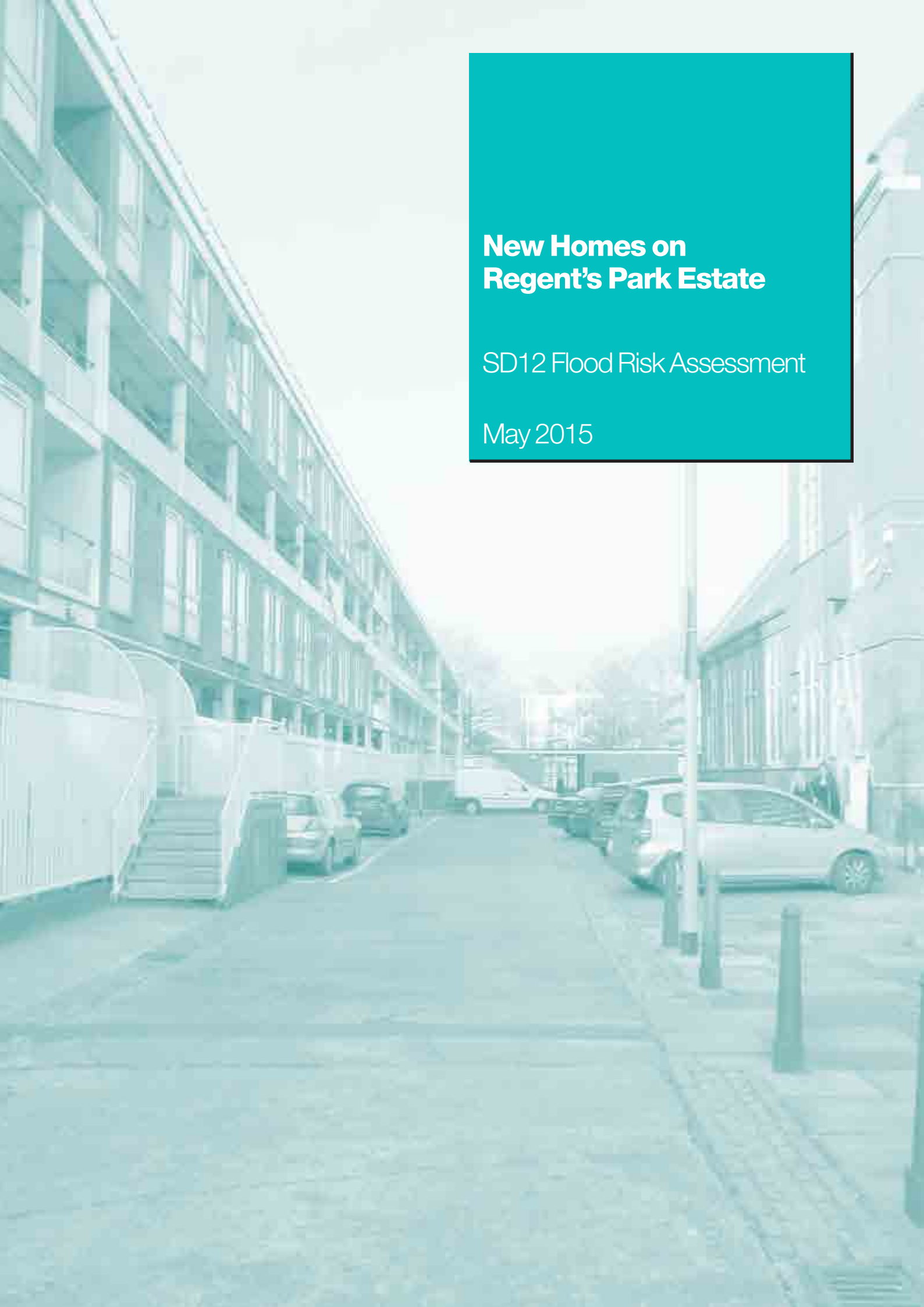

New Homes on Regent's Park Estate

SD12 Flood Risk Assessment

May 2015

Camden

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1.0 EXECUTIVE SUMMARY

CampbellReith has been commissioned, as part of the Tibbalds Multi-Disciplinary team, to prepare a Flood Risk Assessment in support of the Planning Application for the proposed redevelopment of eight plots within Regents Park Estate to provide replacement accommodation for the buildings that are to be demolished to make way for the High Speed Rail 2 (HS2).

The proposed redevelopment works will comprise the demolition of three buildings and the construction of 8 new buildings on 8 different plots within Regents Park Estate. There will also be associated external landscaping works around the proposed buildings.

The Regents Park Estate site is located within Flood Zone 1 therefore the Sequential and Exception Tests are not applicable for the proposed developments. Evidence from the Environment Agency Website, the North London Strategic Flood Risk Assessment, and Camden's Surface water management plan show that Regents Park Estate is considered to be at low risk of flooding from all sources. The residential developments proposed within Regents Park Estate are therefore compliant with the NPPF and its associated Technical Guidance.

The proposed stormwater water management strategy for the development will be designed to prevent flooding of buildings up to the 1 in 100 year storm event including an allowance of +30% for future climate change. Stormwater will be discharged off each proposed plot at controlled rates for rainfall events up to the 1 in 100+30% to ensure that flood risk is not increased offsite as a result of the proposed developments within Regents Park Estate.

Due to space constraints the use of underground attenuation tanks is the preferred stormwater attenuation method. The proposed buildings are also fitted with either a green or brown roof to improve biodiversity on the plot and improve the water quality discharged off the building roofs.

2.0 INTRODUCTION

2.1. Brief

2.1.1. Rail network expansion is proposed at Euston Train Station as part of the Government's High Speed rail proposals. Track widening and larger station building are proposed and as a result three residential buildings located within Regents Park Estate will need to be demolished to make way for the railway line expansion works. The residents from the three buildings, namely Eskdale, Ainsdale, and Silverdale (approximately 94 residential units) will need to be housed in alternative accommodation within Regents Park Estate.

2.1.2. Eleven sites were originally assessed to provide the alternative accommodation and these are listed within the first two columns of Table 2.1 below. However, since the original appraisal was undertaken, the sites are now referred to as 'Plots' and only 9 of the previously identified 11 sites are being taken forward to planning. Plot 7 Camden People's Theatre (formally Site 9) will be applied for via a separate planning application. The Plots that are being taken forward to planning are listed in Table 2.1 below and will be referred to within this document.

