles above tunnels in clays. *Géotechnique* 43, No. 2, pp. 315-320.
- [4] Mair R J, Taylor R N and Burland J B (1996). Prediction of ground movements and assessment of risk of building damage due to bored tunnelling. (In: *International Conference of Geotechnical Aspects of Underground Construction in Soft Ground*, London, pp. 713–718.
- [5] LU Guidance Document G0058 Civil Engineering Technical Advice Notes, Issue No. A17, Feb. 2013.
- [6] Burland J B (1995). Assessment of risk of damage to buildings due to tunnelling and excavation. *Proceedings: 1st International Conference of Earthquake Geotechnical Engineering*, IS Tokyo

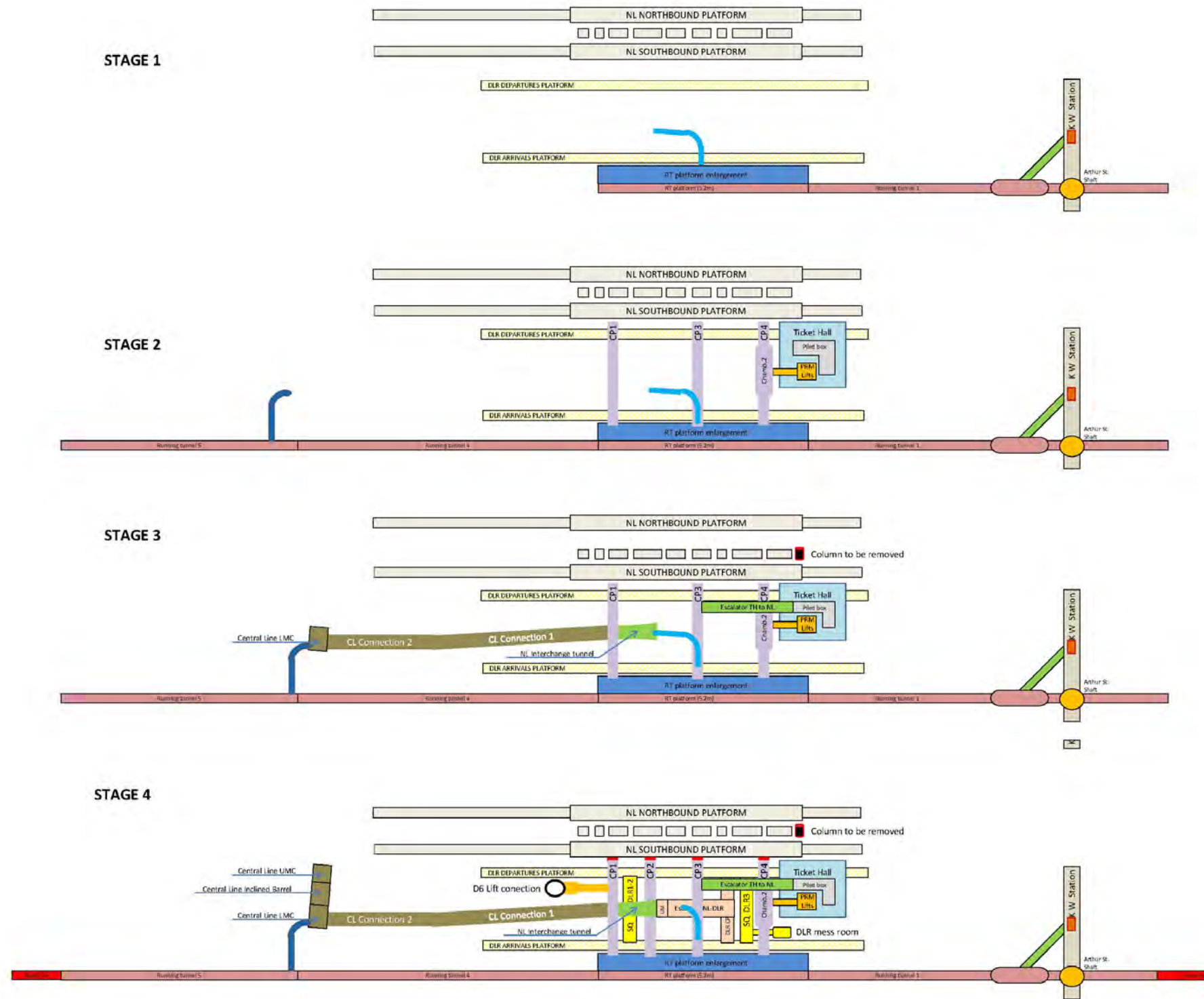


Figure 1: Construction Stage model



Figure 2: Location plan showing building location in relation to BSCU works

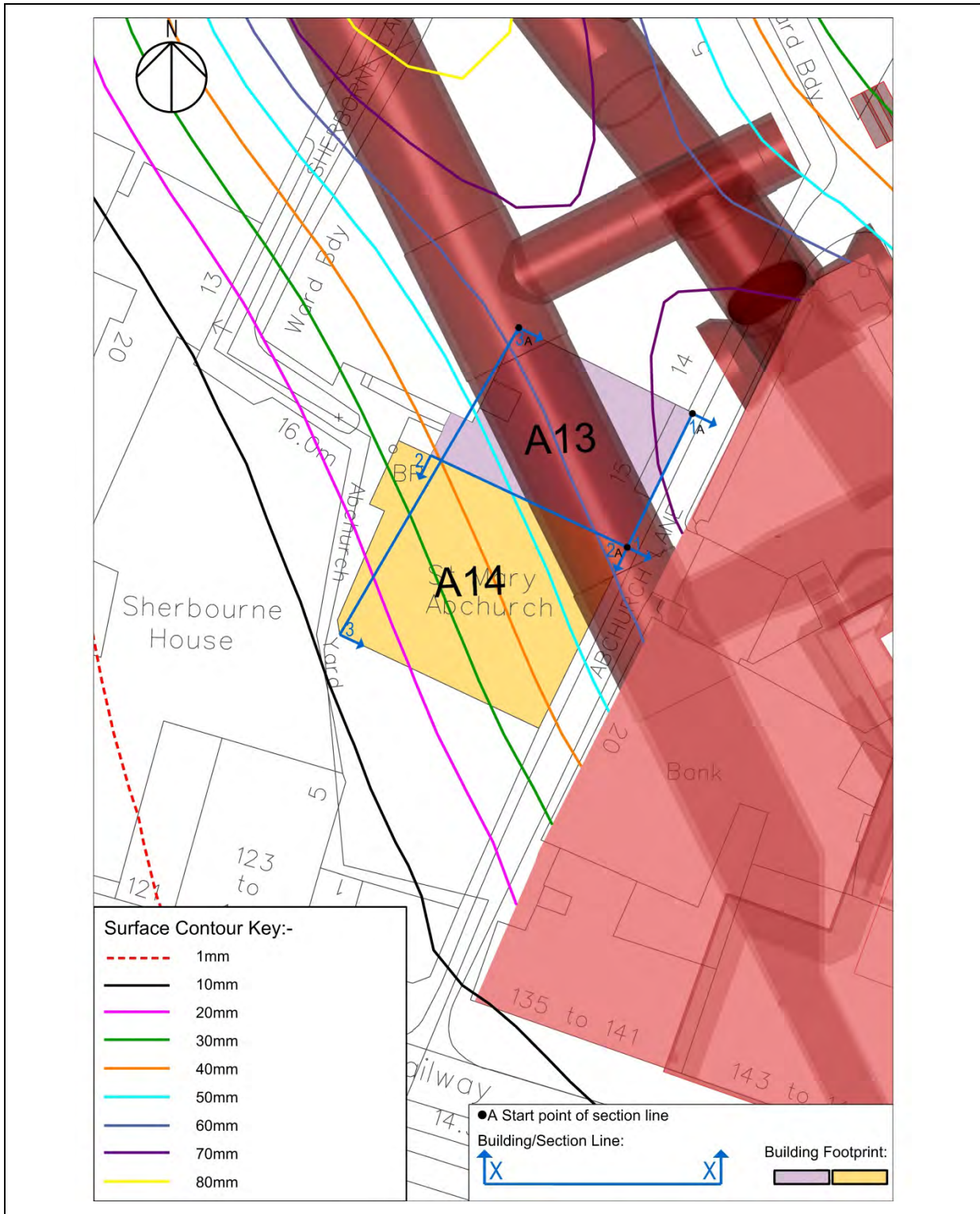


Figure 3: Building location, sections analysed and Settlement Contours at stage of worst case for tensile strains

