Earthworks & Remediation Plan

Buildings T2-T3

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General Partner Ltd

June 2016

King's Cross

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KING'S CROSS CENTRAL BUILDINGS T2-T3 EARTHWORKS AND REMEDIATION PLAN

RAMBOLL ENVIRON

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EXECUTIVE SUMMARY

SCOPE	
PURPOSE OF THE REPORT	Ramboll has been appointed by King's Cross Central General Partnership Ltd. ('KCCGP'), to provide geo-environmental services to support the development of new buildings T2-T3 at the development site of King's Cross Central ('KXC'). This report provides the Earthworks and Remediation Plan for the submission site in accordance with the requirements of Condition 18 of Outline Planning Permission referenced 2004/2307/P dated 22 July 2008.
SITE INFORMATION	
APPROX. GRID REFERENCE	TQ 529975, 183868 **APPROX. AREA (ha)** 0.7
SITE SETTING	The site is located north of King's Cross Station in the London Borough of Camden ('LBC'). The site occupies a narrow corridor of land positioned between the access road (feeding Plots T1 to T6) and the HS1 land. The sites are currently undeveloped brownfield land. Buildings T2-T3 currently house the temporary welfare compounds for Kier and BAM for the adjacent Plot T1 and Plot T5 construction development plots, respectively.
SITE HISTORY	As a summary, between 1746 and 1834, the site comprised large open fields. The first indication of the site's use as railway lands appears on the 1862 map with this continuing relatively unchanged until around 1994. During the period between 1968 and the early 1990s, historic maps show a significant contraction of the goods and railway infrastructure, with the gradual reduction in goods buildings and the closure of ancillary buildings. By the early 1990s, the majority of the wider KXC site (including Buildings T2-T3) had been cleared and remained relatively undeveloped until implementation of the KXC development in 2008.
PROPOSED DEVELOPMENT	Buildings T2-T3 are proposed to be constructed as a commercial office building within the KXC development area. The proposed development is a commercially led scheme, providing Grade A office space over 12 storeys, with retail units and a possible health centre at grade. No basement is proposed as part of the development. It is understood that areas of proposed soft-landscaping are limited to a brown/green roof area i.e. not at ground level.
ENVIRONMENTAL SETTING AND FINDINGS OF GROUND INVESTIGATION	
GROUND INVESTIGATION	A site investigation has been undertaken between the 14th September and 4th October 2015. The ground investigation scope comprised five cable percussive boreholes advanced to a maximum depth of 50.0mbgl, twelve trial pits advanced to a maximum depth of 4.2mbgl and three observation trenches advanced to a maximum depth of 4.0mbgl. A programme of geo-environmental laboratory analysis was undertaken on selected samples. In addition six ground gas and groundwater monitoring visits have been undertaken as part of this study.
GEOLOGY	The geology has been identified to be comprised by between 2.3mbgl to 4.8mbgl of Made Ground which overlies 30.6mbgl to 36.9mbgl of London Clay. Underlying the London Clay is the Lambeth Group which was proven to a depth of 50.0mbgl.
HYDROLOGY	The nearest surface water body is the Grand Union Canal which lies approximately 150m to the south west of the site, the nearest surface water abstraction to the site is from this canal.

HYDROGEOLOGY	The Made Ground is unclassified whilst the London Clay is classified as Unproductive Strata. At depth, the granular Lambeth Group is classified as a Secondary A Aquifer whilst the Thanet Sands and White Chalk Subgroup form the Principal Aquifer. The site does not lie within a groundwater Source Protection Zone (SPZ). The nearest groundwater abstraction licence is for a non-potable water abstraction situated 141m north-west relating to the King's Cross Concrete Batching Plant. In the absence of further information, the abstraction is assumed to be sourced from the White Chalk Subgroup (at depth). The nearest potable groundwater supply abstraction is located over 1km east of the site.
CONTAMINATION FINDINGS	*Human Health* Asbestos containing materials (ACM), chrysotile, were identified within the Made Ground soils during the ground investigation. This has the potential to pose a risk to human health during the operational and construction phases of development. The risk to construction workers and adjacent site users can be mitigated via the use of appropriate PPE and on-site health and safety precautions. The site soils are not considered suitable for the build-up of the proposed brown/green roof area. However, the risk to human health within this area can be reduced to acceptable provided the materials that are used are certified as suitable for use.
	Controlled Waters A number of leachable contaminants have been identified in the Made Ground, however the impact to the underlying perched water is considered to be negligible based on the limited correlation between the leachate and groundwater data. Elevated perched water results are not considered to be indicative of an on-site source due to the limited correlation between soil leachate and perched water results. Based on the lack of proximal sensitive receptors i.e. groundwater abstractions and surface water features, these exceedences are not considered significant. Furthermore, perched water exceedences for sulphate and selenium have been identified to be typical of perched water within the KXC development. There will be limited potential for the formation of preferential pathways to the underlying aquifers. Overall the risks to Controlled Waters are considered to be Low.
GROUND GAS	Although methane has been detected, the site has been classified as a Characteristic Situation of 1 (very low risk) and therefore ground gas protection measures are not deemed necessary for the proposed development.
PRELIMINARY WASTE ASSESSMENT	The preliminary waste assessment undertaken as part of this study indicates that if material is disposed from site the Made Ground is likely to be suitable for disposal as a combination of inert, stable non-reactive hazardous waste in a non-hazardous landfill and hazardous waste. The London Clay is likely to be suitable as stable non-reactive hazardous waste in a non-hazardous landfill. These should be confirmed by any receiving facility prior to disposal, under Duty of Care, following discussions with the producer of the waste. Due to the detection of ACM, contractor vigilance and specialist advice is advised to determine the appropriate waste stream for materials requiring disposal.
EARTHWORKS	
EARTHWORKS REQUIREMENTS	Earthworks at the site are proposed to comprise the reduction of site levels to formation level, installation of piles to approximately 27 m depth and excavation for pile caps and formation of lift shafts. Approximately 33,131 cubic metres of soil material are

	anticipated to be excavated, and 7,985 cubic meters of soil and fill are anticipated to be imported to the site. These combined would be expected to generate approximately 4,836 lorry movements.
REMEDIATION STRATEGY	
REMEDIATION STRATEGY	Based on the data and the ground contamination risk assessment, it is not considered that remedial measures are required as part of the proposed development. The site Made Ground soils are unsuitable for re-use in soft landscaping in the wider KXC development, although they could be re-used on site or on part of the wider KXC development providing they are placed under hardstanding. A number of best practice measures are also recommended to be incorporated as part of the development which should include: • An Environmental Management Plan (EMP) should be implemented in order to prevent construction work and future operations from giving rise to land contamination. • The preparation of an asbestos management protocol for the site. • The foundation solution should be designed to avoid impact to the underlying Aquifers and be subject to a Foundation Works Risk Assessment in accordance with Environment Agency Document NC/99/73. • An unforeseen contamination protocol should be established and an environmental watching brief undertaken by Ramboll throughout groundworks to provide guidance in the event that unexpected or gross contamination is encountered. Following development works a verification report should be prepared documenting the successful completion of work in accordance with the requirements of this Earthworks and Remediation Plan.

1. INTRODUCTION

1.1 Brief

At the request of King's Cross Central General Partnership Limited ('KCCGPL'), Ramboll Environ has been instructed to provide an Earthworks and Remediation Plan (ERP) to support a Reserved Matters Submission for new offices premises for Buildings T2-T3 of the King's Cross Central ('KXC') development.

The KXC Redevelopment site was granted Outline Planning Permission in 2004 under application reference 2004/2307/P. Land Contamination matters are dealt with under Condition 18 which states that *"relevant applications for approval of the reserved matters shall be accompanied by an Earthworks and Remediation Plan to deliver appropriate site levels and ground conditions for that part of the development. All works shall be carried out in accordance with the Earthworks and Remediation Plan as approved'.*

The purpose of this ERP is to provide information pertaining to the ground conditions and prevailing geo-environmental setting at the site in the context of the development proposal. In addition this document highlights the potential contamination risks present at the site and provides a strategy for addressing the identified risks as part of the earthworks and construction phases of the development.

1.2 Pertinent Reports

This ERP should be read in the context of the following overarching documents which were submitted in support of the original KXC outline planning application (2004/2307/P) and/or the current Reserved Matters submission for Buildings T2-T3.

- King's Cross Central Environmental Statement (ES) Volume 4: Part 16 Soils and Contamination Specialist Report, Arup, May 2004;
- King's Cross Central ES Volume 5: Supplement, Arup, September 2005; and,
- King's Cross Revised Code of Construction Practice (CoCP), RPS, September 2005.

In April 2015, Ramboll completed a combined Geotechnical and Geo-environmental Desk Study (DBA) Buildings T2-T3. Following the recommendation for site-specific exploratory works, an intrusive Phase II site investigation of Buildings T2-T3 was undertaken by Concept Engineering Consultants (Concept) between the 14th September and 4th October 2015, under the technical supervision of Ramboll.

Salient reports used in the preparation of this ERP have been presented as Table 1-1, below.

Table 1-1: List of Salient Reports

Report Title	Author	Date
King's Cross Central P1 Ground Contamination Interpretative Report 6727.E.GCIR.1B.	Ramboll UK	July 2012
King's Cross Central P1 Earthworks and Remediation Plan ref 6727.E.ERP.5A	Ramboll UK	August 2012
King's Cross T1 Building Ground Contamination Interpretative Report 4970.E.GCIR.1C	Ramboll Whitbybird	August 2008
King's Cross T1 Building Addendum to Ground Contamination Interpretative Report 4970.E.AGCIR.2A	Ramboll Whitbybird	March 2009
King's Cross Central Plot T1 Phase 2 Earthworks and Remediation Plan Report 4970.E.ERP.T1S.4A	Ramboll UK	January 2013
King's Cross T5 Desktop Site Appraisal Report 7437.E.DSA.1C	Ramboll UK	May 2010

Report Title	Author	Date
King's Cross T5 Ground Contamination Interpretative Report 7437.E.GCIR.1A	Ramboll UK	August 2010
King's Cross T2 Plots Geotechnical and Geo-environmental Desk Study KXC-T2-001-Z-000147-XX-910-01	Ramboll Environ	April 2015
King's Cross Cooling Pod Ground Contamination Interpretative Report 61033466.E.GCIR.I02	Ramboll Environ	July 2015
King's Cross Cooling Pod Earthworks Remediation Plan Report 61033466.E.ERP.I03	Ramboll Environ	August 2015
King's Cross T2 Ground Contamination Interpretative Report KXC-T2-001-R-000147-11-0921-01	Ramboll Environ	November 2015

2. SITE CHARACTERISATION

2.1 Location & Description

The site is located within the London Borough of Camden and makes up part of the KXC development as shown on the site location plan included in Figure 2.1. Figure 2.2 shows the approximate redline boundary of the site. The subject site comprises two individual buildings; Building T2 to the south and Building T3 to the north and has an approximate National Grid Reference 529975, 183868, and is *circa* 0.7 hectares in size.

The site is located in the northern region of the KXC development, between the S1 and S3 plots to the east, and the proposed Cooling Pod and T-Block access road to the west. South and north east of the subject site are plots T1 and T5, respectively, both currently under construction.

The two site buildings are currently undeveloped brownfield land. Buildings T2 and T3 currently house the temporary welfare compounds for Kier and BAM for the adjacent Plot T1 and Plot T5 developments respectively. The majority of the site is covered with hard-standing (concrete or tarmac); however, localised areas of soft landscaping exist on the western extent of Building T2.

The northern and eastern sections of Building T2 contain a number of porta-cabins used by Kier as site offices and for the storage of materials and equipment. The majority of the central area contains further construction equipment, whilst a steel cage used for the storage of chemicals and a mobile above ground diesel storage tank (AST) was also identified within this central area of Building T2. From a site walkover undertaken, the chemical containers and AST were considered to be in good condition and no leakages were evident upon the underlying hard-standing. Emergency spill kits and bunds were also present. A mortar containing silo found upon a concrete slab was identified from a walkover to be located within the south-western section of Building T2.

BAM's site offices sit within a number of porta-cabins within the central-eastern section of Building T3. To the north of the cabins the area is occupied by the storage of equipment whilst an electricity sub-station was identified within the north-western corner. The central western section consists of a fenced off area containing four mortar containing silos which sit on a concrete slab. The southern section is characterised by further storage of equipment which is underlain by a concrete slab which is approximately 200mm thick.

The topography of the site is slightly undulating. There are gentle slopes from the central area of the four buildings towards the outer edges of the the site, with the central area being at an elevation of circa +28 m Ordnance Datum (OD), and the lowest points at these buildings lying at circa +26.70 mOD and +27.00 mOD respectively.

A GroundSure report for the site has identified one record for an historical permit for concrete and crushing processes and one entry relating to a conveyor.

2.2 Site Surroundings

Buildings T2-T3 lie within the KXC development area. To the west of the site is the Cooling Pod development plot, beyond which are the HS1 railway tracks, which curve in a similar orientation to the western boundary of Buildings T2-T3. South of Building T2 is Plot T1, and to the southeast is Plot P1. East of Building T3 is Plot T5 with Plot T6 beyond. Plots S1-S5 are located to the east

of Buildings T2-T3, below which are the Thameslink 2000 Tunnels, which also pass beneath Plot T1 but do not pass under Buildings T2-T3. A plan is provided in Appendix 1.

2.3 Proposed Development

Buildings T2-T3 are proposed to be constructed as a commercial office building within the KXC development area. The proposed development is a commercially led scheme, providing Grade A office space over 12 storeys, with retail units and a possible health centre at grade. No basement is proposed as part of the development.

The principal constraints for the project are the site geometry, the existing T1 and T5 buildings at either end of the site and the presence of live services across the site which feed the Cooling Pod located to the immediate northwest of Site T2. The distance of the site from existing rail assets (adjacent Highspeed 1 (HS1) railway fence and the underlying (but not directly beneath) Thameslink Canal Tunnels) also create a constraint at the site.

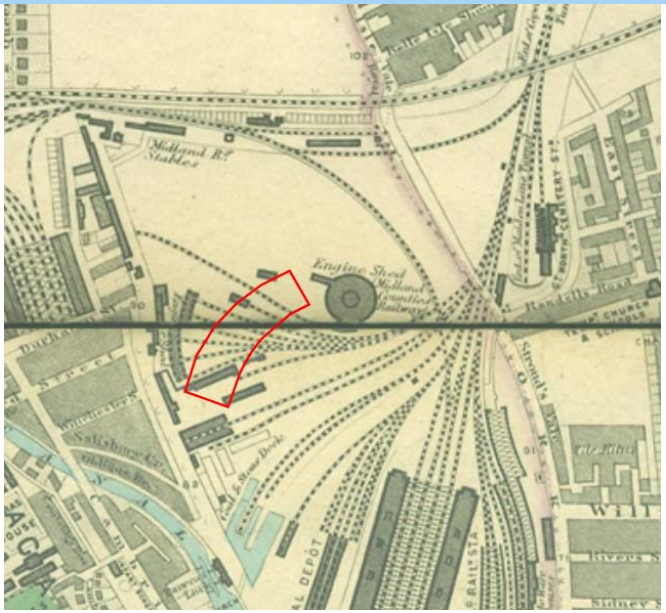
Figure 2.2 provides a plan of the site areas and the adjacent surrounding development sites, including the HS1 tracks and the underlying Thameslink Canal Tunnels.

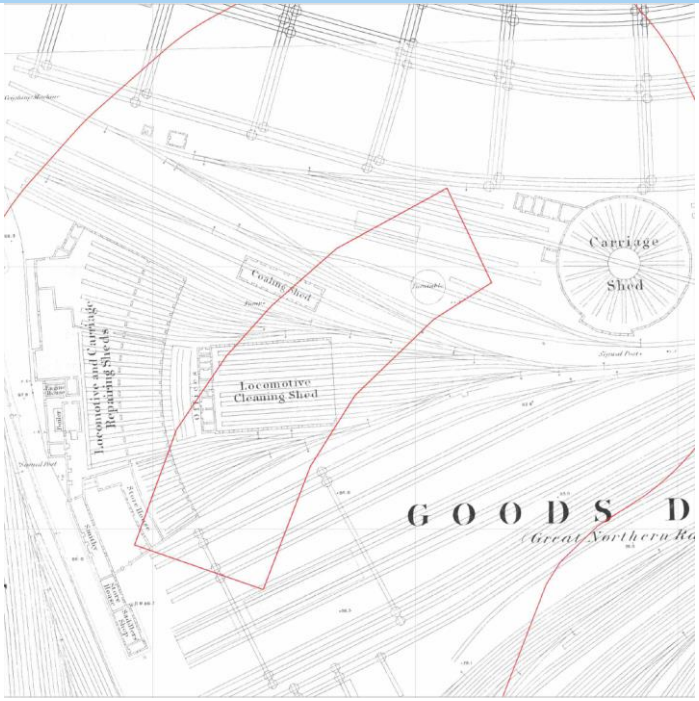
Proposed plan (Bennetts Associates Architects drawing KXC-T2-001-A-1503-P20-001)is contained is within Appendix 2 of this report.

2.4 Site History

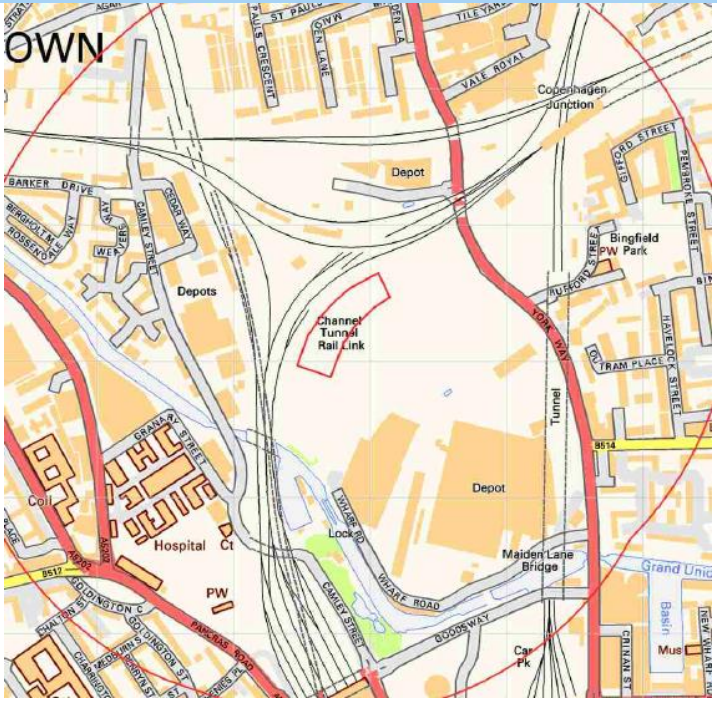
Until the early 1830s, the site comprised large open fields. The first indication of the site's use as railway land appears on historical mapping data taken from the early 1860s. Between the early 1860s and late 1960s the site remains largely unchanged with the continuing occupation of railway infrastructure. The phased removal of railway infrastructure began during the late 1970s and by the early 1990s had been largely removed leaving the site unoccupied until the implementation of the wider KXC redevelopment in 2008. A summary of the history of the site and its immediate surroundings is presented in Table 2-1. Potentially contaminative activities are shown in bold.

Table 2-1: Summary of History

Source	Site	Surrounding	Map
Pre - 1871	Roque's Map of London shows the area of the site as undeveloped and covered by open fields. No significant deviations from this are shown on Tomson's Map (1801), Greenwood's Map (1827) or Bartlett's Map (1834). By Standford's Map of 1862 the site is occupied by **railway tracks.**	On Rouqe's map the surrounding area is undeveloped with a small settlement, Pancras Wells shown to the north of the site. Tomson's Map of 1801 shows significant development in the vicinity of the site. On Greenwood's map of 1827 extensive development has taken place to the north and west of the site. A **tank farm** associated with a **gas works** is shown ~400m to the south. Continued development has occurred on Bartlett's Map of 1834. On Standford's map of 1862 there have been significant developments within the immediate vicinity of the site with the redevelopment of the area as **railway land** with associated **rail tracks** and ancillary buildings.	 Standford's Map 1862 (no scale)

Source	Site	Surrounding	Map
1871 to 1925	The site is almost entirely occupied by **railway lines** and structures pertaining to a **locomotive cleaning shed** (known as an 'Engine Shed' from 1894), **locomotive and carriage repairing sheds** (known as 'Carriage Works Repairing from 1894), **coaling shed**, **store house,** offices and turntable associated with King's Cross and St. Pancreas Stations.	Railway Lines associated with King's Cross Station and St. Pancreas Station approximately 600m south occupy much of the land surrounding the site. Further railway associated structures comprising **carriage sheds** *(referred to from 1894 as engine sheds),* **weighing machines, repair sheds, store houses, engine houses** and **boilers**, **workshops**, a **smithy, goods sheds, coal sheds/depot** and stables all lie within the vicinity of the site. The Regent's Canal is demarcated 100m south of the site and runs from south-east to north-west prior to heading west. Beyond the Canal to the west lies residential property, whilst a **burial ground** and **gas works** are situated circa 300m and 500m south-west and south of the site respectively. By 1916 a railway tunnel, running south to north, circa 250m east of the site becomes evident.	 1871 1:1,056

Source	Site	Surrounding	Map
1926 to 1975	Other than the 'Carriage Works Repairing' building being renamed as '**Engine Shed and Workshops'**, no significant changes occurred on-site until 1968. By this time the majority of railway lines and structures were no longer present with the exception of the northern and far southern extents of the site which remained in use as railway tracks. The area in which the site lies became known as a '**Freightliner Terminal**'. It is unclear from OS map editions when the site is no longer used for railway purposes however; data collected as part of adjacent assessments undertaken for the wider KXC development indicates land redundancy from the late 2000s.	By 1951, several buildings in the area highlight the impacts from Luftwaffe raiding. An area circa 300m south-west previously marked as a workhouse with St. Pancreas Gardens attached is labelled as St. Pancreas Hospital by 1948. By 1968 a tunnel is demarcated to run from south to north, approximately 75m west of the site. During this time an electricity sub-station also becomes evident circa 50m south of the site. A diesel depot runs adjacent to Wharf Road 100m south of the site. By 1968 a tunnel had been constructed to run from south to north, approximately 75m west of the site. During this time an **electricity sub-station** also becomes evident circa 50m south of the site, and a **diesel depot** had been constructed adjacent to Wharf Road, approximately 100m south of the site.	 1968-1971 1:1,250

Source	Site	Surrounding	Map
1976 to 2014	By 1982 the site remained demarcated as the **Freightliner Terminal** and contained a conveyor in the northern section of the site. During the period 1989 to 2014, much of the land previously occupied by King's Cross station was no longer used for railway purposes and was undergoing redevelopment as part of the King's Cross Central Redevelopment.	By the early 1990s, within 100 m north of the site, a number of silos were constructed adjacent to goods sheds. By 2010 the Channel Tunnel Rail Link had been constructed and is shown on historic maps from this time.	 2010 1:10,000

2.5 Potential for contamination

With reference to the Department of the Environment Industrial Profile for Railway Engineering Works, DoE, 1995, typical contaminants of concern associated with former railway land-uses include:

- fuels, oils and hydraulic lubricants as a result of past spills;
- heavy metals such as mercury associated with old relay switches;
- solvents associated with maintenance activities (degreasing and thinning);
- creosotes used to preserve timber-based infrastructure;
- polychlorinated bi-phenols associated with electrical infrastructure (substations and transformers);
- herbicides / pesticides associated with vegetation control; and,
- asbestos containing material (ACM) used in locomotive lagging, rail stock breaks and insulation and building infrastructure (cabling, ducts).

The site and immediate surroundings has been occupied by a variety of railway infrastructure including goods and coal depots, locomotive cleaning and repair/engine sheds, carriage sheds, tracks and works. Therefore any potential contaminants of concern associated with the historical railway land use could potentially be site-wide.

Brownfield sites, such as this, are seldom underlain by natural soils but rather a general Made Ground fill material of variable thickness and chemical composition. The presence of Made Ground beneath the site is considered likely in this instance and therefore it is not unusual to encounter low levels of ACM, heavy metals and poly aromatic hydrocarbons (PAHs).

The presence of a significant thickness of Made Ground does present a potential source of hazardous ground gas including elevated concentrations of methane (CH4) and or carbon dioxide (CO2).

2.6 Unexploded Ordnance

RPS Explosives Engineering Team has carried out a separate desktop study which specifically considers the potential presence of historic Unexploded Ordnance (UXO) at the KXC regeneration area. With reference to RPS's drawing JER3699-KXC-003 within the desktop study, South Building Block S1 is shown to be predominantly an area of Low/Moderate Risk with an area of Moderate risk on the western boundary. South Building Block S2 and North Building Block N1 are largely designated as an area of Moderate Risk, while North Building Block N2 is almost entirely Low/Moderate Risk with a localised section of the site being Low risk.

In order to mitigate the risk of UXO it is recommended that a UXO management plan is in place prior to commencing intrusive works and that all site personnel attend an Explosive Ordnance Site Safety and Awareness Briefing. Furthermore, for any works within the moderate risk areas, an Explosives Safety Engineer should be onsite to supervise excavations and an intrusive magnetometer survey should be undertaken ahead of exploratory boreholes and/or piling.

Contractors risk assessments & method statements (RAMS) covering all groundwork should take into consideration the information presented within RPS's risk assessment.

3. GROUND CONDITIONS

3.1 Introduction

A combined geo-environmental and geotechnical ground investigation was undertaken between the 14th September and 4th October 2015 by Concept Engineering Consultants (Concept) under the supervision of Ramboll. The scope of the ground investigation was specified by Ramboll based on the parameters approved at the outline stage and emerging proposals for the Buildings T2-T3.

The geo-environmental findings of the site investigation are provided in detail within the Ground Contamination Interpretative Report (GCIR) (Ramboll, 2015) and have been summarised for the purpose of this document within the following section.

3.2 Exploratory Works

The scope of the ground investigation comprised the following:

- Five cable percussive boreholes (BH01, BH02B and BH03-BH05) advanced to a maximum depth of 50.0mbgl;
- Twelve trial pits (TP02-TP13) advanced to a maximum depth of 4.2mbgl;
- Three Observation trenches (OT02-OT04) advanced to a maximum depth of 4.0mbgl;
- In-situ testing;
- Groundwater monitoring;
- Ground gas monitoring; and
- Geo-environmental & Geotechnical laboratory testing.

Geo-environmental samples were obtained from all exploratory positions with selected samples scheduled for laboratory analysis to determine the chemical composition of the strata encountered across the site both laterally and with depth.

The Exploratory Hole Plan (ref. 15/2758) from the Concept/Ramboll 2015 ground investigation is contained within the Appendix 3.

Full details of the ground investigation including exploratory hole rationale, sampling strategy and chemical analysis undertaken are contained within the Ground Contamination Interpretative Report (GCIR) included in Appendix 3 of this report.

3.3 Geology

Based upon the findings of the 2015 site investigation the ground conditions beneath the site have been summarised in Table 3-1 below.

Table 3-1: Summary of Geological Sequence

Stratum	Top Depth (mbgl)	Top Depth (m OD)	Thickness Range (mbgl)	Description of Stratum
Made Ground	Ground level	+28.11 to +27.05	2.3 to 4.8	Typically varied from brown clayey sandy GRAVELs to sandy gravelly CLAYs with inclusions of ash. Gravel comprising fine to coarse angular to rounded brick, concrete, flint, chalk, granite, asphalt, clinker, coal with plastic, metal, shell and woody fragments and frequent brick, concrete and granite cobbles.
London Clay	2.3 to 4.8	+24.76 to +23.02	30.6 to 36.9	Firm brown slightly sandy CLAY, becoming a very stiff dark grey brown CLAY at depth.
Lambeth Group	35.3 to 37.8	-7.58 to -9.81	Unproven	Very stiff, brown mottled bluish grey and red silty CLAY with locally grey fine sand.

Given the site's historical railway land-use, localised buried obstructions cannot be ruled out, particularly within the shallow Made Ground and upper bearing stratum of the underlying London Clay.

3.4 Hydrogeology

Under the Water Framework Directive, the Environment Agency (EA) classified geological stratum to reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The Aquifer classifications for the underlying stratum have been summarised as Table 3-2, below.

Table 3-2: Environment Agency Aquifer Classification

Stratum	Environment Agency Aquifer Classification	Environment Agency Aquifer Description
Made Ground	Unclassified	None
London Clay	Unproductive Strata	Rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
Lambeth Group	Secondary A Aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers

The site is not located within a Groundwater Source Protection Zone (GSPZ), nor is there a GSPZ within 500m of the site. The nearest groundwater abstraction licence is situated 141m north-west of the site for a non-potable borehole used at the King's Cross Concrete Plant.

Perched groundwater strikes were encountered during the ground investigation within the London Clay of exploratory positions BH03 and BH04 at depths of 31mbgl (-3.07m Ordnance Datum ('OD')) and 15.7mbgl (+12.29mOD) respectively.

Upon completion all boreholes were installed with 50mm monitoring standpipes to enable subsequent groundwater monitoring to be undertaken.

The monitoring program identified perched water within exploratory holes BH01, BH02B, BH04 and BH05 at depths between 1.87mbgl and 3.94mbgl (+25.77mOD and +23.62mOD). The findings of the groundwater monitoring programme indicated the perched water within the Made Ground occurs as isolated incidences and is not representative of a larger groundwater body underlying the site.

3.5 Hydrology

The nearest surface water body is the Grand Union Canal (GUC) which lies approximately 125m to the southwest of the subject site. The GUC is contained within the combination of canal wall and liner construct, and is considered to be a hydraulically isolated water body which is flowing towards the east. The River Quality Record for the GUC is Chemical Grade B and Biological Grade O.

It should be noted that the majority of natural tributaries to the River Thames have been culverted, dried up or were in-filled during various development of the city. The map of these "lost rivers" (Barton, 1992) indicates that the nearest of these (Fleet) is located approximately 450m to the west of the site and flows southwards into the Thames.

3.6 Ground Gases

Ground gas monitoring was undertaken on six occasions from the 3rd September to 12th October 2015. Atmospheric pressure was recorded to be high to moderate and falling on several occasions with recorded pressures of between 1005 and 1022mB. The results of the ground gas monitoring program have been summarised in Table 3-3.

Table 3-3 Summary of Field Ground Gas Data

I.D	No of Visits	Gas Flow (l/hr)	Max CH_4 (%v/v)	Max CO_2 (%v/v)	Min O_2 (%v/v)	VOC (ppm)
BH01	6	*0.1*	*0.1*	*0.1*	0.2	0.0
BH02B	6	*0.1*	*0.1*	0.6	14.6	0.0
BH03	6	*0.1*	*0.1*	0.1	10.0	0.0
BH04	6	*0.1*	*0.1*	0.6	6.7	0.0
BH05	6	*0.1*	1.7	0.0	0.0	0.0

Italics represent the instrument level of detection

Due to the elevated concentrations of methane it was considered necessary to supplement the gas monitoring data with laboratory data. Ground gas samples from exploratory positions BH01, BH02B, BH03 and BH05 were collected during the monitoring visit on the 5th November 2015.

The laboratory gas data indicates that the concentration of methane (at the limit of detection of 0.02%v/v) was significantly lower than the concentration recorded during the field monitoring visit on the 5th November 2015 (1.2%v/v). There were also differences between the field and laboratory results for oxygen with concentrations of 0.0%v/v and 21%v/v respectively. Whilst inconsistencies have arisen between the field and laboratory data, it is considered that the laboratory data may be more accurate in this instance. A comparison of the laboratory data and field monitoring data from the 5th of November is presented in Table 3-4.

Table 3-4 Summary of Laboratory Ground Gas Data

I.D	Field Result CO2 (%v/v)	Field Result CH4 (%v/v)	Field Result O2 (%v/v)	Laboratory Result CO2 (%v/v)	Laboratory Result CH4 (%v/v)	Laboratory Result O2 (%v/v)
BH01	0.0	0.0	0.7	0.14	< 0.02	21
BH02B	0.0	0.6	14.6	0.12	< 0.02	21
BH03	0.0	0.1	10.0	0.15	< 0.02	21
BH05	0.0	1.2	0.0	0.11	< 0.02	21

TPH and VOC analysis was undertaken on a sample collected from BH05 to determine whether the methane concentrations detected in the field were a masked signal related to petroleum hydrocarbons. The laboratory data highlighted generally low concentrations (i.e. less than 1ppm) which also corresponded with the VOC concretions recorded during field monitoring using a Photo Ionization Detector (PID).

In accordance with CIRIA C665, the findings of the ground gas monitoring program undertaken to date indicate a Characteristic Situating 1 (CS1) scenario (very low risk), namely that no ground gas protection measures are required as part of the proposed development.