Sites originally assessed		Plots being taken forward to planning	
Site	Site Name	Plot	Plot Name
Site 1	Roberts Street Car Park	Plot 1:	Robert Street Car Park
Site 2:	Rydal Water Open Space	Plot 2:	Former One Stop Shop
Site 3:	Varndell Street	Plot 3:	Varndell Street Corner
Site 4:	Newlands Open Space	Plot 4:	Newlands Plot
Site 5:	Rothay / Dick Collins Community Hall	Plot 5:	Dick Collins Hall
Site 6:	Cape of Good Hope Public House	Plot 6:	Cape of Good Hope
Site 7:	Troutbeck Overbuilds	No longer considered	
Site 8:	Staveley / Newby Overbuilds	No longer considered	
Site 9:	Camden Peoples Theatre	Plot 7:	Camden Peoples Theatre*
Site 10:	Victory Public House	Plot 8:	The Victory Pub
Site 11:	St Bede's Hall	Plot 9:	St Bede's Mews

*Note that Plot 7 Camden Peoples Theatre will be applied for via a separate planning application

Table 2.1: Superseded site names and plots being taken forward to planning

2.1.3. The locations of the 8 plots within the Regent's Park Estate are shown on Figure 3.2

2.1.4. CampbellReith has been appointed as the Structural and Civil Engineers to design the new buildings that will provide the alternative accommodation on the Eight (8) plots that are now being taken forward for planning to provide the replacement accommodation for the residents of the Eskdale, Ainsdale and Silverdale buildings.

2.1.5. This Flood Risk Assessment Report has been prepared by CampbellReith as part of its commission to ensure that the eight plots chosen to provide the alternative accommodation for the residents affected by Rail Expansion works takes into account flood risk as required by the National Planning Policy Framework.

3.0 EXISTING SITE CONTEXT

3.1. Site Location

3.1.1. Regent Park Estate is located in the Borough of Campden, and is centred at OS grid TQ290828. The extent of the Regents Park Estate is shown in Figure 1 below. Regents Park is roughly rectangular in shape and is bordered to the east by Hampstead Road and to the west by Albany Street. Granby Terrace forms the north eastern boundary of the Estate. Cumberland Market and Redhill Street form the north western boundary of the Estate. Munster Square and William Road form the South west and South East boundaries of the Estate respectively.

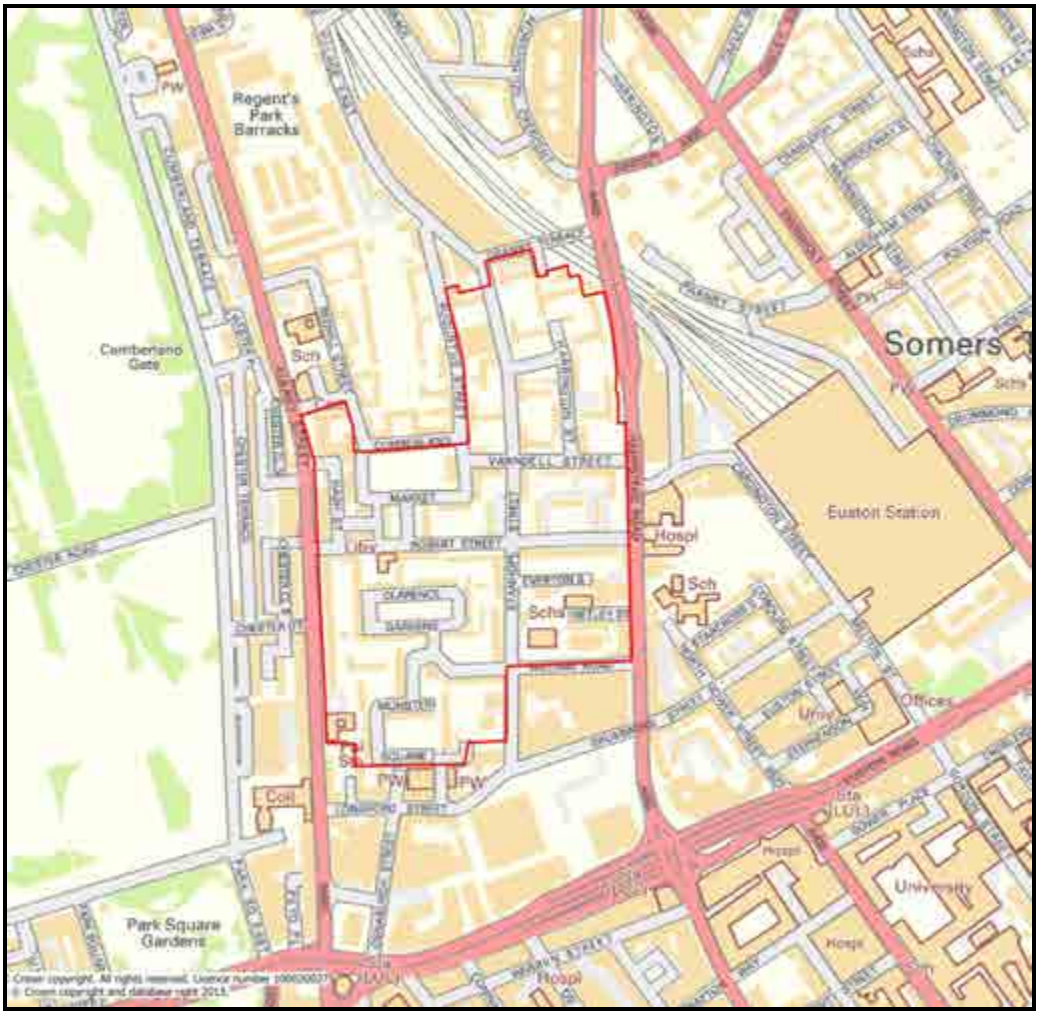

Figure 3.1: Regent Park Estate Location Plan

3.1.2. The buildings to be demolished are coloured red in Figure 2 below. The plots chosen within the Estate to provide replacement accommodation are also included in Figure 2.

