Job Number: 220901
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CROFT STRUCTURAL ENGINEERS

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Basement Impact Assessment

Site Address
4 Murray Mews
NW1 9RJ

Client Address
Paul Stuart Ltd.

Rev	Date	Author	Checker	Comment
-	17.10.22	VLD	PDH	First Isuue

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Contents

Basement Impact Assessment for Site 4 Murray Mews

1. Non Technical Summary

1.1. Existing Property, Site & Neighbouring Sites

The existing site is an open land. Surrounding the site there has been residential housing. Railway lines to the west of the site at a reduced level. The lines go underground just to the north and south of the site.

1.2. Proposed Development

It is proposed to develop the site to form residential flats with communal gardens around the building and parking area to the northern corner. The proposed development consists of four storeys which included a lower ground floor (Basement) below the existing ground level.

Aerial view with approx. site area indicated

1.3. Geology and Land Stability

The assessment of impacts relating to Geology and Land Stability are summarised in the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref BIA MGC-GMA-22-40, dated October 2022]. The key features and concerns are reproduced below:

• A ground investigation confirms that the formation level of the basement will be on clay.
• The anticipated Damage Category (as defined on the Burland Scale) will not be greater than Category 1 (Very Slight). • Monitoring of existing structures should be carried out during construction

1.4. Hydro-geology

The assessment of impacts relating to Hydro-geology are summarised in the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref BIA MGC-GMA-22-40, dated October 2022].

The report concluded that groundwater is not a concern given that no water table is present on site. Any local seepages encountered during construction can be controlled and discharged.

1.5. Drainage, Surface Water & Flooding

The BIA has identified

- The construction of the basement will not have any significant impacts on the Surface water.
- The area is in a CDA but not in a local flood risk zone. Flooding is not a concern because the risk of flooding is low. Mitigation factors will be put into place to deal with residual risks of flooding.
- The risk of flooding from excess surface water is not considered significant. There is a risk of flooding due to the failure of the pumping system but this can be reduced to acceptable levels with appropriate design and installation measures.

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2. Introduction

2.1. Report Authors and Qualifications

2.1.1. Land Stability / Slope Stability

Croft has appointed the following suitably qualified professional to assess the impacts related to Land Stability:

Mr. Julian Maund BSc PhD FGS CGeol MIMMM CEng
Maund Geo-Consulting Ltd

This assessment has been reviewed by:

Phil Henry
MEng CEng MICE
Croft Structural Engineers

2.1.2. Hydrogeology and Groundwater Flooding

Croft has appointed the following suitably qualified professional to assess the impacts related to Hydrogeology and Groundwater Flooding:

Mr. Julian Maund BSc PhD FGS CGeol MIMMM CEng
Maund Geo-Consulting Ltd

2.1.3. Hydrology, Surface Water Flooding and Sewer Flooding

The following individuals have reviewed the impacts related to Surface Water and Flooding:

Phil Henry
MEng CEng MICE
Croft Structural Engineers

Chris Tomlin
MEng CEng MIStructE
Croft Structural Engineers

2.2. Sources of Information

The following baseline data have been referenced to complete the BIA in relation to the proposed development:

- Site walkover survey 14th September 2022.
- LB Camden, Strategic Flood Risk Assessment (produced by URS, 2014);
- LB Camden, Floods in Camden, Report of the Floods Scrutiny Panel (2013);
- LB Camden, Planning Guidance (CPG) – Basements (January 2021);
- LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010);
- LB Camden, Local Plan Policy A5 Basements (2017);
- LB Camden's Audit Process Terms of Reference;

Other sources of data are referred to within the relevant sections of this report.

2.3. Existing Site & Location

The is located in north east side of the Camden and is in densely built up area with a railway line at a lower level.

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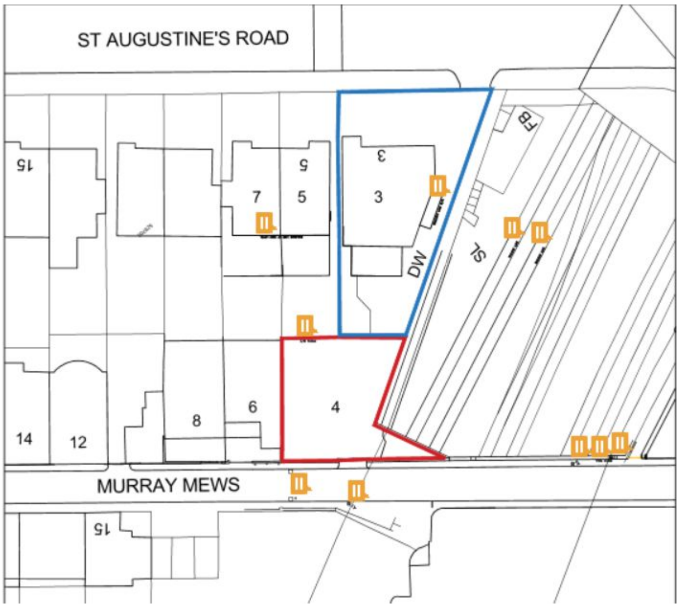

Plan view of site (approx. area outlined in red) and the surrounding properties

For further information refer to the Desk Study Section.

2.4. Proposed Works

The proposed development involves the construction of a four storey property comprising of residential flats. The floors include lower ground floor (Basement) below existing ground level, ground floor, first floor and second floor. This assessment is concerned with alterations below ground level only.

A site location plan is shown above indicating the site boundary. In addition to the basement area, this also includes areas that are likely to be temporarily occupied for construction purposes.

Architectural drawings that show the extent of the proposed alterations have been produced by Tasou associates and are available separately.

Engineering outline design proposals and a temporary works construction sequence are appended.

3. Desk Study & Walk over Survey

For Camden BIAs, site investigations are expected to follow Screening and Scoping stages. In this assessment initial inspections and studies were carried out to give a more informed view for the screening and scoping. These are presented in this section. More detailed investigations are referred to after the scoping stage.

3.1. General Desk Study

4 Murray Mews is an open land surrounded by residential buildings and railway at lower level on one side. The site is sloping from Northeast to South west.

3.1.1. Site History

The Historical Map for review is located in the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref BIA MGC-GMA-22-40, dated October 2022].

3.1.2. Listed buildings

The existing site is not listed. Data from Historic England shows that No. 22 Murray Mews is Grade II listed building.

Extract from Listed Building maps

The site in Camden Square conservation area.

Extract from Camden Conservation map

3.1.3. London Under Ground and Network Rail Infrastructures

The site is adjacent to network rail lines. The Network rail was already contacted regarding the new construction. Network rail approved the new construction next to the railway lines. The correspondence letter Dtd.16th May 2011 is appended.

3.1.4. Highways

The site is within 5m of the public highway and foot path.

3.1.5. UK Power Network

There are no significant items of electrical infrastructure (such as pylons, substations or tunnels) in the immediate vicinity.

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3.1.6. Utility Search

A utility search has been completed and is attached in the Appendices.

3.2. Walk Over Survey

A structural engineer from Croft Structural Engineers visited the site on 14th September 2022.

3.2.1. Site and Existing Property

The existing site is an open land. Surrounding the site there has been residential housing. Railway lines to the west of the site at a reduced level. The lines go underground just to the north and south of the site. The site was previously occupied by garages. The site is sloping from Northeast to Southwest by about 7 degrees.
At present there are no surface water features near the site. There is a retaining wall next to the railway line at the side boundary of the site.

3.2.2. Proximity of Trees

There is a mature maple tree to the rear of the site in the neighbouring garden. The tree is around 15 meters away from the site. This tree will not affect the new basement construction and the tree will not be affected from the new basement construction.

There is a tree called tree of heaven in the site and the height is 3m. This tree will be removed to form the new development.

3.2.3. Adjacent Properties

3.2.3.1. Nos 6 Murray Mews – Property to Left

This property is built approximately around 1900s. There were recent alterations to the front and the rear of the property. The property is used for residential purposes only. This is a three-storey building with no basement. No defects noted from outside.

6 Murray Mews side view

3.2.3.2. Railway Lines to the right of the property

There are railway lines to the right side of the property at a lower level. There is a masonry retaining wall between the site and the railway lines.

Railway lies

3.2.3.3. No.3 St Augustine's Road

No 3 St Augustine Road is a recently built property (approximately in 2012). It is a five-storey building used for residential purposes. No defects noted from outside. No basement present for the property.

No. 3 St Augustine's Road rear view

3.3. Surface Water and Drainage Walk Over Survey

3.3.1. Hardstanding

At present the site is an empty land with general vegetation.

3.3.2. Site Drainage

Currently the site is an empty land.

3.3.3. Surface Water

No areas of surface water in the form of ponds lakes, streams or rivers were noted on the site.

3.3.4. Summary Surface Water and Drainage Walk Over

A walk over survey has confirmed that there are no surface water features, either within or close to the site. Rainwater from the surfaces is likely to flow in the direction of the slope of the surrounding area.

3.4. Geology and Hydro geology : Ground Investigation

See Herts and Essex Site investigations Report (Ref: CSG 7769). The ground investigation report, which has data from initial site investigations and data from subsequent monitoring, is available as a separate report.
This contains data required for assessing the impacts related to Land Stability and Hydrogeology.

4. Screening Stage

This stage identifies any areas for concern that should be investigated further.

4.1. Geology and Land Stability

See Report Completed by Maund Geo-consulting [ref BIA MGC-GMA-22-40, dated October 2022].

4.2. Hydro-geology

See Report Completed by Maund Geo-consulting [ref BIA MGC-GMA-22-40, dated October 2022].

4.3. Surface Flow and Flooding

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)

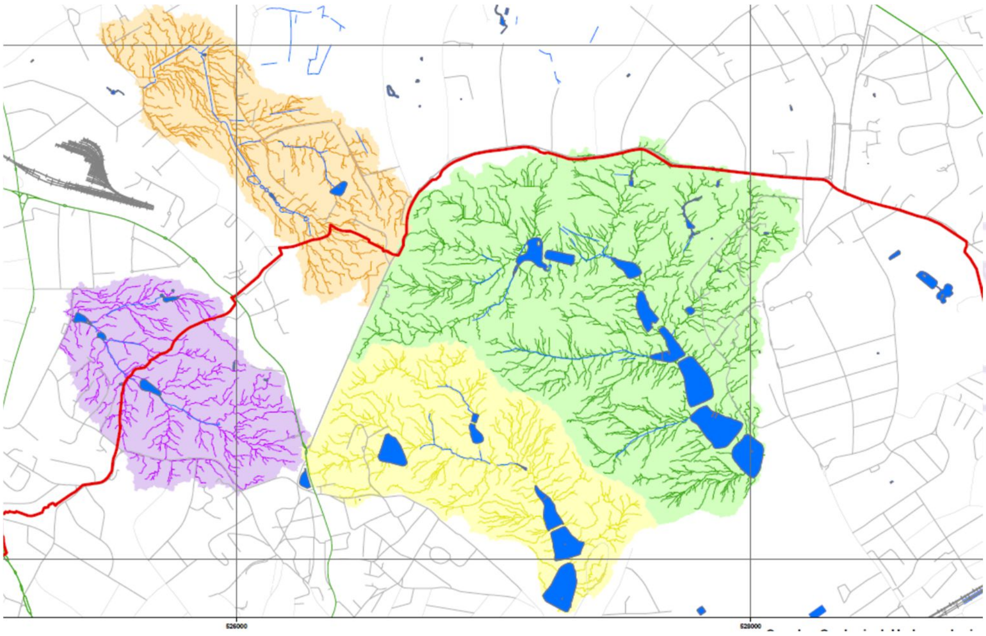


Figure 1: Extract from Figure 14 of the GSD (site lies to the south of the shaded areas)

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?

Unknown – Due to the construction of the new building, the flow of water into the ground and the existing surface water drainage system may change. Carry forward to scoping

Question 3. Will the proposed basement development result in a change to the hard surfaced /paved external areas?

Unknown – Due to the construction of new building, the impermeable areas may change. Carry forward to scoping

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 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 building roofs and paving, 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?

The potential sources of flooding are summarised below:

Potential Source	Potential Flood Risk at site?	Justification
Fluvial flooding	No	EA Flood Mapping shows Flood Zone 1. Distance from nearest surface watercourse >1km
Tidal flooding	No	Site location is 'inland' and topography > 35mAOD.
Flooding from rising / high groundwater	No	The site is located on low permeability London Clay.
Surface water (pluvial) flooding	No	4 Murray Mews is not noted on the flooded street list and maps from 1975 or 2002
Flooding from infrastructure failure	Yes	Drainage at or near the site could potentially become blocked or cracked and overflow or leak. Drainage of the basement terrace areas may rely on pumping.
Flooding from reservoirs, canals and other artificial sources	No	There are no reservoirs, canals or other artificial sources in the vicinity of the site that could give rise to a flood risk.

The answers to Questions 1-5 above indicate that the issues related to surface water flow and flooding are not significant. These questions therefore do not have to be carried forward to Scoping Stage.

Summary

In answering Question 6, a flood risk assessment is not considered necessary: the property is not on a street that has flooded in 1975 or 2002 and there are no risks to flooding that are greater than those inherent with all subterranean structures. However, the risks associated with infrastructure failure should be investigated further. The assessment, with regards to Surface Water Flow, should be carried forward to Scoping Stage.

5. Scope Stage

5.1. Geology and Land Stability

See Report Completed by Maund Geo-consulting [ref BIA MGC-GMA-22-40, dated October 2022].

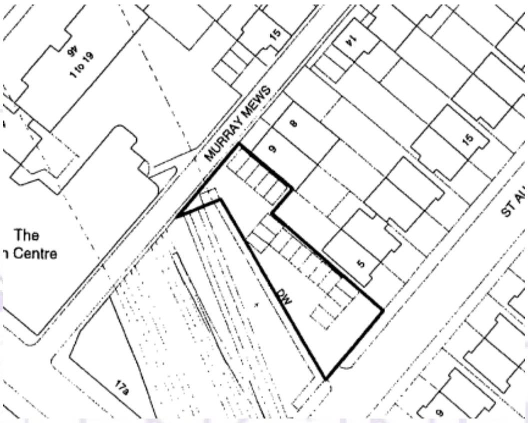
5.2. Hydro-geology

See Report Completed by Maund Geo-consulting [ref BIA MGC-GMA-22-40, dated October 2022].

5.3. Surface Flow and Flooding

5.3.1. Conceptual Model

The site was previously occupied by garages. From the photos below, it can be seen that the exisitng surface was fully paved with impermeable surface.



Old area plan showing previously exisitng garages

Extract from old photos of existing garages

The basement will be below an area that was hard-surfaced due to the presence of the garages. The development will therefore not affect the above ground flow.

6. Construction Methodology and Engineer Statements

6.1. Outline Geotechnical Design Parameters

From the Geological report and soil investigation reasonably conservative geotechnical parameters have been determined, based on the the soil investigation: design overall stability to K_a & K_p values.

K_a = 0.49 , K_p = 2.3

6.2. Hydro Static Pressure

Design temporary condition for water table level, If deeper than basement ignore.

Design permanent condition for water table level:

If deeper than existing, design reinforcement for water table at full basement depth to allow for local failure of water mains, drainage and storm water. Global uplift forces can be ignored when the water table is lower than the basement. BS8102 only indicates guidance.

6.2.1. Intended Use & Loadings

	UDL kN/m²	Concentrated Load kN
Domestic Single Dwellings	1.5	2.0

Below ground level, the reinforced concrete retaining walls are designed to carry the lateral loading applied from above.

The lateral earth pressure exerts a horizontal force on the retaining walls. The retaining walls will be checked for resistance to the overturning force this produces.

Lateral forces will be applied from:

- Soil loads
- Hydrostatic pressures
- Surcharge loading from behind the wall

These produce retaining wall thrust. This will be restrained by the opposing retaining wall.

6.2.1.1. Surcharge Loading

The following will be applied as surcharge loads to the front/ front lightwell retaining walls:

- 10kN/m² if within 45° of road
- 100kN point loads if under road or within 1.5m
- 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

Adjacent Properties:

All adjacent property footings within 45° to have additional geotechnical engineers input. A line at 45° from the base of the neighbours' wall footing would be intersected by the basement retaining wall. This should be accounted for in the design.

6.3. Permanent Design Proposals

As there is railway line at lower level next to the proposed development, pile foundations are proposed for the new development. The property wall along the party wall line will be underpinned with mass concrete and a new retaining wall will be constructed adjacent to the MC underpin. The front and the rear also, the soil will be retained with new retaining walls. These retaining walls will be connected to the pile foundations and ground beams.

The design of the retaining walls and ground beam was calculated using software by TEDDS. The software is specifically designed and ensures that the construction is kept to a limit to prevent damage to the adjacent property.

The overall stability of the walls is designed using K_a & K_p values, while the design of the wall structure uses K_0 values. This approach minimises the level of movement from the concrete affecting the adjacent properties.

The investigations highlight that water is not present. The design of the walls considers long term scenarios. It is possible that a water main may break causing a local high water table. To account for this, the wall is designed for water 1m from the top of the wall.

The design also considers floatation as a risk. The design has accounted for the weight of the building and the uplift forces from the water. The weight of the building is greater than the uplift, resulting in a stable structure.

The preliminary calculations are appended. The most critical parameters have been used for this.

6.3.1. Temporary works

Walls are designed to be structurally stable with bottom propping . Temporary propping details will be required to be provided by the contractor and must be completed by a suitability qualified professional.

To demonstrate the feasibility of the works, a proposed basement construction sequence is appended.

6.4. Ground Movement Assessment

See Geologists ground movement Assessment

6.5. Control of Construction Works

6.5.1. Control of Construction Works

A construction sequence has been formulated with Croft's experience of over 500 basements. The procedures described in this statement will mitigate the impacts that the construction of the basement will have on nearby properties.

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.

With the measures listed above, the maximum level of cracking anticipated is 'Hairline' cracking. This can be repaired with normal decorative works. Under the Party Wall Act, minor damage, although unwanted, can be tolerated it is permitted to occur to a neighbouring property as long as repairs are suitability undertaken to rectify this. To mitigate this risk, the Party Wall Act is to be followed and a Party Wall Surveyor will be appointed.

6.5.2. Noise and Nuisance Control

The contractor is to follow the good working practices and guidance laid down in the 'Considerate Constructors Scheme'.

The hours of working will be limited to those allowed; 8am to 5pm Monday to Friday and Saturday Morning 8am to 1pm.

None of the practices cause undue noise that one would typically expect from a construction site (a conveyor belt typically runs at around 70dB).

The site will be hoarded with 8' site hoarding to prevent access.

The hours of working will further be defined within the Party Wall Act.

The site is to be hoarded to minimise the level of direct noise from the site.

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.

6.5.3. Construction Management Plan

For the Construction Phase Management Plane it may be beneficial to compile a Construction Management Plan (CMP). A suitably qualified person, typically the contractor, would provided the CMP. The items that should be considered are

- Delivers routes and times
- Expected working hours
- Times when local roads may become bust: school times, other construction sites.
- Volume of muck away, how this is managed and when.
- Required plant
- Noise dust and Vibration
- Waste Management

This is outside the brief of the Basement Impact Assessment and is not covered within Croft's brief.

6.5.4. Monitoring

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

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
- Frequency of Monitoring
- Specification for Instrumentation
- Monitoring of Existing cracks
- Monitoring of movement
- Reporting

We would recommend that the monitoring frequency should follow:

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.

Trigger values and contingency actions are noted in the table below. Monitoring locations are noted on the drawing which is included in the appendix F.

MOVEMENT	CATEGORY	ACTION

Vertical	Horizontal		
0mm-1.25mm	0-5mm	Green	No action required
1.25mm-3mm	5-6mm	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
3mm-6mm	6-8mm		Implement remedial measures review method of working and ground conditions
>6mm	>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

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7. Basement Impact Assessment

7.1. Geology, Land stability and Hydro Geology

To undertake the Land stability Geology and Hydro Geology, Croft Structural engineers has employed a suitably qualified professional, Mr. Julian Maund BSc PhD FGS CGeol MIMMM CEng from Maund Geo-Consulting Ltd

7.2. Surface Water & Flooding Assessment

The significant risk of flooding is from failure of infrastructure, such as flooding due to unexpected failure of the drainage, water mains, etc. This risk is inherent in the construction of all subterranean structures.