Depleted Oxygen levels to a minimum 0.0%v/v were reported at the site. It is understood that earthworks will be undertaken for the foundation and basement excavations. Provided appointed contractors adhere to industry best-practice with regards to confined space entry requirements, the risks posed by depleted oxygen levels are considered negligible.

The site lies within a lower probability radon affected area, as less than 1% of homes are above the action level. Consequently, no radon protection measures are deemed necessary for any future development.

3.7 Evidence of Ground Contamination

Evidence of ground contamination is comprehensively discussed in detail as part of the GCIR (Ramboll, 2015), located in Appendix 3 of this report. The following section provides a summary of the findings.

With reference to the exploratory hole logs contained within the Concept Factual Report (Appendix 3), visual evidence of contamination was limited to black staining within BH01 at 3.5m and frequent site-wide anthropogenic inclusions of brick, charcoal, lime, concrete, plastic, slag, clinker, ash, glass and most notably tile fragments which have the potential to be asbestos containing. Potentially asbestos containing tile fragments were encountered in BH02B at 0.2mbgl and BH03 at 0.5mbgl and 2.5mbgl. The greatest thickness of Made Ground at 4.8mbgl was encountered in BH04.

Potential asbestos was identified during an archaeological excavation at the site in April 2016. The potential asbestos was identified within the western portion of Trench 1, located in the northern portion of the site (Appendix 4 indicates the location of Trench 1). The potential asbestos was identified within the Made Ground at approximately 2.4mbgl and was described as 'white asbestos' in the form of sheeting, asbestos quantification was not undertaken. Upon the discovery of the potential asbestos the Trench was abandoned and covered.

Olfactory evidence of contamination principally in the form of hydrocarbon odours were identified in several locations including BH04 between 2.5mbgl and 3.5mbgl, OT04 between 2.5mbgl and 2.8mbgl, TP04 at 1.7mbgl to 2.6mbgl, TP06 between 1.0mbgl and 1.7mbgl, TP09 between

1.5mbgl and 2.2mbgl, TP10 between 2.9mbgl and 3.5mbgl and TP13 between 2.3mbgl and 2.9mbgl. A cementaceous odour was also encountered in BH02 at a depth of 2.75mbgl.

Following the initial screening for odours, samples were analysed for VOC concentrations using a PID. This highlighted VOC concentrations up to 90.0ppm (BH04 at 3.7mbgl) amongst samples which exhibited hydrocarbon odours. The PID results are contained with the exploratory hole log within the Concept Factual Report.

As part of the ground investigation works, chemical laboratory testing was undertaken for a range of potential contaminants including heavy metals, semi-metals (Arsenic, Boron, Cadmium, Chromium, hexavalent Chromium, Copper, Lead, Mercury, Nickel, Selenium and Zinc), Inorganics (Sulphate, Sulphide, Ammonia, Ammonium, Cyanide) Organics (Total Petroleum Hydrocarbons, Poly Aromatic Hydrocarbons, volatile and semi-volatile organic compounds (SVOCs and VOCs)), and Asbestos identification/quantification.

In total thirty six soil samples were submitted for laboratory analysis, with thirty three obtained from the Made Ground (0.2mbgl to 3.7mbgl) and three from the London Clay (4.0mbgl to 6.0mbgl).

Human Health

Within the GCIR, soil results were compared against generic assessment criteria (GAC) for a commercial/industrial scenario for soils of 1% organic matter.

Made Ground

The screening assessment identified concentrations of 2-methylnapthalene (1.7 mg/kg), dibenzofuran (0.8 mg/kg), carbazole (0.9 mg/kg) and anthraquinone (0.6 mg/kg) above detection limits as in the absence of relevant GAC, detection limits have been used as the threshold value. Notwithstanding this, in the context of the general SVOC profile and due to the lack of other SVOC exceedences, the aforementioned SVOCs are not considered to present a risk to human health and are eliminated from further assessment.

It is of note that while hydrocarbon odours were encountered in several locations during the ground investigation, no exceedences of the TPH CWG GAC for the relevant speciates were identified during the screening assessment.

Asbestos containing materials (ACM) in the form of chrysotile loose fibres were recorded in two of thirty-three Made Ground samples. The ACM were encountered in samples obtained from exploratory positions TP04 and TP07 at depths of 1.7mbgl and 0.5mbgl respectively. The maximum asbestos concentration was 0.001%w/w within the sample obtained from TP04 at a depth of 1.7mbgl.

With the exception of ACM, no other contaminants of concern were identified within the site Made Ground soils.

Natural Ground

No contaminants of concern were identified within the Natural Ground.

Controlled Waters

A Controlled Waters Assessment (CWA) has been undertaken due to the presence of the Grand Union Canal located approximately 125m to the south west of the site and the presence of the

underlying aquifers of the Lambeth Group (Secondary A Aquifer), Thanet Sands and White Chalk Subgroup (both Principal Aquifer). Water Quality Standards (WQS) were selected to assess the potential risks to identified environmental receptors.

As there are no potable groundwater abstractions within 500m of the site, soil leachate and groundwater results have been primarily compared against Freshwater Environmental Quality Standards (EQS) with Drinking Water Standards used in their absence.

Leachate Data

In total, seven Made Ground samples were submitted for subsequent leachate analysis. Ammonium was identified as leachable within the Made Ground with the sample obtained from TP04 at 1.7mbgl recording a maximum concentration of 1,700µg/l.

There were also exceedences for copper, lead and mercury in the sample obtained from TP04 at 1.7mbgl with concentrations of 33µg/l, 25µg/l and 0.8 µg/l. A marginal exceedence for mercury was also recorded within the sample obtained from BH03 at 0.6mbgl with a concentration of 0.08 µg/l. TPH was found to have one exceedence of WQS with a concentration of 87 µg/l recorded in the sample obtained from TP13 at 2.7mbgl

Perched Water Screening Analysis

Determinand concentrations exceeding the groundwater WQS are summarised with the GCIR. In the absence of relevant GAC, detection limits have been used as the threshold value. Nonetheless, considering the general SVOC profile and with no other SVOC exceedences, the aforementioned SVOCs are not considered to present a risk to human health and are eliminated from further assessment.

The perched water screening assessment identified elevated concentrations of sulphate and selenium within both samples collected from BH04 and BH05. Sulphate exceeded the WQS of 400,000 µg/l with a maximum concentration of 1,010,000 µg/l, while selenium exceeded the WQS of 10 µg/l with a maximum concentration of 33 µg/l. There was also an exceedence for mercury within the sample collected from BH05 with a concentration of 1.23 µg/l.

The screening assessment identified concentrations of 4-methylphenol (1.5 µg/l), 2,4-dimethylphenol (µg/l) and 2-methylnaphthalene (0.29 µg/l) to be above detection limits. However, the recorded concentrations of phenol and naphthalene were below WQS and the remainder of all SVOCs analysed were recorded below detection limits. Consequently the SVOC detection limit exceedences are not considered to represent a risk to the identified Controlled Waters receptors and are therefore eliminated from further assessment.

<u>Controlled Water Summary</u>

The soil leachate data highlights the potential for ammonium, copper, lead, mercury and TPH to be mobilised within the Made Ground. However, with reference to the limited perched water results, the impact is considered to be negligible due to the limited correlation between the results, with the exception to a single perched water exceedence for mercury.

The elevated perched water results for sulphate and selenium have been identified to be typical of perched water within the KXC development and are not considered to be indicative of an on-site source of contamination.

3.8 Preliminary Waste Classification

3.8.1 Results

The results of the preliminary waste classification are discussed in detail in the GCIR (Ramboll, 2015), located in Appendix 3 of this report. The following section provides a summary of the findings.

Thirty-six soil samples were submitted for HazWasteOnline Assessment to determine the potential for soils to be classified as Hazardous Waste. Thirty-three of the samples were obtained from the Made Ground while the remaining three were collected from the London Clay.

Eight of the thirty-three Made Ground samples were indicated to be hazardous with twenty-two indicated to be potentially hazardous and three non-hazardous. Hazardous properties within the Made Ground were principally associated with flammability, however samples were also found to be carcinogenic, mutagenic, ecotoxic and corrosive. Two of the London Clay samples were indicated to be potentially hazardous. This was associated with TPH concentrations and associated potential flammability.

Following the HazWasteOnline assessment six Made Ground samples and one London Clay samples were submitted for Waste Acceptance Criteria (WAC) laboratory analysis to ascertain the likely waste stream should soils be disposed of from site as waste.

The six Made Ground samples submitted for WAC analysis had previously been indicated to be a mixture of potentially hazardous and hazardous as part of the HazWasteOnline assessment. The WAC analysis identified the samples obtained from BH01 at 2.0mbgl and TP12 at 0.3mbgl to be suitable for disposal at an inert waste landfill.

Samples obtained from exploratory positions TP03 at 0.2mbgl, TP07 at 0.5mbgl and TP11 at 0.3mbgl have been deemed suitable for disposal as stable non-reactive hazardous waste in a non-hazardous landfill based on exceedences of inert WAC for antimony, sulphate and total dissolved solids (TDS). Soils identified to exceed hazardous WAC will require treatment prior to disposal at landfill. The sample obtained from BH04 at 3.7mbgl was found to exceed hazardous WAC due to an exceedence for the loss on ignition content.

The London Clay sample submitted for WAC analysis had previously been indicated to be potentially hazardous by the HazWasteOnline assessment due to a TPH concentration of 32 mg/kg. The WAC analysis indicated the sample is likely to be suitable for disposal as stable non-reactive hazardous waste in a non-hazardous landfill due to sulphate and TDS exceedences of inert WAC. Based on professional knowledge and experience of other plots on the KXC development, exceedences for sulphate and TDS within London Clay soils is not considered uncommon.

As detailed in Section 3.7, asbestos containing materials were detected in two of the thirty-three Made Ground samples in the form of chrysotile loose fibres. In addition, the ground investigation encountered tile fragments within BH02B and BH03 which have the potential to be asbestos containing. An archaeological excavation at the site undertaken in April 2016 identified potential asbestos within the northern portion of the site. The potential asbestos was identified within the Made Ground at approximately 2.4mbgl and was described as ‘white asbestos’ in the form of sheeting.

Where the waste contains identifiable pieces of asbestos (i.e. any particle of a size than can be identified as potentially being asbestos by a competent person by the naked eye), then the

asbestos must be assessed separately. The waste is hazardous if the concentration of asbestos in the pieces alone is 0.1%.

Out of the two samples positively identified for asbestos, none of the samples exceeded the 0.1%w/w Hazardous Waste threshold (The Hazardous Waste (England and Wales) Regulations 2005). This does however warrant further consideration in the context of future waste streams. As such, site soils are not considered suitable for use in the brown/green roof area.

3.8.2 Interpretation

As detailed within Section 2.5, the occurrence of ACM, elevated heavy metals and PAHs within reworked brownfield soils is not uncommon.

Based on the outcome of the HazWasteOnline assessment, approximately 66% of the Made Ground soil samples were classified as potentially hazardous with 24% classified as hazardous and the remaining 10% classified as non-hazardous. Similarly, based on the outcome of the HazWasteOnline assessment, 66% of the London Clay could be classified as potentially hazardous with 34% classified as non-hazardous.

For the purposes of waste classification, the occurrence of ACM in the Made Ground material is unlikely to be classified as hazardous waste, as concentrations remain below the 0.1% hazardous waste threshold. It was noted that potential asbestos sheeting was identified within the northern portion of the site during an archaeological investigation, asbestos quantification was not undertaken to confirm the potential presence. Due to the detection of ACM, contractor vigilance and specialist advice is advised to determine the appropriate waste stream for materials requiring disposal.

Following the preliminary waste assessments undertaken above it is considered that, pending agreement with potential receiving facilities, the following indicative waste classification splits are applicable to the site soils. Note that these splits are based on a statistical analysis of the HazWasteOnline, WAC and asbestos results only. See Table 3-5.

Table 3-5 Waste Classification – percentage spilt

Soils / Stratum	Classification	Percentage
Made Ground	Inert	35%
	Stable non-reactive hazardous	50%
	Hazardous	15%
London Clay	Inert	0%
	Stable non-reactive hazardous	100%
	Hazardous non-reactive & hazardous	0%

It is of note that the inclusion of any anthropogenic materials (wood, clinker etc.) within any soil arisings is unlikely to be acceptable at some inert sites therefore, adequate segregation is essential in order to minimise site waste disposal costs.

The final classification of the arisings generated as part of this development is ultimately dependent on the outcome of the necessary additional testing required under current legislative requirements post excavation and through negotiations with the intended receiving facility. Given the inherent heterogeneity of Made Ground soils and the positive identification of asbestos it would be prudent to make a provisional allowance for encountering isolated fragments and fibres of asbestos that will need to be disposed of under appropriate Duty of Care procedures.

Subject to the implementation of appropriate material segregation strategies, e.g. separating Made Ground from inert London Clay, it may be possible to register the development site as a "Donor Site" under the CLAIRE Industry Code of Practice such that site won materials are not classified as wastes. As part of the framework, site won materials could be transferred to a "Receiver Site" for reuse, thereby increasing reuses, sustainability and reducing disposal costs. A Material Management Plan (MMP) approved by a Qualified Person and the Environment Agency will need to be developed and implemented on site.

4. EARTHWORKS STATEGY

4.1 Introduction

The following earthworks strategy is proposed for Buildings T2-T3.

4.2 Anticipated Construction Activities

The anticipated construction activities likely to be undertaken as part of the proposed development have been summarised (in sequence) below:

i. Re-profiling of ground to formation level;
ii. Excavations for services;
iii. Placement of piling mat;
iv. Installation of building piles;
v. Installation of piles caps;
vi. Excavate for lift shafts;
vii. Construct suspended reinforced concrete slab;
viii. Construct proposed superstructure and infrastructure connections; and
ix. Construction of roads and surfacing.

It has been assumed that the piling mat will remain in-situ once piling is complete, and will form the sub-base to the new buildings and surfaced areas.

References for calculations below have been taken from:

- Cross sectional areas from KXC-T2-001-A-1503-P20-001 rev 01 Floor Plan level GF; and
- Structural slab levels and slab thicknesses from KXC-T2-001-S-BD4507-20-1GF01 (S1), KXC-T2-001-S-BD4507-20-1GF02 (S2), KXC-T2-001-S-BD4507-20-1GF03 (N1), KXC-T2-001-S-BD4507-20-1GF03 (N2).

4.3 Estimated Volumes

Based on available information pertaining to the proposed development, the estimated volumes of material requiring excavation and importation have been calculated and the findings are summarised within Table 4-1 and Table 4-2 below.

Table 4-1: Estimated Excavated Volumes

Excavation Type	Approximate Volumes by Soil Type (m^3)		
	Made Ground	Piling Mat	London Clay
Excavations to form pile mat formation level	13,915	0	0
Piles	345	175	4,150
Pile Caps	4,850	8,390	0
Infrastructure	150	0	0
Piling Mat (to replace 0.15 m allowing due to deterioration during piling or post piling)	0	1,020	0
Lift Shafts	45	90	0
Sub-Totals	**19,305**	**9,675**	**4,150**
Total Excavation = 33,130m^3			

Clarification, Assumptions and Exclusions of Excavation Assumptions:

- Excavation depth to base of slab or formation level for new roads / hardstanding
- Assumes natural London Clay is not encountered (any reworked Clay has been assigned as Made Ground)
- Total length of area 'used' has been estimated to take into account the curvature of the subject site
- Size of areas inferred from Bennetts Associates Architect drawing KXC-T2-001-A-1503-P20-001 rev 01 dated 15-04-2016.
- Existing ground level estimated from topographic survey as typical average across the area
- Cross sectional drawing used for area calculations taken from Bennetts Associates Architects Site T2 KXC Atrium Sections AA/BB/CC/DD 1503(SK)135 Rev A dated 27-08-2015.
- Total volumes of excavated Made Ground and London Clay Formation are based on the stratigraphy encountered during ground investigations undertaken on site in 2015
- Structural slab levels and slab thicknesses from KXC-T2-001-S-BD4507-20-1GF01 (S1), KXC-T2-001-S-BD4507-20-1GF02 (S2), KXC-T2-001-S-BD4507-20-1GF03 (N1), KXC-T2-001-S-BD4507-20-1GF03 (N2)
- Total pile volume estimated from number of piles, diameter and length, as per details provided above.
- Foundation scheme obtained from Ramboll Drawing number 1620000147sSK076 (Stage 2) and Stage 3 information is provided in sketch 1503(SK)0092 Ground Floor Plan as per that designed on 06 October 2015.
-Pile caps ranging in thickness from 3.15 to 1.2m.
- Assumed entire area will be covered by piling mat.
- Piling mat assumed to be 1000mm thick
- Assumed that piling mat will form sub base to slab
- Assumed dig down to level at which piling mat will be placed, and piling mat will form subgrade beneath the slab
- Slab thickness of 300mm assumed
- Assumed no overdig.
- Volumes quoted are estimates based on the existing information and assumed uniform pile lengths of 27 m.
- Volumes quoted exclude bulking which depend on material type.

Table 4-2: Estimated Imported Volumes

Importation Type	Engineered Fill (m^3)	Aggregate (6F2) (m^3)	Topsoil (m^3)
Infrastructure	150	0	0
Pile Mat	0	7835	0
Topsoil	0	0	542
Sub-Totals	150	7835	542
Total Importation = 7, 985 m^3			

Importation Assumptions:

- A nominal value of 150m^2 is provided as a conservative estimate for service connections in trenches and the utilities corridor to the Cooling Pod.
- Imported pile mat material volumes are based on a 1.0 m pile mat being emplaced across the site area as indicated by Ramboll Drawing number 1620000147sSK076 (Stage 2) and Stage 3 information is provided in sketch 1503(SK)0092 Ground Floor Plan as per that designed on 25 September 2015.
- Calculated volumes of imported material includes amount of topsoil used within the green roof area, which has been assumed to incorporate 0.3 m of topsoil only.

As part of the construction works for Buildings T2-T3, it is anticipated that there will be approximately 33,130 m^3 of cut and approximately 7,985 m^3 of fill, so a total of **41,115 m^3** of exported and imported materials.

4.4 Estimated Lorry Movements

The total number of lorry movements carrying excavated soils and imported fill/aggregate has been estimated based on 8.5m^3 of un-bulked (as dug) material per lorry movement (King's Cross Central Environmental Statement, Appendix 16A, Arup May 2004).

4.4.1 Export

The estimated number of lorry movements carrying all excavated material as described in King's Cross Central Environmental Statement, Appendix 16A above is approximately **3,897**. This estimate assumes that no excavated material (Made Ground, or London Clay) are re-used on-site and therefore, are based on a worse –case scenario assuming the assumptions made for the volume calculations remain accurate. These movements will be either to off-site material disposal or recycling facilities, or to sites elsewhere within the wider KXC development area, for temporary storage prior to re-use elsewhere in the KXC development.

4.4.2 Import

The estimated number of lorry movements carrying all imported material as described in King's Cross Central Environmental Statement, Appendix 16A above is approximately **939**. This estimate relies on the accuracy of the assumptions made for volume calculations as described earlier within this Section.

4.5 Suitability of Materials

4.5.1 Introduction

For the purposes of this document, suitable material is defined as 'material that, by its chemical and physical composition, is suitable for use as part of the proposed development'.

Conversely, unsuitable material is defined as 'material that, by its chemical and physical composition, is only suitable for off-site disposal either to landfill or treatment facility, and cannot be incorporated into the proposed development'.

4.5.2 Soft Landscaping Material

A green roof has been included as part of the proposed design. It is unlikely that the site won Made Ground soils will suitable for use within the proposed green roof areas due to the anticipated chemical composition and potential exposure to future site users. Similarly based on a number of physical parameters the Made Ground soils are not deemed suitable as a growing medium. The landscaping design is to be finalised but is not anticipated to include areas of soft landscaping other than the green roof.

Despite the anticipated chemical suitability of the underlying London Clay Formation, these relatively impermeable soils are unlikely to provide a suitable growing medium for future vegetation.

4.5.3 Engineering Fill (Below Roads & Hard-standing)

In the context of this subsection entitled 'suitability of materials' engineering fill is defined as the site-won material that is suitable as fill to structures for applications within carriageways, pedestrian pavements and hard-landscaped areas and not imported fill.

Based on the ground conditions established from the ground investigations on and near to Buildings T2-T3, assuming the geotechnical soundness of site-won material, the majority of the underlying Made Ground and London Clay Formation is likely to be considered chemically suitable below hard-standing and roads however; where hydrocarbon odorous soils occur, the Made Ground soils are considered unsuitable for re-use within future service corridors. Soils which show evidence of being impacted by contamination in the form of odours and/or discolouration, particularly if free phase oils are identified, will need to be tested to ascertain suitability for re-use beneath hard-standing and roads. Odorous soils would similarly need to be tested in order to verify suitability for use prior to re-use beneath new buildings.

Due to the potential aggressivity of the underlying Made Ground, it is recommended that 'clean' imported aggregate is used within all future service corridors, with particular reference to the potential for permeation of hydrocarbons into potable water supply lines. Furthermore, it is recommended that prior to backfill, a teram (or similar) demarcation layer is installed within each corridor.

4.5.4 Unsuitable Materials

No chemically or geotechnically unsuitable material will be imported to the site. Any site-won material that is unsuitable for use as part of the proposed development will be removed from the site to a suitably licensed landfill or treatment facility under appropriate Duty of Care Procedures.

Materials which do not have the appropriate geotechnical properties in accordance with the Highways Agency Specification for Highway Works based on the proposed end use will be deemed unsuitable. This could include the following materials:

- Soft cohesive material, not suitable as fill under new pavement or hard landscape areas;
- Contaminated material;
- Made Ground with unsuitable engineering properties (e.g. high fines content, high moisture content, significant quantities of organic matter); and,
- Other material designated as unsuitable due to lack of compliance with particular engineering fill parameters, and as determined in the Specification for Highway Works.

All unsuitable excavated material will require information that is appropriate to the receiving waste facility. This may include:

- Material description;
- Basic Waste Characterisation; and
- Waste Acceptance Criteria (WAC) testing as appropriate.

All material disposed off-site will be accompanied by the appropriate duty of care documents.

4.5.5 Treatment & Re-use

The Section 106 of the Outline Planning Permission requires the developer to re-use site won materials where possible. During excavation some materials may be suitable for re-use in other areas of the KXC site, subject to validation testing to confirm chemical and geotechnical suitability.

Based on the results of the surrounding ground investigations, the need to undertake pre-treatment of soils prior to disposal or re-use is unlikely. The protocols and procedures to be adopted on-site, should any areas of unforeseen contamination be encountered, are outlined in Section 6 of this document.

As discussed in Section 3.7 of this report, of the up to half of Made Ground samples obtained from near to Buildings T2-T3, which were submitted for asbestos identification returned positive results, typically in the form of chrysotile and amosite loose fibres while only 2No of 33No samples submitted from the T2-T3 investigation return positive asbestos identifications. Whilst it is acknowledged that none of the subsequent quantification analysis reported concentrations >0.001% w/w, due to the inherent heterogeneity of Made Ground soils, ACM as either free-fibres or fragments cannot be ruled out entirely, particularly as site specific analysis has not been undertaken to date.

Should visible fragments of asbestos be identified during any earthwork activities, on the advice of a suitably licenced contractor / qualified personnel, ACM fragments will need to be segregated

from any associated soils and stockpiled in a controlled manner (double bagged, segregated and adequately labelled) for subsequent off-site disposal as hazardous waste under suitable duty of care.

4.6 Material Handling

4.6.1 General

The sequence of excavating and relocating material for reuse will be coordinated to ensure that the following objectives are met:

- Transportation and double handing is kept to a minimum; and,
- A designated area is provided for stockpiling material for use during and after the works.

The anticipated material sequencing would be as follows, although is subject to change through development design:

i. Re-profiling of ground to formation level;
ii. Excavations for services;
iii. Placement of piling mat;
iv. Installation of building piles;
v. Installation of piles caps;
vi. Excavate for lift shafts;
vii. Construct suspended reinforced concrete slab;
viii. Construct proposed superstructure and infrastructure connections; and
ix. Construction of roads and surfacing.

4.6.2 Stockpiling and re-use on-site

Excavated materials shall be adequately segregated in accordance with material type (Made Ground and London Clay Formation) and temporarily stockpiled for classification.

Surplus and / or unsuitable materials will be removed from site as generated following classification to negate the requirement for more onerous stockpile management measures such as surface water run-off mitigation measures. However; the requirements for additional mitigation will be continuously assessed throughout the course of the construction program.

In the absence of any detailed material management plan, it is anticipated that the stockpiling of material on-site will be restricted by access requirements and therefore arrangements may need to be made for temporary stockpiling of material on vacant plots of the wider KXC development.

4.6.3 Contaminated Material

Where suspected impacted material is encountered, material will be segregated and placed upon impermeable plastic sheeting and or hardstanding for subsequent classification prior to disposal.

Mitigation measures including the use of dust suppression methods and containment via bunding shall be implemented to restrict dust entrainment and surface water run-off from the temporary stockpile in order to reduce the potential for contaminant migration.

Any excavated material that is unsuitable for re-use will be removed from the site to a suitably licensed waste facility under duty of care regulations.

4.6.4 Drainage of Excavated Areas

It is considered likely that perched water within the Made Ground and the London Clay Formation will be encountered as part of the earthworks. The investigations undertaken near to the site

identified perched water within the Made Ground and the London Clay Formation to be at elevations of up to 25.5 mAOD.

Where encountered, a localised sump and pump methodology will be adopted on-site. Discharge will either be used for dust suppression techniques on-site, assuming no evidence of impact is observed, or discharge to the KXC site-wide drainage network, specifically the combined sewer system.

Prior to the commencement of earthworks on-site, discharge consent will be sought by the contractor from the operator, Metropolitan.

Where practicable, excavations and superficial soils will be kept free of standing water in order to minimise any potential risks associated with access and or ground stability.

5. GROUND CONTAMINATION ASSESSMENT

5.1 Introduction

The following Section summarises the source, pathway, receptor (S-P-R) model generated as part of the DBA (Ramboll, 2015) and refined as part of the GCIR (Ramboll, 2015) based on the recent plot specific ground investigation.

5.2 Environmental Risk Assessment

Environmental risks are assessed within the risk management framework established in Part IIA of the Environmental Protection Act (EPA) 1990 (HMSO, 1990), which provides a statutory definition of contaminated land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that:

- Significant harm is being caused or there is a significant possibility of such harm being caused; or,
- Pollution of controlled water is being, or is likely to be caused.

Risk from contamination is assessed by consideration of possible linkages between contaminant sources and potential receptors which could be harmed or polluted.

The key aspect of the contaminated land risk management framework is the development of a Conceptual Site Model (CSM) which illustrates the spatial interaction between the potential sources and receptors on site.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A source, i.e., a substance that is capable of causing pollution or harm;
- A receptor, i.e., something which could be adversely affected by the contaminant; and,
- A pathway, i.e., a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the degree of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

5.2.1 Preliminary Conceptual Site Model

The preliminary conceptual model for the site was developed as part of the DBA (Ramboll, 2015). A summary of the qualitative risk assessment has been presented in Table 5-1 below.

Table 5-1 Results of the Preliminary Contaminated Land Risk Assessment

Source	Pathway	Receptor	Potential Severity	Probability	Risk
On-site					
Made Ground (heavy metals, semi metals, inorganics, sulphates,	Direct contact with contaminated soils and inhalation and	Future Site Users	Medium	Low	Moderate/ Low

Source	Pathway	Receptor	Potential Severity	Probability	Risk
On-site					
petroleum hydrocarbons, PAHs, tars, lubricants, VOCs, SVOCs, herbicides, PCBs) **Chemical Store and AST** (Organics, petroleum hydrocarbons, PAHs, VOCs and SVOCs)	ingestion of dusts.	Construction Workers	Medium	Likely	Moderate [a]
	Inhalation and ingestion of dusts	Adjacent Site Users	Medium	Unlikely	Low [a]
Underground Structures (unknown organic and inorganic contaminants)	Leaching and vertical migration via preferential pathways	Secondary A Aquifer (Lambeth Group and Principal Aquifer (Thanet Sands and Upper Chalk)	Medium	Low	Moderate/ Low
Made Ground – Asbestos Containing Material (ACM)	Direct contact with contaminated soils and inhalation and ingestion of dusts.	Future Site Users	Severe	Unlikely	Moderate / Low
		Construction Workers	Severe	Low	Moderate [a]
	Inhalation and ingestion of dusts	Adjacent Site Users	Severe	Unlikely	Moderate / Low [a]
Made Ground - Aggressive ground conditions	Direct contact	Buildings and Infrastructure	Mild	Likely	Moderate / Low
Ground gas (elevated carbon dioxide, methane, volatile vapours and depleted oxygen)	Inhalation and accumulation of ground gas in confined areas via vertical/lateral migration.	Future site users	Severe	Low	Moderate
		Construction workers	Severe	Low	Moderate [a]
		Adjacent site users	Severe	Low	Moderate
		Property	Severe	Low	Moderate

Source	Pathway	Receptor	Potential Severity	Probability	Risk
Off-site					
Historical Landuse Potential contaminative land uses include storage tanks, concrete batching plants, electricity substations, coal sheds and railway land uses	Leaching and vertical migration via preferential pathways	Secondary A Aquifer (Lambeth Group and Principal Aquifer (Thanet Sands and Upper Chalk)	Medium	Low	Moderate/ Low
Ground Gas (elevated carbon dioxide, methane, volatile vapours and depleted oxygen)	Inhalation and accumulation of ground gas in confined areas via vertical/lateral migration.	Future site users	Severe	Low	Moderate
		Construction workers	Severe	Low	Moderate [a]
		Adjacent site users	Severe	Low	Moderate
		Property	Severe	Low	Moderate

[a] The risks to construction workers and adjacent site users will be reduced to Low on the assumption that the contractor will deal with all risks based on the hazards identified within this report and revised according to ground conditions encountered during any on-site activities. The Contractor will be responsible for managing site environmental and health and safety procedures including provision of PPE, education of the workforce and inductions for all site staff and visitors.

5.2.2 Refined Conceptual Site Model

Following the completion of the exploratory works by Concept, the preliminary conceptual site model has been refined as part of the GCIR (Ramboll, 2015).

5.3 Potential Contamination Sources

The potential contamination sources are summarised in Table 5-2 based on the site investigation results.

Table 5-2: Potential Sources of Contamination

Source	Comments
Soil Impacts	ACM within the Made Ground. Several leachable contaminants pertaining to ammonium, copper, lead, mercury and TPH.
Underground Structures	Unknown organic and inorganic contaminants.
Groundwater Impacts	Exceedences for sulphate, selenium and mercury have been identified within perched water.
Ground Gas	Elevated concentrations of methane up to 1.7%v/v.

5.4 Potential Receptors

The site-specific receptors that could potentially be affected by contamination hazards are summarised in Table 5-3.

Table 5-3: Potential Receptors

Feature		Details
On-site		
Future Site Users		Future site users within the proposed development.
Construction Workers		Any workers coming into contact with ground, or material impacted by any contamination.
Controlled Waters	Groundwater	The Lambeth Group (Secondary A Aquifer), Thanet Sands and White Chalk Subgroup (Principal Aquifer) are separated from the Made Ground by a significant thickness of London Clay (circa 30m).
Property and Building Materials		Residential and commercial buildings and construction materials e.g. buried concrete and water supply pipes.
Off-site		
Adjacent Site Users		Operational residential and commercial property within the vicinity of the site.

5.5 Potential Pathways

In order for the contaminants identified in this site investigation to reach potential receptors, there has to be a viable pathway for the contaminant. Potential pathways were identified as part of the DBA (Ramboll, 2015) and are refined and discussed further in Table 5-4 in relation to the identified source impacts and receptors identified.

