Job Number:160812

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Basement Impact Assessment

Property:

22 Kings Mews
Camden
WC1N 2JB

Client:

Rosebery Financial

Structural Design Reviewed by	Above Ground Drainage Reviewed by
Chris Tomlin MEng CEng MIStructE	Phil Henry BEng MEng MICE

Hydrogeology and Land Stability Report by
(Separate Report) Julian Maund CGeol

Revision	Date	Comment
-	14th November 2016	First Issue
1	7th December 2016	Minor alteration to Appendix F
2	17th March 2017	Minor alterations to drawings in Appendices E and F

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Contents

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Executive (non-technical) Summary

	The London Borough of Camden requires a Basement Impact Assessment (BIA) to be prepared for developments that include basements and lightwells. This document forms the main part of the BIA and gives details on the impact of surface water flow. The scheme design for the proposed subterranean structure is also included. This document should be used in conjunction with the Land Stability and Groundwater BIA (dated 11 November 2016, Ref. MGC/16/26-BIA-GMA) by Maund Geo-consulting. This is a separate report and is referred to, where relevant, within this document. This BIA follows the requirements contained within Camden Council's planning guidance CGP4 – Basements and Lightwells (2015). In summary, the council will only allow basement construction to proceed if it does not: • cause harm to the built or natural environment and local amenity • result in flooding • lead to ground instability. In order to comply with the above clauses, a BIA must undertake five stages detailed in CPG 4. This report has been produced in line with Camden planning guidance and associated supporting documents such as CPG1, CPG4, DP23, DP26, DP25 and DP27. Technical information from 'Camden geological, hydrogeological and hydrological study - Guidance for subterranean development', Issue 01, November 2010 (GSD, hereafter) was also used and is referred to in this assessment.
Existing Property	The site comprises a disused Victorian building. The property is two storeys high and completely occupies the site. The structure adjoins properties to the left and right.
Proposed Development	The proposed development involves the construction of a new basement below the existing building. The applicant owns the adjacent property (No 23 & 24 Kings Mews) and intends to re-build the party wall with this, above ground level. The other perimeter walls will remain. Structural alterations are also proposed above ground level. These are not described in detail within this BIA. Architectural drawings, illustrating the scope of the proposals have been produced by Buchanan Hartley Architects Ltd and are submitted

	separately.  *Figure 1: Map / Aerial view with approx. site area indicated*
Stage 1 – Screening	Screening identified areas of concern and concluded a requirement to proceed to a scoping stage for the potential impacts relating to Land Stability, Hydrogeology. These included the possibility of made ground being present below the property, the proximity to a public highway and the differential depth of the new basement relative to the level of the neighbouring buildings. The Screening Stage did not identify any Surface Water or Flooding issues that needed to be carried forward to the Scoping Stage.
Stage 2 – Scoping	The Scoping stage identified the potential impacts and set the parameters required for further study of the areas of concern highlighted in the Screening phase. A desk survey was completed by an engineer. The information from this was utilised to formulate the requirement for a ground investigation. For land stability issues, a Ground Movement Assessment (GMA) was identified as being required to predict the anticipated damage category. Hydrogeological concerns led the requirement to monitor the ground water level.

Stage 3 – Site Investigation and Study	A structural engineer inspected the building to determine the current condition of the property and verify information from a desk study. Visual inspections were completed of the adjacent properties and external features surrounding the site. A ground investigation was completed. Made ground was found to be present at the proposed formation level of the basement. Laboratory testing was undertaken on the soil samples. The absence and subsequent presence of groundwater was noted, during an initial investigation and return visit respectively.
Stage 4 – Impact Assessment	**Land Stability** The potential impacts of the excavation of the basement were assessed. With the proposed construction methods, the maximum damage category predicted is Category 1 on the Burland Scale. Heave is anticipated to be less than 10mm. This is accommodated by the proposed construction of a reinforced concrete. The BIA advises that various mitigation measures should be adopted to reduce the likelihood of undermining adjacent structures. Proposals for this are presented. Movement monitoring during the construction phase is also recommended. The BIA concludes that the basement will not make the area unstable. **Hydrogeology** The hydrogeology impact assessment noted that the ground water level is below the proposed basement. However, to account for a potential increase in groundwater level, the walls of the basement should be designed to resist water pressure. **Surface Water Flow** The BIA does not identify any adverse effects that the basement will have on surface water flow and potential for flooding.

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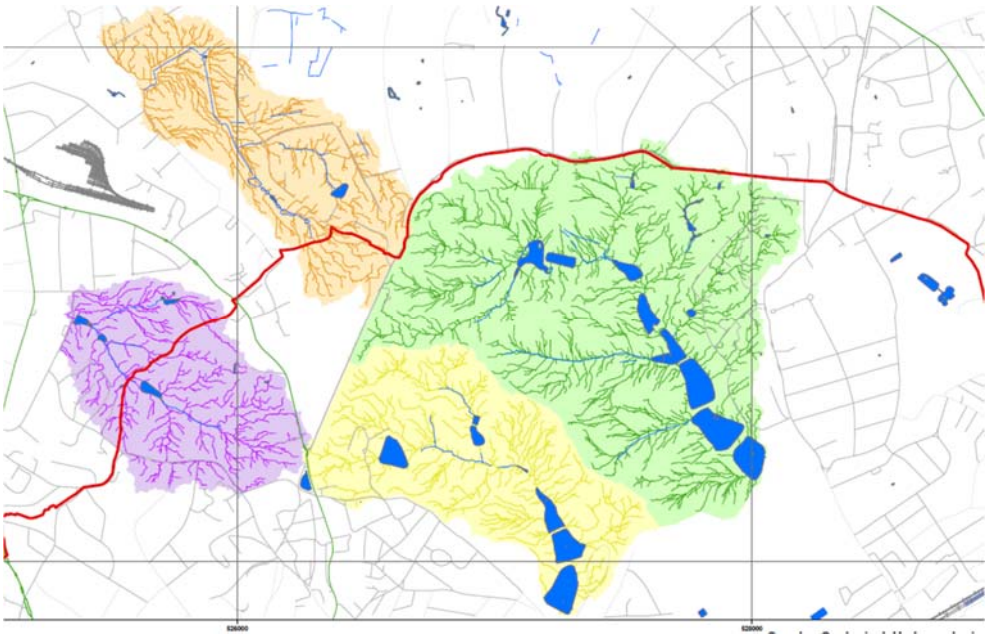
1. Screening Stage

	This stage identifies any areas for concern that should be investigated further.
Land Stability	Refer to the assessment on Land Stability.
Subterranean Flow	Refer to the assessment on Groundwater.
Surface Flow and Flooding	The questions below are taken from the Camden CPG 4 – Basements and Lightwells.
	Question 1: Is the site within the catchment of the pond chains on Hampstead Heath? **No**. The site lies outside the areas denoted by Figure 14 of the GSD (extract shown below)  *Figure 2: Extract from Figure 14 of the GSD (site lies to the south of the shaded areas)*
	Question 2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?

	No – The surface water that flows from the proposed development will be the same way as before. The site is covered with hard standing and this will remain the case with the proposed development. The volume of surface water will therefore remain unaltered.
	Question 3. Will the proposed basement development result in a change to the hard surfaced /paved external areas? **No.** The amount of hard standing will remain unchanged
	Question 4. Will the proposed basement result in changes to the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses? **No**. Surface water that is received by adjacent properties and downstream watercourses is not from the site. This is will remain the case with the proposed development.
	Question 5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses? **No**. Collected surface water will be from the roof of the building, as before. The quality of the water received downstream will therefore not change.
	Question 6 : Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature? **No.** Flood risk maps from the Environment Agency show that the site is not at risk of flooding from rivers and seas. There are no reservoirs or static water features nearby that put the site at risk of flooding in the event of failure. The site is not on a street that was reported to have flooded in 1975 or 2002. <u>There are no potential issues related to Surface Water and Flooding that need to be carried forward to the Scoping Stage.</u>

2. Scoping Stage	
	This stage identifies the potential impacts of the areas of concern highlighted in the Screening phase.
Land Stability	Refer to the assessment on Land Stability.
Subterranean Flow	Refer to the assessment on Groundwater.
Surface Flow & Flooding	No further study required.

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3. Site Investigation and Desk Study

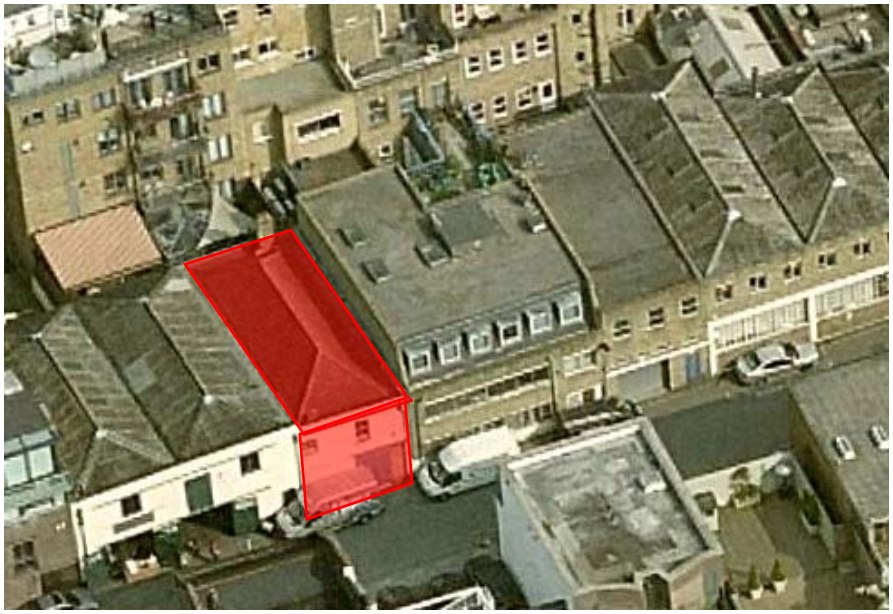
	This section identifies the relevant features of the site and its immediate surroundings, providing further scoping where required. Additional information is on the site investigation is described within the report by Maund Geo-consulting Ltd.
Walkover Survey	A structural engineer from Croft visited the site on 8 September 2016 The site comprises a disused Victorian building which front directly onto Kings mews. The property is two storeys high and completely occupies the site. The structure adjoins properties to the left and right. The perimeter walls are built from brickwork. The roof and the first floor are constructed from timber. A concrete slab forms the ground floor.  *Figure 3: Bird's-eye view of property from West* Cracks were noted in the party wall with No 21 Kings Mews. No.s 23 and 24 were inspected internally and are described later in this section. The area in front for the site (Kings Mews, a public highway) is covered with hard surfaces. It was not possible to inspect the area immediately behind the site. This belongs to 51 Grays Inn Road, and is described later in this section. Rainwater pipes appear to discharge directly on to the road surface. There are no gullies on the road.

Figure 4: Partial view of front elevation of property showing hard-standing and rain water pipes.

The road in front of the property slopes gently downward from south to north. No surface water features were noted nearby. No trees are present within the site boundary, or within the immediate vicinity.

Proposed Development

The proposed development involves the construction of a new basement below the existing building. The applicant owns the adjacent property (No 23 & 24 Kings Mews) and intends to re-build the party wall with this, above ground level. The other perimeter walls will remain. Structural alterations are also proposed above ground level. These are not described in detail within this BIA. Architectural drawings, illustrating the scope of the proposals have been produced by Buchanan Hartley Architects Ltd and are submitted separately.

The approximate site area for the development is indicated below. In addition to the basement area, this also includes areas that are likely to be temporarily occupied for construction purposes.

Figure 5: Map / Aerial view with approx. site area indicated

The outline construction sequence is appended to this report.

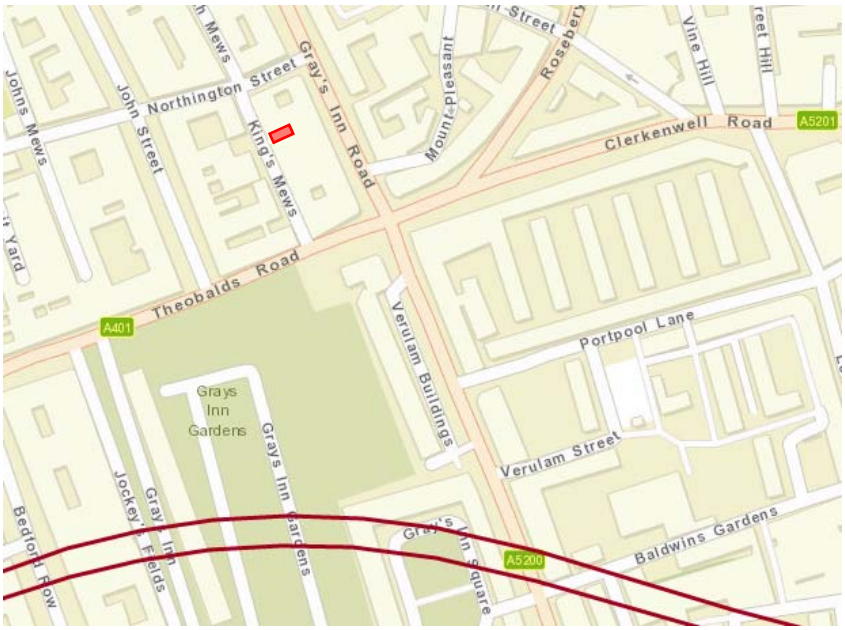
Local topography and physical features, not noted from walk over survey

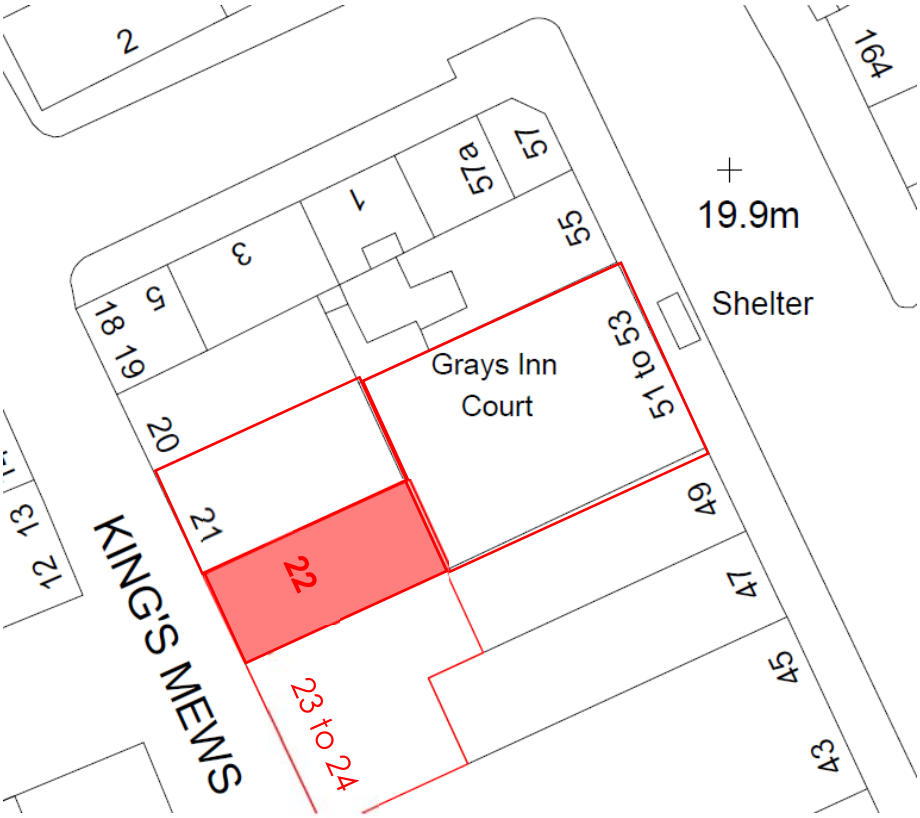
The site is approximately 21m AOD. The surrounding area is populated by residential and commercial buildings.