SUDS aims to mimic the route that rainwater would take in a natural environment. In this development, this is achieved by plantation and permeable paving to the side.

There is a risk of flooding due to the failure of the pumping system but this can be reduced to acceptable levels with appropriate design and installation measures. Measures to mitigate this risk are described later.

7.2.1. Flood Hazards

The potential hazards related to flooding are as follows:

Tidal and Fluvial Flooding

Given that the site lies in Flood Risk Zone 1 (defined by the Environment Agency as having low risk of flooding from rivers and seas), the risk of flooding from fluvial and tidal sources is not significant.

Surface Water and Pluvial Flooding

The site is adequately drained, as are the surrounding roads (which are drained by gullies maintained by Thames Water). Though the site is an empty land now, the site was previously occupied by a series of garages and hard paved surface as explained in scoping stage. Rainwater will be able to infiltrate into the ground as before and will not migrate to alternative locations above ground level.

Groundwater Flooding

The presence of the new basement has the potential to affect groundwater flow. The risk of groundwater flooding is concluded as being low, both on-site and off-site

Infrastructure Flooding

There are no reservoirs nearby which could cause flooding in the event of failure. Further more these items are assumed to have a high level of maintenance thus the risk of flooding from these is considered very low.

There are no known cases of flooding from sewers in the local area. There is always a risk that incoming water mains may break, causing significant flood risk to the occupants of the basement. This risk is inherent with all basement structures. Mitigation measures are proposed in the following section.

7.2.2. Flooding Mitigation Measures

To mitigate the risks associated with flooding, Croft would recommend the following mitigation measures:

- A pumping mechanism 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.
- The pumping system should be a dual mechanism to maintain operation in the event of a failure. This should include a battery backup and a suitable alarm system for warning purposes. After the planning application is concluded, the design team should seek consent from Thames Water to pump and discharge water into the sewer.
- Route all electrical wiring at high level
- Ensure that the basement structure is adequately waterproofed during construction.

7.2.3. Surface Water and Flood Risk Assessment Summary

The risk of flooding from excess surface water is not considered significant. There is a risk of flooding due to the failure of the pumping system but this can be reduced to acceptable levels with appropriate design and installation measures.

7.3. Drainage Assessment

The design of drainage and damp-proofing is not within the scope of this assessment and would normally be expected to be part of the structural waterproofers 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 existing 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. They 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

7.3.1. SUDS Assessment & Mitigation Measures

Existing Hard Standing when garages were present = 248 m^2

Proposed Hardstanding with new development = 167 m^2

When the site was occupied by the garages, the whole site was occupied with hard surfaces. But due to the new development, this can be reduced to an area indicated as above.
To minimise the discharge to the existing sewer SuDS (Sustainable Drainage Systems) should be considered at detailed design stage. This aims to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. To achieve this, the generally accepted hierarchy of these methods are presented below:

1. store rainwater for later use
2. attenuate rainwater by storing in tanks or sealed water features for gradual release
3. discharge rainwater to a surface water sewer/drain
4. discharge rainwater to the combined sewer.

The suitability of different SuDS features is unique to each site: some features may not be practical or not be suitable due to space constraints or soil conditions. SuDS proposals, which should be considered further at detailed design stage (after the Planning Application is concluded) should note the following:

1. There is limited space in the gardens for rainwater storage butts
2. There is no scope for infiltration by means of soakaways due to the low permeability of the soil (clay is present below ground level)
3. Given the size of the site the use of open water features would not be practical
4. Given the scale of the proposal, the use of attenuation tanks would be out of proportion to the site development
5. There are no water courses traversing the site and therefore discharging into these is not possible
6. The property is understood to discharge water into a combined sewer. It is therefore not possible to discharge water into a separate surface water drain
7. There may be a minor increase in surface water discharge into the existing (combined) sewer. At detailed design stage the discharge stage should be calculated and this should be approved by the local sewerage undertaker.

It is pertinent to note that with the proposed development, there can be soft landscaping in the side. This will allow infiltration of surface water into the more permeable ground above the clay. At detailed design stage, if the design team consider paving areas, then permeable paving should be incorporated into the design. This will allow for a steady discharge of water into the ground and is illustrated below.

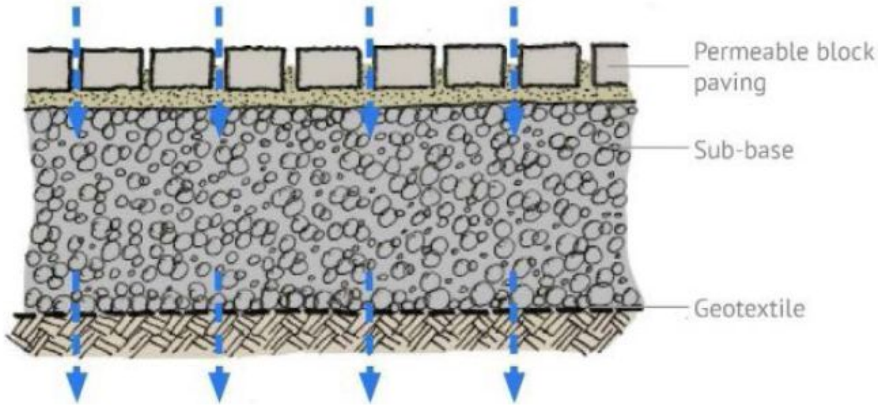

Figure 2: Typical section through permeable paving and sub-base showing infiltration

The lightwell will create an additional hard surfaced area at basement level. This will be drained via Aco channels (or similar) and the water will be pumped and discharged into the existing sewer system.

7.3.2. Drainage & SUDS Summary

There is no significant increase in the discharge of surface water into the existing sewer system. The use of complex SUDS features is therefore not considered applicable to a development of this scale. However, Croft has proposed the use of permeable paving to minimise the amount of surface water discharge into the sewer. This will act as a storage area for surface water allowing the water to recharge the ground water in the area.

Where basements below a garden are present, then a soil band will be provided. This will act as a storage area for surface water allowing the water to recharge the ground water in the area.

7.3.3. Mitigation Measures - Localised Dewatering

Monitor water levels 1 month prior to starting on site and throughout the construction process.

Localised dewatering to pins may be necessary.

Appendix A : Structural Calculations

Building Regulations will be required after planning. As part of the building control pack 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 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 regulations.

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SCHEME

The proposed scheme is to support the building on pile foundations due to the railway line next to the property. Retaining walls on the boundary will support the soil, hydro static pressures and surcharge due to highway, garden and neighbouring property loads. The wall of no. 6 Murray mews will be underpinned with mass concrete pins and a retaining wall pins will be constructed next to these pins to support the lateral and vertical pressures. Ground beams are proposed to carry the vertical loads. These ground beams are supported on piles. The retaining walls will be connected to the piles

Retaining wall on party wall side and a central ground beam initial design is presented below. These calculations are only for planning purposes only, and they are not fit for any party walls, building regulations.

RETAINING WALL ON NO. 6 MURRAY MEWS SIDE-IN TEMPORARY CONDITION

Location	Area			Type	L	Action	Actions, kN or kN/m			
	L	W	m^2			kN/m^2	Perm., g_k	%	Var., q_k	Total
Retaining wall	2.5	m								
Wall	9.3	1	9.3	g_k		5.00	46.5	kN/m		
Floors	3	3	9	g_k		0.63	5.7	kN/m		
				q_k		1.50			13.5	kN/m
Roof	3	1	3	g_k		1.10	3.3	kN/m		
				q_k		0.75			2.3	kN/m
							55.5	kN/m	**15.8**	kN/m

RETAINING WALL ANALYSIS

In accordance with EN1997-1:2004 incorporating Corrigendum dated February 2009 and the UK National Annex incorporating Corrigendum No.1

Tedds calculation version 2.9.16

Retaining wall details

Stem type	Cantilever
Stem height	h_{stem} = **2500** mm
Stem thickness	t_{stem} = **300** mm
Angle to rear face of stem	α = **90** deg

Stem density	γ_{stem} = **25** kN/m^3		
Toe length	l_{toe} = **1000** mm		
Base thickness	t_{base} = **300** mm		
Base density	γ_{base} = **25** kN/m^3		
Height of retained soil	h_{ret} = **2500** mm	Angle of soil surface	β = **0** deg
Depth of cover	d_{cover} = **0** mm		
Height of water	h_{water} = **1500** mm		
Water density	γ_w = **9.8** kN/m^3		

Retained soil properties

Soil type	Firm clay
Moist density	γ_{mr} = **18** kN/m^3
Saturated density	γ_{sr} = **18** kN/m^3

Base soil properties

Soil type	Stiff clay
Soil density	γ_b = **19** kN/m^3
Presumed bearing capacity	$P_{bearing}$ = **125** kN/m^2

Loading details

Variable surcharge load	$Surcharge_Q$ = **5.5** kN/m^2	
Vertical line load at 1150 mm		P_{G1} = **55.5** kN/m
	P_{Q1} = **15.8** kN/m	

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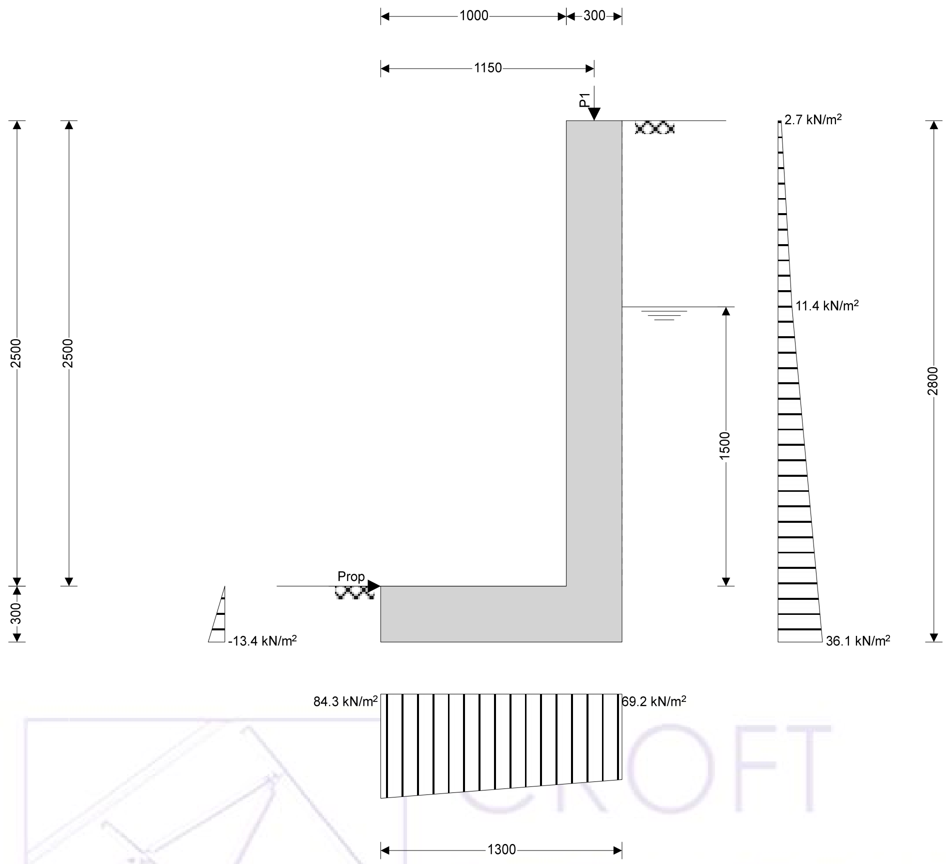


General arrangement - sketch pressures relate to bearing check

Calculate retaining wall geometry

Base length	l_{base} = **1300** mm		
Saturated soil height	h_{sat} = **1500** mm		
Moist soil height	h_{moist} = **1000** mm		
Length of surcharge load	l_{sur} = **0** mm		
Vertical distance	x_{sur_v} = **1300** mm		
Effective height of wall	h_{eff} = **2800** mm		
Horizontal distance	x_{sur_h} = **1400** mm		
Area of wall stem	A_{stem} = **0.75** m^2	Vertical distance	x_{stem} = **1150** mm
Area of wall base	A_{base} = **0.39** m^2	Vertical distance	x_{base} = **650** mm

Retained soil properties

Design moist density	γ_{mr}' = **18** kN/m^3	Design saturated density	γ_{sr}' = **18** kN/m^3

Base soil properties

Design soil density γ_b' = **19** kN/m^3

Soil coefficients

Coeff.friction to back of wall	K_{fr} = **0.325**		
Coeff.friction to front of wall	K_{fb} = **0.325**	Coeff.friction beneath base	K_{fbb} = **0.325**

Active pressure coefficient K_A = **0.483** Passive pressure coefficient K_P = **2.359**

Bearing pressure check

Vertical forces on wall

Total $F_{total\_v} = F_{stem} + F_{base} + F_{P\_v} + F_{water\_v}$ = **99.8** kN/m

Horizontal forces on wall

Total $F_{total\_h} = F_{sur\_h} + F_{sat\_h} + F_{water\_h} + F_{moist\_h} + F_{pass\_h}$ = **47.7** kN/m

Moments on wall

Total $M_{total} = M_{stem} + M_{base} + M_{sur} + M_P + M_{sat} + M_{water} + M_{moist}$ = **62.7** kNm/m

Check bearing pressure

Propping force F_{prop_base} = **47.7** kN/m

Bearing pressure at toe q_{toe} = **84.3** kN/m^2 Bearing pressure at heel q_{heel} = **69.2** kN/m^2

Factor of safety FoS_{bp} = **1.482**

PASS - Allowable bearing pressure exceeds maximum applied bearing pressure

RETAINING WALL DESIGN

In accordance with EN1992-1-1:2004 incorporating Corrigendum dated January 2008 and the UK National Annex incorporating National Amendment No.1

Tedds calculation version 2.9.16

Concrete details - Table 3.1 - Strength and deformation characteristics for concrete

Concrete strength class C32/40

Char.comp.cylinder strength f_{ck} = **32** N/mm^2 Mean axial tensile strength f_{ctm} = **3.0** N/mm^2

Secant modulus of elasticity E_{cm} = **33346** N/mm^2 Maximum aggregate size h_{agg} = **20** mm

Design comp.concrete strength f_{cd} = **18.1** N/mm^2 Partial factor γ_C = **1.50**

Reinforcement details

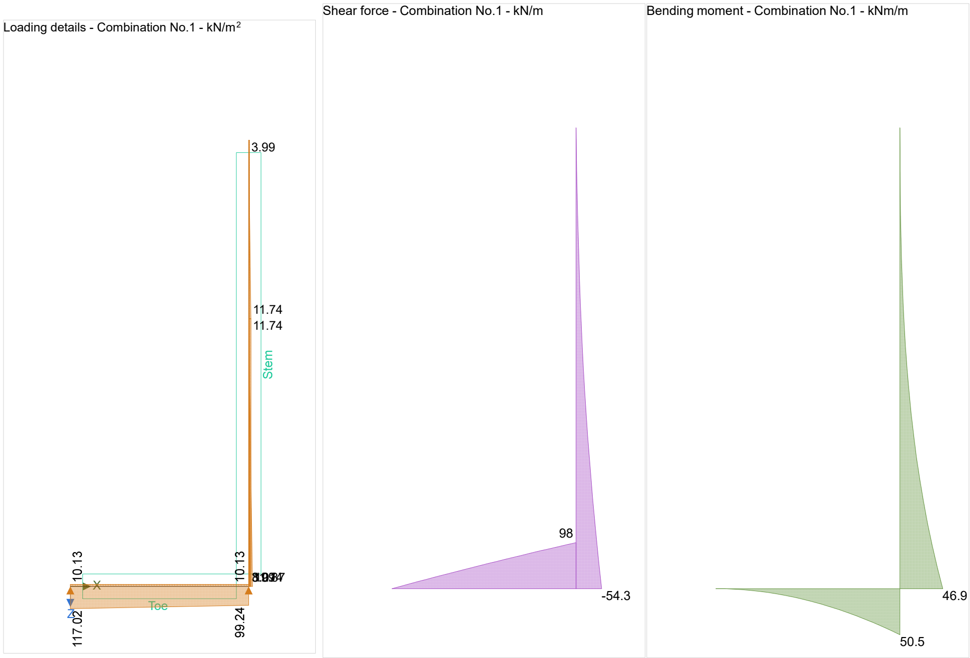
Characteristic yield strength f_{yk} = **500** N/mm^2 Modulus of elasticity E_s = **200000** N/mm^2

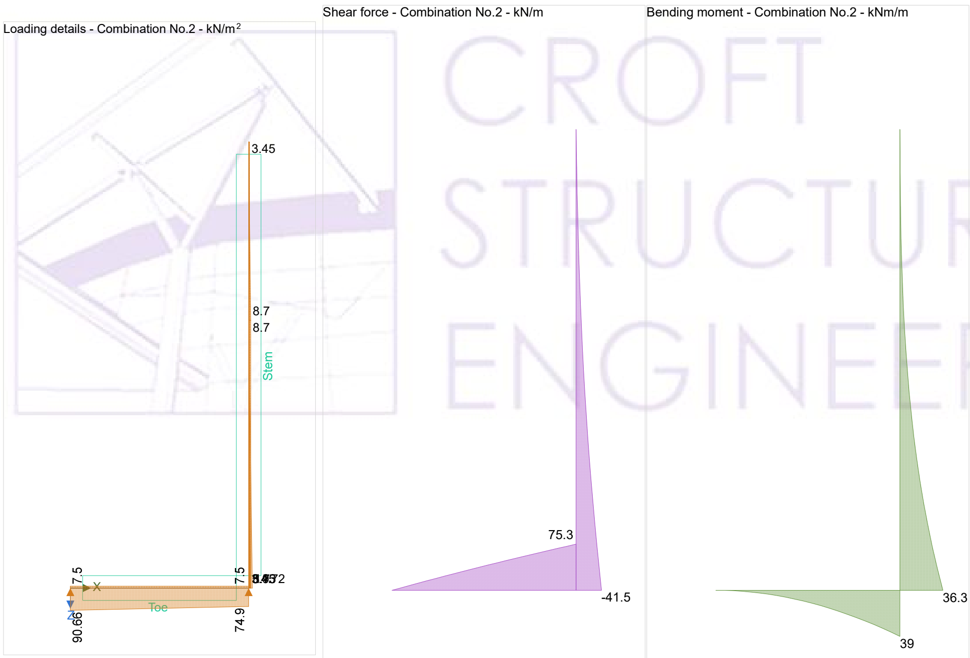
Design yield strength f_{yd} = **435** N/mm^2 Partial factor γ_S = **1.15**

Cover to reinforcement

Front face of stem c_{sf} = **50** mm Rear face of stem c_{sr} = **75** mm

Top face of base c_{bt} = **50** mm Bottom face of base c_{bb} = **75** mm





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Check stem design at base of stem

Depth of section h = **300** mm

Rectangular section in flexure - Section 6.1

Design bending moment M = **46.9** kNm/m K = **0.031** K' = **0.207**

K' > K - No compression reinforcement is required

Tens.reinforcement required $A_{sr.req}$ = **518** mm^2/m

Tens.reinforcement provided 12 dia.bars @ 100 c/c Tens.reinforcement provided $A_{sr.prov}$ = **1131** mm^2/m

Min.area of reinforcement $A_{sr.min}$ = **344** mm^2/m Max.area of reinforcement $A_{sr.max}$ = **12000** mm^2/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Library item: Rectangular single summary

Deflection control - Section 7.4

Limiting span to depth ratio 16 Actual span to depth ratio 11.4

PASS - Span to depth ratio is less than deflection control limit

Crack control - Section 7.3

Limiting crack width w_{max} = **0.3** mm Maximum crack width w_k = **0.163** mm

PASS - Maximum crack width is less than limiting crack width**Rectangular section in shear - Section 6.2**