Table 5-4: Potential Pathways

Receptor	Pathway	Comments
Human Health	Inhalation of fibrous materials.	The shallow Made Ground soils have been identified to contain ACM. No soft landscaped areas are due to be included at ground level however a brown/green roof has been included within the design. Site Made Ground soils are not considered suitable for use within the brown/green roof due to the presence of ACM. However, future site users are eliminated from the direct contact, ingestion and inhalation pathways providing the brown/green roof is constructed with materials deemed suitable for use. Construction workers have the potential to be exposed to ACM within the Made Ground during site enabling works and construction activities. There is also the potential for the inhalation of fibres by adjacent site users. However in both instances it is assumed that appropriate Health, Safety and Environmental procedures e.g. asbestos management, will be adopted during development works to mitigate potential risks.
	Inhalation of hazardous ground gases and depleted oxygen	Elevated concentrations of methane have been detected. However, the site has been classified as a Characteristic Situation of 1 (very low risk) and therefore ground gas protection measures are not deemed necessary for the proposed development.
Controlled Waters	Leaching and vertical migration of soil impacts to the underlying Secondary A and Principal Aquifer followed by	The soil leachate data highlights the potential for ammonium, copper, lead, mercury and TPH to be mobilised within the Made Ground. However with the exception of Mercury, impacts have not been identified in the perched water. The elevated perched water results for sulphate and selenium have been identified to be typical of perched water within the KXC development and are not considered to be

Receptor	Pathway	Comments
	migration of contaminants within the Aquifers.	indicative of an on-site source of contamination due to the limited correlation between soil leachate and perched water results and lack of identified sources. Based on the lack of proximal sensitive receptors i.e. groundwater abstractions and surface water features, these exceedences are not considered significant. Furthermore the proposed development will be covered by buildings/ hardstanding and as such the potential for the infiltration of meteoric water into the ground, and in turn, potential leaching of contaminants will remain limited. The London Clay was found to extend to a depth of circa 35mbgl, below which the Lambeth Group is present. Building foundations are likely to extend to a maximum depth of approximately 31mbgl, within the low permeability London Clay Formation, therefore there will be limited potential for the formation of preferential pathways to the underlying Secondary Lambeth Group and Principal (Thanet Sands and White Chalk Subgroup) Aquifers.
Buildings and Structures	Aggressive attack and permeation into water supply pipes	Risks to subsurface construction materials from aggressive attack are discussed as part of the geotechnical assessment (Ref KXC-T2-001-Z-000147-XX-0920-01) (Ramboll, 2015). Laboratory analysis identified TPH and PAHs within the Made Ground to be at concentrations several orders of magnitude above detection limits which could potentially permeate into potable water supply pipes.

5.6 Qualitative Risk Assessment

Potential pollutant linkages are identified using the source-pathway-receptor framework detailed above. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways.

This qualitative hazard assessment has been undertaken in accordance with NHBC and Environment Agency, 2008. Further details of legislative Context, are presented in Appendix 3 including definition or risk categories. Table 5-5 forms an assessment of the significance of potential pollutant linkages associated with the site.

Table 5-5: Refined Conceptual Site Model

Source	Pathway	Receptor	Potential Severity	Probability	Risk
Soil Impacts					
Made Ground (ACM)	Inhalation of fibrous materials.	Construction Workers	Severe	Low	Moderate*
		Adjacent Site Users	Severe	Unlikely	Moderate/Low*
Organic Contaminants	Permeation of organics	Water Supply Pipes	Mild	Likely	Moderate/Low
Made Ground (ammonium, copper, lead,	Leaching and vertical migration of	Secondary A Aquifer (Lambeth Group)	Medium	Unlikely	Low

Source	Pathway	Receptor	Potential Severity	Probability	Risk
mercury and TPH)	soil impacts to the Secondary A and Principal Aquifers.	Principal Aquifer (Thanet Sands and White Chalk Subgroup)			
Underground Structures (unknown organic and inorganic contaminants)	Direct contact, inhalation, ingestion of soil, dust and vapour	Construction Workers	Medium	Low	Moderate/Low*
	Soil and dust ingestion and inhalation	Adjacent Site Users	Medium	Unlikely	Low*
	Leaching and vertical migration of impacts to the Secondary A A and Principal Aquifers via preferential pathways	Secondary A Aquifer (Lambeth Group) Principal Aquifer (Thanet Sands and White Chalk Subgroup)	Medium	Unlikely	Low
	Permeation of organics	Water Supply Pipes	Mild	Unlikely	Very Low
Groundwater Impacts					
Perched Water (selenium, sulphate and mercury)	Vertical migration of impacts to the Secondary A A and Principal Aquifers.	Secondary A Aquifer (Lambeth Group) Principal Aquifer (Thanet Sands and White Chalk Subgroup)	Medium	Unlikely	Low
Ground Gas Impacts					
Ground Gas methane and depleted oxygen	Accumulation of ground gases	Future Site Users	Medium	Unlikely	Low
		Construction Workers	Medium	Unlikely	Low*
		Adjacent Site Users	Medium	Unlikely	Low*
		Property	Medium	Unlikely	Low

Notes
Assessment completed assuming no remediation/mitigation in place.
* Given the use of appropriate PPE and on-site health and safety precautions, risk to site development workers would be reduced to low.

6. REMEDIATION STRATEGY

6.1 Introduction

In accordance with the King's Cross Central Environmental Statement, Part 16, Arup May 2004, during the construction phases, mitigation measures to prevent the risk of harm to human health and risk of pollution to controlled waters will be implemented as detailed within the ES and CoCP.

In accordance with Part 16.4.16, the subject site falls within the Area 4 defined as Railway Lands and Part of the Cambridge Street Diesel Depot.

As stated within Part 16.6.7, remedial measures to be implemented within Area 4 of the wider KXC development (within which Buildings T2-T3 are present) include the use of a capillary break layer within the soft-landscaping, inert backfill within services trenches, cement stabilisation of coal rich material, removal for off-site disposal of liquid tars and sludge from gas holder sumps and excavation and treatment of material with high hydrocarbon / PAH content using bio-remediation (including perched water).

The following Section outlines the Conceptual Site Model for the site and the remediation strategy to be adopted based on available site specific exploratory data.

6.2 Conceptual Site Model

As highlighted in Section 5, a conceptual site model was developed in order to detail the level of risk associated with each exposure pathway was developed for the proposed development. A summary of plausible pathways of potentially significant concern has been provided in Table 6-1. For the purposes of this document 'potentially significant' is defined as having been assigned a level of risk greater than 'low'.

Table 6-1: Summary of Potentially Significant Pollution Pathways

Source	Pathway	Receptor	Potential Severity	Probability	Risk
Made Ground (ACM)	Inhalation of fibrous materials.	Construction Workers	Severe	Low	Moderate*
		Adjacent Site Users	Severe	Unlikely	Moderate/Low*
Organic Contaminants	Permeation of organics	Water Supply Pipes	Mild	Likely	Moderate/Low
Underground Structures (unknown organic and inorganic contaminants)	Direct contact, inhalation, ingestion of soil, dust and vapour	Construction Workers	Medium	Low	Moderate/Low*

Notes

Assessment completed assuming no remediation/mitigation in place.

* Given the use of appropriate PPE and on-site health and safety precautions, risk to site development workers would be reduced to low.

6.3 Site Specific Remediation Strategy

Based on the data presented and the above mentioned ground contamination risk assessment, it is not considered that remedial measures are required as part of the proposed development. The site Made Ground soils are unsuitable for re-use in soft landscaping in the wider KXC development, although they could be re-used on site or on part of the wider KXC development providing they are placed under hardstanding.

In addition, the best practice measures outlined in Sections 6.4 and 6.5 will be undertaken as part of the development. This includes the Asbestos Management Protocol outlined within Appendix 5.

6.4 Unforeseen Contamination

It is possible that unforeseen contamination will be encountered on the site. In the event that previously unidentified contamination is encountered during the construction phase of works, the following approach will be implemented.

- Any remediation will be carried out in accordance with the principles of the site wide remediation strategy as set out in the KXC ES, Vol 4 Part 16 (Paragraph 16.6.7 to 16.6.9);
- A contamination watching brief will be maintained during the construction phases and any contaminated materials identified during earthworks will be segregated and dealt with in line with paragraph 16.6.9 of the KXC ES. This states that if unforeseen contamination is identified during the course of the works, the construction manager would instruct specific investigations, advise the Local Authority and liaise on the remediation methodology as appropriate. Also, as stated in the ES (Section 16.9), the results of the validation testing will form the basis of a Remediation Plan/Report for each plot/phase.

6.5 Best Practice Risk Management Measures

In the absence of any special remedial measures being required as part of the proposed development, best practice risk management measures will be adopted as part of the construction phases of works. The best practice risk management measures to be adopted have been tabulated and presented in Appendix 5 of this ERP.

7. REFERENCES

- Arup (2004). King's Cross Central Environmental Statement (ES) Volume 4: Part 16 Soils and Contamination Specialist Report. May 2004.
- Arup (2005). King's Cross Central ES Volume 5: Supplement. September 2005.
- BGS (1994). British Geological Survey Map 1: 50 000 Map England and Wales Sheet 256 North London.
- British Standard Institute Code of Practice for Protective Measures for Methane and Carbon Dioxide BS8485:2015.
- Department of the Environment (1995). Industrial Profile for Railway Engineering Works, DoE, 1995, typical contaminants of concern associated with former railway land-uses.
- HMSO (1990). Environmental Protection Act 1990.
- RPS (2005). King's Cross Revised Code of Construction Practice (CoCP).
- Ramboll (2012) King's Cross Central P1 Ground Contamination Interpretative Report 6727.E.GCIR.1B.
- Ramboll (2012) King's Cross Central P1 Earthworks and Remediation Plan ref 6727.E.ERP.5A
- Ramboll Whitbybird (2008) King's Cross T1 Building Ground Contamination Interpretative Report 4970.E.GCIR.1C.
- Ramboll Whitbybird (2009) King's Cross T1 Building Addendum to Ground Contamination Interpretative Report 4970.E.AGCIR.2A.
- Ramboll (2013) King's Cross Central Plot T1 Phase 2 Earthworks and Remediation Plan Report 4970.E.ERP.T1S.4A.
- Ramboll (2010) King's Cross T5 Desktop Site Appraisal Report 7437.E.DSA.1C.
- Ramboll (2010) King's Cross T5 Ground Contamination Interpretative Report 7437.E.GCIR.1A.
- Ramboll (2010) King's Cross Central Building T6 Earthworks Remediation Plan Report 6955.E.ERP.8A.
- Ramboll Environ (2015) King's Cross Cooling Pod Ground Contamination Interpretative Report 61033466.E.GCIR.I02.
- Ramboll Environ (2015) King's Cross Cooling Pod Earthworks Remediation Plan Report 61033466.E.ERP.I03.

APPENDIX 1
FIGURES

Legend

Site Location

Client
Kings Cross Central Development Partnership

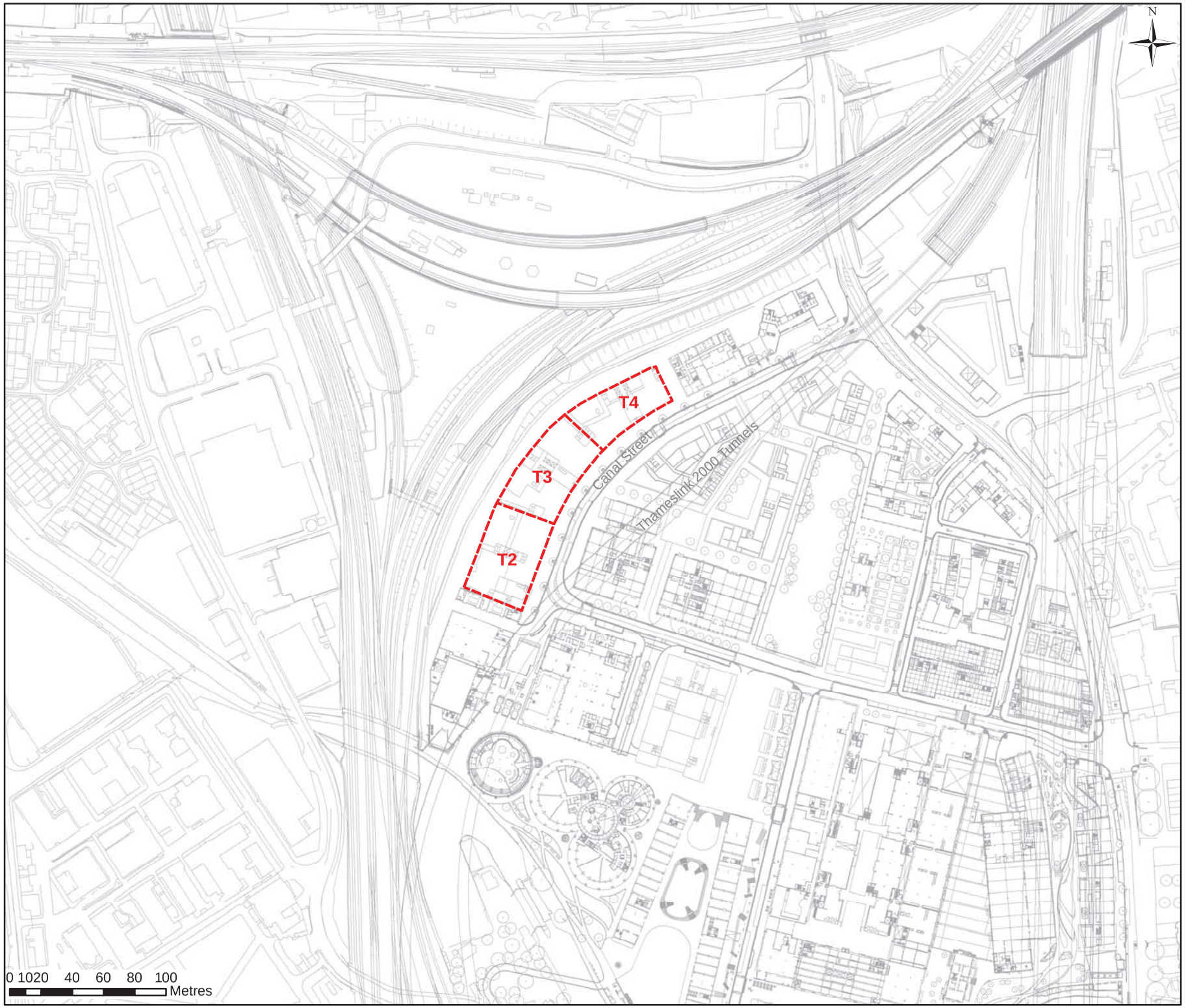
Project Title
Kings Cross T2-T3

Project Number
1620000147

Figure Title
Redline Boundary

RAMBOLL
Tel: 020 7631 5291
Fax 020 7323 4645
london@ramboll.co.uk
www.ramboll.co.uk

Date	Prepared By
24705/2016	JP
Drawing number	**Revision**
Figure 2.1	I02



Legend

Approximate Redline Boundary

Base map reproduced from Allies and Morrison's Drawing No. 280_01_04_100

Client

Kings Cross Central Development Partnership

Project Title

Kings Cross T2 - T3

Project Number

1620000147

Figure Title

Redline Boundary

RAMBOLL

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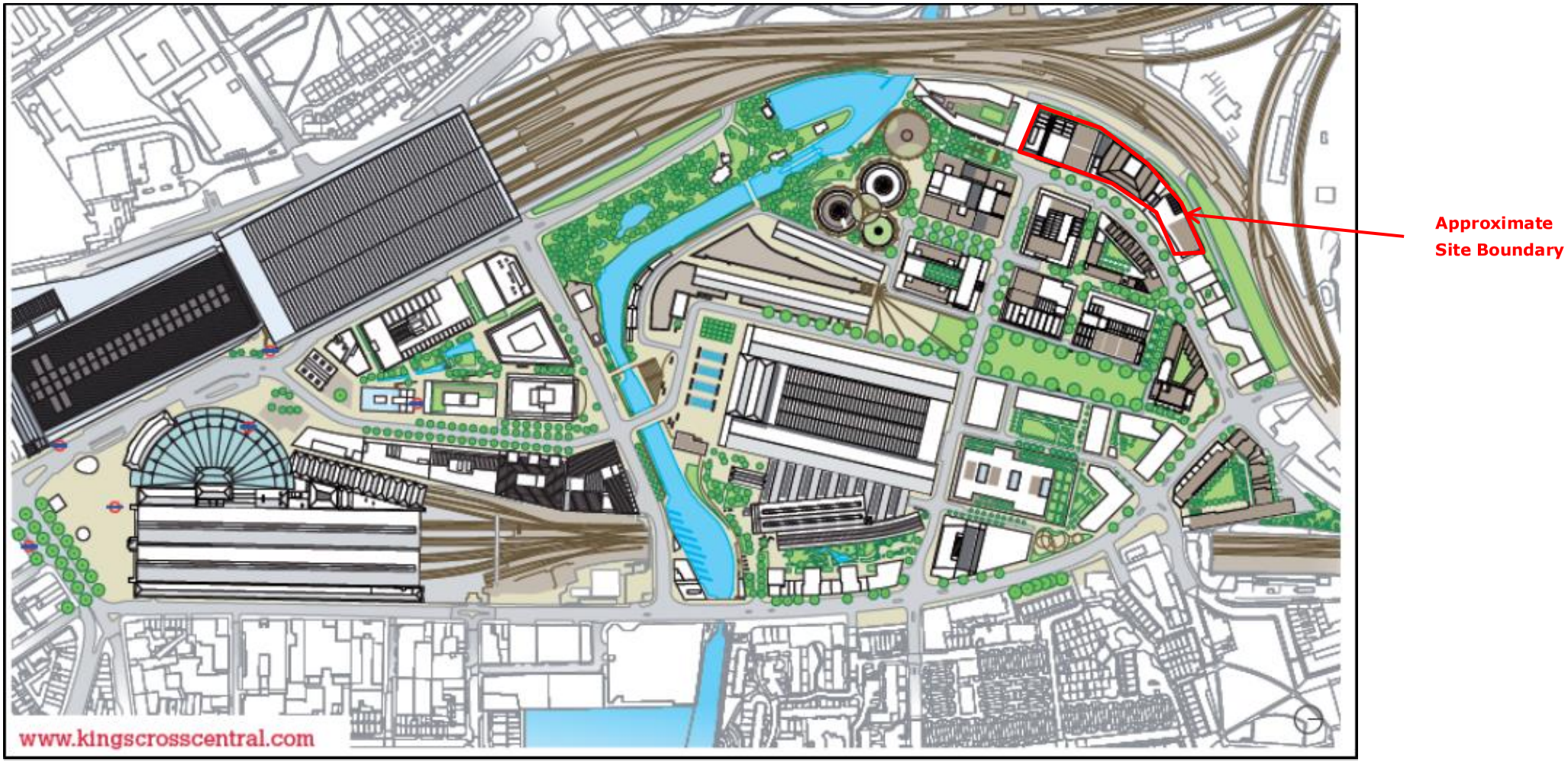
london@ramboll.co.uk
www.ramboll.co.uk

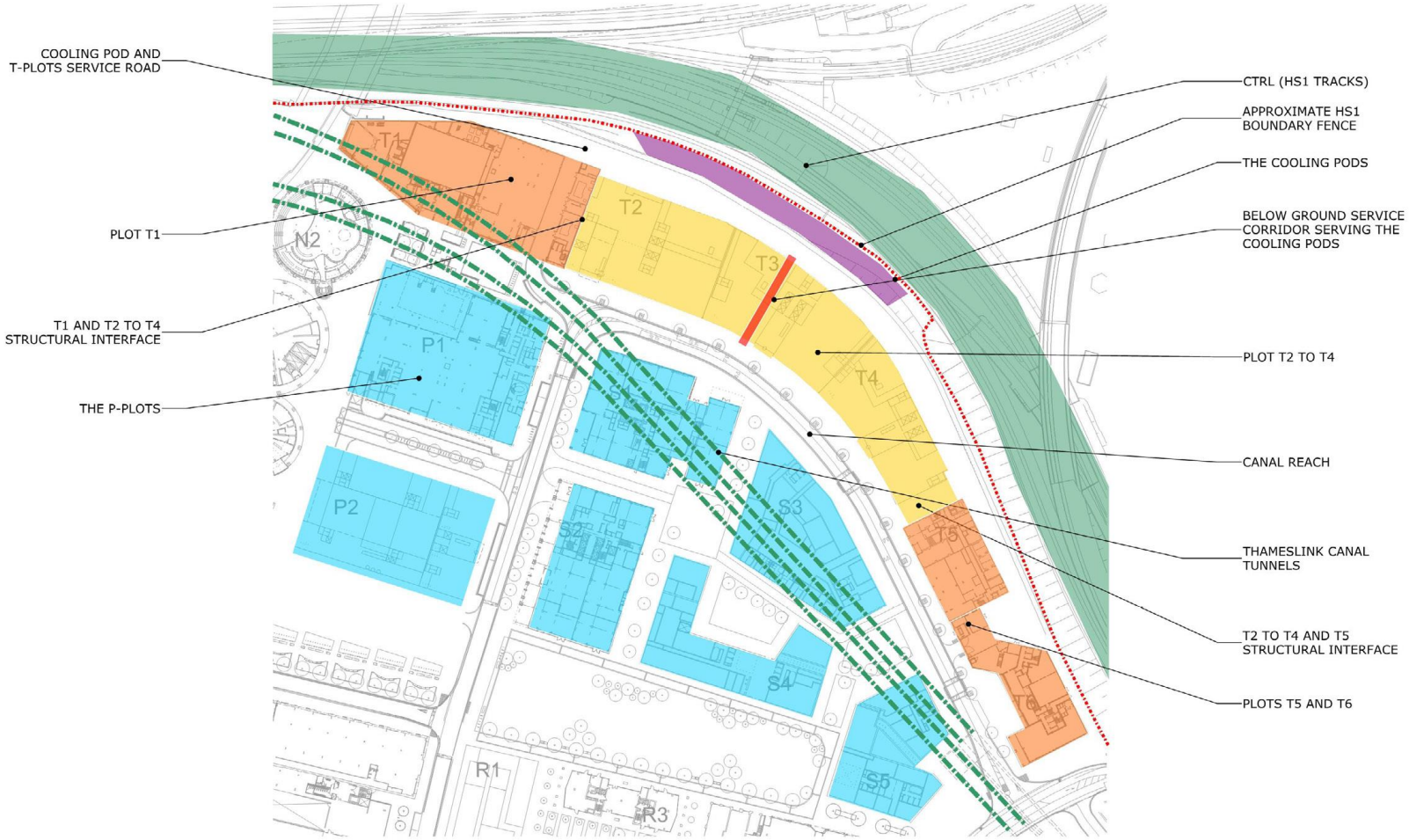
Date	Prepared By
27/05/2016	JP

Drawing number	Revision
Figure 2.2	I02

Indicative KXC Masterplan

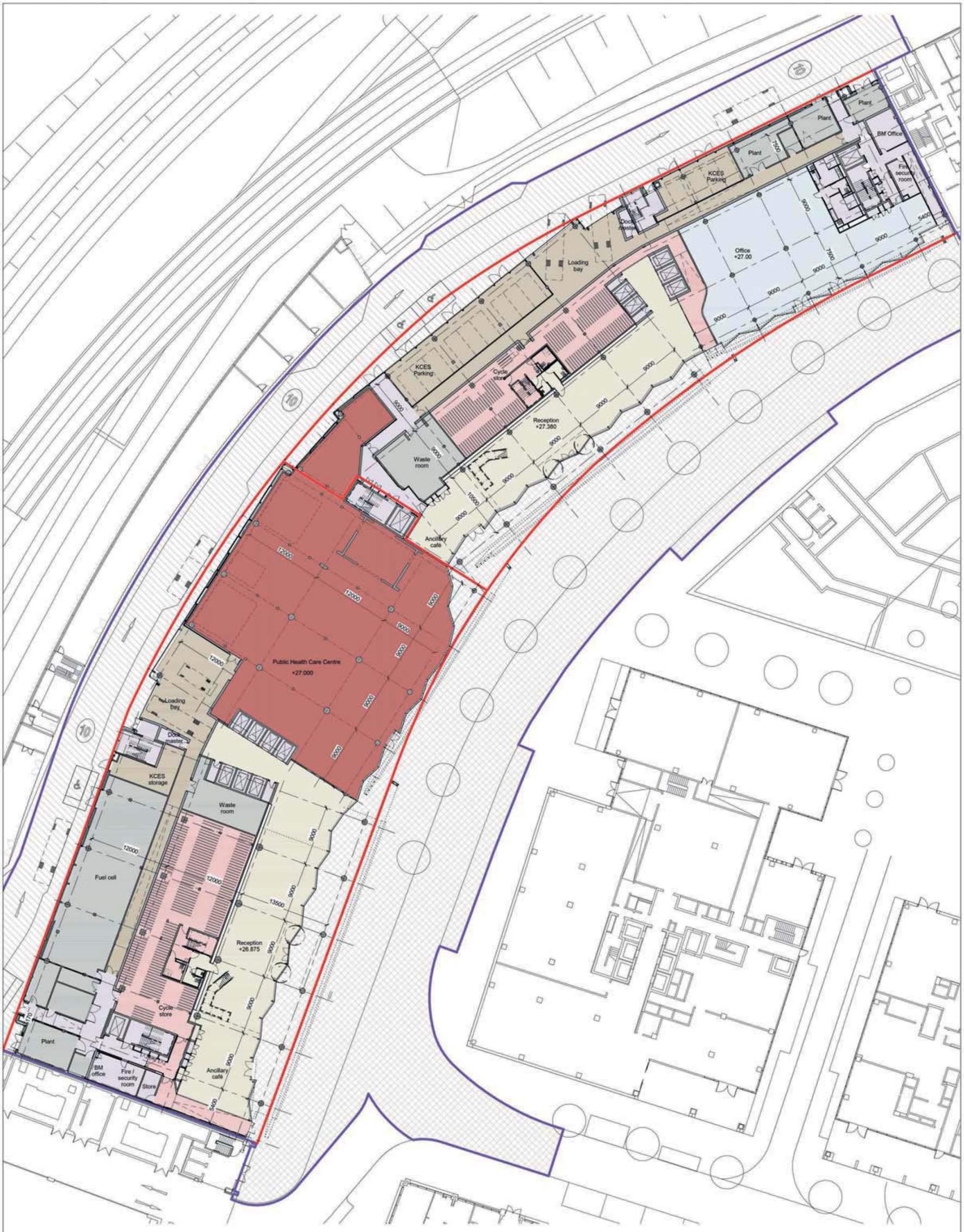


Indicative site location in the context of the KXC masterplan



Site surroundings and constraints (King's Cross Central Buildings T2-T3 KXC-T2-001-S-000147-XX-0902-01 Stage 2 Report)

APPENDIX 2
PROPOSED DEVELOPMENT DRAWINGS



Revisions	By	Chk
01 160415 Issued for Planning	BH	SL

Notes

Key

- Offices
- Lifts/Cores
- Office Reception/Ancillary Café
- Servicing
- Plant Room
- Cycle Store/Changing/Showers
- Reserved Matters Submission Boundary
- T2/T3 Demise

0 10m

For Public Realm Design refer to TLA drawings
For Service Road Design refer to RUK drawings

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Project
Site T2 KXC
Kings Cross Central Partnership Ltd.

Project No. 1503

Drawing Title
Floor Plan - Level GF
PHCC 1250sqm

Drawing Number
KXC-T2-001-A-1503-P20-001

Revision
01

Scale @ A3
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Scale @ A1
1 : 250

Revision Date
160415
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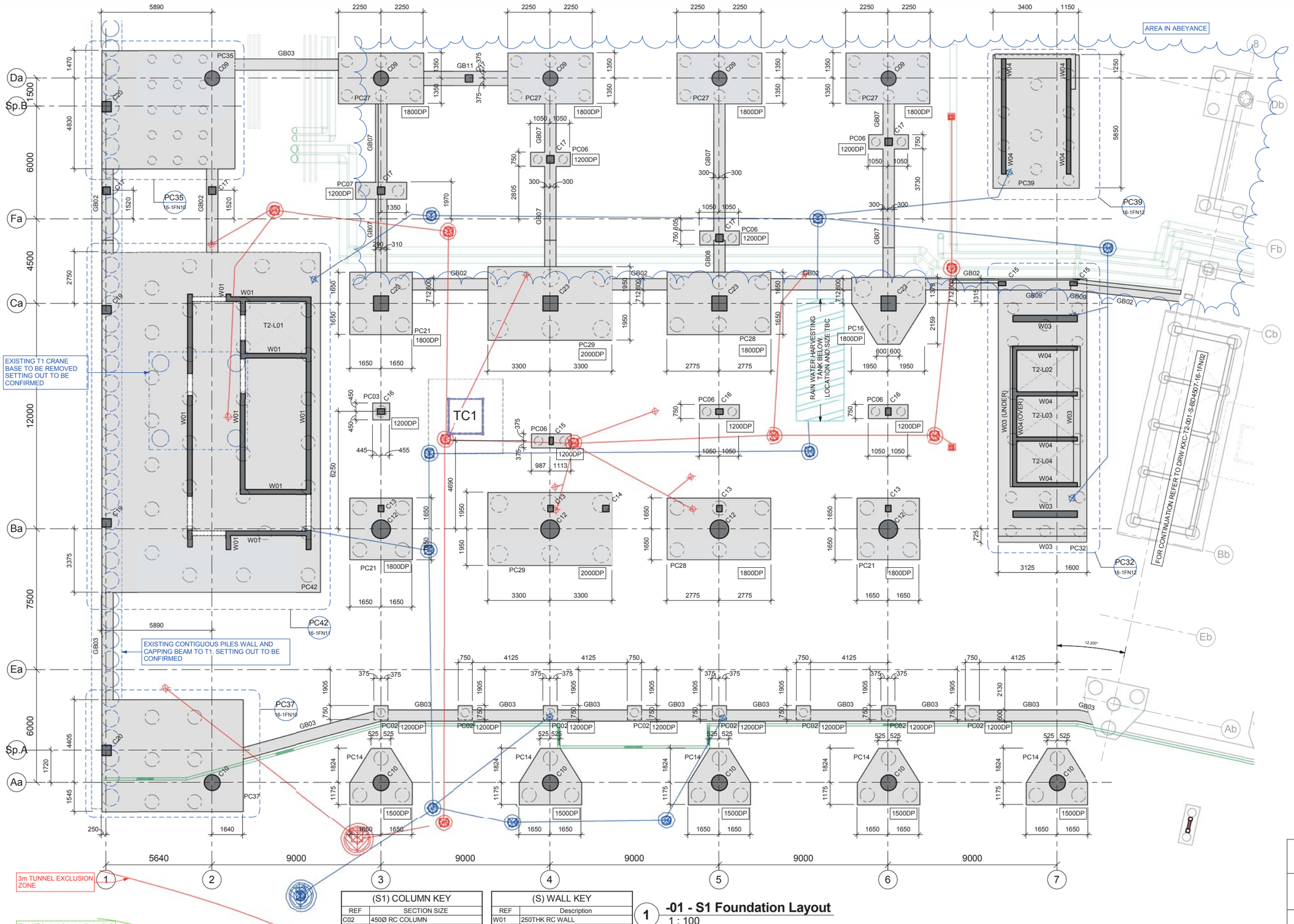


DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

SUBSTRUCTURE NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECT, SERVICE ENGINEERS, SPECIALIST SUB CONTRACTORS DRAWINGS AND THE SPECIFICATION.

2. REINFORCED CONCRETE FOUNDATIONS, TOWER CRANE BASES & LINER WALLS, CORE WALLS AND BASEMENT SLABS ARE TO BAM DESIGN MIX No. 9 (C35/C45). GROUND FLOOR SLABS ARE TO BAM DESIGN MIX No. 9 (C35/C45).

3. REINFORCED CONCRETE COLUMNS AND THEIR COLUMN HEADS TO BE GRADE RC50/60.

4. NOMINAL COVER TO REINFORCEMENT TO BE:
   FOUNDATIONS 75mm BTM, 50mm SIDES U.N.O.
   GROUND FLOOR SLABS T&B 50mm U.N.O.
   BEAMS 35mm BTM, 35mm SIDES U.N.O.
   CORE WALLS 30mm ALL FACES U.N.O.
   COLUMNS 40mm ALL FACES U.N.O.
   SUSPENDED SLABS 30mm TOP, 30mm BTM U.N.O.

5. REFER TO ARCHITECTS DRAWINGS FOR BELOW SLAB INSULATION.

6. GROUND FLOOR SLAB TO BE CONSTRUCTED IN WATER PROOF CONCRETE. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

7. ALL WATERPROOFING / TANKING TO ARCHITECTS AND SPECIALIST SUB CONTRACTORS DETAILS. ALLOW FOR RX101 WATER BARS TO ALL HORIZONTAL AND VERTICAL CONSTRUCTION JOINTS.

8. CONCRETING - ALL CONCRETING OPERATIONS, INCLUDING SAMPLING AND TESTING TO BE CARRIED OUT IN ACCORDANCE WITH THE BAM SPECIFICATION E10.

9. ALL CONCRETE CORE WALLS ARE 250mm THICK U.N.O.

10. ALL COLUMNS ARE LOCATED SYMMETRICALLY ON GRID LINES U.N.O..

11. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METRES U.N.O. USE FIGURED DIMENSIONS ONLY - DO NOT SCALE.