Further inspection from OS maps show that there are no water courses, ponds or similar open water features are present within 100m of the site

Figure 6: Extract from OS map with approx. site area indicated (with a star)

	The existing foundations are believed to be between 1 and 2m below ground level. Information on the depth of the foundation of the party wall with No 21 Kings Mews is available from the planning website of Camden Council. This is described in more detail later in this section.
Listed Buildings and Conservation Areas	The existing building is not listed. Data from Historic England shows that there are no listed buildings immediately adjacent to the site  *Figure 7: Extract showing listed buildings* The site is in the Bloomsbury Conservation Area.
Geology	Made ground is present below the property. Below this there is gravel and alluvium. More details are presented in the Ground Investigation report and the Hydrogeological and Land Stability assessment.
Site history	Historical maps show that the site and the surrounding area has been built up for over 100 years. Historical maps are included in Appendix C of the Hydrogeology and Land Stability BIA. The Aggregate Night Time Bomb Census records bombs reported between 7th October 1940 to 6 June 1941. This shows that the nearest reported bomb was in Grays Inn Road. An extract from a map showing this is presented below.

	 *Figure 8: Extract from bomb census map*
Highways & public footpaths	The site is within 5m of the public highway.
London Underground and Network Rail	The nearest operational underground line is more than 200m away, to the from the underground line. The Elizabeth line is more than 100m to the south. The proposed basement is unlikely to affect either of these.  *Figure 9: Extract from Crossrail map showing the nearest subterranean train line to the site*

UK Power Networks	There are no significant items of electrical infrastructure (such as pylons or substations) in the immediate vicinity.
Underground water services	A Thames Water search has revealed the presence of water mains and a combined sewer along 22 Kings Mews. This is appended.
	Adjacent Properties The locations of the adjacent properties, relevant to this assessment are shown below.  *Figure 10: Plan view of site and the surrounding properties (outlined in red)*
Nos 21 Kings Mews – Property to Left	No 21 Kings Mews is a two-storey property similar age and construction to No 22. Historic maps of the local area show that the site has been built on for over 100 years.

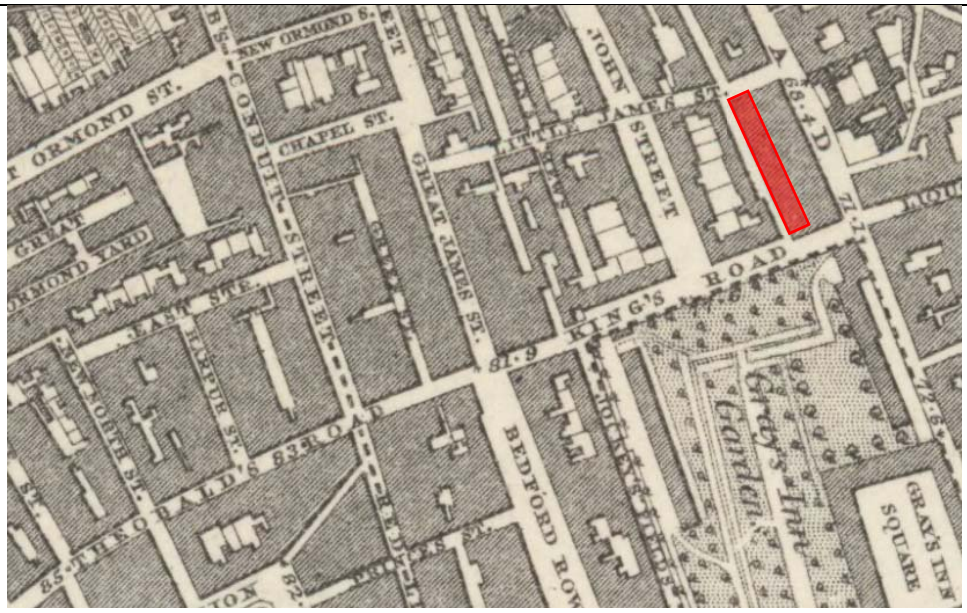


Figure 11: Extract from 1880 map with properties on Kings Mews in red

Figure 12: Street view of No 21 Kings Mews

From observing the external façade of the building, there were no visible signs of movement.

This building does not have a basement. However, planning permission has recently been granted for a basement development.

Information on the depth of the foundation of the party wall with No 22 Kings Mews is available from the planning website of Camden Council. This includes a BIA submitted as part of the planning submission documentation (Camden Planning reference 2016/1093/P). This shows the foundation at 1.2m below ground level. Relevant extracts from this are reproduced below.

Figure 13: Extract from BIA for 21 Kings Mew showing trial pit location plan

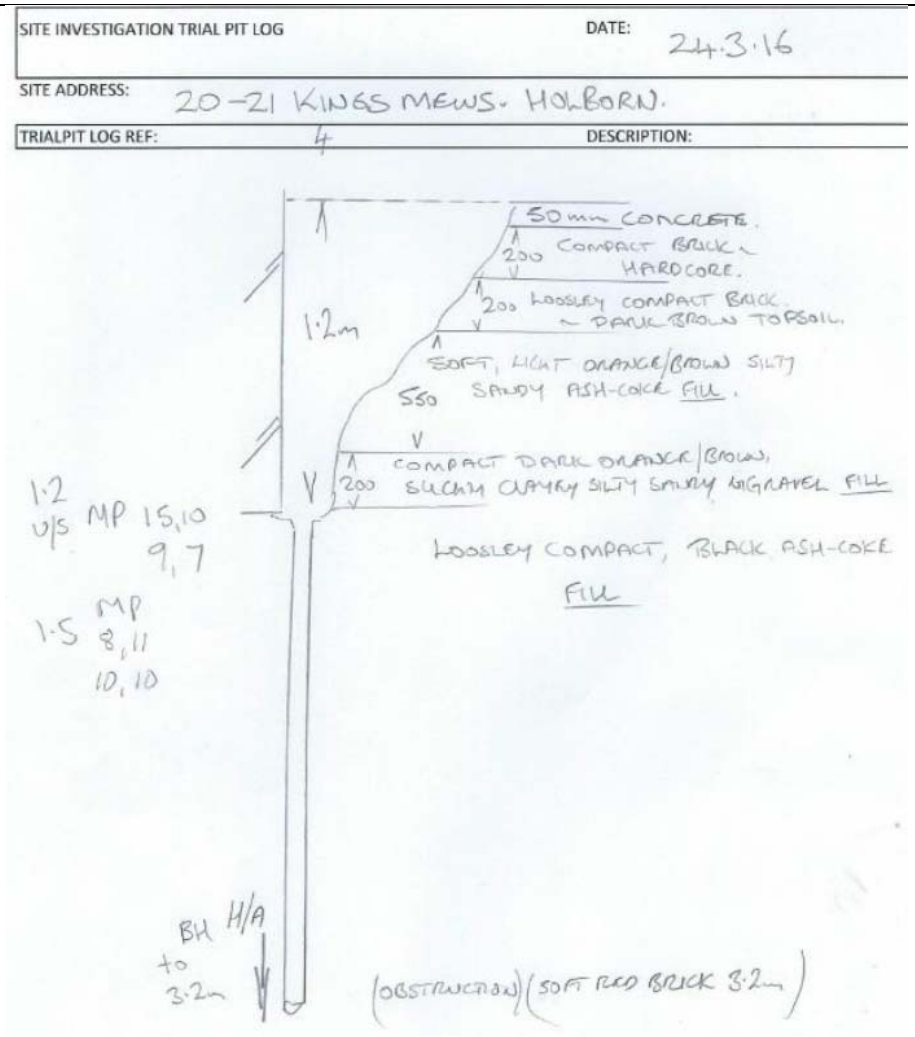
	 *Figure 14: Extract from BIA for 21 Kings Mew showing trial for party wall with No 22* For the purposes of this assessment, a conservative approach will be taken which will assume that the new basement will not have been constructed, when the works at No 22 commence.
Nos 23 & 24 Kings Mews – Property to Right	23-24 Kings Mews is a combined three storey property built from brickwork, timber and structural steelwork. This is an un-occupied mid-terrace building and it shares a party wall with No 22. This party wall has an opening at ground floor level, allowing access between the two properties. From observing the external façade of the building, there were no visible signs of movement. This building does not have a basement. At the time of reporting, there were proposals to re-build the party wall between No 22 and No 23/24.

	 *Figure 15: street view of No 23/24*
Nos 51 to 53 Grays Inn Road – Property to Rear	51-53 Grays Inn Road is a combined, five-storey high building. Access to this building was not possible. Planning applications for this building show that this is a mixed-use residential and commercial property and that a basement is present. There is an open terrace at first floor level at the rear which borders No 22 Kings Mews. A ground floor is believed to be below this. The extent of the basement is not known at present.
	Monitoring, Reporting and Investigation The ground investigation report, which has data from initial site investigations and data from subsequent monitoring, is available as a separate report.

Ground Investigation	
Ground Investigation Brief	A ground investigation was completed by Ground and Water Ltd. From the Scoping Stage, Croft considered that the brief of this should cover: • Two boreholes to a depth of at least 5m below ground level • Stand pipe to be inserted to monitor ground water; record initial

	strike and the water level after one month. • Site testing to determine in-situ soil parameters. SPT testing to be undertaken. • Laboratory testing to confirm soil make up and properties. • The Historic maps and walk over survey did not highlight any significant contamination sources, therefore no site test of the ground has been requested. • Factual report on soil conditions. • Indication of soil type Refer to the ground investigation report by Ground & Water Ltd, which is submitted as a separate document [ref GWPR1789]. Data relevant to land stability and subterranean flow is examined in separate documents.

4. Basement Impact Assessment

	Impacts relating to Land Stability and Groundwater are described within the BIA produced by Maund Geo-consulting. Proposed measures to mitigate these, which should be developed further at detailed design stage, are presented in this section.

Ground Movement Assessment & Predicted Damage Category

The design and construction methodology aims to limit damage to the existing building on the site, and to the neighbouring buildings, to Category 2 or lower as set out in Table 2.5 of CIRIA report C580. For this development, suitable temporary propping during the construction phase will limit the amount of movement due to the basement works. This is described in the Basement Method Statement (appended).

The ground movement assessment is contained within the BIA by Maund Geo-consulting.

Not all the foundation depths of the party walls are known at present. Furthermore, the extent of the basement in plan, below No.s 51-53, is not known. When predicting ground movement, a conservative approach is taken which uses the maximum differential depth possible. This is the depth of the excavation for the basement, relative to the ground level.

Mitigation Measures Ground Movement

A method statement, appended, has been formulated with Croft's experience of over 500 basements completed without error. As mentioned previously, the procedures described in this statement will mitigate the impacts that the construction of the basement will have on nearby properties.

The works must be carried out in accordance with the Party Wall Act and condition surveys will be necessary at the beginning and the end of the works. The Party Wall Approval procedure will reinforce the use of the proposed method statement and, if necessary, require it to be developed in more detail with more stringent requirements than those required at planning stage.

It is not expected that any cracking will occur in nearby structures during the works. However, Croft's experience advises that there is a risk of movement to the neighbouring property.

To reduce the risk to the development:

- Employ a reputable firm that has extensive knowledge of basement works.
- Employ suitably qualified consultants Croft Structural Engineers has completed over 500 basements in the last five years.
- Provide method statements for the contractors to follow
- Investigate the ground this has now been done.
- Record and monitor the properties close by. This is completed by a condition survey under the Party Wall Act, before and after the works are completed. Particular attention should be made to the vertical crack in the party wall with No 21 Kings Mews. Refer to the end of the appended Basement Construction Method Statement.

Monitoring of Structures

In order to safeguard the existing structures during underpinning and new basement construction, movement monitoring is to be undertaken.

Risk Assessment

Monitoring Level proposed	Type of Works.
Monitoring 4 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment Lateral movement between walls by laser measurements	<u>New basements greater than 2.5m and shallower than 4m deep in gravels</u> Basements up to 4.5m deep in clays Underpinning works to grade I listed building

Before the works begin, a detailed monitoring report is required to confirm the implementation of the monitoring. The items that this should cover are:

- Risk Assessment to determine level of monitoring
- Scope of Works
- Applicable standards
- Specification for Instrumentation
- Monitoring of Existing cracks
- Monitoring of movement
- Reporting
- Trigger Levels using a RED / AMBER / GREEN System

Recommend levels are shown within the proposed monitoring statement (appended).

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Basement Design & Construction Impacts and Initial Design Considerations

Design Concept

Reinforced concrete (RC) cantilevered retaining walls will be designed to resist the lateral loads around the perimeter of the basement. The lateral load applied to the walls will be transferred along the basement slab and will be resisted by the wall and retained soil on the opposite side. The RC perimeter wall will also transfer vertical loads to the ground via an RC slab that is supported by piles (refer to appended drawing SL-10).

The investigations highlight that water is present. The walls should be designed to cope with the hydrostatic pressure. The design of the walls should consider worst case scenarios. This should include the possibility that a water main may break, causing a local high water table. To account for this, and also the possibility that the ground water level may rise, the walls should be designed for water up 0.6m bgl or 19.50m AOD, as recommended in the Hydrogeology BIA by Maund Geo-consulting..

Floatation is not a significant risk for this development. The basement is below the footprint of the building and the weight of the building is greater than the uplift forces from the water. This results in a stable structure.