Design shear force V = **54.3** kN/m

Rectangular section in shear - Section 6.2

Design shear force V = **54.3** kN/m Design shear resistance $V_{Rd.c}$ = **130.9** kN/m

PASS - Design shear resistance exceeds design shear force

Horizontal reinforcement parallel to face of stem - Section 9.6

Min.area of reinforcement $A_{sx.req}$ = **300** mm^2/m Max.spacing of reinforcement s_{sx_max} = **400** mm

Trans.reinforcement provided 10 dia.bars @ 200 c/c

Trans.reinforcement provided $A_{sx.prov}$ = **393** mm^2/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Check base design at toe

Depth of section h = **300** mm

Rectangular section in flexure - Section 6.1

Design bending moment M = **50.5** kNm/m K = **0.033** K' = **0.207**

K' > K - No compression reinforcement is required

Tens.reinforcement required $A_{bb.req}$ = **558** mm^2/m

Tens.reinforcement provided 12 dia.bars @ 100 c/c Tens.reinforcement provided $A_{bb.prov}$ = **1131** mm^2/m

Min.area of reinforcement $A_{bb.min}$ = **344** mm^2/m Max.area of reinforcement $A_{bb.max}$ = **12000** mm^2/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Library item: Rectangular single summary

Crack control - Section 7.3

Limiting crack width w_{max} = **0.3** mm Maximum crack width w_k = **0.195** mm

PASS - Maximum crack width is less than limiting crack width**Rectangular section in shear - Section 6.2**

Design shear force V = **98** kN/m

Rectangular section in shear - Section 6.2

Design shear force V = **98** kN/m Design shear resistance $V_{Rd.c}$ = **130.9** kN/m

PASS - Design shear resistance exceeds design shear force

Secondary transverse reinforcement to base - Section 9.3

Min.area of reinforcement $A_{bx.req}$ = **226** mm^2/m Max.spacing of reinforcement s_{bx_max} = **450** mm

Trans.reinforcement provided 10 dia.bars @ 200 c/c

Trans.reinforcement provided $A_{bx.prov}$ = **393** mm^2/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

RETAINING WALL ANALYSIS

In accordance with EN1997-1:2004 incorporating Corrigendum dated February 2009 and the UK National Annex incorporating Corrigendum No.1

Tedds calculation version 2.9.16

Retaining wall details

Stem type Cantilever

Stem height h_{stem} = **2500** mm

Stem thickness t_{stem} = **300** mm

Angle to rear face of stem α = **90** deg

Stem density γ_{stem} = **25** kN/m^3

Toe length l_{toe} = **1000** mm

Base thickness t_{base} = **300** mm

Base density γ_{base} = **25** kN/m^3

Height of retained soil h_{ret} = **2500** mm Angle of soil surface β = **0** deg

Depth of cover d_{cover} = **0** mm

Height of water h_{water} = **1500** mm

Water density γ_w = **9.8** kN/m^3

Retained soil properties

Soil type Firm clay

Moist density γ_{mr} = **20** kN/m^3

Saturated density γ_{sr} = **20** kN/m^3

Base soil properties

Soil type Stiff clay

Soil density γ_b = **20** kN/m^3

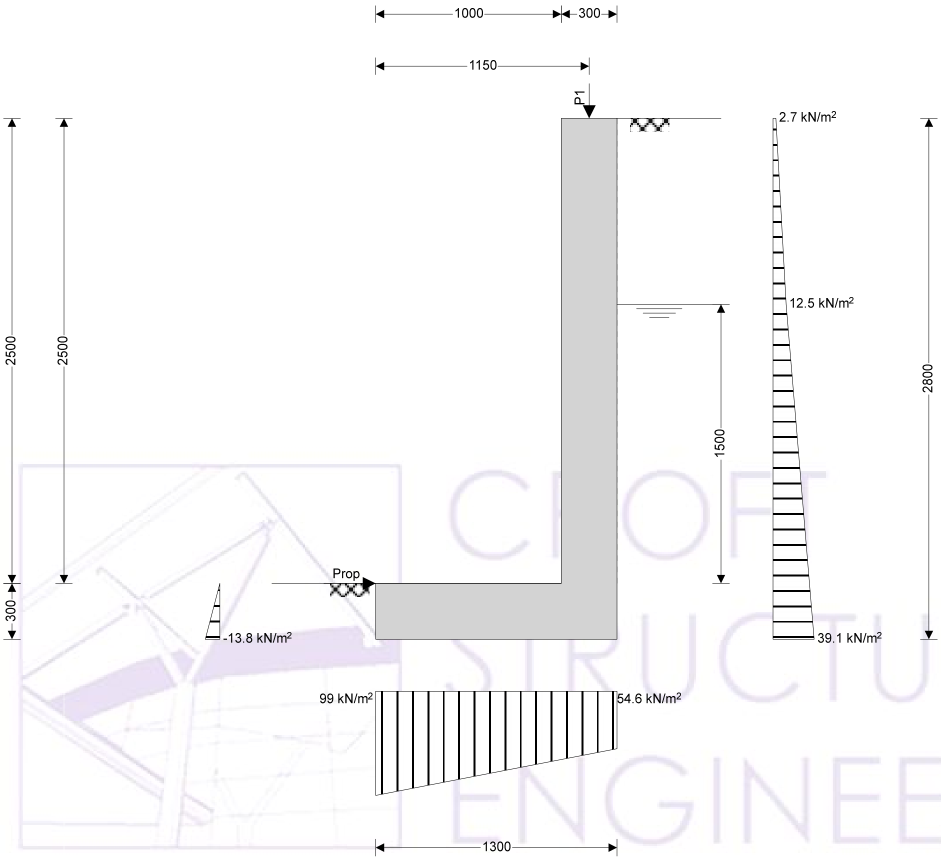
Presumed bearing capacity $P_{bearing}$ = **125** kN/m^2

Loading details

Variable surcharge load $Surcharge_Q$ = **5.5** kN/m^2

Vertical line load at 1150 mm P_{G1} = **55.5** kN/m

P_{Q1} = **15.8** kN/m



General arrangement - sketch pressures relate to bearing check

Calculate retaining wall geometry

Base length l_{base} = **1300** mm

Saturated soil height h_{sat} = **1500** mm

Moist soil height h_{moist} = **1000** mm

Length of surcharge load l_{sur} = **0** mm

Vertical distance x_{sur_v} = **1300** mm

Effective height of wall h_{eff} = **2800** mm

Horizontal distance x_{sur_h} = **1400** mm

Area of wall stem A_{stem} = **0.75** m^2 Vertical distance x_{stem} = **1150** mm

Area of wall base A_{base} = **0.39** m^2 Vertical distance x_{base} = **650** mm

Retained soil properties

Design moist density γ_{mr}' = **20** kN/m^3 Design saturated density γ_{sr}' = **20** kN/m^3

Base soil properties

Design soil density γ_b' = **20** kN/m^3

Soil coefficients

Coeff.friction to back of wall K_{fr} = **0.325**

Coeff.friction to front of wall K_{fb} = **0.325** Coeff.friction beneath base K_{fbb} = **0.325**

Active pressure coefficient K_A = **0.490** Passive pressure coefficient K_P = **2.300**

Bearing pressure check

Vertical forces on wall

Total $F_{total\_v} = F_{stem} + F_{base} + F_{P\_v} + F_{water\_v}$ = **99.8** kN/m

Horizontal forces on wall

Total $F_{total\_h} = F_{sur\_h} + F_{sat\_h} + F_{water\_h} + F_{moist\_h} + F_{pass\_h}$ = **52** kN/m

Moments on wall

Total $M_{total} = M_{stem} + M_{base} + M_{sur} + M_P + M_{sat} + M_{water} + M_{moist}$ = **58.6** kNm/m

Check bearing pressure

Propping force F_{prop_base} = **52** kN/m

Bearing pressure at toe q_{toe} = **99** kN/m^2 Bearing pressure at heel q_{heel} = **54.6** kN/m^2

Factor of safety FoS_{bp} = **1.263**

PASS - Allowable bearing pressure exceeds maximum applied bearing pressure

RETAINING WALL DESIGN

In accordance with EN1992-1-1:2004 incorporating Corrigendum dated January 2008 and the UK National Annex incorporating National Amendment No.1

Tedds calculation version 2.9.16

Concrete details - Table 3.1 - Strength and deformation characteristics for concrete

Concrete strength class C32/40

Char.comp.cylinder strength f_{ck} = **32** N/mm^2 Mean axial tensile strength f_{ctm} = **3.0** N/mm^2

Secant modulus of elasticity E_{cm} = **33346** N/mm^2 Maximum aggregate size h_{agg} = **20** mm

Design comp.concrete strength f_{cd} = **18.1** N/mm^2 Partial factor γ_C = **1.50**

Reinforcement details

Characteristic yield strength f_{yk} = **500** N/mm^2 Modulus of elasticity E_s = **200000** N/mm^2

Design yield strength f_{yd} = **435** N/mm^2 Partial factor γ_S = **1.15**

Cover to reinforcement

Front face of stem c_{sf} = **50** mm Rear face of stem c_{sr} = **75** mm

Top face of base c_{bt} = **50** mm Bottom face of base c_{bb} = **75** mm

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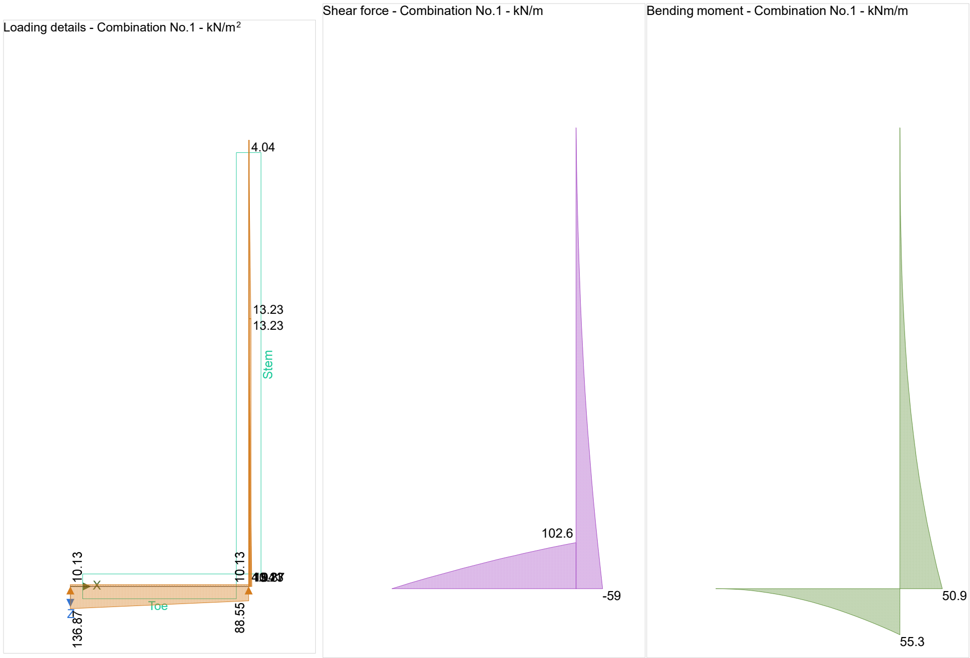

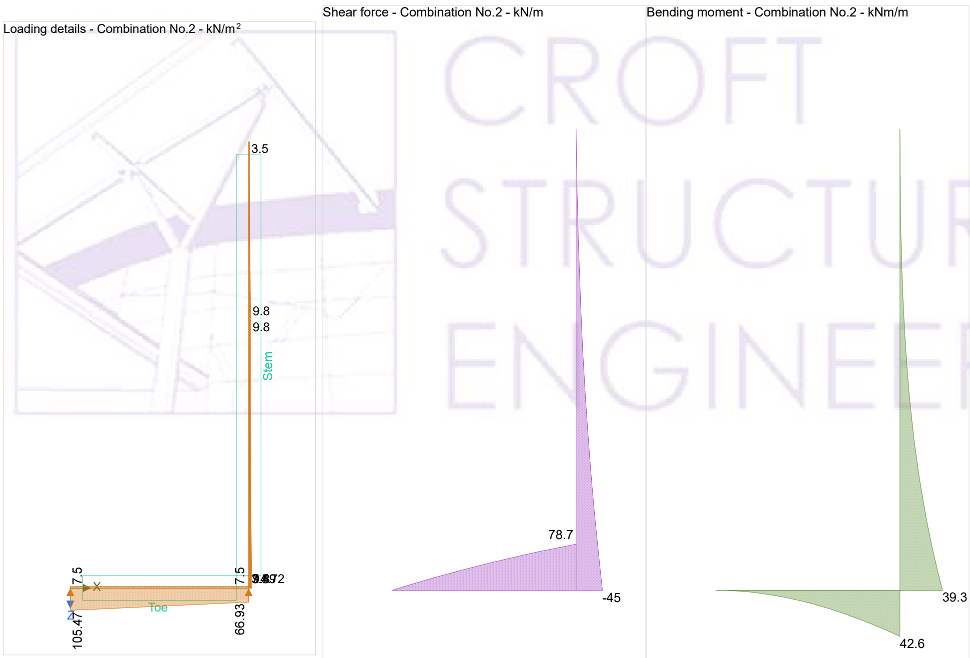

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Check stem design at base of stem

Depth of section h = **300** mm

Rectangular section in flexure - Section 6.1

Design bending moment M = **50.9** kNm/m K = **0.033** K' = **0.207**

K' > K - No compression reinforcement is required

Tens.reinforcement required $A_{sr.req}$ = **563** mm^2/m

Tens.reinforcement provided 12 dia.bars @ 100 c/c Tens.reinforcement provided $A_{sr.prov}$ = **1131** mm^2/m

Min.area of reinforcement $A_{sr.min}$ = **344** mm²/m Max.area of reinforcement $A_{sr.max}$ = **12000** mm²/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Library item: Rectangular single summary

Deflection control - Section 7.4

Limiting span to depth ratio 16 Actual span to depth ratio 11.4

PASS - Span to depth ratio is less than deflection control limit

Crack control - Section 7.3

Limiting crack width w_{max} = **0.3** mm Maximum crack width w_k = **0.178** mm

PASS - Maximum crack width is less than limiting crack width**Rectangular section in shear - Section 6.2**

Design shear force V = **59** kN/m

Rectangular section in shear - Section 6.2

Design shear force V = **59** kN/m Design shear resistance $V_{Rd.c}$ = **130.9** kN/m

PASS - Design shear resistance exceeds design shear force

Horizontal reinforcement parallel to face of stem - Section 9.6

Min.area of reinforcement $A_{sx.req}$ = **300** mm²/m Max.spacing of reinforcement s_{sx_max} = **400** mm

Trans.reinforcement provided 10 dia.bars @ 200 c/c

Trans.reinforcement provided $A_{sx.prov}$ = **393** mm²/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Check base design at toe

Depth of section h = **300** mm

Rectangular section in flexure - Section 6.1

Design bending moment M = **55.3** kNm/m K = **0.036** K' = **0.207**

K' > K - No compression reinforcement is required

Tens.reinforcement required $A_{bb.req}$ = **612** mm²/m

Tens.reinforcement provided 12 dia.bars @ 100 c/c Tens.reinforcement provided $A_{bb.prov}$ = **1131** mm²/m

Min.area of reinforcement $A_{bb.min}$ = **344** mm²/m Max.area of reinforcement $A_{bb.max}$ = **12000** mm²/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Library item: Rectangular single summary

Crack control - Section 7.3

Limiting crack width w_{max} = **0.3** mm Maximum crack width w_k = **0.214** mm

PASS - Maximum crack width is less than limiting crack width**Rectangular section in shear - Section 6.2**

Design shear force V = **102.6** kN/m

Rectangular section in shear - Section 6.2

Design shear force V = **102.6** kN/m Design shear resistance $V_{Rd.c}$ = **130.9** kN/m

PASS - Design shear resistance exceeds design shear force

Secondary transverse reinforcement to base - Section 9.3

Min.area of reinforcement $A_{bx.req}$ = **226** mm^2/m Max.spacing of reinforcement s_{bx_max} = **450** mm

Trans.reinforcement provided 10 dia.bars @ 200 c/c

Trans.reinforcement provided $A_{bx.prov}$ = **393** mm^2/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

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GROUND BEAM

Location	Area			Type	L	Action	Actions, kN or kN/m			
	L	W	m^2			kN/m^2	Perm., g_k	%	Var., q_k	Total
Ground beam	0.75	2.9	3.8	3.3						
RC slab	3.75	1	3.75	g_k		7.00	26.3	kN/m		
				g_k		1.50			5.6	kN/m
Wall	9	1	9	g_k		5.00	45.0	kN/m		
Floors	3.75	2	7.5	g_k		0.63	4.7	kN/m		
				g_k		1.50			11.3	kN/m
Roof	3.75	1	3.75	g_k		1.10	4.1	kN/m		
				g_k		0.75			2.8	kN/m
							80.1	kN/m	19.7	kN/m

RC MEMBER ANALYSIS & DESIGN (EN1992-1-1:2004)

In accordance with EN1992-1-1:2004 incorporating Corrigenda January 2008 and the UK national annex

Tedds calculation version 3.3.07

ANALYSIS

Tedds calculation version 1.0.37

Geometry

Span	Length (m)	Section	Start Support	End Support
1	0.75	R 1000x600	Free	Roller Pin X
2	2.9	R 1000x600	Roller Pin X	Roller Pin X
3	3.8	R 1000x600	Roller Pin X	Roller Pin X
4	3.3	R 1000x600	Roller Pin X	Pinned
R 300x500: Area 1500 cm^2, Inertia Major 312500 cm^4, Inertia Minor 112500 cm^4, Shear area parallel to Minor 1250 cm^2, Shear area parallel to Major = 1250 cm^2				
R 1000x600: Area 6000 cm^2, Inertia Major 1800000 cm^4, Inertia Minor 5000000 cm^4, Shear area parallel to Minor 5000 cm^2, Shear area parallel to Major = 5000 cm^2				
Concrete (C32 2500 Quartzite): Density 2500 kg/m^3, Youngs 33.3457645 kN/mm^2, Shear 13.8940685 kN/mm^2, Thermal 0.00001 °C^{-1}				

Loading

Self weight included

Permanent - Loading (kN/m)

Imposed - Loading (kN/m)

Results

Reactions

Load case: Self Weight

Node	Force Fx (kN)	Force Fz (kN)	Moment My (kNm)
2	0	28.5	0
3	0	52.1	0
4	0	59	0
5	0	18.5	0

Load case: Permanent

Node	Force Fx (kN)	Fz (kN)	Moment My (kNm)
2	0	155.2	0
3	0	283.8	0
4	0	321.5	0
5	0	100.5	0

Load case: Imposed

Node	Force Fx (kN)	Fz (kN)	Moment My (kNm)
2	0	38.2	0
3	0	69.8	0
4	0	79.1	0
5	0	24.7	0

Load combination: 1.35G + 1.5Q + 1.5RQ (Strength)

Node	Force Fx (kN)	Fz (kN)	Moment My (kNm)
2	0	305.3	0
3	0	558.2	0
4	0	632.4	0
5	0	197.7	0

Load combination: 1.0G + 1.0Q + 1.0RQ (Service)

Node	Force Fx (kN)	Fz (kN)	Moment My (kNm)
2	0	221.9	0
3	0	405.7	0
4	0	459.6	0
5	0	143.7	0

Load combination: 1.0G + 1.0ψ_2Q (Quasi)

Node	Force Fx (kN)	Fz (kN)	Moment My (kNm)
2	0	195.2	0
3	0	356.8	0
4	0	404.3	0
5	0	126.4	0