12. REFER TO LIFT MANUFACTURERS DRAWINGS FOR DETAILS OF ALL CAST IN INSERTS TO SHAFT WALLS & PITS, AND FOR SETTING OUT OF ALL DOOR OPENINGS.

13. REFER TO ARCHITECT/M&E SUBCONTRACTOR DRAWINGS FOR DETAILS OF CONCEALED CAST IN CONDUIT AND ALL OTHER CAST IN ITEMS.

14. ALLOW FOR 50mm CONCRETE BLINDING BELOW ALL REINFORCED FOUNDATION AND GROUND BEAMS TO BAM DESIGN MIX No. 2 (C8/C10).

15. ALL PUMP CHAMBER AND SUSPENDED MANHOLES BASES AND WALLS TO BE A MINIMUM 250mm THICK. REFER TO PUBLIC HEALTH DRAWINGS FOR COVER DETAILS, RECESSES, ETC.

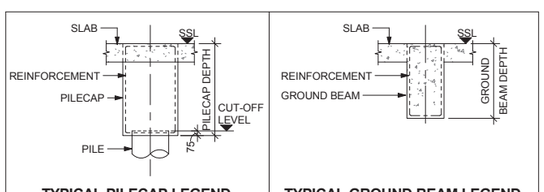
16. ALL PERIMETER UPSTANDS TO BE CONFIRMED BY ARCHITECT.

17. CONCRETE SURFACE FINISHES TO ALL PLANT AREAS TO BE POWER FLOAT FINISHED AND ALL OTHER GROUND FLOOR SLABS TO HAVE SKIP FLOATED FINISH IN ACCORDANCE WITH ARCHTECT'S SPECIFICATION.

NOTE:
ALL BELOW GROUND SERVICES SHOWN ARE FOR INDICATIVE PURPOSES ONLY AND ARE STILL BEING DEVELOPED / CO-ORDINATED.

IMPORTANT CDM/H&S NOTE
THE DESIGNERS HIGHLIGHT THE SIGNIFICANT RESIDUAL HEALTH AND SAFETY RISKS THAT HAVE NOT BEEN ELIMINATED FROM THE DESIGNS. THESE SIGNIFICANT RESIDUAL RISKS ARE IDENTIFIED BELOW.

A	(i) UNIDENTIFIED SERVICES AND GROUND OBSTRUCTIONS. (ii) CONTAMINATED MATERIALS.
B	TEMPORARY WORKS MAY BE REQUIRED LOCALLY TO SUPPORT THE GROUND WHERE EXISTING SERVICES LOCATIONS DO NOT ALLOW FOR BATTERED EXCAVATION.



TYPICAL PILECAP LEGEND

TYPICAL GROUND BEAM LEGEND

(S1) COLUMN KEY	
REF	SECTION SIZE
C02	450Ø RC COLUMN
C03	500Ø RC COLUMN
C06	650Ø RC COLUMN
C08	750Ø RC COLUMN
C09	800Ø RC COLUMN
C10	850Ø RC COLUMN
C12	1000Ø RC COLUMN
C13	350 x 300 RC COLUMN
C14	350 x 350 RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C19	450 x 500 RC COLUMN
C20	550 x 500 RC COLUMN
C22	700 x 700 RC COLUMN
C23	800 x 800 RC COLUMN
CR151	RHS250x150x10.0
CS101	SHS200x200x5.0

(S) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

(S1) RC GROUND BEAM KEY	
REF	SECTION SIZE
GB02	600w x 600dp RC GROUND BEAM
GB03	600w x 750dp RC GROUND BEAM
GB07	600w x 1200dp RC GROUND BEAM
GB08	600w x 1225dp RC GROUND BEAM
GB09	600w x 1450dp RC GROUND BEAM
GB11	750w x 1200dp RC GROUND BEAM

1 **-01 - S1 Foundation Layout**
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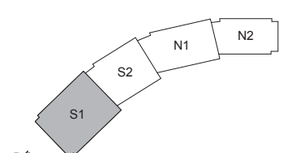

rev | by | chkd | date | description

ARGENT

bam
BAM Design
An operating company of BAM Construct UK Ltd

Architecture
Interior Design
3D Visualisation
Feasibility Studies
Structural Engineering
Environmental Services
Building Information Modelling

Centrium Business Park
Griffiths Way, St Albans
Hertfordshire, AL1 2RD

01727 894200
design@bam.co.uk
www.bam.co.uk

project KINGS CROSS T2

title FOUNDATIONS LAYOUT BLOCK S1

purpose of issue **TENDER**

scale	drawn	BAM job no.	drg. status
As indicated @ A1	CMO	4507	D2
date 02/01/16	checked MCH		

drg / doc ref: site KXC- location T2- proj ref 001- role S- consultant BD4507- CI/SfB 16-1FN01 content - rev. -

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3. REINFORCED CONCRETE COLUMNS AND THEIR COLUMN HEADS TO BE GRADE RC50/60.

4. NOMINAL COVER TO REINFORCEMENT TO BE:
   FOUNDATIONS 75mm BTM, 50mm SIDES U.N.O.
   GROUND FLOOR SLABS T&B 50mm U.N.O.
   BEAMS 35mm BTM, 35mm SIDES U.N.O.
   CORE WALLS 30mm ALL FACES U.N.O.
   COLUMNS 40mm ALL FACES U.N.O.
   SUSPENDED SLABS 30mm TOP, 30mm BTM U.N.O.

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7. ALL WATERPROOFING / TANKING TO ARCHITECTS AND SPECIALIST SUB CONTRACTORS DETAILS. ALLOW FOR RX101 WATER BARS TO ALL HORIZONTAL AND VERTICAL CONSTRUCTION JOINTS.

8. CONCRETING - ALL CONCRETING OPERATIONS, INCLUDING SAMPLING AND TESTING TO BE CARRIED OUT IN ACCORDANCE WITH THE BAM SPECIFICATION E10.

9. ALL CONCRETE CORE WALLS ARE 250mm THICK U.N.O.

10. ALL COLUMNS ARE LOCATED SYMMETRICALLY ON GRID LINES U.N.O..

11. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METRES U.N.O. USE FIGURED DIMENSIONS ONLY - DO NOT SCALE.

12. REFER TO LIFT MANUFACTURERS DRAWINGS FOR DETAILS OF ALL CAST IN INSERTS TO SHAFT WALLS & PITS, AND FOR SETTING OUT OF ALL DOOR OPENINGS.

13. REFER TO ARCHITECT/M&E SUBCONTRACTOR DRAWINGS FOR DETAILS OF CONCEALED CAST IN CONDUIT AND ALL OTHER CAST IN ITEMS.

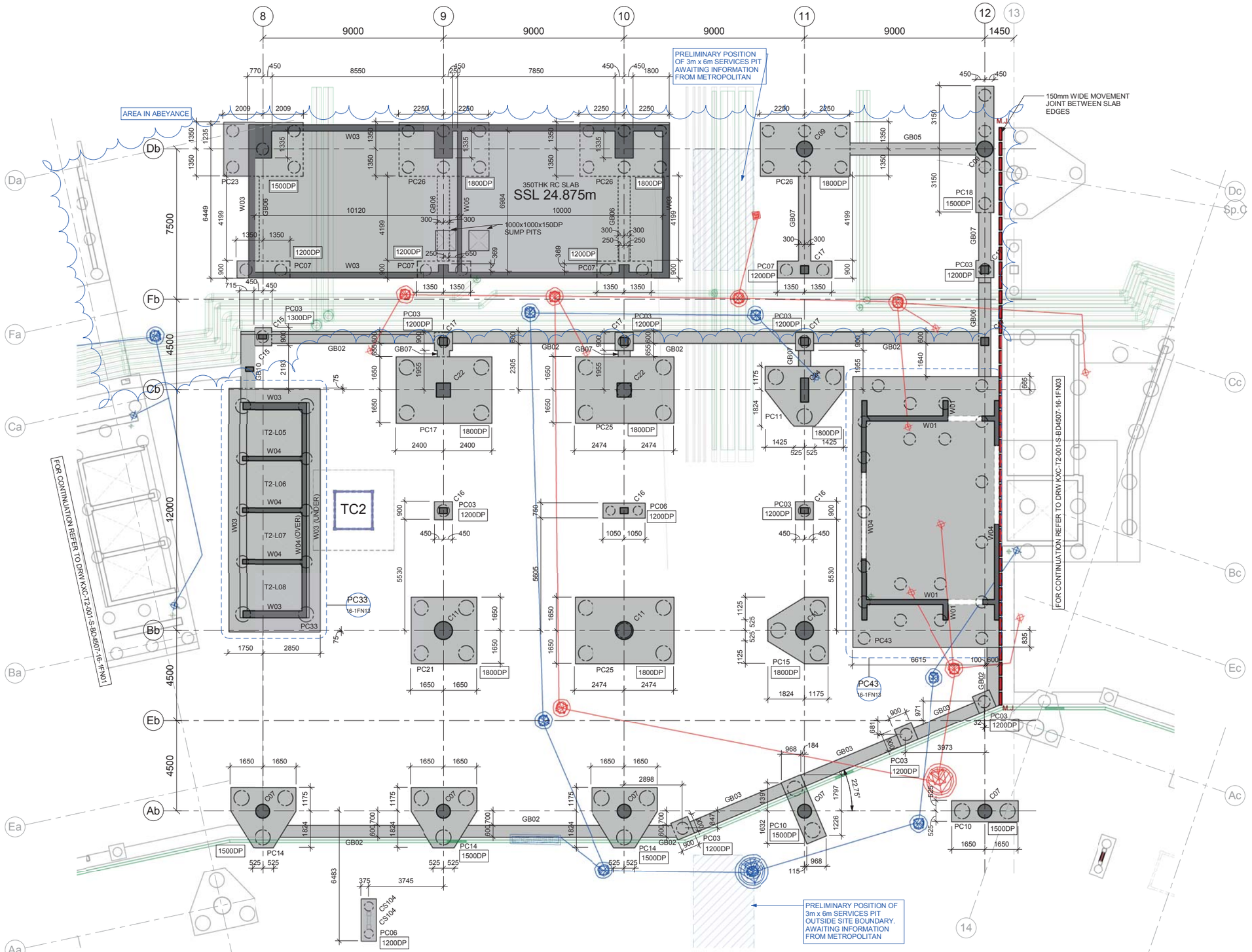
14. ALLOW FOR 50mm CONCRETE BLINDING BELOW ALL REINFORCED FOUNDATION AND GROUND BEAMS TO BAM DESIGN MIX No. 2 (C8/C10).

15. ALL PUMP CHAMBER AND SUSPENDED MANHOLES BASES AND WALLS TO BE A MINIMUM 250mm THICK. REFER TO PUBLIC HEALTH DRAWINGS FOR COVER DETAILS, RECESSES, ETC.

16. ALL PERIMETER UPSTANDS TO BE CONFIRMED BY ARCHITECT.

17. CONCRETE SURFACE FINISHES TO ALL PLANT AREAS TO BE POWER FLOAT FINISHED AND ALL OTHER GROUND FLOOR SLABS TO HAVE SKIP FLOATED FINISH IN ACCORDANCE WITH ARCHTECT'S SPECIFICATION.

NOTE:
ALL BELOW GROUND SERVICES SHOWN ARE FOR INDICATIVE PURPOSES ONLY AND ARE STILL BEING DEVELOPED / CO-ORDINATED.

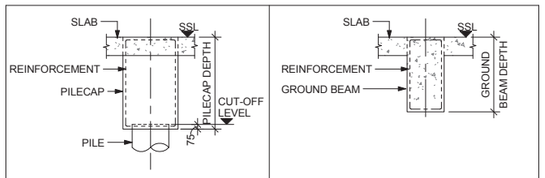


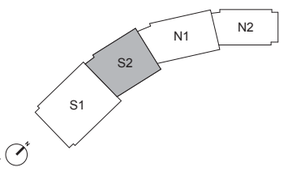
1 -01 - S2 Foundation Layout
1 : 100

(S2) COLUMN KEY	
REF	SECTION SIZE
C01	400Ø RC COLUMN
C02	450Ø RC COLUMN
C06	650Ø RC COLUMN
C07	700Ø RC COLUMN
C08	750Ø RC COLUMN
C09	800Ø RC COLUMN
C11	900Ø RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C22	700 x 700 RC COLUMN
C24	1200 x 400 RC COLUMN
CR151	RHS250x150x10.0

(S) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

(S2) RC GROUND BEAM KEY	
REF	SECTION SIZE
GB02	600w x 600dp RC GROUND BEAM
GB03	600w x 750dp RC GROUND BEAM
GB05	600w x 900dp RC GROUND BEAM
GB06	600w x 950dp RC GROUND BEAM
GB07	600w x 1200dp RC GROUND BEAM
GB10	750w x 600dp RC GROUND BEAM





IMPORTANT CDM/H&S NOTE
THE DESIGNERS HIGHLIGHT THE SIGNIFICANT RESIDUAL HEALTH AND SAFETY RISKS THAT HAVE NOT BEEN ELIMINATED FROM THE DESIGNS. THESE SIGNIFICANT RESIDUAL RISKS ARE IDENTIFIED BELOW.

A	(i) UNIDENTIFIED SERVICES AND GROUND OBSTRUCTIONS. (ii) CONTAMINATED MATERIALS.
B	TEMPORARY WORKS MAY BE REQUIRED LOCALLY TO SUPPORT THE GROUND WHERE EXISTING SERVICES LOCATIONS DO NOT ALLOW FOR BATTERED EXCAVATION.

rev | by | chkd | date | description

ARGENT

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Hertfordshire, AL1 2RD

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design@bam.co.uk
www.bam.co.uk

project KINGS CROSS T2

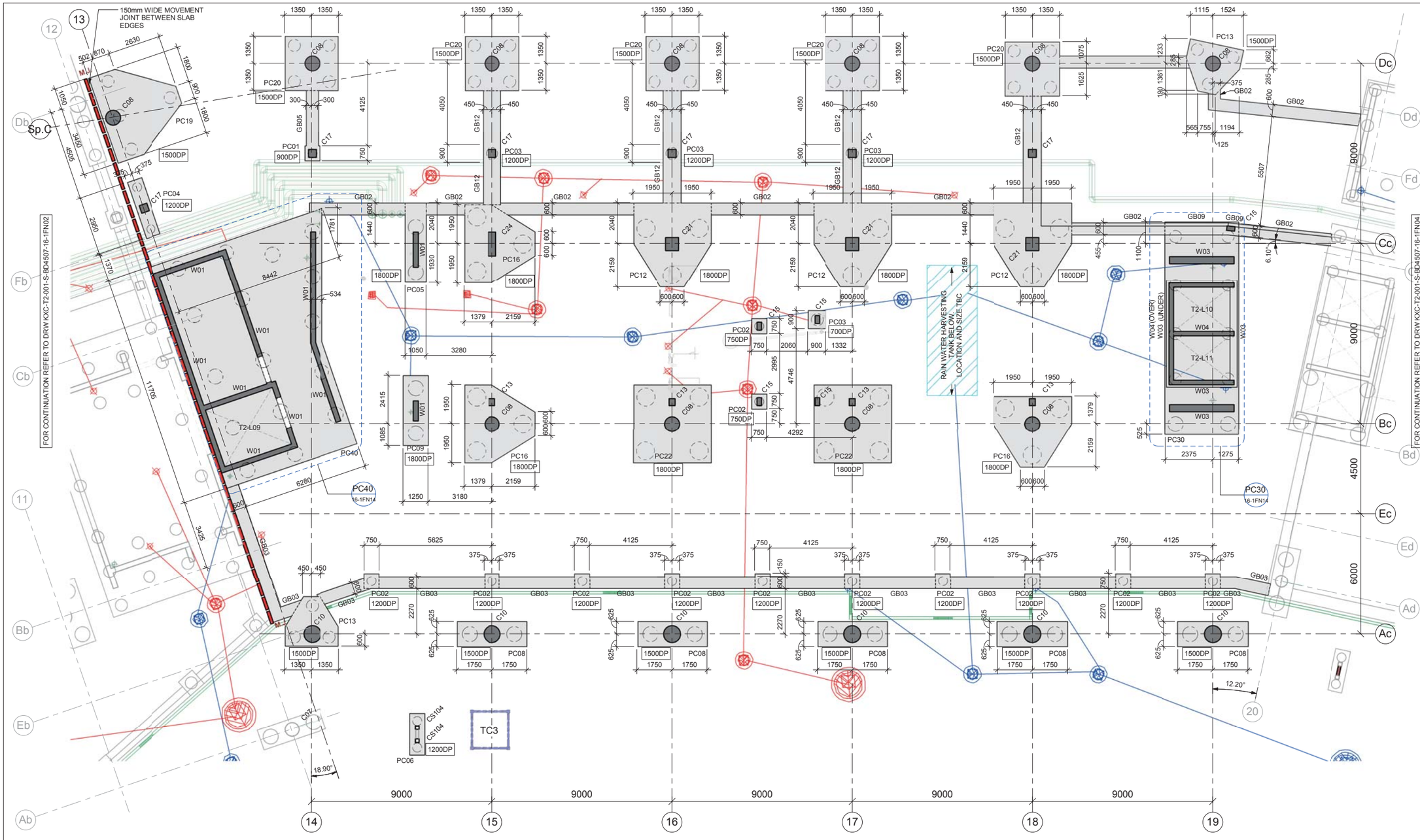
title FOUNDATIONS LAYOUT BLOCK S2

purpose of issue TENDER

scale As indicated @ A1 | drawn CMO | BAM job no. 4507 | drg. status D2

date 02/11/16 | checked MCH

drg / doc ref: KXC-T2- 001- S- BD4507- 16-1FN02 | site | location | proj ref | role | consultant | CI/SB | content | rev. -



1 -01 - N1 Foundation Layout

1 : 100

DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

SUBSTRUCTURE NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECT, SERVICE ENGINEERS, SPECIALIST SUB CONTRACTORS DRAWINGS AND THE SPECIFICATION.

2. REINFORCED CONCRETE FOUNDATIONS, TOWER CRANE BASES & LINER WALLS, CORE WALLS AND BASEMENT SLABS ARE TO BAM DESIGN MIX No. 9 (C35/C45). GROUND FLOOR SLABS ARE TO BAM DESIGN MIX No. 9 (C35/C45).

3. REINFORCED CONCRETE COLUMNS AND THEIR COLUMN HEADS TO BE GRADE RC50/60.

4. NOMINAL COVER TO REINFORCEMENT TO BE:

FOUNDATIONS	75mm BTM, 50mm SIDES U.N.O.
GROUND FLOOR SLABS T&B	50mm U.N.O.
BEAMS	35mm BTM, 35mm SIDES U.N.O.
CORE WALLS	30mm ALL FACES U.N.O.
COLUMNS	40mm ALL FACES U.N.O.
SUSPENDED SLABS	30mm TOP, 30mm BTM U.N.O.

5. REFER TO ARCHITECTS DRAWINGS FOR BELOW SLAB INSULATION.

6. GROUND FLOOR SLAB TO BE CONSTRUCTED IN WATER PROOF CONCRETE. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

7. ALL WATERPROOFING / TANKING TO ARCHITECTS AND SPECIALIST SUB CONTRACTORS DETAILS. ALLOW FOR RX101 WATER BARS TO ALL HORIZONTAL AND VERTICAL CONSTRUCTION JOINTS.

8. CONCRETING - ALL CONCRETING OPERATIONS, INCLUDING SAMPLING AND TESTING TO BE CARRIED OUT IN ACCORDANCE WITH THE BAM SPECIFICATION E10.

9. ALL CONCRETE CORE WALLS ARE 250mm THICK U.N.O.

10. ALL COLUMNS ARE LOCATED SYMMETRICALLY ON GRID LINES U.N.O..

11. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METRES U.N.O. USE FIGURED DIMENSIONS ONLY - DO NOT SCALE.

12. REFER TO LIFT MANUFACTURERS DRAWINGS FOR DETAILS OF ALL CAST IN INSERTS TO SHAFT WALLS & PITS, AND FOR SETTING OUT OF ALL DOOR OPENINGS.

13. REFER TO ARCHITECT/M&E SUBCONTRACTOR DRAWINGS FOR DETAILS OF CONCEALED CAST IN CONDUIT AND ALL OTHER CAST IN ITEMS.

14. ALLOW FOR 50mm CONCRETE BLINDING BELOW ALL REINFORCED FOUNDATION AND GROUND BEAMS TO BAM DESIGN MIX No. 2 (C8/C10).

15. ALL PUMP CHAMBER AND SUSPENDED MANHOLES BASES AND WALLS TO BE A MINIMUM 250mm THICK. REFER TO PUBLIC HEALTH DRAWINGS FOR COVER DETAILS, RECESSES, ETC.

16. ALL PERIMETER UPSTANDS TO BE CONFIRMED BY ARCHITECT.

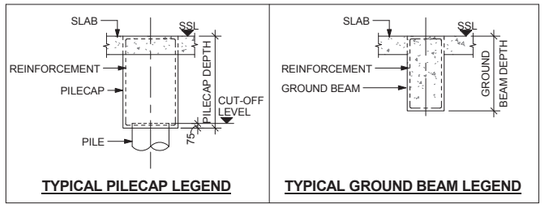
17. CONCRETE SURFACE FINISHES TO ALL PLANT AREAS TO BE POWER FLOAT FINISHED AND ALL OTHER GROUND FLOOR SLABS TO HAVE SKIP FLOATED FINISH IN ACCORDANCE WITH ARCHTECT'S SPECIFICATION.

NOTE:
ALL BELOW GROUND SERVICES SHOWN ARE FOR INDICATIVE PURPOSES ONLY AND ARE STILL BEING DEVELOPED / CO-ORDINATED.

(N1) COLUMN KEY	
REF	SECTION SIZE
C02	450Ø RC COLUMN
C05	600Ø RC COLUMN
C06	650Ø RC COLUMN
C08	750Ø RC COLUMN
C10	850Ø RC COLUMN
C13	350 x 300 RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C21	650 x 650 RC COLUMN
C24	1200 x 400 RC COLUMN
CR151	RHS250x150x10.0

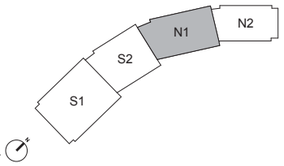
(N) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

(N1) RC GROUND BEAM KEY	
REF	SECTION SIZE
GB02	600w x 600dp RC GROUND BEAM
GB03	600w x 750dp RC GROUND BEAM
GB05	600w x 900dp RC GROUND BEAM
GB09	600w x 1450dp RC GROUND BEAM
GB12	900w x 1200dp RC GROUND BEAM



TYPICAL PILECAP LEGEND

TYPICAL GROUND BEAM LEGEND



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B	TEMPORARY WORKS MAY BE REQUIRED LOCALLY TO SUPPORT THE GROUND WHERE EXISTING SERVICES LOCATIONS DO NOT ALLOW FOR BATTERED EXCAVATION.

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ARGENT

project KINGS CROSS T2

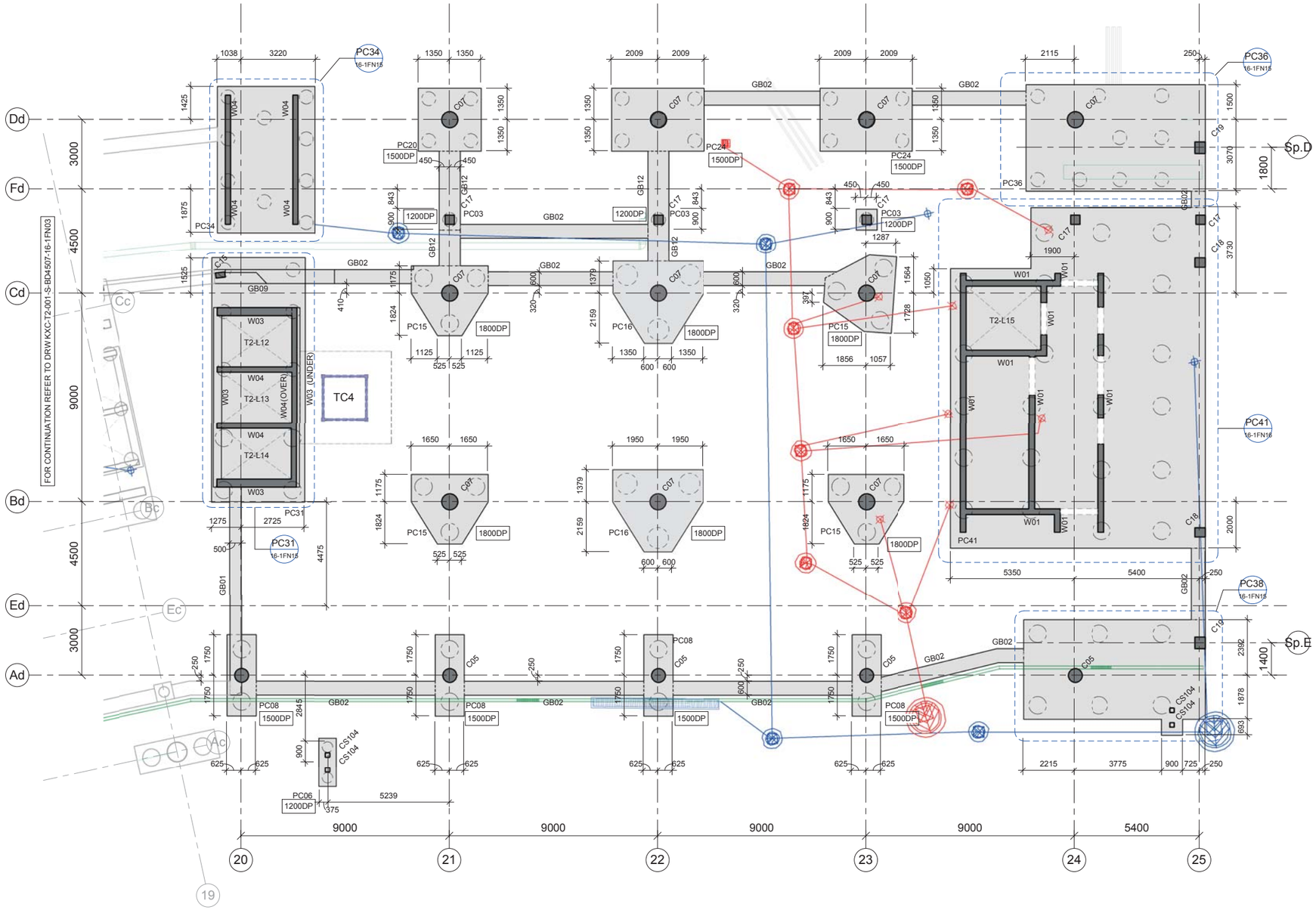
title FOUNDATIONS LAYOUT BLOCK N1

purpose of issue: **TENDER**

scale	As indicated @ A1	drawn	CMO	BAM job no.	drg. status
date	02/11/16	checked	MCH	4507	D2

drg / doc ref.	site	location	proj ref	role	consultant	CI/SB	content	rev.
	KXC-T2-	001-	S-	BD4507-	16-1FN03			-

rev	by	chkd	date	description

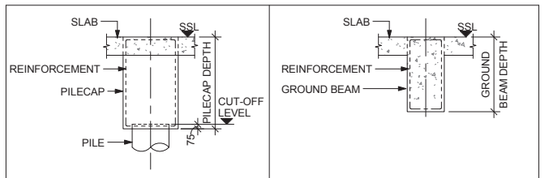


1 -01 - N2 Foundation Layout
1 : 100

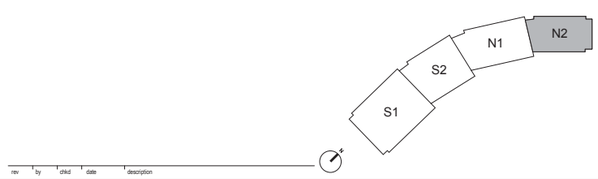
(N2) COLUMN KEY	
REF	SECTION SIZE
C01	400Ø RC COLUMN
C03	500Ø RC COLUMN
C04	550Ø RC COLUMN
C05	600Ø RC COLUMN
C06	650Ø RC COLUMN
C07	700Ø RC COLUMN
C15	400 x 225 RC COLUMN
C17	400 x 400 RC COLUMN
C18	450 x 400 RC COLUMN
C19	450 x 500 RC COLUMN
C20	550 x 500 RC COLUMN
CR151	RHS250x150x10.0

(N2) RC GROUND BEAM KEY	
REF	Type
GB01	S_GroundBeam_500wx880dp_GB01
GB02	S_GroundBeam_600wx600dp_GB02
GB09	S_GroundBeam_600wx1450dp_GB09
GB12	S_GroundBeam_900wx1200dp_GB12

(N) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL



TYPICAL PILECAP LEGEND | **TYPICAL GROUND BEAM LEGEND**



DO NOT SCALE FROM THIS DRAWING.

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GROUND FLOOR SLABS ARE TO BAM DESIGN MIX No. 9 (C35/C45).

3. REINFORCED CONCRETE COLUMNS AND THEIR COLUMN HEADS TO BE GRADE RC50/60.

4. NOMINAL COVER TO REINFORCEMENT TO BE:
FOUNDATIONS 75mm BTM, 50mm SIDES U.N.O.
GROUND FLOOR SLABS T&B 50mm U.N.O.
BEAMS 35mm BTM, 35mm SIDES U.N.O.
CORE WALLS 30mm ALL FACES U.N.O.
COLUMNS 40mm ALL FACES U.N.O.
SUSPENDED SLABS 30mm TOP, 30mm BTM U.N.O.

5. REFER TO ARCHITECTS DRAWINGS FOR BELOW SLAB INSULATION.

6. GROUND FLOOR SLAB TO BE CONSTRUCTED IN WATER PROOF CONCRETE. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

7. ALL WATERPROOFING / TANKING TO ARCHITECTS AND SPECIALIST SUB CONTRACTORS DETAILS. ALLOW FOR RX101 WATER BARS TO ALL HORIZONTAL AND VERTICAL CONSTRUCTION JOINTS.

8. CONCRETING - ALL CONCRETING OPERATIONS, INCLUDING SAMPLING AND TESTING TO BE CARRIED OUT IN ACCORDANCE WITH THE BAM SPECIFICATION E10.

9. ALL CONCRETE CORE WALLS ARE 250mm THICK U.N.O.

10. ALL COLUMNS ARE LOCATED SYMMETRICALLY ON GRID LINES U.N.O..

11. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METRES U.N.O. USE FIGURED DIMENSIONS ONLY - DO NOT SCALE.

12. REFER TO LIFT MANUFACTURERS DRAWINGS FOR DETAILS OF ALL CAST IN INSERTS TO SHAFT WALLS & PITS, AND FOR SETTING OUT OF ALL DOOR OPENINGS.

13. REFER TO ARCHITECT/M&E SUBCONTRACTOR DRAWINGS FOR DETAILS OF CONCEALED CAST IN CONDUIT AND ALL OTHER CAST IN ITEMS.

14. ALLOW FOR 50mm CONCRETE BLINDING BELOW ALL REINFORCED FOUNDATION AND GROUND BEAMS TO BAM DESIGN MIX No. 2 (C8/C10).

15. ALL PUMP CHAMBER AND SUSPENDED MANHOLES BASES AND WALLS TO BE A MINIMUM 250mm THICK. REFER TO PUBLIC HEALTH DRAWINGS FOR COVER DETAILS, RECESSES, ETC.