The stability of the walls should be designed using K_a & K_p values. The Land Stability BIA has proposed parameters for this. These are reproduced below:

	Design Level	Class	Undrained Cohesion	Effective angle of shearing resistance	Bulk unit weight*	Deformation Modulus E_u (E')	K_a	K_p
Strata	m bgl		Cu (kPa)	MPa	kN/m^3	MPa		
Made Ground (granular)	0.0 (21.1)	n/a	n/a	30	16*	(10)**	0.35	3.0
Alluvium (granular)	3.50 (17.6)	n/a	n/a	30	16*	(10)**	0.35	3.0
Alluvium (cohesive)	4.5 (16.6)	n/a	195	20	19	117** (87)	0.5	2.0

Figure 16: Extract from Table 4.3 of Land Stability BIA

The Land Stability predicts heave below the basement. This will be less than 10mm and can be accommodated by installing compressible material or a void former (Claymaster or similar) between the basement slab and the ground.

	At detailed design stage (after the planning application is complete), record drawings of the neighbouring properties should be obtained to ascertain the depth of the foundations and to find out whether the basement for No.s 51-53 Grays Inn Road meets the rear boundary of No. 22 Kings Mews. If there is no such record information, trail pits should be excavated adjacent to the existing party walls to find the depth and spread of the existing foundations and whether a basement is present at the rear.
Additional loading requirements	Lateral forces will be applied from: • Soil loads • Hydrostatic pressures • Surcharge loading from behind the wall **Surcharge Loading** The following will be applied as surcharge loads to the retaining walls: • 10kN/m² if within 45° of road • 5kN/m² if within 45° of Pavement • Garden Surcharge 2.5kN/m² + 1 m of soil (if present above basement ceiling) 20kN/m² • Surcharge for adjacent property 1.5kN/m² + 4kN/m² for concrete ground bearing slab <u>Highways loading:</u> The basement is within 5m of the public highway. For the design of retaining walls at the front of the property, a highways loading of 10kN/m² should therefore be allowed for, at detailed design stage. The appended calculations show the design of one of the most heavily loaded retaining wall. The most critical parameters have been used for this.
Mitigation Measures - Internal Flooding	Basements have an inherent risk of flooding internally (eg due to burst mains). To mitigate the risks associated with this, and to mitigate any related damage, Croft would recommend the following: • A positive pumping device should be installed for the proposed basement. There is a likelihood that this may fail and allow excess water to accumulate. If this were to occur, the build-up of water would be gradual and noticeable before it becomes a significant life-threatening hazard. • Install a dual pumping system to maintain operation in the event of a failure. This should include a battery backup and a suitable alarm system for warning purposes. • Route all electrical wiring at high level.

Mitigation Measures - Drainage and Damp-proofing	The design of drainage and damp-proofing is not within the scope of this assessment and would not normally be expected to be part of the structural engineer's remit at detailed design stage. A common and anticipated detailed design stage approach is to use internal membranes (Delta or similar). These will be integral to the waterproofing of the basement. Any water from this will enter a drainage channel below the slab. This will be pumped and discharged into the exiting sewer system. It is recommended that a waterproofing specialist is employed to ensure all the water proofing requirements are met. The waterproofing specialist must name their structural waterproofer. The structural waterproofer must inspect the structural details and confirm that he is happy with the robustness. Due to the segmental construction nature of the basement, it is not possible to water proof the joints. All waterproofing must be made by the waterproofing specialist. He should review the structural engineer's design stage details and advise if water bars and stops are necessary. The waterproofing designer must not assume that the structure is watertight. To help reduce water flow through the joints in the segmental pins, the following measures should be applied: • All faces should be cleaned of all debris and detritus • Faces between pins should be needle hammered to improve key for bonding • All pipe-work and other penetrations should have puddle flanges or hydrophilic strips
Mitigation Measures - Localised Dewatering	Water levels should be monitored for at least one month prior to starting on site and throughout the construction process. The water table is not expected to rise above the formation level. If pre-excavation monitoring records otherwise, the contractor should adopt measures (eg grouting) to seal the water during construction and prevent removal of fines.
Temporary Works	Temporary propping details will be required. This must be provided by the contractor. Their details should be forwarded to the design stage engineer. To demonstrate the feasibility of the works, a proposed basement construction method statement is appended.

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Construction Management

The site is in a conservation area. The contractor should strictly control the impacts on the local amenity. A management plan for demolition and construction will be required at detailed design stage.

Considerations that the contractor and the design team should account for in the construction management plan are described below.

Noise Control

- The hours of working will be limited to those allowed: 8am to 5pm Monday to Friday and Saturday, 8am to 1pm. The hours of working will further be defined within the Party Wall Act and the requirements of Camden Council.
- The site will be hoarded with 8' site hoarding to prevent access.
- Working in the basement generally requires hand tools to be used. The level of noise generally will be no greater than that of digging of soil. The noise is reduced and muffled by the works being undertaken underground. The level of noise from basement construction works is lower than typical ground level construction due to this.
- None of the construction practices cause undue noise greater than what is expected on a typical construction site (a conveyor belt typically runs at around 70dB). Site hoarding acts as a partial acoustic screen and will reduce the level of direct noise from the site.

Dust and Vibration Control

- Reduce the need to use vibrating and percussive machinery.
- Use well-maintained and modern machinery
- Plant/vehicles should be cleaned before exiting the site.
- Water should be applied to suppress dust
- Skips and storage of fine materials should be covered

Traffic Control

- Consideration of site traffic to, from and along Kings Mews should be considered carefully; this should include identifying access and exit routes, planned delivery times and vehicle swept paths.
- Banksmen should assist with vehicle movements close to and within the site to ensure the safety of site staff, visitors and other people close to the site.
- Construction vehicle movements should be co-ordinated with deliveries to other properties close by and vehicle movements for other construction sites in the vicinity.
- A Construction Traffic Management Plan should implement the above. This should be developed at detailed design stage.

	The contractor is to follow the good working practices and guidance laid down in the 'Considerate Constructors Scheme'. This scheme commits construction sites to commit to care about appearance, respect the community, protect the environment and secure everyone's safety. The scheme will reinforce the measures above described above. With good construction practices adopted, the impact on the local amenity will be minimised.

Appendix A: Thames Water Asset Search

Asset Location Search

Croft Structural Engineers
Clockshop Mews
60Rear of 60 Saxon Rd
LONDON
SE25 5EH

Search address supplied 22
Kings Mews
Camden
London
WC1N 2JB

Your reference 160812

Our reference ALS/ALS Standard/2016_3442445

Search date 31 October 2016

Notification of Price Changes…

From **1 September 2016** Thames Water Property Searches will be increasing the prices of its Asset Location Searches. This will be the first price rise in three years and is in line with the RPI at 1.84%. The increase follows significant capital investment in improving our systems and infrastructure.

Enquiries received with a higher payment prior to 1 September 2016 will be non-refundable. For further details on the price increase please visit our website at

www.thameswater-propertysearches.co.uk

Asset Location Search

Search address supplied: 22, Kings Mews, Camden, London, WC1N 2JB

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset Location Search

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and

pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Asset Location Search

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

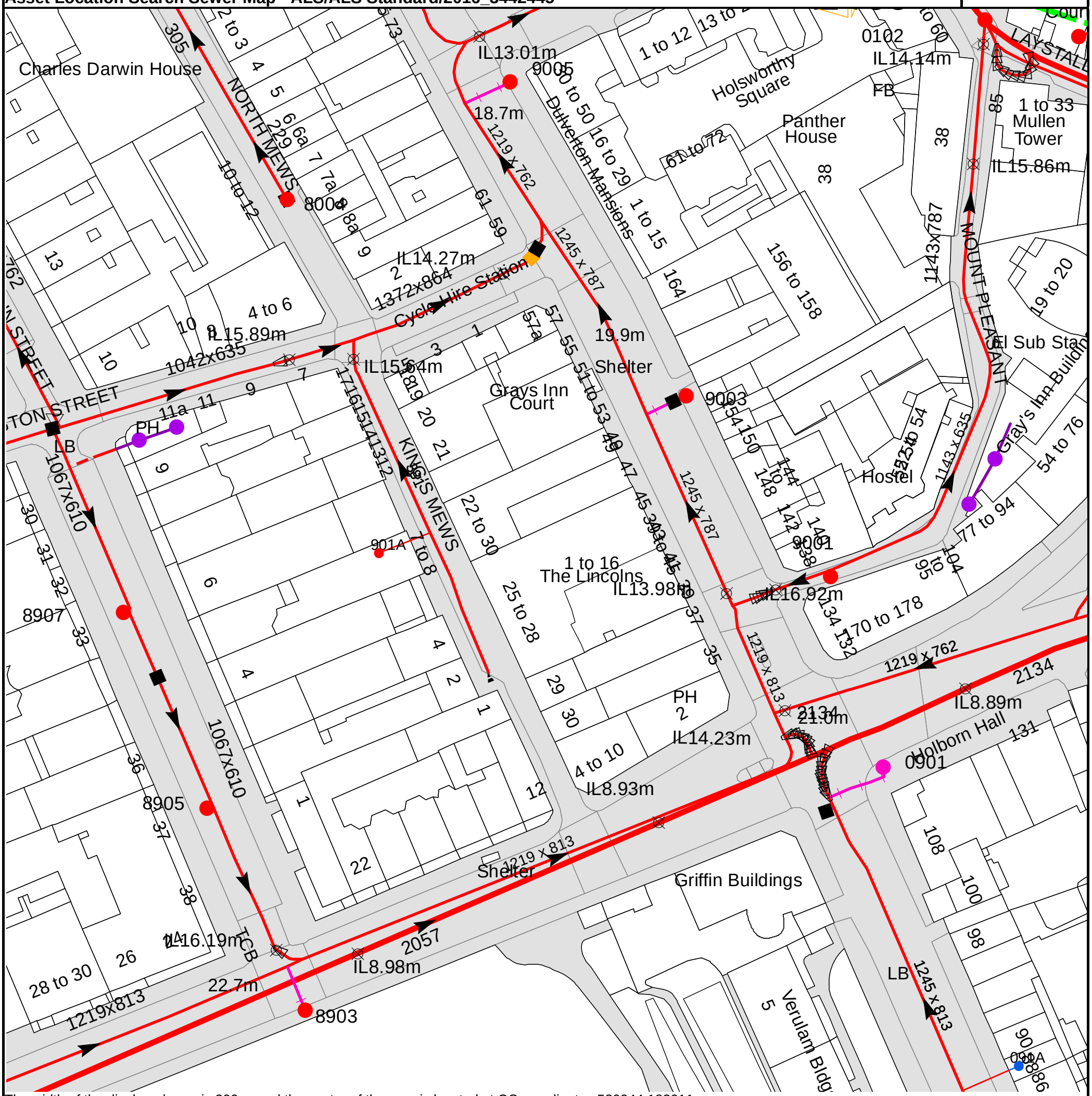
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2016_3442445



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 530944,182011

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
091A	n/a	n/a
0901	n/a	n/a
9001	20.62	n/a
9005	n/a	n/a
9003	n/a	n/a
001A	n/a	n/a
0102	16.54	n/a
001B	n/a	n/a
01FF	n/a	n/a
8907	22.36	17.08
801B	n/a	n/a
801A	n/a	n/a
8905	22.51	16.58
8004	20.05	16.3
8903	n/a	n/a
901A	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

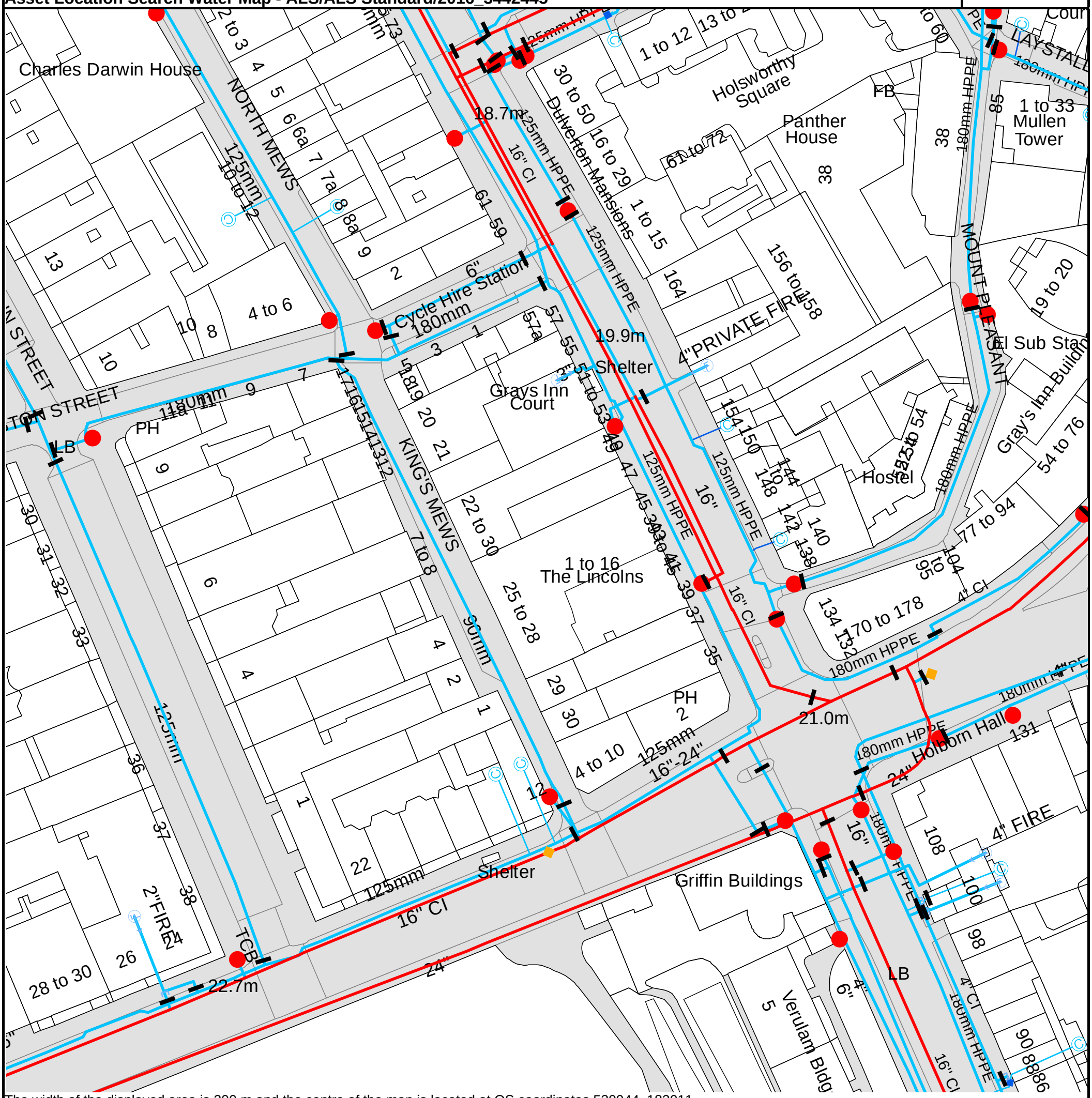
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2016_3442445



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 530944, 182011.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

CROFT STRUCTURAL ENGINEERS

Appendix B: Structural Calculations

CPG4 Section 5 highlights that other permits and requirements will be necessary after planning. Item 5.1 highlights that Building Regulations will be required. As part of the Building Control application, full calculations must be undertaken and provided at detailed design stage once planning permission is granted. The calculations must be completed to a recognised Standard (BS or Euro Codes). The calculations must take into account the findings of this report and the recommendations of the auditors.