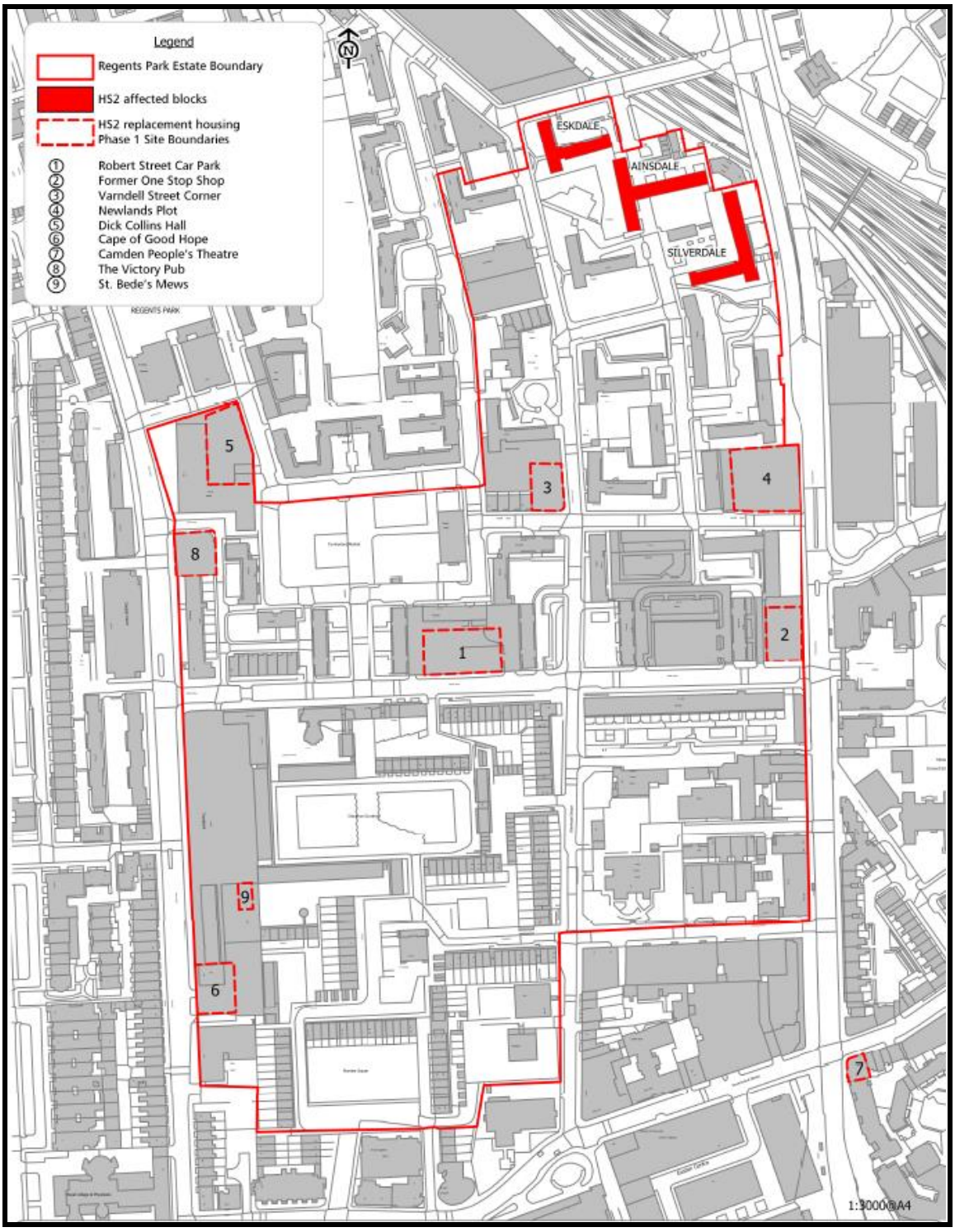

Figure 3.2: Plots in Regents Park Estate proposed for Redevelopment

3.2. Site Characterisation

3.2.1. The topographical surveys for the individual plots selected for redevelopment are included in Appendix 1. The current land use for each of eight plots selected is summarised in the Table 3.1 below

Plot No.	Plot Name	Current Use
1	Robert Street Car Park	Residents car park and soft landscaped area
2	Former One Stop Shop	Amenity space in front of Rydal Water block
3	Varndell Street Corner	Communal open space for residents in the surrounding blocks
4	Newlands Plot	Communal garden for the residents of Newlands block
5	Dick Collins Hall	Community hall, currently houses the TRA (Tenants & Residents Association)
6	Cape of Good Hope	Disused Public House and the current working area for Lakehouse (residential development)
8	The Victory Pub	Active Public House with garden
9	St Bede's Mews	Car park to the north of St Bede's Hall

Table 3.1: The Current land use of plots in Regents Park Estate proposed for redevelopment

3.2.2. The local sewerage network within the Estate is operated by Thames Water and their asset records have been obtained and are included in Appendix 2.

3.2.3. A drainage survey for the existing foul and surface water network detailing condition, size, depths and route for drainage within and around each individual plot has not yet been carried out. However, from the topographical and services survey information provided by others it was assumed the existing surface water drainage discharging to local public sewers located relatively close to the plot or within the plot boundary. It is also assumed that the existing foul drainage network discharges into the local public sewers via gravity and was designed to meet the regulated design standards at the time of its implementation.

3.2.4. A brief overview of the land-use, topography, and the available drainage features within and around each individual proposed plot is outlined below.

Plot 1: Robert Street Car Park

3.2.5. The plot is located to the north of Robert Street in the centre of the Regents Park Estate. It is rectangular in shape, 0.243 ha in size, and is relatively flat. The plot consists of a car park which covers a large proportion of the plot, and a smaller strip of shrubs and trees to the north of the plot. The car park is accessed from an unnamed access road to the east, and there are large trees which surround the car park on the west side.

3.2.6. The plot is bounded the east and west by access roads, with high rise residential blocks beyond. Immediately to the north of the plot is pedestrian access to the residential block.

3.2.7. There is no foul water currently being discharged from this plot and the existing surface water discharges to TW public sewer via TW services manhole reference 0702 that runs through the plot.

3.2.8. Approximately 0.194ha of the plot is covered by impervious surfaces and approximately 0.049ha is covered by soft landscaping.

Plot 2: Former One Stop Shop

3.2.9. The plot is located to the north of Robert Street and to the west of Hampstead Road. It is rectangular in shape, 0.131 ha in area, and slopes very gently to the east. The plot has pedestrian access only which is located to the north west, and there is evidence of various services on the plot. The plot comprises hard and soft landscaping. A large willow tree occupies the north eastern corner of the plot. A temporary structure was previously situated on the plot and consequently there are areas with minimal vegetation.

3.2.10. Immediately to the east of the plot is Hampstead Road, to the south of the plot is Robert Street, to the west is an access road with a locked gate to Robert street and residential properties beyond. To the north of the plot is a residential block and associated gardens.

3.2.11. The existing plot has approximately 0.05ha of impervious surfaces and approximately 0.081 ha is soft landscaped.

Plot 3: Varndell Street

3.2.12. The plot is located to the north west of the crossroads between Varndell Street and Stanhope Street. The plot slopes slightly to the east and is 0.166 ha in area. Ground coverage comprises entirely soft landscaping, with trees lining the eastern border, and areas of shrubs and plants in the centre of the plot. The boundary of the plot to the roadways has a medium height hedge encompassing the fence. The plot is accessed by locked gates which would allow vehicular from Stanhope Street to the East.

3.2.13. To the east of the plot is Stanhope Street, to the south is Varndell Street, to the west is a residential block, and to the north is a soft landscaped area.

Plot 4: Newlands Plot

3.2.14. The plot is located to the north of Varndell Street and to the west of Hampstead Road. It is roughly square in shape, 0.181 ha in size and relatively flat. The plot comprises 0.025ha of hard landscaping and 0.156ha of soft landscaping with trees in the centre of the plot, shrubs and small trees lining the boundary. There is a 6ft fence around the plot with locked gates which would allow vehicular access to the plot. BT boxes are set into the fence line along Varndell Street.

3.2.15. To the east of the plot is Hampstead Road, to the south is Varndell Street, to the west is an pedestrian access way to the residential block beyond, and to the north of the plot is Cartmel Block, which is identified as a property which may be affected by the HS2 developments.

