

soiltechnics

environmental and geotechnical consultants

New basement and extensions
95 Hillway, Highgate
London
N6 6AB

Basement Impact Assessment Report

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BASEMENT IMPACT ASSESSMENT REPORT

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Report originators

Prepared by



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Aerial photograph of property



Approximate property boundaries edged in red.

Report status and format

Report section	Principal coverage	Report status	
		Revision	Comments
1	Introduction and brief		
2	Description of the property and project proposals		
3	Desk study information and site observations		
4	Ground investigations		
5	External ground movements around the basement		
6	Hardened areas		
7	Tree removal		
8	Existing damage to adjacent buildings		
9	Subterranean (Groundwater flow) screening		
10	Stability impact identification		
11	Surface flow and flooding impact identification		
12	Summary and Conclusion.		

List of appendices

Appendix	Content
A	Copy of drawings illustrating proposal
B	Ground investigation data
C	Copy of CV of Nigel Thornton and examples of Soiltechnics commissions on basement investigations and analysis.
D	Copy of comments on this report by Chartered Geologist.

1 Introduction and brief

1.1 Objectives

This report presents a Basement Impact Assessment (BIA) for a proposed development at 95 Hillway, Highgate in London.

The principal objective of the assessment is to present evidence to support a planning application for the project as required by Camden Planning Guidance (CPG4) '*Basements and lightwells*'.

1.2 Client instructions and confidentiality

This report has been produced following instructions received from C.J O'shea and Co Ltd.

This report has been prepared for the sole benefit of our above named instructing client, but this report, and its contents, remains the property of Soiltechnics Limited until payment in full of our invoices in connection with production of this report.

1.3 Author qualifications

This report has been prepared by a Chartered Civil Engineer, (C.Eng., M.I.C.E) who is also a Fellow of the Geological Society (FGS). The Author is a practising Civil Engineer with specialist experience (34 years) in geotechnical engineering (including basement construction), flood risk and drainage. A copy of my CV and examples of experience in basement construction is presented in Appendix C. This report has been reviewed by John Evans of Chord Environmental who is a Chartered Geologist and expertise in hydrogeology. Copies of their comments are presented in appendix D.

1.4 Guidance used for scoping exercise

As described in paragraph 1.1.2 above we have followed Camden Planning Guidance (CPG4) '*Basements and lightwells*', and Camden geological, hydrogeological and hydrological study report '*Guidance for subterranean development*,' produced by Arup on behalf of the London Borough of Camden. We have also referred to the '*Strategic Flood Risk Assessment Report for North London*' dated August 2008 prepared by Mouchel, as well as other readily available information on websites. This report has considered all four stages of the BIA process as described in CPG4, by incorporating the results of a ground investigation carried out in advance of production of this report.

2 Description of the property and project proposals

2.1 Description of the property

The site is currently occupied by a two storey semi-detached house with a garage. Based on inspection of old Ordnance Survey maps the house was constructed in the early 1900's. There are gardens both to the front and rear principally laid to grass with some trees. General ground levels in the area fall in a southern direction and based on a topographical of and around the property, ground levels fall by about 6 degrees generally following Hillway. There is also an air raid shelter located in the rear north western part of the property with floor levels about 1.5m below surrounding garden levels.

Front garden levels are reasonably uniform, but there is a shallow retaining wall along the southern boundary down to neighbouring gardens. There is a drop of about 1.3m from ground floor levels down to rear gardens. Again rear garden levels are reasonably uniform.

2.2 Project proposals

Proposals are to construct a single storey deep basement to the rear part of the building of together with a single storey ground floor extension to the rear and a single storey extension to the front of the existing garage. As ground levels to the rear of the existing building are about 1.3m below ground floor levels excavations to formation levels of the new basement will extend around 1.9m below ground levels and around 0.8m below air raid shelter floor levels. Excavations to basement floor formation level below the existing house / garage could extend to depths of around 3.2m.

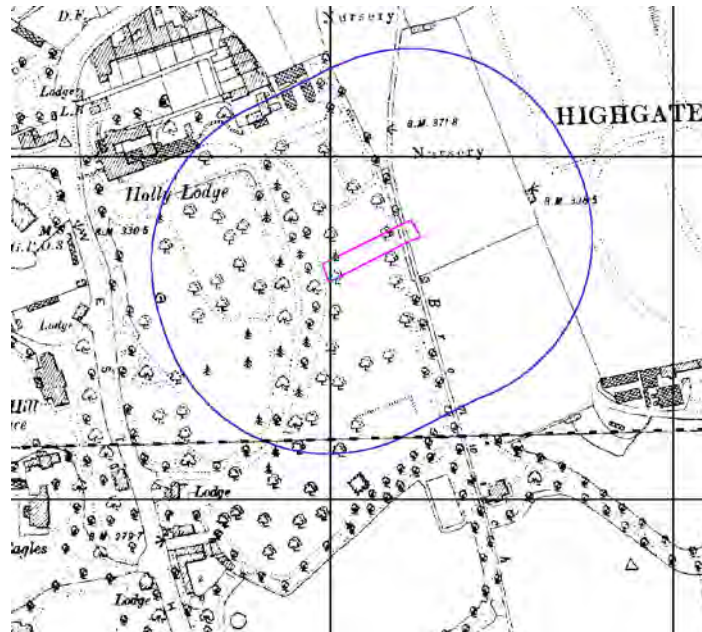
Our client's Structural Engineer proposes to underpin existing buildings around the perimeter of the proposed basement allowing basement excavations to be carried out with temporary propping providing lateral restraint to the underpinning whilst a permanent concrete box to form the basement is installed.

Copies of our client's Structural Engineer's drawings (Form) showing project proposals outlining construction details are presented in Appendix A.

3 Desk study information and site observations

3.1 Site history

Review of Ordnance Survey and London town maps dating back to 1850s indicate the site comprised open fields / parkland until the 1930s when the current footprint of the property and surrounding buildings is recorded. Extract copies of key mapping is presented below with property boundaries edged in purple.



Extract copy of 1896 map



Extract copy of 1936 map

3.2 Geology and geohydrology of the area

3.2.1 Geology

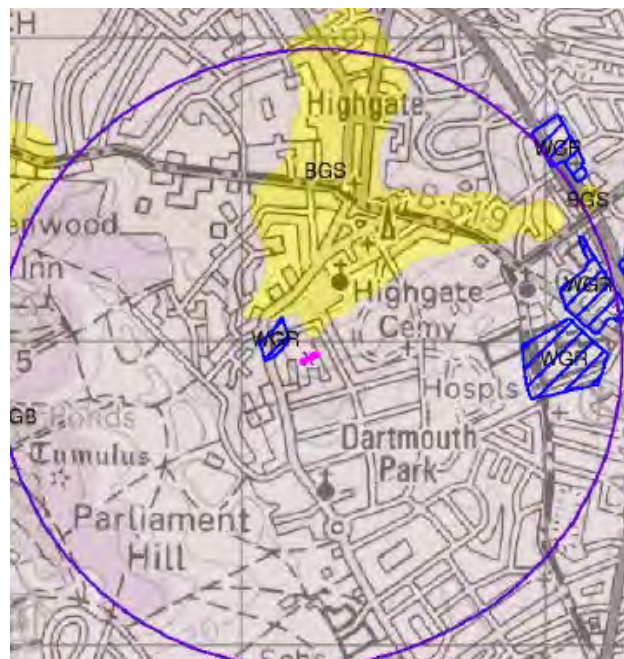
Inspection of the geological map of the area published by the British Geological Survey (BGS) indicates the following sequence of strata. The thickness of the strata has been obtained from a combination borehole record data formed within 500m of the property available on the BGS website, and geological sections shown on the BGS map.

Summary of Geology and likely aquifer containing strata					
Strata	Bedrock or drift	Approximate thickness	Typical soil type	Likely permeability	Likely aquifer designation
Claygate Beds	Bedrock	5m	Clays	Low	Secondary Aquifer
London Clay Formation	Bedrock	100	Clays	Low	Unproductive
Thanet sands	Bedrock	17	Fine sands	Low/moderate	Secondary Aquifer
Chalk	Bedrock	200	Chalk	High	Principal

Table 3.2

The soil types and assessments of permeability are based on geological memoirs, in combination with our experience of investigations in these soil types.

An extract copy of the geological map (based on Envirocheck data base) is presented below, with brown shading representing the outcrop of the London Clay Formation. The yellow represents the Bagshot Beds (on higher ground) which overlie the Claygate beds. Areas shaded in blue denote worked ground. The property is located within the purple box.



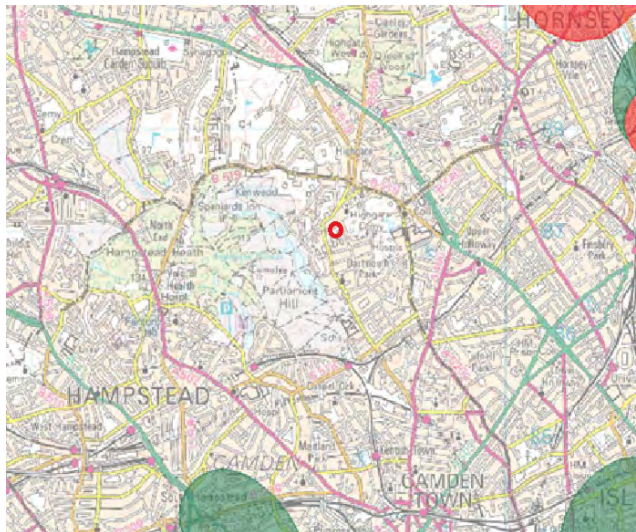
3.2.2 Geohydrology

The Claygate Member and overlying Bagshot Formation strata are classified Secondary A Aquifer, which are defined as deposits with permeable layers capable of supporting local water supplies and base flow to watercourses. The London Clay is classified as unproductive and regarded as not containing groundwater in exploitable quantities.