The design must resist:

- Vertical loads from the proposed works and adjacent properties
- Lateral loads from wind, soil, water and adjacent properties
- Loadings in the temporary condition
- All other applied loads on the building
- Uplift forces from hydrostatic effects and soil heave

The final proposed scheme must:

- Provide stability in the temporary condition to all forces
- Provide stability to all forces in the permanent condition

As part of the planning application, Croft structural engineers has considered some of the pertinent parts of the basement structure to ensure that it can be constructed. The following calculations are not a full set of calculations for the final design which must be provided for Building Control. The structural calculations that Croft considers pertinent and are included in this appendix for this development are:

1. Basement wall lateral loading, analysis and partial design
2. Typical ground floor steel beam analysis and partial design

WALL DESIGN

Surcharge q = 10 kN/m^2

Soil properties

moist density of retained material γ_m = 16 kN/m^3
saturated density of retained material γ_s= 19 kN/m^3
water density γ_w= 9.81 kN/m^3

Soil depth h = 3300 mm

For water to full height
Height of water $h_w = h - 600mm$ = **2.700** m

Active coeff K_a = 0.35

Surcharge pressure surcharge = q * K_a = **3.500** kN/m^2

Soil (saturated) pressure soil = K_a * (γ_s - γ_w) * h_w = **8.685** kN/m^2

Max water pressure p_w = 9.81kN/m^3*h_w = **26.487** kN/m^2

ANALYSIS

Tedds calculation version 1.0.13

Geometry

Nodes

Node	Co-ordinates		Freedom			Coordinate system		Spring		
	X (m)	Z (m)	X	Z	Rot.	Name	Angle (°)	X (kN/m)	Z (kN/m)	Rot. kNm/°
1	0	0	Fixed	Fixed	Fixed		0	0	0	0
2	3.15	0	Free	Free	Free		0	0	0	0

Materials

Name	Density (kg/m^3)	Youngs Modulus kN/mm^2	Shear Modulus kN/mm^2	Thermal Coefficient °C^{-1}
Concrete (BS8110 normal)	2400	29	12	0.00001

Sections

Name	Area (cm^2)	Moment of inertia		Shear area	
		Major (cm^4)	Minor (cm^4)	A_y (cm^2)	A_z (cm^2)
R 1000x350	3500	357292	2916667	2917	2917

Elements

Element	Length (m)	Nodes		Section	Material	Releases			Rotated
		Start	End			Start moment	End moment	Axial	
1	3.15	1	2	R 1000x350	Concrete (BS8110 normal)	Fixed	Fixed	Fixed	

Members

Name	Elements	
	Start	End
Member	1	1

Loading

Load cases

Name	Enabled	Self weight factor	Patternable
Self Weight	yes	1	no
Permanent	yes	0	no
Imposed	yes	0	no

Load combinations

Load combination	Type	Enabled	Patterned
1.4D	Strength	no	no
1.4D + 1.6I + 1.6RI	Strength	yes	no
1.0D + 1.0I + 1.0RI	Service	no	no
1.4D + 1.6I + 1.6S	Strength	yes	no
1.0D + 1.0I + 1.0S	Service	no	no
1.2D + 1.2I + 1.2RI + 1.2W	Strength	no	no
1.0D + 1.0I + 1.0RI + 1.0W	Service	no	no
1.0D + 1.4W	Strength	yes	no

Load combination: 1.4D + 1.6I + 1.6RI (Strength)

Load case	Factor
Self Weight	1.4
Permanent	1.4
Imposed	1.6

Load combination: 1.4D + 1.6I + 1.6S (Strength)

Load case	Factor
Self Weight	1.4
Permanent	1.4
Imposed	1.6

Load combination: 1.0D + 1.4W (Strength)

Load case	Factor
Self Weight	1
Permanent	1

Member UDL loads

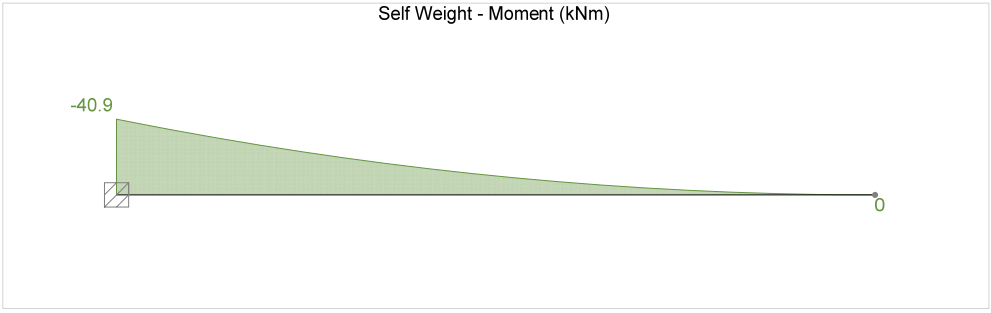
Member	Load case	Position			Load (kN/m)	Orientation
		Type	Start	End		
Member	Imposed	Ratio	0	1	4	GlobalZ

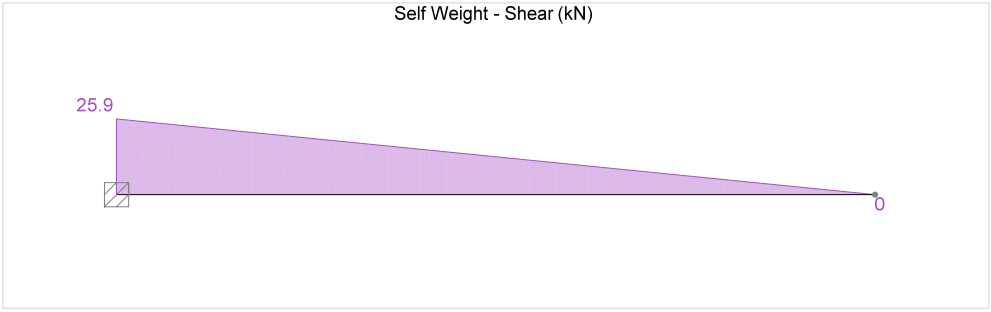
Member VDL loads

Member	Load case	Position			Load		Orientation
		Type	Start	End	Start (kN/m)	End (kN/m)	
Member	Permanent	Ratio	0	1	9	0	GlobalZ
Member	Permanent	Ratio	0	1	27	0	GlobalZ

Results

Forces

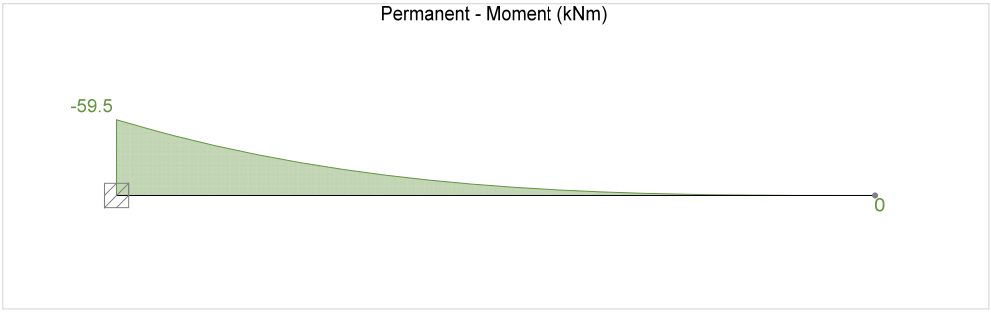


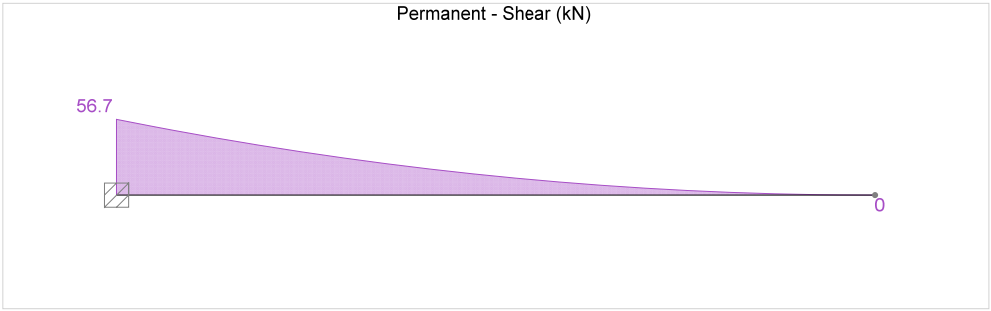


Element results

Load case: Self Weight

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	0	25.9	3.15	0	0	-40.9

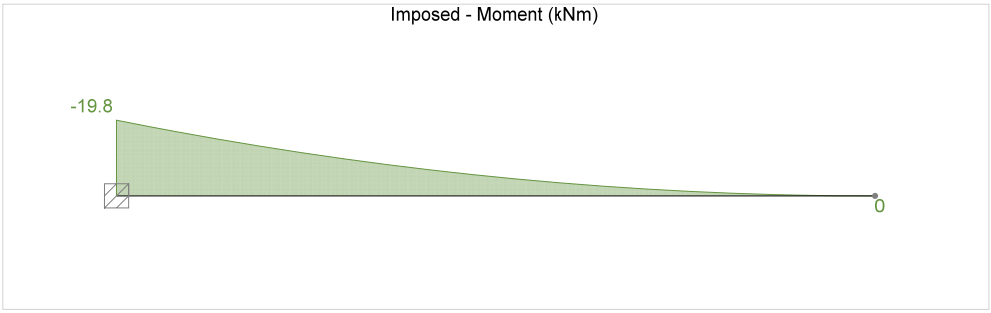


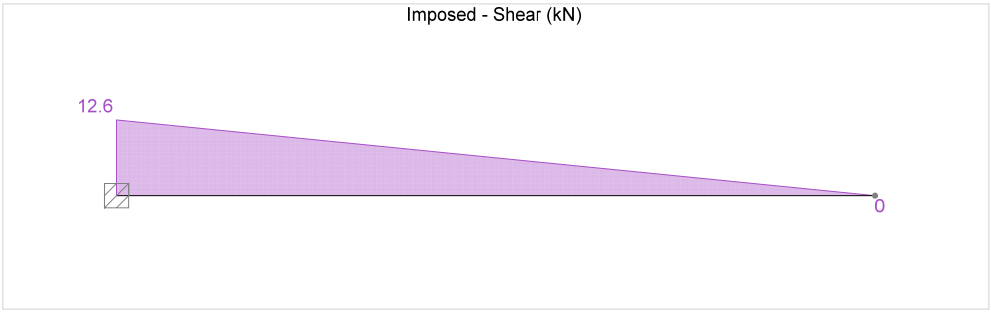


Element results

Load case: Permanent

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	0	56.7	3.15	0	0	-59.5

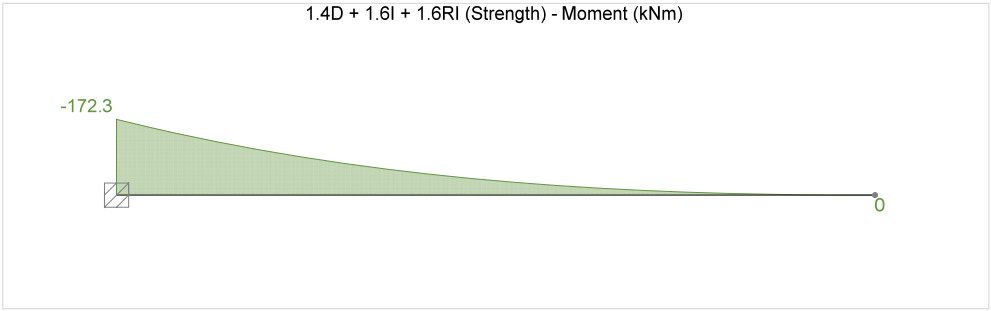


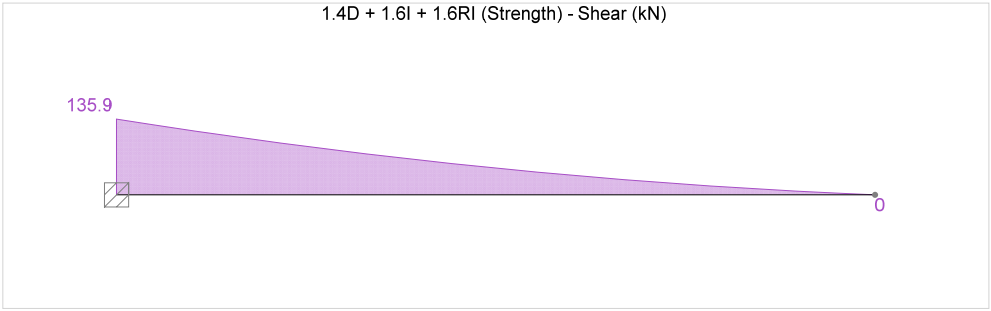


Element results

Load case: Imposed

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	0	12.6	3.15	0	0	-19.8

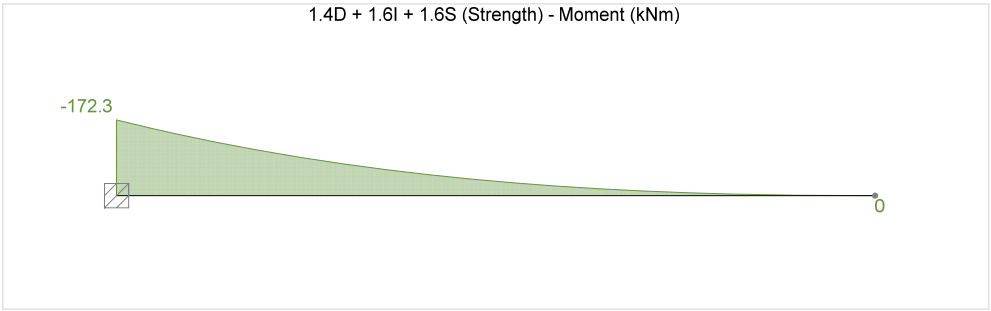


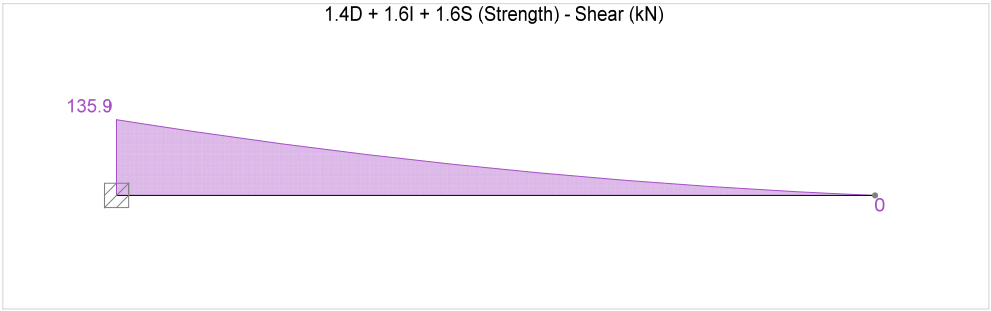


Element results

Load combination: 1.4D + 1.6I + 1.6RI (Strength)