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design@bam.co.uk
www.bam.co.uk

ARGENT

project KINGS CROSS T2

title FOUNDATIONS LAYOUT BLOCK N2

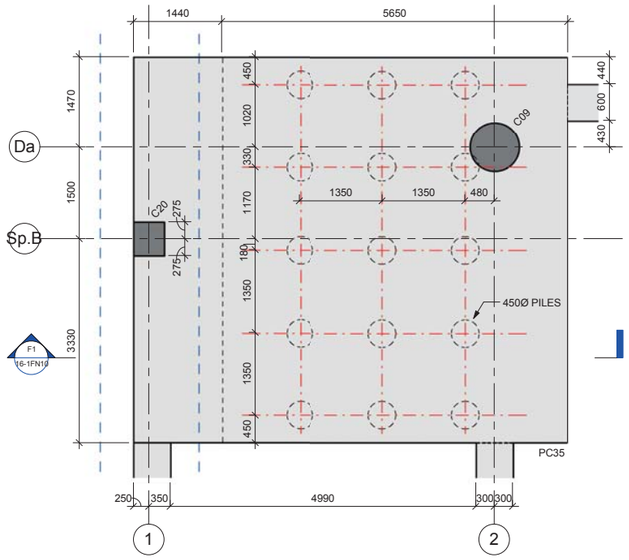
purpose of issue: TENDER

scale	As indicated @ A1	drawn	CMO	BAM job no.	drg. status
date	02/11/16	checked	MCH	4507	D2

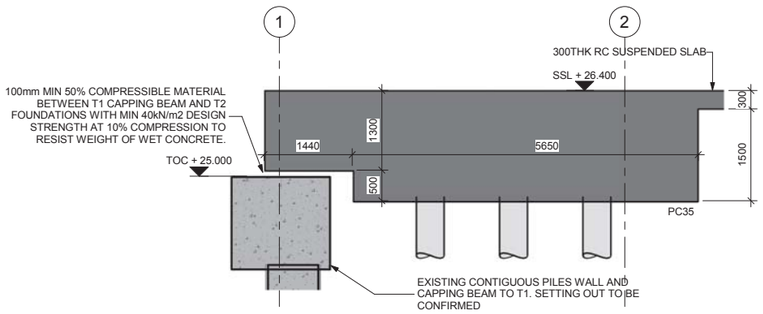
drg / doc ref. site: KXC- location: T2- proj ref: 001- role: S- consultant: BD4507- CISB: 16-1FN04 content: rev. -

DO NOT SCALE FROM THIS DRAWING.

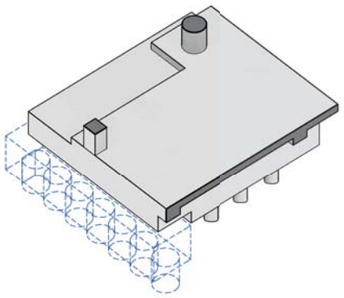
ALL DIMENSIONS TO BE CHECKED ON SITE.



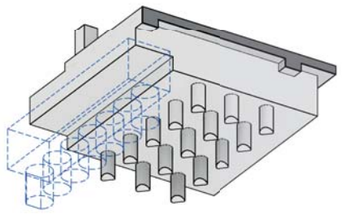
PC35 PILECAP TYPE PC35
1 : 50



F1 PC35 SECTION 1
1 : 50



3D VIEW PILE CAP PC35

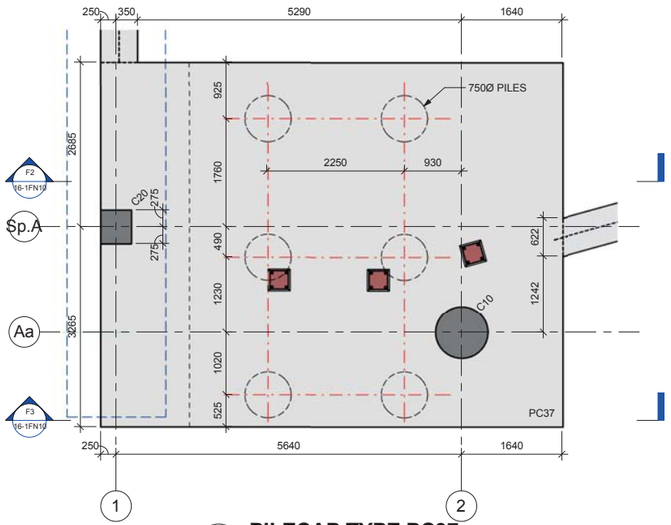


3D VIEW UNDERSIDE PILE CAP PC35

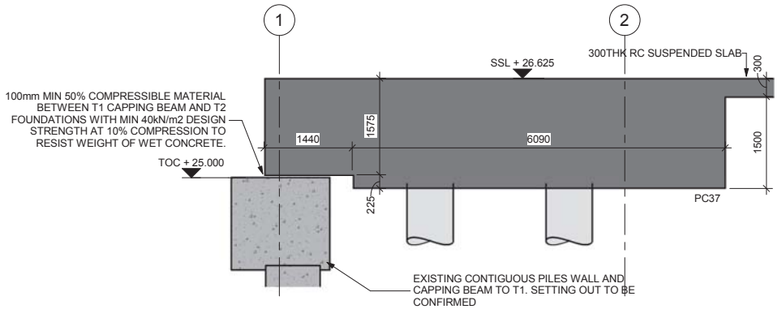
NOTE:

1. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

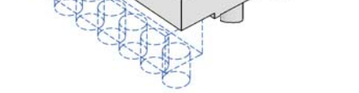
2. FOR LOCATION OF PILECAPS REFER TO DRW: KXC-T2-001-S-BD4507-16-1FN01.



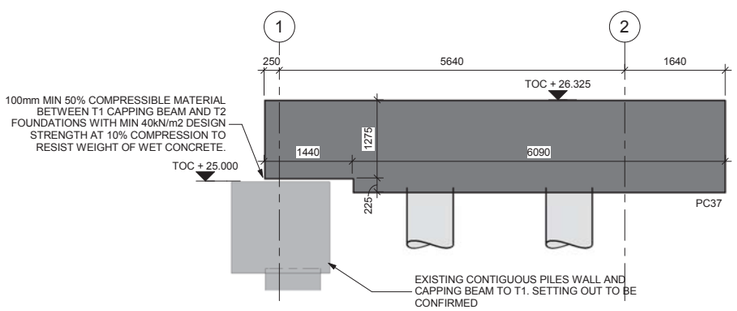
PC37 PILECAP TYPE PC37
1 : 50



F2 PC37 SECTION F2
1 : 50



3D VIEW PILE CAP PC37



F3 PC37 SECTION 3
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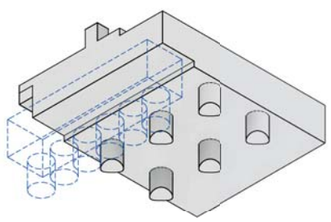
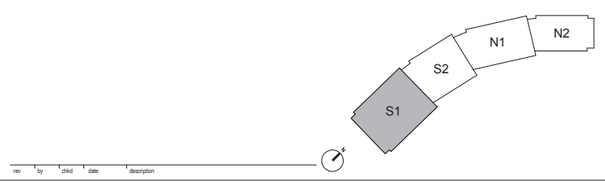


3D VIEW UNDERSIDE PILE CAP PC37



ARGENT

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Structural Engineering
Environmental Services
Building Information Modeling

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Griffiths Way, St Albans
Hertfordshire, AL1 2RD

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design@bam.co.uk
www.bam.co.uk

project KINGS CROSS T2

title PILECAP DETAILS SHEET 1

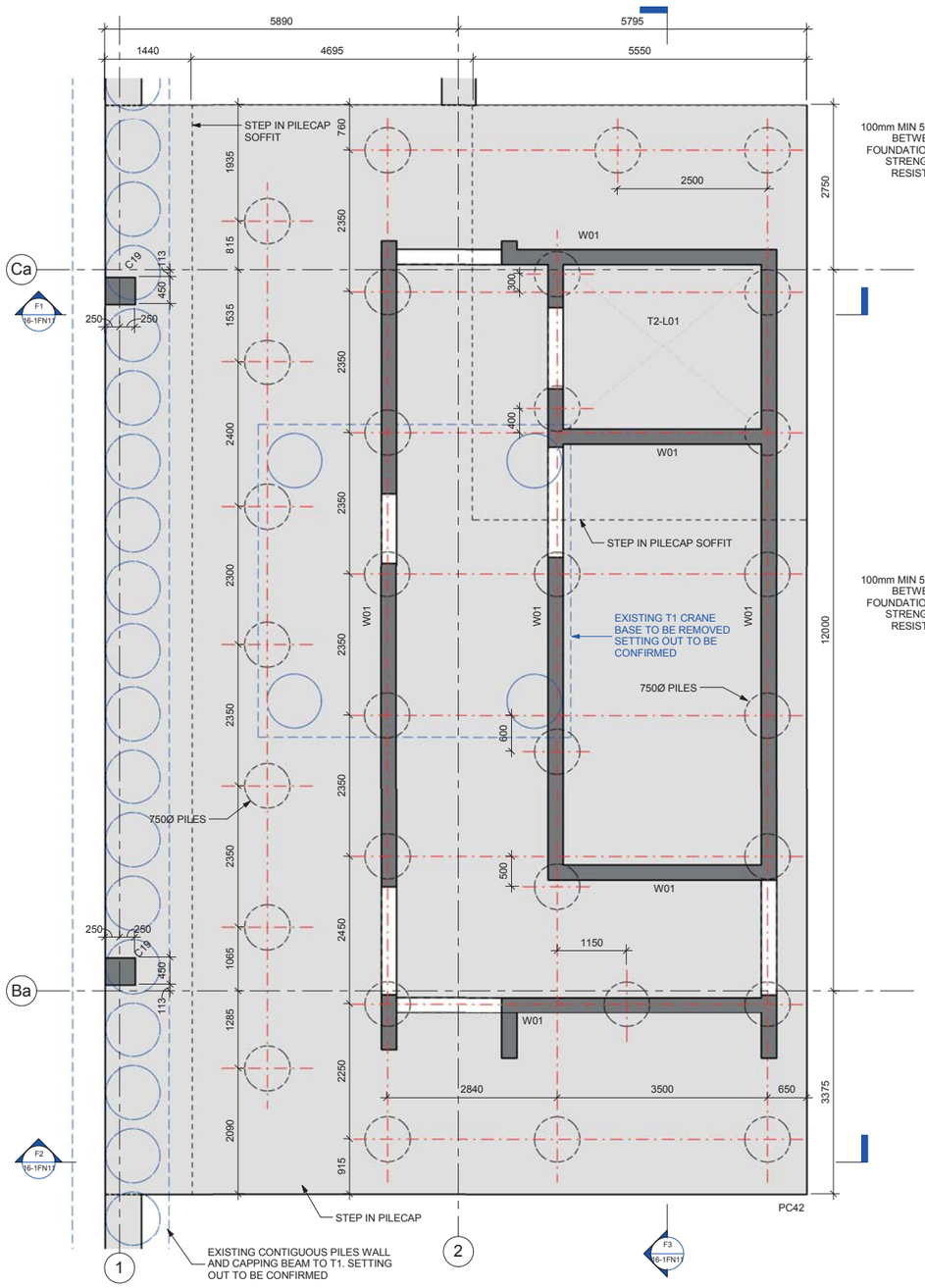
purpose of issue **TENDER**

scale	drawn	BAM job no.	drg. status
1 : 50 @ A1	CMO	4507	D2
date 02/25/16	checked MCH		

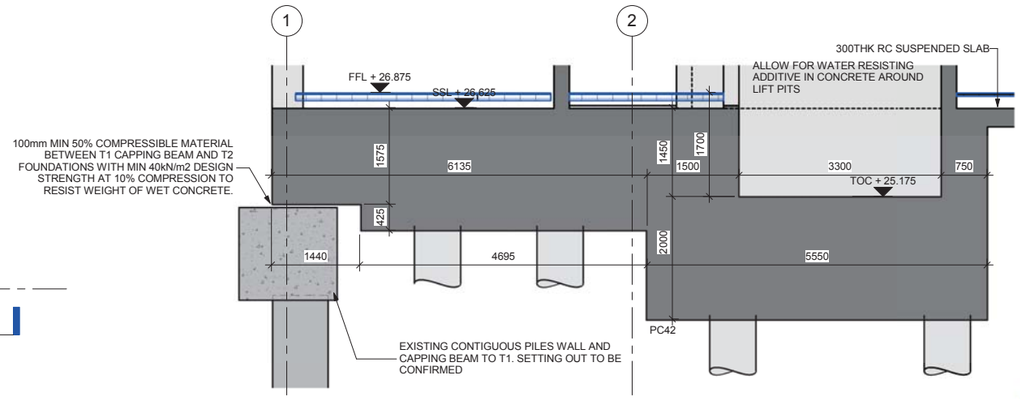
drg / doc ref. site KXC- location T2- proj ref 001- role S- consultant BD4507- CISB 16-1FN10 content - rev. -

DO NOT SCALE FROM THIS DRAWING.

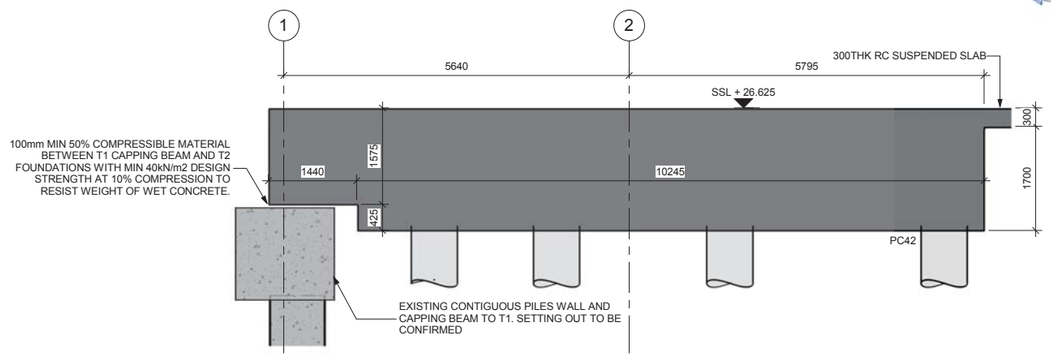
ALL DIMENSIONS TO BE CHECKED ON SITE.



PC42 **PILECAP TYPE PC42**
1 : 50



F1 **PC42 SECTION 1**
1 : 50

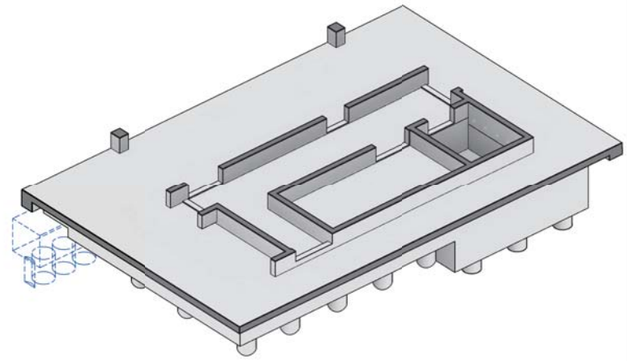


F2 **PC42 SECTION 2**
1 : 50

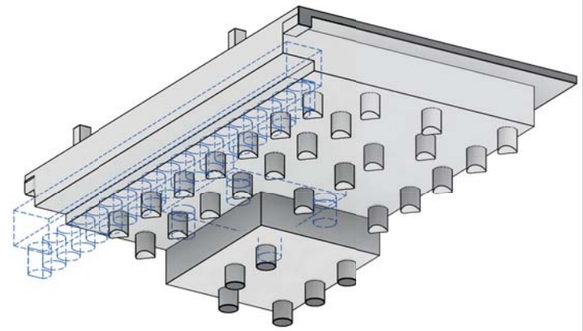
NOTE:

1. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

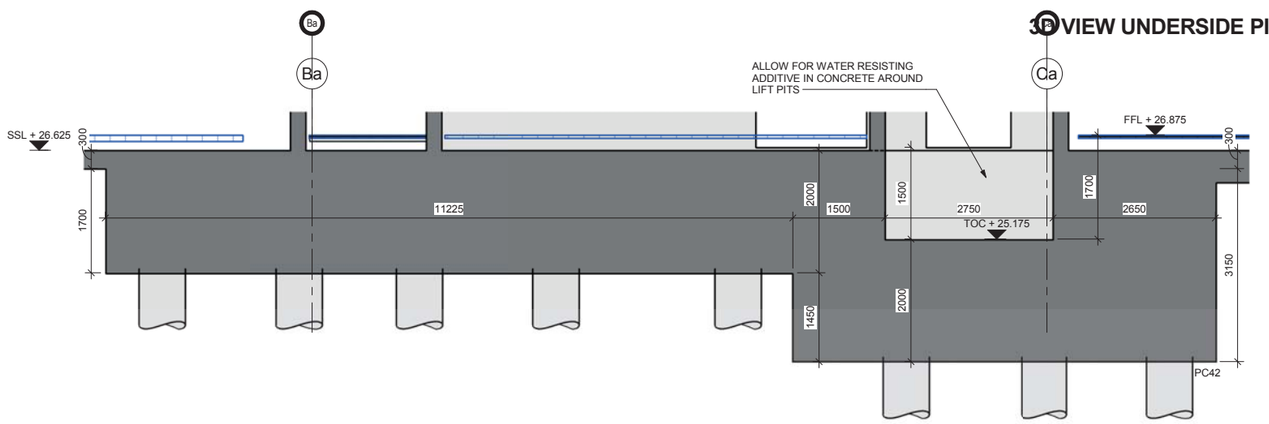
2. FOR LOCATION OF PILECAPS REFER TO DRW: KXC-T2-001-S-BD4507-16-1FN01.



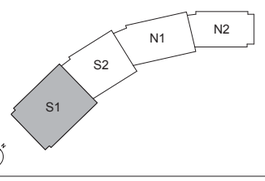
3D VIEW PILE CAP PC42



3D VIEW UNDERSIDE PILE CAP PC42



F3 **PC42 SECTION 3**
1 : 50



rev | by | chkd | date | description

ARGENT

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01727 894200
design@bam.co.uk
www.bam.co.uk

project KINGS CROSS T2

title PILECAP DETAILS SHEET 2

purpose of issue **TENDER**

scale	1 : 50 @ A1	drawn	CMO	BAM job no.	drg. status
date	02/25/16	checked	MCH	4507	D2

drg / doc ref. site KXC- location T2- proj ref 001- role S- consultant BD4507- CISB 16-1FN11 content - rev. -

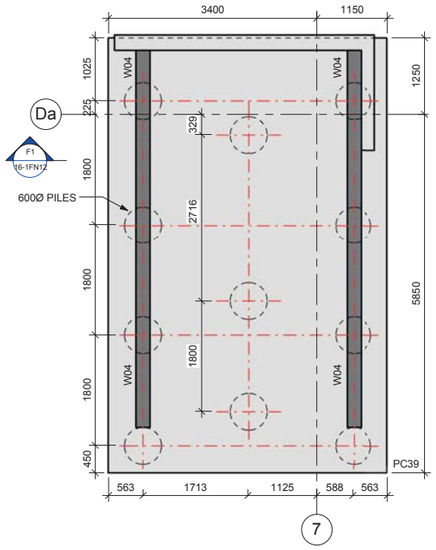
DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

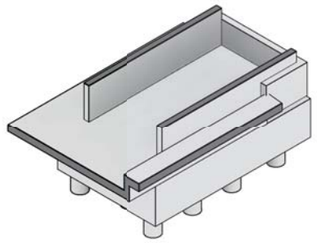
NOTE:

1. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

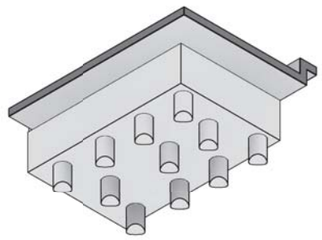
2. FOR LOCATION OF PILECAPS REFER TO DRW: KXC-T2-001-S-BD4507-16-1FN01.



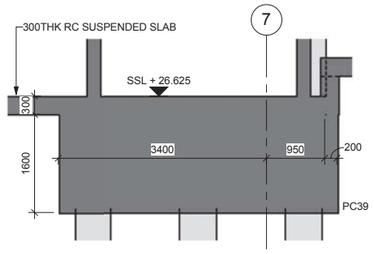
PC39 PILECAP TYPE PC39
1 : 50



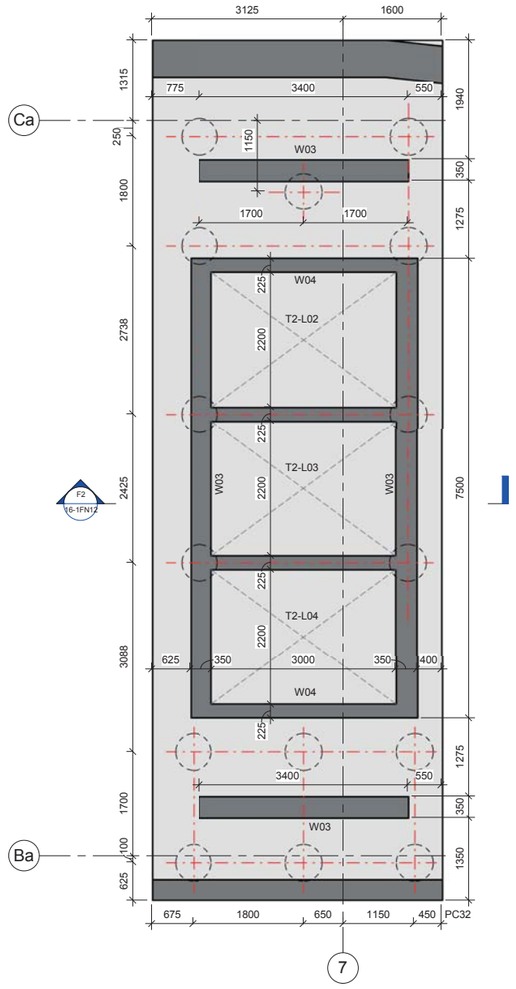
3D VIEW PILE CAP PC39



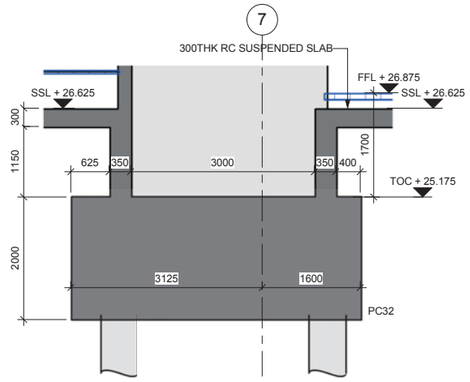
3D VIEW UNDERSIDE PILE CAP PC39



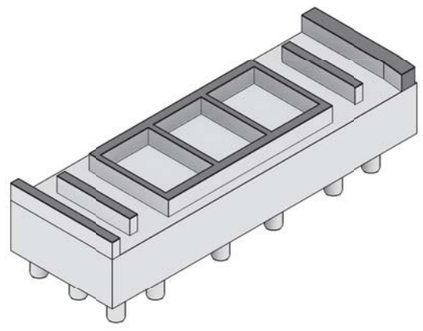
F1 PC39 SECTION 1
1 : 50



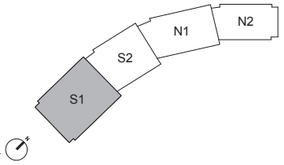
PC32 PILECAP TYPE PC32
1 : 50



F2 PC32 SECTION 2
1 : 50



3D VIEW PILE CAP PC32



rev | by | chkd | date | description

ARGENT

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project: KINGS CROSS T2

title: PILECAP DETAILS SHEET 3

purpose of issue: **TENDER**

scale	drawn	BAM job no.	drg. status
1 : 50 @ A1	CMO	4507	D2
date 02/26/16	checked MCH		

drg / doc ref.	site	location	proj ref	role	consultant	CISIB	content	rev.
	KXC-T2-	001-	S-		BD4507-		16-1FN12	-

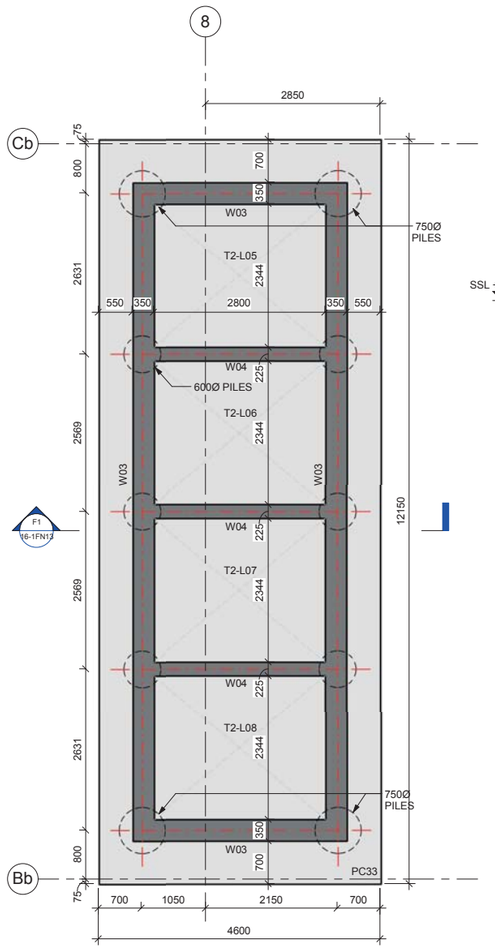
DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

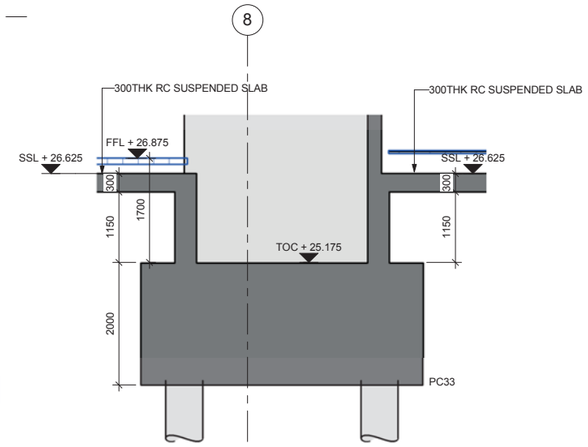
NOTE:

1. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

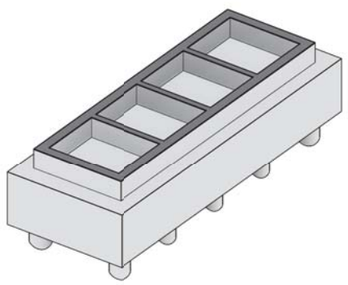
2. FOR LOCATION OF PILECAPS REFER TO DRW: KXC-T2-001-S-BD4507-16-1FN02



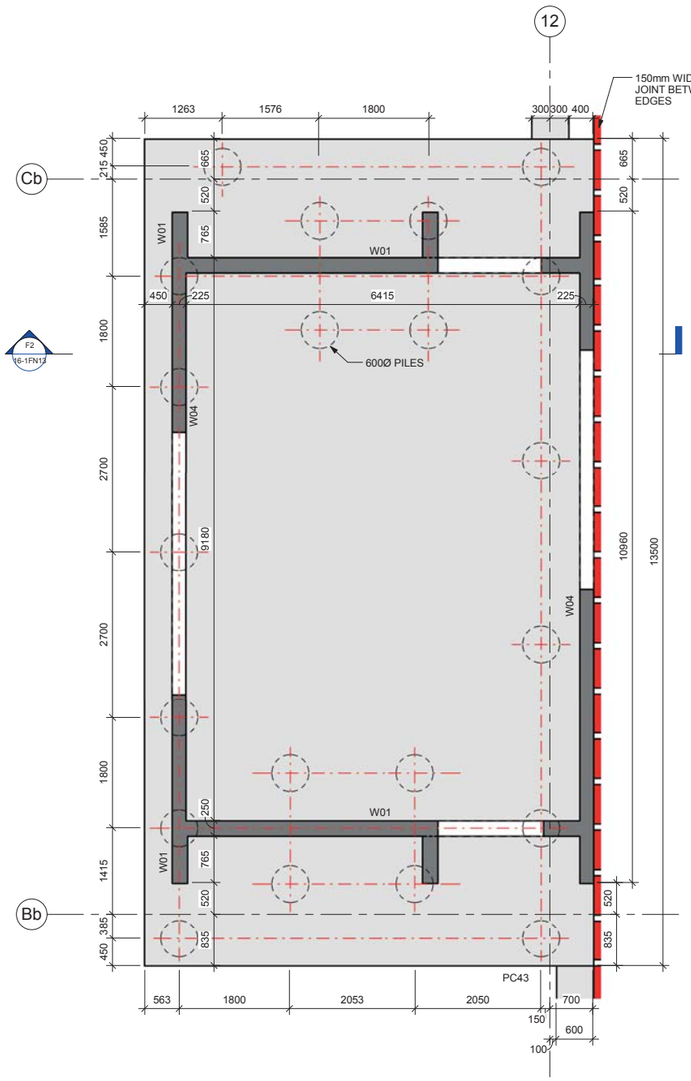
PC33 PILECAP TYPE PC33
1 : 50



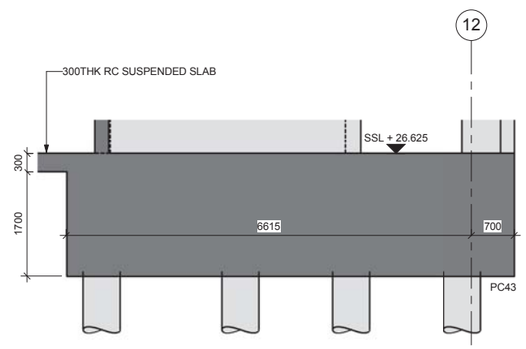
F1 PC33 SECTION 1
1 : 50



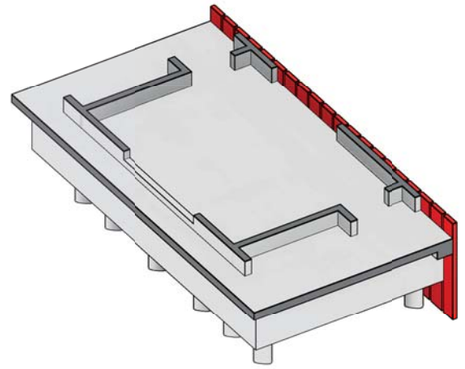
3D VIEW PILE CAP PC33



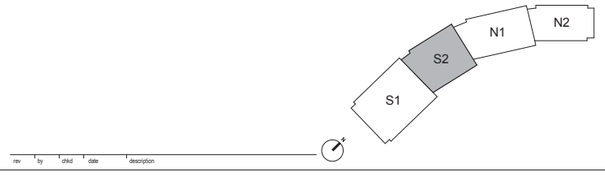
PC43 PILECAP TYPE PC43
1 : 50



F2 PC43 SECTION 2
1 : 50



3D VIEW PILE CAP PC43



rev | by | chkd | date | description

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project: KINGS CROSS T2

title: PILECAP DETAILS SHEET 4

purpose of issue: TENDER

scale: 1 : 50 @ A1 | drawn: CMO | BAM job no.: 4507 | drg. status: D2

date: 02/25/16 | checked: MCH

drg / doc ref.: site KXC- | location T2- | proj ref 001- | role S- | consultant BD4507- | CI/SfB | content 16-1FN13 | rev. -

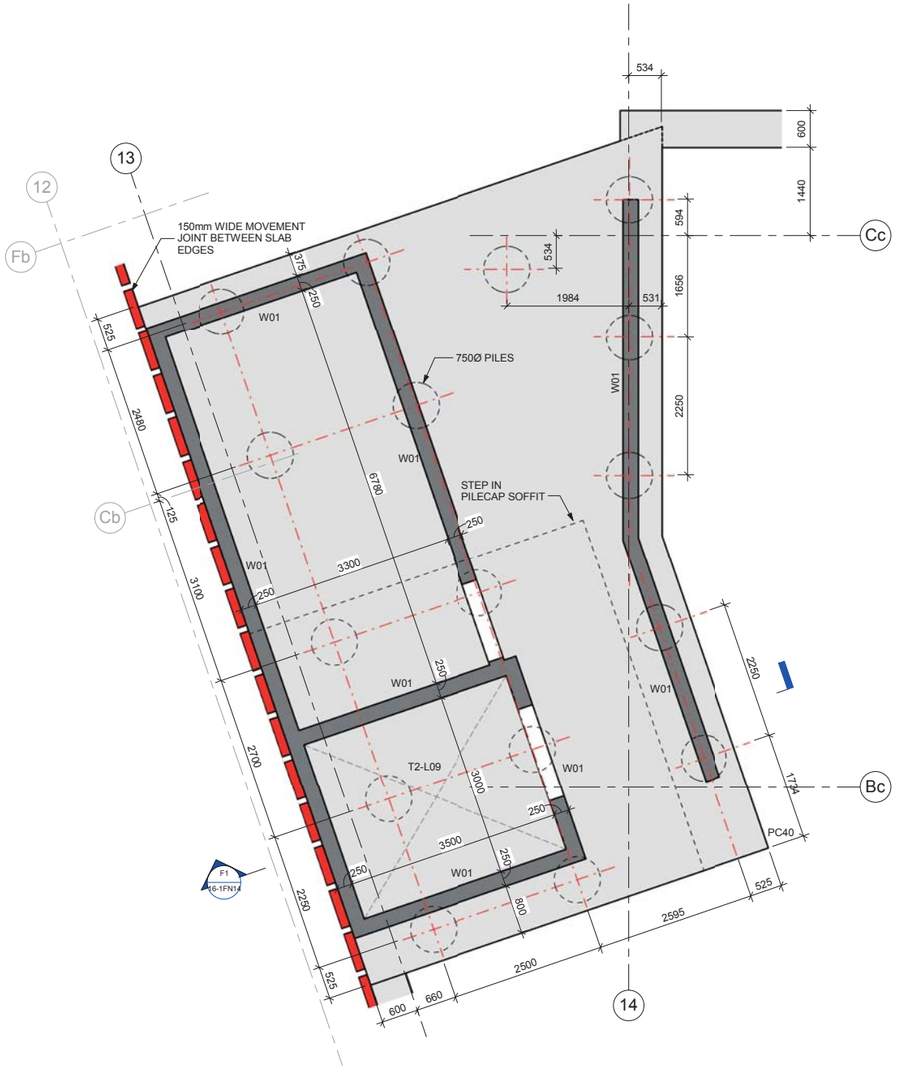
DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

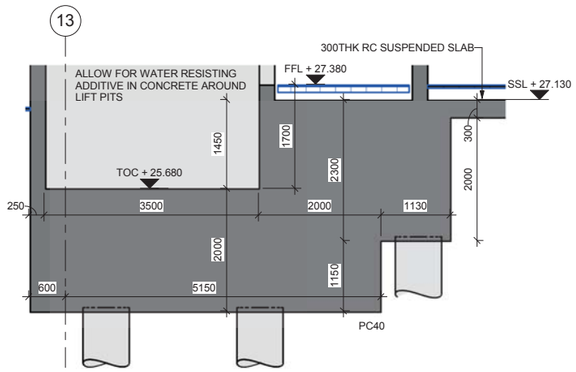
NOTE:

1. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

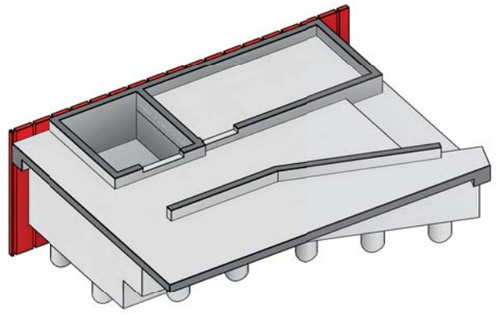
2. FOR LOCATION OF PILECAPS REFER TO DRW: KXC-T2-001-S-BD4507-16-1FN03.