Chalk is classified a Principal Aquifer. Principal aquifers are defined as deposits exhibiting high permeability capable of high levels of groundwater storage. Such deposits are able to support water supply and river base flows on a strategic scale.

3.2.3 Source protection zone

The site is not recorded as being located within or close to a zone protecting a potable water supply abstracting from a principle aquifer (i.e. a source protection zone). An extract of the plan recording source protection zones is presented below, with green shading representing outer protection zones and red inner protection zones. The property is located within the red circle and remote from source protection zones.



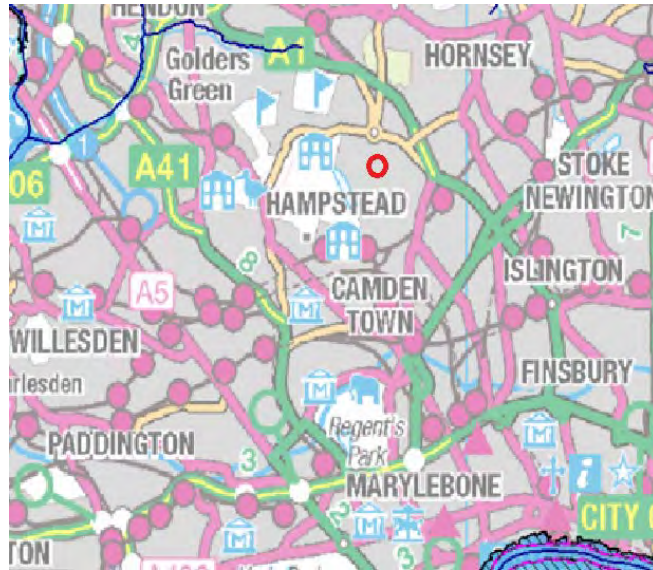
3.3 Quarrying/mining

3.3.1 With reference to the coal mining and brine subsidence claims gazetteer for England and Wales, available on the Coal Authority web site, the area has not been subject to exploitation of coal or brine. Inspection of old Ordnance Survey maps dating back to the first editions (late 1800s) does not record any quarrying activities within 250m of the property.

3.4 Flood risk

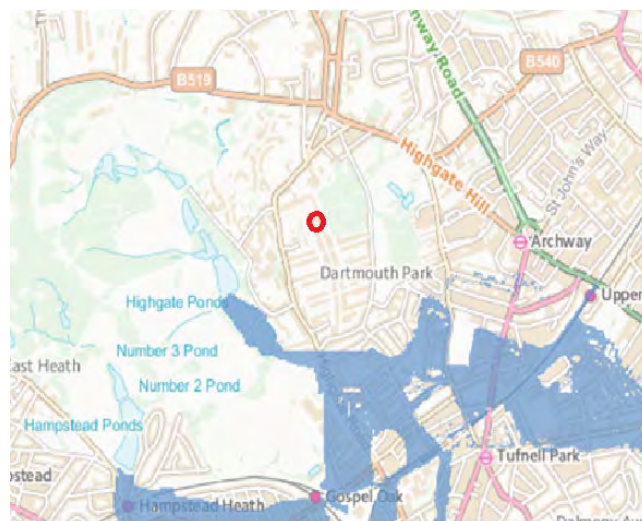
3.4.1 Fluvial/tidal flooding

The Environment Agency website indicates the site is not located within a fluvial or tidal flood plain. An extract copy of the flood risk map is presented below which shows no blue shading representative of flooding. The property is located within the red circle.



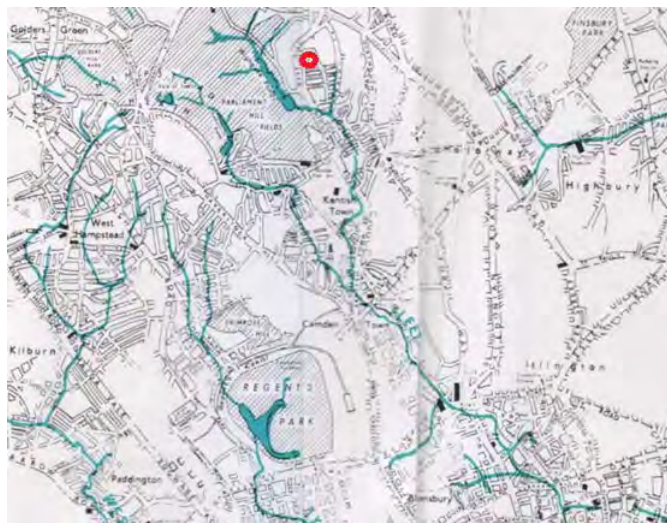
3.4.2 Flooding from Reservoirs, Canals and other Artificial Sources

The Environment Agency website indicates the site is not located within an area considered at risk of flooding from breach of reservoir containment systems. An extract copy of the flood risk map is presented below which shows no blue shading representative of flooding as a result of failure of containment systems close to the site. The property is located within the red circle

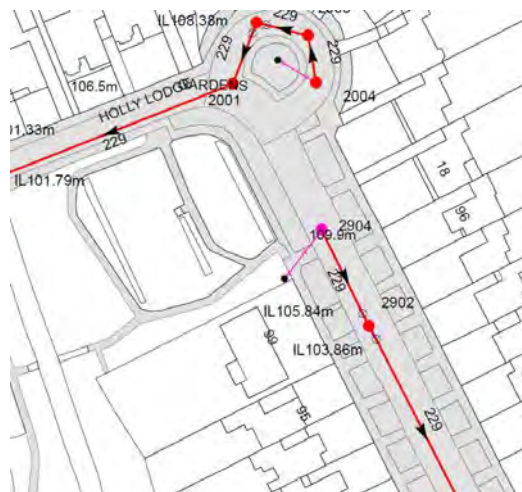


The nearest watercourse is located about 450m to the west and forms part of the upper reaches of the Fleet which follows a route in a southerly direction ultimately outfalling into the Thames. The Fleet close to the property has been dammed to form a chain of ponds known as Highgate ponds. The approximate level of the ponds is about 76m AOD with the subject property located around the 106m AOD contour, indicating the property is elevated some 30m above pond levels and thus not a risk of flooding from the ponds.

An extract of figure 11 from the Camden Geological, Hydrogeological and Hydrological Study (referenced in Section 1.4) is presented below. The blue lines show the locations of branches of the former River Fleet. The property is located within the red circle



There are below ground water supply pipes operated by Thames Water in public highways around the property. These are generally relatively small diameter pipes. It is considered that the property is unlikely to be at enhanced risk of flooding due to ruptures in the potable water supply system in the area. We have obtained a copy of Thames Water Sewer asset register, an extract copy of which is presented below. The plan shows a 229mm diameter combined sewer in Hillway with the property close to the head of the run. It is considered that the property is unlikely to be at enhanced risk of flooding from this sewer infrastructure

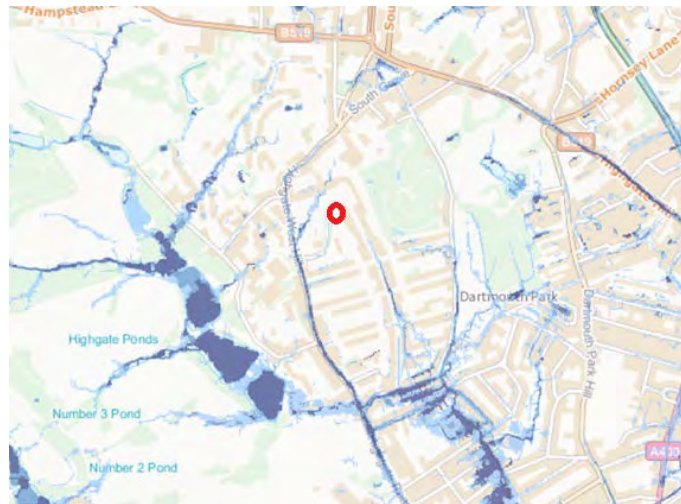


We have reviewed Map 22: Camden Flooding Map. The map does not record Hillway as a road which has suffered from flooding due to high rainfall or surcharging of sewer network during the events of 1975 and 2003.

3.4.3 Flooding from Groundwater and surface waters

Based on ground investigation data, the property is likely to be underlain with granular Claygate Member deposits, which does contain ground water in basal deposits. The property is located on locally high ground and in our opinion unlikely to be at a significant risk of being flooded from groundwaters.

We have viewed the Environment Agency web site which provides maps showing areas a risk of flooding from surface waters. An extract of the map is presented below. The property is located within the red circle and blue shading represents areas at risk of surface water flooding. The property is remote from blue shaded areas.



3.4.4 Conclusions

Based on the above, in our opinion, the property is considered unlikely to be at enhanced risk of being flooded by exceedences in capacity of foul and stormwater drainage or water supply pipes. Evidence presented above demonstrates the property is not at an enhanced risk of being affected by tidal or fluvial flooding or indeed from artificial sources.

4 Ground Investigations

4.1 Scope

A ground investigation has been carried out on site comprising the excavation of five boreholes in the depth range of 2 to 5m. In addition dynamic cone penetration testing was carried out in four locations to 9mm to provide a measure of the insitu density of the soils to below proposed basement level.

A copy of borehole records and summary of cone penetration testing is presented in appendix B together with a plan showing the location of exploratory points.

4.2 Summary of ground conditions

Each borehole encountered a similar soil profile of made ground overlying naturally deposited soils considered to be granular Claygate Member deposits. Made Ground was measured in the range of 1.8 to 0.5m in front gardens and 0.2m in rear gardens and generally comprises gravelly clays.