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	0	135.9	3.15	0	0	-172.3

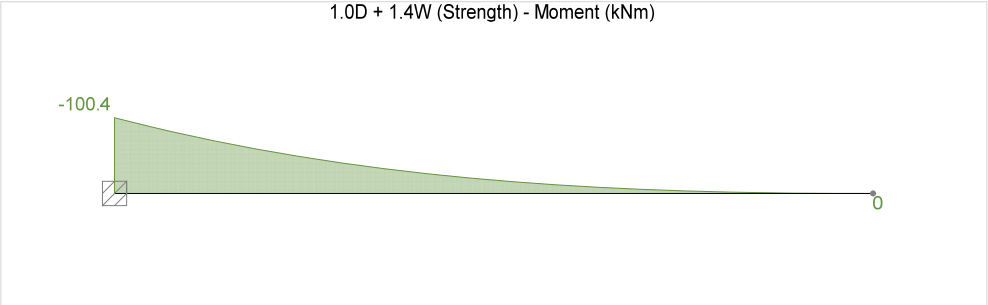


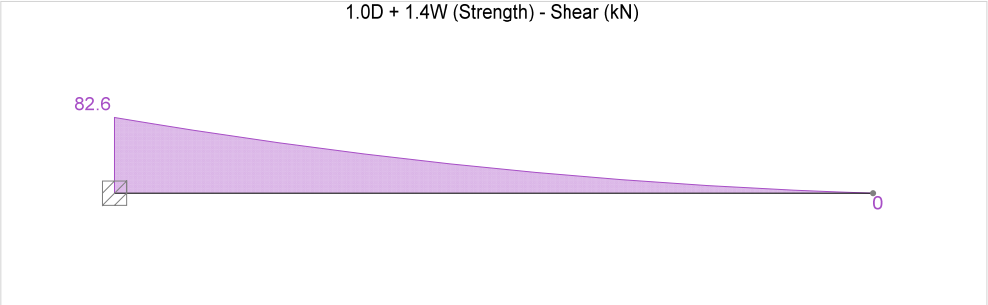


Element results

Load combination: 1.4D + 1.6l + 1.6S (Strength)

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	0	135.9	3.15	0	0	-172.3





Element results

Load combination: 1.0D + 1.4W (Strength)

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	0	82.6	3.15	0	0	-100.4

<u>Wall stem main reinforcement</u>

ULS moment (approx)	M = 180 kNm
Overall depth (wall thickness)	h = 350mm
Cover	c = 75mm
Bar diameter	D = 16mm
Effective depth	d = h – c – D/2 = **267.000** mm
Width	b = 1m
Concrete strength	f_{cu} = 35N/mm^2
Ratio	k = M/(f_{cu}*b*d^2) = **0.072**

Assuming redistribution does not exceed 10 % (this implies a limitation of the neutral axis depth to d/2),

k' = 0.156

Compression re-bar required? check = if(k<k',"No","Yes") = **"No"**

Lever arm (assuming no comp steel req'd) z = min(d*(0.5 + √(0.25-k/0.9)),0.95*d) = **243.536** mm

Steel strength f_y = 500N/mm^2

Area of steel required A_s = M/(0.95*f_y*z) = **1556.021** mm^2

H16s @ 100cc (2011mm/m) will suffice

GROUND FLOOR BEAM

Secondary steel beams currently proposed to transfer floor load to cross beams. Equivalent UDL loading is appied in the follwing analysis.

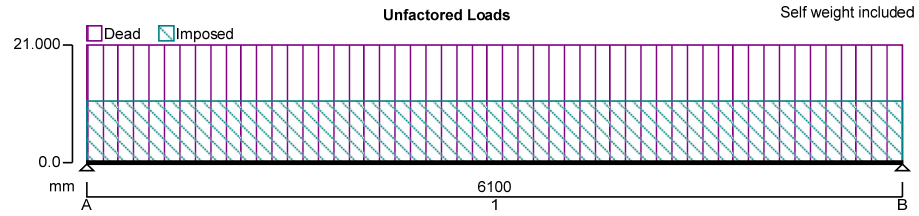
Dead load (150mm thick ribdeck + screed, insulation and finishes) DL = 5 kN/m^2* 8.2m/2 = **20.500** kN/m

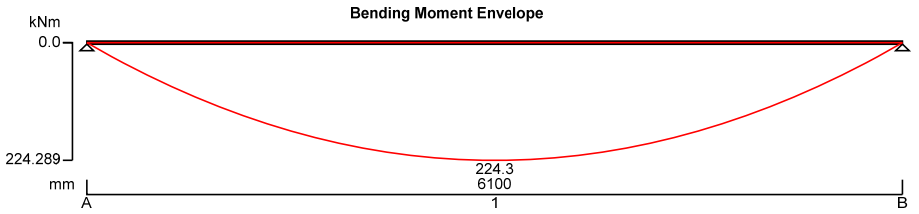
Live load (domestic + partitions) LL = 2.5 kN/m^2 * 8.2m/2 = **10.250** kN/m

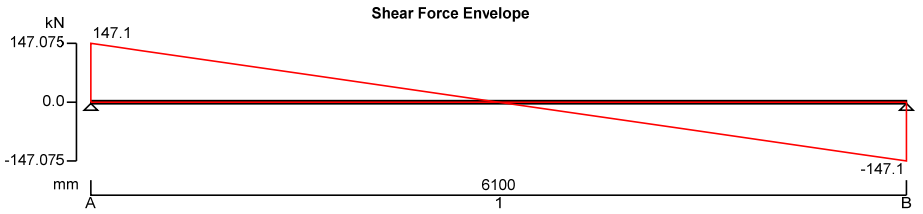
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.05







Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Dead full UDL 21 kN/m
	Imposed full UDL 11 kN/m
	Dead self weight of beam × 1

Load combinations

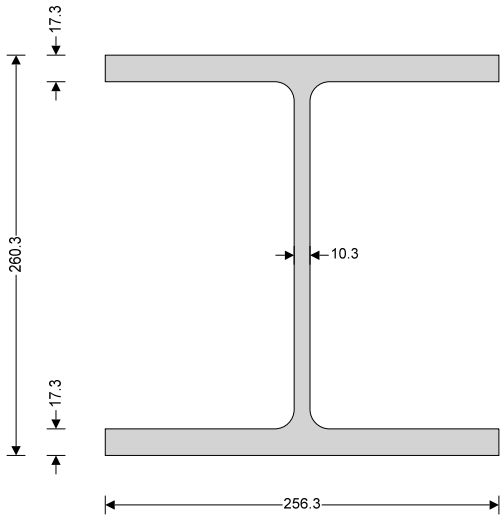
Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
	Span 1	Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **224.3** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **147.1** kN	V_{min} = **-147.1** kN
Deflection	δ_{max} = **20.3** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **147.1** kN	R_{A_min} = **147.1** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **66.7** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **33.6** kN	
Maximum reaction at support B	R_{B_max} = **147.1** kN	R_{B_min} = **147.1** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **66.7** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **33.5** kN	

Section details

Section type **UC 254x254x89 (BS4-1)** Steel grade **S275**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **1.02** Section classification **Plastic**

Shear capacity - Section 4.2.3

Design shear force F_v = **147.1** kN

Design shear resistance P_v = **426.3** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **224.3** kNm

Moment capacity low shear M_c = **324.3** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **254.4** kNm

M_b / m_{LT} = **275** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection δ_{lim} = **24.4** mm

Maximum deflection δ = **20.262** mm

PASS - Maximum deflection does not exceed deflection limit

CROFT STRUCTURAL ENGINEERS

Appendix C: Construction Programme

The Contractor is responsible for the final construction programme

Outline Construction Programme

(For planning purposes only)

	Months															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Planning Approval																
Detailed Design																
Tender																
Party Wall Approval																
Monitoring of Adjacent Structures																
Enabling Works + Demolition																
Basement Construction																
Superstructure construction																

Appendix D: Monitoring Statement

Job Number: 160812

CROFT STRUCTURAL ENGINEERS

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Structural Monitoring Statement

Property:

22 Kings Mews
Camden
WC1N 2JB

Client:

Rosebery Financial

Revision	Date	Comment
-	14 November 2016	First Issue

LABC Regional winner 2013 awards
constructionline
TRADA
ice Institution of Civil Engineers
The Institution of Structural Engineers

CROFT STRUCTURAL ENGINEERS

Contents

CROFT STRUCTURAL ENGINEERS

1. Introduction

Basement works are intended at 22 Kings Mews. The structural works for this require Party Wall Awards. This statement describes the procedures for the Principal Contractor to follow to observe any movement that may occur to the existing properties, and also describes mitigation measures to apply if necessary.

2. Risk Assessment

The purpose of this risk assessment is to consider the impact of the proposed works and how they impact the party wall. There are varying levels of inspection that can be undertaken and not all works, soil conditions and properties require the same level of protection.

Monitoring Level Proposed	Type of Works.
Monitoring 1 Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works.	Loft conversions, cross wall removals, insertion of padstones Survey of LUL and Network Rail tunnels. Mass concrete, reinforced and piled foundations to new build properties

Monitoring 2 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate.	Removal of lateral stability and insertion of new stability fames Removal of main masonry load bearing walls. Underpinning works less than 1.2m deep
Monitoring 3 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment	Lowering of existing basement and cellars more than 2.5m Underpinning works less than 3.0m deep in clays Basements up to 2.5m deep in clays
Monitoring 4 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment Lateral movement between walls by laser measurements	<u>New basements greater than 2.5m and shallower than 4m Deep in gravels</u> Basements up to 4.5m deep in clays Underpinning works to Grade I listed building
Monitoring 5 Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by theodolite at specific times during the projects.	Underpinning works to Grade I listed buildings Basements to Listed building Basements deeper than 4m in gravels Basements deeper than 4.5m in clays Underpinning, basements to buildings that are expressing defects.
Monitoring 6	

Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by electronic means with live data gathering. Weekly interpretation	Double storey basements supported by piled retaining walls in gravels and soft sands. (N<12)
Monitoring 7 Visual inspection and production of condition survey by Party wall surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing party wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by electronic means with live data gathering with data transfer.	Larger multi-storey basements on particular projects.

3. Scheme Details

This document has been prepared by Croft Structural Engineers Ltd. It covers the proposed construction of a new basement underneath the existing structure at 22 Kings Mews.

Scope of Works

The works comprise:

- Visual Monitoring of the party wall
- Attachment of Tell tales or Demec Studs to accurately record movement of significant cracks.
- Attachment of levelling targets to monitor settlement.
- The monitoring of the above instrumentation is in accordance with Appendix A. The number and precise locations of instrumentation may change during the works; this shall be subject to agreement with the Principal Contractor (PC).
- All instruments are to be adequately protected against any damage from construction plant or private vehicles using clearly visible markings and suitable head protection e.g. manhole rings or similar. Any damaged instruments are to be immediately replaced or repaired at the contractors own cost.
- Reporting of all data in a manner easily understood by all interested parties.
- Co-ordination of these monitoring works with other site operations to ensure that all instruments can be read and can be reviewed against specified trigger values both during and post construction.
- Regular site meetings by the Principal Contractor (PC) and the Monitoring Surveyor (MS) to review the data and their implications.
- Review of data by Croft Structural Engineers

In addition, the PC will have responsibility for the following:

- Review of methods of working/operations to limit movements, and
- Implementation of any emergency remedial measures if deemed necessary by the results of the monitoring.

The Monitoring Surveyor shall allow for settlement and crack monitoring measures to be installed and monitored on various parts of the structure described in Table 1 as directed by the PC and Party Wall Surveyor (PWS) for the Client.

Item	Instrumentation Type
Party Wall Brickwork	
Settlement monitoring	Levelling equipment & targets
Crack monitoring	Visual inspection of cracking, Demec studs where necessary

Table 1: Instrumentation

General

The site excavations and substructure works up to finished ground slab stage have the potential to cause vibration and ground movements in the vicinity of the site due to the following:

a) Removal of any existing redundant foundations / obstructions;
b) Installation of reinforced concrete retaining walls under the existing footings;
c) Excavations within the site

The purpose of the monitoring is a check to confirm building movements are not excessive.

This specification is aimed at providing a strategy for monitoring of potential ground and building movements at the site.

This specification is intended to define a background level of monitoring. The PC may choose to carry out additional monitoring during critical operations. Monitoring that should be carried out is as follows:

a) Visual inspection of the party wall and any pre-existing cracking
b) Settlement of the party wall

All instruments are to be protected from interference and damage as part of these works.

Access to all instrumentation or monitoring points for reading shall be the responsibility of the Monitoring Surveyor (MS). The MS shall be in sole charge for ensuring that all instruments or monitoring points can be read at each visit and for reporting of the data in a form to be agreed with the PWS. He shall inform the PC if access is not available to certain instruments and the PC will, wherever possible, arrange for access. He shall immediately report to the PC any damage. The Monitoring Surveyor and the Principal Contractor will be responsible for ensuring that all the instruments that fall under their respective remits as specified are fully operational at all times and any defective or damaged instruments are immediately identified and replaced.

The PC shall be fully responsible for reviewing the monitoring data with the MS - before passing it on to Croft Structural Engineers - determining its accuracy and assessing whether immediate action is to be taken by him and/or other contractors on site to prevent damage to instrumentation or to ensure safety of the site and personnel. All work shall comply with the relevant legislation, regulations and manufacturer's instructions for installation and monitoring of instrumentation.