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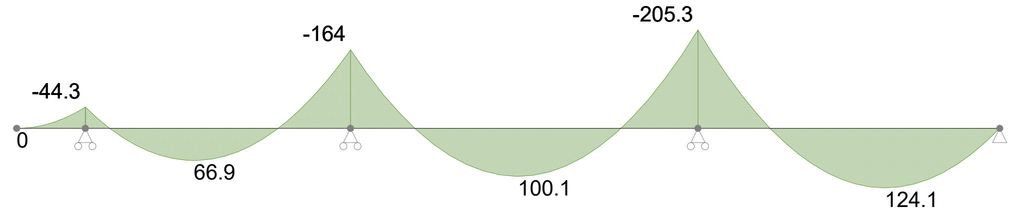
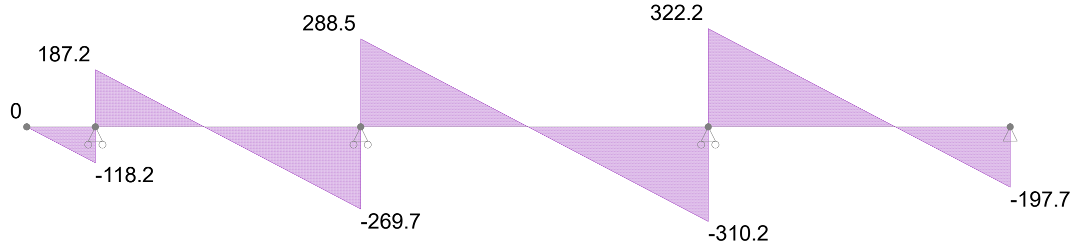
Forces

1.35G + 1.5Q + 1.5RQ (Strength) - Moment (kNm)



1.35G + 1.5Q + 1.5RQ (Strength) - Shear (kN)



1.0G + 1.0Q + 1.0RQ (Service) - Deflection (mm)

Concrete details (Table 3.1 - Strength and deformation characteristics for concrete)

Concrete strength class C32/40 Char. comp. cylinder strength f_{ck} = **32** N/mm²

Design comp conc. strength f_{cwd} = **21.3** N/mm² Maximum aggregate size h_{agg} = **20** mm

Reinforcement details

Char. yield strength of rinf. f_{yk} = **500** N/mm² Partial factor for reinf. steel γ_S = **1.15**

Design yield strength of reinf. f_{yd} = **435** N/mm²

Nominal cover to reinforcement

Nominal cover to top reinf c_{nom_t} = **50** mm Nominal cover to bottom reinf c_{nom_b} = **50** mm

Nominal cover to side reinf c_{nom_s} = **50** mm

Fire resistance

Standard fire resistance period R = **60** min No. sides exposed to fire 3

Minimum width of beam b_{min} = **120** mm

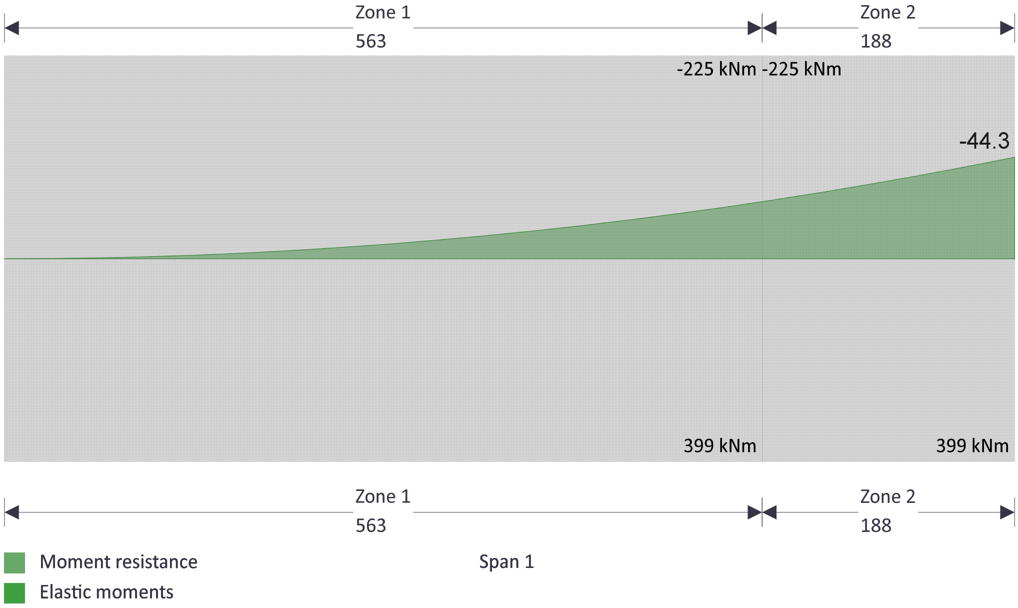
Beam - Span 1

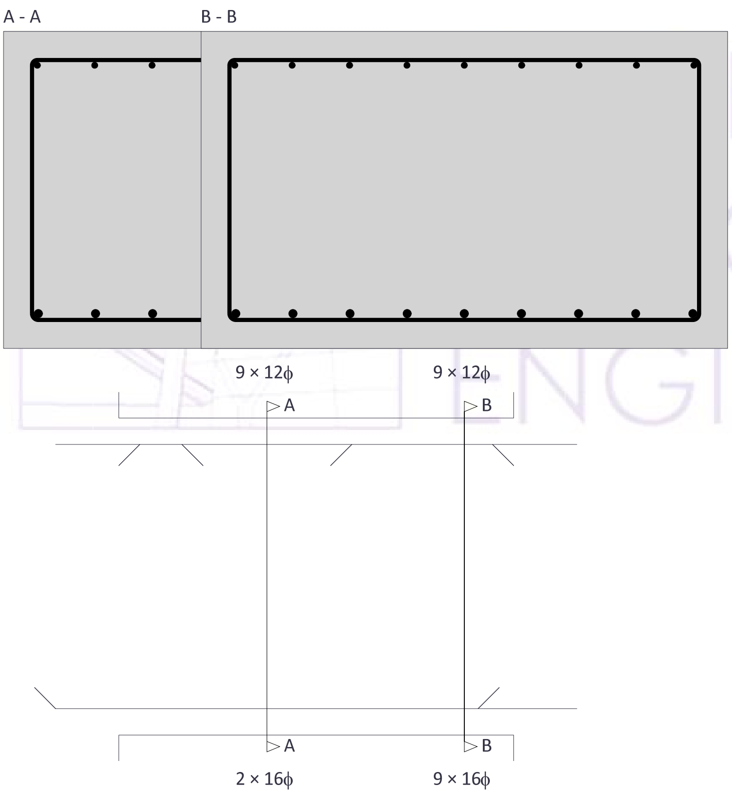
Rectangular section details

Section width b = **1000** mm Section depth h = **600** mm

PASS - Minimum dimensions for fire resistance met

Moment design





Zone 1 (0 mm - 563 mm) Negative moment - section 6.1

Design bending moment M = **24.9** kNm Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **113** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **15.9**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Minimum bar spacing (Section 8.2)

Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **852.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Zone 2 (563 mm - 750 mm) Negative moment - section 6.1

Design bending moment M = **44.3** kNm Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **200** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **28.3**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Deflection control - Section 7.4

Allow. span to depth ratio $span\_to\_depth_{allow}$ = **16.000** Actual span to depth ratio $span\_to\_depth_{actual}$ = **1.399**

PASS - Actual span to depth ratio is within the allowable limit

Minimum bar spacing (Section 8.2)

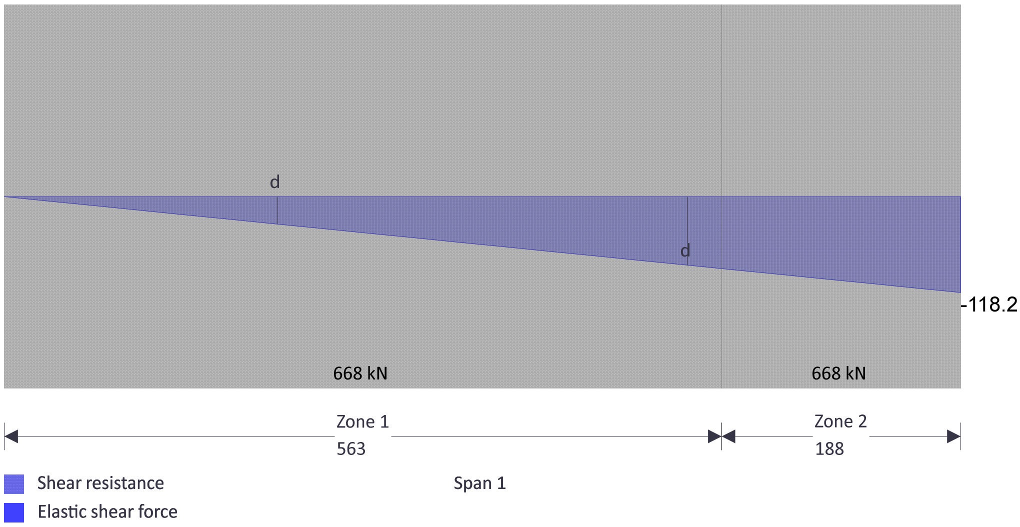
Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

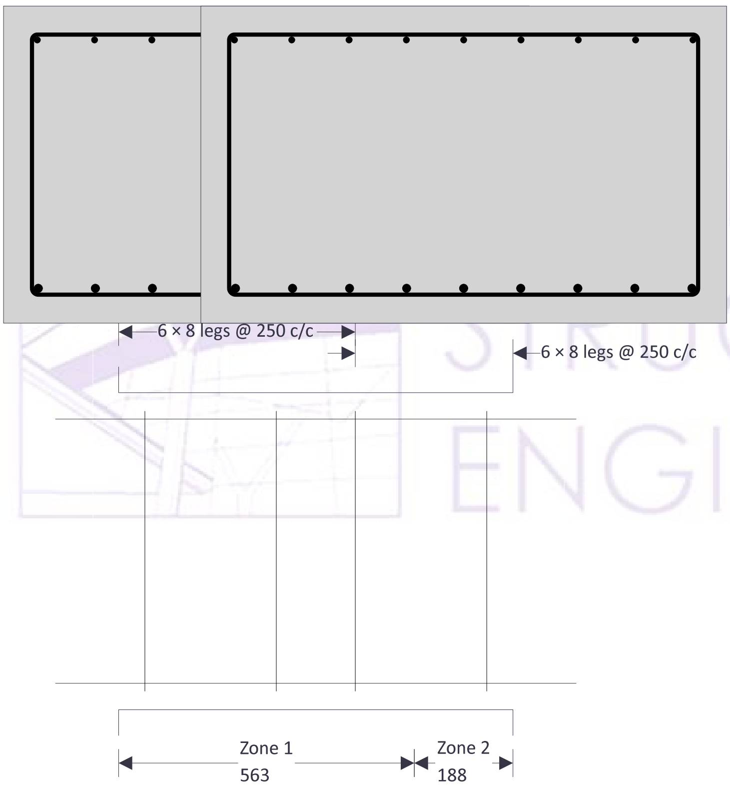
PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **92.5** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Shear design





Angle of comp. shear strut θ_{max} = 45 deg   Strength reduction factor v_1 = **0.523**
Compression chord coefficient α_{cw} = **1.00**   Minimum area of shear reinf. $A_{sv,min}$ = **905** mm^2/m

Zone 1 (0 mm - 563 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **34** kN   Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **34** kN   Area shear reinf. req'd $A_{sv,req}$ = **905** mm^2/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm^2/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Zone 2 (563 mm - 750 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **118** kN Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **34** kN Area shear reinf. req'd $A_{sv,req}$ = **905** mm^2/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm^2/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

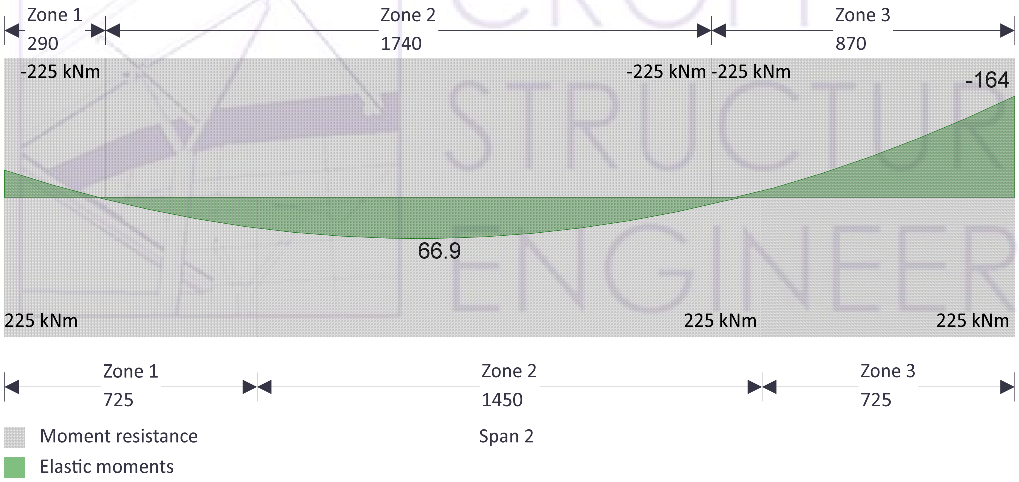
Beam - Span 2

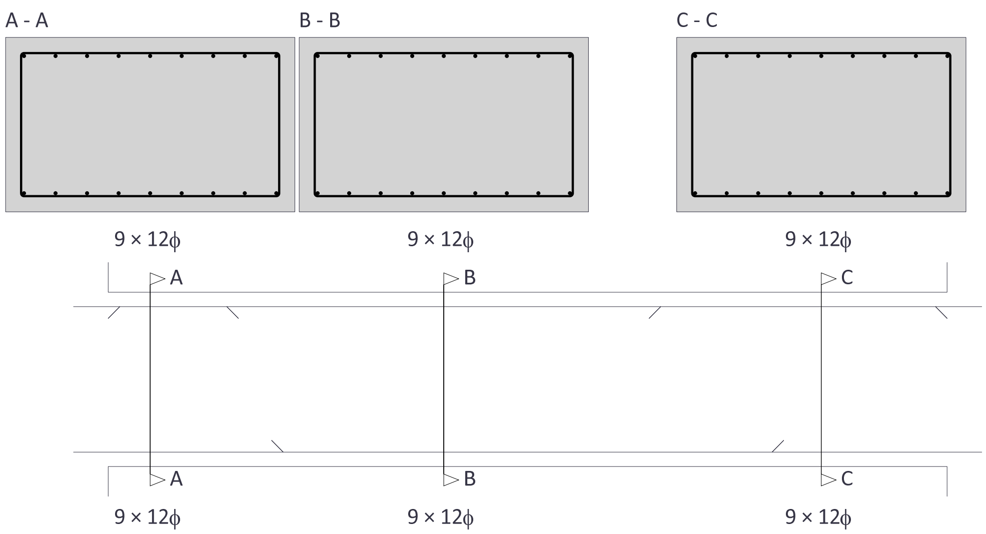
Rectangular section details

Section width b = **1000** mm Section depth h = **600** mm

PASS - Minimum dimensions for fire resistance met

Moment design





Zone 1 (0 mm - 725 mm) Positive moment - section 6.1

Design bending moment M = **50.0** kNm Effective depth tension reinf. d = **536** mm
Area of tension reinf. req'd $A_{s,req}$ = **226** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2
Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **32.0**kNm
Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Zone 1 (0 mm - 290 mm) Negative moment - section 6.1

Design bending moment M = **44.3** kNm Effective depth tension reinf. d = **536** mm
Area of tension reinf. req'd $A_{s,req}$ = **200** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2
Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **28.3**kNm
Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Minimum bar spacing (Section 8.2)

Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Zone 2 (725 mm - 2175 mm) Positive moment - section 6.1

Design bending moment M = **66.9** kNm Effective depth tension reinf. d = **536** mm
Area of tension reinf. req'd $A_{s,req}$ = **302** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2
Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

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Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **42.8**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Deflection control - Section 7.4

Allow. span to depth ratio $span\_to\_depth_{allow}$ = **60.000** Actual span to depth ratio $span\_to\_depth_{actual}$ = **5.410**

PASS - Actual span to depth ratio is within the allowable limit

Minimum bar spacing (Section 8.2)

Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Zone 3 (2030 mm - 2900 mm) Negative moment - section 6.1

Design bending moment M = **164.0** kNm Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **741** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **104.8**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **247.2** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Minimum bar spacing (Section 8.2)

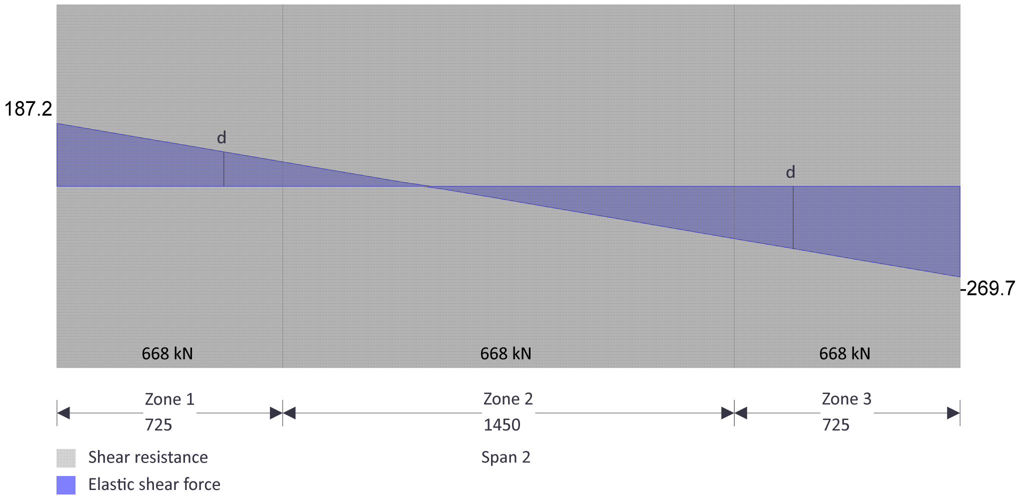
Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

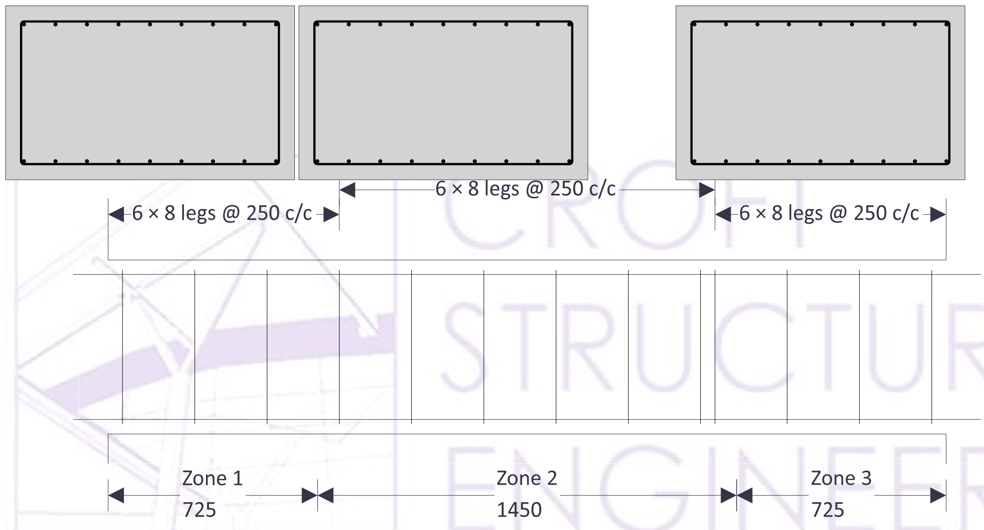
PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Shear design





Angle of comp. shear strut θ_{max} = 45 deg Strength reduction factor v_1 = **0.523**
Compression chord coefficient α_{cw} = **1.00** Minimum area of shear reinf. $A_{sv,min}$ = **905** mm²/m

Zone 1 (0 mm - 725 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **187** kN Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **103** kN Area shear reinf. req'd $A_{sv,req}$ = **905** mm²/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm²/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Zone 2 (725 mm - 2175 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **155** kN Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **155** kN Area shear reinf. req'd $A_{sv,req}$ = **905** mm^2/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm^2/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Zone 3 (2175 mm - 2900 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **270** kN Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **185** kN Area shear reinf. req'd $A_{sv,req}$ = **905** mm^2/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm^2/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