4.3 Ground waters

Groundwater was encountered in borehole DTS01 as a seepage at 4.7m depth. Groundwater was not encountered in the other borehole excavations. Water level monitoring stand pipes were installed in three of the boreholes and water levels were monitored during return visits to site. The following table summarises our observations with water levels related to a formation level below underpinning bays at 104.21m AOD. It is important to note that a slight accumulation of water 30 to 40mm deep was observed in borehole DTS03 (excavated to 2m) and this is likely to represent leakage at the cap level rather than a water table. An adjacent borehole, DTS05 had no accumulation of water. Based on this, ground water levels measured in borehole DTS01 at a depth of around 4.5m (102.8m) is considered representative of a water table.

With a water table at 102.8m (varying from 102.74 to 102.85m), ground water will be located some 1.56 to 1.67m below underpinning bay formation levels. Given the topography of the area, groundwater is likely to flow in a southwesterly direction but at a depth well below basement levels. On this basis the proposed basement will not interrupt any ground water flows.

Date	Borehole	Approximate ground level	Water depth (m)	Level (m)	Depth below formation level (m)
03/11/2014	DTS01	107.34	4.6	102.74	1.67
10/11/2014	DTS01	107.34	4.49	102.85	1.56
10/11/2014	DTS01	107.34	4.52	102.82	1.59
14/11/2014	DTS01	107.34	4.48	102.86	1.55
03/11/2014	DTS03	105.35	Dry		
10/11/2014	DTS03	105.35	1.97	103.38#	1.03
14/11/2014	DTS03	105.35	1.96	103.39#	1.02
03/11/2014	DTS05	105.83	Dry		
10/11/2014	DTS05	105.83	Dry		
14/11/2014	DTS05	105.83	Dry		

5 External ground movements around basement

5.1 Construction proposals

Proposals are to construct a single storey deep basement to the rear part of the building of together with a single storey ground floor extension to the rear and a single storey extension to the front of the existing garage. As ground levels to the rear of the existing building are about 1.3m below ground floor levels excavations to formation levels of the new basement will extend around 1.9m below ground levels and around 0.8m below air raid shelter floor levels. Excavations to basement floor formation level below the existing house / garage could extend to depths of around 3.2m.

Our client's Structural Engineer proposes to underpin existing buildings around the perimeter of the proposed basement allowing basement excavations to be carried out with temporary propping providing lateral restraint to the underpinning whilst a permanent concrete box to form the basement is installed.

For the sake of simplicity we have considered a worst case scenario of the excavation to formation level of the basement floor extending to around 3.2m.

5.2 Settlement around and inward yielding of basement excavations

The following analysis is based on observations of ground movements around basement excavations in clays as reported in Tomlinson '*Foundation design and construction*' (seventh Edition)

It is recognised that some inward yielding of supported sides of strutted excavations and accompanying settlement of the retained ground surface adjacent to the excavation will occur even if structurally very stiff props / strutting is employed. The amount of yielding for any given depth of excavation is a function of the characteristics of the supported soils and not the stiffness of the supports. Based on observations of other excavations in granular sands (which will be the case at this site) the average maximum yield / excavation depth (%) was 0.19 with a range of 0.04 to 0.46. Assuming a maximum excavation depth of 3.25m then the likely inward yield will be in the order of $3.2 \times 0.19/100 \times 1000 = 6\text{mm}$. Taking a worst case upper bound factor (0.3%) then the inward yield would be about 14mm

Coincidental with the inward yield of perimeter walls, some settlement of the retained soils around the excavation will occur. Again, based on published observations, the ratio of surface settlement to excavation depth in sands is about 0.1% (range 0.1 to 0.2). Adopting the average of 0.1, and a maximum 3.2m deep excavation, then surface settlement in the order of $3.2 \times 0.1/100 \times 1000 = 3.2\text{mm}$ will occur. Again taking an upper bound factor of 0.2% then the surface settlement will be 6mm. Importantly, whilst some surface settlement will occur around the excavation, this settlement profile will extend for a distance of about 3 times the depth of excavation ie about 10m in a reasonably linear fashion. For a settlement of 3.2mm immediately adjacent to the excavation, diminishing over 10m this amounts to an angle of distortion of about 1 in 3000 (again a worst case of 1 in 666). Such an angle of distortion would not cause damage to any nearby buildings or indeed below ground services. Published values indicate angles of distortions up to 1 in 500 could cause crack damage in buildings and with structural damage around 1 in 150.

6 Hardened areas

There will be a marginal increase in hardened and drained areas resulting from the development. We have carried out investigations to provide a measurement of the permeability of the near surface Claygate Member in rear gardens, with results presented in Appendix B. The near surface Claygate Member deposits exhibit relatively high permeability and thus proposals are to discharge any additional rainwater collected by the development into soakaways constructed in rear gardens. On this basis the development will not discharge any additional stormwater to sewers and thus not contribute to flood risk downstream of the property.

7 Tree removal

We are not aware that any trees will be remove as part of the project proposals

8 Existing damage to adjacent buildings

We are not aware of any subsidence damage to existing buildings.

9 Subterranean (Ground water) flow screening

9.1 General overview.

The property is positioned on locally high ground known as Highgate to the north-west of central London. The property is outside areas considered to be at risk of being affected by tidal and fluvial flooding associated with the Thames or its tributaries, or artificial water sources (canals/reservoirs). In addition the property is not considered to be at enhanced risk of flooding from sewers or water supply pipes.

Geological records indicate the site is underlain by deposits of London Clay Formation extending to depths of approximately 100m. A ground investigation has been carried out at the site which encountered soils considered to be Claygate Member which comprise sands occasionally interbedded with clays. Groundwater was encountered (and monitored) at a depth of 4.48m below ground levels and thus some 1.55m below underpinning formation levels. With groundwater at such a depth the property is not considered to be at risk of flooding from groundwater. The proposed basement development would not act as a barrier to groundwater flow.

9.2 Responses to flow chart questions

The following provides site specific responses to questions posed in figure 1 of CPG4

Question 1a Is the site located directly above an aquifer?

Response. Yes. The property is directly underlain by soils considered to be Claygate Member comprising sands interbedded with clays. These deposits are classified as a Secondary A aquifer

Question 1b Will the proposed basement extend beneath the water table surface?

Response No. The ground investigation has measured water table depths as well below proposed basement levels.

Question 2 Is the site within 100m of a watercourse, well or potential spring line?

Response. No. The site is remote (in excess of 400m) of any known watercourse.

- Question 3 Is the site within the catchment of the pond chains on Hampstead Heath?
- Response Yes. The property is located within the catchment of the pond chains. The proposed foundations do not extend into groundwater and therefore change to groundwater flow to the pond chains will not occur due to the proposed development.
- Question 4 Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?
- Response Yes. The extensions to the property may marginally increase the hardened area of the site.
- Question 5 As part of the site drainage, will more surface water (e.g. rainfall and run off) than present be discharged to the ground (e.g. via soakaways/SUDS)?
- Response Yes. Proposals are to drain additional hardstanding areas to soakaways installed in permeable Claygate Member sands.
- Question 6 Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?
- Response No. The basement excavation will not extend into the local groundwater table and in the absence of any ponds local to the site will not be affected by pond water. Based on this there are no matters of concern.

The groundwater flow screening assessment has established the site lies within the catchment of the pond chains on Hampstead Heath and is underlain by the sands and clays of the Claygate Member, a Secondary A Aquifer. However there are no surface watercourses within 100m of the site and the proposal would promote surface drainage to the Claygate Member using SUDs designed soakaways.

The site investigation has established an unsaturated thickness greater than 4.5m beneath the site and that the proposed basement development underpinning formation levels would be approximately 1.50 m above monitored winter groundwater levels. The proposed basement would therefore not change the existing groundwater flow regime beneath the site.

10 Stability impact identification

10.1 General overview.

The property is positioned on locally high ground known as Highgate to the north-west of central London. Ground levels in the area fall in a general southerly direction (down Hillway) at a slope of 6 degrees.

No trees will be removed as part of the development.

Our client's Structural Engineer proposes to underpin existing buildings around the perimeter of the proposed basement allowing basement excavations to be carried out with temporary propping providing lateral restraint to the underpinning whilst a permanent concrete box to form the basement is installed.

10.2 Responses to flow chart questions

The following provides site specific responses to questions posed in figure 2 of CPG4

Question 1 Does the existing site include slopes, natural or manmade greater than 7° (approximately 1 in 8).

Response. No. The topography of the area falls by about 6 degrees in a southerly direction. Based on this there are no matters of concern.

Question 2 Will the proposed profiling of landscaping at the site change slopes at the property boundary to more than 7°?

Response No. The proposed basement will not change the current topographical conditions. Based on this there are no matters of concern.

Question 3 Does the development neighbour land including railway cuttings and the like with slopes greater than 7° (approximately 1 in 8)?

Response. No. The topography of the area falls by about 6 degrees in a southerly direction, and there are no manmade cuttings in the area other than shallow garden retaining walls which will not be affected by proposals. Based on this there are no matters of concern.

Question 4 Is the site within a wider hillside setting in which the slope is greater than 7°?

Response No. The topography of the area falls by about 6 degrees in a southerly direction with the slope (down Hillside) being reasonably uniform. Based on this there are no matters of concern.