Sub-Structure Displacements

Structure 2: A13-(15 Abchurch Lane) - E/Sub 109, Offset 1: 0.000m

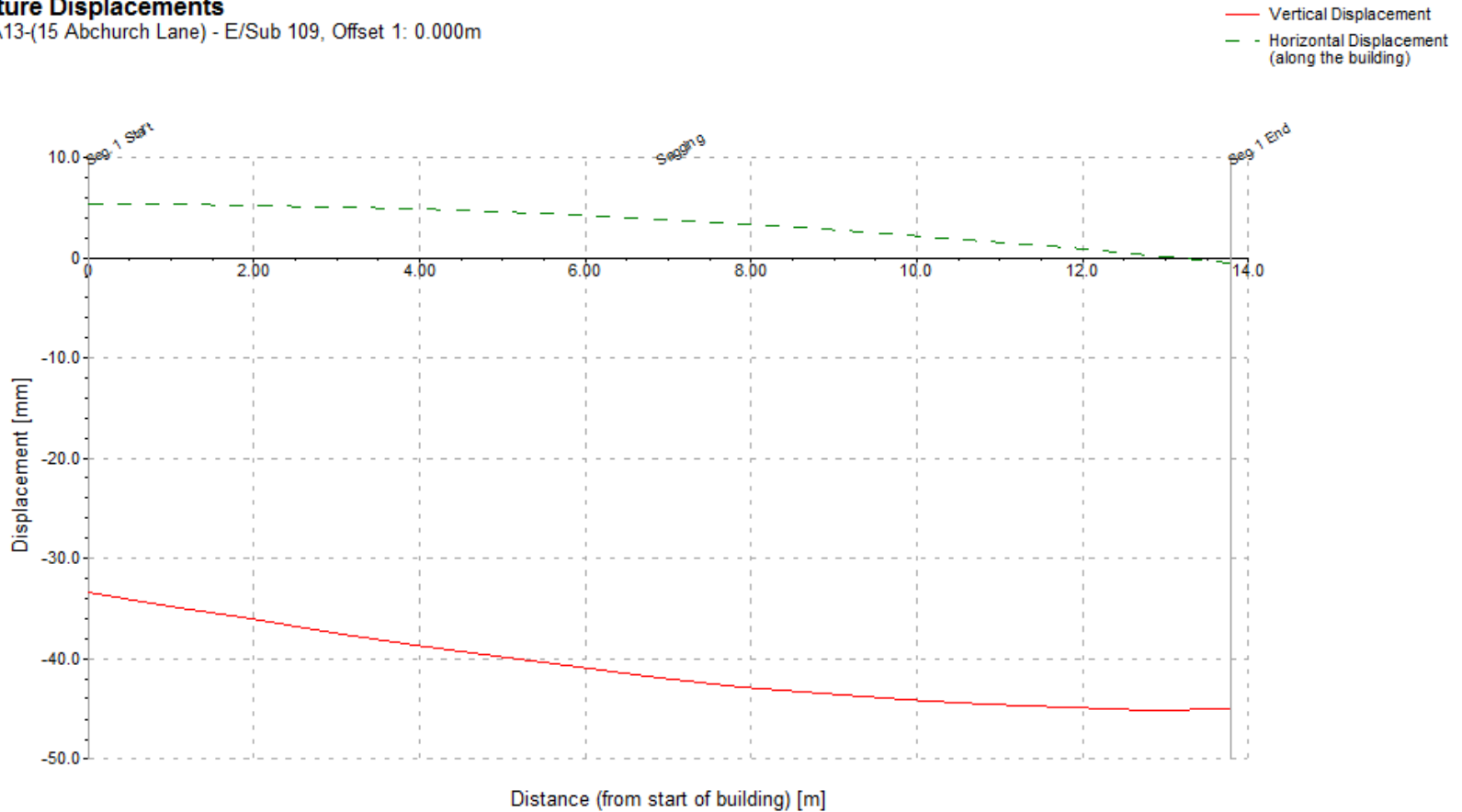


Figure 4: Building displacement at founding level of (line 1) at stage 2 of worst case for tensile strains