Applicable Standards and References

The following British Standards and civil engineering industry references are applicable to the monitoring of ground movements related to activities on construction works sites:

1. BS 5228: Part 1: 1997 - Noise and Vibration Control on Construction and Open Sites -Part 1.Code of practice for basic information and procedures for noise and vibration control, Second Edition, BSI 1999.
2. BS 5228: Part 2: 1997 - Noise and Vibration Control on Construction and Open Sites -Part 2.Guide to noise and vibration control legislation for construction and demolition including road construction and maintenance, Second Edition, BSI 1997.
3. BS 7385-1: 1990 (ISO 4866:1990) - Evaluation and measurement for vibration in buildings - Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings, First Edition, BSI 1990.
4. BS 7385-2: 1993 - Evaluation and measurement for vibration in buildings - Part 2: Guide to damage levels from ground-borne vibration, First Edition, BSI 1999.
5. CIRIA SP 201 - Response of buildings to excavation-induced ground movements, CIRIA 2001.

SPECIFICATION FOR INSTRUMENTATION

General

The Monitoring Contractor is required to monitor, protect and reinstall instruments as described. The readings are to be recorded and reported. The following instruments are defined:

a) Automatic level and targets: A device which allows the measurement of settlement in the vertical axis. To be installed by the MS.

b) Tell-tales and 3 stud sets: A device which allows measurement of movement to be made in two axes perpendicular to each other. To be installed by the MS.

Monitoring of existing cracks

The locations of tell-tales or Demec studs to monitor existing cracks shall be agreed with Croft Structural Engineers.

Instrument Installation Records and Reports

Where instrumentation is to be installed or reinstalled, the Monitoring Surveyor, or the Principal Contractor, as applicable, shall make a complete record of the work. This should include the position and level of each instrument. The records shall include base readings and measurements taken during each monitoring visit. Both tables and graphical outputs of these measurements shall be presented in a format to be agreed with the CM. The report shall include photographs of each type of instrumentation installed and clear scaled sections and plans of each instrument installed. This report shall also include the supplier's technical fact sheet on the type of instrument used and instructions on monitoring.

Two signed copies of the report shall be supplied to the PWS within one week of completion of site measurements for approval.

Installation

All instruments shall be installed to the satisfaction of the PC. No loosening or disturbance of the instrument with use or time shall be acceptable. All instruments are to be clearly marked to avoid damage.

All setting out shall be undertaken by the Monitoring Surveyor or the Principal Contractor as may be applicable. The precise locations will be agreed by the PC prior to installation of the instrument.

The installations are to be managed and supervised by the Instrumentation Engineer or the Measurement Surveyor as may be applicable.

Monitoring

The frequencies of monitoring for each Section of the Works are given in Appendix A.

The following accuracies/ tolerances shall be achieved:

Party Wall settlement	±1.5mm
Crack monitoring	±0.75mm

CROFT STRUCTURAL ENGINEERS

REPORT OF RESULTS AND TRIGGER LEVELS

General

Within 24 hours of taking the readings, the Monitoring Surveyor will submit a single page summary of the recorded movements. All readings shall be immediately reviewed by Croft Structural Engineers prior to reporting to the PWS.

Within one working day of taking the readings, the Monitoring Contractor shall produce a full report (see below).

The following system of control shall be employed by the PC and appropriate contractors for each section of the works. The Trigger value, at which the appropriate action shall be taken, for each section, is given in Table 2, below.

The method of construction by use of sequential underpins limits the deflections in the party wall.

Between the trigger points, which are no greater than 2 m apart (giving a combined horizontal distance of 4m between two points either side of each node), there should be no more than:

Allowable movement to BS5950 for brittle finishes

Vertical = Span / 360 = 4000mm / 360 = 11.1mm

Croft proposes a tighter recommendation of 3mm

Above Monitoring Level 3, lateral movement is required to be measured. Based on studs placed 1m above ground level (which will be 4500mm above the formation level), the figures should be

Horizontal = Height / 500 = 4500mm / 500 = 9mm

Croft proposes a tighter recommendation of 3mm

During works measurements are taken, these are compared with the limits set out below:

MOVEMENT		CATEGORY	ACTION
Vertical	Horizontal		
0-3mm	0-3mm	Green	No action required
3-5mm	3-5mm	AMBER	Detailed review of Monitoring: Check studs are OK and have not moved. Ensure site staff have not moved studs. If studs have moved reposition. Relevel to ensure results are correct and tolerance is not a concern. Inform Party Wall surveyors of amber readings. Double the monitoring for 2 further readings. If stable revert back. Carry out a local structural review and inspection. Preparation for the implementation of remedial measures should be required. Double number of lateral props
5-8mm	5-8mm		Implement remedial measures review method of working and ground conditions
>8mm	>8mm	RED	Implement structural support as required; Cease works with the exception of necessary works for the safety and stability of the structure and personnel; Review monitoring data and implement revised method of works

Table 2 – Movement limits between adjacent sets of Tell-tales or stud sets

Any movements which exceed the individual amber trigger levels for a monitoring measure given in Table 2 shall be immediately reported to the PWS, and a review of all of the current monitoring data for all monitoring measures must be implemented to determine the possible causes of the trigger level being exceeded. Monitoring of the affected location must be increased and the actions described above implemented. Assessment of exceeded trigger levels must not be carried out in isolation from an assessment of the entire monitoring regime as the monitoring measures are

inter-related. Where required, measures may be implemented or prepared as determined by the specific situation and combination of observed monitoring measurement data.

Standard Reporting

1 No. electronic copy of the report in PDF format shall be submitted to the PWS.

The Monitoring Surveyor shall report whether the movements are within (or otherwise) the Trigger Levels indicated in Table 2. A summary of the extent of completion of any of the elements of works and any other significant events shall be given. These works shall be shown in the form of annotated plans (and sections) for each survey visit both local to the instrumentation and over a wider area. The associated changes to readings at each survey or monitoring point shall be then regulated to the construction activity so that the cause of any change, if it occurs, can be determined.

The Monitoring Surveyor shall also give details of any events on site which in his opinion could affect the validity of the results of any of the surveys.

The report shall contain as a minimum, for each survey visit the following information:

a) The date and time of each reading:
b) The weather on the day:
c) The name of the person recording the data on site and the person analysing the readings together with their company affiliations;
d) Any damage to the instrumentation or difficulties in reading;
e) Tables comparing the latest reading with the last reading and the base reading and the changes between these recorded data;
f) Graphs showing variations in crack width with time for the crack measuring gauges; and
g) Construction activity as described. It is very important that each set of readings is associated with the extent of excavation and construction at that time. Readings shall be accompanied by information describing the extent of works at the time of readings. This shall be agreed with the PC.

Spread-sheet columns of numbers should be clearly labelled together with units. Numbers should not be reported to a greater accuracy than is appropriate. Graph axis should be linear and clearly labelled together with units. The axis scales are to be agreed with the PC before the start of monitoring and are to remain constant for the duration of the job unless agreed otherwise. The specified trigger values are also to be plotted on all graphs.

The reports are to include progress photographs of the works both general to the area of each instrument and globally to the main Works. In particular, these are to supplement annotated plans/sections described above. Wherever possible the global photographs are to be taken from approximately the same spot on each occasion.

Erroneous Data

All data shall be checked for errors by the Monitoring Surveyor prior to submission. If a reading that appears to be erroneous (i.e. it shows a trend which is not supported by the surrounding instrumentation), he shall notify the PC immediately, resurvey the point in question and the

neighbouring points and if the error is repeated, he shall attempt to identify the cause of the error. Both sets of readings shall be processed and submitted, together with the reasons for the errors and details of remedial works. If the error persists at subsequent survey visits, the Monitoring Surveyor shall agree with the PC how the data should be corrected. Correction could be achieved by correcting the readings subsequent to the error first being identified to a new base reading.

The Monitoring Surveyor shall rectify any faults found in or damage caused to the instrumentation system for the duration of the specified monitoring period, irrespective of cause, at his own cost.

Trigger Values

Trigger values for maximum movements as listed in Table 2. If the movement exceeds these values then action may be required to limit further movement. The PC should be immediately advised of the movements in order to implement the necessary works.

It is important that all neighbouring points (not necessarily a single survey point) should be used in assessing the impact of any movements which exceed the trigger values, and that rechecks are carried out to ensure the data is not erroneous. A detailed record of all activities in the area of the survey point will also be required as specified elsewhere.

Responsibility for Instrumentation

The Monitoring Surveyor shall be responsible for: managing the installation of the instruments or measuring points, reporting of the results in a format which is user friendly to all parties; and immediately reporting to all parties any damage. The Monitoring Surveyor shall be responsible for informing the PC of any movements which exceed the specified trigger values listed in Table 2 so that the PC can implement appropriate procedures. He shall immediately inform the PWS of any decisions taken.

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APPENDIX A
MONITORING FREQUENCY

INSTRUMENT	FREQUENCY OF READING
Settlement monitoring and Monitoring existing cracks	**Pre-construction** Monitored once. **During construction** Monitored after every pin is cast for first 4 no. pins to gauge effect of underpinning. If all is well, monitor after every other pin. **Post construction works** Monitored once.

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APPENDIX B

An Analysis on allowable settlements of structures (Skempton and MacDonald (1956))

The most comprehensive studies linking self-weight settlements of buildings to structural damage were carried out in the 1950's by Skempton and MacDonald (1956) and Polshin and Tokar. These studies show that damage is most often caused by differential settlements rather than absolute settlements. More recently, similar empirical studies by Boscardin and Cording (1989) and Boone (1996) have linked structural damage to ground movements induced by excavations and tunnelling activities.

In 1955 Skempton and MacDonald identified the parameter $\delta\rho/L$ as the fundamental element on which to judge maximum admissible settlements for structures. This criterion was later confirmed in the works of GRANT *et al.* [1975] and WALSH [1981]. Another important approach to the problem was that of BURLAND and WROTH [1974], based on the criterion of maximum tensile strains.

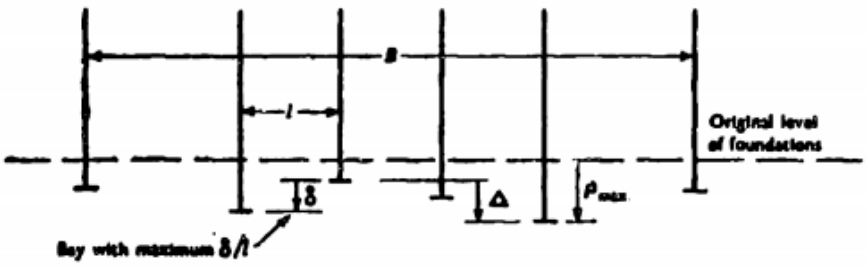

Figure 2.1 – Diagram illustrating the definitions of maximum angular distortion, δ/l, maximum settlement, ρ_{max}, and greatest differential settlement, Δ, for a building with no tilt (Skempton and MacDonald, 1956).

Figure 1: Diagram illustrating the definitions of maximum angular distortion, δ/l, maximum settlement, p_{max}, and greatest differential settlement ,Δ , for a building with no tilt (Skempton and MacDonald, 1956)

The differential settlement is defined as the greatest vertical distance between two points on the foundation of a structure that has settled, while the angular distortion, is the difference in elevation between two points, divided by the distance between those points.

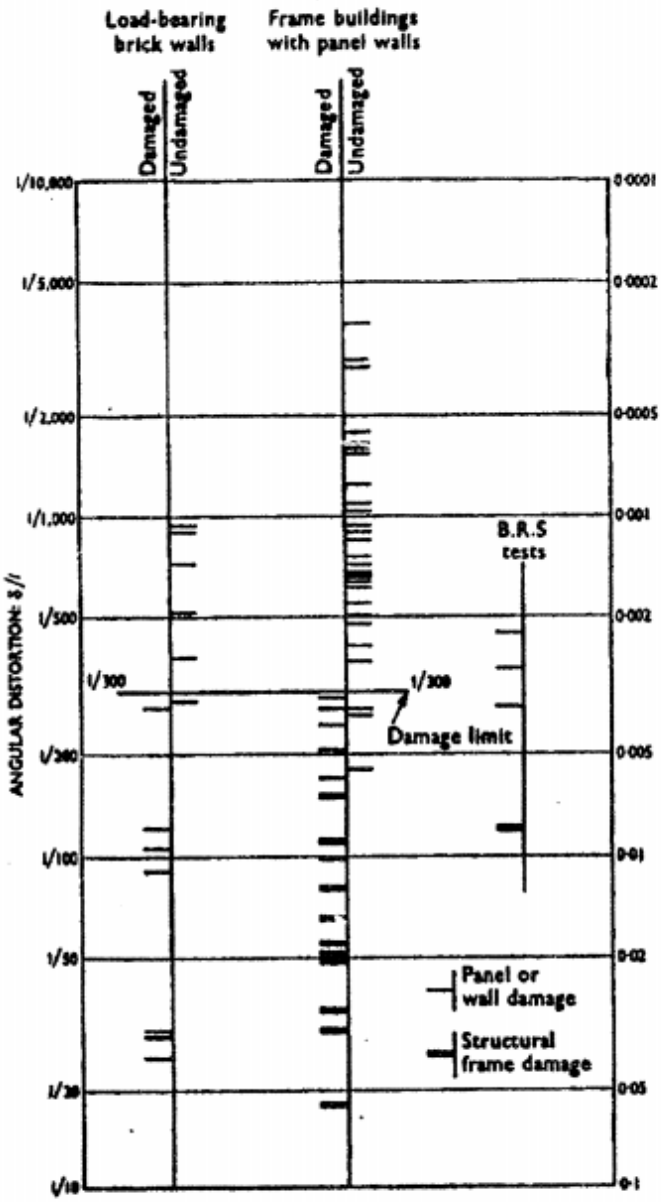

Figure 2: Skempton and MacDonald's analysis of field evidence of damage on traditional frame buildings and loadbearing brick walls

Data from Skempton and MacDonald's work suggest that the limiting value of angular distortion is 1/300. Angular distortion, greater than 1/300 produced visible cracking in the majority of buildings studied, regardless of whether it was a load bearing or a frame structure. As shown in the figure 2.

