DEVELOPMENT OPTIONS APPRAISAL REPORT

Land at Abbey Road

Old Oak and Park Royal Development Corporation
Framework Number: TfL 90748

Private & Confidential

Date of Report: 22 March 2018



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INTRODUCTION

INSTRUCTION

1.1 CBRE is instructed by the Old Oak and Park Royal Development (OPDC) to advise on a 3.83 hectares (9.46 acres) brownfield site situated adjacent to the North Circular Road at Park Royal, known as the former Twyford Tip West site, having previously been used for land-fill and now being contaminated.

1.2 There is an extant planning permission, granted consent in September 1993, for a mixed-use scheme comprising hotel, television centre, social community and leisure facilities, together with service roads and landscaping. The site is currently located within the Park Royal Strategic Industrial Location (SIL) whereby planning policy seeks to protect, strengthen and intensify the SIL to support industrial employment uses, particularly with the relocation of existing businesses from Old Oak Common. As part of the draft Local Plan consultation process there is a proposal from the current owner of the site that the Abbey Road site should be de-designated through the OPDC Local Plan.

1.3 The purpose of this report is first, to consider the viability of various development options at the site in terms of potential land uses that could be accommodated on the site and, second, to assist with understanding whether any public subsidy may be required given the degree and cost of decontamination works required.

1.4 The main objective of this report is to:

1. Review the contamination work already completed by Arcadis and explore the potential impact of the existing contamination on the redevelopment potential of the site.
2. Understand and assess the levels of remediation required for different end uses and the associated costs of remediation for each use.
3. Undertake a high-level financial viability of a range of potential land uses and development options.

1.5 The opinions contained within the report are prepared on a desktop basis with limited information and are informal, for guidance purposes only and are not a substitute for a formal valuation prepared in accordance with the RICS 'Red Book'.

PROPERTY OVERVIEW

LOCATION

2.1 The former Twyford Tip West site is located within Park Royal, approximately eight miles to the west of central London. The property lies within the south west corner of the London Borough of Brent, bordering the Boroughs of Harrow and Barnet to the north, Hammersmith & Fulham to the east and Ealing to the south.

2.2 The subject land is situated adjacent to the A406 North Circular and benefits from good accessibility to central London, the wider London area, and regions beyond via the motorway network. Road links are good with access to the A40 1.6 km (1.0 mile) to the south and Junction 1 of the M1 6.4 km (4 miles) to the north, both linking to the M25 motorway. Heathrow, the UK's largest passenger and freight airport, is situated some 22.5 km (14.0 miles) to the south west.

2.3 London Underground (Bakerloo Line) services are within close proximity to the subject property with access from Stonebridge Park station, approximately 0.8 miles to the east, providing a journey time of circa 18 minutes to Paddington and 26 minutes to Oxford Circus. Regular London Overground services are also accessible from Stonebridge Park, providing a journey time of 23 minutes to London Euston. However, pedestrian access to Stonebridge Park station is not ideal with crossings over the North Circular Road, either by pavement or a footbridge, making the site seem more isolated than the distance alone to the station suggests.

2.4 Location, situation and site plans are attached at Appendix A.

DESCRIPTION

2.5 The site is a brownfield site of approximately 3.83 hectares (9.46 acres) adjacent to the A406 North Circular, Park Royal, NW10. The site is bounded by a petrol filling station and Abbey Road to the east, the Tudor Estate with industrial commercial uses to the south, London Borough of Brent's refuse and recycling centre to the south and west, the Grand Union Canal to the west and the A406 North Circular Road to the north.

2.6 The entire site is currently overgrown with vegetation, in the main with grasses, weeds, bushes, scrub and brambles and short trees. It is bordered by a solid timber fence to the northern and western boundaries with a wire fence to the southern boundary. The site may be considered as two areas, the main site being a former tip and a strip of land situated alongside the Grand Union Canal.

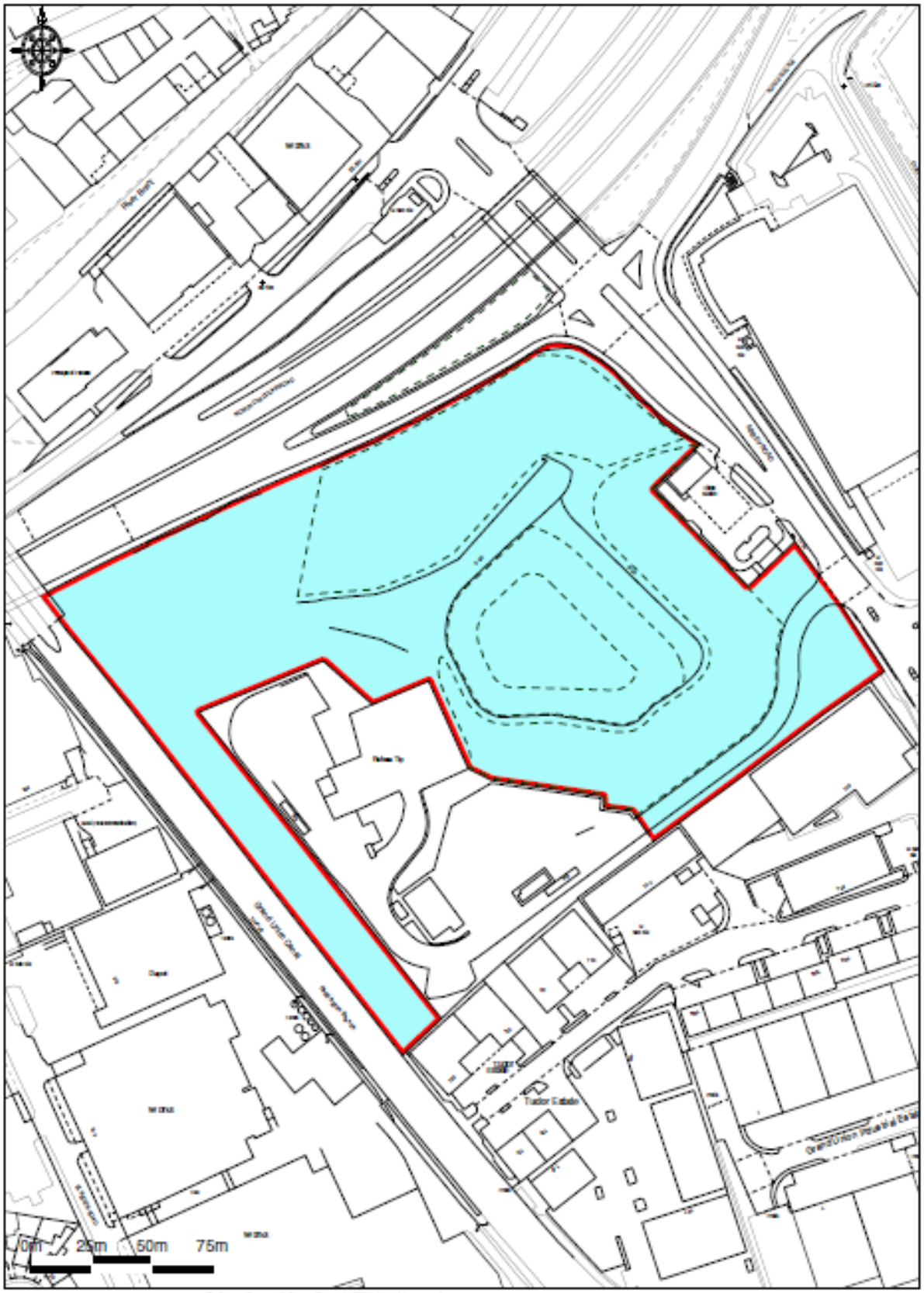
2.7 We understand the site has been subjected to significant waste deposition during the 20th century, both below and above the prevailing ground level (discussed further below). The existing site varies in levels with the resulting mound of waste rising to approximately 18m above the original ground level. It would therefore be necessary to remove a significant amount of the waste prior to any development proceeding at the site.

2.8 There is a vehicular access from Abbey Road at the eastern end of the site. This access road is shared with users of the current refuse and recycling centre.

2.9 We understand that Ashia Centur Ltd hold the freehold ownership of the property. Planning permission was granted in September 1993 for a mixed-use redevelopment of the site to provide a hotel, television centre, social community and leisure facilities. The extant permission is accompanied by a Lawful Development Certificate which confirms that the scheme has been commenced. However, there does not appear to have been any site clearance works and no buildings have been erected.

2.10 We have been supplied with a copy of a report prepared by Arcadis (UK) Ltd dated February 2016 which provides a high level assessment of the potential abnormal redevelopment costs and liabilities associated with the site, based on the environmental conditions as understood from available data supplied by the clients and third-parties. Further comment is in the Environmental Review section of this report. The costs of clearing the site are considerable and have a significant impact on the viability of any potential scheme.

2.11 Photographs of the site are attached at Appendix B.



2.12 A copy of the plan is provided at Appendix A.

LAND CONTAMINATION AND REMEDIATION

INTRODUCTION

3.1 Commentary on land contamination and associated requirements for remediation is provided following review of relevant documentation provided by the Client. In addition to the Arcadis High Level Liabilities Assessment CBRE have been provided with reports produced by Intergeo Environmental Technology (Intergeo) that detail the findings of an intrusive investigation completed at the site in 1999 and propose an outline strategy for remediation. It is not anticipated that any reliance on the findings of the investigation works completed by Intergeo has been provided and their reports have therefore been reviewed for information purposes only.

THE SITE

3.2 As noted above, the site forms the majority of the 'Twyford Tip' former landfill site. Historical mapping suggests that the site was utilised for mineral (sand and gravel) extraction during the early/mid 20th century, with the resultant excavation backfilled with a variety of waste materials. The Environment Agency (EA) online database records the site as the 'Twyford Service Station' landfill site and indicates that it operated from 1905 to 1968 for the disposal of inert, industrial, commercial and household wastes. Anecdotal information indicates that the wastes deposited may have included gasworks residues. Historical mapping from the 1960s annotates the site as a refuse tip extending off-site to the north-east, albeit it is noted that the EA online database only maps the extent of the Twyford Service Station site to encompass the area of the subject site. Given the indicated nature of the wastes deposited on site there is an associated potential for contamination, principally comprising landfill gas (primarily methane and carbon dioxide) and/or leachate (contaminated water present within the waste mass).