Plot 5: Dick Collins Hall

3.2.16. The plot is located to the south east of Redhill Street, is roughly rectangular in shape and is 0.114 ha in size. Dick Collins hall is a single storey community hall which occupies the northern half of the plot. There is a small garden area which occupies the central part of the plot, which has only pedestrian access. The southern area of the plot comprises vehicular access for the underground parking for the Rothay Block. This access passes underneath part of the Rothay Block in the south east corner of the plot. The wall between the garden and access showed signs of repair.

3.2.17. To the north and east of the plot is Redhill Street, and Rothay Block immediately borders the south and west of the plot. The Rothay block has underground parking of unknown extent and layout.

3.2.18. The plot comprises 0.045ha of soft and 0.0694ha of hard landscaped areas.

Plot 6: Cape of Good Hope

3.2.19. The plot is located to the east of Albany Street, is rectangular in shape and is 0.154 ha in size. Situated on the northern part of the plot is a vacant property, formerly the Cape of Good Hope Public House. The southern part of the plot comprises access roads and parking. The parking spaces are currently occupied by temporary storage containers in use by Lakehouse. The areas surrounding the property and access roads are entirely hard surfacing in reasonable condition. To the north of the plot there is an approximately 8 ft high retaining wall down to the basement level of the Troutbeck Block to the north. The wall appeared to be in good conditions.

3.2.20. Immediately north of the plot is the Troutbeck block, to the south is an access road and the disused police station beyond. To the east of the plot is a car parking/ access road for the surrounding residential properties and to the west of the plot is Albany Street.

3.2.21. The majority of the plot is occupied by hard standing surfaces, 0.154ha in area, consisting of the main building, access roads and car parking. Part of the plot (0.067ha) is proposed for redevelopment. The remainder (0.087ha) will remain as existing.

Plot 8: The Victory Pub

3.2.22. The plot is roughly square in shape, situated to the east of Albany Street and to the south of Nash Street. The plot slopes relatively steeply to the east and is 0.061 ha in size. The Victory Public House is situated to the east of the plot, with a garden to the west and is an active public house. The parking to the north of the plot appears to be rented to the public on a day rate.

3.2.23. To the south and east of the plot are residential properties. Albany Street and Nash Street border the west and north of the plot respectively.

3.2.24. This plot consists of entirely impermeable areas made up of the existing building and a car park. The existing foul and surface water is assumed to drain to the public sewers located on Nash Street and Albany Street.

Plot 9: St Bede's Mews

3.2.25. The plot is rectangular in shape, approximately 0.078ha in area, and is relatively flat. The plot is currently an area of car parking to the north of St Bede's Hall, comprises entirely hard surfacing in reasonable condition. Access to the plot is via an unnamed access road of Albany Street to the east.

3.2.26. St Bede's Hall is situated immediately to the south of the plot, with access roads and parking for the surrounding residential blocks to the west. To the north of the plot is a pedestrian walkway between the Troutbeck block and Clarence Gardens and to the east of the plot is a soft landscaped area.

3.2.27. The plot is currently used as a car park and comprises of entirely hard surfaces. Part of the plot (0.033ha) is proposed for redevelopment. The remainder (0.045ha) will remain as existing

3.3. Existing Peak Stormwater flows

3.3.1. Based on the impervious surfaces within the plots proposed for redevelopment, the peak stormwater flows currently generated from each plot are given in the Table 3.2 below.

Plot No.	Plot Name	Impervious area (ha)	1 in 2 year peak flow (l/s)	1 in 30 year peak flow (l/s)	1 in 100 year peak flow (l/s)
1	Robert Street Car Park	0.194	28.2	44.1	57.3
2	Former One Stop Shop	0.049	5.9	11.3	14.5
3	Varndell Street Corner	0	0.5	1.4	1.9
4	Newlands Plot	0.025	3.0	5.7	7.4
5	Dick Collins Hall	0.069	8.2	15.7	20.4
6	Cape of Good Hope	0.067*	8.0	15.2	19.7
8	The Victory Pub	0.061	7.3	13.9	18.0
9	St Bede's Mews	0.033*	3.9	7.5	9.7

**the entire plot will not be redeveloped. The impervious area included comes only from the extents of the plot that will be redeveloped.*

Table 3.2: Existing Plot Peak Surface Water Flows

3.3.2. The surface water peak flow values for all the plots, except Plot No. 3, in Table 3.2 above have been calculated using the Modified Rational Method based on the following parameters

- M5-60 value = 20.80
- R = 0.438
- Time of concentration = 15minutes

3.3.3. Plot No. 3's values were calculated using the IH 124 method.

Regent Park Estate Geology

3.3.4. The ground investigation carried out by Harrison Group Environmental Ltd. (2014) show that the geology of the local area is underlain by London Clay Formation

Regent Park Estate Hydrology

3.3.5. There are no major water features such as rivers, ponds or lake near the Estate.

Regent Park Estate Hydrogeology

3.3.6. The online EA maps show that the Estate is not within a groundwater source protection zone and neither is it in a Ground water Vulnerability Zone. The ground investigation carried out by Harrison Group Environmental Ltd. (2014) stated that ground water was encountered on one occasion at 7m within the superficial deposits during a borehole drill at a depth of approximately 7.0m bgl. However, no groundwater was further encountered during drilling of the other boreholes.

4.0 DEVELOPMENT PROPOSALS

4.1. Proposed Scheme

4.1.1. The proposed Development proposals on each plot are included in Appendix 3.

4.1.2. Table 4.1 below summarises the proposed development proposal on each individual plot

Plot No.	Plot Name	Proposed Development/ After Use Proposal
1	Robert Street Car Park	A five storey residential block with 13 residential dwellings and a Community Hall (336m^2 in area) is proposed. Landscaping works are also proposed.
2	Former One Stop Shop	A seven storey building is proposed to provide 24 residential dwellings and approximately 162m^2 of commercial space. Landscaping works are also proposed
3	Varndell Street Corner	A six storey building, to provide 8 residential units, and some external landscaping are proposed
4	Newlands Plot	Some external landscaping and an eleven storey building are proposed. The building will have 32 residential units and 95m^2 of commercial space
5	Dick Collins Hall	Demolition of the existing community hall is proposed to permit 11 new homes in a five storey block. External landscaping is also proposed.
6	Cape of Good Hope	15 new homes are proposed in a seven storey building (inclusive of the basement). External landscaping is also proposed around the building
8	The Victory Pub	184m^2 of commercial space and 10 residential dwellings are proposed in a six storey building. External landscaping will also be carried out around the building
9	St Bede's Mews	3 residential units are proposed within a three storey building. Some external landscaping around the building is also proposed.