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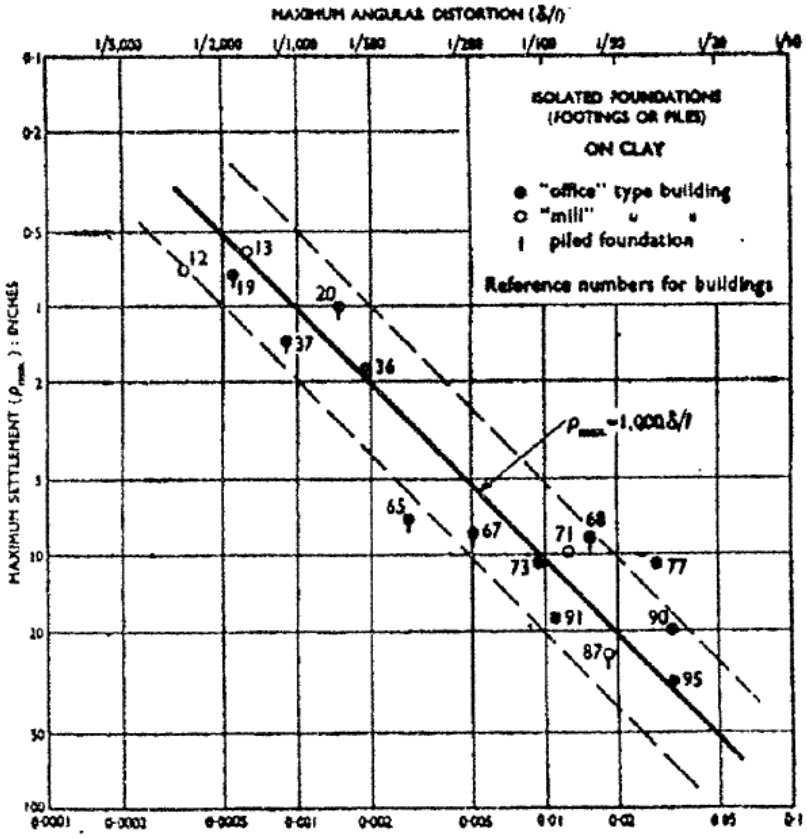
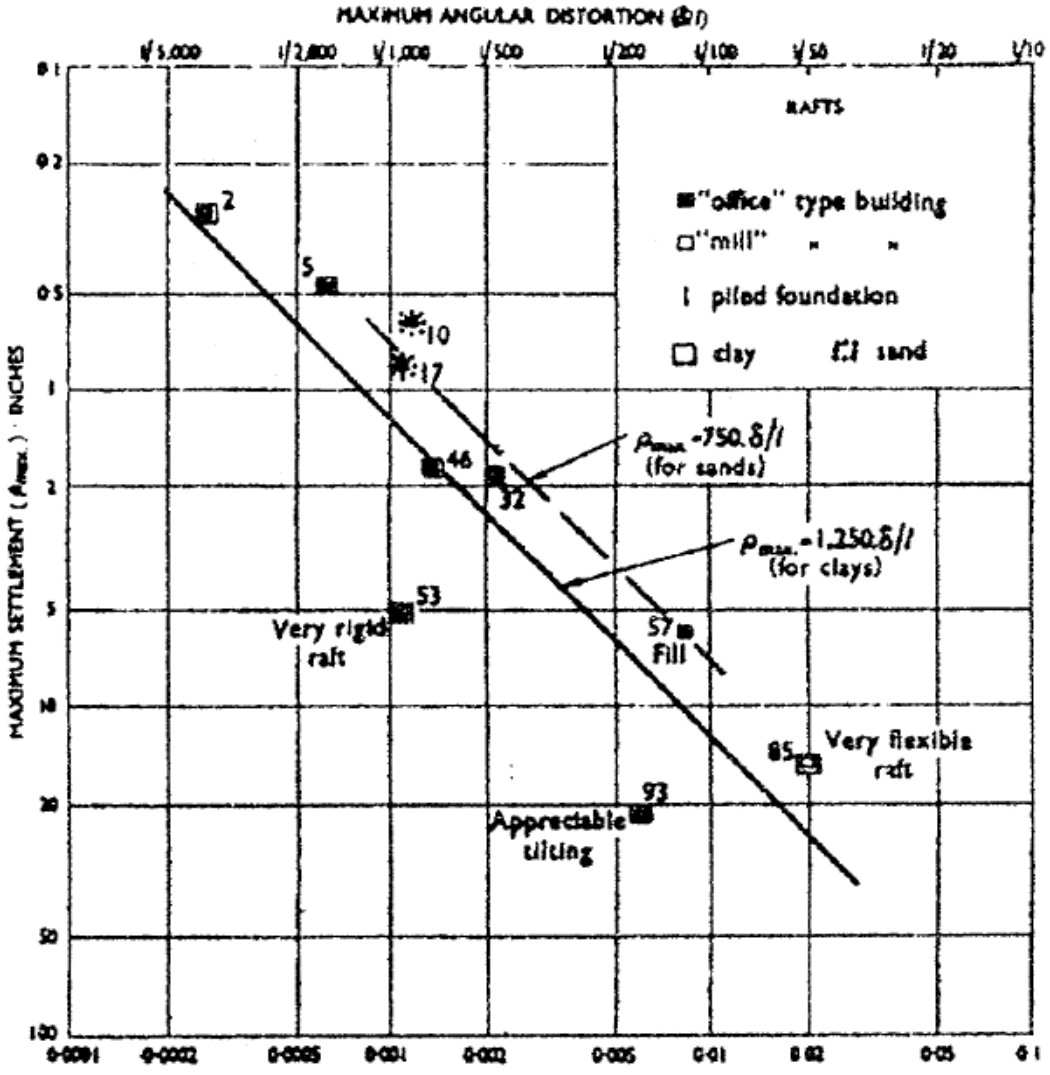
Other key findings by Skempton and MacDonald include limiting values of δ/l for structure, and a relationship between maximum settlement, ρ_{max} and δ/l for structures founded on sands and clays. The charts below show these relations for raft foundations and isolated footings.





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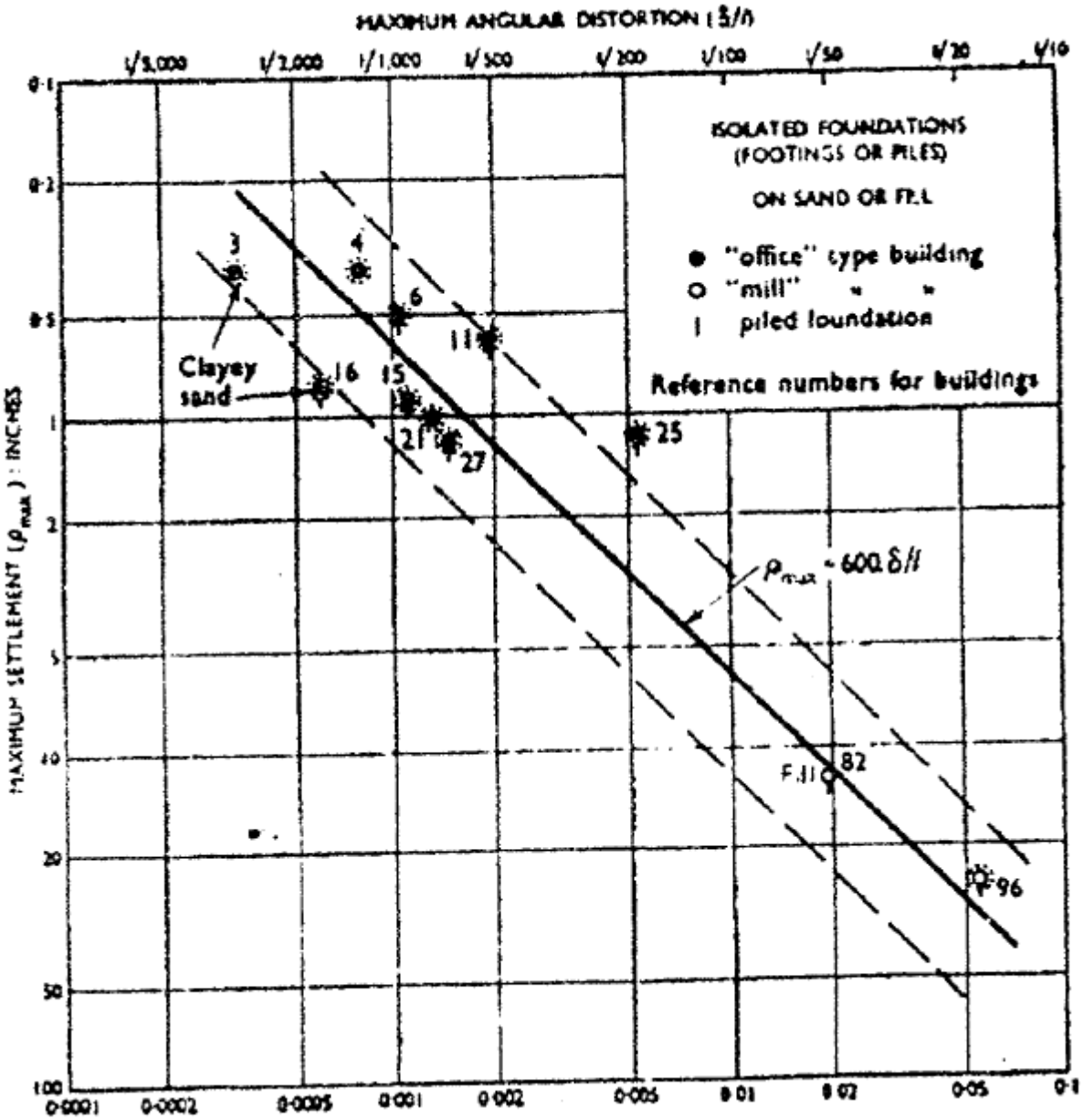

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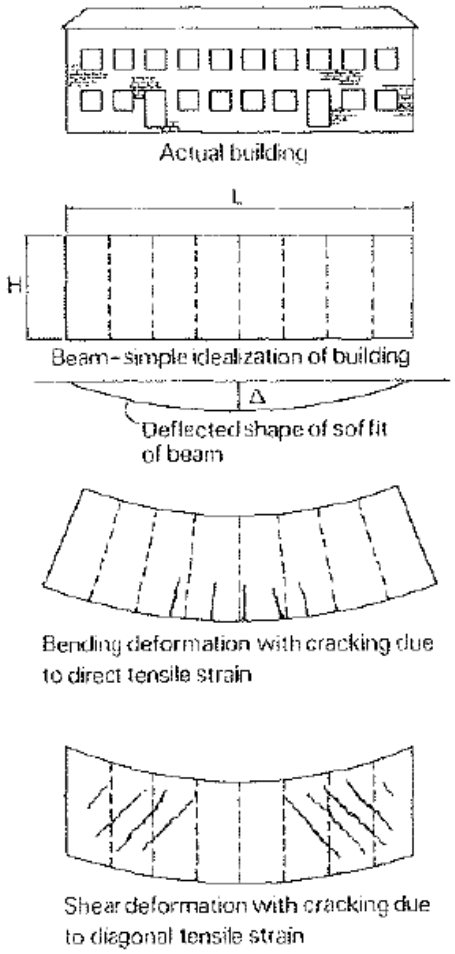

TABLE I

Angular distorsion	Characteristic situation
1/300	Cracking of the panels in frame buildings of the traditional type, or of the walls in load-bearing wall buildings;
1/150	Structural damage to the stanchions and beams;
1/500	Design limit to avoid cracking;
1/1000	Design limit to avoid any settlement damage.

Appendix E: Construction Sequence and Plans

Job Number: 160812

CROFT STRUCTURAL ENGINEERS

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Basement Method Statement

Property:

22 Kings Mews
Camden
WC1N 2JB

Client:

Rosebery Financial

Revision	Date	Comment
-	14 November 2016	First Issue

CROFT STRUCTURAL ENGINEERS

Contents

CROFT STRUCTURAL ENGINEERS

1. Preamble

1.1. This method statement provides an approach that will allow the basement design to be correctly considered during design, temporary design and construction. This statement is for planning purposes only. Once planning and Building Control has been completed, the responsibility for the temporary works will transfer to the Contractor during works on site.

1.2. This sequence has been written by a Chartered Engineer. The sequencing has been developed using guidance from ASUC (Association of Specialist Underpinning Contractors).

1.3. This method has been produced to demonstrate the feasibility of the works at planning and for inclusion in the Basement Impact Assessment at Planning for Camden.

2. Enabling Works

2.1. The site is to be hoarded to prevent unauthorised public access.

2.2. Licences for skips and conveyors should be posted on the hoarding.

2.3. Before works commence, install a standpipe within the ground to record ground water levels. It is possible that water may be encountered above the basement foundation level. The contractor should make provisions (eg injection grouting) for preventing removal of fines if excavation is required below the recorded ground water level. If the ground water is not significantly higher than the formation level of the basement, water can be pumped away from the site. The contractor should seek the advice of a specialist de-watering contractor who should advise on the most appropriate method.

2.4. On commencement of construction, for all sides of the property, the contractor will re-confirm the wall foundation type, width and depth. Any discrepancies will be reported to the structural engineer in order that the detailed design may be modified as necessary.

3. Basement Sequencing

Temporary props will be provided along the head of the pin in the temporary condition. Before the base is cast cross, props are needed. The base/ground slab provides propping in the final condition. In the temporary condition, the edge of the slab is buttressed against the soil in the middle of the property. Also, the skin friction between the concrete base and the soil provides further resistance. The central soil mass is to be removed in portions (in thirds, but no greater than 8m) and cross propping subsequently added as the central soil mass is removed

The general sequence is shown on illustratively on drawing TW-10.

4. Basement Temporary Works: Design Lateral Propping

This calculation has been provided for the trench sheet and prop design of underpins in the temporary condition. There are gaps left between the sheeting and as such no water pressure will

occur. Unless the groundwater is significantly higher than the formation level of the basement, any water present will flow through the gaps between the sheeting and will be required to be pumped out.

Following removal of the central soil mound. Cross props will be required at regular centres. An example of this arrangement is shown below.

Props should be placed a third up the wall measured from the bottom slab. Calculations for permanent structure show the SLS propping force not to exceed 100kN. For 6m long cross props spaced 2m apart (ie 200kN per prop), Maybe Mass 50 props will suffice.