3.3 Waste deposition on site involved both landfilling, i.e. the emplacement of waste materials within the former sand and gravel excavation, and land raising, where waste has been deposited above the level of the prevailing ground. Arcadis have estimated that the total volume of waste deposited at the site is c.300,000m^3, of which c.200,000m^3 is considered to be located above the prevailing ground level (i.e. comprises land-raise material). In the absence of detailed site-specific topographical information, it is not possible to verify this but open access Lidar data suggests the main tipped areas range from c.1m to c.18m above the prevailing ground level of the surrounds.

3.4 Little information has been obtained detailing the design and operation of the landfill but given the period during which tipping occurred and the findings of previous phases of intrusive investigation (discussed further below), it is anticipated that the landfill operated on the principal of 'dilute and disperse', with no engineered basal liner or cap to help prevent the horizontal or vertical migration of landfill gas or leachate from the waste mass.

3.5 Since cessation of landfilling activities, it is understood that the site has remained ostensibly unused, with the possible movement of waste materials to facilitate the construction of the North Circular to the north-west, existing petrol filling station to the east and Local Authority civic amenity disposal site to the south. The potential for the subsequent fly-tipping of waste materials on site cannot be discounted. Furthermore, the derelict and vegetated nature of the site, combined with its location in proximity to the Grand Union Canal, means that there is the potential for infestations of invasive weeds, such as Japanese Knotweed, Himalayan Balsam or Giant Hogweed to be present on site.

PREVIOUS INVESTIGATIONS

3.6 Intergeo were commissioned to undertake an intrusive investigation of the site in order to allow a remediation strategy to be devised in the context of the proposed construction of the proposed Asian Centre, as discussed above. The site investigation report references earlier phases of investigation relating to the site and the adjacent North Circular, none of which have been provided for review. It is, however, noted that borehole records published on the British Geological Survey's online map viewer include a

number that appear to relate to an investigation completed by contractors Soil Mechanics in the late 1980s.

3.7 It is very important to highlight that the works completed by Intergeo provide the majority of currently available site-specific information available regarding the composition, quantity and contamination potential of the tipped waste materials, along with the broader geological and hydrogeological setting of the site. The works completed are considered to be extremely limited in terms of scope and extent and, whilst they may be broadly commensurate with guidance and best-practice at the time (i.e. 1999), they do not comprise a comprehensive assessment of the site that allows a detailed appraisal of potential risks, and consequent requirements for remediation and risk mitigation, to be made.

3.8 The relative lack of relevant data for the site means that any consideration of likely remediation and risk mitigation requirements can only be considered to be indicative and may be subject to significant change. CBRE would therefore concur with Arcadis that the completion of further investigation and risk assessment works should be undertaken as a priority where further clarity on the scope and cost of remediation/risk mitigation works is required.

3.9 The works undertaken by Intergeo confirmed the presence of significant and highly heterogeneous waste deposits on site, that varied in thickness from 2.4 to 19.6m. The deposits comprised re-worked natural sand, gravel and clay with significant components of clinker, ash and coal. Observed putrescible/degradable wastes were largely limited to paper, although highly organic clay and fibrous material was also frequently recorded. Evidence of a clay capping layer (c.1.0 – 1.3m thick) was observed in a number of exploratory locations. The waste materials were found to overlie a generally thin layer of remnant natural River Terrace Gravel deposits (c.0.6 – 2.6m thick, locally re-worked) and, in turn, the solid geology of the London Clay.

3.10 A limited number of soil and groundwater samples were collected and submitted for laboratory testing for a range of parameters, albeit the extent and type of analysis completed is considered to be both extremely limited and basic when considered in terms of current best practice. Additionally, landfill gas monitoring and sampling was also completed. The investigation some evidence of contamination within soil and groundwater, with the principal contaminants comprising petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAH) and metals. Notably, no asbestos was recorded in the samples of soil submitted for screening. The gas monitoring/testing recorded the presence of elevated concentrations of methane and carbon dioxide, albeit the assessment methods utilised do not allow a direct assessment of potential risks in accordance with current published guidance.

3.11 Based on the findings of the investigation, Intergeo proposed that a programme of 'bioventing' should be undertaken to reduce concentrations of methane within the waste mass, principally in order to facilitate the safe excavation and minimise potential nuisance issues (i.e. odour) during the redevelopment of the site. Additionally, Intergeo concluded that bioventing could reduce the overall mass of the waste material by accelerating degradation and lower concentrations of organic contaminants such as petroleum hydrocarbons/PAH. Following completion of the bioventing process, excess material would be removed for off-site disposal. CBRE would concur with Arcadis' stated view that the use of bioventing is unlikely to be an effective remediation technique.

ARCADIS HIGH LEVEL LIABILITIES ASSESSMENT & REMEDIATION REQUIREMENTS

3.12 In general terms, CBRE considers that the assessment works completed by Arcadis provide an appropriate appraisal of the extent of potential risks and liabilities associated with historical landfilling that utilises a number reasonable assumptions.

3.13 The assessment made by Arcadis considers the nature and extent of works that would be necessary in order to address contamination risks and liabilities and facilitate future development. To this end, they consider that the removal of a substantial proportion of the tipped material would be required, principally due to an assumed requirement to tie-in any levels on site with those in the immediate surrounds, to a greater or lesser degree. This assumed requirement is planning-led and subject to approval of the regulatory authorities it may be possible to retain a greater proportion of the tipped material. In addition,

the proportion of material that could feasibly be retained on site is likely to be affected by the composition of the tipped material and specifically the degree and nature of associated contamination and its engineering properties. This is acknowledged by Arcadis.

3.14 Arcadis consider in detail options that involve addressing at least a proportion of the tipped waste materials located above the prevailing ground level of the surrounds (i.e. the land-raised portion). They dismiss consideration of the removal of all tipped material, including that present below the prevailing ground level (i.e. the landfill portion, comprising material used to backfill the former sand and gravel pit excavations). Such works were considered to be too costly to undertake. CBRE would concur and consider it is unlikely to be appropriate, for a number of reasons, including 'costs v benefits' and sustainability, to undertake the wholesale excavation and treatment/disposal of all tipped material present.

3.15 In addition to removal of a proportion of the tipped materials, Arcadis consider that the further works required to ensure that all risks are appropriately mitigated, and therefore ensure that the site is suitable for a future use, would seek to sever identified potential pollutant linkage between the source of the contamination (i.e. the tipped waste) and potential receptors, comprising both human health (principally future site users) and controlled waters (groundwater and surface water bodies beneath or in the vicinity of the site). Specific aspects and requirements of such an approach are discussed further below but overall it is considered that this approach to risk mitigation is a reasonable strategy that is routinely adopted to enable the successful redevelopment of former landfills.

3.16 Whilst Arcadis' assessment considers the extent of waste disposal and mitigation works required to facilitate redevelopment it does not consider in any detail the nature and extent of works that would be required for differing end uses, for example residential, commercial and light industrial. However, the extent of the waste removal works materials to provide an appropriate development platform are largely independent of the nature of the proposed end use. Whilst there is likely to be some variance in the nature and extent of other mitigation measures required for different end uses the significance of these, in terms of cost, may be relatively small. Notwithstanding this, it may be the case that more extensive remediation/risk mitigation works would be required in the event of residential redevelopment due to the sensitivity of this end use and a desire to minimise any negative perception of developing on a former landfill that may result in increased regulatory concern/scrutiny and/or perceived blight issues for investors/funders or occupiers.

3.17 A more detailed appraisal of the remediation and risk mitigation works considered to be necessary for the key possible development scenarios is provided in the table below.

ENVIRONMENTAL CONSIDERATIONS

3.18 Having regard to the Arcadis report produced in February 2016, we have carried out an assessment that provides indicative remediation and risk mitigation requirements, as highlighted below. As noted above, given the absence of comprehensive and up to date site investigation information about this commentary can only be considered to be indicative and remediation and risk mitigation requirements may alter significantly upon completion of the necessary assessment works:

REMEDIATION/RISK MITIGATION WORKS REQUIRED	COMMENTARY
Removal of unsuitable material for off-site disposal	As noted above, the requirement to remove material is anticipated to be primarily driven by planning requirements and it is not clear as to whether the regulatory authorities responsible (i.e. EA and Local Authority Contaminated Land Officer) would accept retention of material on site. This would be partly informed by the findings of the further investigation works. Notwithstanding, the above, whilst it may be feasible in terms of planning and regulatory approvals to reduce the quantity of material requiring off-site disposal, it is almost certain that some proportion of the tipped waste material will be unsuitable for retention due to its geotechnical properties (i.e. suitability to be used as engineered fill) and/or due to the presence of significant contamination. The proportion of material that may require off-site disposal cannot be accurately determined based on currently available information. The quantity of material requiring removal may not be dependent upon the end-use proposed as risks posed to future site users by contamination will be mitigated by other measures, as set out below, whilst the risks to environmental receptors (e.g. groundwater and nearby surface water) will be similar for all end uses. The amount of material that may require off-site disposal due to geotechnical unsuitability may, in reality, vary depending upon the end use but there is limited information allowing this to be assessed reasonably. Given that any removal of waste material will be beneficial in terms of generally reducing site levels (provided that they do not extend significantly beneath the prevailing level of the surrounds) it is reasonable to assume that no 'like for like' import of replacement fill will be required.
General Earthworks/Material Movement	Earthworks undertaken on site to re-profile any residual waste mass will need to appropriately consider associated risks/constraints, this includes the potential for hazardous materials to be present (such as asbestos and ground gas) and potential for odour/dust generation and management of leachate (i.e. contaminated water present within the waste mass) run-off/de-watering. Appropriate consideration will also need to be given to the successful completion of the necessary earthworks at a highly constrained site in terms of available space.
Engineering/capping of Landscaped Areas	Whilst intensive compaction/treatment of any retained waste material is unlikely to be required for proposed landscaped areas (which would be significantly more extensive for the proposed commercial and residential end use scenarios), it is nevertheless likely to be necessary for soils to undergo a degree of treatment to avoid unacceptable total/differential settlement of these areas once constructed. It will also be necessary to cap these areas, possibly including an engineered low permeability cap (clay) and suitable capping layer of certified topsoil/sub-soil to prevent the infiltration of rainwater into the waste mass, provide a suitable growth medium for planting and to prevent exposure to contaminants present.
Engineering of Service Yard Areas	Even where upgraded foundations have been allowed for, it is likely that compaction/treatment of waste materials and/or importation of engineering to be placed beneath yard/roadway areas will be necessary. This is particularly significant for an industrial end use scenario where extensive hard surfaced areas are proposed.
Piling	Any piling undertaken will need to utilise techniques that do not create preferential migration pathways for, or mobilise, contamination present within the waste mass. Furthermore, in the event that techniques such as continuous flight auger (CFA) are proposed then appropriate provision of the costs of