- Question 5 Is the London Clay the shallowest strata at the site?
- Response No. The property is underlain with Claygate Member, extending to depths in excess of 5m (maximum depth of the borehole investigation). Given geological conditions the property is not in an area considered to be at risk of slope instability. Based on this there are no matters of concern.
- Question 6 Will any trees be felled as part of the development and/or are there any works proposed within any tree protection zones where trees are to be retained?
- Response No. No trees will be removed as part of the proposals. Based on this there are no matters of concern.
- Question 7 Is there a history of any seasonal shrink swell subsidence in the local area and/or evidence of such effects on site?
- Response No. The Claygate Member are principally granular (non shrinkable), but are occasionally interbedded with clays at depth which could exhibit plasticity. We are not however aware of any evidence of damage attributable to subsidence either on the subject property or on adjacent properties. Based on this there are no matters of concern.
- Question 8 Is the site within 100m of a watercourse, well or potential spring line.
- Response No. The site is remote (in excess of 400m) of any known watercourse. With groundwater at depths some 4.48m below ground levels there will not be any spring points on the site. Based on this there are no matters of concern.
- Question 9 Is the site within an area of previously worked ground?
- Response No. Five boreholes excavated within the property encountered naturally deposited soils at shallow depths, although one borehole DTS01 in front gardens did locate some 1.8m of made ground probably resulting from some profiling works to accommodate relatively level front gardens, but not considered to be an area of previously worked ground. Based on this there are no matters of concern.

Question 10 Is the site located above an aquifer? If so will the proposed basement extend beneath the water table such that dewatering may be required during construction?

Response Yes. The property is directly underlain by soils considered to be Claygate Member comprising an interbedded mixture of clay and sands. These deposits are classified as a secondary A aquifer. The ground investigation has measured water table depths as well below proposed basement levels and thus dewatering will not be required as part of the construction process. Based on this there are no matters of concern.

Question 11 Is the site within 50m of Hampstead Heath ponds?

Response No. The property is located about 450m to the east of the pond chain on Hampstead Heath. Based on this there are no matters of concern.

Question 12 Is the site within 5m of a public highway or pedestrian right of way?

Response. No. The proposed basement will not be located within 5m of a public highway/footway. Based on this there are no matters of concern.

Question 13 Will the proposed basement significantly increase the differential depth of foundations relative to adjacent properties?

Response Yes. Traditional underpinning will be used to extend existing foundations down to proposed basement levels. Underpinning will be propped whilst excavations take place to basement formation levels followed by concoction of a basement box. Although there will be differences in ground / basement level floors between the new build and adjacent properties, the proposed basement construction solution will not affect neighbouring properties, and estimates of movements which may occur during the construction phase are described in section 5 which indicate acceptable levels of differential movement. Based on this there are no matters for concern.
A copy of the project Engineer's drawings illustrating proposed foundations for the basement are presented in Appendix A.

Question 14 Is the site over (or within the exclusion zone of) any tunnels e.g. Railway lines.

Response No. London Underground, advise the site is not located within 50m of an underground railway. Based on this there are no matters of concern.

11 Surface flow and flooding impact identification

11.1 General overview.

Although the proposed development will marginally increase hardened areas, proposals are to drain increased hardened areas into soakaways formed in the permeable Claygate Member beds.

11.2 Responses to flow chart questions

The following provides site specific responses to questions posed in figure 3 of CPG4

- | | |
|------------|--|
| Question 1 | Is the site within the catchment of the pond chains on Hampstead Heath? |
| Response. | Yes. The property is located within the catchment of the pond chains. This is discussed further below. |
| Question 2 | As part of the site drainage, will surface water flows (e.g. rainfall and run off) be materially changed from the existing route? |
| Response | No. Proposals will not have a material impact on surface water flows. |
| Question 3 | Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas? |
| Response. | Yes. This is discussed further below. |
| Question 4 | Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream water courses? |
| Response | No. Proposals will have no impact on surface water received by adjacent properties or downstream watercourses. |
| Question 5 | Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream water courses? |
| Response | No. Proposals will have no impact on surface water flows to adjacent properties or downstream water courses. |

The proposed development includes an increase in hardened areas to accommodate an extension to the footprint of the existing property. The proposed area of increased hardened surfacing is currently occupied by a raised decking area over a flag stone patio, hard footpaths and flower beds. It is anticipated that the existing drainage of this area comprises of soakage directly to permeable underlying sand beds and does not result in significant surface water flow. It is proposed that hardened areas are drained to soakaways and therefore there will be not be a change to surface water runoff from the site, whether to neighbouring properties or downstream watercourses, including the Hampstead Heath chain of ponds. The site is currently well drained and the use of a SUDs based soakaway system to manage site drainage for the proposed development will ensure that surface water drainage continues to not leave the site.

12 Summary and Conclusions

- 12.1 A single storey deep basement is proposed to the rear quadrant of the existing building. Proposals include the addition of some single storey extensions at ground level.
- 12.2 Old mapping of the area records the site in open field and subsequently parkland in the late 1800s and early 1900s. There is no evidence of any watercourses or ponds close to the site. The existing property footprint is first recorded on the 1935 map.
- 12.3 A ground investigation has been carried out at the site comprising five boreholes. Each borehole encountered a similar soil profile of made ground overlying naturally deposited soils considered to be Claygate Member sands and clays. Made ground varied in thickness generally 0.5 to 0.2m but locally 1.8m in front gardens probably resulting from terracing earthworks to produce relatively level front gardens. Made ground generally comprises clays with some gravels of flint, brick and ash. The Claygate Member comprise sands occasionally interbedded with clays extending to depths in excess of 5m.
- 12.4 The groundwater flow screening assessment has established the site lies within the catchment of the pond chains on Hampstead Heath and is underlain by the sands and clays of the Claygate Member, a Secondary A Aquifer. However there are no surface watercourses within 100m of the site and the proposal would promote surface drainage to the Claygate Member using SUDs based soakaways.
- 12.5 The geology of the area is not amenable to spring lines in close proximity to the property and no such features were observed on or adjacent sites. Groundwater was encountered (and monitored) at a depth of 4.48m below ground levels and thus some 1.55m below proposed basement underpinning formation levels. The proposed basement would therefore not change the existing groundwater flow regime beneath the site.
- 12.6 Ground levels do fall in a southerly direction by about 6 degrees, but as the area is underlain by Claygate Member slope instability is not considered to present a risk, and installation of the basement will not induce any slope instability.
- 12.7 There is no evidence of any subsidence to any adjacent properties or indeed the existing building on the site.
- 12.8 No trees will be removed as part of the project.
- 12.9 Installation of the basement will generate some ground movement close to the perimeter of the basement excavation. The amount of movement has been predicted based on records of observed movement in other basements during construction. The amount of movement is relatively small and will result in angles of distortion which do not present a matter of concern to adjacent properties.

- 12.10 The property is considered to be at no enhanced risk of being subject to flooding. There is likely to be a marginal increase in hardened areas following completion of construction. Proposals are to drain additional hardened areas to soakaways
- 12.11 The site is remote from underground tunnels.
- 12.12 In overall conclusion there are no outstanding issues of concern (singularly or cumulatively) from a stability, groundwater or surface water perspective.

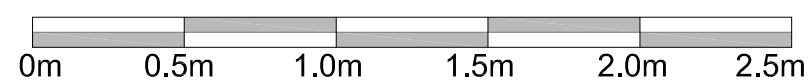
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SECTION 3 - PROPOSED
SCALE 1:25 @ A1, 1:50 @ A3

SECTION 4 - EXISTING
SCALE 1:25 @ A1, 1:50 @ A3

SECTION 4 - PROPOSED OPTION A
SCALE 1:25 @ A1, 1:50 @ A3



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P1	13.11.14	PRELIMINARY ISSUE	SM	RJM
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Drawing Status **PRELIMINARY**

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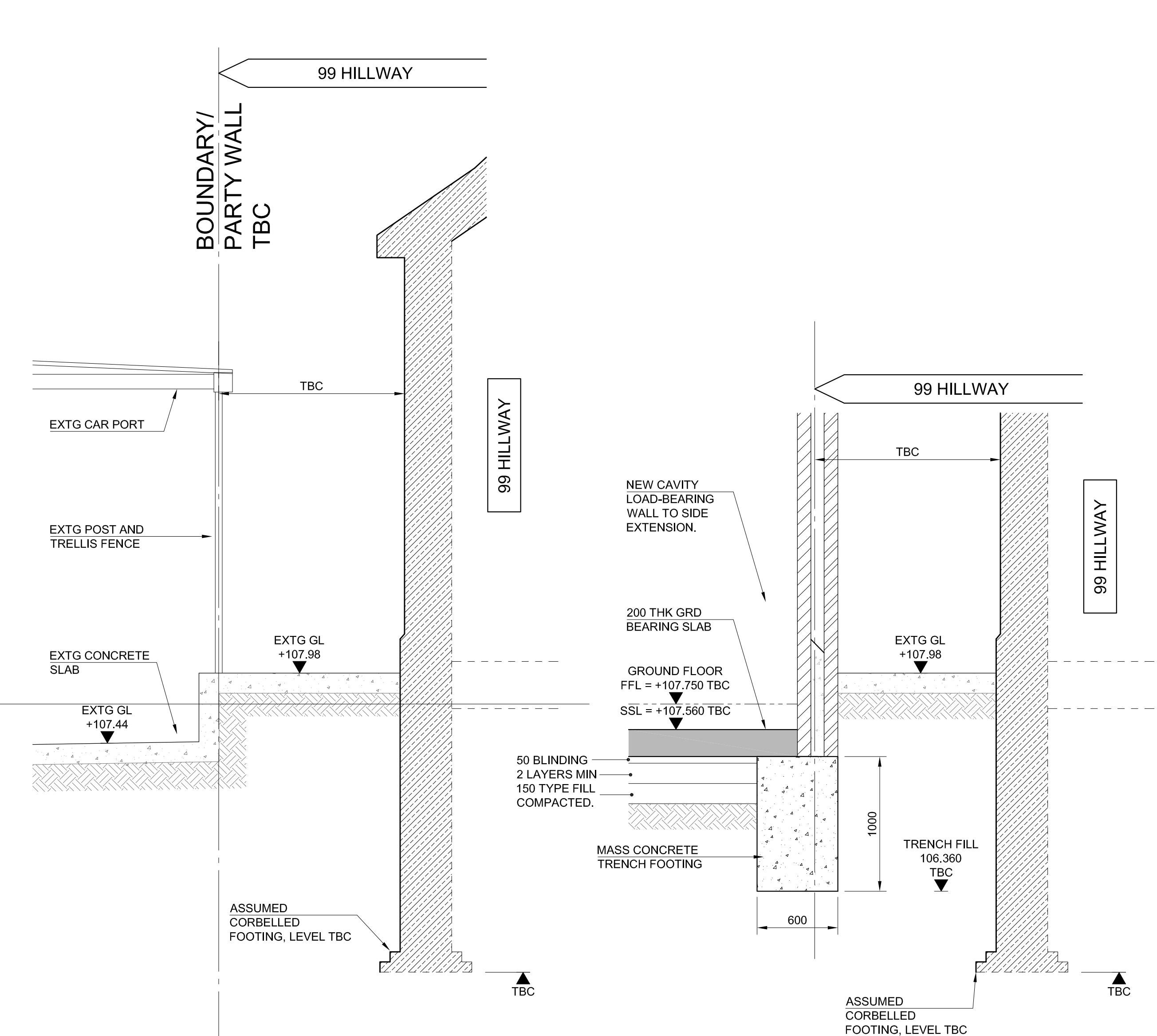
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LONDON
N6 6AB