Table 4.1: Summary of Proposed Development for each plot

4.1.3. Table 4.2 below summarises the proposed surface area finishes within each development

Plot No	Plot Name	Approximate Green Roof Area (m^2)	Approximate Brown Roof Area (m^2)	Hard Landscaping Area (m^2)	Soft Landscaping Area (m^2)	Total Area (m^2)
1	Robert Street Car Park	518	0	1369	537	2424
2	Former One Stop Shop	391	0	374	542	1307
3	Varndell Street Corner	362	0	243	1055	1660
4	Newlands Plot	0	391	298	1116	1805
5	Dick Collins Hall	88	274	489	284	1135
6	Cape of Good Hope	0	279	320	68	667*
8	The Victory Pub	0	277	286	47	610
9	St Bede's Mews	115	0	198	16	330**

** The total area is only for part of the plot that will be redeveloped; 870m^2 will not be redeveloped and will remain as existing and will therefore not been included in the calculations.*

*** The total area is only for part of the plot that will be redeveloped; 447m^2 will not be redeveloped and will remain as existing and will therefore not been included in the calculations.*

Table 4.2: Summary of the proposed surface finishes

4.1.4. The exact areas for green and brown roofs will be finalised during detailed design to account for any M&E equipment that my need to be installed on the building roofs.

5.0 FLOOD RISK ASSESSMENT

5.1. Reference Documents

5.1.1. The Flood Risk Assessment for the proposed developments within the Regents Park Estate has been prepared based on the guidance from the following reference documents

- National Planning Policy Framework
- Technical Guidance to the National Planning Policy Framework
- North London Strategic Flood Risk Assessment (SFRA)
- Drain London, London Borough of Campden's Surface Water management Plan
- CIRIA Guide 624
- Environment Agency's (EA) Flood Risk Assessment (FRA) Guidance Note 1

5.2. Flood Risks to the Site

5.2.1. The following flood risks to the Regents Park Estate were considered

- Flood risk from the Sea;
- Flood risk from Fluvial (river) flows;
- Flood risks from Groundwater
- Flood risk due to off-site Surface Water flows;
- Flood risk form Reservoirs failures

5.2.2. The impact of each of the flood risk is described in detail below

Sea and Fluvial Flood Risks

5.2.3. Regents Park Estate as a whole is shown to lie on the Environment Agency Flood Maps located within Flood Zone 1, i.e. the Estate is in an that has a less than 1 in 1000 annual probability of river and coastal flooding in any year (<0.1%) see figure 5.1 below. Therefore the proposed plots are considered to be at 'low risk' of sea or river flooding. The North London SFRA also shows the Regents Park Estate to be in an area of low fluvial and sea flood risk.

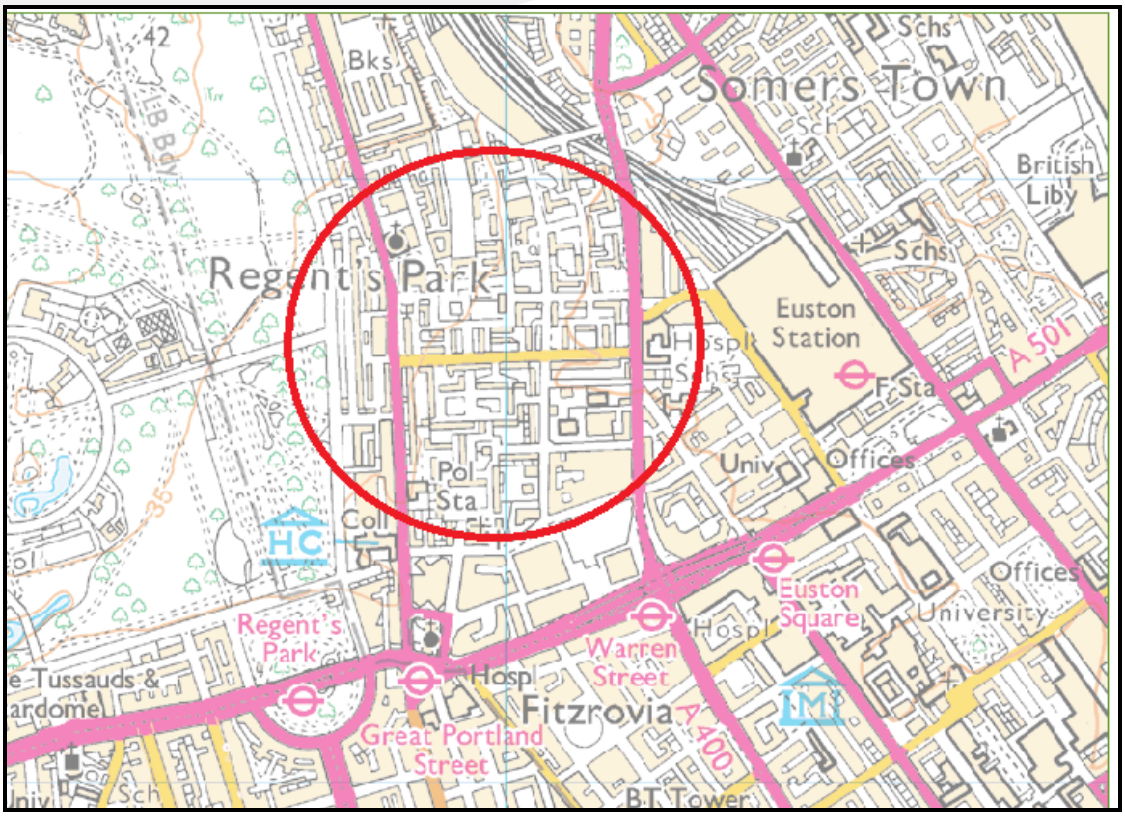

Figure 5.1: Extract of the EA Flood Map

Groundwater Flood Risk

5.2.4. The online EA flood maps show that the Regents Park Estate is not with a Groundwater Source protection Zone and neither is it in a Groundwater Vulnerability Zone. The ground investigation carried out by Harrison Group Environmental Ltd. (2014) stated that ground water was encountered on one occasion at 7m within the superficial deposits during a borehole drill at a depth of approximately 7.0m bgl. However, no groundwater was further encountered during drilling of the other boreholes.

5.2.5. London Clay Formation is considered to have low permeability, hence preventing the flow of groundwater to rise near the ground surface. Therefore the risk of flooding from groundwater within Regents Park Estate site is currently considered to be low.

Flood risk due to off-site Surface Water flows

5.2.6. An Extract from the Drain London, London Borough of Campden's Surface Water Management Plan is included in Figure 5.2 below. The areas hatched in green in Figure 5.2 are areas that are at high risk of Surface water Flood. Regents Park Estate is however shown to be in an area that is at low risk of surface water flooding.