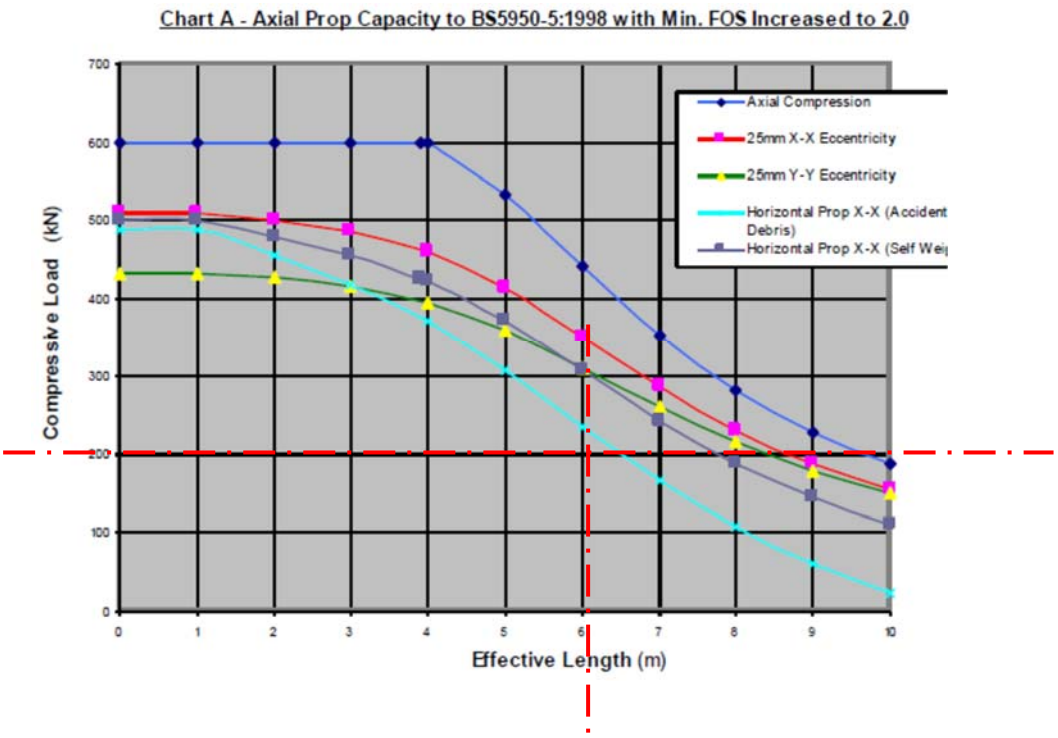


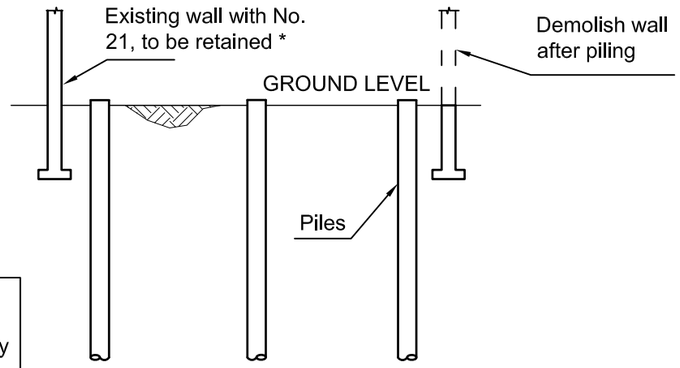
Figure 1 Mabey Mass 50 Load Chart

Provide Mabey Mass 50 at 2m centres at 1/3 the height of the wall.

PHASE 1

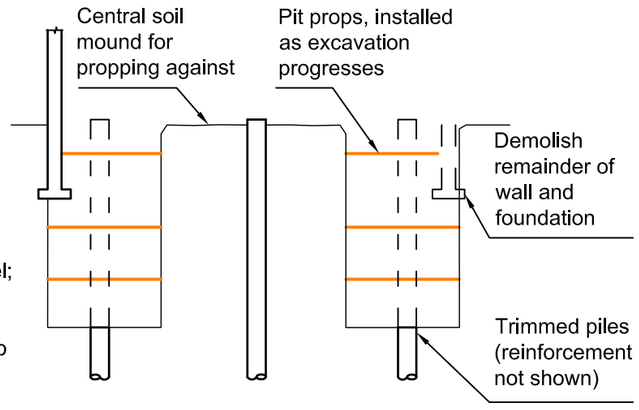
1. Carefully demolish internal walls and floors.
2. Install piles to piling contractor's method statement (to be produced at detailed design/ construction stage)

* Subject to agreement with owner of No. 21, an alternative procedure of rebuilding the party wall may be used. If agreed, follow the same procedure as with the opposite side



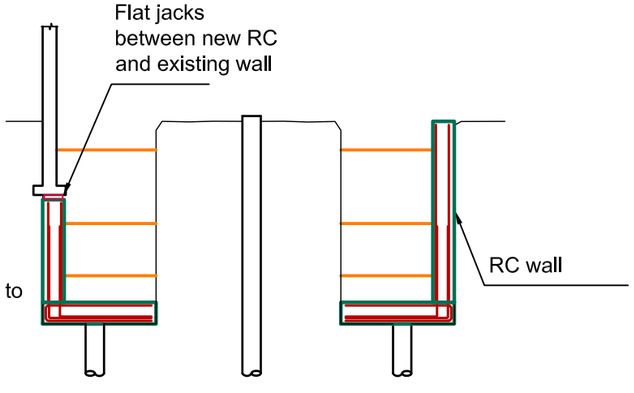
PHASE 2

1. Excavate initial pits for retaining wall construction, excavating around piles where present.
2. As each excavation progresses, prop against central soil mound
3. Trim piles to formation level; bend protruding reinforcement to horizontal for subsequent tying to slab reinforcement



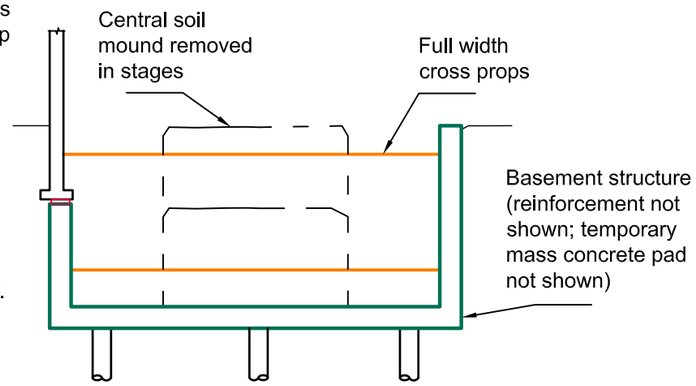
PHASE 2a

1. Cast base and stems for RC retaining walls; install flat jacks between top of underpins and existing brickwork wall; Drypack adjacent to flat jacks.
2. As each excavation progresses, prop against central soil mound
3. Subject to movement monitoring, adjust flat jacks and add additional Drypack to suit
4. Repeat the above steps in phases 2 and 2a, following the numbering sequence shown in plan (drawing SL-10)



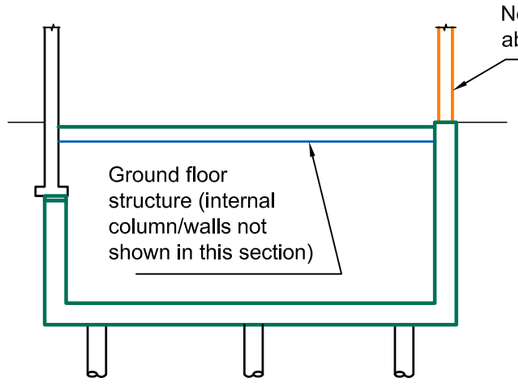
PHASE 3

1. Once all the perimeter walls have been cast, remove top part of central soil mound and install full width cross props.
2. Repeat for lower part of central soil mound.
3. Trim central piles to formation level and bend reinforcement to horizontal.
4. Install below slab drainage then conctruct RC slab.



PHASE 4

1. Proceed with ground floor construction and structure above.
2. Remove flat jacks and infill void with Drypcak
3. After ground floor concrete has gained sufficient strength remove props.



- PLANNING ISSUE -
NOT FOR CONSTRUCTION

Rev	Date	Amendments
1	17.03.2017	Phases altered and details added; alternative construction note added for wall with No. 21
-	11.11.2016	First issue for comment

Job No 160812	Client: Rosebery Financial
Dwg No TW-10	Project: 22 Kings Mews
Date November 2015	Title : Proposed Basement Construction Sequence
Drawn GW / Chk'd NM	
Scale As shown @ A3 / Rev 1	

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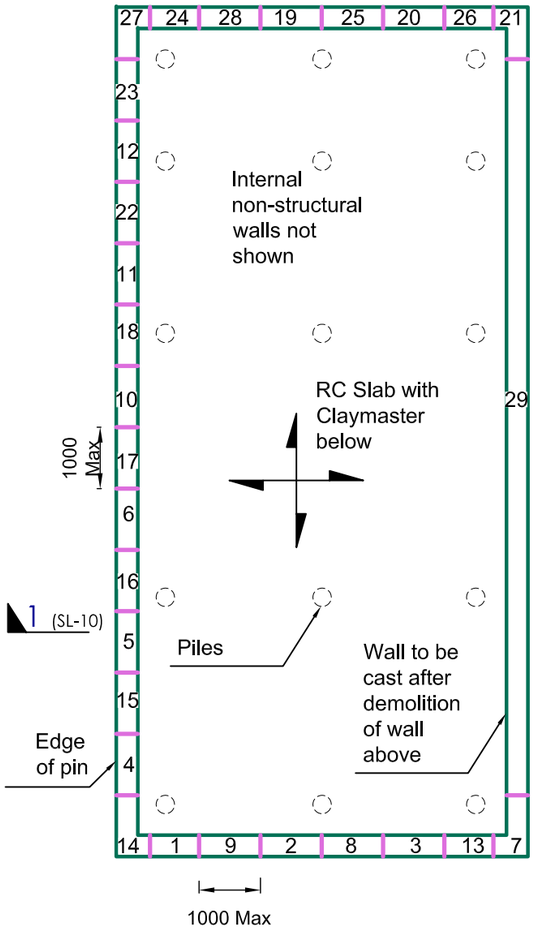
CROFT STRUCTURAL ENGINEERS

Appendix F: Structural Drawings

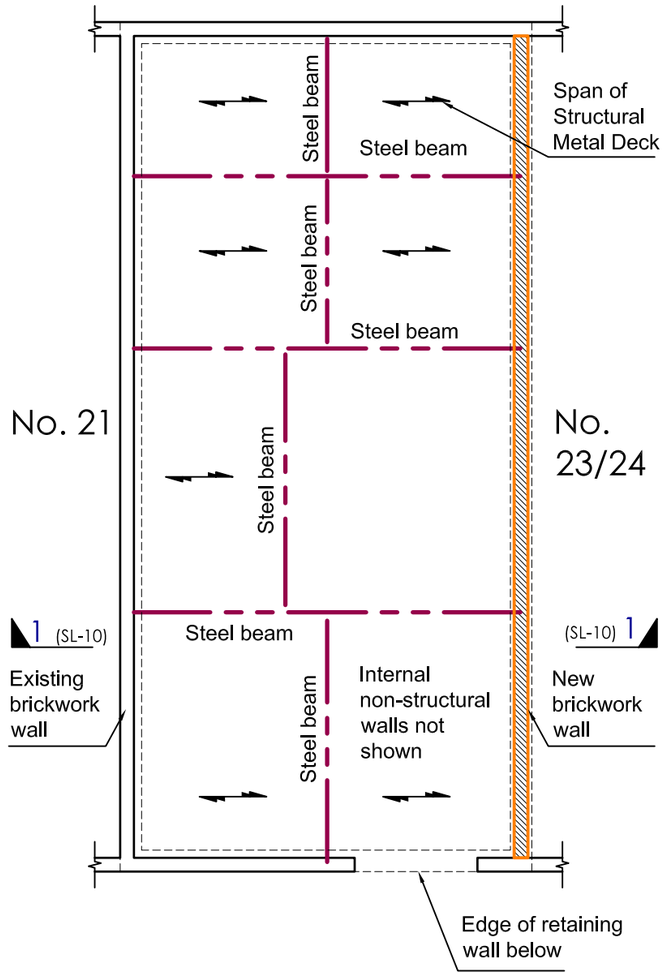
No. 51 Grays Inn Road

Numbers below denote proposed wall construction sequence



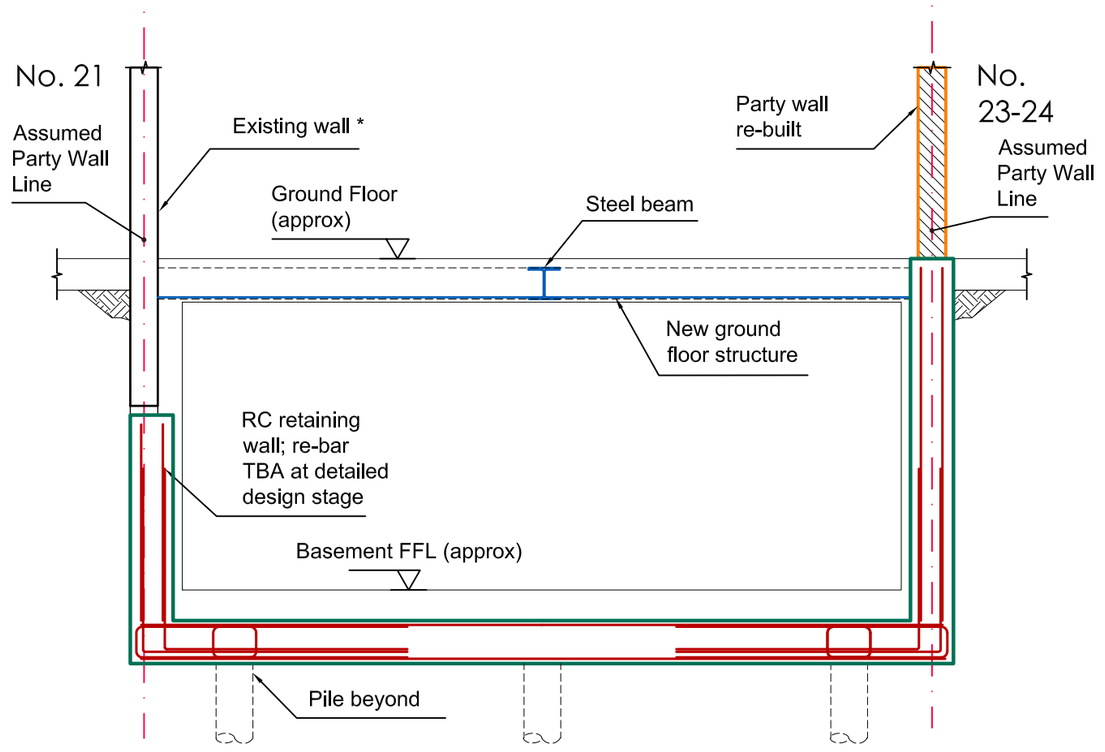
Basement Floor Plan

(Scale 1:100)



Ground Floor Plan

(Scale 1:100)



* Alternatively, subject to agreement with owner of No. 21, re-build party wall (same details as opposite face)

Section 1-1

(1:50)

Rev	Date	Amendments
2	17.03.2017	Alternative construction note added for party wall with No. 21
1	07.12.2016	Minor alteration to Ground Floor
-	11.11.2016	First issue for comment

- PLANNING ISSUE - NOT FOR CONSTRUCTION

Job No 160812	Client: Rosebery Financial
Dwg No SL-10	Project: 22 Kings Mews
Date November 2015	Title : Floor Plans and Sections
Drawn GW / Chk'd NM	
Scale As shown @ A3 / Rev 2	

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