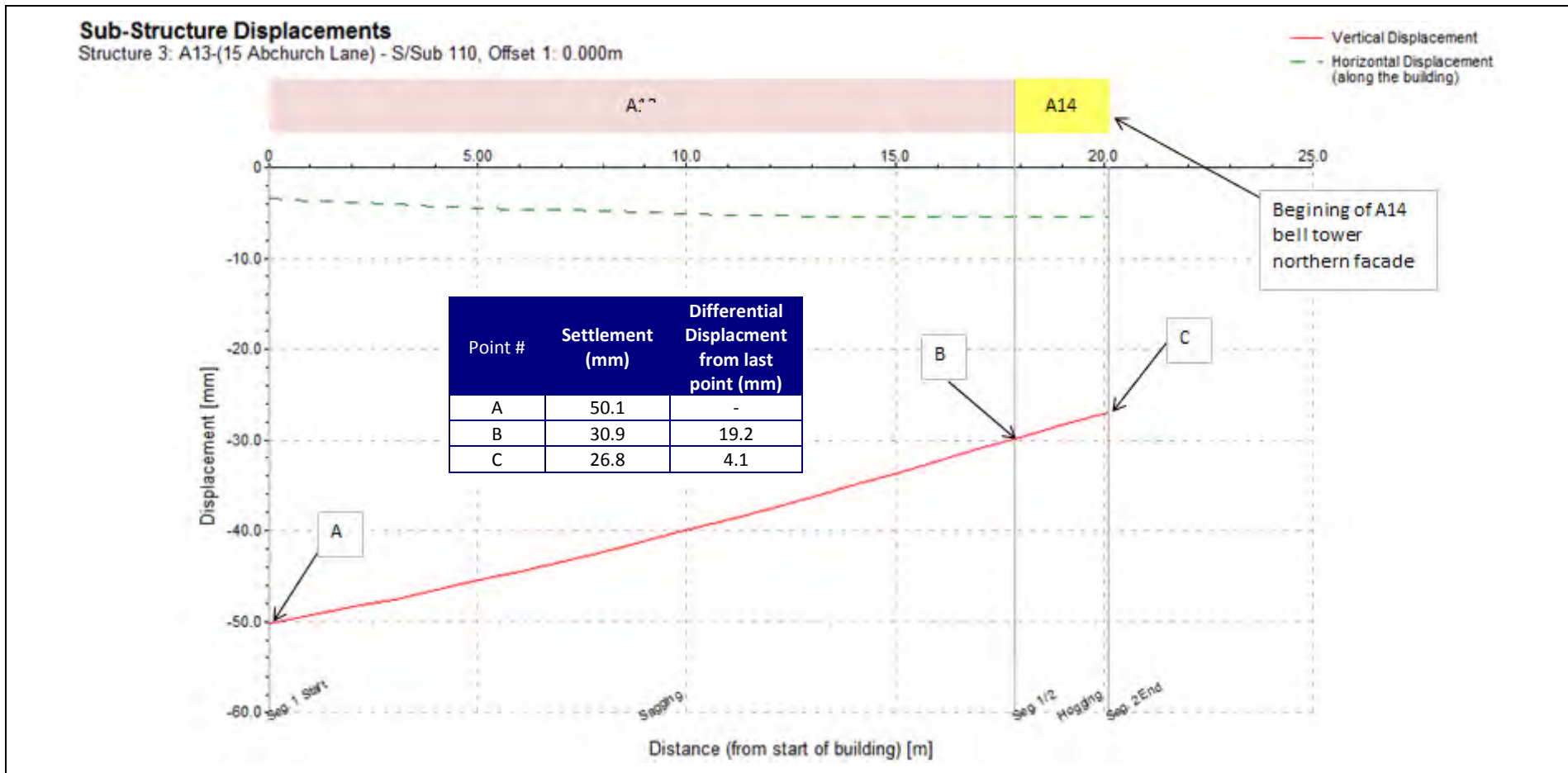