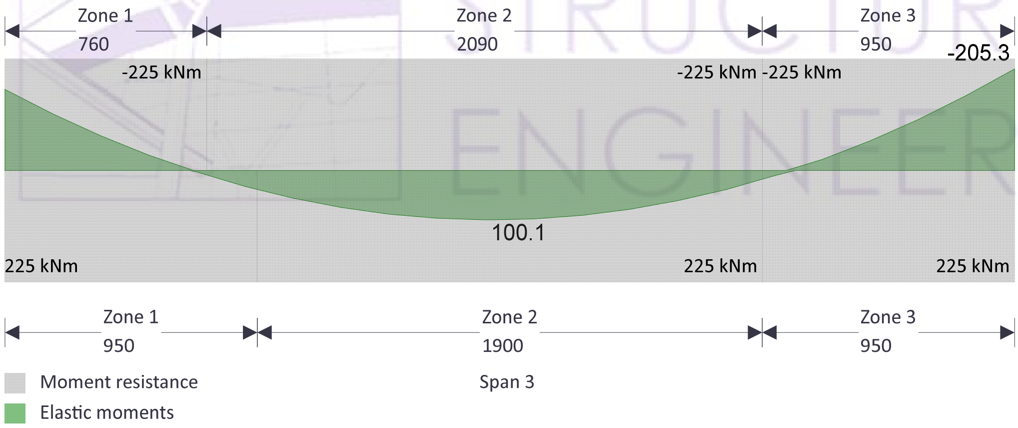
Beam - Span 3

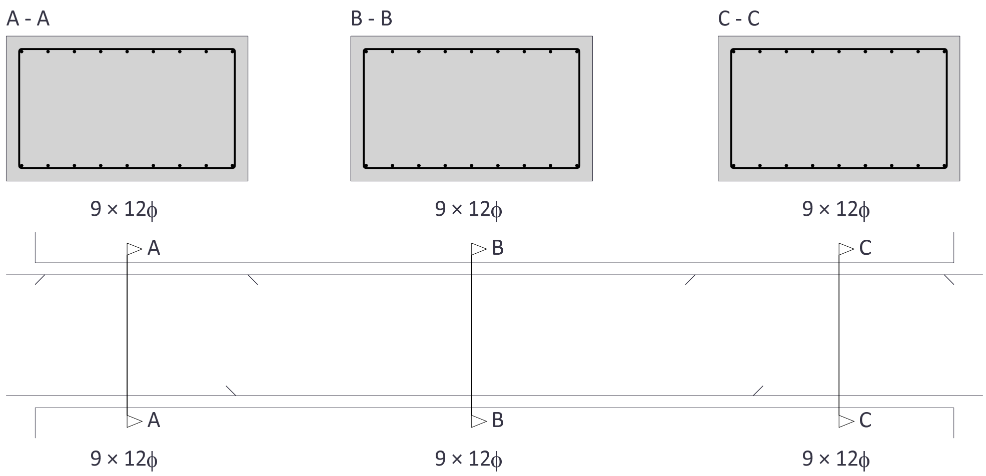
Rectangular section details

Section width b = **1000** mm Section depth h = **600** mm

PASS - Minimum dimensions for fire resistance met

Moment design





Zone 1 (0 mm - 950 mm) Positive moment - section 6.1

Design bending moment M = **39.0** kNm Effective depth tension reinf. d = **536** mm
Area of tension reinf. req'd $A_{s,req}$ = **176** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2
Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **24.9**kNm
Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Zone 1 (0 mm - 760 mm) Negative moment - section 6.1

Design bending moment M = **164.0** kNm Effective depth tension reinf. d = **536** mm
Area of tension reinf. req'd $A_{s,req}$ = **741** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2
Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **104.8**kNm
Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **247.2** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Minimum bar spacing (Section 8.2)

Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Zone 2 (950 mm - 2850 mm) Positive moment - section 6.1

Design bending moment M = **100.1** kNm Effective depth tension reinf. d = **536** mm
Area of tension reinf. req'd $A_{s,req}$ = **452** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2
Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **64.0**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Deflection control - Section 7.4

Allow. span to depth ratio $span\_to\_depth_{allow}$ = **60.000** Actual span to depth ratio $span\_to\_depth_{actual}$ = **7.090**

PASS - Actual span to depth ratio is within the allowable limit

Minimum bar spacing (Section 8.2)

Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Zone 3 (2850 mm - 3800 mm) Positive moment - section 6.1

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Design bending moment M = **18.3** kNm Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **83** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **11.7**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Zone 3 (2850 mm - 3800 mm) Negative moment - section 6.1

Design bending moment M = **205.3** kNm Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **927** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **131.3**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **183.4** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Minimum bar spacing (Section 8.2)

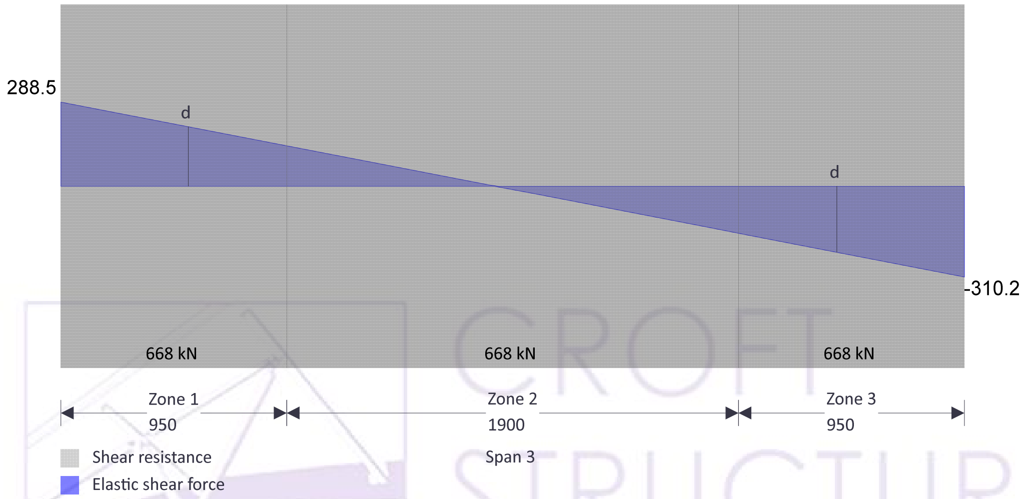
Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

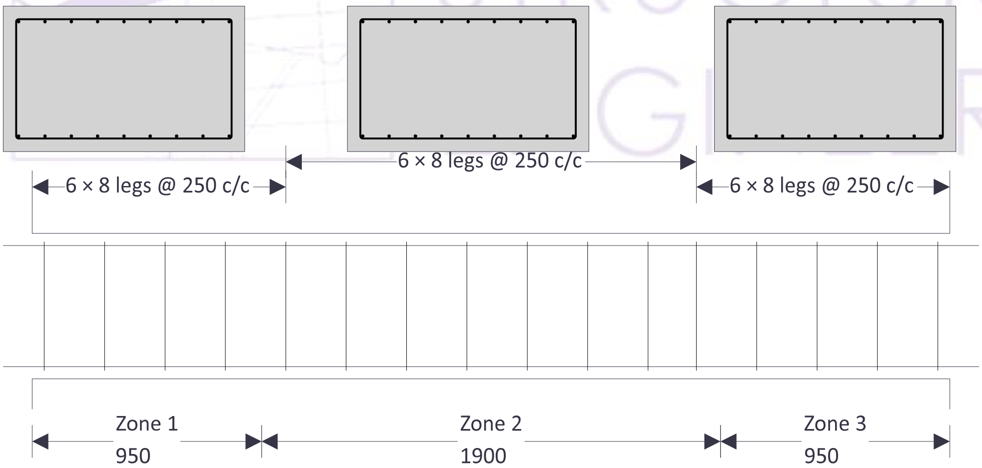
PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Shear design





Angle of comp. shear strut θ_{max} = 45 deg Strength reduction factor v_1 = **0.523**

Compression chord coefficient α_{cw} = **1.00** Minimum area of shear reinf. $A_{sv,min}$ = **905** mm²/m

Zone 1 (0 mm - 950 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **288** kN Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **204** kN Area shear reinf. req'd $A_{sv,req}$ = **905** mm²/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm^2/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Zone 2 (950 mm - 2850 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **161** kN Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **161** kN Area shear reinf. req'd $A_{sv,req}$ = **905** mm^2/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm^2/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Zone 3 (2850 mm - 3800 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **310** kN Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **226** kN Area shear reinf. req'd $A_{sv,req}$ = **905** mm^2/m

Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm^2/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

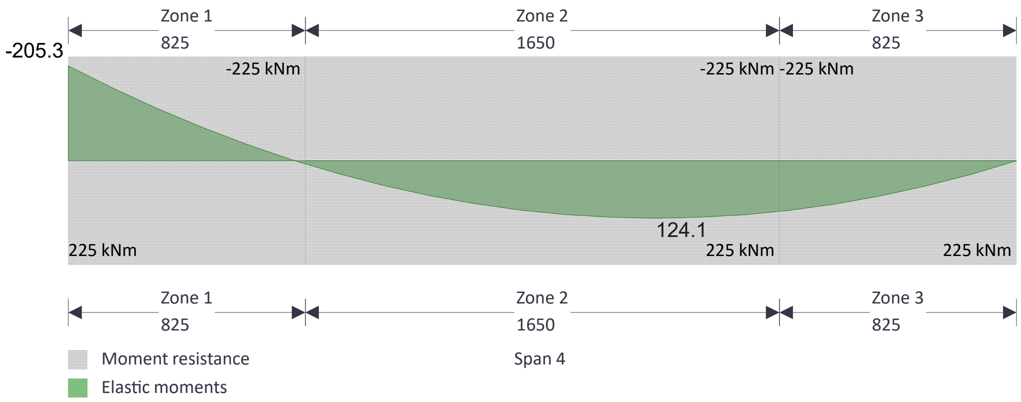
Beam - Span 4

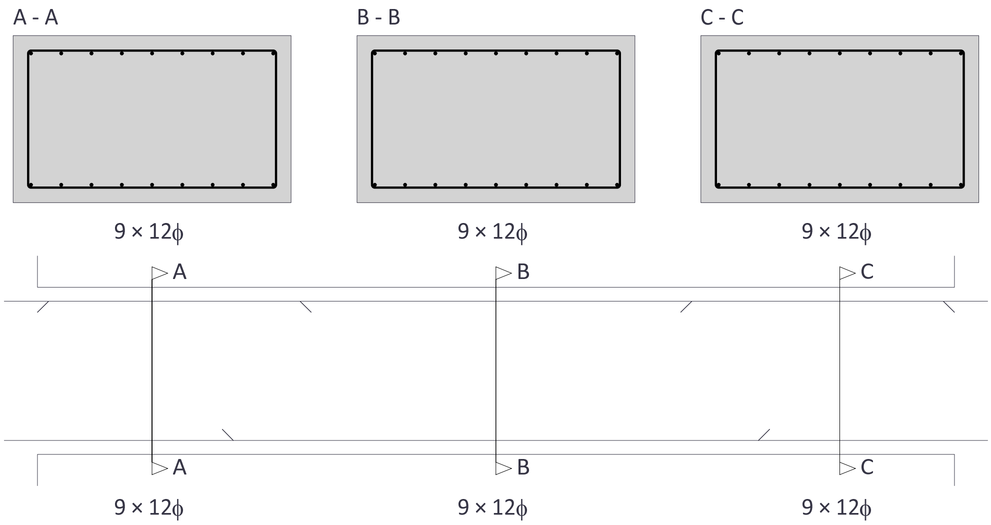
Rectangular section details

Section width b = **1000** mm Section depth h = **600** mm

PASS - Minimum dimensions for fire resistance met

Moment design





Zone 1 (0 mm - 825 mm) Positive moment - section 6.1

Design bending moment M = **6.8** kNm — Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **31** mm² — Area of tension reinf. prov $A_{s,prov}$ = **1018** mm²

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm² — Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm²

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm — Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm²

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **4.4**kNm

Actual tension bar spacing s_{bar} = **109** mm — Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Zone 1 (0 mm - 825 mm) Negative moment - section 6.1

Design bending moment M = **205.3** kNm — Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **927** mm² — Area of tension reinf. prov $A_{s,prov}$ = **1018** mm²

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm² — Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm²

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm — Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm²

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **131.3**kNm

Actual tension bar spacing s_{bar} = **109** mm — Max bar spacing (Table 7.3N) $s_{bar,max}$ = **183.4** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Minimum bar spacing (Section 8.2)

Top bar spacing s_{top} = **97.0** mm — Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Zone 2 (825 mm - 2475 mm) Positive moment - section 6.1

Design bending moment M = **124.1** kNm Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **560** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **79.3**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Deflection control - Section 7.4

Allow. span to depth ratio $span\_to\_depth_{allow}$ = **40.000** Actual span to depth ratio $span\_to\_depth_{actual}$ = **6.157**

PASS - Actual span to depth ratio is within the allowable limit

Minimum bar spacing (Section 8.2)

Top bar spacing s_{top} = **97.0** mm Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Zone 3 (2475 mm - 3300 mm) Positive moment - section 6.1

Design bending moment M = **109.5** kNm Effective depth tension reinf. d = **536** mm

Area of tension reinf. req'd $A_{s,req}$ = **495** mm^2 Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2

Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2 Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **70.0**kNm

Actual tension bar spacing s_{bar} = **109** mm Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

CROFT STRUCTURAL ENGINEERS

Zone 3 (2475 mm - 3300 mm) Negative moment - section 6.1

Design bending moment M = **31.0** kNm
Effective depth tension reinf. d = **536** mm
Area of tension reinf. req'd $A_{s,req}$ = **140** mm^2
Area of tension reinf. prov $A_{s,prov}$ = **1018** mm^2
Min area of reinf. (exp.9.1N) $A_{s,min}$ = **843** mm^2
Max area reinf. (cl.9.2.1.1(3)) $A_{s,max}$ = **24000** mm^2

PASS - Area of reinforcement provided is greater than area of reinforcement required

Crack control - Section 7.3

Maximum crack width w_k = **0.30** mm
Min area reinf req'd (exp.7.1) $A_{sc,min}$ = **910** mm^2

PASS - Area of tension reinforcement provided exceeds minimum required for crack control

Quasi-permanent moment M_{QP} = **0.0**kNm
Actual tension bar spacing s_{bar} = **109** mm
Max bar spacing (Table 7.3N) $s_{bar,max}$ = **300** mm

PASS - Maximum bar spacing exceeds actual bar spacing for crack control

Minimum bar spacing (Section 8.2)

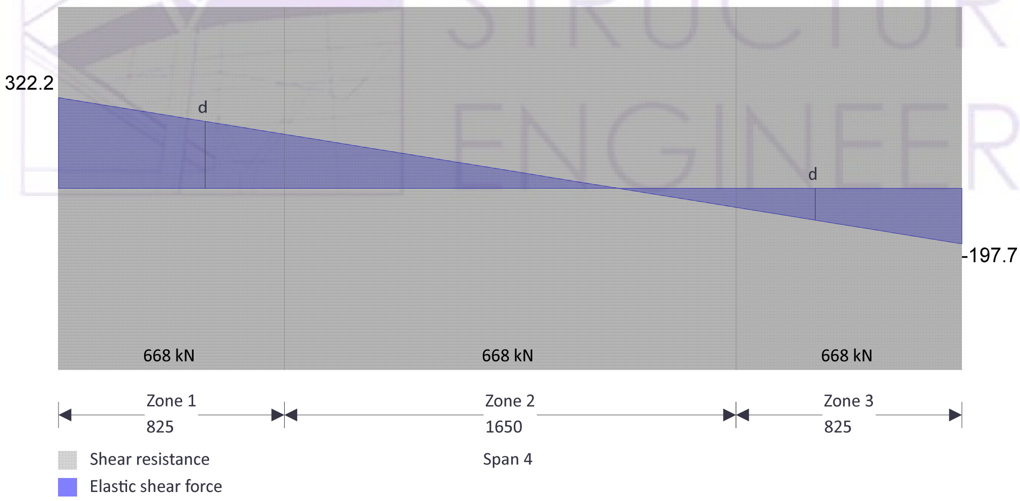
Top bar spacing s_{top} = **97.0** mm
Min allow. top bar spacing $s_{top,min}$ = **25.0** mm

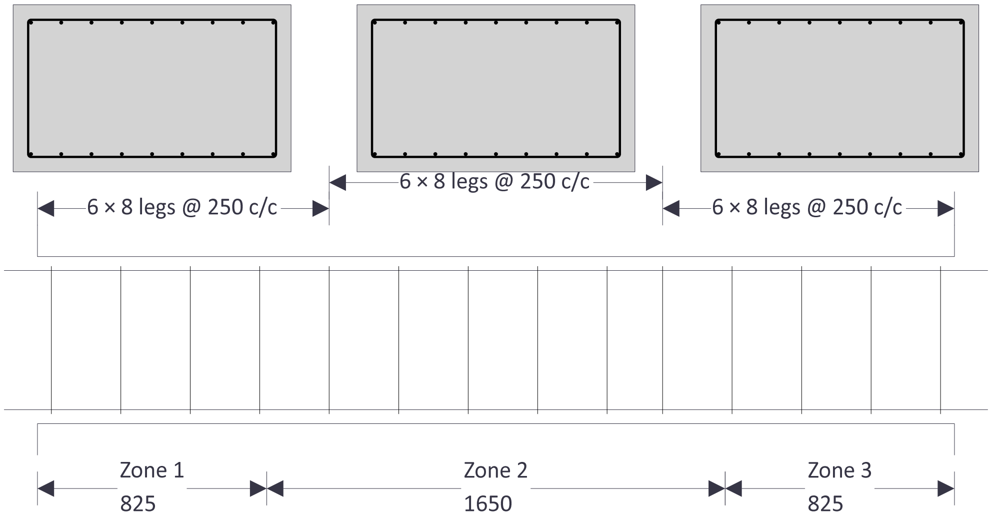
PASS - Actual bar spacing exceeds minimum allowable

Bottom bar spacing s_{bot} = **97.0** mm
Min allow. bottom bar spacing $s_{bot,min}$ = **25.0** mm

PASS - Actual bar spacing exceeds minimum allowable

Shear design





Angle of comp. shear strut θ_{max} = 45 deg
Strength reduction factor v_1 = **0.523**
Compression chord coefficient α_{cw} = **1.00**
Minimum area of shear reinf. $A_{sv,min}$ = **905** mm²/m

Zone 1 (0 mm - 825 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **322** kN
Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **238** kN
Area shear reinf. req'd $A_{sv,req}$ = **905** mm²/m
Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm²/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Zone 2 (825 mm - 2475 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **192** kN
Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **192** kN
Area shear reinf. req'd $A_{sv,req}$ = **905** mm²/m
Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm²/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Zone 3 (2475 mm - 3300 mm) shear - section 6.2

Shear force at support $V_{Ed,max}$ = **198** kN
Max design shear resistance $V_{Rd,max}$ = **2842** kN

PASS - Design shear force at support is less than maximum design shear resistance

Design shear force V_{Ed} = **113** kN
Area shear reinf. req'd $A_{sv,req}$ = **905** mm²/m
Area of shear reinf prov. $A_{sv,prov}$ = **1206** mm²/m