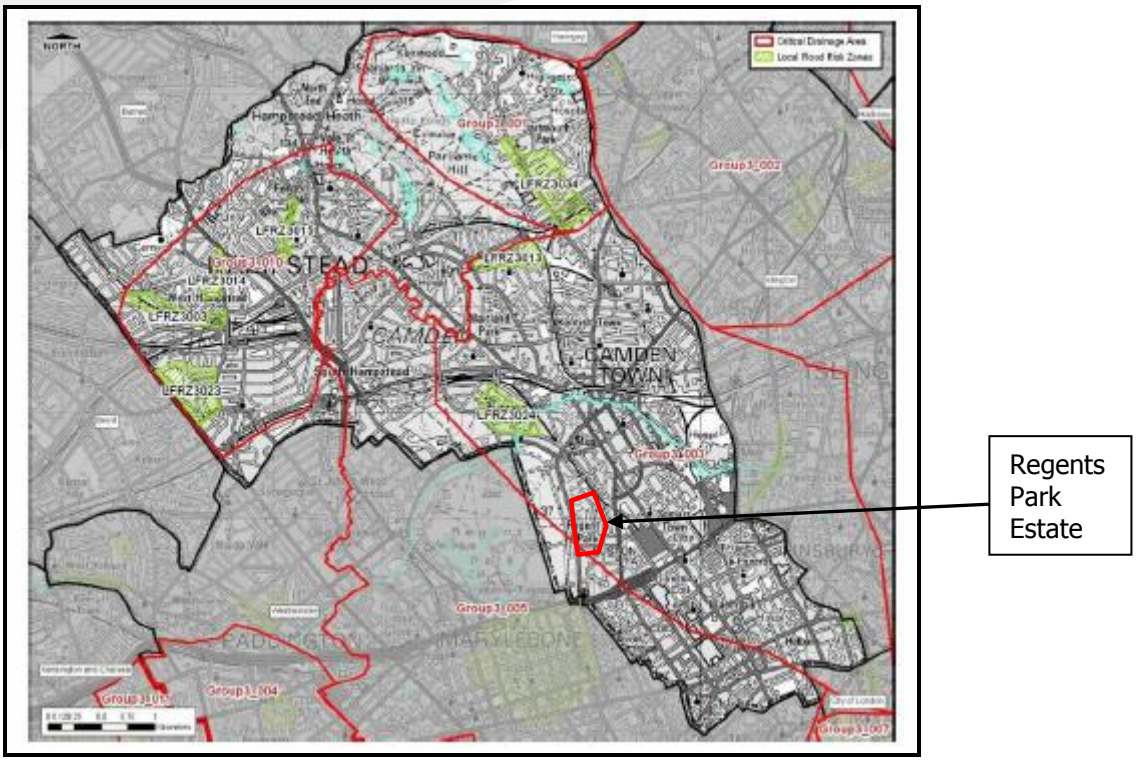

Figure 5.2: Extract from London Borough of Campden's Surface Water Management Plan

Flood risk form reservoirs failures

5.2.7. The online EA plans show that Regents Park Estate is in an area that is at low risk of inundation from Highgate Pond No.3 reservoir should there be uncontrolled release of water from the reservoir.

5.3. FLOOD RISK FROM THE SITE

General

5.3.1. The proposed redevelopment of Regents Park Estate will have an impact on the flood risk on and off site. An increase in hard paved areas has the potential to increase flood risk on and off site. To ensure that flood risk in not increased on or off site the following measures are proposed in accordance with the requirements of the reference documents mentioned in section 5.1 above

1. Post development peak rate of run-off is reduced to the limiting discharge for rainfall events up to the 1 in 100 year +30%. The limiting discharge is defined as the highest flow rate from the following options:

- The 50% of pre-development peak flow rates for brownfield plots; OR
- The mean annual flow rate Qbar for greenfield plots; OR
- Where the limiting discharge flow rate would require a flow rate of less than 5 l/s at a discharge point, a flow rate of up to 5 l/s will be used where required to reduce the risk of blockage.

2. Sustainable Urban Drainage Systems (SUDs) will be used to attenuate peak flows off the proposed development.

3. On-plot stormwater sewers will be sized to ensure there will be no on-plot sewer flooding experienced for rainfall events up the 1 in 30year

4. Should there be any on-plot stormwater sewer flood for events in excess of the 1 in 30year up to the 1 in 100year+30% events suitable flood routes will be provided so that there is no flooding to the buildings and that the flood water will be accommodated in suitable locations such as soft landscaped areas within the plot

5.3.2. Based on the existing peak stormwater flows in Table 3.2 above and the discharge limits as required by the North London SFRA, the permitted peak stormwater discharge from each of the plots is given in Table 5.1 below

Plot No.	Plot Name	1 in 2 year peak flow (l/s)	1 in 30 year peak flow (l/s)	1 in 100 year peak flow (l/s)
1	Robert Street Car Park	14.1	22.05	28.65
2	Former One Stop Shop	5.0	5.65	7.25
3	Varndell Street Corner	5.0	5.0	5.0
4	Newlands Plot	5.0	5.0	5.0
5	Dick Collins Hall	5.0	7.85	10.2
6	Cape of Good Hope	5.0	7.5	9.9
8	The Victory Pub	5.0	7.0	9.0
9	St Bede's Mews	5.0	5.0	5.0

Table 5.1: Proposed Stormwater Peak Discharge limits

5.3.3. The detailed stormwater drainage proposals to mitigate flood risk from each of the plots are discussed in detail in Sections 5.3.1 to 5.3.9 below.

5.3.4. The Building Regulation Part H stipulates that stormwater should be "discharged to one of the following, listed in order of priority:

a) an adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,

b) a watercourse; or, where that is not reasonably practicable,

c) a sewer."

5.3.5. The above hierarchy was considered in preparing the drainage proposals in Regents Park Estate. Soakaways were discounted on any of the proposed plots as Regents Park Estate is located within the London Clay Formation which is not suitable for soakaways. As there are no natural watercourses in close proximity to any of the plots, surface water run-off will to be attenuated then discharged to the public stormwater sewers, if available or public combined sewers.

5.3.6. At the time of writing this report the condition of the onsite existing private drainage network was still to be surveyed by electronic trace and CCTV (to be completed in due course). There may be sections of existing sewers within some plots that may require repair/replacement for both the foul and surface water drainage systems to comply with modern design standards and proposed alterations to plot drainage. The conditions of the onplot existing drainage are only relevant if intended for re-use.

5.3.7. The preliminary drainage design prepared for the proposed plots, included in Appendix 4, is based on the principles outlined in following documents:

- BS EN 12056 - Drains and Sewer Systems Inside Buildings
- BS EN 752 - Drains and Sewer Systems Outside Buildings
- Building Regulations part 'H' - Drainage and waste Disposal
- Sewers for Adoption 7th Edition
- CIRIA C697 The SUDS Manual (2007)
- DEFRA/ EA Preliminary Rainfall Run Off Management for Developments (2013)
- CIRIA Interim Code of Practice for Sustainable Drainage (2004)
- CIRIA C609 SUDs, Hydraulic, Structural and Water Quality Advice (2004)
- Environment Agency Rainfall Run Off Management for Development Interim Procedure
- CIRIA C539 Guidance on the Design of Rainwater Reuse Systems (2004)
- CIRIA C635 Designing for Exceedance in Urban Drainage Good Practice (2006)
- CIRIA C680 Structural Design of Modular Geo-cellular Drainage Tanks (2008)

5.3.8. The proposed stormwater drainage network for each plot will be designed to conform to the following criteria;

- No pipe surcharge for events up to 1 in 2 year design storm
- No on plot stormwater sewer flooding for rainfall events 1 in 30 year
- No stormwater flooding off the plot from the proposed development for rainfall events up to the 1 in 100 year+30%
- Minimum pipe velocity at full flow = 0.75m/s
- Pipe roughness value (ks) = 0.6
- M5-60 value = 20.800
- R = 0.438

5.3.9. Below ground attenuation storage systems will be used store stormwater and discharge it at controlled run-off rates. The attenuation system will store the run off from the new buildings and associated hard standing areas.