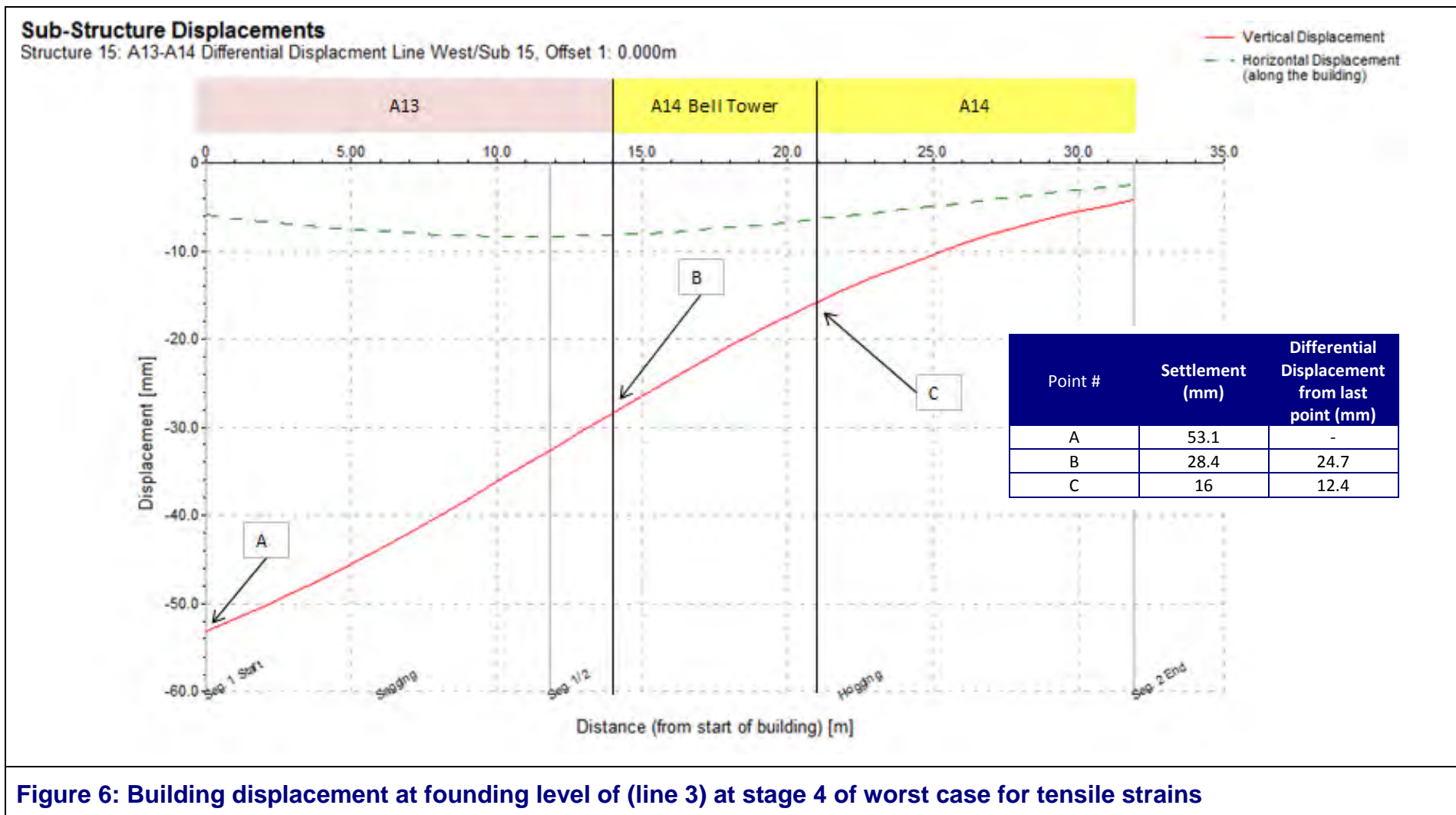