	disposal for pile arisings (possibly as hazardous waste) will need to be made.
Surface Water Drainage	The use of soakaway drainage solutions is unlikely to be viable/acceptable and therefore appropriate provision will need to be made to allow attenuation of surface run-off for all end uses. It is likely that drainage will need to be isolated from the residual waste mass (e.g. construction within lined service corridors and/or use of upgraded materials) so it does not result in the preferential discharge of contaminated leachate off-site via drainage infrastructure. Drainage infrastructure will also need to be constructed in a way that can accommodate possible settlement of the residual waste materials over time.
Leachate Drainage	The retention of waste materials above ground may create an issue with the discharge of leachate, even where material is capped. Furthermore, the incorporation of drains to prevent the accumulation of leachate behind retained structures may also be necessary. Therefore, provision may need to be made to install leachate interception drains to allow the discharge of leachate to foul sewer, or possibly surface water sewer following treatment.
Service Upgrades	As noted for drainage above, all services to be laid within waste materials are likely to require placement within lined corridors backfilled with clean fill material. The upgrading of water supply pipes may also be necessary as a precaution.
Gas Protection Measures	The gas regime on site has not been fully determined but it is reasonable to assume that the presence of residual waste materials will require the incorporation of gas protection measures. The nature of gas protection measures required will depend upon the extent of gas generation and building design but may range from basic passive measures (i.e. incorporation of gas-resistant sub-slab membrane and granular pressure relief layer) to more extensive passive measures (i.e. gas-resistant membrane with passive dispersal layer such as installed void former to disperse gas) or even active systems (i.e. active dispersal or positive pressurisation system using monitored fans/suction units incorporated into buildings' Building Management System). In line with published guidance (BS:8485, 2015) different uses are of differing sensitivity (i.e. the residential scheme is considered to consist of 'Type B' buildings, the commercial scheme 'Type C 'buildings and the industrial scheme 'Type D' buildings). As a result, for any given gas 'regime' the mitigation required will vary depending upon the proposed end use, with more extensive measures required for more sensitive (i.e. Type B) buildings in comparison with less sensitive (i.e. Type D) buildings. Therefore, the likelihood that the incorporation of more basic passive measures will be sufficient to mitigate impacts associated with ground gas is greater for the industrial scheme, whilst use of an extensive active system is more likely to be necessary for the residential scheme. It is assumed that any residential scheme will comprise managed apartments, i.e. where there is a degree of central management control over the buildings and their mechanical and electrical systems. This is important in the event that extensive gas protection measures are required as the use of active systems is generally not considered to be appropriate for private houses for which limited or no such control exists. It is also conceivable, albeit unlikely, that the ground gas issues could be so significant that even a managed apartment residential use will be unacceptable to the regulatory authorities. For all end uses, it is possible that the incorporation of vertical gas venting trenches at the eastern and southern boundaries of the site will be necessary to mitigate risks to third party land associated with ground gas.
In-ground Barrier	As discussed above, Arcadis assumed that no excavation/treatment of below ground waste materials would be required. Based on the nature of works undertaken at a site to the north-east they did consider that the incorporation of an in-ground, low permeability, cut off barrier would be necessary to prevent the migration of contaminated groundwater to third party land. Whilst it is possible that there shall be a need for such a feature it is by no means certain that it will be required and it is entirely feasible that no further mitigation will be necessary. It is also considered to be reasonable to assume that no active treatment of groundwater present beneath the site within the River Terrace Gravels will be required, albeit this will need to be confirmed following completion of additional site investigation and risk assessment works.

FINANCIAL VIABILITY APPRAISALS

4.1 We have given consideration to a number of development options based upon very high-level massing appraisals for the site, the main options being for the following uses:

- Residential
- Industrial
- Business Park / Offices

4.2 In addition, we have considered some variation to the schemes to include a hotel, waste uses and the mix of residential accommodation.

4.3 We deal with the three principle uses considering first, a master plan for the site, followed by commentary on the particular market sector and then a financial viability appraisal with sensitivity and any variations as to the principle use thereof.

4.4 We have adopted estimated construction costs as advised by our Cost Consultancy team which are based on a combination of in-house benchmark data, project costs, published indices and BCIS cost data.

4.5 It should be noted that residual site appraisals are sensitive to a change in inputs and small changes in these assumptions can result in a significant change in the residual site value. We have undertaken analysis to ascertain sensitivities of the residual land value for the various schemes, further details are set out in the options below.

4.6 For all the development options we have assumed that the existing access arrangements off Abbey Road will have sufficient capacity to accommodate the indicative schemes without requiring any significant highway upgrade works or expenditure. Further, we have assumed that infrastructure utilities are existing to service all the options that we have reviewed.

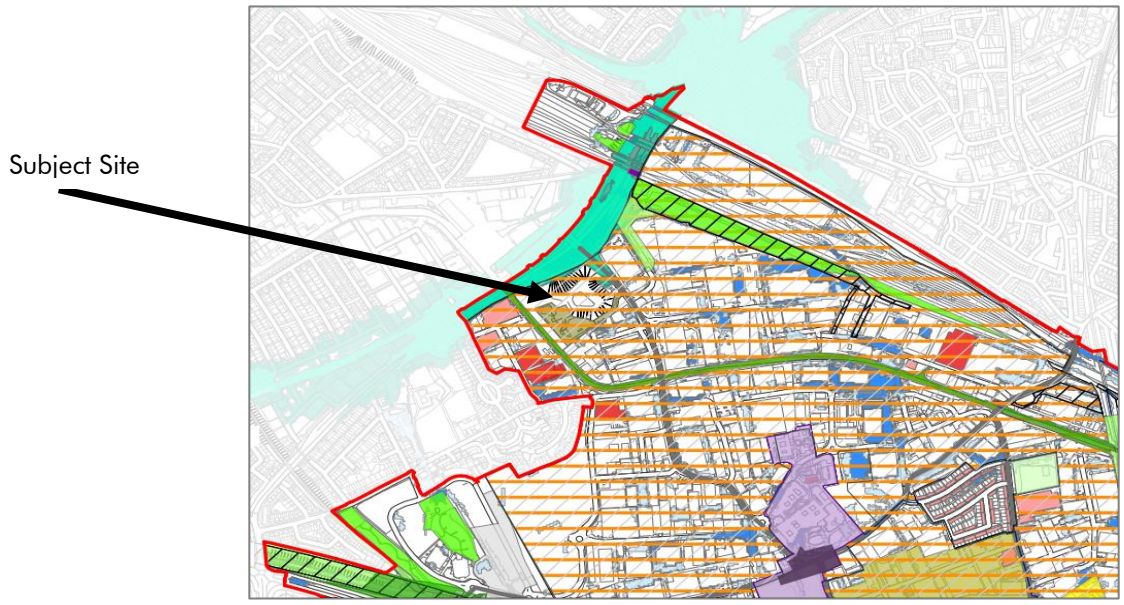
4.7 As instructed, we have reflected Mayoral CIL in our appraisals but we have not reflected any additional S.106 costs or potential OPDC / London Borough of Brent CIL costs.

PLANNING BACKGROUND

4.8 The development options have been considered against the background of the draft OPDC Local Plan, which was subject to a public consultation exercise from June until September 2017. The next stage is for an Independent Examination in Public anticipated to take place in the Autumn of this year with a view to having the Local Plan ready for adoption by the end of 2018. Unit the OPDC adopts its own Local Plan the London Borough of Brent's planning documents also form part of the OPDC's Development Plan.

Proposals Map

4.9 The subject site is located within the Strategic Industrial Location as per OPDC's draft Local Plan, indicated cross hatched orange on the extract from the Proposals Map below.



4.10 The draft Local Plan notes that the area's public transport access with provide significant opportunities to create high density development which will have benefits in terms of homes and jobs. It further notes that if not appropriately designed and managed, high densities can present challenges in terms of potential impact on the transport network, townscape, climate change and the local environment, community services and on health and well-being.

Grand Union Canal

4.11 We anticipate that any development at the site will have to have regard and make a positive contribution to the Grand Union Canal Linear Park. Having regard to the depth of the strip of land alongside the Canal forming part of the overall site we have assumed that no development in terms of material built form would take place on this part of the site. Policy P3 of the draft Local Plan deals specifically with the Grand Union Canal and considers the prospect of active frontages of social and leisure uses with the potential of positive frontages from housing and employment uses, as well as opportunities for tall buildings at key crossings. The juncture of the site at its south western corner with the Canal and North Circular Road could be considered as an area suitable for tall buildings.

4.12 The North Circular Road is noted as being an Air Quality Focus Area. The design and layout of any new development should seek to minimise exposure to pollution.

Employment Uses

4.13 Policy E1 of the draft Local Plan seeks to protect existing economic and employment functions with new developments expected to strengthen and intensify the Park Royal industrial estate and support new employment growth across a variety of sectors. Strong demand for space is anticipated from light industry, general industry, logistics / warehousing / storage, waste management and recycling, utilities, wholesale markets and some creative industries. Such demand having increased over recent years with the accelerated loss of commercial premises to residential uses. Intensification of industrial uses is envisage with, for example, consideration of multi storey warehousing.