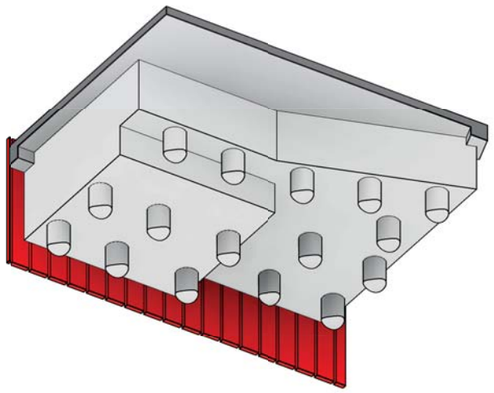
PC40 PILECAP TYPE PC40
1 : 50



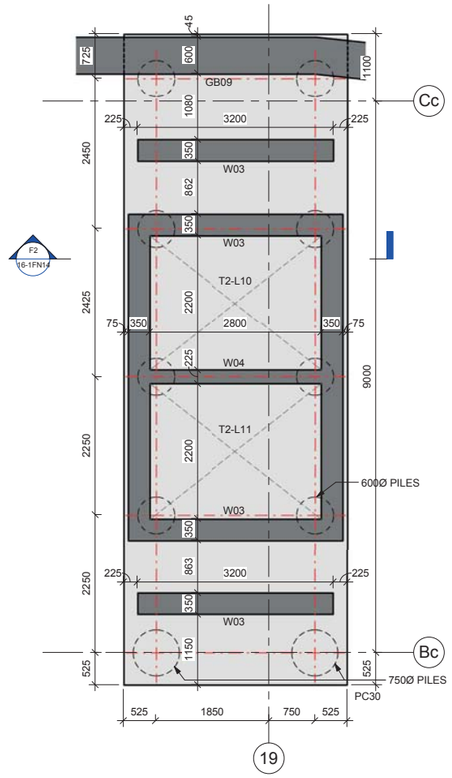
F1 PC40 SECTION 1
1 : 50



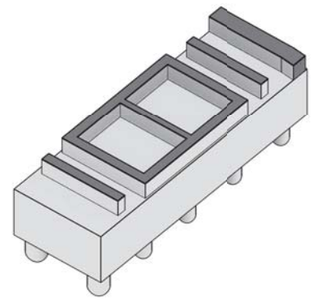
3D VIEW PILE CAP PC40



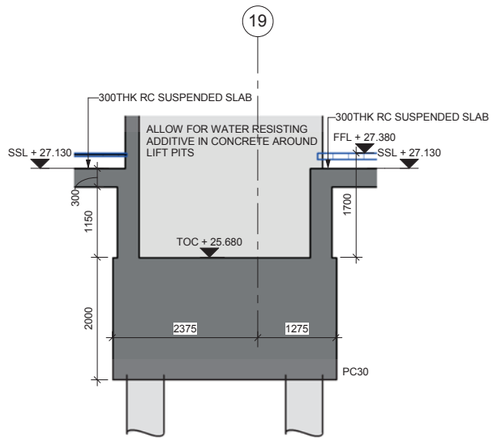
3D VIEW UNDERSIDE PILE CAP PC40



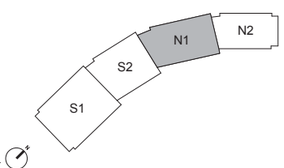
PC30 PILECAP TYPE PC30
1 : 50



3D VIEW PILE CAP PC30



F2 PC30 SECTION 2
1 : 50



rev | by | chkd | date | description

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project: KINGS CROSS T2

title: PILECAP DETAILS SHEET 5

purpose of issue: **TENDER**

scale: 1 : 50 @ A1 | drawn: CMO | BAM job no.: 4507 | drg. status: **D2**

date: 02/25/16 | checked: MCH

drg / doc ref.: site **KXC-T2-** location **001-** proj ref **S-** role consultant **BD4507-** CI/SB **16-1FN14** content | rev. **-**

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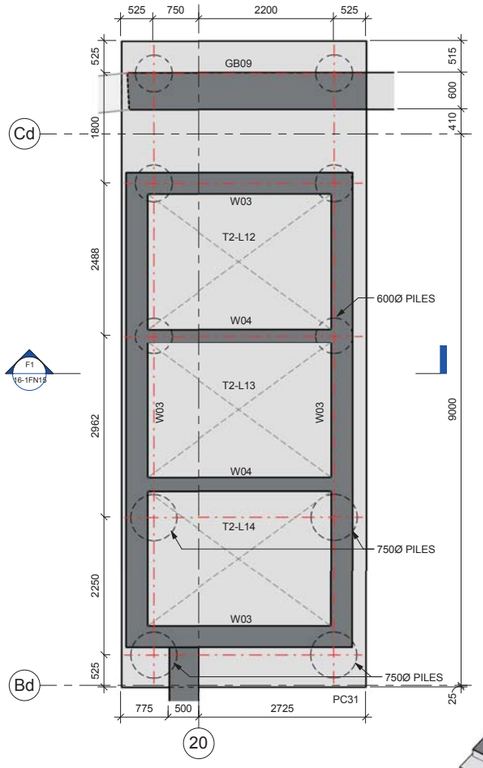
ALL DIMENSIONS TO BE CHECKED ON SITE.

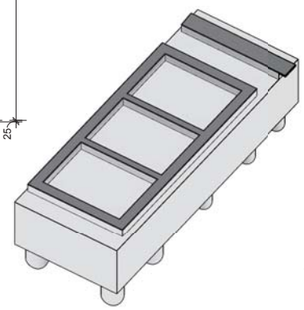
NOTE:

1. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

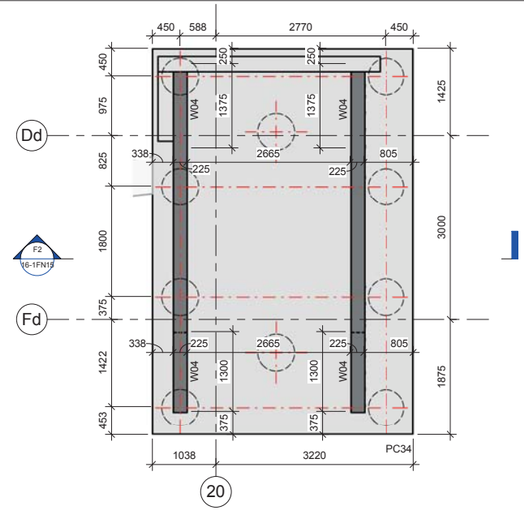
2. FOR LOCATION OF PILECAPS REFER TO DRW: KXC-T2-001-S-BD4507-16-1FN04.



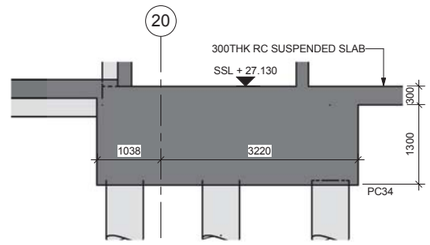
PC31 PILECAP TYPE PC31
1 : 50



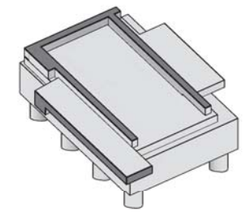
3D VIEW PILE CAP PC31



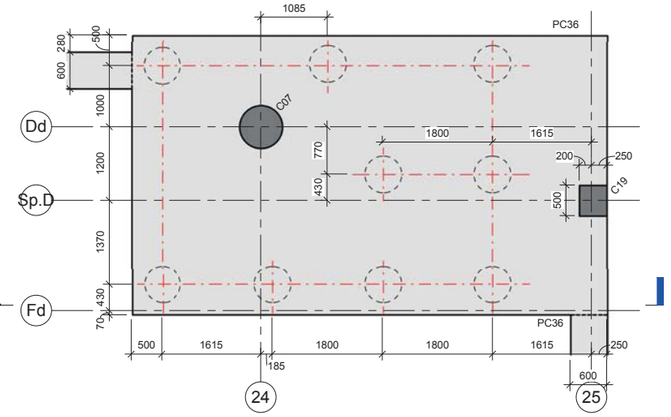
PC34 PILECAP TYPE PC34
1 : 50



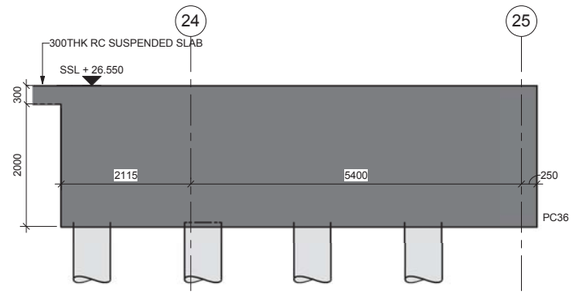
F2 PC34 SECTION 2
1 : 50



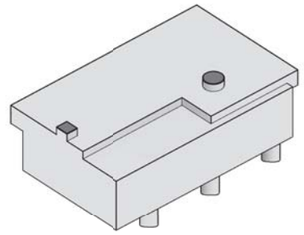
3D VIEW PILE CAP PC34



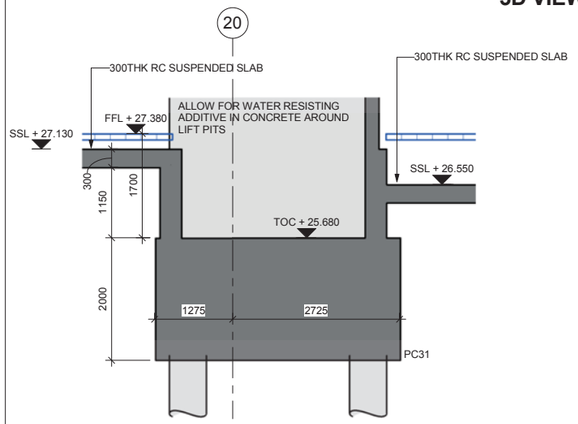
PC36 PILECAP TYPE PC36
1 : 50



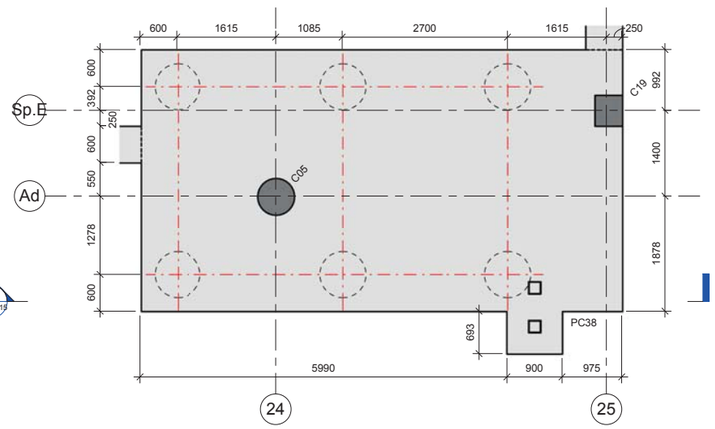
F3 PC36 SECTION 3
1 : 50



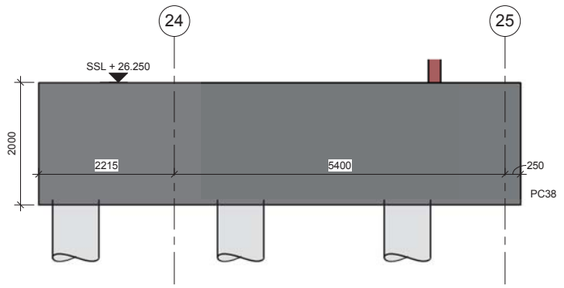
3D VIEW PILE CAP PC36



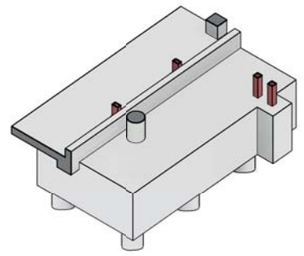
F1 PC31 SECTION 1
1 : 50



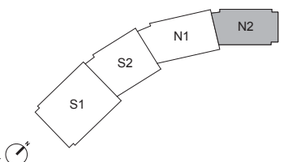
PC38 PILECAP TYPE PC38
1 : 50



F4 PC38 SECTION 4
1 : 50



3D VIEW PILE CAP PC38



rev | by | chkd | date | description

ARGENT

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project: KINGS CROSS T2

title: PILECAP DETAILS SHEET 6

purpose of issue: **TENDER**

scale: 1 : 50 @ A1 | drawn: CMO | BAM job no.: 4507 | drg. status: **D2**

date: 02/25/16 | checked: MCH | rev.: -

drg / doc ref.: site location proj ref role consultant CISB content
KXC-T2- 001- S- BD4507- 16-1FN15

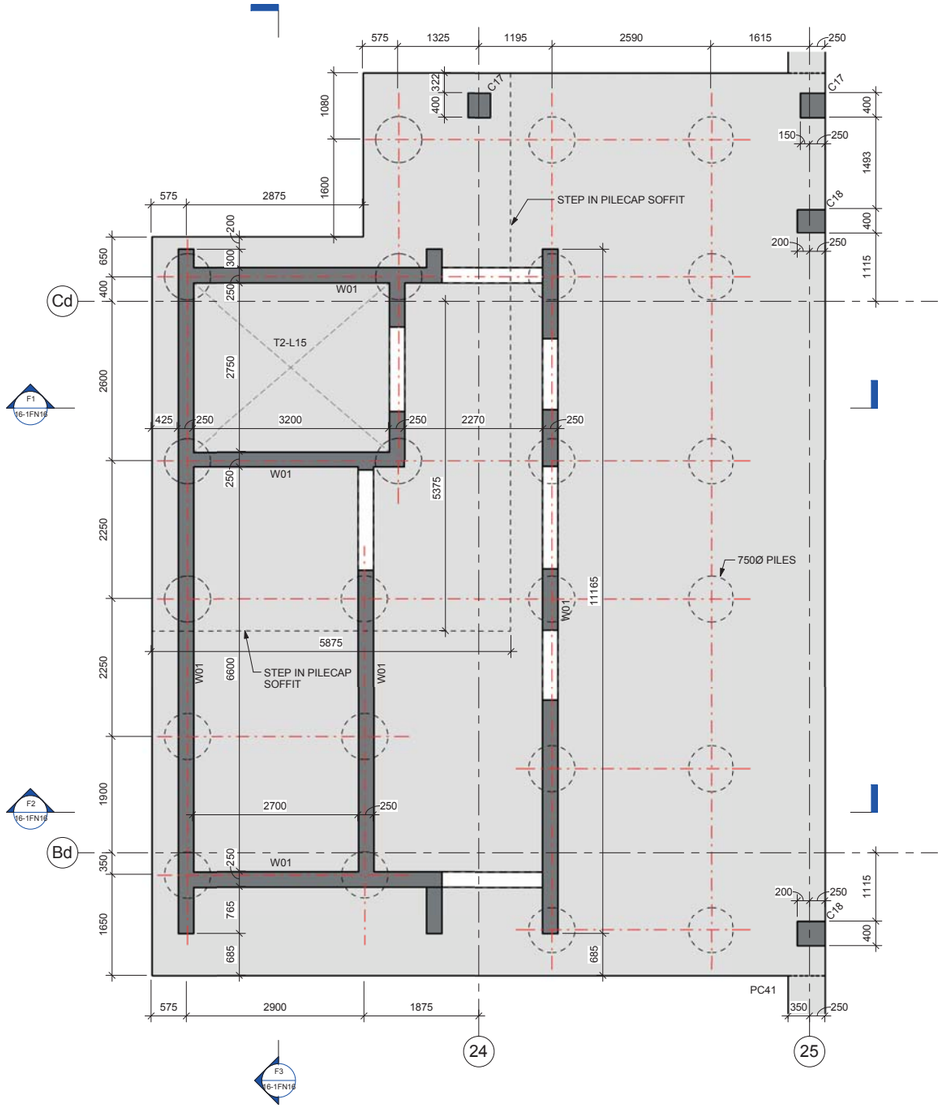
DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

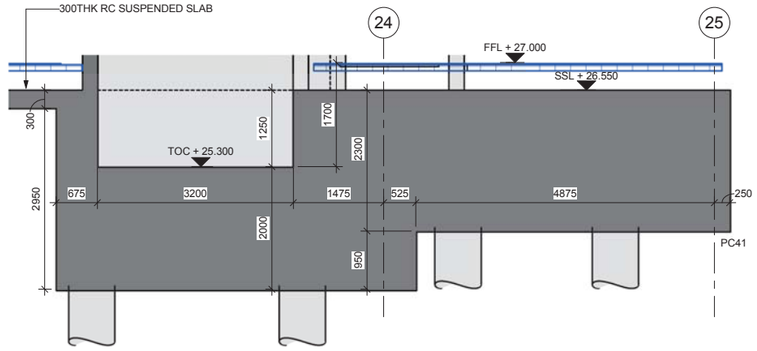
NOTE:

1. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

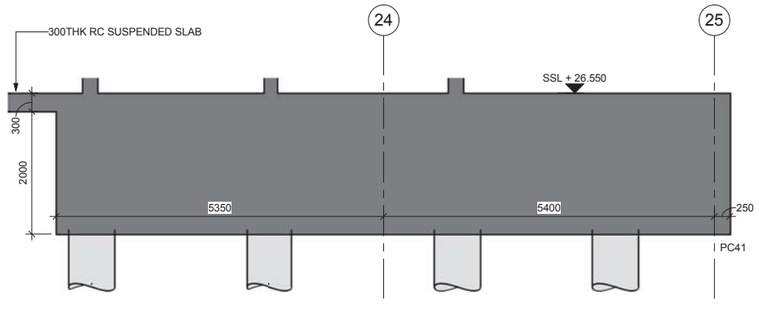
2. FOR LOCATION OF PILECAPS REFER TO DRW: KXC-T2-001-S-BD4507-16-1FN04.



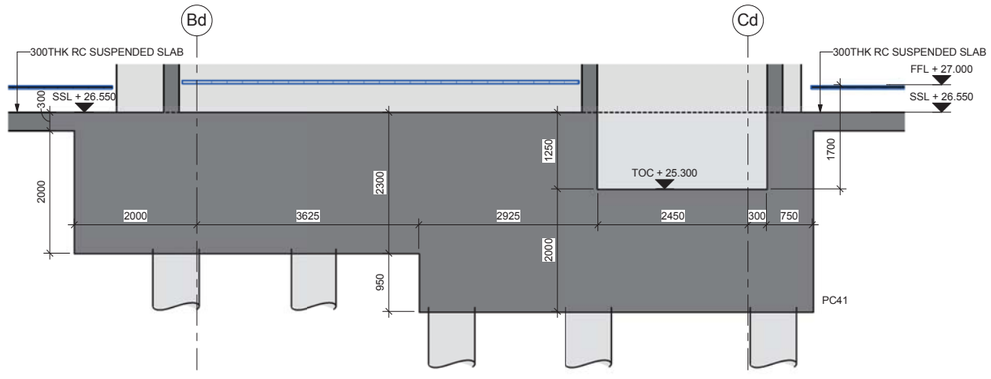
PC41 PILECAP TYPE PC41
1 : 50



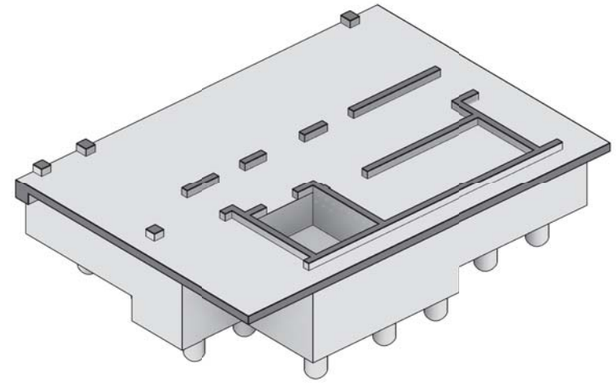
F1 PC41 SECTION 1
1 : 50



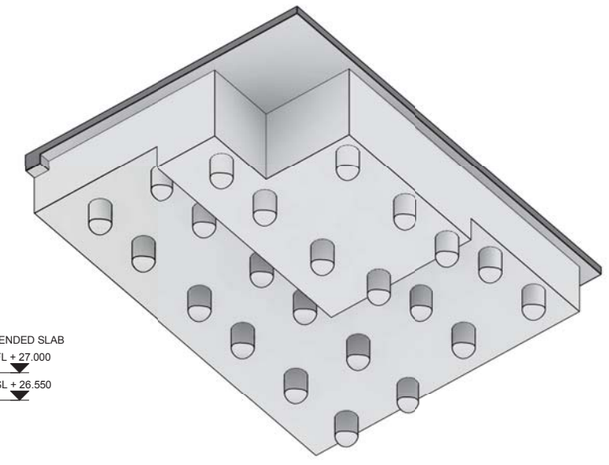
F2 PC41 SECTION 2
1 : 50



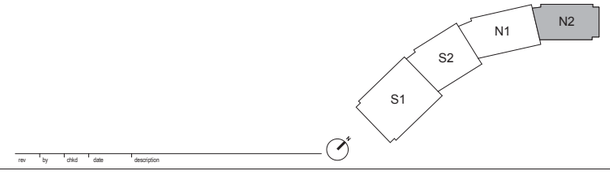
F3 PC41 SECTION 3
1 : 50



3D VIEW PILE CAP PC41



3D VIEW UNDERSIDE PILE CAP PC41



rev | by | chkd | date | description

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Environmental Services
Building Information Modelling

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www.bam.co.uk

project: KINGS CROSS T2

title: PILECAP DETAILS SHEET 7

purpose of issue: **TENDER**

scale	drawn	BAM job no.	drg. status
1 : 50 @ A1	CMO	4507	D2
date 02/29/16	checked MCH		

drg / doc ref.: site KXC- location T2- proj ref 001- role S- consultant BD4507- CISIB 16-1FN16 content

rev.: -

DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

SUBSTRUCTURE NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECT, SERVICE ENGINEERS, SPECIALIST SUB CONTRACTORS DRAWINGS AND THE SPECIFICATION.

2. REINFORCED CONCRETE FOUNDATIONS, TOWER CRANE BASES & LINER WALLS, CORE WALLS AND BASEMENT SLABS ARE TO BAM DESIGN MIX No. 9 (C35/C45).
GROUND FLOOR SLABS ARE TO BAM DESIGN MIX No. 9 (C35/C45).

3. REINFORCED CONCRETE COLUMNS AND THEIR COLUMN HEADS TO BE GRADE RC50/60.

4. NOMINAL COVER TO REINFORCEMENT TO BE:
FOUNDATIONS 75mm BTM, 50mm SIDES U.N.O.
GROUND FLOOR SLABS T&B 50mm U.N.O.
BEAMS 35mm BTM, 35mm SIDES U.N.O.
CORE WALLS 30mm ALL FACES U.N.O.
COLUMNS 40mm ALL FACES U.N.O.
SUSPENDED SLABS 30mm TOP, 30mm BTM U.N.O.

5. REFER TO ARCHITECTS DRAWINGS FOR BELOW SLAB INSULATION.

6. GROUND FLOOR SLAB TO BE CONSTRUCTED IN WATER PROOF CONCRETE. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

7. ALL WATERPROOFING / TANKING TO ARCHITECTS AND SPECIALIST SUB CONTRACTORS DETAILS. ALLOW FOR RX101 WATER BARS TO ALL HORIZONTAL AND VERTICAL CONSTRUCTION JOINTS.

8. CONCRETING - ALL CONCRETING OPERATIONS, INCLUDING SAMPLING AND TESTING TO BE CARRIED OUT IN ACCORDANCE WITH THE BAM SPECIFICATION E10.

9. ALL CONCRETE CORE WALLS ARE 250mm THICK U.N.O.

10. ALL COLUMNS ARE LOCATED SYMMETRICALLY ON GRID LINES U.N.O..

11. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METRES U.N.O. USE FIGURED DIMENSIONS ONLY - DO NOT SCALE.

12. REFER TO LIFT MANUFACTURERS DRAWINGS FOR DETAILS OF ALL CAST IN INSERTS TO SHAFT WALLS & PITS, AND FOR SETTING OUT OF ALL DOOR OPENINGS.

13. REFER TO ARCHITECT/M&E SUBCONTRACTOR DRAWINGS FOR DETAILS OF CONCEALED CAST IN CONDUIT AND ALL OTHER CAST IN ITEMS.

14. ALLOW FOR 50mm CONCRETE BLINDING BELOW ALL REINFORCED FOUNDATION AND GROUND BEAMS TO BAM DESIGN MIX No. 2 (C8/C10).

15. ALL PUMP CHAMBER AND SUSPENDED MANHOLES BASES AND WALLS TO BE A MINIMUM 250mm THICK. REFER TO PUBLIC HEALTH DRAWINGS FOR COVER DETAILS, RECESSES, ETC.

16. ALL PERIMETER UPSTANDS TO BE CONFIRMED BY ARCHITECT.

17. CONCRETE SURFACE FINISHES TO ALL PLANT AREAS TO BE POWER FLOAT FINISHED AND ALL OTHER GROUND FLOOR SLABS TO HAVE SKIP FLOATED FINISH IN ACCORDANCE WITH ARCHTECT'S SPECIFICATION.

NOTE:
FOR EARTHING REQUIREMENTS REFER TO M&E DRAWINGS

NOTE:
FOR DETAILS OF PLANT PLINTHS REFER TO M&E SCHEDULE OF PLINTHS FOR M&E EQUIPMENT

ALL PLANT PLINTHS TO HAVE A 25x25mm CHAMFER TO TOP EDGES

NOTE: PLANT PLINTHS TO BE CAST SEPARATELY TO SLAB

NOTE : FOR ALL PLANT PLINTH SETTING OUT AND LOCATIONS REFER TO BAMSE DRAWINGS

NOTE:
REFER TO ARCHITECT'S & SPECIALIST SUB-CONTRACTOR DRAWINGS FOR GROUND FLOOR WATERPROOFING DETAILS

LEGEND

HATCHING DENOTES EXTENT OF TEMPORARY RECESS FOR TOWER CRANE. ALLOW FOR COUPLERS TO FULL PERIMETER TEMPORARY INFILL SLAB.

(S1) COLUMN KEY	
REF	SECTION SIZE
C02	450Ø RC COLUMN
C03	500Ø RC COLUMN
C06	650Ø RC COLUMN
C08	750Ø RC COLUMN
C09	800Ø RC COLUMN
C10	850Ø RC COLUMN
C12	1000Ø RC COLUMN
C13	350 x 300 RC COLUMN
C14	350 x 350 RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C19	450 x 500 RC COLUMN
C20	550 x 500 RC COLUMN
C22	700 x 700 RC COLUMN
C23	800 x 800 RC COLUMN
CR151	RHS250x150x10.0
CS101	SHS200x200x5.0

(S) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

1 00 - S1 Ground Floor
1 : 100

rev	by	chkd	date	description

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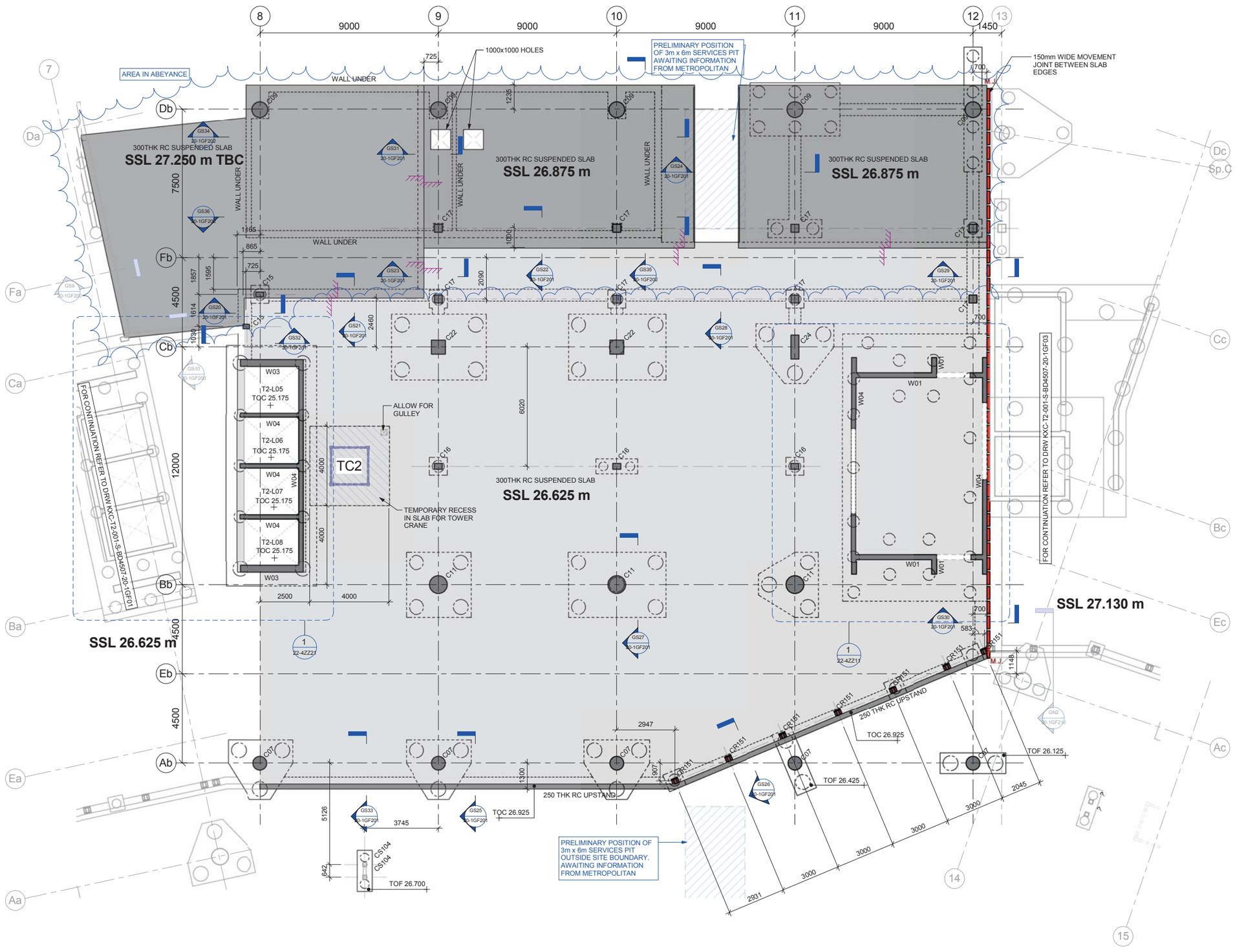
Hertfordshire, AL1 2RD
01727 894200
design@bam.co.uk
www.bam.co.uk

ARGENT

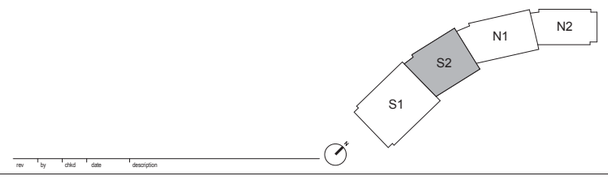
project	KINGS CROSS T2
title	GROUND FLOOR LAYOUT BLOCK S1
purpose of issue	TENDER
scale	As indicated @ A1
date	01/27/16
drawn	CMO
checked	MCH
BAM job no.	4507
drg. status	D2
drg / doc ref.	KXC-T2- 001- S- BD4507- 20-1GF01
rev.	-



(S2) COLUMN KEY	
REF	SECTION SIZE
C01	400Ø RC COLUMN
C02	450Ø RC COLUMN
C06	650Ø RC COLUMN
C07	700Ø RC COLUMN
C08	750Ø RC COLUMN
C09	800Ø RC COLUMN
C11	900Ø RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C22	700 x 700 RC COLUMN
C24	1200 x 400 RC COLUMN
CR151	RHS250x150x10.0

(S) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

1 00 - S2 Ground Floor
1 : 100



DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

SUBSTRUCTURE NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECT, SERVICE ENGINEERS, SPECIALIST SUB CONTRACTORS DRAWINGS AND THE SPECIFICATION.