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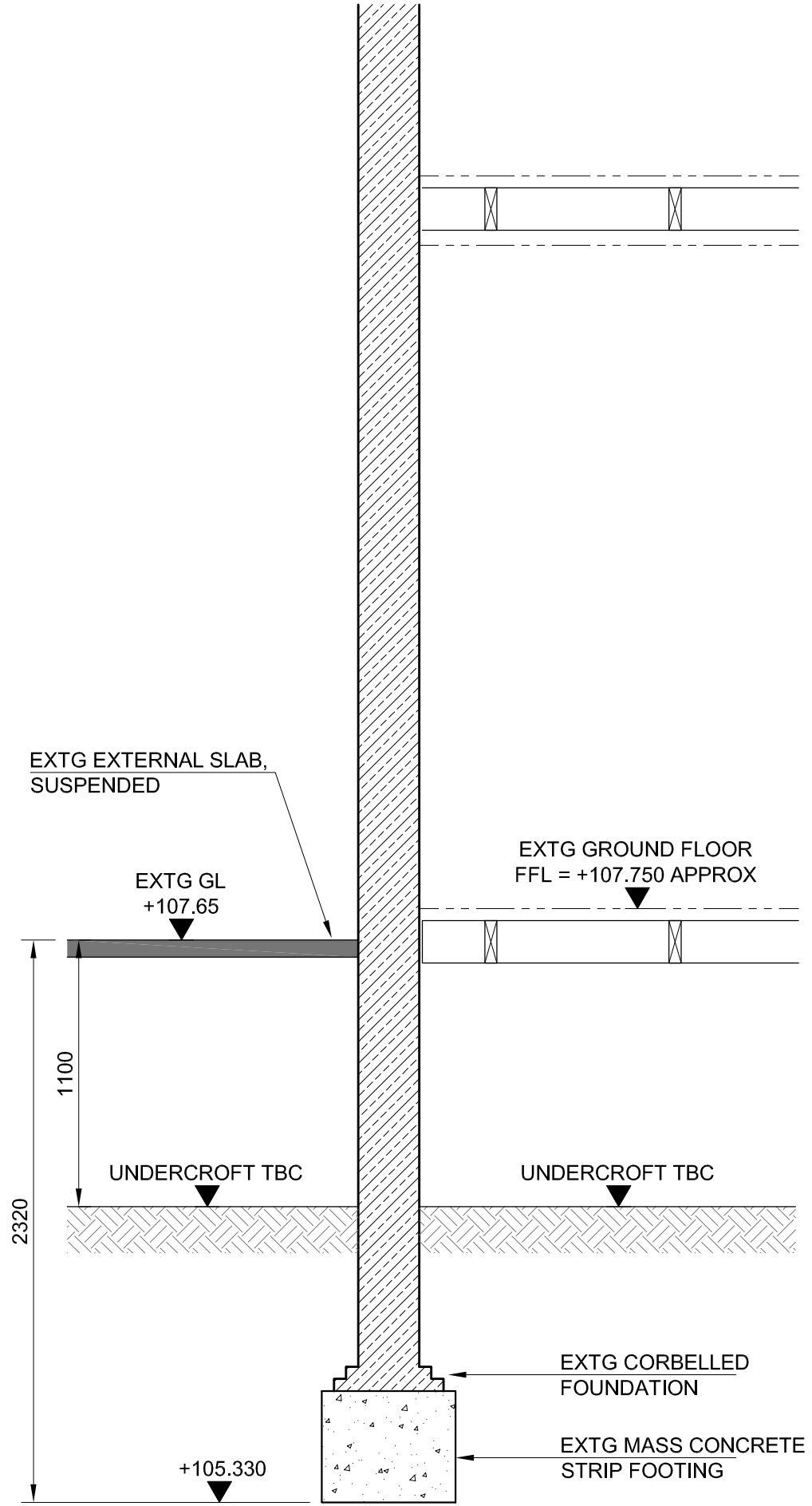
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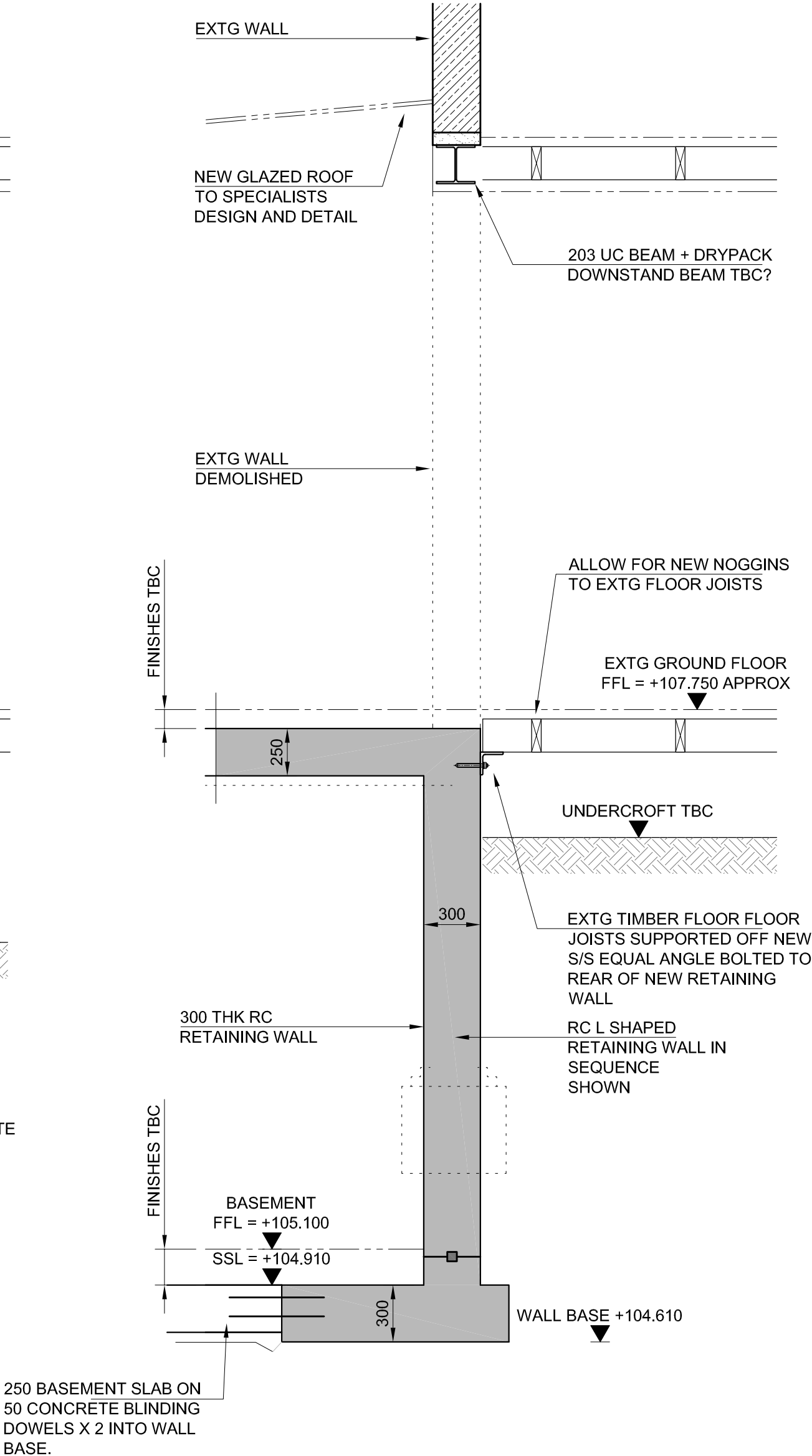
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Job No. 142242	Drawing No. A(28)06	Revision P1	