5.3.10. All the buildings are fitted with either a brown or green roof to improve the biodiversity in the area as well as improve the water quality discharged off the building roofs.

5.3.11. New foul water network will be adequately designed for the new proposed residential and mixed use buildings to ensure a self-cleansing regime within gravity foul sewers is achieved. The self-cleansing regime is considered to be achieved if

a) the minimum pipe flow velocity is be 0.75 m per second at one-third design flow. Where this requirement cannot be met, then this criterion would be considered to be satisfied if:

b) a 150 mm nominal internal diameter gravity pipe is laid to a gradient not flatter than 1:150 where there are at least ten dwelling units or 5 WCs connected; or,

c) a pipe with a nominal internal diameter of 100 mm, serving ten or less properties is laid to a gradient not flatter than 1:80, where there is at least one WC connected and 1:40 if there is no WC connected.

ROBERT STREET (PLOT 1)

Surface Water

5.3.12. The preliminary drainage layout for the plot is included in Appendix 4.

5.3.13. A green roof, 518m^2 in area, is proposed to cover the entire roof of the building. Hard landscaping will cover approximately 1369m^2 and the remainder will be soft landscaped.

5.3.14. To limit the peak flows to 28l/s for rainfall events up to the 1 in 100 year including 30% climate change, an attenuation tank is proposed and this will store approximately 55m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds

Foul Water

5.3.15. Based on the proposed 13 dwellings and 336m^2 of Community Hall space the proposed peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 0.7l/s. The peak flows rate has been calculated assuming the following:

- Peak flow of 4000l/dwelling/day
- Peak flow of 1800l/100m^2/day of floor space for the Community Hall.

Diversion of Existing Thames Water Sewer

5.3.16. The existing Thames Water sewer which runs through the plot will be underneath the proposed building footprint. Thames Water have been contacted and they have stated that both a build-over (class 3) agreement or a diversion of the sewer away from the building footprint are feasible. The option of a Building Over (Class 3) agreement will require the

applicant to enter into a Dead of Easement that has a demolition clause, which could be considered onerous and thus the diversion of the sewer is CampbellReith's preferred solution. Further discussions are on-going to facilitate diversion of the sewer.

FORMER ONE STOP SHOP (PLOT 2)

Surface Water:

5.3.17. A green roof, 391m^2 in area, is proposed to cover the entire roof of the building. Hard landscaping will cover approximately 374m^2 and the remainder (542m^2) will be soft landscaped.

5.3.18. To limit the peak flows to 7.3/s for rainfall events up to the 1 in 100 year including 30% climate change an attenuation tank is proposed and this will store approximately 35m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds.

Foul Water:

5.3.19. Based on the proposed 24 dwellings and 162.5m^2 of Community Hall space the proposed peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 1.15l/s. The peak flows rate has been calculated assuming the following:

- Peak flow of 4000l/dwelling/ day
- Peak flow of 1800l/100m^2/day of floor space for the Commercial Space

VARNDELL STREET (SITE 3)

Surface Water

5.3.20. The preliminary drainage layout for the site is included in Appendix 4.

5.3.21. A green roof, 362m^2 in area, is proposed to cover the entire roof of the building. Hard landscaping will cover approximately 243m^2 and the remainder (1055m^2) will be soft landscaped.

5.3.22. To limit the peak flows to 5l/s for rainfall events up to the 1 in 100 year including 30% climate change, an attenuation tank is proposed and this will store approximately 13m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds.

Foul Water

5.3.23. Based on the proposed 13 dwellings the proposed peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 0.37l/s. The peak flows rate has been calculated assuming a peak flow of 4000l/dwelling/day.

NEWLANDS PLOT (PLOT 4)

Surface Water

5.3.24. The preliminary drainage layout for the plot is included in Appendix 4.

5.3.25. A brown roof, 391m^2 in area, is proposed to cover the entire roof of the building. Hard landscaping will cover approximately 298m^2 and the remainder (1116m^2) will be soft landscaped.

5.3.26. To limit the peak flows to 5l/s for rainfall events up to the 1 in 100 year including 30% climate change an attenuation tank is proposed and this will store approximately 12m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds

Foul Water

5.3.27. Based on the proposed 32 dwellings and 95m^2 of commercial space the proposed peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 1.5l/s. The peak flows rate has been calculated assuming the following:

- Peak flow of 4000l/dwelling/day
- Peak flow of 1800l/100m^2/day of floor space for the commercial area.

DICK COLLINS HALL(PLOT 5)

Surface Water

5.3.28. The preliminary drainage layout for the plot is included in Appendix 4.

5.3.29. The 88m^2 of the proposed building roof will be a green roof, and the remainder (274m^2) will be a brown roof. Hard landscaping will cover approximately 489m^2 and the remainder (284m^2) will be soft landscaped.

5.3.30. To limit the peak flows to 10.2l/s for rainfall events up to the 1 in 100 year including 30% climate change, an attenuation tank is proposed and this will store approximately 28m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds

Foul Water

5.3.31. Based on the proposed 11 dwellings the proposed peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 0.51l/s. The peak flows rate has been calculated assuming a peak flow of 4000l/dwelling/day

CAPE OF GOOD HOPE (PLOT 6)

Surface Water

5.3.32. The preliminary drainage layout for the plot is included in Appendix 4.

5.3.33. The area outside the green line (870m^2) within the Cape of Good Hope Plot will remain as existing

5.3.34. The area within the green line (667m^2)will however be redeveloped as

- 279m^2 will be covered by new building with a brown roof,
- Hard landscaping will cover approximately 320m^2 and
- Soft landscaping will cover the remainder (68m^2).

5.3.35. To limit the peak flows to 9.9l/s for rainfall events up to the 1 in 100 year including 30% climate change, an attenuation tank is proposed and this will store approximately 13m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds

Foul Water

5.3.36. Based on the proposed 15 dwellings the proposed peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 0.69/s. The peak flows rate has been calculated assuming a peak flow of 4000l/dwelling/day

The VICTORY PUB (PLOT 8)

Surface Water

5.3.37. The preliminary drainage layout for the plot is included in Appendix 4.

5.3.38. A brown roof, 518m^2 in area, is proposed to cover the entire roof of the building. Hard landscaping will cover approximately 286m^2 and the remainder (47m^2) will be soft landscaped.

5.3.39. To limit the peak flows to 9l/s for rainfall events up to the 1 in 100 year including 30% climate change, an attenuation tank is proposed and this will store approximately 13m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds

Foul Water

5.3.40. Based on the proposed 10 dwellings and 184.5m^2 of commercial space the proposed peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 0.5l/s. The peak flows rate has been calculated assuming the following:

- Peak flow of 4000l/dwelling/day
- Peak flow of 1800l/100m^2/day of floor space for the commercial area.