4.14 Office uses are supported in a town centre location with a new major commercial hub to be created around the planned Old Oak Common station to take advantage of transport connectivity.

4.15 The adjoining Twyford Waste Transfer Station is safeguarded as a waste site. The draft Local Plan notes that there are five waste sites within the OPDC's boundary which may be subject to transformational change and redevelopment in order to realise the planned growth of jobs and

homes. There could be a possibility of the subject site being used for waste purposes and we have considered this further in the Industrial option.

Housing

4.16 The London Plan identifies that the Old Oak and Park Royal Opportunity Area has the capacity to deliver 25,500 homes. Policy H2 of the draft Local Plan sets out that all residential development with the capacity to provide 10 units or more will be required to provide affordable housing, subject to viability, in accordance with the overarching target of 50% and that the provision be on-site. 30% is envisaged as London Affordable Rent with 70% being a range of intermediate housing to include London Living Rent and London Shared Ownership.

4.17 . Student accommodation will be supported where, inter-alia, it contributes to the vibrancy and diversity of an area and is located in an area with a high PTAL score. The TFL PTAL Rating for the site is low with a scope of 3 (northern part) and 1a and 2 (southern part).

RESIDENTIAL SCHEME

5.1 The indicative residential scheme proposes a series of apartment buildings situated surrounding the central (Landfill) mount which will be landscaped. Access is from the existing access road linking to Abbey Road. The following massing is proposed:

- 1,250 units equating to approximately 1,278,225 sq ft (118,750 sq m) of accommodation.
- A mix of 1 bed, 2 bed and 3 bed units, c.330 dwellings per hectare.

  Note: In arriving at an appropriate site density, we have referred to the TfL WebCAT planning tool which defines the site as having a PTAL rating of 1a (very low) on the southern portion of the site and 2/3 (low) on the northern portion. In reviewing the London Plan's Density Matrix using a PTAL rating of 2/3 (low) we understand an appropriate Urban Setting figure to be in the region of 70-170 dwelling units per hectare (du's/ha), and 100-240 du's/ha for a Central Setting.

  We also have noted that St George has recently submitted a planning application to the London Borough of Brent to redevelop the former Northfields Industrial Estate located nearby on the western side of the North Circular Road. St George is proposing new workspace, retail premises, restaurants, a community centre, public open space and 2,900 new homes on the 21acre site.
- Services building to serve all residential accommodation: parking, cycle store, refuse storage, street access and lobby to residential buildings (c.37,100 sq ft / 3,450 sq m over 2 storeys)
- Approximately 53,800 sq ft (5,000 sq m) of commercial space facing Abby Road, with access from the common junction.
- Block F situated on the prominent north-western corner could be residential or a location for a hotel, providing circa 200 keys.



5.2 The plan and supporting notes can be found at **Appendix C**

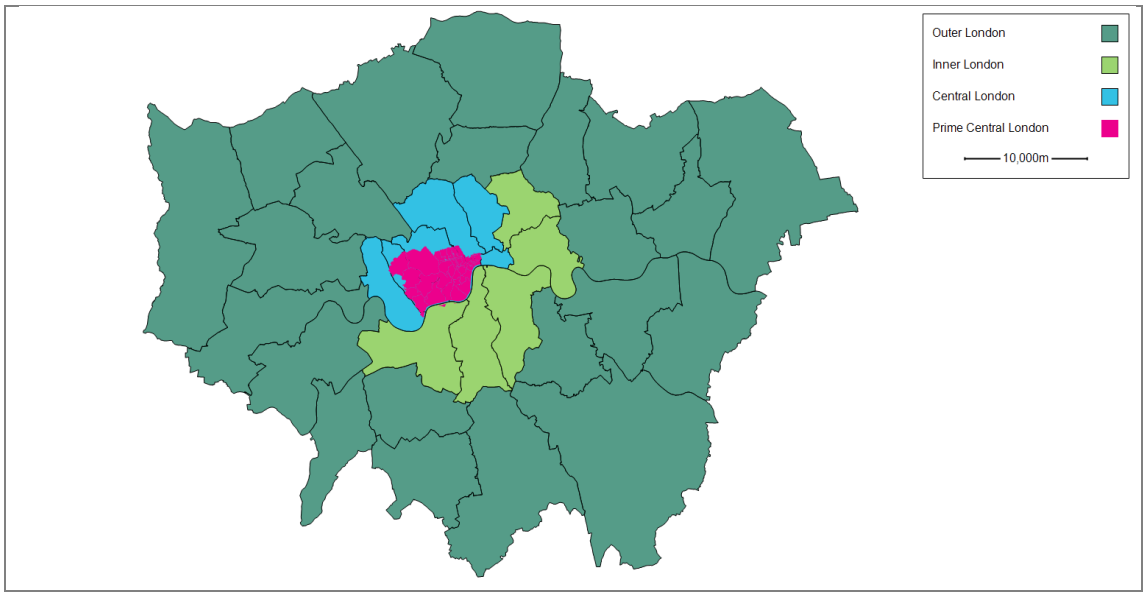
MARKET COMMENTARY

Greater London

5.3 The following commentary will refer to various London geographies, all defined in the map below.

- In dark green, outer London comprises 22 out of London's 33 boroughs.
- Inner London is made up of the remaining 11 boroughs in London's core (blue and light green).
- Central London is defined as the six most central boroughs (blue), all to the north of the river Thames.
- Prime central London is the central core of these boroughs (pink). This area is home to London's Central Activities Zone, the UK government, the core of London's retail and cultural offering, as well as some of London's most expensive residential postcodes.

London area definitions



Source: CBRE

Housing Stock

5.4 The housing stock of London is weighted towards flats, which account for over half of the capital's housing stock. However, there is a stark contrast between inner and outer London. In inner London, flats are the dominant stock accounting for 75% of homes. In contrast, terraced and semi-detached houses are much more prominent in outer London.

Greater London Transaction Volumes

5.5 After the financial crisis, market activity in London has slowed significantly. This was partly a result of stricter rules on mortgage lending following the 2010 Mortgage Market Review. Since the start of 2010, mortgage lending for new house purchases has averaged around 19,000 loans per quarter. This is 42% lower than the pre-crisis long-term average of nearly 33,000 loans per quarter. 2013 to 2015 were the most active years in the post-crisis era, with mortgage approvals averaging 20,400 per quarter. Since then, mortgage approvals have fallen by 10% to an average of 18,325 in 2017.

5.6 In terms of actual transaction volumes, the post-crisis market has been supported by an increasing number of cash buyers. Pre-crisis, this proportion averaged 14%, while the post-crisis average has been 25%. However, following a peak of 39% in Q1 2016, this rate has fallen sharply to an average of 15% in Q3 2017. This has been driven in part by a fall in investment

transactions following the 3-percentage point increase in stamp duty on buy-to-let and second homes in April 2016.

5.7 Since the stamp duty related peak in March 2016, transaction volumes in London have slowed sharply (see chart 1). The latest monthly data shows a 24.6% fall in sales in November 2017 compared with same month in 2016.

5.8 The bulk of transactions in the London market is made up of the sub £600,000 market, which accounts for 69% of all sales. Of these, £300,000 - £400,000 is the largest at 22%. In Q3 2017 (latest full quarter available), sales fell across all price bands, but the sub £300,000 market declined the most by (13%). Sales above £1m accounted for 11% of sales in Q3 2017, with transactions falling by 7% quarter on quarter.

Chart 1: Monthly Transaction Volumes, London



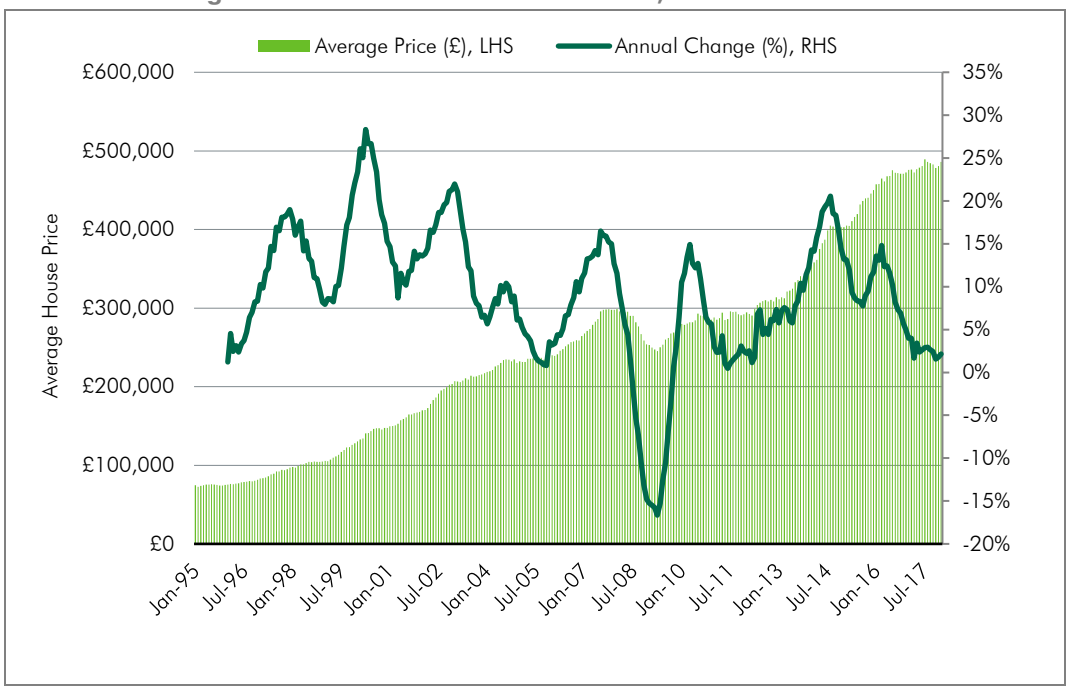
Source: Land Registry

Greater London House Prices and Trends

5.9 The average London house price reached in £485,829 in January 2018 (latest data), following growth of 2.1% year-on-year. Although this is up slightly on 1.8% in December, it represents a sharp slowdown on the most recent peak of 14.8% in March 2016 (see chart 2). This slowdown is driven by a fall in demand, particularly from cash investors as illustrated previously.