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SECTION 6 - PROPOSED
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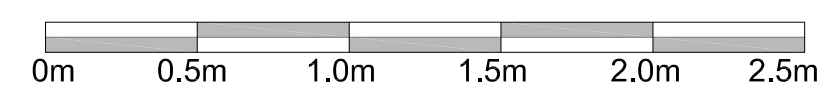
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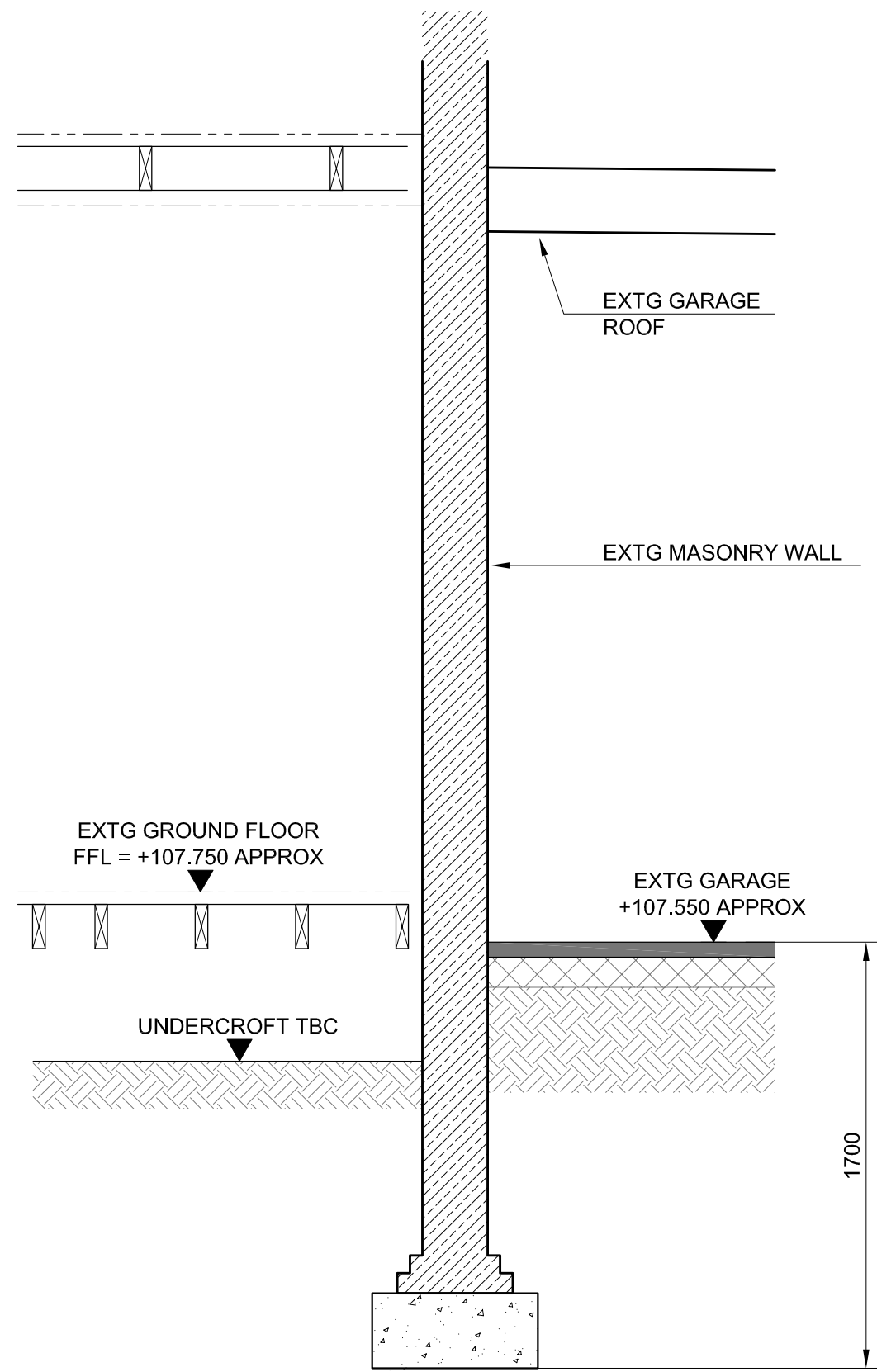
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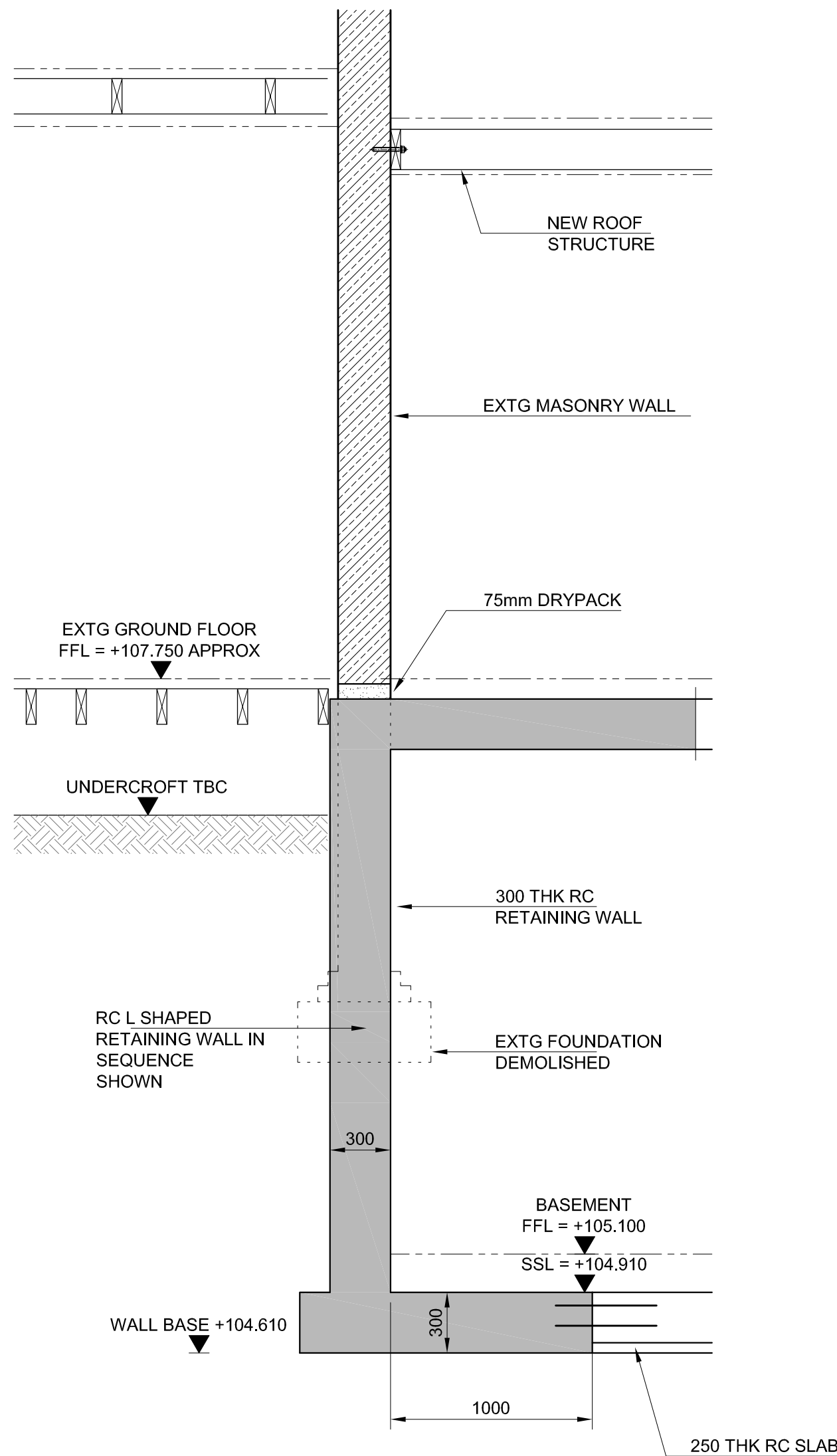