ST. BEDE'S MEWS (PLOT 9)

Surface Water

5.3.41. The preliminary drainage layout for the plot is included in Appendix 4.

5.3.42. The area outside the green line (447m^2) within the At Bede's Mews Plot will remain as existing

5.3.43. The area within the green line (330m^2)will however be redeveloped as follows

- 116m^2 will be covered by new building with a brown roof,
- Hard landscaping will cover approximately 198m^2 and
- Soft landscaping will cover the remainder (16m^2).

5.3.44. To limit the peak flows to 5l/s for rainfall events up to the 1 in 100 year including 30% climate change, an attenuation tank is proposed and this will store approximately 7m^3. Co-ordination has been carried out with the landscape architect to ensure that space has been available for the attenuation tank. Due to space constraints the use of underground attenuation tank is preferred to other attenuation methods/features such as swales and ponds

Foul Water

5.3.45. Based on the 3 dwellings proposed, the peak foul water flow to be discharged off the plot to the Thames Water sewer is approximately 0.14l/s. The peak flows rate has been calculated assuming a peak flow of 4000l/dwelling/day

6.0 RESIDUAL RISKS AND IMPACTS

Residual Risks

6.1.1. The residual flood risks are mainly from stormwater water drainage. Adequate flood routing will need to be considered during detailed design to ensure that for rainfall events greater than the 1 in 100year+30% stormwater will flow away from buildings to carefully chosen areas such as car park, roads and soft landscaping areas.

6.1.2. Flooding to the buildings can also be caused by drains blocking due to lack of maintenance or inappropriate use of the drains. The flood routes carefully designed can mitigate this risk. Flood route design is to be carried out during detailed design as part of the detailed levels design for each plot.

7.0 CLIMATE CHANGE

7.1.1. The impacts of climate change on the proposed development have been considered in developing this flood risk assessment.

7.1.2. In accordance with the National Planning Policy Framework, the peak rainfall intensities have been increased by 30% to account for climate change when determining the size of attenuation tanks on the plot.

7.1.3. Suitable flood routes will need to be considered during detailed design to ensure that there is no flooding to be building for rainfall events up to the 1 in 100+30%.

7.1.4. Stormwater is to be discharged off each individual plot at controlled rates for events up to the 1 in 100year plus the 30% allowance for climate change.

8.0 CONCLUSIONS & RECOMMENDATIONS

8.1.1. Regents Park Estate is located within Flood Zone 1 as shown on the Environment Agency mapping, detailed Section 5.2 of this report.

8.1.2. Environment Agency mapping and the Camden Strategic Flood Risk Assessment show that Regents Park Estate to be at low risk of fluvial and coastal flooding. The site is also at low risk of flooding from groundwater, stormwater and reservoir inundation flooding.

8.1.3. A Stormwater water management strategy for the site has been prepared and is described in Section 5.3 above. Proposed drainage of each individual plot within the site is subject to detailed design with Thames Water and Environment Agency agreement, however the strategy included as part of this FRA demonstrates that the potential flood risk from the eight plots in Regents park Estate proposed for redevelopment is minimised through the use of SuDS storm water management measures.

8.1.4. The proposed developments are considered to be at low risk of flooding from all sources and are therefore compliant with the NPPF and its associated Technical Guidance.

Appendix 1: Existing Plots Information

NOTES

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PLOT AREAS

	TOTAL AREA (M^2)	IMPERMEABLE AREA (M^2)	PERMEABLE AREA (M^2)
PLOT 1	2424	1935	489
PLOT 2	1307	496	811
PLOT 3	1660	0	1660
PLOT 4	1805	245	1560
PLOT 5	1135	683	452
PLOT 6	1537	1522	15
PLOT 7	163	163	0
PLOT 8	610	610	0
PLOT 9	776	776	0

Status/Rev	Description	Date	By
S1	ISSUED FOR INFORMATION	27.03.15	NEJ

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BRISTOL 0117 916 1066 ☐ ☐ DUBAI 00 971 4345 7088
www.campbellreith.com

Job Title: REGENTS PARK ESTATE
Client: TIBBALDS

IMPERMEABLE PLOT AREAS

drawn	date	scale @ A0	C1 checked	CR Project No.
NEJ	27/03/2015	1:1000@A0	BSF	11775SK001

Drg No.	Suitability	Status/Revision
11775-CRH-Z0-00-SK-C-001	S0	S1

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7
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LEGEND

- INDIVIDUAL SITE BOUNDARY
- OVERALL SITE BOUNDARY
- EXISTING HARD SURACE
- EXISTING SOFT SURFACE

Status/Rev	Description	Date	By
S1	ISSUED FOR INFORMATION	15.04.15	NEJ

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Job Title
REGENTS PARK ESTATE

Client
LB CAMDEN

PLOT 1 - ROBERT STREET CAR PARK TOPO SURVEY

drawn	date	scale @ A0	C1 checked	CR Project No.
NEJ	15/04/2015	1:125	BSF	SK-C-016

Drg No.	Suitability	Status/Revision
11775-CRH-Z1-00-SK-C-016	S0	S1

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Status/Rev	Description	Date	By
S1	ISSUED FOR INFORMATION	15.04.15	NEJ

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Job Title
REGENTS PARK ESTATE

Client
LB CAMDEN

PLOT 2 - FORMER ONE STOP SHOP
TOPO SURVEY

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NEJ	15/04/2015	1:125	BSF	SK-C-017

Org No	Suitable	Status/Revision
11775-CRH-Z2-00-SK-C-017	S0	S1

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Status/Rev	Description	Date	By
S1	ISSUED FOR INFORMATION	15.04.15	NEJ

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Job Title
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PLOT 3 - VARNDELL STREET CORNER TOPO SURVEY

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NEJ	15/04/2015	1:125	BSF	SK-C-018

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11775-CRH-Z3-00-SK-C-018	S0	S1

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Status/Rev	Description	Date	By
S1	ISSUED FOR INFORMATION	15.04.15	NEJ

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Job Title
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Client
LB CAMDEN

PLOT 4 - NEWLANDS PLOT
TOPO SURVEY

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NEJ	15/04/2015	1:125	BSF	SK-C-019

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11775-CRH-Z4-00-SK-C-019	S0	S1

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Job Title
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Client
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PLOT 5 - DICK COLLINS HALL
TOPO SURVEY

drawn	date	scale @ A0	C1 checked	CR Project No.
NEJ	15/04/2015	1:125	BSF	SK-C-020

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11775-CRH-Z5-00-SK-C-020	S0	S1

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S1	ISSUED FOR INFORMATION	15.04.15	NEJ

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Job Title:
REGENTS PARK ESTATE

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PLOT 6 - CAPE OF GOOD HOPE TOPO SURVEY

drawn	date	scale @ A0	C1 checked	CR Project No.
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Dng No.	Suitability	Status/Revision
11775-CRH-Z6-00-SK-C-021	S0	S1