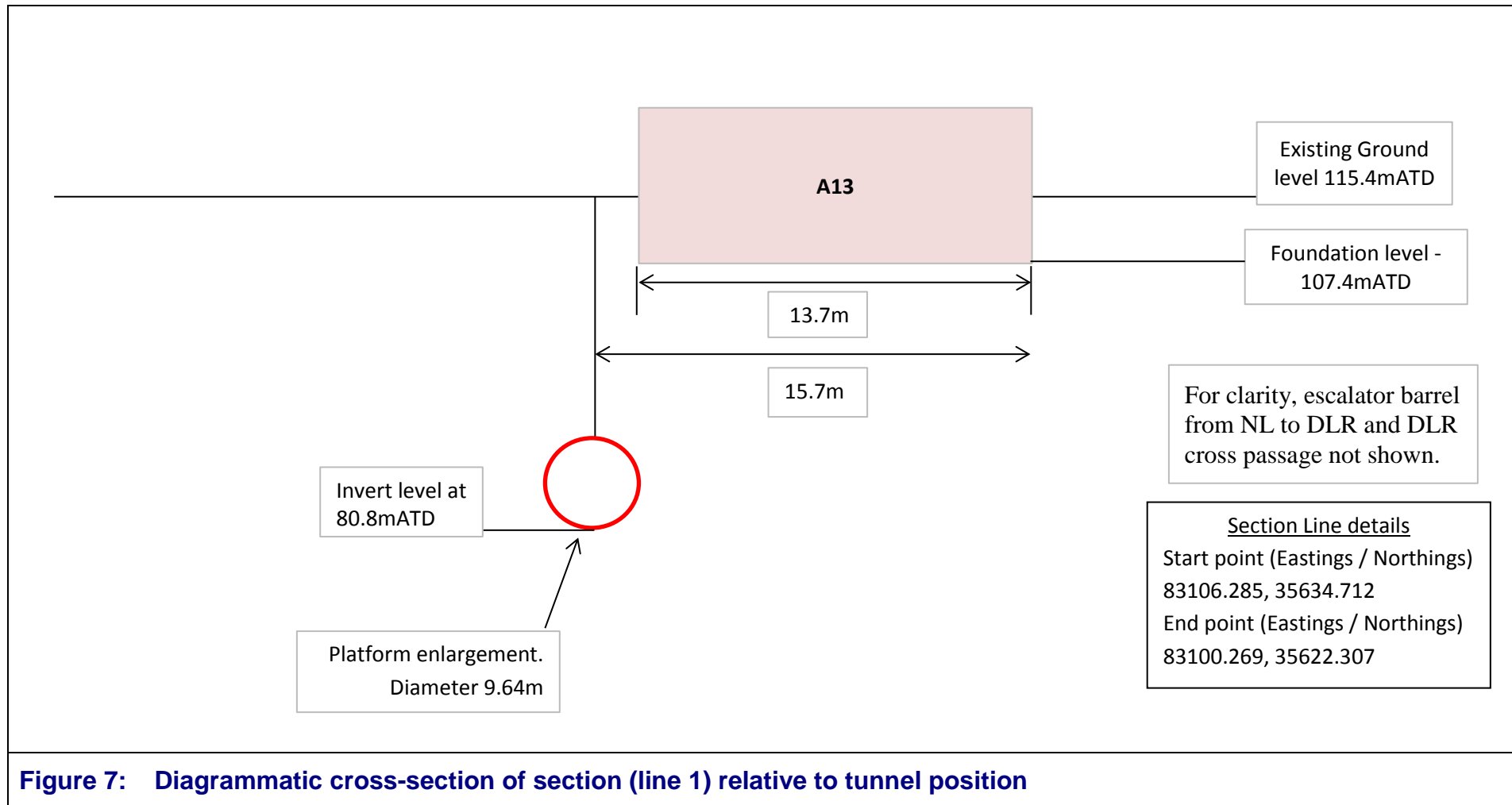