PASS - Area of shear reinforcement provided exceeds minimum required

Max. long. spacing - exp.9.6N $s_{vl,max}$ = **402** mm

PASS - Longitudinal spacing of shear reinforcement provided is less than maximum

Appendix B: Construction programme

<u>The Contractor is responsible for the final construction programme</u>

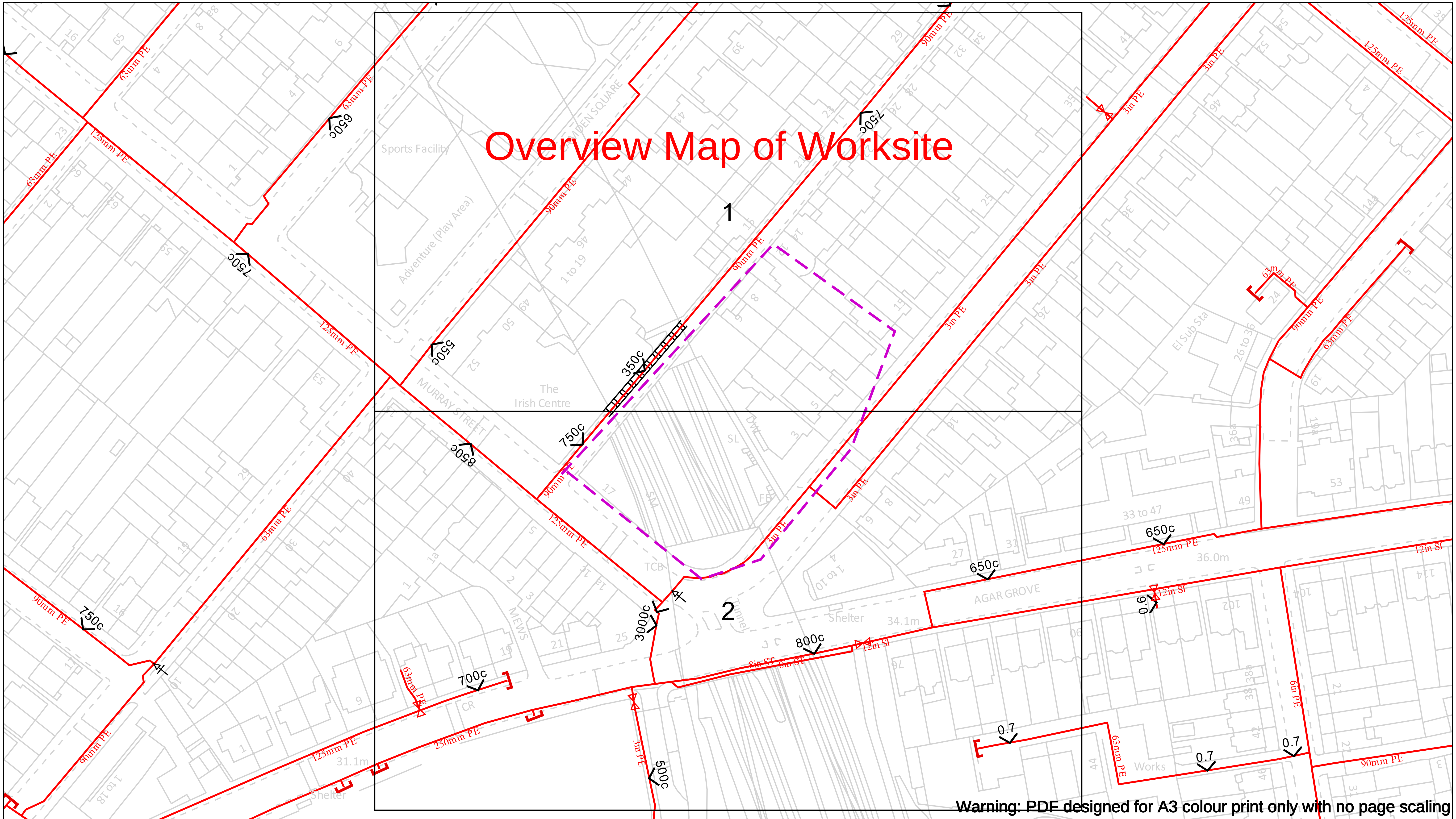
Outline construction Program

(For planning purposes only)

	Months															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Planning approval																
Derailed Design																
Tender																
Party Walls																
Monitoring of Adjacent structures																
Enabling works																
Basement Construction																
Superstructure construction																

Appendix C : Utilities Searches

CROFT STRUCTURAL ENGINEERS



View extent: 200m, 115m

In case of an emergency call 0800 111 999

Date Requested: 25/09/2022
Job Reference: 27031339
Site Location: 529678 184361
Requested by:
Mr Pawel Rogalewicz
Your Scheme/Reference: 4 Murray Mews

IMPORTANT NOTICES

This plan shows these pipes owned by Cadent Gas Limited in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GT's or otherwise privately owned may be present in this area. Information with regards to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Limited or their agents, servants or contractors for any errors or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Scale: 1:1025 (When plotted at A3)

Dig Sites — Area: — Line:

- LP Mains
- MP Mains
- IP Mains
- LHP Mains
- Valve
- Depth of cover
- Syphon
- Diameter Change
- Material Change
- Out of Standard Service

Cadent
Your Gas Network

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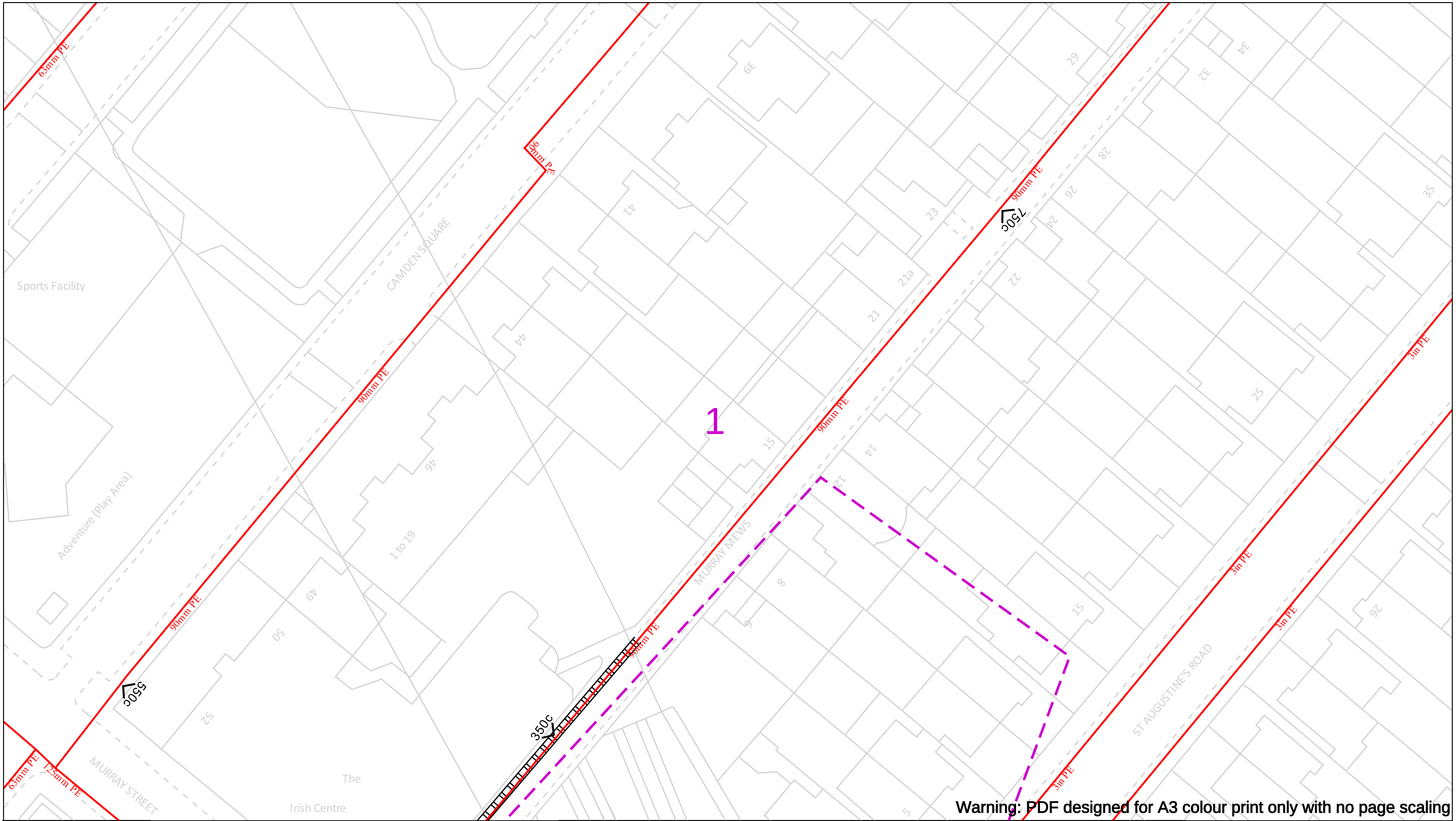

Warning: PDF designed for A3 colour print only with no page scaling

View extent: 200m, 115m

Date Requested: 25/09/2022
Job Reference: 27031339
Site Location: 529678 184361
Requested by:
Mr Pawel Rogalewicz
Your Scheme/Reference: 4 Murray Mews

Scale: 1:500 (When plotted at A3)

IMPORTANT NOTICES

This plan shows these pipes owned by Cadent Gas Limited in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GT's or otherwise privately owned may be present in this area. Information with regards to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Limited or their agents, servants or contractors for any errors or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

In case of an emergency call 0800 111 999

50m

Dig Sites — Area: — Line:

LP Mains	Valve	Diameter Change	
MP Mains	Depth of cover	Material Change	
IP Mains	Syphon	Out of Standard Service	
LHP Mains			

Cadent
Your Gas Network

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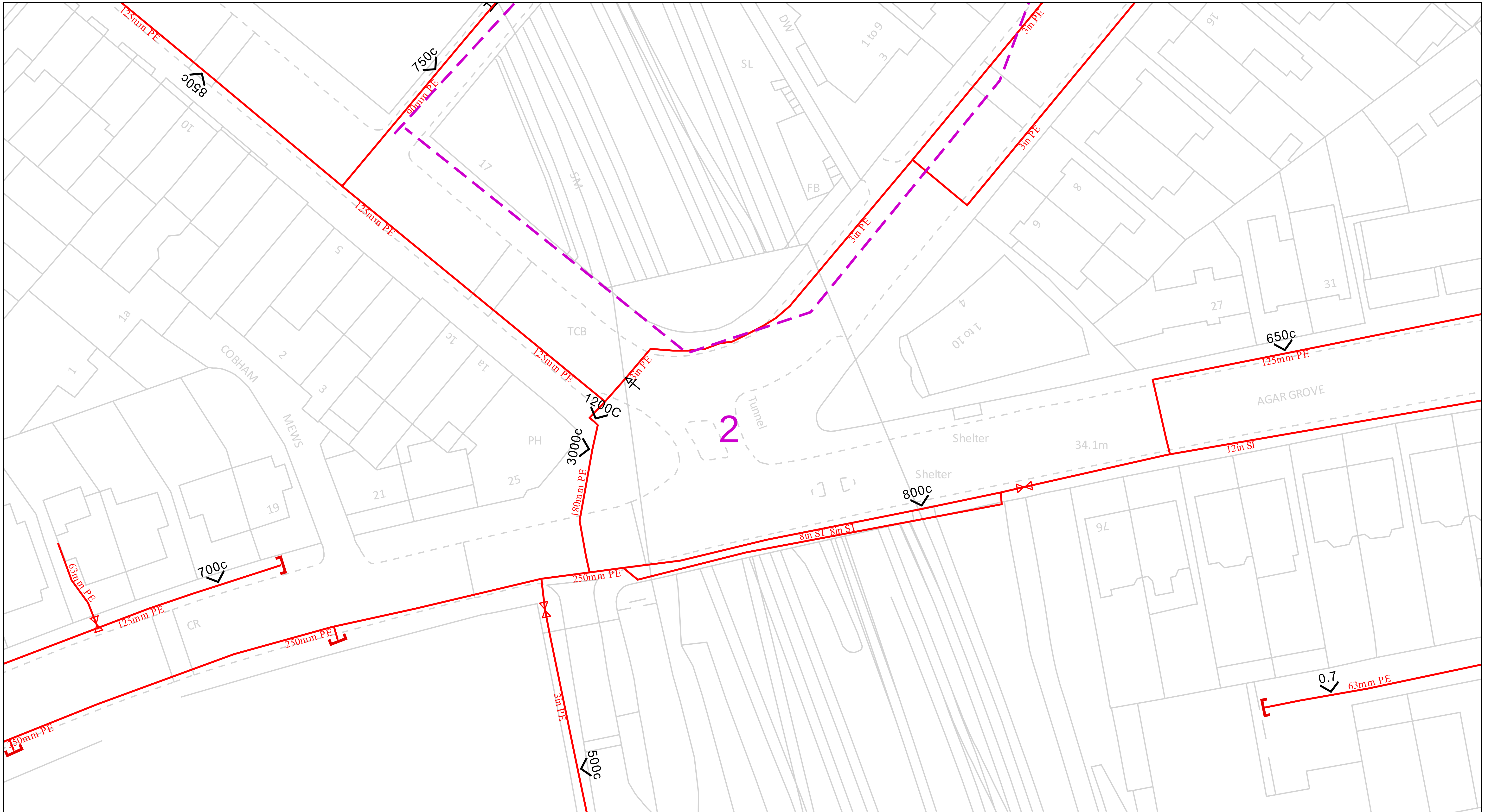

Warning: PDF designed for A3 colour print only with no page scaling

Date Requested: 25/09/2022
Job Reference: 27031339
Site Location: 529678 184361
Requested by:
Mr Pawel Rogalewicz
Your Scheme/Reference: 4 Murray Mews

Scale: 1:500 (When plotted at A3)

View extent: 200m, 115m

IMPORTANT NOTICES

This plan shows these pipes owned by Cadent Gas Limited in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GT's or otherwise privately owned may be present in this area. Information with regards to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Limited or their agents, servants or contractors for any errors or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

In case of an emergency call 0800 111 999

50m

Dig Sites — Area: Line:

LP Mains
MP Mains
IP Mains
LHP Mains

Valve
Depth of cover
Syphon
Diameter Change
Material Change
Out of Standard Service

Cadent
Your Gas Network

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Asset location search

Property Searches

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

Search address supplied	4 Murray Mews Murray Mews 4 Murray Mews London NW1 9RJ
Your reference	4 Murray Mews
Our reference	ALS/ALS Standard/2022_4726679
Search date	29 September 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Search address supplied: 4 Murray Mews, Murray Mews, 4, Murray Mews, London, NW1 9RJ

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 0800 009 4540, 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

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.

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: 0800 009 3921
Email: developer.services@thameswater.co.uk

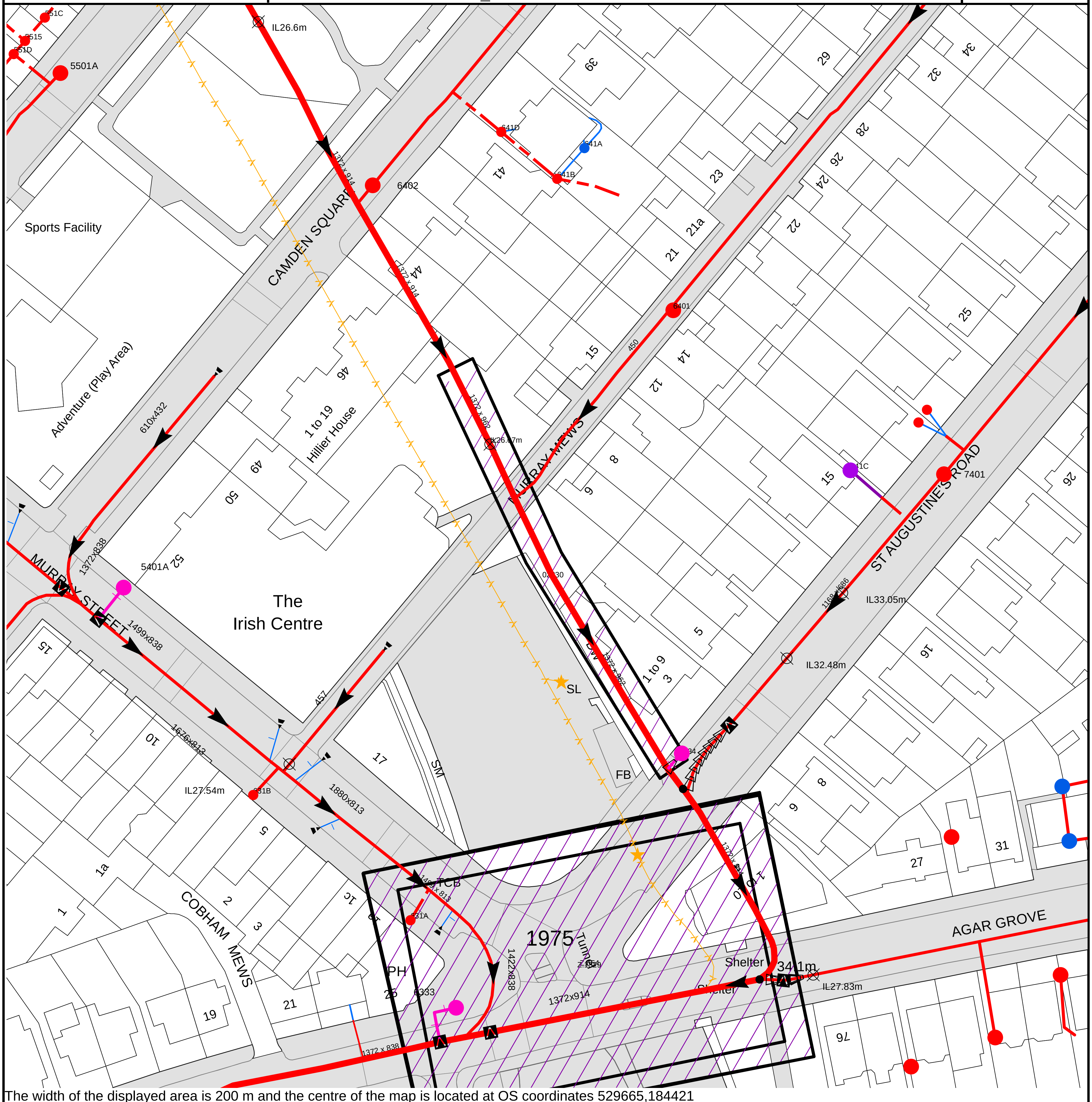
Clean Water queries

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: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4726679



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 529665,184421

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.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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
741B	n/a	n/a
741A	n/a	n/a
6401	36.45	32.54
641A	n/a	n/a
551D	n/a	n/a
5515	n/a	n/a
551C	n/a	n/a
5501A	36.42	32.86
5401A	n/a	n/a
6402	37.06	31.54
641D	n/a	n/a
641B	n/a	n/a
73DE	n/a	n/a
73DF	n/a	n/a
73BB	n/a	n/a
73BH	n/a	n/a
73CD	n/a	n/a
73BG	n/a	n/a
6334	34.7	25.63
7401	36.89	33.79
741C	n/a	n/a
631B	n/a	n/a
631A	n/a	n/a
6333	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.

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

Storm Sewer
Sludge Sewer
Foul Trunk Sewer
Surface Trunk Sewer
Combined Trunk Sewer
Foul Rising Main
Surface Water Rising Main
Combined Rising Main
Vacuum
Thames Water Proposed
Vent Pipe
Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

Sewer
Culverted Watercourse
Proposed
Decommissioned Sewer
Content of this drainage network is currently unknown
Ownership of this drainage network is currently unknown

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
Meter
Dam Chase
Vent
Fitting

Operational Controls

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

Ancillary
Drop Pipe
Control Valve
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.