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FOUNDATIONS 75mm BTM, 50mm SIDES U.N.O.
GROUND FLOOR SLABS T&B 50mm U.N.O.
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COLUMNS 40mm ALL FACES U.N.O.
SUSPENDED SLABS 30mm TOP, 30mm BTM U.N.O.

5. REFER TO ARCHITECTS DRAWINGS FOR BELOW SLAB INSULATION.

6. GROUND FLOOR SLAB TO BE CONSTRUCTED IN WATER PROOF CONCRETE. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

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8. CONCRETING - ALL CONCRETING OPERATIONS, INCLUDING SAMPLING AND TESTING TO BE CARRIED OUT IN ACCORDANCE WITH THE BAM SPECIFICATION E10.

9. ALL CONCRETE CORE WALLS ARE 250mm THICK U.N.O.

10. ALL COLUMNS ARE LOCATED SYMMETRICALLY ON GRID LINES U.N.O..

11. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METRES U.N.O. USE FIGURED DIMENSIONS ONLY - DO NOT SCALE.

12. REFER TO LIFT MANUFACTURERS DRAWINGS FOR DETAILS OF ALL CAST IN INSERTS TO SHAFT WALLS & PITS, AND FOR SETTING OUT OF ALL DOOR OPENINGS.

13. REFER TO ARCHITECT/M&E SUBCONTRACTOR DRAWINGS FOR DETAILS OF CONCEALED CAST IN CONDUIT AND ALL OTHER CAST IN ITEMS.

14. ALLOW FOR 50mm CONCRETE BLINDING BELOW ALL REINFORCED FOUNDATION AND GROUND BEAMS TO BAM DESIGN MIX No. 2 (C8/C10).

15. ALL PUMP CHAMBER AND SUSPENDED MANHOLES BASES AND WALLS TO BE A MINIMUM 250mm THICK. REFER TO PUBLIC HEALTH DRAWINGS FOR COVER DETAILS, RECESSES, ETC.

16. ALL PERIMETER UPSTANDS TO BE CONFIRMED BY ARCHITECT.

17. CONCRETE SURFACE FINISHES TO ALL PLANT AREAS TO BE POWER FLOAT FINISHED AND ALL OTHER GROUND FLOOR SLABS TO HAVE SKIP FLOATED FINISH IN ACCORDANCE WITH ARCHTECT'S SPECIFICATION.

NOTE:
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NOTE: PLANT PLINTHS TO BE CAST SEPARATELY TO SLAB

NOTE : FOR ALL PLANT PLINTH SETTING OUT AND LOCATIONS REFER TO BAMSE DRAWINGS

NOTE:
REFER TO ARCHITECT'S & SPECIALIST SUB-CONTRACTOR DRAWINGS FOR GROUND FLOOR WATERPROOFING DETAILS

LEGEND

HATCHING DENOTES EXTENT OF TEMPORARY RECESS FOR TOWER CRANE. ALLOW FOR COUPLERS TO FULL PERIMETER TEMPORARY INFILL SLAB.

ARGENT

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01727 894200
design@bam.co.uk
www.bam.co.uk

project: KINGS CROSS T2

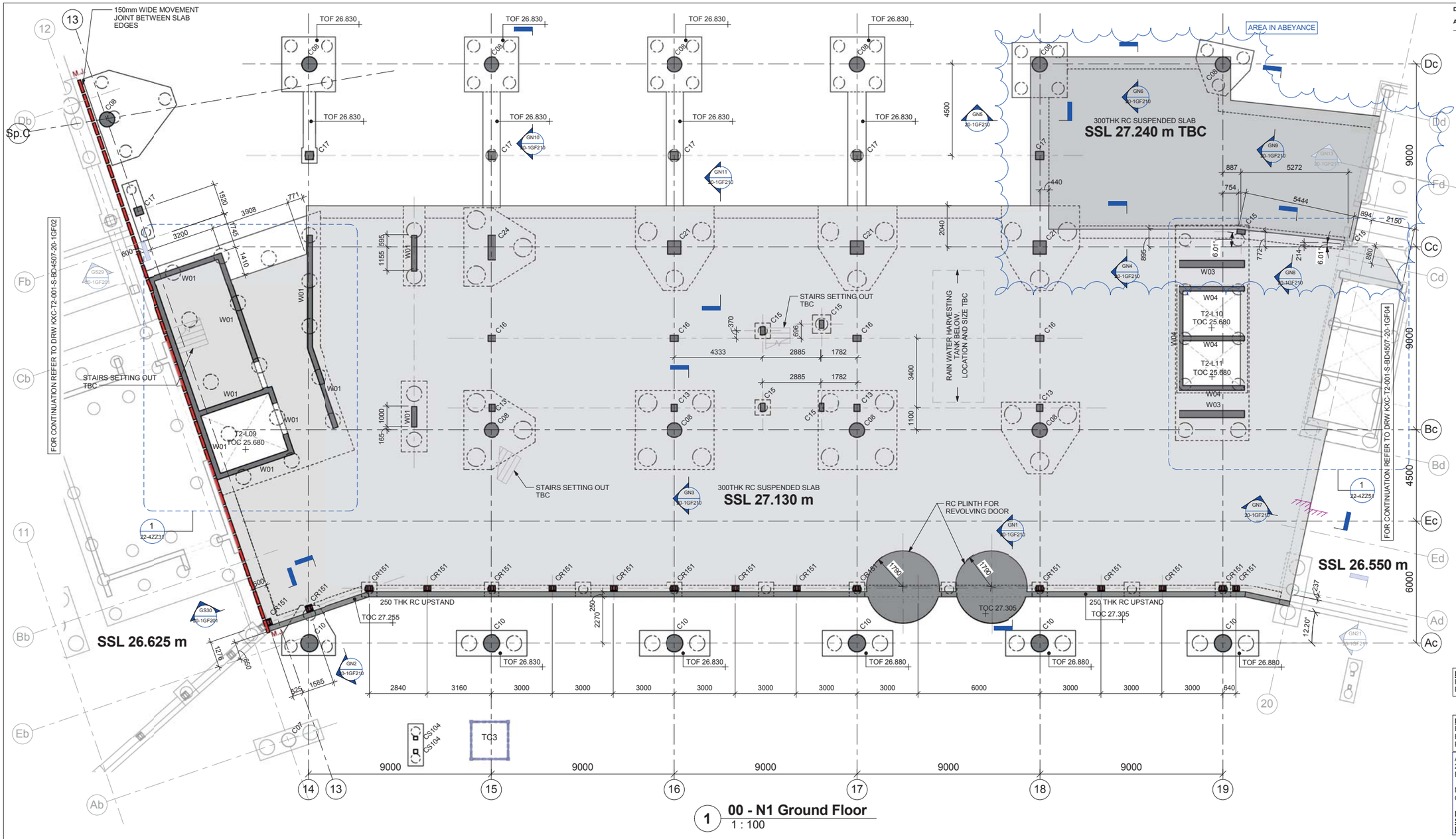
title: GROUND FLOOR LAYOUT BLOCK S2

purpose of issue: TENDER

scale: As indicated @ A1 | drawn: CMO | BAM job no.: 4507 | drg. status: D2

date: 01/27/16 | checked: MCH

drg / doc ref.: KXC-T2- 001- S- BD4507- 20-1GF02 | site | location | zone | ref | role | consultant | CI/SfB | content | rev.: -



1 00 - N1 Ground Floor
1 : 100

DO NOT SCALE FROM THIS DRAWING.

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SUBSTRUCTURE NOTES:

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3. REINFORCED CONCRETE COLUMNS AND THEIR COLUMN HEADS TO BE GRADE RC50/60.

4. NOMINAL COVER TO REINFORCEMENT TO BE:
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   - GROUND FLOOR SLABS T&B 50mm U.N.O.
   - BEAMS 35mm BTM, 35mm SIDES U.N.O.
   - CORE WALLS 30mm ALL FACES U.N.O.
   - COLUMNS 40mm ALL FACES U.N.O.
   - SUSPENDED SLABS 30mm TOP, 30mm BTM U.N.O.

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6. GROUND FLOOR SLAB TO BE CONSTRUCTED IN WATER PROOF CONCRETE. ALLOW FOR ZONE TO INTERNAL FACE OF LIFT PITS TO BE CONSTRUCTED IN WATER PROOF CONCRETE.

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13. REFER TO ARCHITECT/M&E SUBCONTRACTOR DRAWINGS FOR DETAILS OF CONCEALED CAST IN CONDUIT AND ALL OTHER CAST IN ITEMS.

14. ALLOW FOR 50mm CONCRETE BLINDING BELOW ALL REINFORCED FOUNDATION AND GROUND BEAMS TO BAM DESIGN MIX No. 2 (C8/C10).

15. ALL PUMP CHAMBER AND SUSPENDED MANHOLES BASES AND WALLS TO BE A MINIMUM 250mm THICK. REFER TO PUBLIC HEALTH DRAWINGS FOR COVER DETAILS, RECESSES, ETC.

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NOTE:
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FOR DETAILS OF PLANT PLINTHS REFER TO M&E SCHEDULE OF PLINTHS FOR M&E EQUIPMENT

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NOTE:
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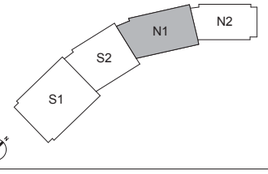
LEGEND

HATCHING DENOTES EXTENT OF TEMPORARY RECESS FOR TOWER CRANE. ALLOW FOR COUPLERS TO FULL PERIMETER TEMPORARY INFILL SLAB.

(N1) COLUMN KEY	
REF	SECTION SIZE
C02	450Ø RC COLUMN
C05	600Ø RC COLUMN
C06	650Ø RC COLUMN
C08	750Ø RC COLUMN
C10	850Ø RC COLUMN
C13	350 x 300 RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C21	650 x 650 RC COLUMN
C24	1200 x 400 RC COLUMN
CR151	RHS250x150x10.0

(N) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL



rev | by | chkd | date | description

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Griffiths Way, St Albans
Hertfordshire, AL1 2RD
01727 894200
design@bam.co.uk
www.bam.co.uk

ARGENT

project KINGS CROSS T2

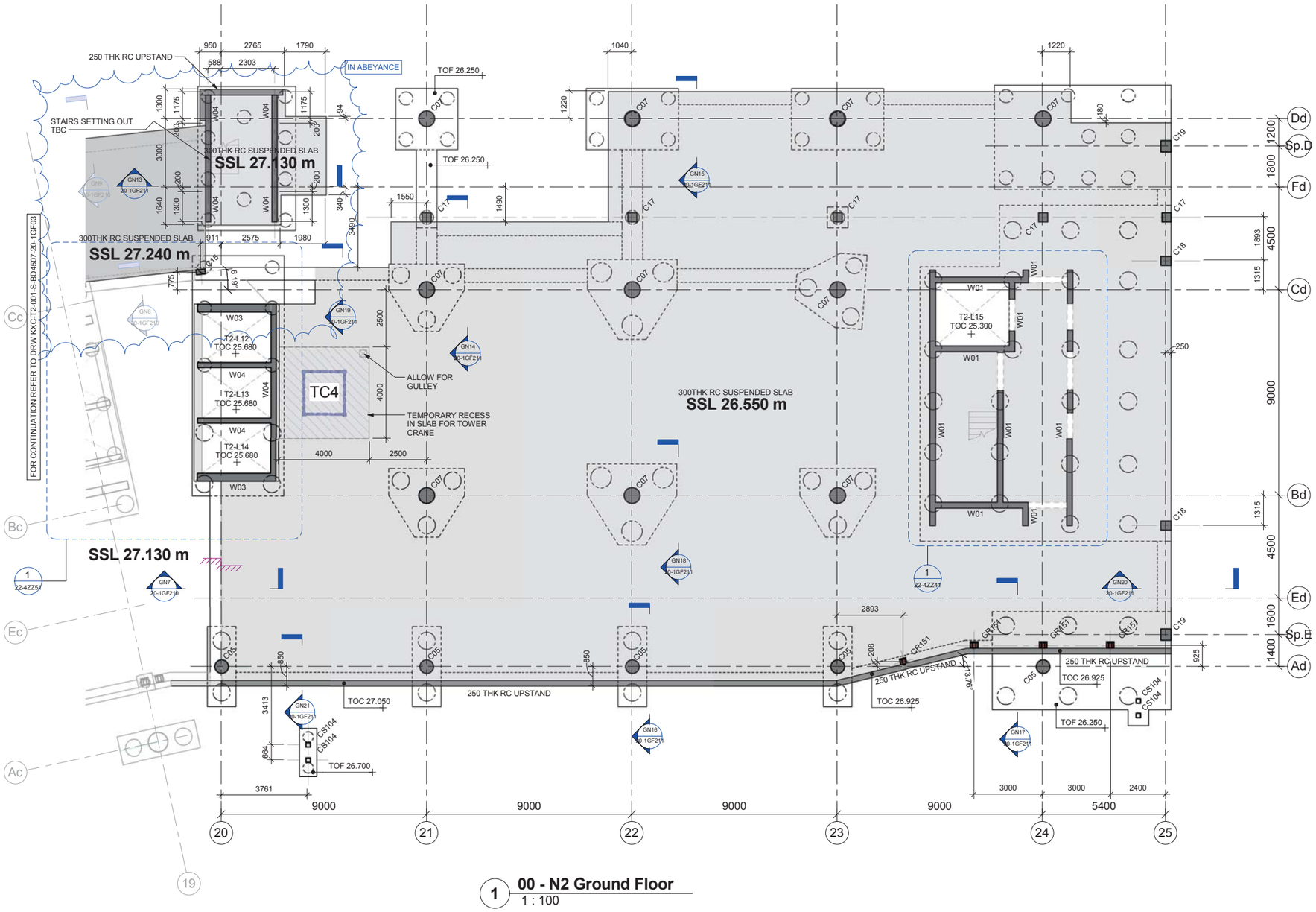
title GROUND FLOOR LAYOUT BLOCK N1

purpose of issue: TENDER

scale	drawn	BAM job no.	drg. status
As indicated @ A1	CMO	4507	D2
date 01/27/16	checked MCH		

drg / doc ref. site location proj ref role consultant CISIB content: KXC-T2- 001- S- BD4507- 20-1GF03

rev. -



1 00 - N2 Ground Floor
1 : 100

(N2) COLUMN KEY	
REF	SECTION SIZE
C01	400Ø RC COLUMN
C03	500Ø RC COLUMN
C04	550Ø RC COLUMN
C05	600Ø RC COLUMN
C06	650Ø RC COLUMN
C07	700Ø RC COLUMN
C15	400 x 225 RC COLUMN
C17	400 x 400 RC COLUMN
C18	450 x 400 RC COLUMN
C19	450 x 500 RC COLUMN
C20	550 x 500 RC COLUMN
CR151	RHS250x150x10.0

(N) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

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SUBSTRUCTURE NOTES:

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LEGEND

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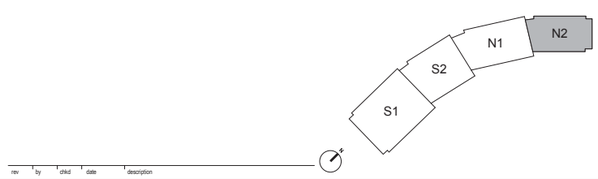

ARGENT

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Griffiths Way, St Albans
Hertfordshire, AL1 2RD

01727 894200
design@bam.co.uk
www.bam.co.uk

project KINGS CROSS T2

title GROUND FLOOR LAYOUT BLOCK N2

purpose of issue: TENDER

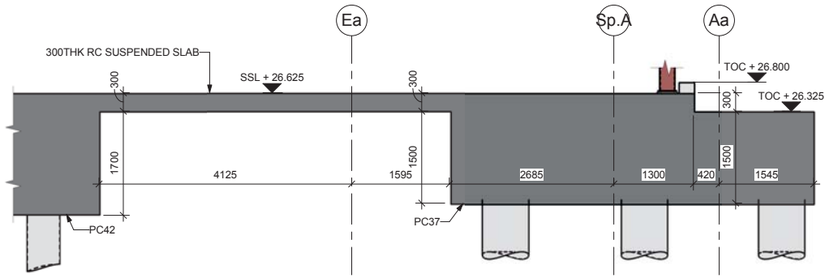
scale	drawn	BAM job no.	drg. status
As indicated @ A1	CMO	4507	D2
date 01/27/16	checked MCH		

drg / doc ref.: KXC-T2- 001- S- BD4507- 20-1GF04 rev. -

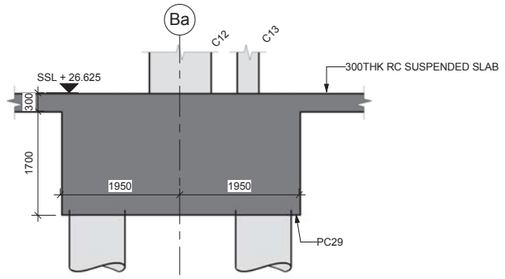
DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

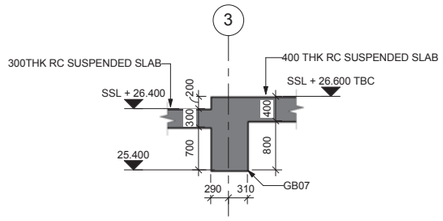
NOTE:
FOR LOCATION OF SECTIONS REFER TO DRW:
KXC-T2-001-S-BD4507-20-1GF01.



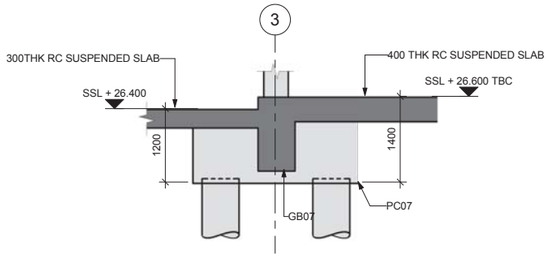
GS1 GROUND FLOOR SECTION GS1
1 : 50



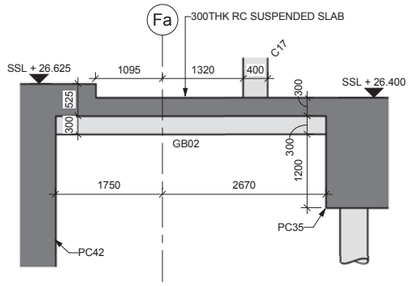
GS2 GROUND FLOOR SECTION GS2
1 : 50



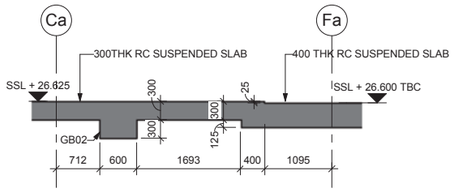
GS3 GROUND FLOOR SECTION GS3
1 : 50



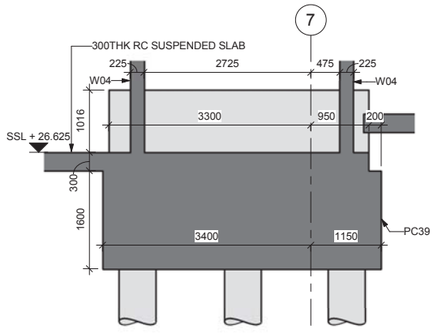
GS4 GROUND FLOOR SECTION GS4
1 : 50



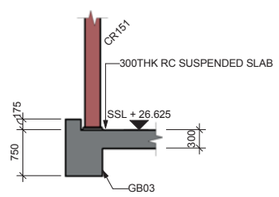
GS5 GROUND FLOOR SECTION GS5
1 : 50



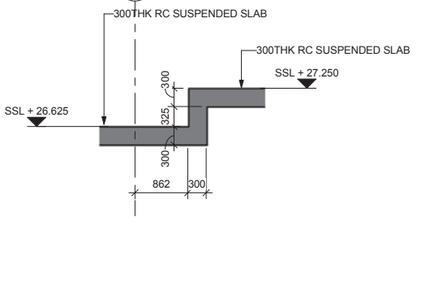
GS6 GROUND FLOOR SECTION GS6
1 : 50



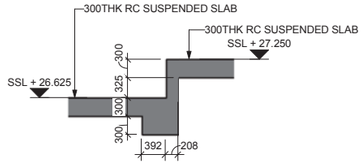
GS7 GROUND FLOOR SECTION GS7
1 : 50



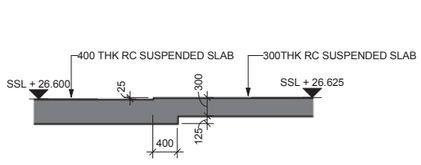
GS8 GROUND FLOOR SECTION GS8
1 : 50



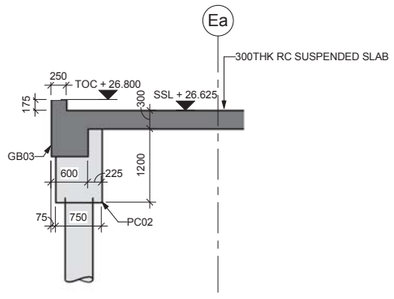
GS9 GROUND FLOOR SECTION GS9
1 : 50



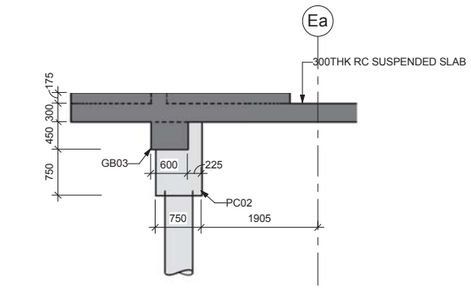
GS10 GROUND FLOOR SECTION GS10
1 : 50



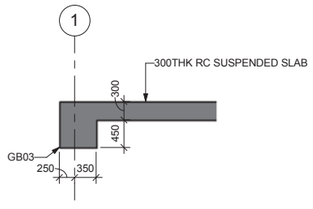
GS11 GROUND FLOOR SECTION GS11
1 : 50



GS12 GROUND FLOOR SECTION GS12
1 : 50



GS13 GROUND FLOOR SECTION GS13
1 : 50

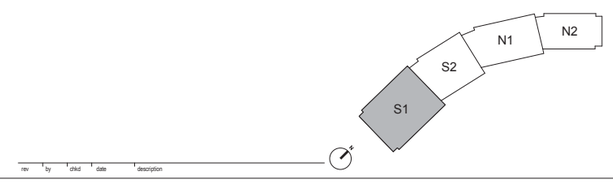


GS14 GROUND FLOOR SECTION GS14
1 : 50

(S1) COLUMN KEY	
REF	SECTION SIZE
C02	450Ø RC COLUMN
C03	500Ø RC COLUMN
C06	650Ø RC COLUMN
C08	750Ø RC COLUMN
C09	800Ø RC COLUMN
C10	850Ø RC COLUMN
C12	1000Ø RC COLUMN
C13	350 x 300 RC COLUMN
C14	350 x 350 RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C19	450 x 500 RC COLUMN
C20	550 x 500 RC COLUMN
C22	700 x 700 RC COLUMN
C23	800 x 800 RC COLUMN
CR151	RHS250x150x10.0
CS101	SHS200x200x5.0

(S) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

(S1) RC GROUND BEAM KEY	
REF	SECTION SIZE
GB02	600w x 600dp RC GROUND BEAM
GB03	600w x 750dp RC GROUND BEAM
GB07	600w x 1200dp RC GROUND BEAM
GB08	600w x 1225dp RC GROUND BEAM
GB09	600w x 1450dp RC GROUND BEAM
GB11	750w x 1200dp RC GROUND BEAM



rev | by | chkd | date | description

ARGENT

bam

BAM Design
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Architecture
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Environmental Services
Building Information Modelling

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design@bam.co.uk
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project KINGS CROSS T2

title GROUND FLOOR SECTIONS BLOCK S1

purpose of issue: TENDER

scale 1 : 50 @ A1 | drawn CMO | BAM job no. 4507 | drg. status D2

date 02/25/16 | checked MCH

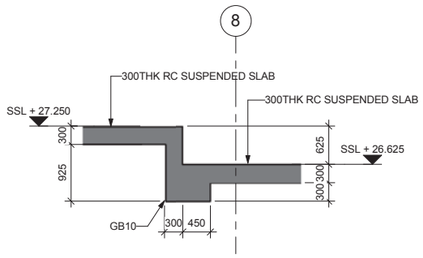
drg / doc ref. KXC-T2- 001- S- BD4507- 20-1GF200 (site | location | proj ref. | role | consultant | CI/SB | content)

rev. -

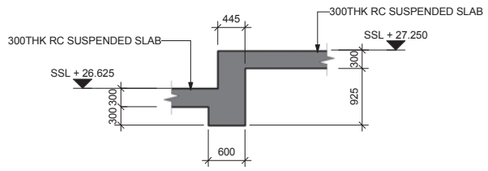
DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

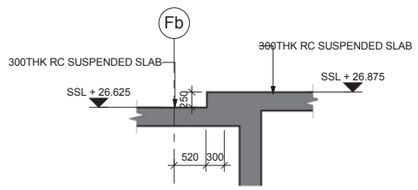
NOTE:
FOR LOCATION OF SECTIONS REFER TO DRW:
KXC-T2-001-S-BD4507-20-1GF02.



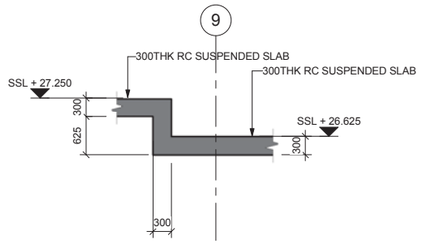
GS20 GROUND FLOOR SECTION GS20
1 : 50



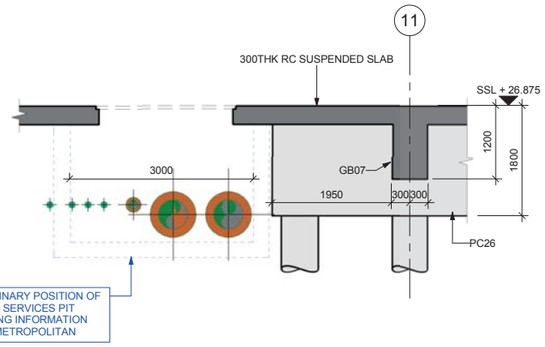
GS21 GROUND FLOOR SECTION GS21
1 : 50



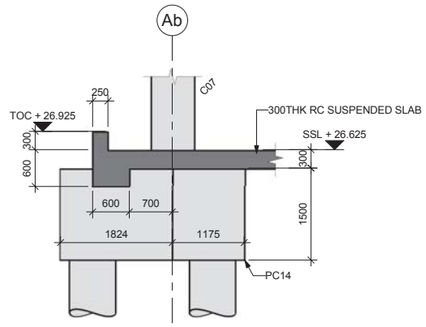
GS22 GROUND FLOOR SECTION GS22
1 : 50



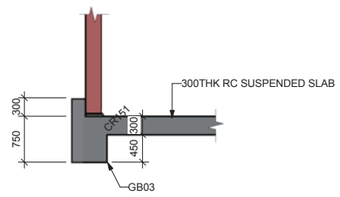
GS23 GROUND FLOOR SECTION GS23
1 : 50



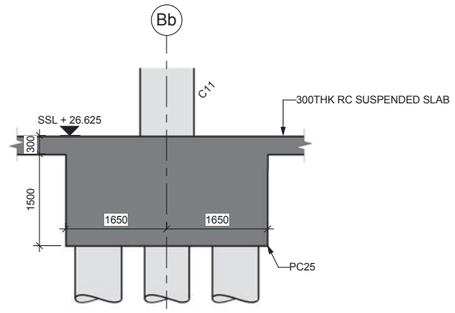
GS24 GROUND FLOOR SECTION GS24
1 : 50



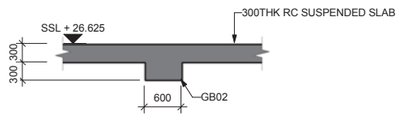
GS25 GROUND FLOOR SECTION GS25
1 : 50



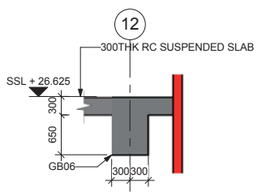
GS26 GROUND FLOOR SECTION GS26
1 : 50



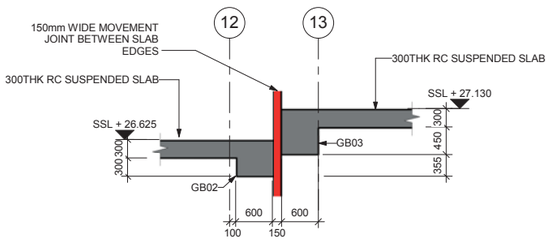
GS27 GROUND FLOOR SECTION GS27
1 : 50



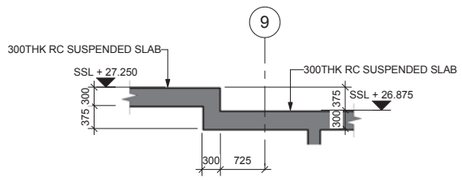
GS28 GROUND FLOOR SECTION GS28
1 : 50



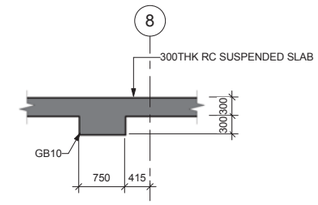
GS29 GROUND FLOOR SECTION GS29
1 : 50



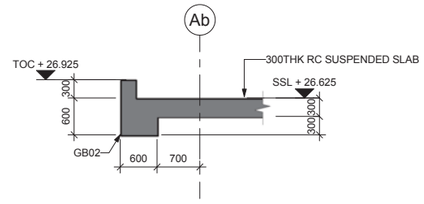
GS30 GROUND FLOOR SECTION GS30
1 : 50



GS31 GROUND FLOOR SECTION GS31
1 : 50



GS32 GROUND FLOOR SECTION GS32
1 : 50

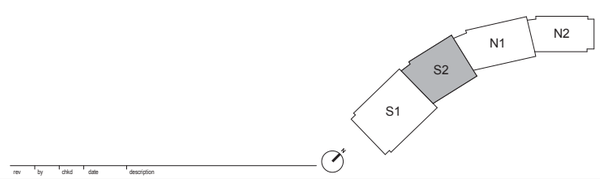


GS33 GROUND FLOOR SECTION GS33
1 : 50

(S1) COLUMN KEY	
REF	SECTION SIZE
C02	450Ø RC COLUMN
C03	500Ø RC COLUMN
C06	650Ø RC COLUMN
C08	750Ø RC COLUMN
C09	800Ø RC COLUMN
C10	850Ø RC COLUMN
C12	1000Ø RC COLUMN
C13	350 x 300 RC COLUMN
C14	350 x 350 RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C19	450 x 500 RC COLUMN
C20	550 x 500 RC COLUMN
C22	700 x 700 RC COLUMN
C23	800 x 800 RC COLUMN
CR151	RHS250x150x10.0
CS101	SHS200x200x5.0