5.10 Over the long term (since 1995) annual house price growth in London has averaged 9.1% per annum, higher than the UK average of 6.7%. Most of this outperformance was achieved during the post-crisis era when the London market diverged from the rest of the UK (see chart 3). Since the previous market peak in 2007, the London house price index has increased by 63%, compared with 19% for the UK. Inner London has been stronger, with prices up 69% compared with outer London at 57%. Both inner and outer London have experienced a rapid slowdown in house price growth over the past 22 months. Outer London remains marginally stronger with prices up 2.3% year-on-year in January. This compares with 1.1% in inner London.

Chart 2: Average House Price and Annual Growth, London



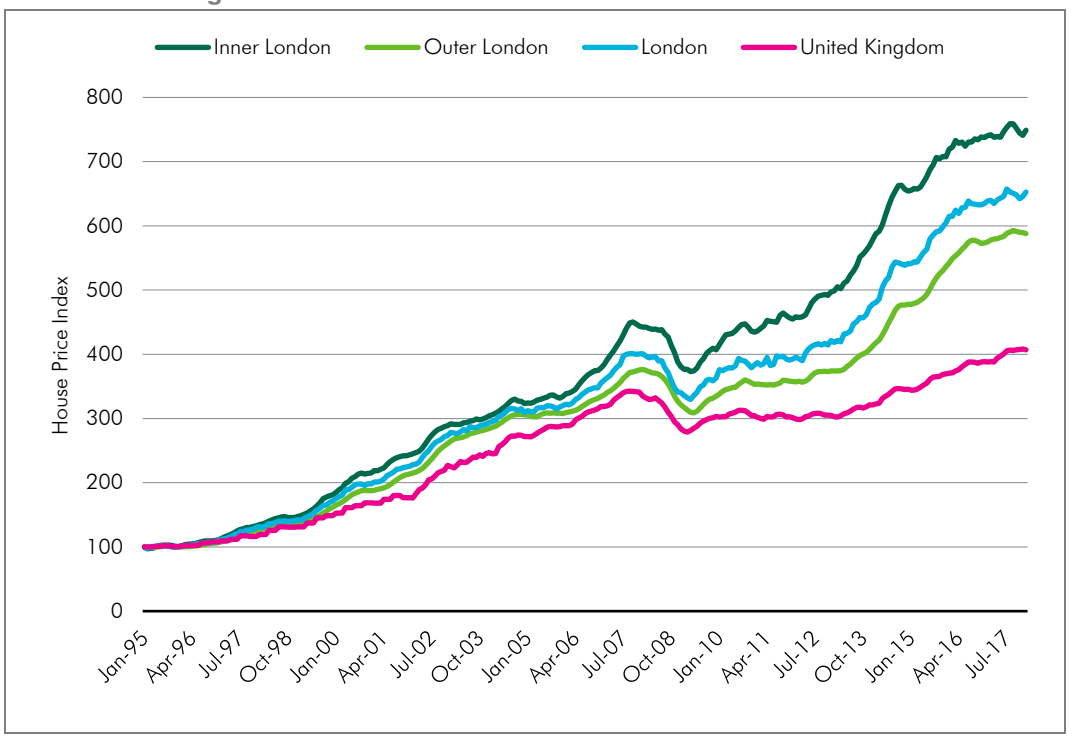
Source: Land Registry, Jan 2018

Table 1: Average Price and Price Growth Summary Table

	INNER LONDON	OUTER LONDON	LONDON	UNITED KINGDOM
Average price	£586,043	£429,014	£485,830	£225,621
Quarterly growth	-0.4%	-0.6%	0.7%	0.1%
1-year growth	1.1%	2.3%	2.1%	4.9%
5-year growth annualised	8.5%	9.5%	9.3%	6.1%
10-year growth annualised	5.4%	4.6%	5.0%	2.0%

Source: Land Registry, Jan 2018

Chart 3: Average House Price and Annual Growth



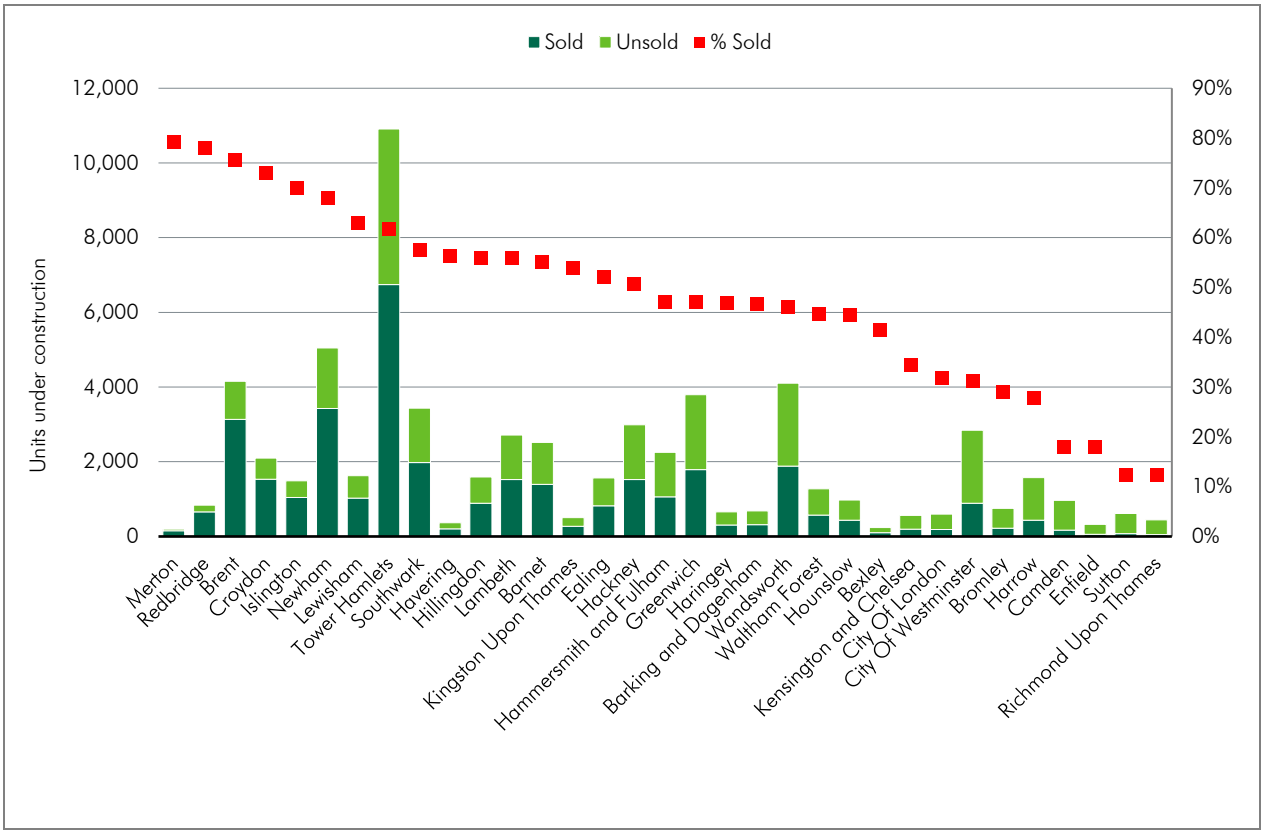
Source: Land Registry

THE NEW BUILD MARKET

5.11 Activity in London's new-build market continues at pace. During 2017, 27,300 private units commenced construction. This up 13% on 2016, but 19% lower than the most recent record of 34,000 starts in 2015. Meanwhile, 22,600 units completed last year, 8% fewer than 2016. With construction starts outpacing completions, the total number of units under construction at the end of 2017 was nearly 65,000, a record level.

5.12 New-build sales activity remains robust. 22,562 units sold in 2017, up 7% year-on-year. However, with construction levels rising faster than sales, the proportion of units sold off-plan has been declining from a peak of 66% in 2014 to 54% in 2017. This equates to 35,070 pre-sales of out of 64,719 units under construction. However, this average masks a wide range across the 33 London boroughs. In Merton, Redbridge and Brent, over 75% of the construction pipeline has been sold, while in Camden, Enfield, Sutton and Richmond it is fewer than 20%. (chart 4). The number unsold completed units in London units has also risen substantially over the past few years. At the end of 2017, this figure was nearly 1,500, an increase of 35% on the previous year and a near four-fold increase on 2015.

Chart 4: Units under construction and proportion sold, by borough



Source: Molior (private units only), as at end 2017

5.13 Analysing new-build sales broken down by price band shows that the £600-£1,000psf bracket was the strongest, accounting for 47% of all sales in 2017. This is up from 41% in 2016. In actual terms, sales in this price bracket increased by 22% in 2017 from 8,522 to 10,396. Units priced between £1,000-£1,500psf accounted for 34% of all sales in 2017, down from 41% in 2016. In actual terms sales in this bracket fell 11% between 2016/17 from 8,524 to 7,569.

5.14 In 2017, the average asking price for new-build stock across London was £901psf. This ranged considerably from £360psf in Bexley and £430psf in Barking and Dagenham, up to £2,435psf in Westminster and £2,760psf in Kensington & Chelsea.

5.15 New-build asking prices were up 2% year-on-year in 2017. Somewhat surprisingly, asking prices grew faster in inner London (3.6%) than outer London (0.3%).

MARKET EVIDENCE

5.16 Much of the latest new build residential developments have been more focused in four nearby centres, namely Wembley Park, Park Royal, Colindale, and Harrow. We have included comparable information on the Emerald Gardens and Alto schemes due to their close proximity to the subject site. It should be noted that these comparables were launched earlier in the property cycle and benefited from an environment of much higher demand both domestically and internationally, compared to today's market.