Inlet
Outfall
Undefined End

Other Symbols

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

Change of Characteristic Indicator
Public / Private Pumping Station
Invert Level
Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement
Chamber
Operational Site

Ducts or Crossings

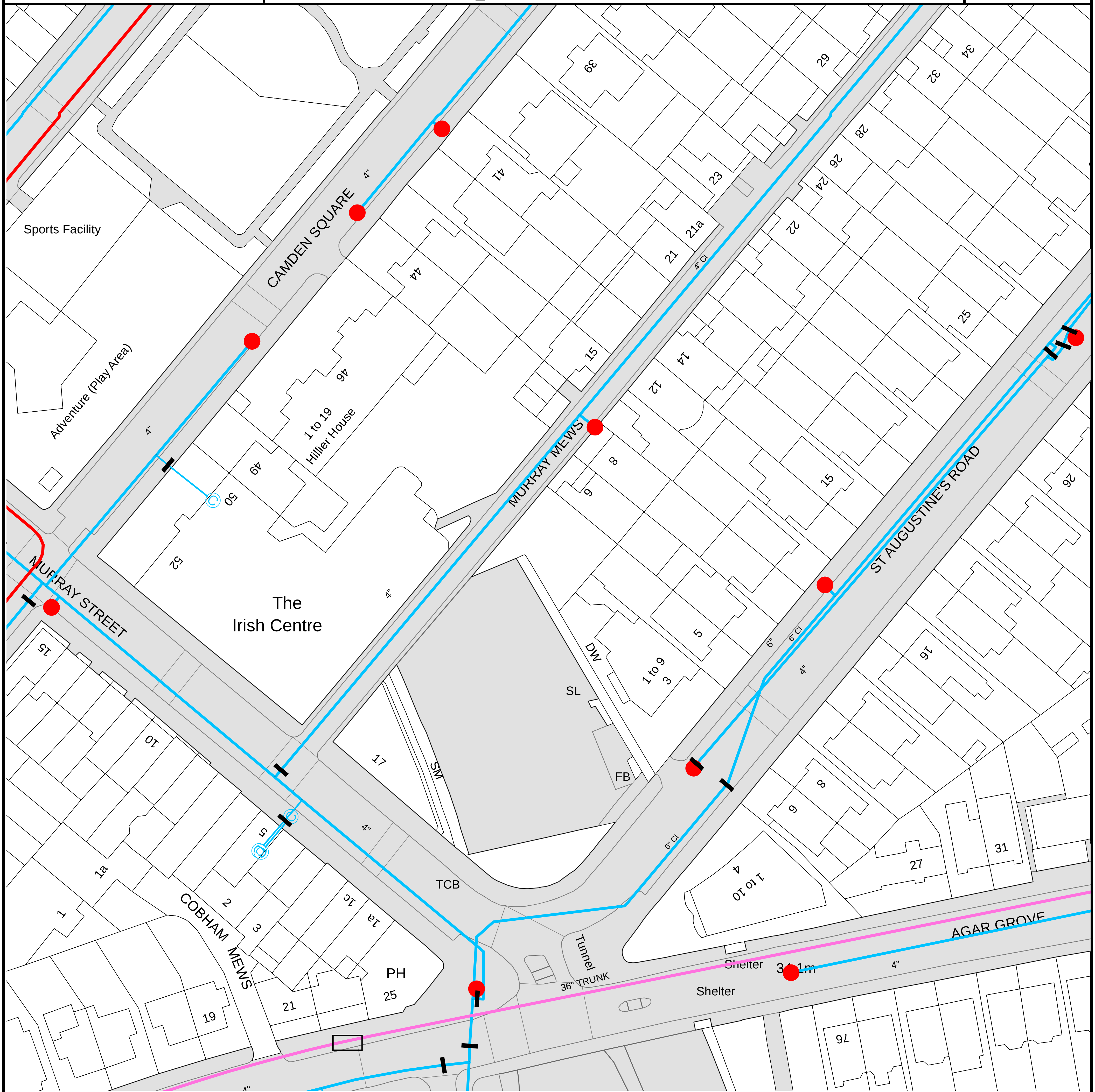
Casement
Conduit Bridge
Subway
Tunnel

Ducts may contain high voltage cables. Please check with Thames Water.

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the 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 indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimeters. 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, please contact Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2022_4726679



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 529665, 184421.

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.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

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

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.

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

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

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.

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')

Valves

General PurposeValve

Air Valve

Pressure ControlValve

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

Casement: Ducts may contain high voltage cables. Please check with Thames Water.

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.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call **0800 009 4540** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

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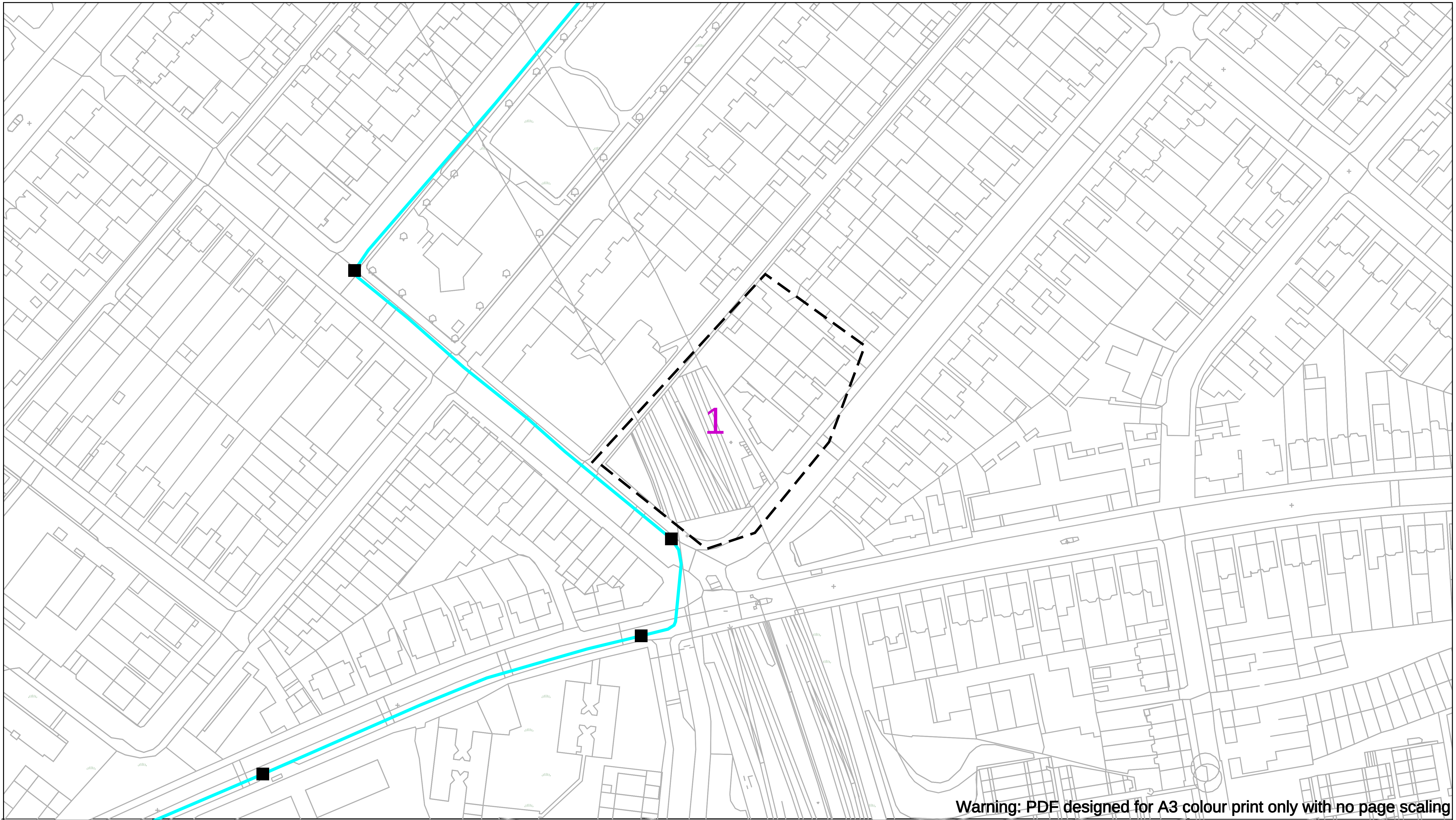

Warning: PDF designed for A3 colour print only with no page scaling

Contact us:

planprotection@eunetworks.com

Date Requested: 25/09/2022
Job Reference: 27031339
Site Location: 529678 184361
Requested by:
Mr Pawel Rogalewicz
Your Scheme/Reference: 4 Murray Mews

Scale: 1:1250 (When plotted at A3)

100m

Dig Sites Line: - - - - Area:

Key

Duct | Long Haul (LHN) Duct | Chamber Location

IMPORTANT WARNING

The information supplied is given in good faith as a guide to locating underground apparatus. Its accuracy cannot be guaranteed, nor does it include comprehensive information about the existence or location of service pipes or cables to individual premises. The responsibility for locating and avoiding damage to apparatus on site shall be that of the persons proposing to excavate in the street shall be liable to the apparatus owner and any third party who may be affected in any way for any loss or damage caused by their failure to do so.

IF IN DOUBT PLEASE ASK! PHONE: 07896 087585

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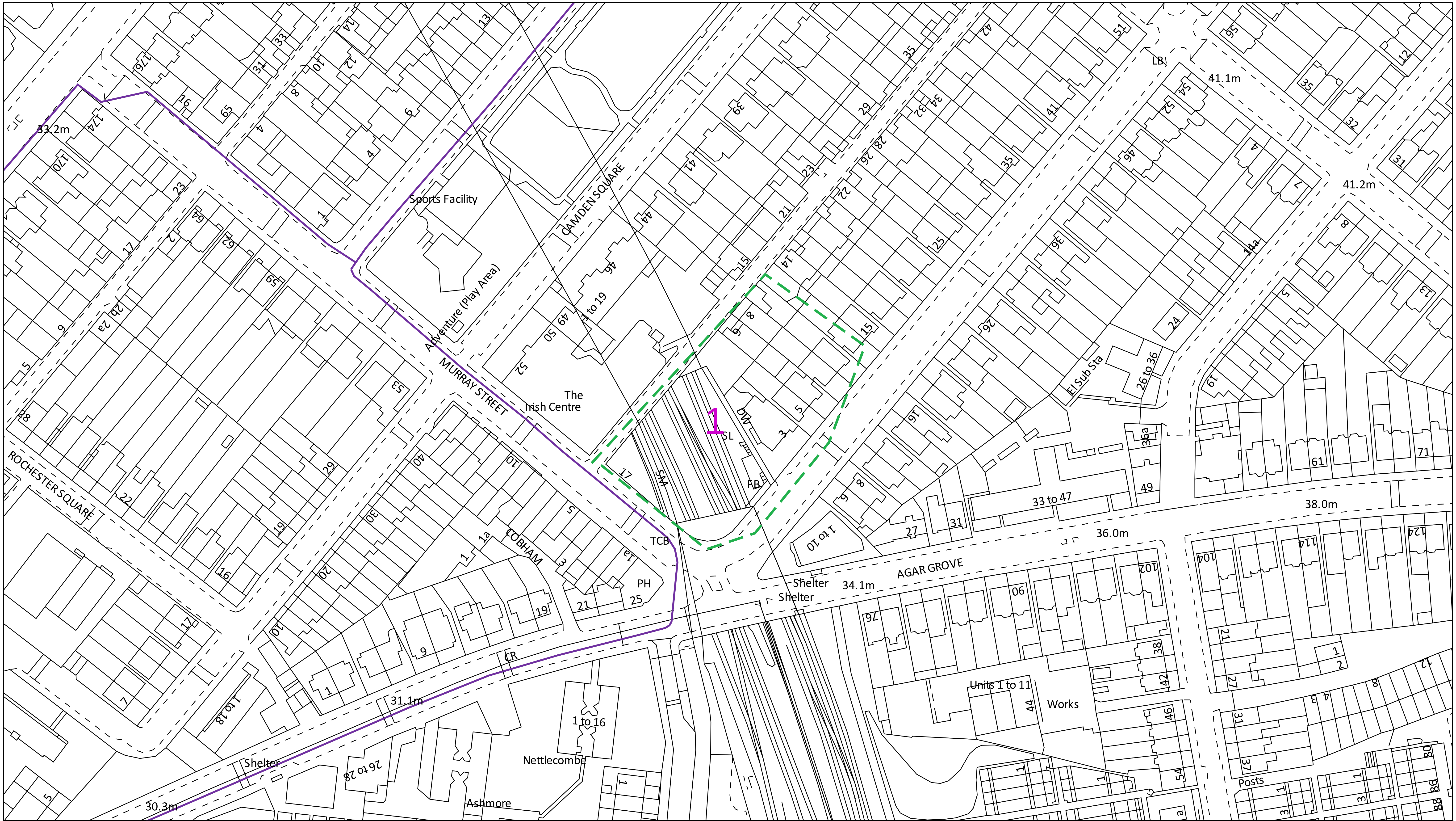

0 100 m

Dig Sites Area: Line:

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Date Requested: 25/09/2022
Job Reference: 27031339
Site Location: 529678 184361

Requested by:
Mr Pawel Rogalewicz
Your Scheme/Reference: 4 Murray Mews

Scale: 1:1250 (When plotted at A3)

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Neos Network Underground Route

Emergency Number: 0345 305 3337

NEOS NETWORKS

Registered Office:

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200 Dunkeld Road,
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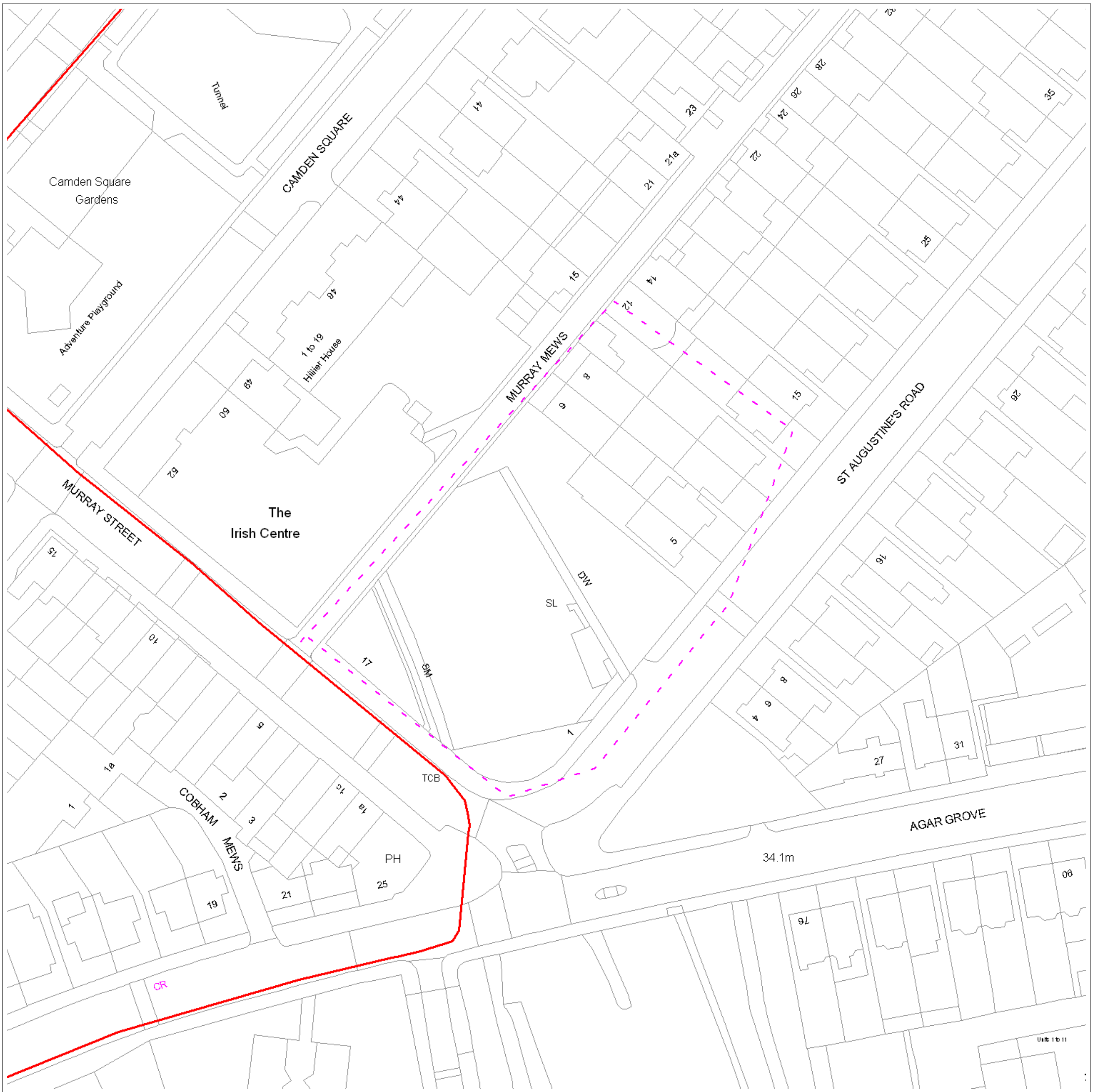

Date Requested: 26/09/2022

Requested by: Pawel Rogalewicz

Company: Croft SE

Job Reference: 27031339

Your Scheme/Reference: 4 Murray Mews

ZAYO DUCT

or ZAYO CHAMBER

Dig Sites: Line Area

Scale on A4 paper: 1:1000

4th Floor Harmsworth House
13-15 Bouverie Street
London EC4Y 8DP

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zayoplantenquiries@jsmgroup.com

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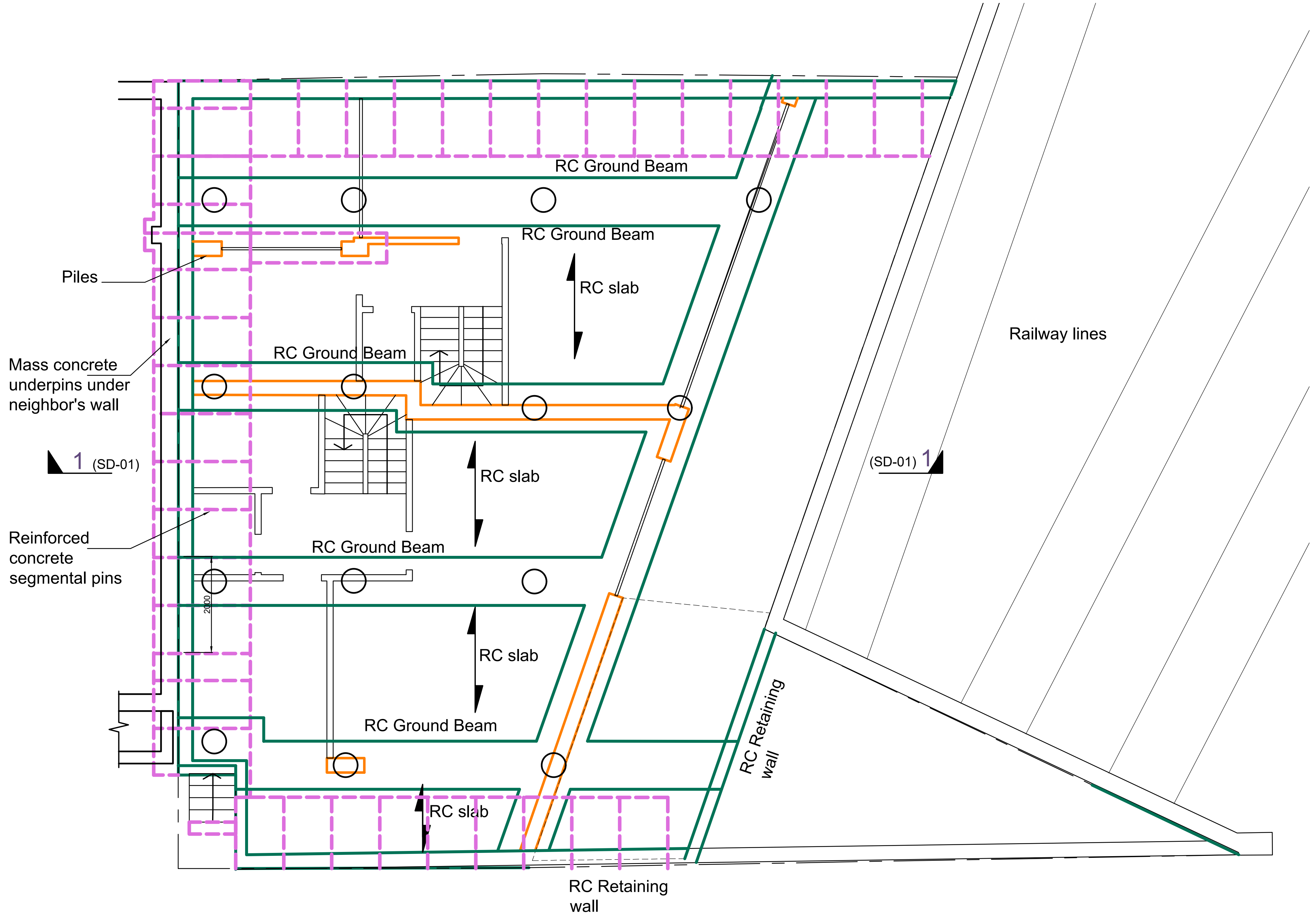
Appendix D : Structural Drawings

1:100 Basement Plan on A3 Showing Neighbouring basements if present
1:100 Ground Floor plan on A3 Showing Neighbouring property
1:50 Section on A3 Including section through Neighbouring Footings



Proposed Lower Ground Floor Plan

Scale 1:100

Rev	Date	by	Amendments
-	30.09.22	VLD	First Issue

Job Number	Dwg Number
220901	SL-01
Scale	Rev
As shown @A3	-
By	Approved by
VLD	VLD

Paul Stuart Ltd.