Figure 5: Building displacement at founding level of (line 2) at stage (4) of worst case for tensile strains

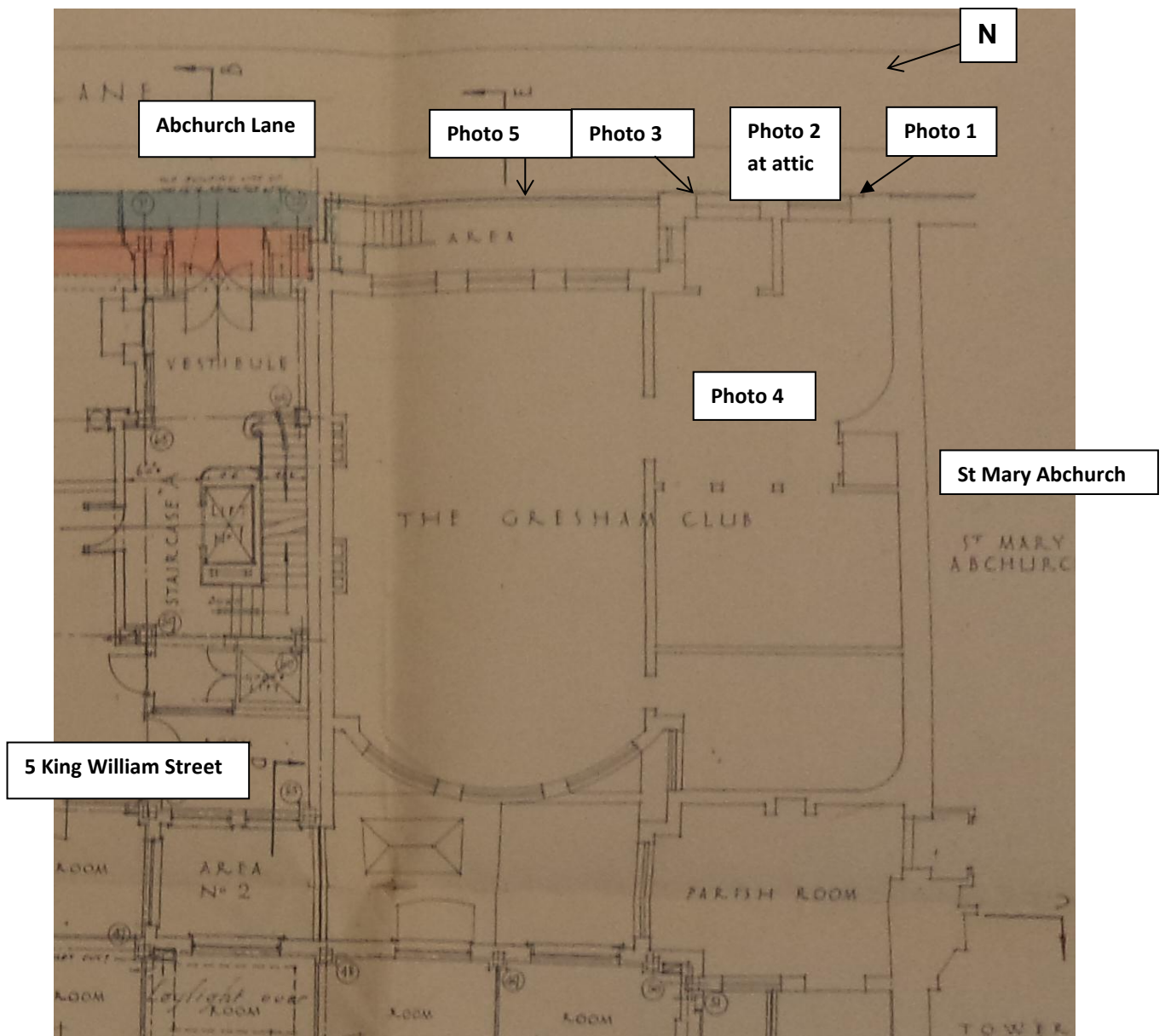




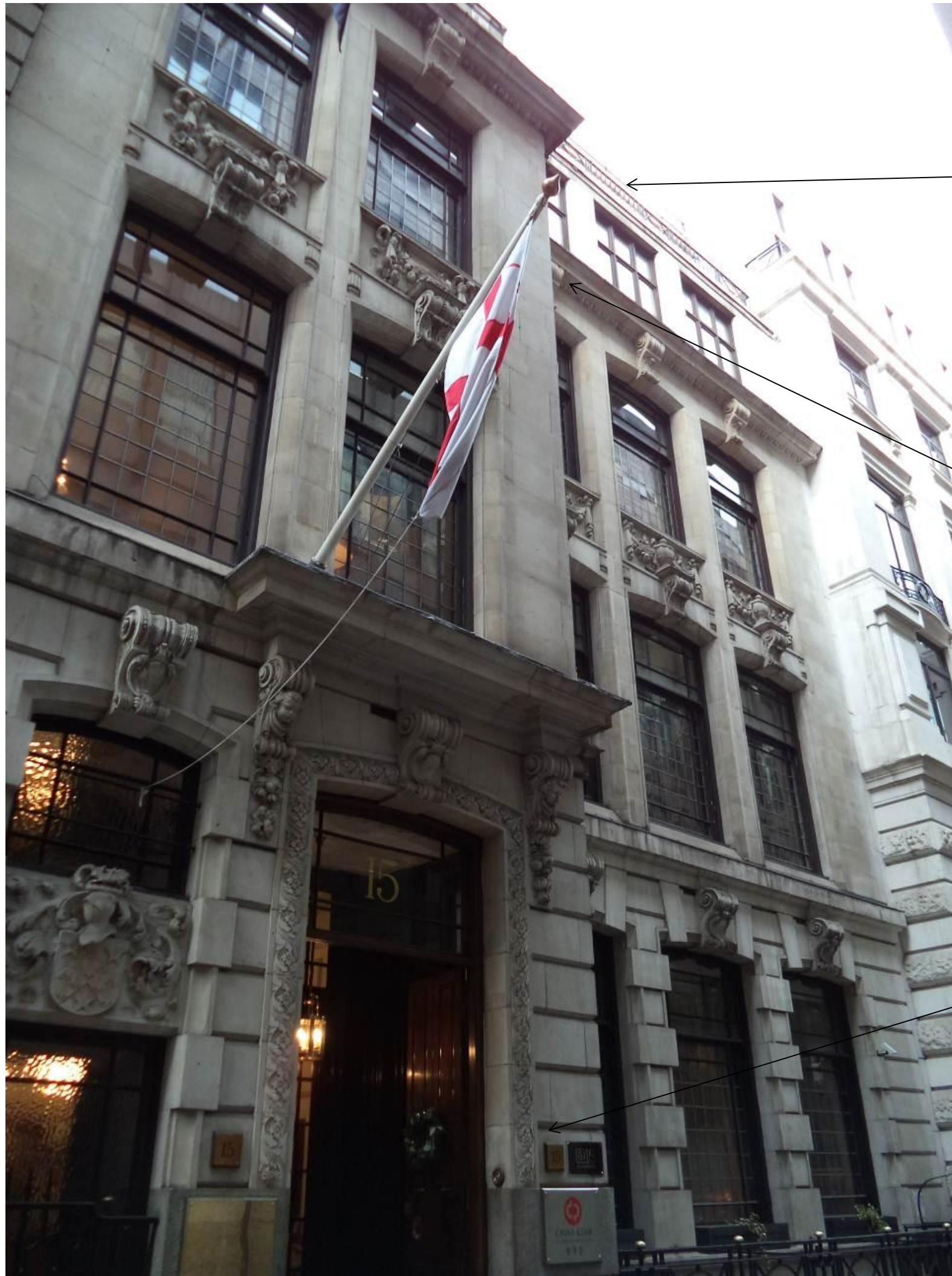
Appendix 6: Photo Locator

Taken from plan of 5 King William Street (part showing 15 Abchurch Lane, the Gresham Club), Phoenix Assurance Co Ltd, 1930.

Note that this layout differs from the current layout of 15 Abchurch Lane.



Appendix 7: Areas of interest potentially affected by ground movement



Areas of cracked stone and brick, and their location on the façade. Exact locations of the most vulnerable stone in need of repair to be verified by detailed condition survey

Appendix 8: Areas to be affected by protective works



Hatching denotes areas of stone and brickwork which may require protective works following survey