Emerald Garden, Wembley



5.17 Emerald Gardens is located to the north west of Wembley Stadium. Construction completed in late 2016 and comprises 475 units, of which 425 are private. We understand that there are only two units left to sell. Emerald Gardens also provides around 5,000 sq ft of commercial, retail and leisure space and two blocks within, totalling 141 units, are being retained for PRS.

5.18 The majority (c. 98% as at December-17) of the 284 apartments for sale have completed. A considerable proportion of these sales occurred soon after the initial launch meaning some of the prices achieved are now historic. The sales/exchanges reflect £604 psf as an overall average. Sales have slowed significantly due to a softening of the market and the lack of availability which narrows purchasers' choice. We set out below a summary of the most recent achieved pricing for the units that have either exchanged or completed in 2016 and 2017 at Emerald Gardens:

UNIT TYPE	UNITS	AVERAGE SIZE (SQ FT)	SALE PRICE RANGE	AVERAGE SALE PRICE	£PSF
Studio	1	421	£300,000 - £300,000	£300,000	£713
1 bed	10	576	£298,000 - £380,000	£349,107	£606
2 beds	19	812	£434,444 - £625,000	£505,897	£623
Total	**27**	**709**	**£298,000 - £580,000**	**£436,967**	**£617**

Alto, Wembley



5.19 Alto is located to the north west of Wembley Stadium. It has recently completed construction and comprises 362 units, of which 331 are private. Alto will also provide around 8,500 sq ft of retail, leisure and community space. Within the development, 120 units are being kept for PRS and 21 remain unsold.

5.20 Since October 2016, the large majority of the sales to have occurred were a bulk purchase which we understand was to a single investor. This purchase comprises 20 units, including a mix of 1, 2 and 3 beds. The aggregate purchase price of £10,490,297 equates to £725 psf. We set out below a summary of the achieved pricing for the 76 units that have been reserved or exchanged during 2016 and 2017 at Alto:

UNIT TYPE	UNITS	AVERAGE SIZE (SQ FT)	SALE PRICE RANGE	AVERAGE SALE PRICE	£PSF
1 bed	26	542	£350,000 - £480,00	£410,000	£729
2 bed	46	732	£461,797 - £815,000	£566,972	£719
3 bed	4	1,202	£710,000 - £1,300,000	£902,500	£759
Total	**76**	**725**	**£350,000 - £1,300,000**	**£530,555**	**£734**

First Central / Royal Waterside



5.21 The Royal Waterside scheme at First Central is slightly historic in comparison to schemes in Wembley that have been provided above, however, due to being less than 1.5 miles from the subject site it is regarded as providing relevant evidence. The scheme, developed by Redrow, provides 265 units in two blocks. The first block of 150 units completed in Q3 2016 and the second block of 115 units completed in Q4 2016. Despite the scheme not completing until Q4 2016 it had fully sold out by Q2 2016, showing the strength of the market at the time. We provide below a summary of 70 units to sell within the scheme, it should be noted that these sales took place between March 2014 to March 2016;

UNIT TYPE	UNITS	AVERAGE SIZE (SQ FT)	SALE PRICE RANGE	AVERAGE SALE PRICE	£PSF
1 bed	16	603	£284,995 - £420,000	£358,780	£598
2 bed	45	848	£349,995 - £575,000	£449,943	£529
3 bed	9	1,050	£464,995 - £634,000	£520,108	£495
Total	**76**	**725**	**£284,995 - £634,000**	**£442,944**	**£541**

OPINION OF SALES RATE / PHASING

Sales Rate

5.22 We are of the view that the subject site would be considered inferior to the benchmarks and comparables outlined above, having poor pedestrian access to public transport at Stonebridge Park station via a footbridge over the North Circular and virtually no local amenities. In addition, we are unsure if housebuilders would have the appetite to build on the former Twyford tip, adjoining a heavily trafficked road with associated fumes / noise etc and, also, if there funding would be available both to a developer and potential future occupiers for mortgage purposes. Capital values are therefore anticipated to be at a discount to developments nearby, reflecting also the current market softening. As such we have adopted an average rate of **£550 per sq ft** across the full development.

Affordable Housing

5.23 In accordance with OPDC's planning policy we have adopted a 50% affordable rate for the purposes of our base appraisal.

5.24 Tenure split will also affect the value of the affordable housing, the higher % of rent and lower % of intermediate will mean a lower overall value on the whole affordable scheme element on a particular site. For the purposes of our appraisal we have assumed a 70%:30% split between Intermediate and London Affordable Rent, with Intermediate at **£365 per sq ft** and London Affordable Rent at **£249 per sq ft**. These affordable prices have been generated using an industry-wide pricing system which is the toolkit used by the majority of London's G15 Registered Providers.

Phasing

5.25 For any new development launched at this price point, assuming the appropriate level of marketing collateral and PR, we would expect around 30% of the private units would be sold off plan and for that to taper off over say the year. Subsequent launches of new buildings within the wider development will provide a boost to interest and sales, but tend not to attract such as high a demand as the initial launch.

5.26 Based on the phasing, analysis of comparable schemes and the quantum of units we would advise a sales period of approximately 12 months per phase for the private units, with the affordable elements being sold off plan and transferred on practical completion.

RESIDENTIAL APPRAISAL SUMMARY

PHASE		Months	Start Date	End Date
Phase 1 (Blocks A, B, C)	Pre-construction	36	Mar 2018	Feb 2021
	Construction	24	Mar 2021	Feb 2023
	Post Development	12	Mar 2023	Feb 2023
Phase 2 (Blocks D, E, F, G)	Pre-construction	48	Mar 2018	Feb 2022
	Construction	24	Mar 2022	Feb 2024
	Letting	12	Mar 2024	Feb 2025
Phase 3 (Blocks H, I, J)	Pre-construction	60	Mar 2018	Feb 2023
	Construction	24	Mar 2023	Feb 2025
	Letting	12	Mar 2025	Feb 2026
Total		**96**		

GROSS DEVELOPMENT VALUE		
Private Residential – (666,721 sq ft)	£550 psf	£366,700,000
London Affordable Rent– (153,388 sq ft)	£249 psf	£38,195,000
Intermediate (357,902 sq ft)	£365 psf	£130,635,000
Commercial Space (43,056 sq ft)	£30 psf, 18 months' rent free, 5.0%	£24,010,000
Net Development Value (after purchaser's costs @ 6.8%)		**£558,010,000**

DEVELOPMENT COSTS		
Construction	1,526,334 GIA @ £212 psf	£323,585,000
Site Preparation Works	Indicative Average Case Cost as per Arcadis report for removal of landfill material to match surrounding ground surface elevations.	£48,100,000
Contingencies	5.0%	£18,585,000
CIL		£2,255,000
Professional Fees	12.0%	£44,600,000
Developer's Contingency	5.0%	£16,180,000
Letting & Disposal Costs		£10,065,000
Sub Total		**£463,370,000**
Finance	@ 5.50%	£28,590,000
Profit	20% on cost	£93,000,000
Total		**£584,960,000**
Residual Land Value	(negative land value)	**-£26,950,000**

5.27 Adopting the inputs and assumptions as set out in the tables above results in a residual site value of **negative £26.95m**. A printout of the appraisal together with a more detailed cost breakdown is attached as part of Appendix C.

SENSITIVITY & RESIDENTIAL CONCLUSIONS

5.28 We have undertaken sensitivity analysis on the construction costs and sales values for the private residential units as summarised in the table below:

		Construction Costs				
		-20.0%	-10%	0%	+10%	+20.0%
Private Residential Sales Rate	-£10.00	£27.27 m	£1.30 m	-£29.66 m	-£63.79 m	-£100.02 m
	-£5.00	£30.44 m	£2.47 m	-£28.30 m	-£62.30 m	-£98.49 m
	£0.00	£31.61 m	£3.64 m	**-£26.95 m**	-£60.80 m	-£96.95 m
	+£5.00	£32.78 m	£4.81 m	-£25.60 m	-£59.32 m	-£95.42 m
	+£10.00	£33.95 m	£5.99 m	-£24.26 m	-£57.84 m	-£93.89 m

5.29 The scheme is more sensitive to changes in build costs rather than the sales values.

5.30 We have also considered variations to the residential scheme to include the following:

- 35% affordable (having regard to the Mayor's 'threshold' for schemes which would not require a viability assessment, although this disregards the draft London Plan requirement for 50% affordable for 'fast-track' viability where Strategic Industrial Land is being released),
- 50% affordable but with reduced site clearance costs, and

- the inclusion of a budget hotel at Block F providing 200-keys in substitution for residential units.

5.31 We set out below the results of each appraisal;

Scheme	Timing	Residual	Comments
35% affordable	96 months (March 2018 – March 2026)	-£19,185,000	Having regard to the Mayor's 'threshold' for schemes which would not require a viability assessment.
35% affordable (reduced site clearance costs to £31.4m)	96 months (March 2018 – March 2026)	-£17,950,000	Despite a reduction in the overall costs of clearing the site, the overall construction cost per sq ft would increase from £212 to £226 to account for the extra piling that would be required to support the buildings.
50% affordable (reduced site clearance costs to £31.4m)	96 months (March 2018 – March 2026)	-£28,630,000	Despite a reduction in the overall costs of clearing the site, the overall construction cost per sq ft would increase from £212 to £226 to account for the extra piling that would be required to support the buildings.
50% affordable & hotel	96 months (March 2018 – March 2026)	-£41,365,000	For the Park Royal budget hotel market, we would expect a rent of between £5,500 and £6,500 per key. Assuming it would be let to Travelodge or Premier Inn, the NIY could be circa 4.5%. However, the local market is potentially reaching saturation with a number of schemes proposed, most better located in Park Royal off the A40 with better access to public transport. The yield would be softer for an unproven covenant to circa 5.0% - 5.5%.