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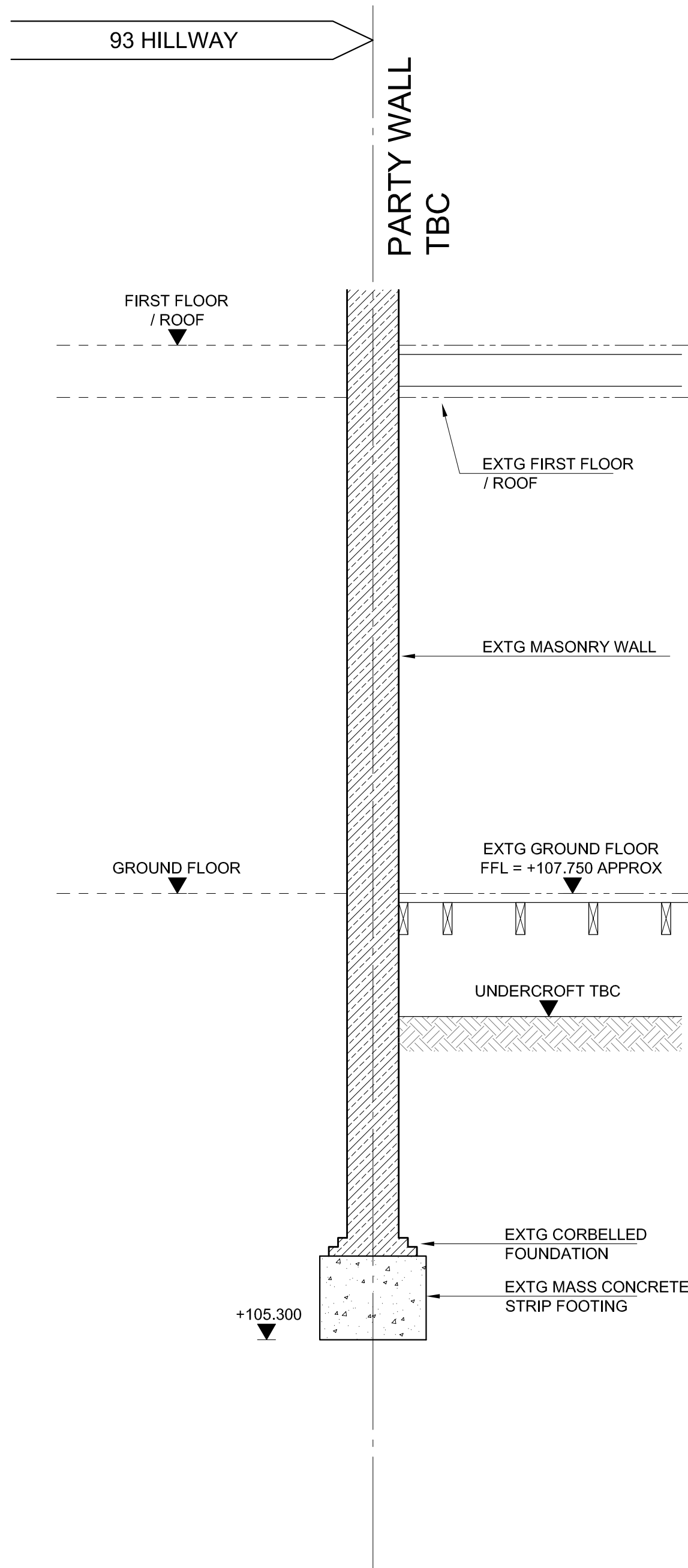
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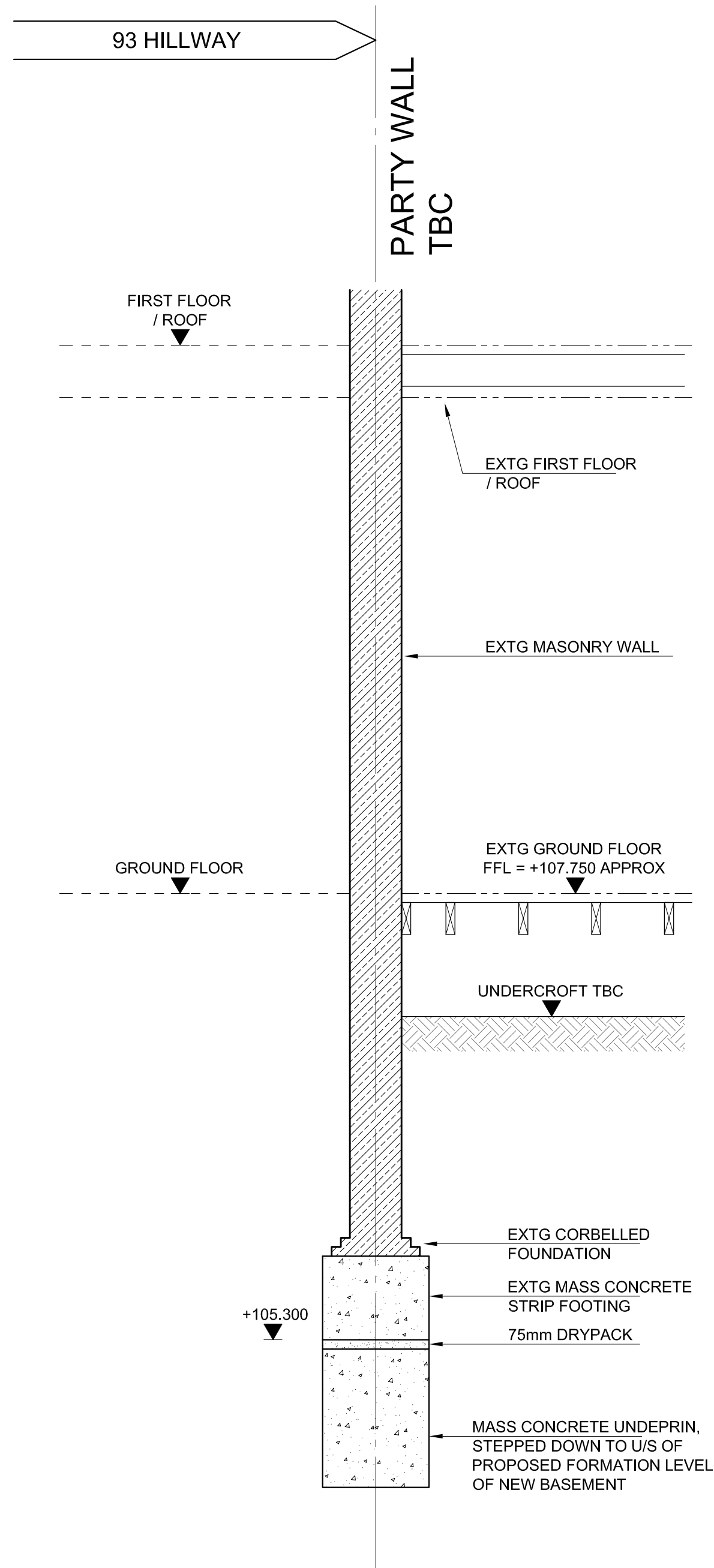
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SECTION 7 - PROPOSED
SCALE 1:25 @ A1, 1:50 @ A3



SECTION 8 - EXISTING
SCALE 1:25 @ A1, 1:50 @ A3



SECTION 8 - PROPOSED
SCALE 1:25 @ A1, 1:50 @ A3

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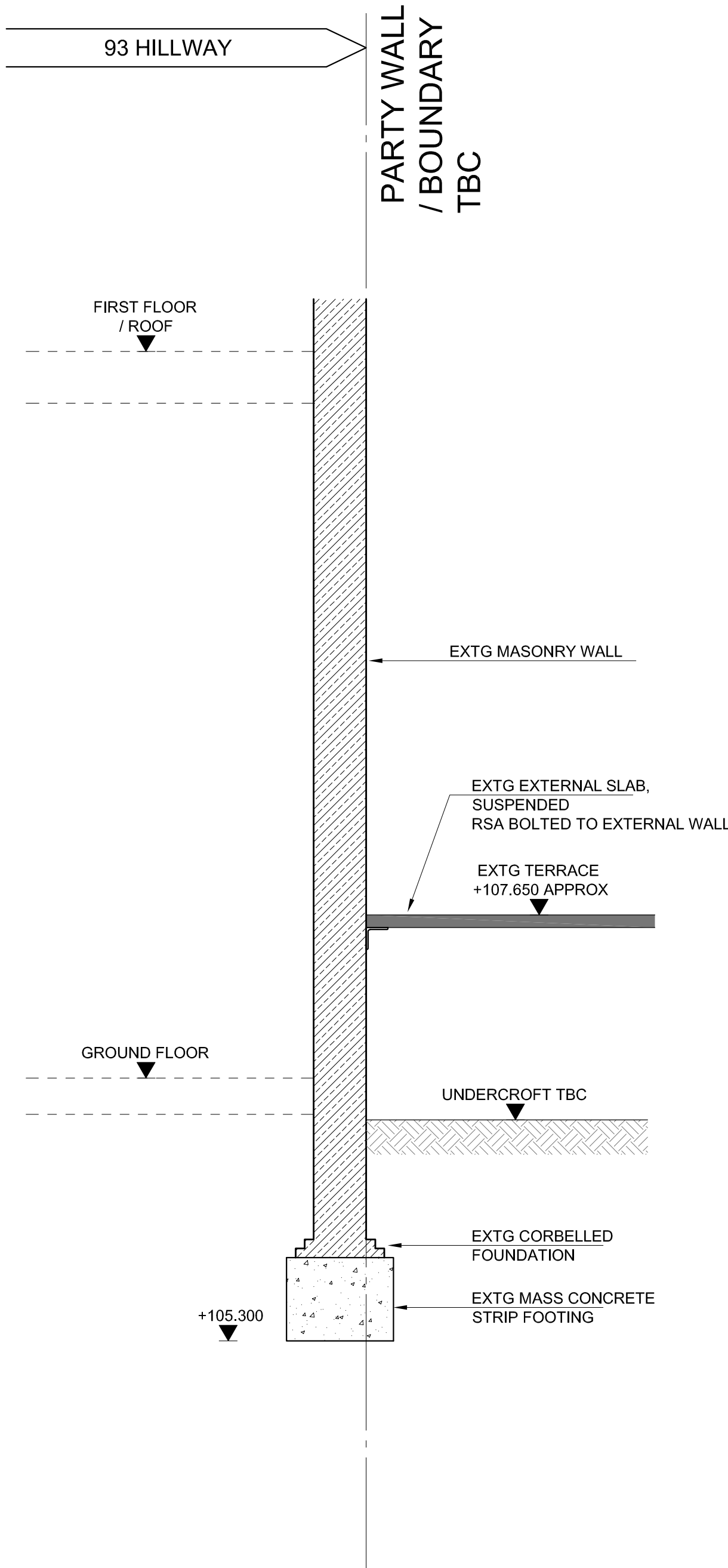
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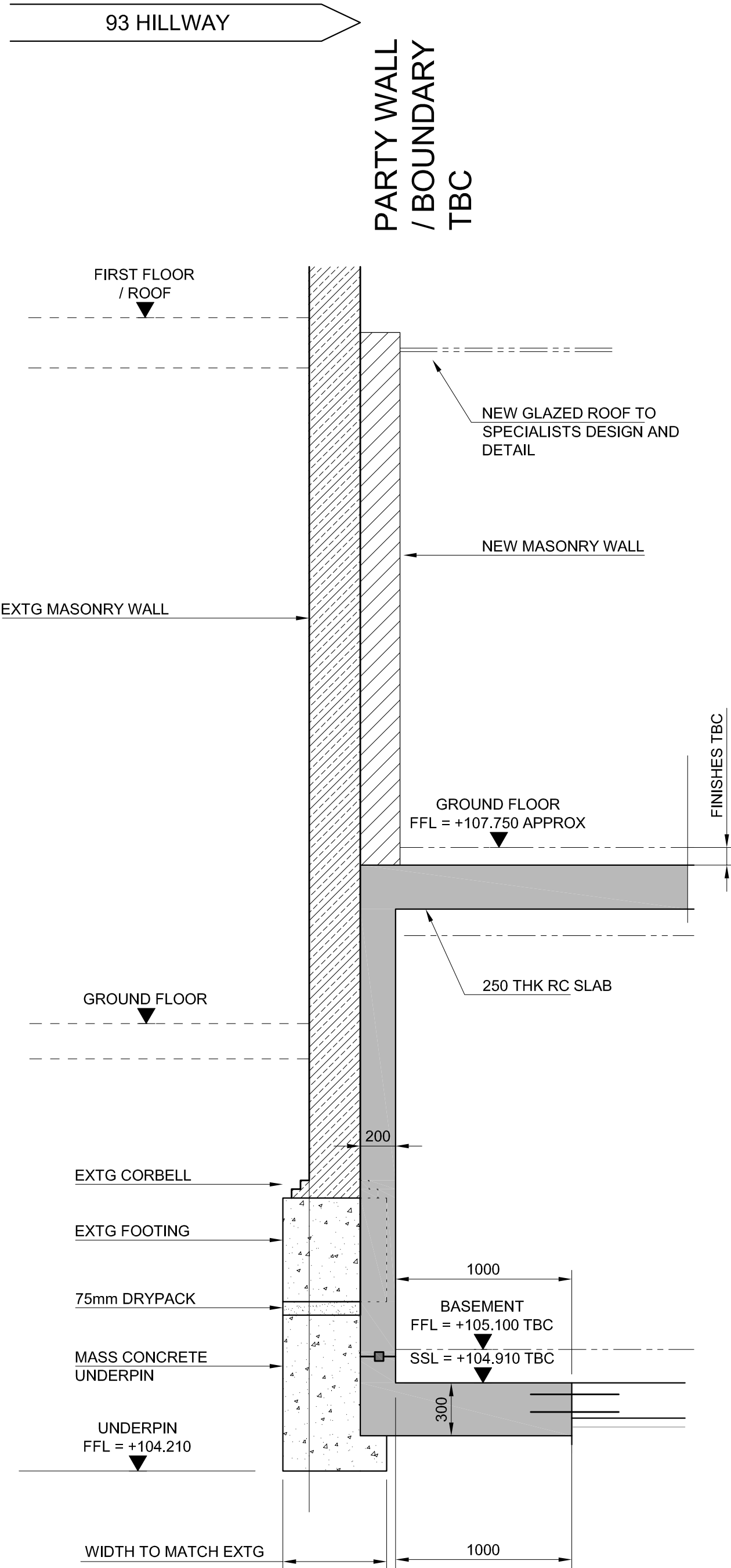