(S) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

(S1) RC GROUND BEAM KEY	
REF	SECTION SIZE
GB02	600w x 600dp RC GROUND BEAM
GB03	600w x 750dp RC GROUND BEAM
GB07	600w x 1200dp RC GROUND BEAM
GB08	600w x 1225dp RC GROUND BEAM
GB09	600w x 1450dp RC GROUND BEAM
GB11	750w x 1200dp RC GROUND BEAM



rev | by | chkd | date | description

ARGENT

bam
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Structural Engineering
Environmental Services
Building Information Modelling

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design@bam.co.uk
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project: KINGS CROSS T2

title: GROUND FLOOR SECTIONS
BLOCK S2 SHEET 1

purpose of issue: TENDER

scale: 1 : 50 @ A1 | drawn: CMO | BAM job no.: 4507 | drg. status: D2

date: 03/02/16 | checked: MCH

drg / doc ref.: site KXC- | location T2- | proj ref 001- | role S- | consultant BD4507- | CISB 20- | content 1GF201 | rev. -

DO NOT SCALE FROM THIS DRAWING.
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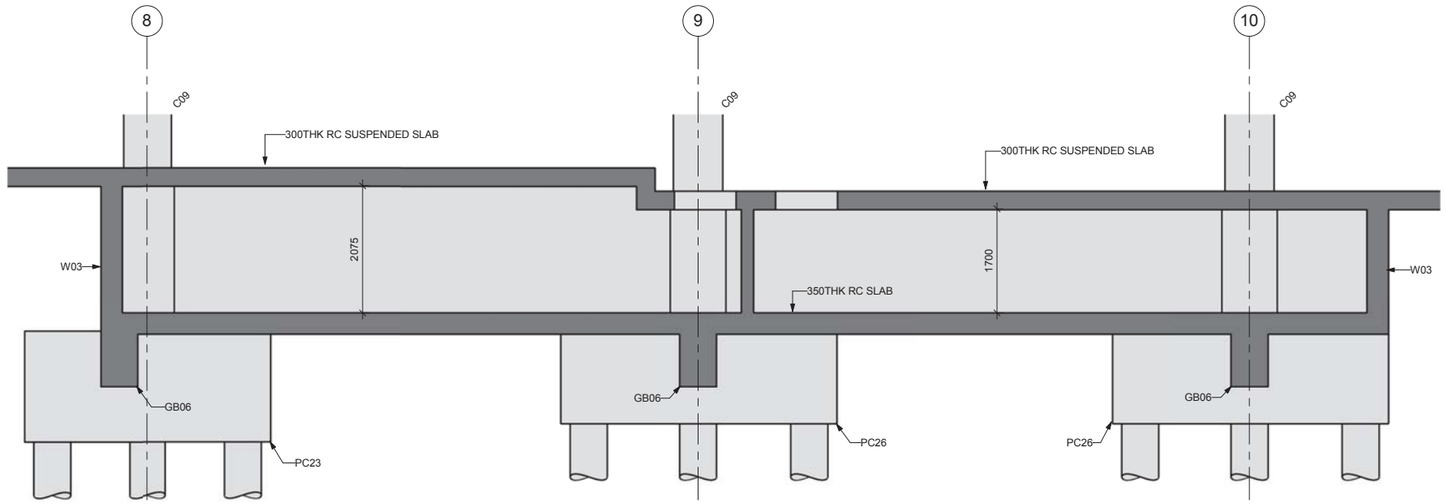
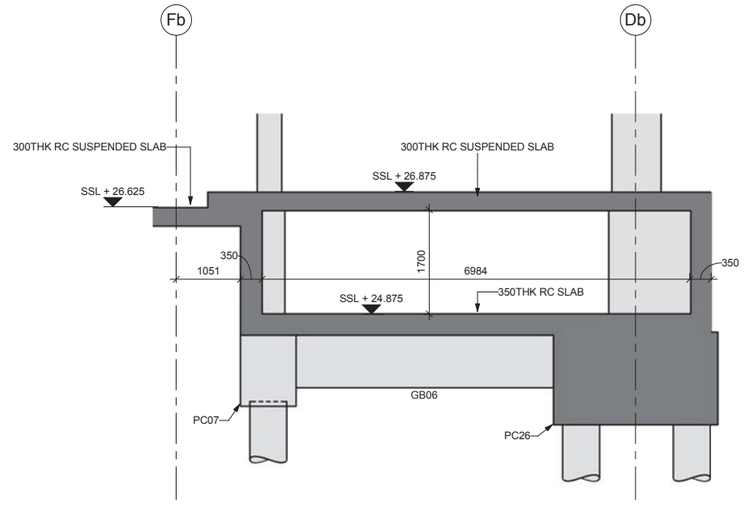
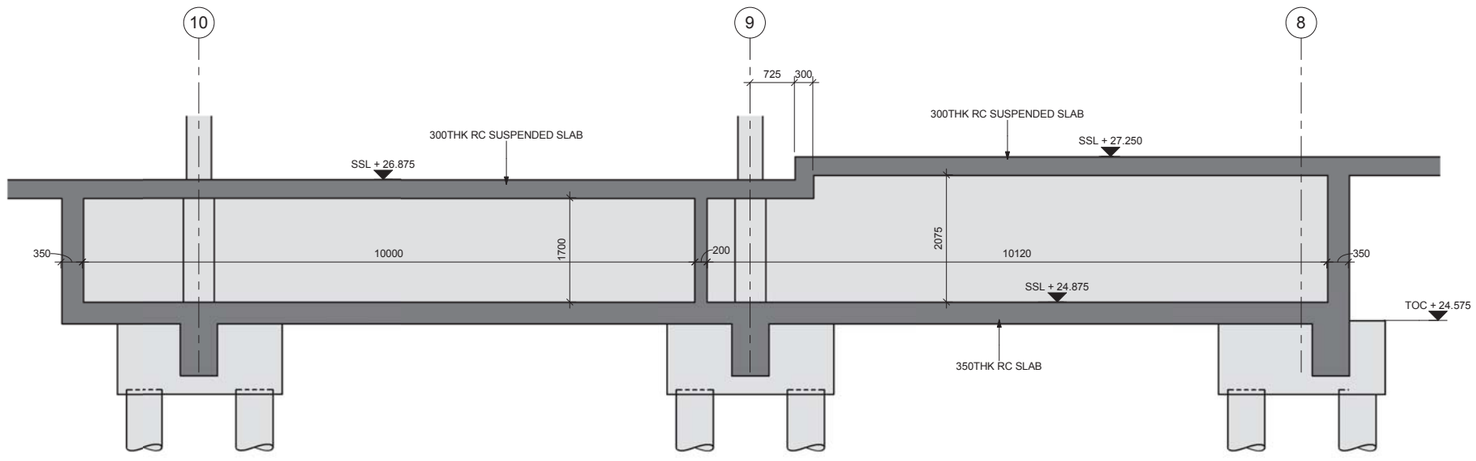


GS34 GROUND FLOOR SECTION GS34
1 : 50



GS35 GROUND FLOOR SECTION GS35
1 : 50

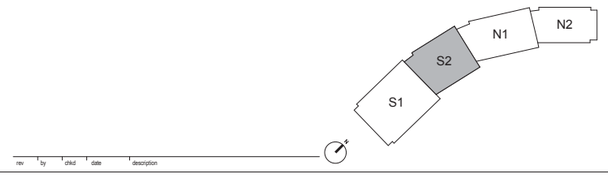


GS36 GROUND FLOOR SECTION GS36
1 : 50

(S1) COLUMN KEY	
REF	SECTION SIZE
C02	450Ø RC COLUMN
C03	500Ø RC COLUMN
C06	650Ø RC COLUMN
C08	750Ø RC COLUMN
C09	800Ø RC COLUMN
C10	850Ø RC COLUMN
C12	1000Ø RC COLUMN
C13	350 x 300 RC COLUMN
C14	350 x 350 RC COLUMN
C15	400 x 225 RC COLUMN
C16	350 x 300 RC COLUMN
C17	400 x 400 RC COLUMN
C19	450 x 500 RC COLUMN
C20	550 x 500 RC COLUMN
C22	700 x 700 RC COLUMN
C23	800 x 800 RC COLUMN
CR151	RHS250x150x10.0
CS101	SHS200x200x5.0

(S) WALL KEY	
REF	Description
W01	250THK RC WALL
W03	350THK RC WALL
W04	225THK RC WALL
W05	200THK RC WALL

(S1) RC GROUND BEAM KEY	
REF	SECTION SIZE
GB02	600w x 600dp RC GROUND BEAM
GB03	600w x 750dp RC GROUND BEAM
GB07	600w x 1200dp RC GROUND BEAM
GB08	600w x 1225dp RC GROUND BEAM
GB09	600w x 1450dp RC GROUND BEAM
GB11	750w x 1200dp RC GROUND BEAM



rev	by	chkd	date	description

ARGENT

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Feasibility Studies
Structural Engineering
Environmental Services
Building Information Modeling

Centrium Business Park
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project KINGS CROSS T2

title GROUND FLOOR SECTIONS
BLOCK S2 SHEET 2

purpose of issue

scale	drawn	BAM job no.	drg. status
1 : 50 @ A1	Author	4507	
date 02/19/16	checked Checker		

drg / doc ref.	site	location	proj ref	role	consultant	CI/SfB	content	rev.
	KXC-T2-	001-			BD4507-	20-1	GF202	

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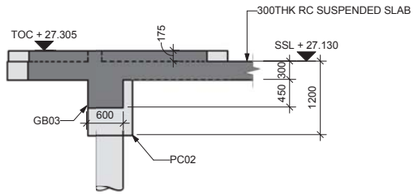
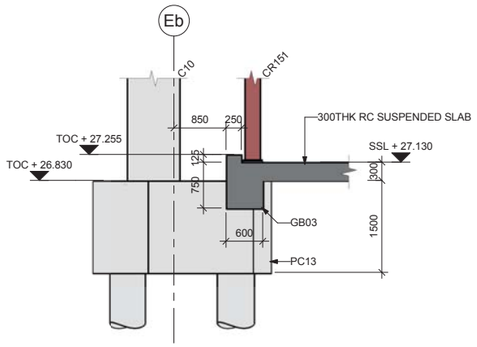
ALL DIMENSIONS TO BE CHECKED ON SITE.

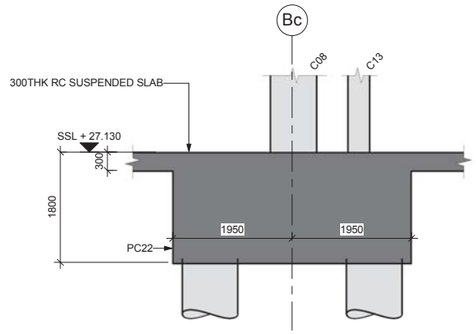
NOTE:
FOR LOCATION OF SECTIONS REFER TO DRW:
KXC-T2-001-S-BD4507-20-1GF03.



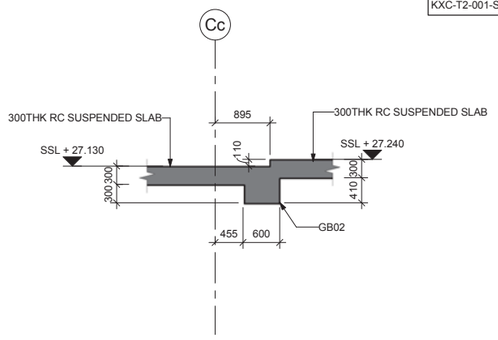
GN1 GROUND FLOOR SECTION GN1
1 : 50



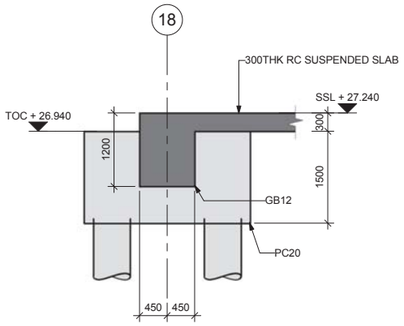
GN2 GROUND FLOOR SECTION GN2
1 : 50



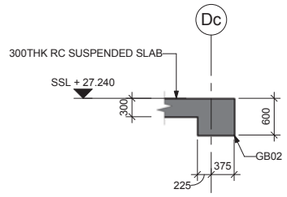
GN3 GROUND FLOOR SECTION GN3
1 : 50



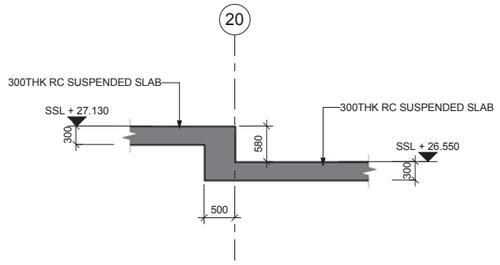
GN4 GROUND FLOOR SECTION GN4
1 : 50



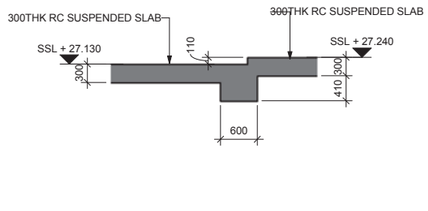
GN5 GROUND FLOOR SECTION GN5
1 : 50



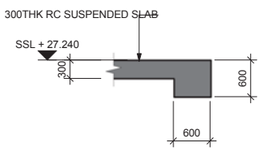
GN6 GROUND FLOOR SECTION GN6
1 : 50



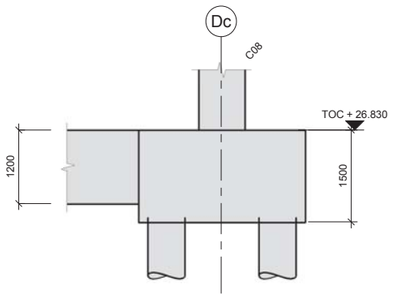
GN7 GROUND FLOOR SECTION GN7
1 : 50



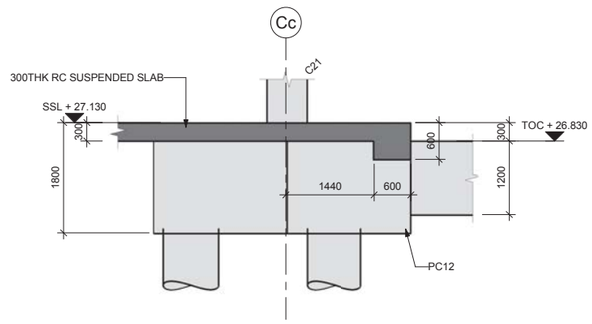
GN8 GROUND FLOOR SECTION GN8
1 : 50



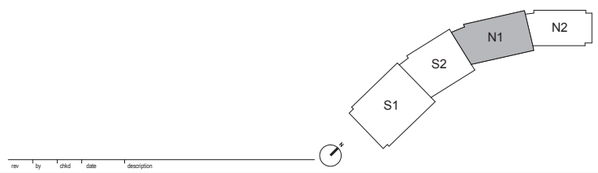
GN9 GROUND FLOOR SECTION GN9
1 : 50



GN10 GROUND FLOOR SECTION GN10
1 : 50



GN11 GROUND FLOOR SECTION GN11
1 : 50



rev | by | chkd | date | description

ARGENT

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Architecture
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Structural Engineering
Environmental Services
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project: KINGS CROSS T2

title: GROUND FLOOR SECTIONS
BLOCK N1

purpose of issue: TENDER

scale: 1 : 50 @ A1 | drawn: CMO | BAM job no.: 4507 | drg. status: D2

date: 03/02/16 | checked: MCH

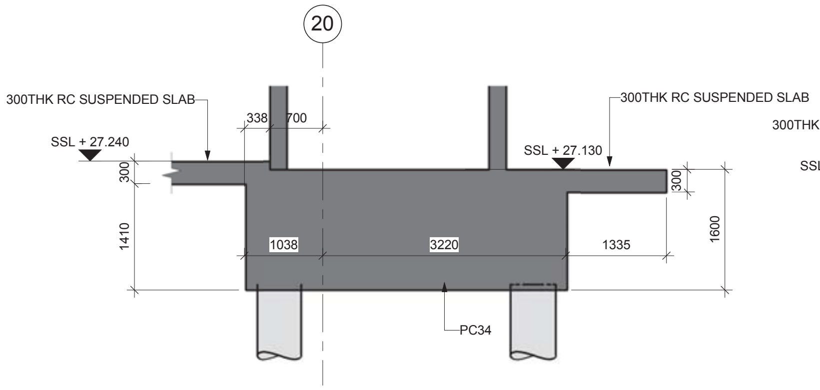
drg / doc ref.: site KXC- | location T2- | proj ref 001- | role S- | consultant BD4507- | CISIB 20- | content 1GF210

rev.: -

DO NOT SCALE FROM THIS DRAWING.

ALL DIMENSIONS TO BE CHECKED ON SITE.

NOTE:
FOR LOCATION OF SECTIONS REFER TO DRW:
KXC-T2-001-S-BD4507-20-1GF04.



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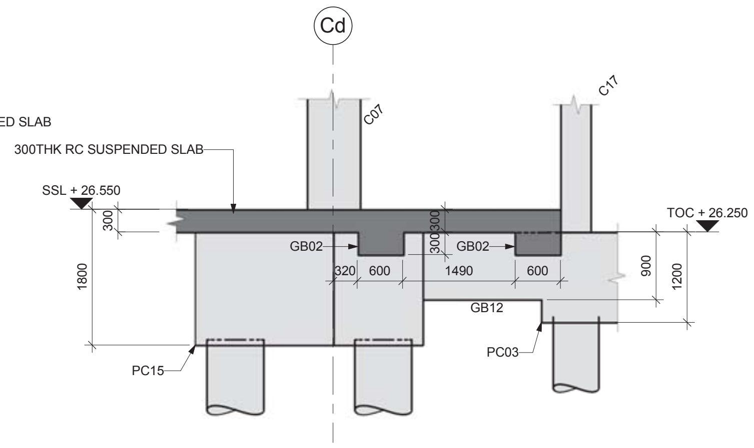

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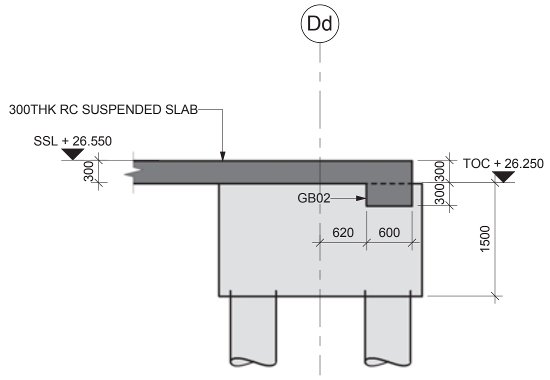

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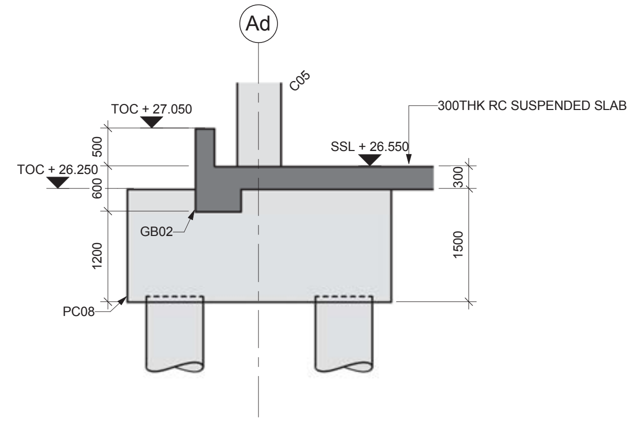

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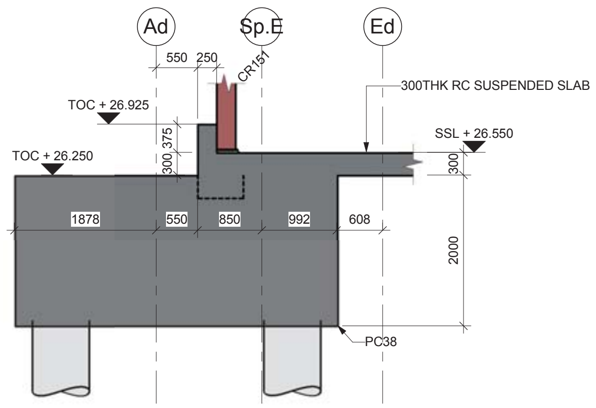

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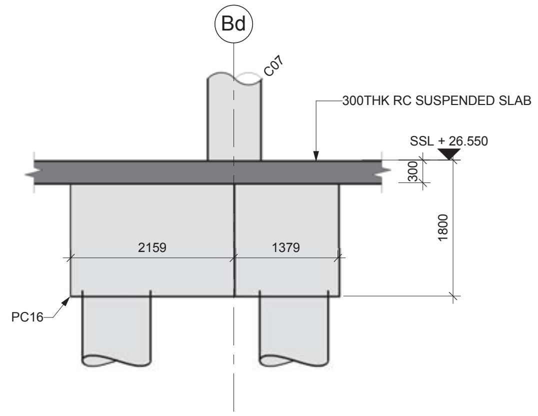

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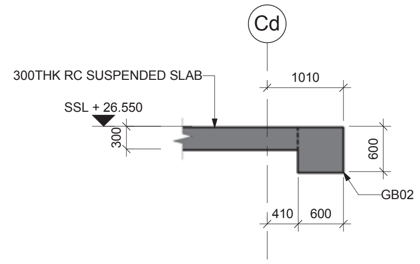

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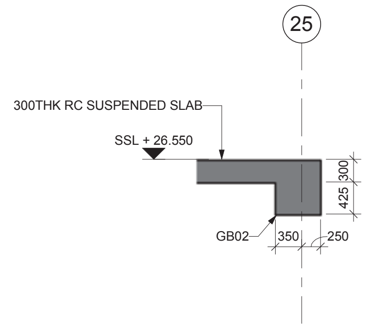

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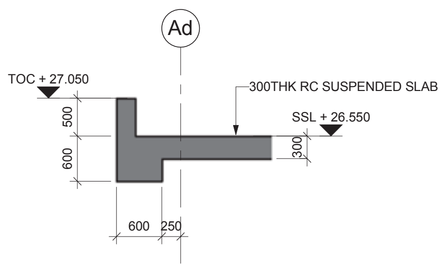

GN21 GROUND FLOOR SECTION GN21
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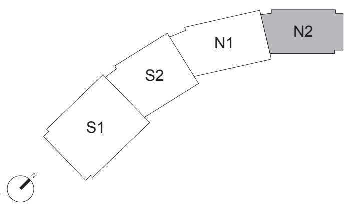

rev by chkd date description

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project KINGS CROSS T2

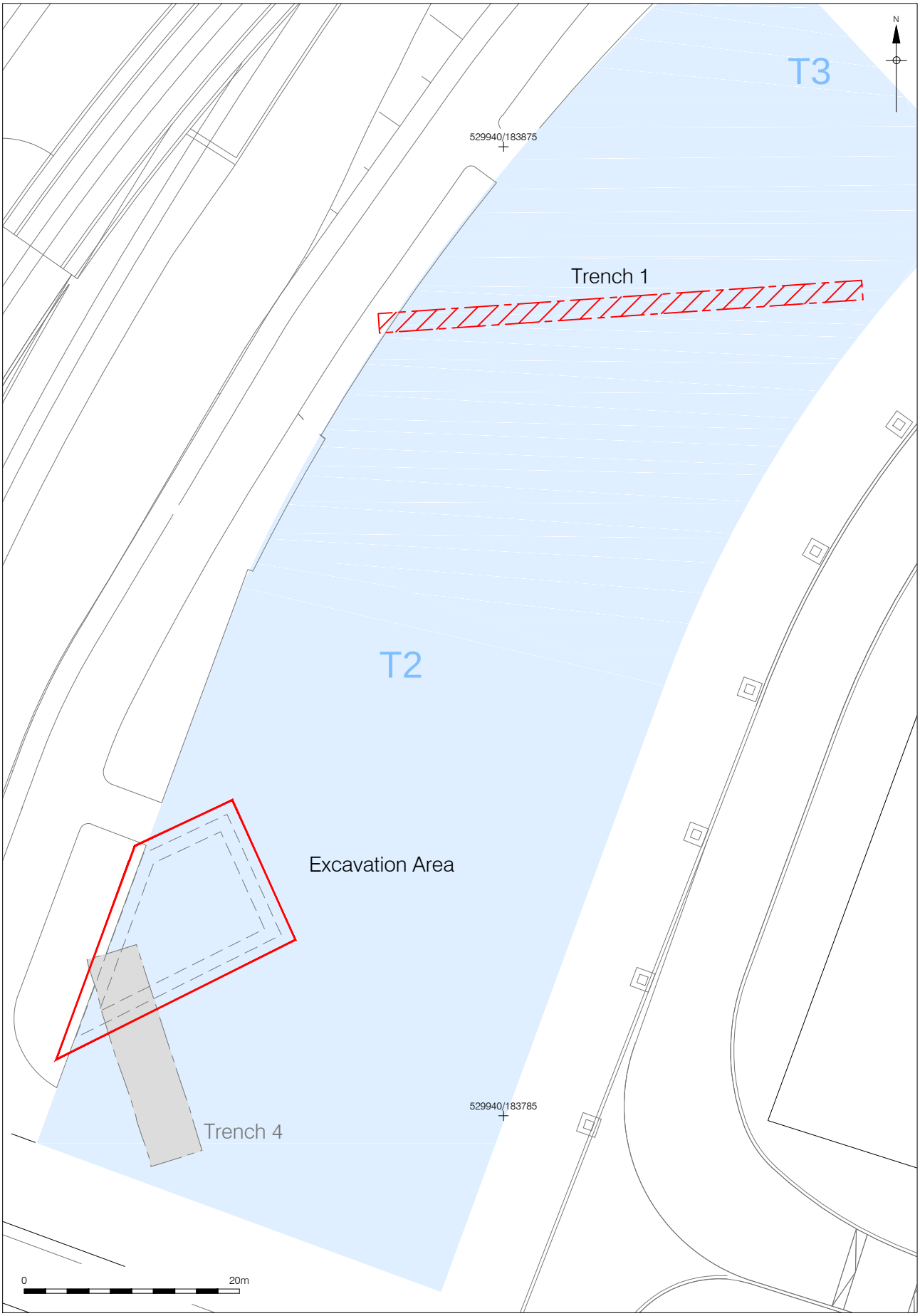
title GROUND FLOOR SECTIONS
BLOCK N2

purpose of issue TENDER

scale 1 : 50 @ A1	drawn CMO	BAM job no.	drg. status
date 03/02/16	checked MCH	4507	D2

drg / doc ref. site KXC-T2- location 001- proj.ref role S- consultant BD4507- CI/SfB 20- content 1GF211 rev. -

APPENDIX 3
LOCATION OF THE ARCHEOLOGICALLY EXCAVATION AREA AND TRENCH



15/03/16 MR

Location of Excavation Area and Trench 1
1:500 at A4

APPENDIX 4
BEST PRACTICE RISK MANAGEMENT MEASURES

Appendix 4: Proposed Best Practice Risk Management Measures

Category of Mitigation	Description of Mitigation Measures
Protective measures during construction	Many of the potentially significant effects on the construction work force are mitigated as part of the health and safety precautions. Risk to construction workers should be dealt with by the Contractor based on the identified hazards. These should also be revised based on the ground conditions encountered during on site activities. The Contractor will be responsible for site health and safety and will manage the risk through control of suitable Health and Safety measures including provision of PPE, education of the workforce and inductions for all site staff and visitors. The proposed development is subject to CDM Regulations. Works to be undertaken in accordance with the Construction Code of Practice.
Environmental Management Plan	An Environmental Management Plan (EMP) should be implemented in order to prevent construction work and future operations from giving rise to land contamination. The EMP should include the risk management measures proposed above as well as the following measures: • Mitigation and risk management measures identified in this report; • Legislative compliance; • Noise and Vibration Management; • Imported soils control and verification; • Site Welfare; • Control of Excavation Works; • Waste Management; • Air Quality and Dust; and, • Environmental Accidents and Emergency Situations. • Protocol for dealing with areas of unforeseen contamination including procedures to be adopted in the event that Asbestos Containing Material is identified (see below).
Site Enabling and Clearance works	Best practice approaches including bunding of materials should be implemented in order to minimise cross contamination of excavation materials and/or perched water, if encountered in any excavations during the site works. Should any previously unidentified contamination be encountered during site works, an environmental watching brief will be required.
Piling	The adopted foundation solution will be subject to agreement with the Environment Agency following preparation of a Foundation Works Risk Assessment in accordance with Environment Agency Document NC/99/73.
Underground Services	Laying underground services in potentially contaminated Made Ground materials has the potential to establish preferential flow pathways. In addition, certain contaminants e.g. hydrocarbons may penetrate and impact on water supply. Therefore materials should be used appropriate to the level of contamination identified on site, particularly with regard to underground mains water supply.
Landscaping	A green roof has been included as part of the proposed design. Site Made Ground soils are not considered suitable for the build-up of soft landscaped areas within the green roof. Soils imported for use within the green roof area should be deemed suitable for use. However; although considered unlikely, the existing Made Ground soils can be re-used on site under hardstanding. No areas of soft-landscaping have been proposed at ground level.
Waste Management	Waste disposal should be undertaken in accordance with current legislative requirements. The potential presence of asbestos containing material may have a significant cost implication for the disposal of soil materials.
Asbestos Management Protocol (can be incorporated into EMP)	Asbestos Containing Materials have been identified within the shallow Made Ground soils on surrounding plots Details of on-site procedures to be adopted in the event that asbestos containing material is suspected and or encountered. Details may include but not limited to: • Monitoring; • Watching briefs; • Competency of personnel; • Licenced contractors; and • HSE notification (if required).

Category of Mitigation	Description of Mitigation Measures
Unforeseen Contamination	If encountered any remediation will be carried out in accordance with the principles of the remediation strategy for the wider KXC development site and set out in the KXC ES, Vol 4 Part 16 (Paragraph 16.6.7 to 16.6.9) A contamination watching brief will be maintained during the construction phase and any contaminated materials identified during earthworks will be segregated and dealt with appropriately. If unforeseen contamination is identified during the course of the works, the construction manager would instruct specific investigations, advise the Local Authority and liaise on the remediation methodology as appropriate. The results of any validation testing will form the basis of a Remediation Plan/Report for the buildings at Site T2. Outline procedure to be adopted in the event of encountering any unforeseen contamination: • Soil contamination: to be sampled either in-situ or as part of an excavated stockpile stored and segregated; • Asbestos Containing Material (ACM): specific precautions will need to be implemented in accordance with Control of Asbestos Regulations (CAR) 2012 and CIRIA C733; • Underground Fuel Storage Tanks (USTs): although not anticipated these cannot be ruled out entirely. Decommissioning of any identified tanks to be undertaken in accordance with Environment Agency guidance (PPG27). • Validation testing will be undertaken and a record of the mitigation implemented will be maintained for subsequent reporting.
Verification	The verification plan outlines a formal monitoring procedure to be conducted throughout the works and will determine whether the remedial objective has been met. In accordance with EA guidance document a 'Verification and Remediation of Land Contamination Report SC030114/R1' (2010) will need to be produced in order to verify the completion of works and any previously unforeseen contamination encountered during the construction phase of works. Testing of materials for chemical suitability is to ensure that materials on site are not likely to cause risk to human health, future structures, or the environment following development of the site. All laboratory analysis conducted as part of the verification phase of works will need to be submitted to a UKAS / MCERTs accredited laboratory to ensure the accuracy of data obtained. Information contained within the verification report will include, but not limited to: • Summary verification works from site diary; • Plan denoting sample locations; • Plan showing the location of re-use of site derived materials; • Quantities of re-used, imported and disposed material; • Waste Classification Certificates; • Receiving / Originating Sites; • Sources, type of import and placement location; • Carrier / receiving facility Licences; • Details and demonstration of any relevant permits or exemptions required by the Environment Agency for re-using material or importing material, particularly where there is the potential for material being considered waste; • Waste Transfer Notes; • Areas of unexpected contamination and subsequent works conducted; • Details of any water discharges / off-site removal of groundwater; • Laboratory Chemical testing results of validation samples, imported material, waste material; • Details of remedial measures taken, i.e. verification of depth, chemical composition and identification of marker layer; • Photographic log / site diary of works; • Details of site audits completed; • Details of watching briefs completed (site works diary); and, • Details of any liaison and agreements with Regulators.

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