5.32 None of the four schemes that have been appraised produce a positive land value and , having regard to the Mayor's aspiration for 50% of new housing to be affordable particularly in cases where Strategic Industrial Land is proposed to be released, we are of the view that the prospect of gaining a planning consent for a residential scheme without a material amount of affordable is extremely unlikely.

5.33 As mentioned above, in addition to the schemes failing to produce a positive land value, consideration needs to be given to whether there would be appetite to fund a scheme above a landfill site, or if a bank would provide a mortgage for a property built above these ground conditions.

5.34 Consideration was also given to the possibility of student accommodation being provided at the site. We concluded that this would be of very limited appeal to student accommodation operators and universities alike with similar concerns to residential uses in respect of location, environment, lack of amenities, the walk to the train station and the fact that the location is not a student hub.

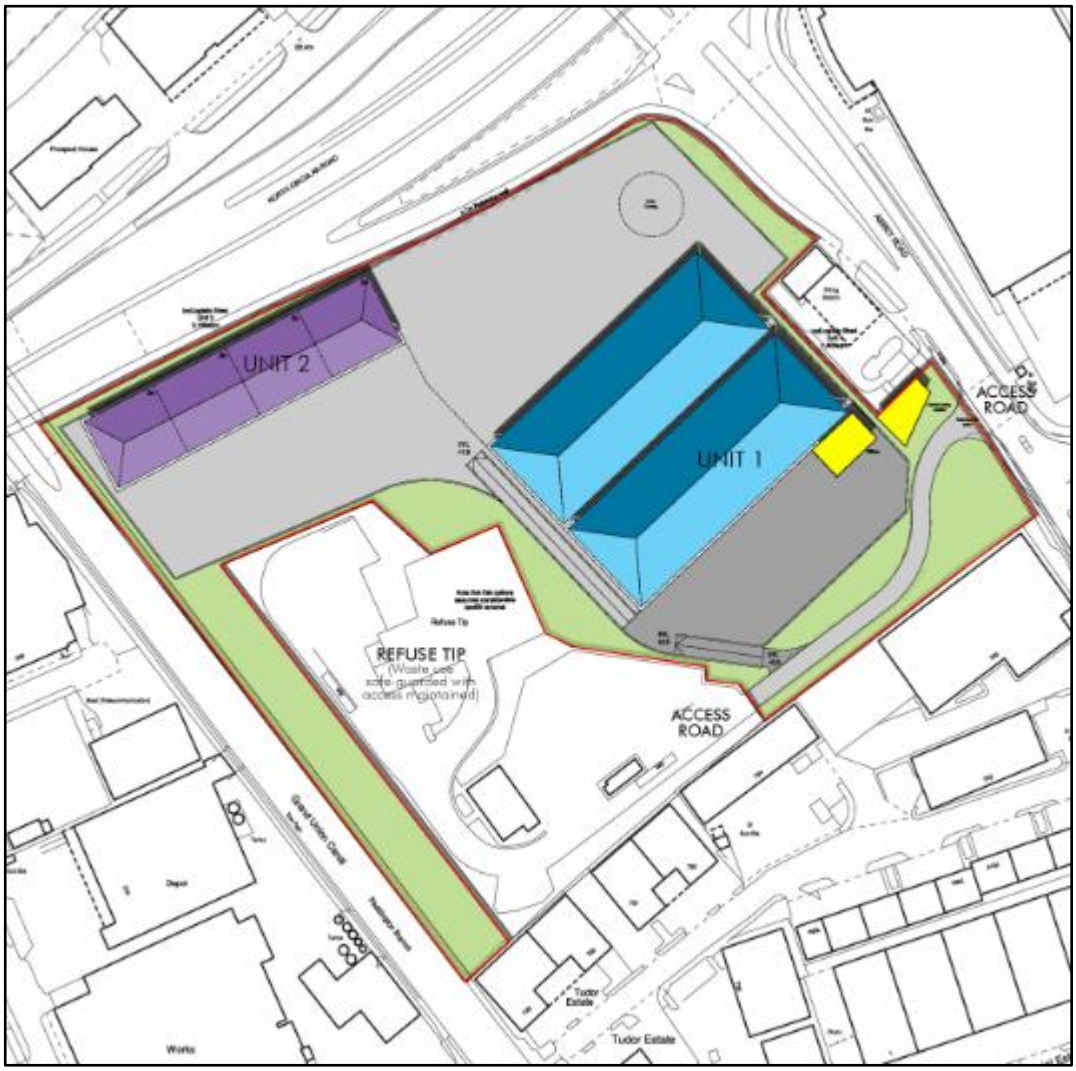
INDUSTRIAL

INDUSTRIAL SCHEME

6.1 In considering an industrial scheme we have appraised two potential options with slightly different layouts as more specifically described below. Both schemes envisage a significant amount of hardstanding for building footprints, yards, service areas and car parking. Access is from the existing road serving the site off Abbey Road.

Industrial Scheme 1

- Unit 1 – 84,000 sq ft (7,800 sq m) of industrial accommodation and a two storey 8,400 sq ft (780 sq m) office building.
- Unit 2 – 33,900 sq ft (3,150 sq m) of industrial accommodation.
- 4,300 sq ft (400 sq m) 2 storey admin / entry control building.



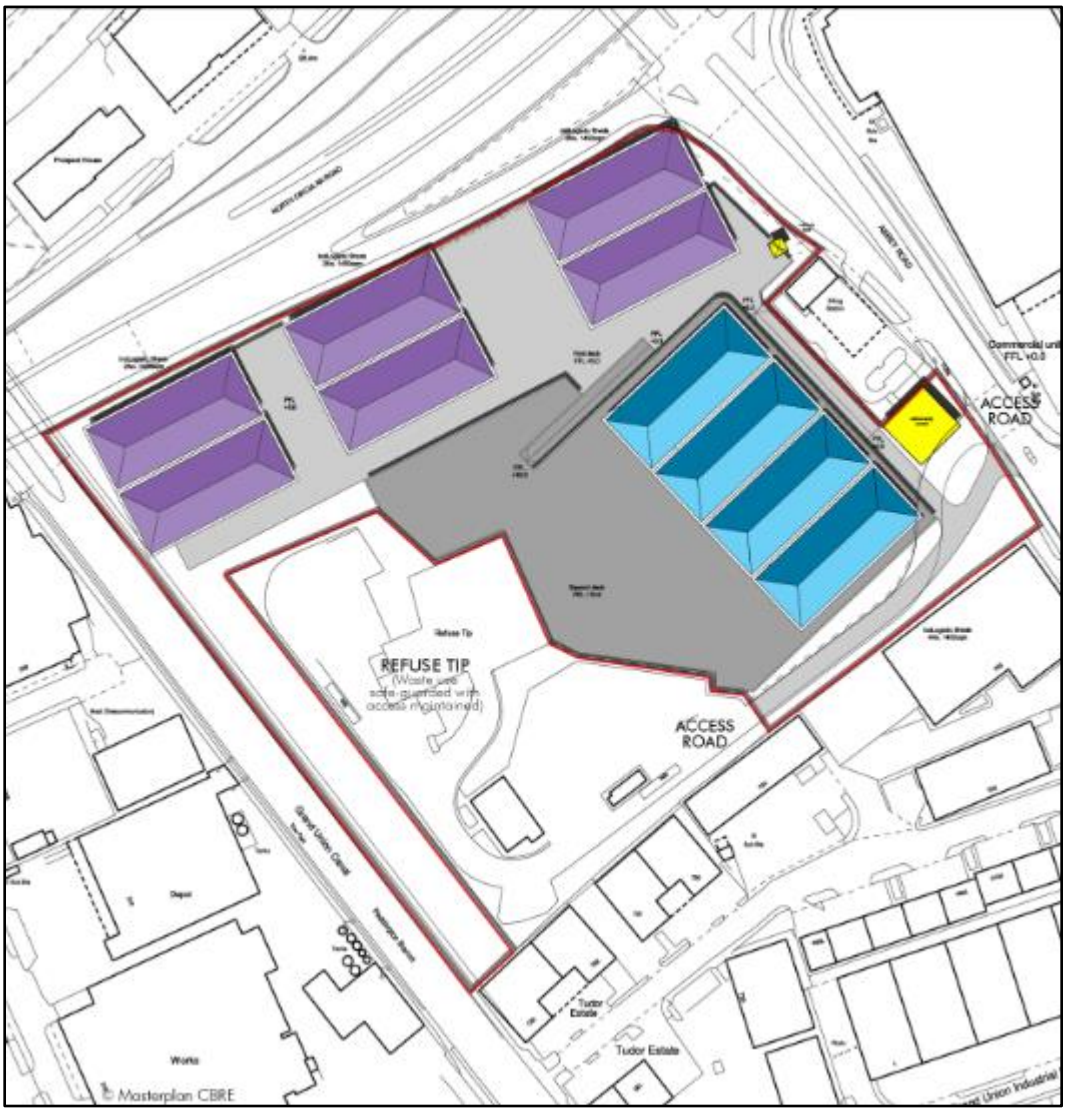
6.2 The plans and supporting notes can be found at **Appendix D**

Industrial Scheme 2

- Level 1 (purple blocks) consists of 93,650 sq ft (8,700 sq m) of industrial / logistic sheds.
- Level 2 (blue blocks) consists of 42,383 sq ft (3,937 sq m)

- Admin / entry control building (yellow blocks) of 15,600 sq ft (1,450 sq m)

6.3 Again. the plans and supporting notes can be found at **Appendix D**



MARKET COMMENTARY

OCCUPATIONAL MARKET COMMENTARY

6.4 From an industrial perspective Park Royal is one of the UK's premier locations and boasts being the most economically active industrial area in Inner London. Over the past five years, general rent levels at Park Royal have moved from approximately £10.00 per sq ft to approximately £16.00 per sq ft on mid-sized units for the location. This movement reflects staggering headline rental growth of approximately 8.50% per annum.