4 Murray Mews, NW1 9RJ

Proposed Lower Ground Floor Plan

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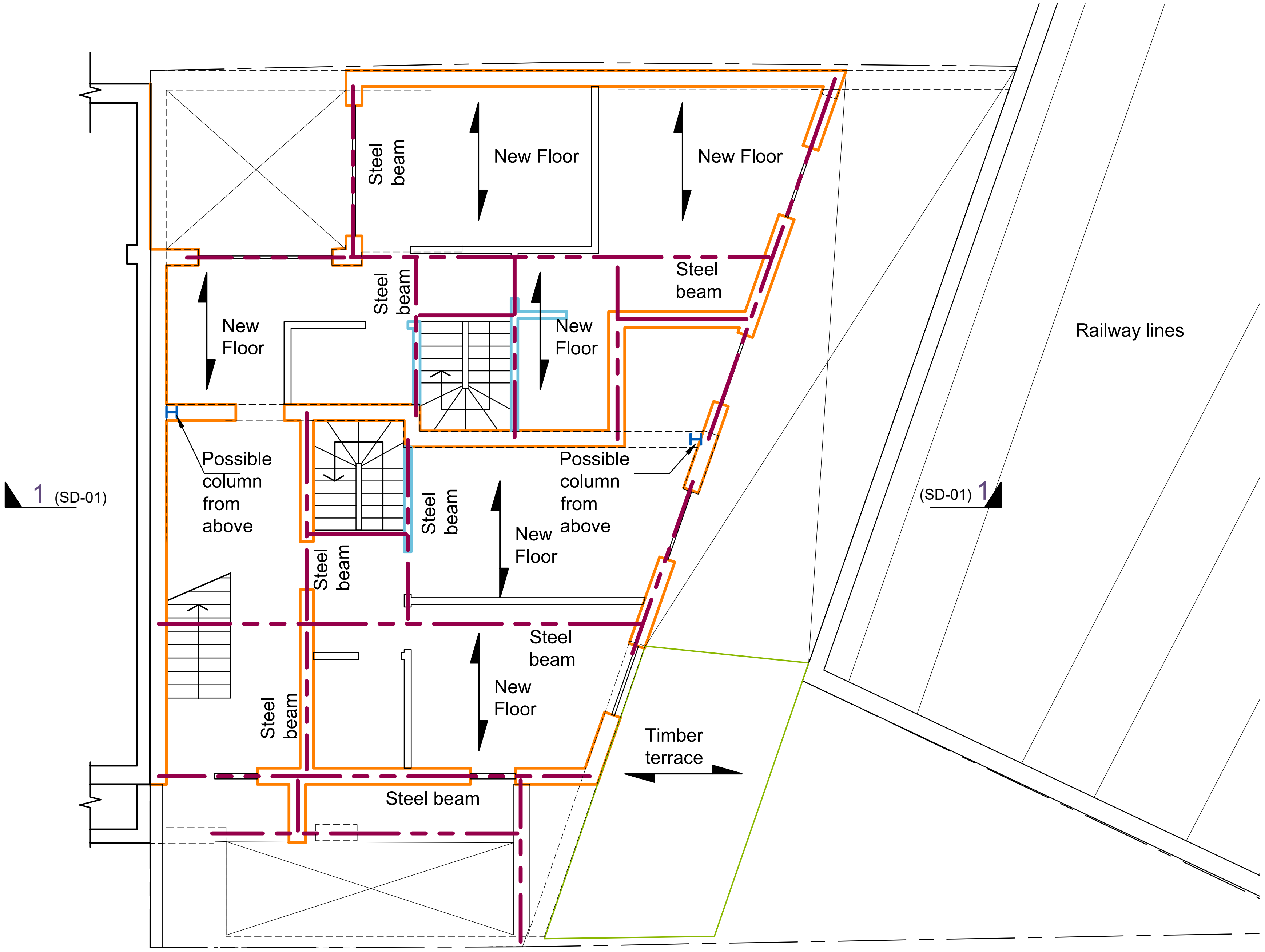

Proposed Upper Ground Floor Plan

Scale 1:100

Rev	Date	by	Amendments
-	Date	VLD	First Issue

Job Number	Dwg Number
220901	SL-02
Scale	Rev
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By	Approved by
VLD	VLD

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Proposed Ground Floor Plan

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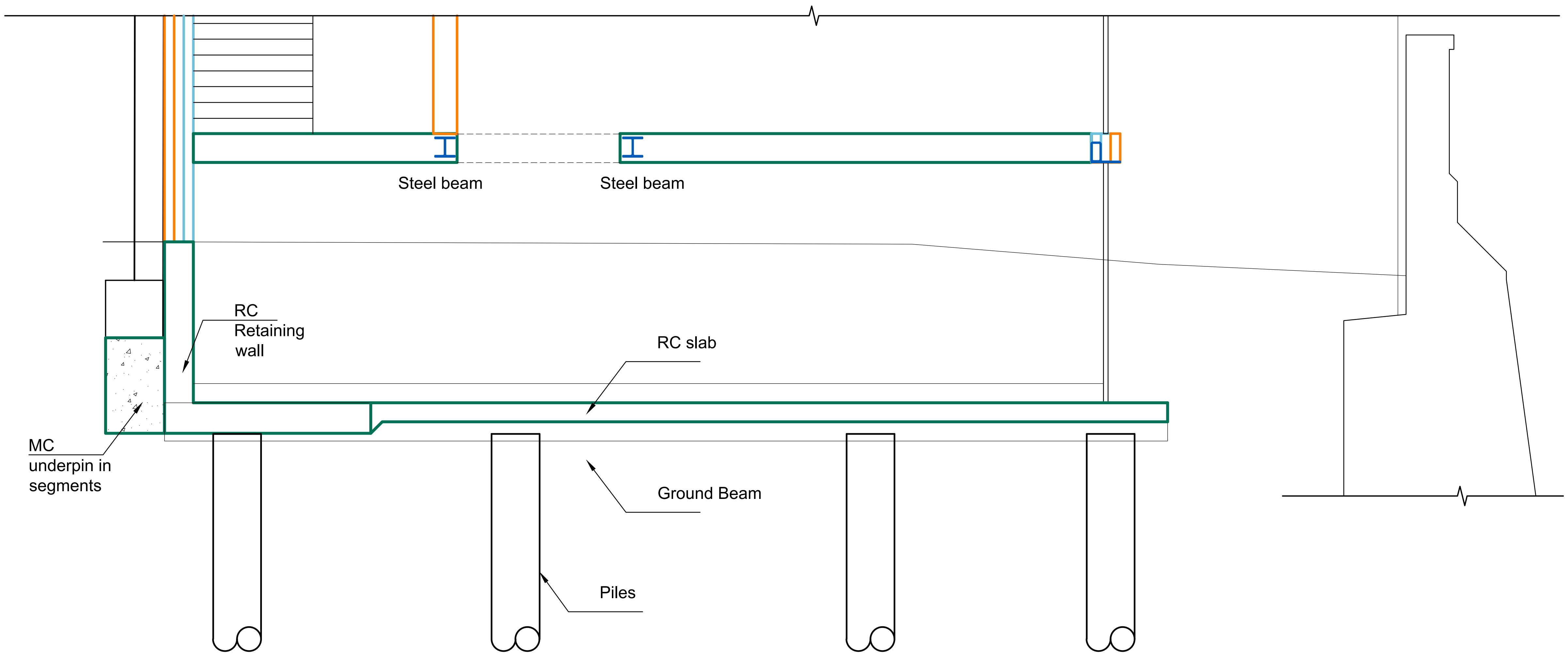

Section 1-1
Scale 1:50

Rev	Date	by	Amendments
-	Date	VLD	First Issue

Job Number 220901	Dwg Number SD-01
Scale As shown @A3	Rev -
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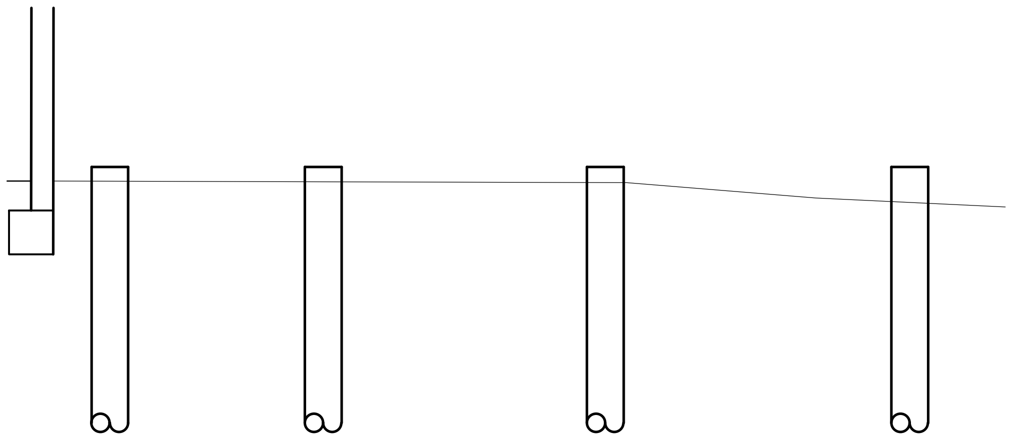
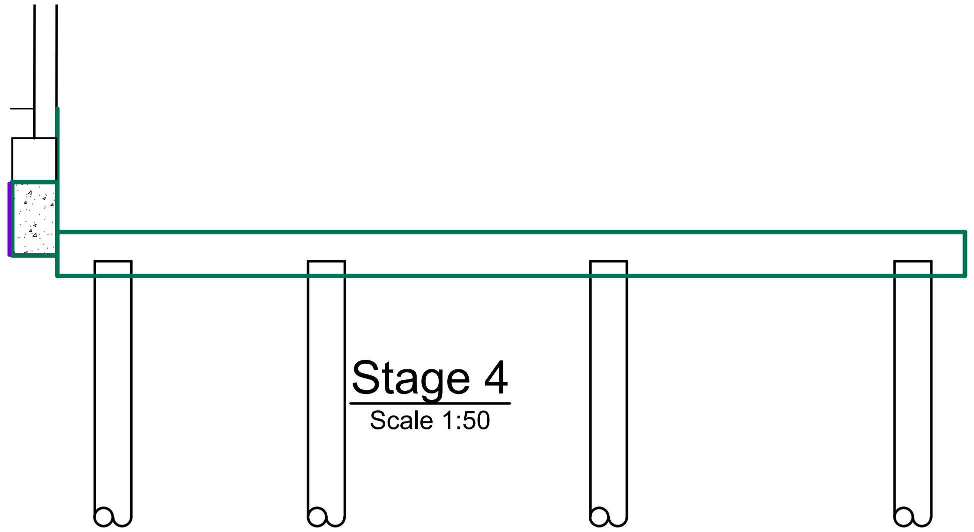
Appendix E : Temporary Works Sequence

- Lateral propping
- Sequencing



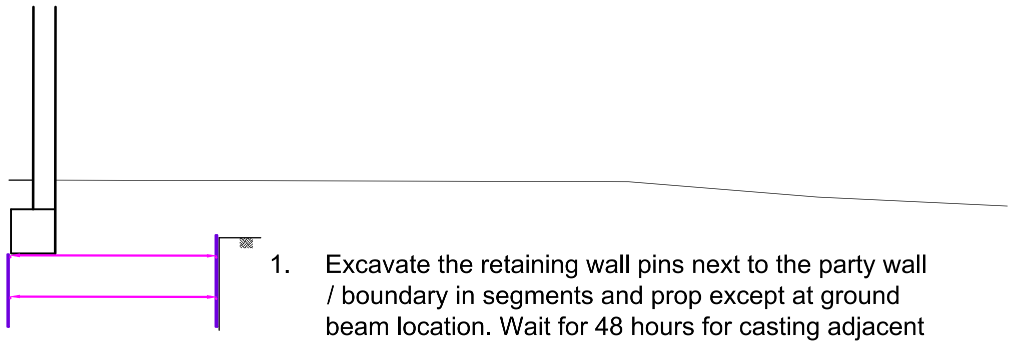
1. Clear the site
2. Place the piling mat
3. Install piles as per the piling contractor's method statement

Stage 1
Scale 1:50



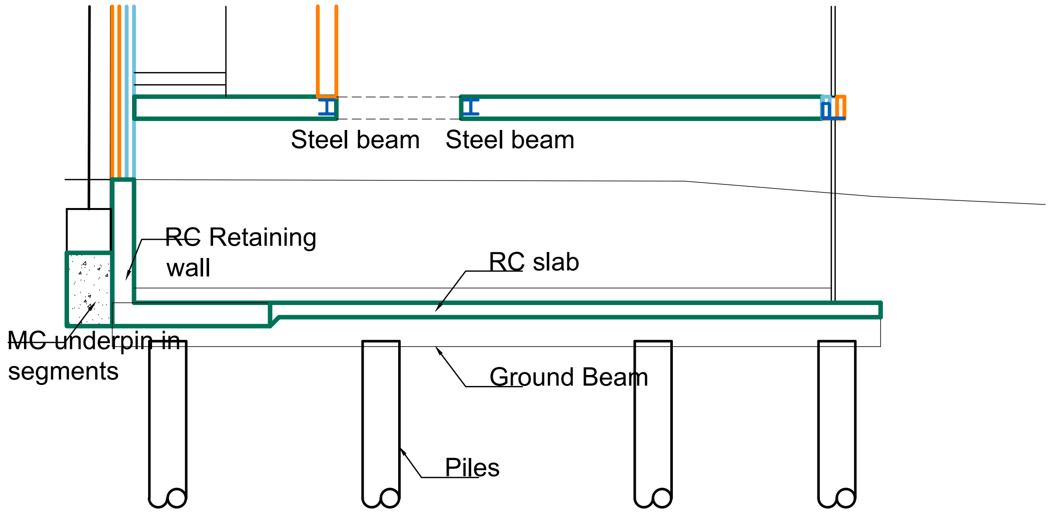
Stage 4
Scale 1:50

1. After completing the segmental pins, excavate down at ground beams location and cut the piles
2. Cast the ground beam



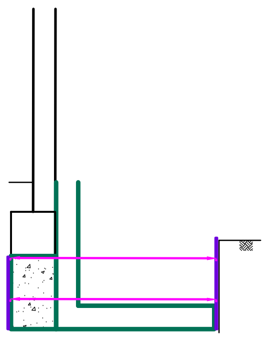
1. Excavate the retaining wall pins next to the party wall / boundary in segments and prop except at ground beam location. Wait for 48 hours for casting adjacent pin.

Stage 2
Scale 1:50



1. Complete the ground floor structure and super structure

Stage 5
Scale 1:100



1. Cast the pins and prop

Stage 3
Scale 1:50

Rev	Date	by	Amendments
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Scale	Rev
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By	Approved by
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Temporary Works Sequence

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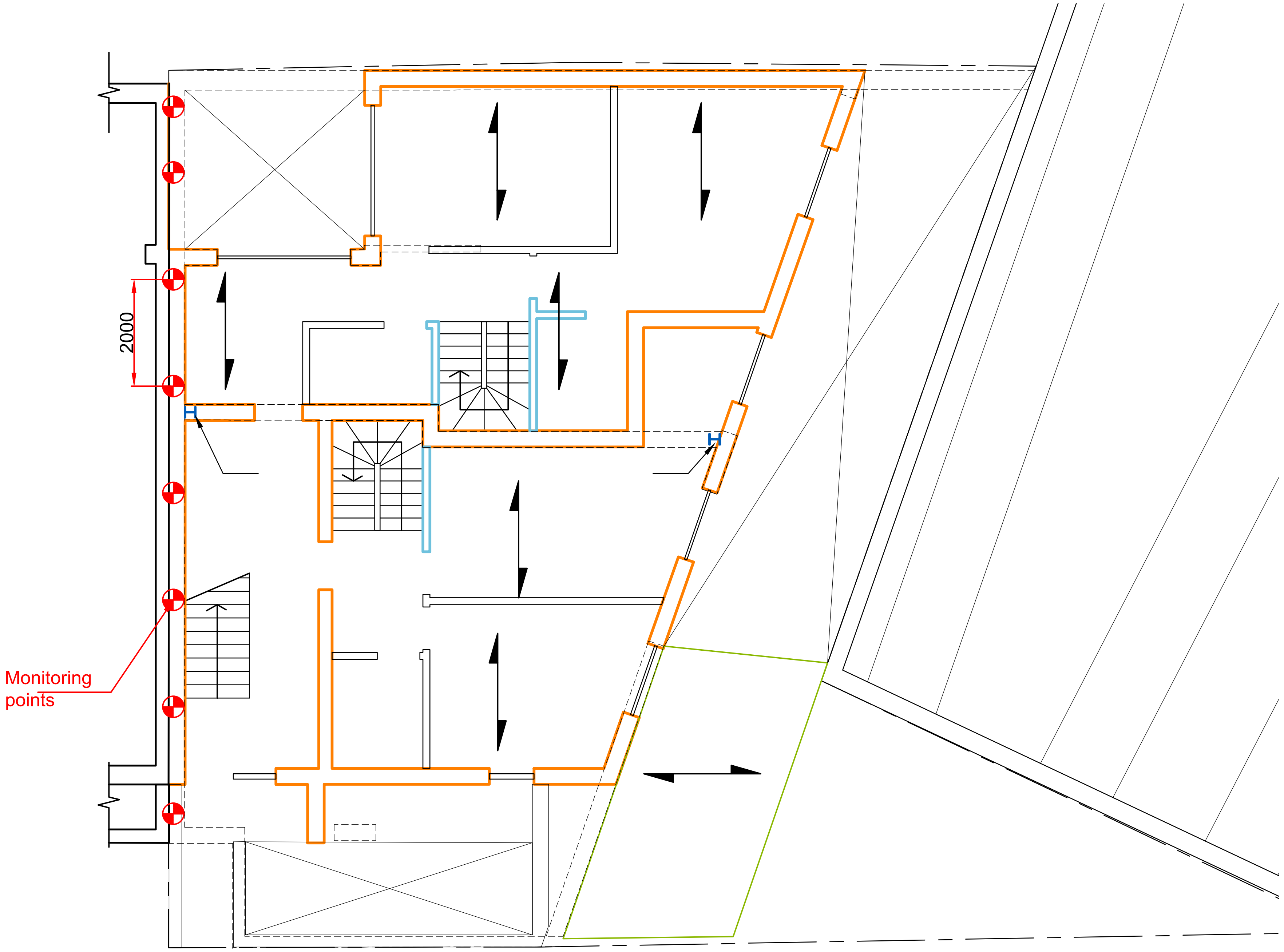
Appendix F : Monitoring locations

For Trigger values and frequency see BiA report



Monitoring Points

Scale 1:100

Rev	Date	by	Amendments
-	Date	VLD	First Issue

Job Number	Dwg Number
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Scale	Rev
As shown @A3	-
By	Approved by
VLD	VLD

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Monitoring Points

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