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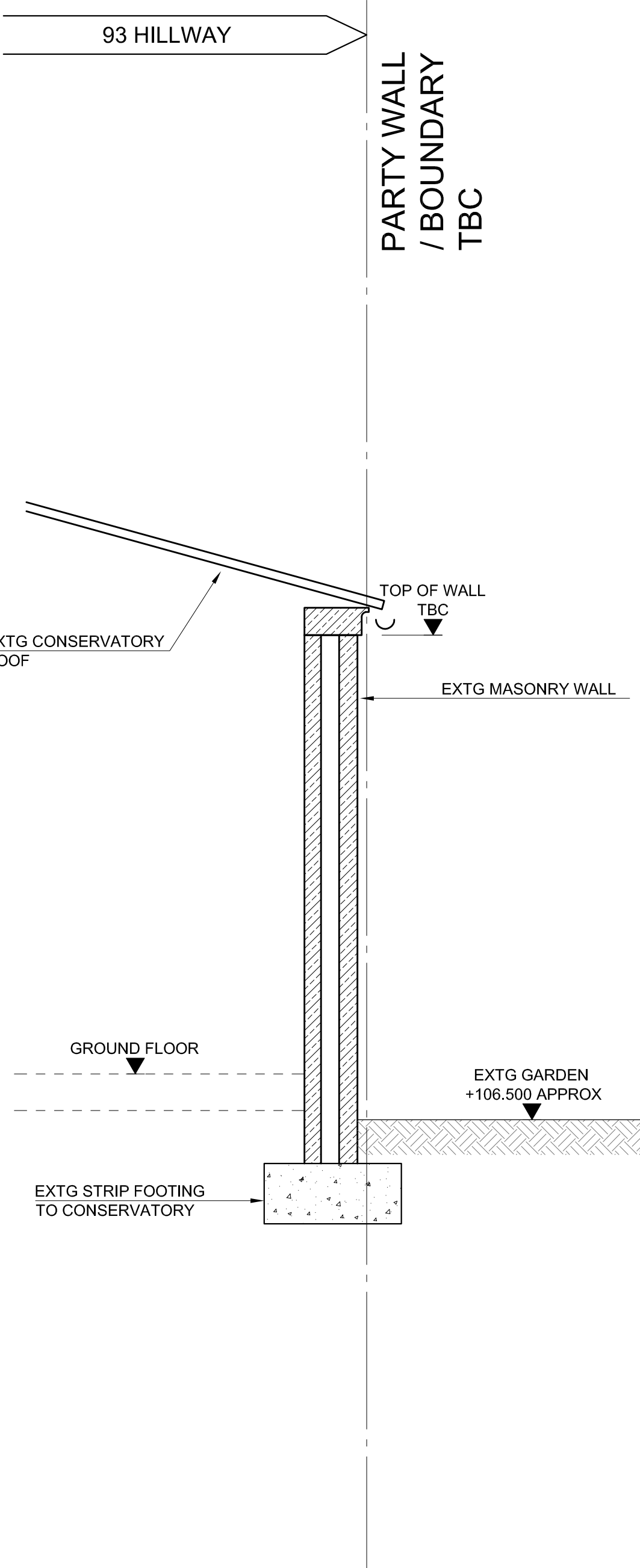
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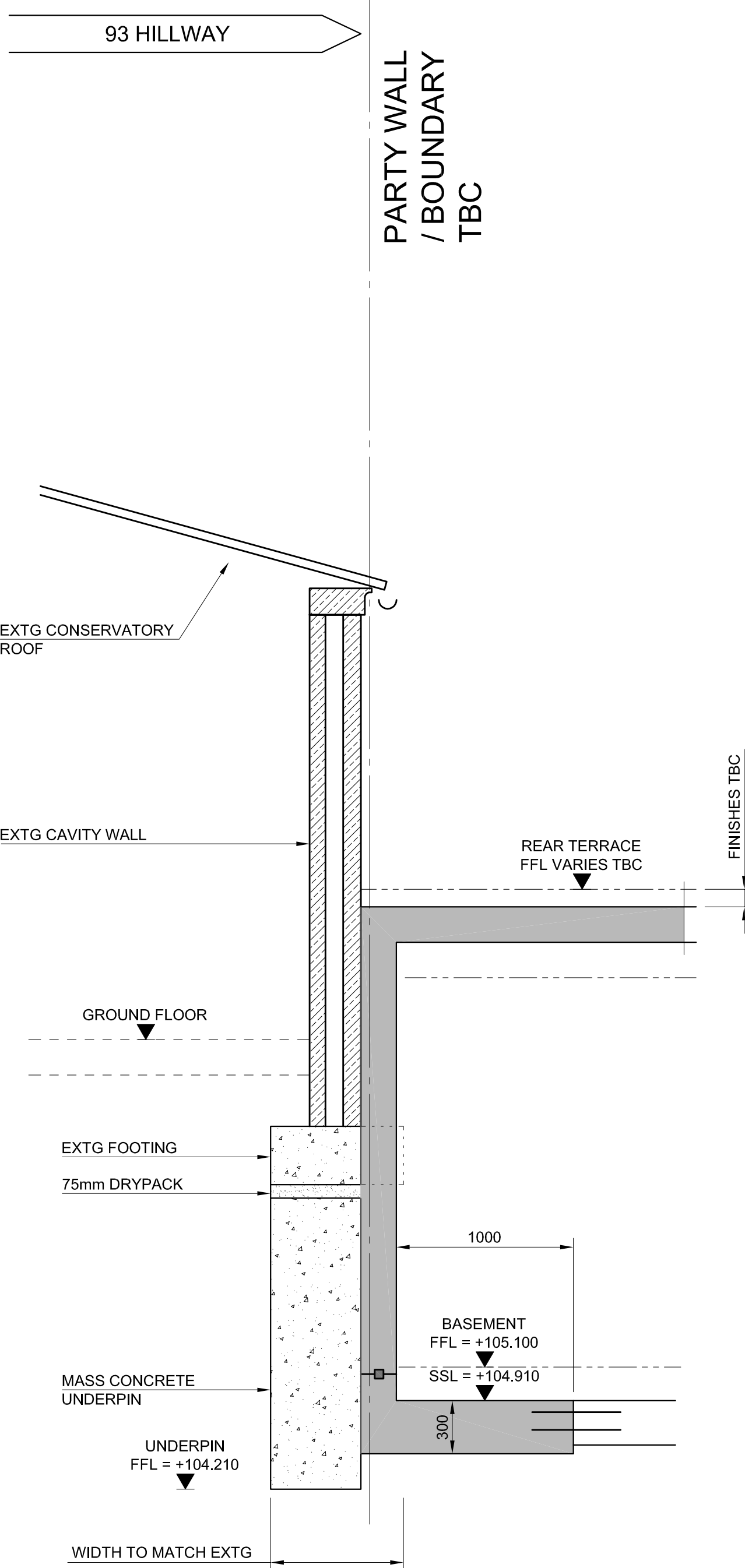
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SECTION 9 - PROPOSED
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SECTION 10 - EXISTING
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SECTION 10 - PROPOSED
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