6.5 Rental growth within London industrial markets is being driven by a persistent supply/demand imbalance, whereby much of London's industrial stock has been converted to higher-value uses, including residential, leading to significant reductions in supply. Twelve London Boroughs have already released industrial land for conversion at a rate four times greater than the targeted level. At this rate, the 2031 target for the release of industrial land in London will be reached within the next few years. This is coupled with an expanding pool of businesses attempting to locate in strategic inner-London locations, of which Park Royal is the prime example.

6.6 The Quad Scheme on Abbey Road is currently the premier industrial scheme within the Park Royal market and quoting rents are now at £17.95 per sq ft - £18.50 per sq ft for a 10,000 sq ft unit.

6.7 The factors highlighted above provide strong indication that rents in Park Royal are likely to continue on the steep upward trend that has been witnessed in recent years.

6.8 Detailed below is a schedule of rental transactions which evidence the strength of the market.

OCCUPATIONAL MARKET EVIDENCE

6.9 In forming our opinion of rental value, we have had regard to the following transactions:

Address	Area sq ft (sq m)	Date	Lease	Rent £ pa
Unit 18, Metropolitan Park, Greenford	3,518 sq ft (327 sq m)	Under Offer	10 years (5 year break)	£17.00 per sq ft (£183 per sq m)
Rock N Roll, Waxlow Road, Park Royal	34,641 sq ft (3,218 sq m)	Dec 17	20 years	£15.00 per sq ft (£164 per sq m)
Unit F23 Acton Business Centre, NW10	1,062 sq ft (99 sq m)	Dec 17	3 years	£23.00 per sq ft (£248 per sq m)
Unit 2, Origin, Park Royal,	36,015 sq ft (3,345 sq m)	Nov 17	15 years (10 year break)	£15.00 per sq ft (£161 per sq m)
Unit 5-9 Willenfield Road, Park Royal	44,032 sq ft (4,090 sq m)	Nov 17	10 years	£12.75 per sq ft (£137 per sq m)

Address	Area sq ft (sq m)	Date	Lease	Rent £ pa
Metropolitan Park, Greenford, UB6		Unit 2 – Nov 17 (36,015 sq ft / 3,346 sq m) Unit 12 - Nov 17 (2,711 sq ft/ 252 sq m) Unit G – Nov 17 (12,071 sq ft/1,121 sq m) Unit F – Nov 17 (12,057 sq ft/1,120 sq m) Unit K1 – Nov 17 (5,468 sq ft/508 sq m) Unit H – Mar 17 (12,042 sq ft/1,119 sq m) Unit K2 – Mar 17 (6,278 sq ft/583 sq m)	15 years (10 year break) 10 years (5 year break) 2 years (1 year break) 5 years, 4 months RF 10 years, 2 months RF (5 year break) 10 years, 3 months RF (5 year break) 10 years, 2 months RF (5 year break)	£14.50 per sq ft (£156 per sq m) £16.50 per sq ft (£178 per sq m) £25.00 per sq ft (£269 per sq m) £11.00 per sq ft (£118 per sq m) £12.25 per sq ft (£132 per sq m) £11.00 per sq ft (£118 per sq m) £11.00 per sq ft (£118 per sq m)
455 Sunleigh Road, HA0	1,000 sq ft (935 sq m)	Oct 17	3 years	£13.00 per sq ft (£140 per sq m)
153 Dukes Road, W3	5,592 sq ft (520 sq m)	Sep 17	10 years, 4 months RF (5 year break)	£12.96 per sq ft (£140 per sq m)
455b Sunleigh Road, HA0	2,000 sq ft (185 sq m)	Aug 17	3 years	£17.40 per sq ft (£187 per sq m)
Unit 6 Cumberland Avenue, NW10	35,024 sq ft (3,253 sq m)	Jul 17	-	£15.50 per sq ft (£167 per sq m)
164 Dukes Road, W3	7,752 sq ft (720 sq m)	Jun 17	10 years	£11.00 per sq ft (£118 per sq m)
Units 7-12 Vision, Kendal Avenue, W3	5,890 sq ft (547 sq m)	Jun 17	10 years, 5 months RF	£17.95 per sq ft (£193 per sq m)
Unit 1 Quad, Abbey Road, NW10	10,387 sq ft (965 sq m)	Jun 17	10 years	£17.95 per sq ft Asking (£193 per sq)
159 Dukes Road, Park Royal, W3	3,466 sq ft (322 sq m)	May 17	15 years	£12.12 per sq ft (£130 per sq m)
6-7 Alliance Road, W3	1,221 sq ft (113 sq m)	May 17	6 years, 2 months RF	£16.00 per sq ft (£172 per sq m)
Unit 24 Greenford Park, UB6	4,908 sq ft (456 sq m)	Apr 17	10 years, 3 months RF (5 year break)	£16.00 per sq ft (£172 per sq m)
4 McNicol Drive, Park Royal NW10	10,978 sq ft (1,020 sq m)	March 17	10 years	£14.50 per sq ft (£151 per sq m)

OPINION OF RENTAL VALUE

6.10 The subject land would be regarded as one of the premier sites within Park Royal were it to become available for industrial use, due to its prominence and access to the North Circular. Furthermore, there are currently neither any proposed speculative developments nor are there any existing units available between 50,000 – 100,000 sq ft on the A40 corridor (between Acton and Greenford), it is therefore assumed that a unit of this size would be received exceptionally well in the market place.

6.11 Based on the evidence detailed above we provide a breakdown of the assumed letting packages for both options below. The levels of rent achieved on the site will be affected by the quality and specification of the units built, along with the configuration and site layout.

6.12 We are of the opinion that Option 1 provides a better layout for the site and would be preferred by any potential occupiers, we have therefore applied a higher rent to the units within Option 1.

Scheme	Block	Rent	Rent Free	Marketing / Letting Void
Option 1	Block 1(sub-divisions)	£21.00	12 months	6 months
	Block 2	£16.50	18 months	6 months
Option 2	Level 1 (sub-divisions)	£18.50	12 months	6 months
	Level 2	£15.00	18 months	6 months

INVESTMENT EVIDENCE

6.13 UK property investment yields for industrial properties continued to improve across nearly all subsectors over the last year, particularly for South East and Greater London multi-let estates, with yields trending stronger.

6.14 The table below summarises the CBRE view on benchmark yields:

Industrial	Dec-16	Mar-17	Jun - 17	Sept -17	Dec-17	Feb -18
Prime Distribution	5.00%	5.00%	4.85%	4.85%	4.50%	4.50%
Prime Greater London Industrial Estate (Excluding HTW)	5.00%	4.75%	4.50%	4.50%	4.35%	4.35%
Good Secondary	6.25%	6.00%	5.75%	5.75%	5.50%	5.50%

Note - Prime yields refer to the equivalent yield for a prime (well specified, well located and rack rented) property let to financially strong tenants, but not Govt, on a lease with 15 years unexpired and open market rent reviews.

6.15 There have been a few recently traded, prime industrial properties in the south east of England. Park Royal's status as the UK's premier industrial location means there is high demand for properties resulting in an improvement in the market over the last six months.

6.16 We have set out below summary details of some investment comparables that are considered relevant to the subject site:

Date of Completion	Address	Purchase Price	NIY	Cap Val (per sq ft)	Area (Sq ft)	Description	AWULT (years)	Passing Rent pa (per sq ft)
On Market	10 Cullen Way, Park Royal, NW10	£4,490,000 (asking)	4.60%	n/a	n/a	3 tenants	7.80	£220,000
Under Offer	12 Waxlow Road, Park Royal	£14,430,000 (under offer in excess of)	3.00%	£336	42,889	Built 1998, single let. Low 30% site cover	6.00	£462,000 (£10.77 psf)
Under Offer	Martinbridge Trading Estate, Enfield	£47,590,000	3.5%	£170	280,015	Nine units ranging in size from 9,022 sq ft – 78,287 sq ft	7.87	£1,778,726 (£6.35 psf)
Jan 2018	The Griffin Centre, Feltham	£20,910,000	4.13%	£200	104,035	8 x industrial units (1,800 to 23,091 sq ft) & 2 x office buildings	5.20 to expiry (4.30 to break)	£925,547 (£8.87 psf)

Date of Completion	Address	Purchase Price	NIY	Cap Val (per sq ft)	Area (Sq ft)	Description	AWULT (years)	Passing Rent pa (per sq ft)
Dec 2017	401-409 Oldfield Lane, Greenford	£8,450,000	3.90%	£220	38,367	4 x trade counter units, ranging from 5,589 sq ft to 15,227 sq ft	8.30	£351,100 (£9.15 psf)
Nov 2017	Oldhams Trading Estate, Watford	£25,510,000	3.98%	£202	125,476	7 x units in 4 terraces	6.00 to expiry (3.8 to break)	£1,084,108 (£8.64 psf)
Nov 2017	Crown Business Centre, West Drayton	£19,060,000	3.90%	£275	69,214	14 x units on 4 terraces, 3 undergoing refurbishments	5 to expiry (3 to break)	£793,391 (£11.46 psf)
Oct 2017	Pier Road Industrial Estate, Feltham	£12,300,000	4,50%	£268	45,859	2 x units – 22,345sq ft & 23,514 sq ft	8.95 to expiry (3.95 to break)	£591,176 (£12.89 psf)
Sept 2017	Units 2-6 King George Close, Romford	£6,000,000	4.10%	£174	34,464	5 x 1980s units, ranging from 5,503 sq ft to 7,785 sq ft	3.50	-
Mar 2017	Unit 14, NCR Business Centre, 400 North Circular Road	£815,000	4.59%	£263	3,100	Multi-unit, light industrial building built in 2008	Unknown	To be £39,500 (£12.74 psf) when the new 10 year lease signs
Feb 2017	Leyton Business Centre, Leyton	£7,260,000	4.50%	£291	24,943	16 units arranged on a single terrace, ranging in size from 1,101 sq ft to 2,026 sq ft.	2.33 to break 3.1 to expiry	£982,360 (£12.79 psf)

6.17 The transactions provided illustrate NIY's of well below 5.00% and are reflective of the strength and demand for industrial investments as well as the potential to realise rental growth in some instances.

6.18 There have been few recent deals on Park Royal but, as evidenced above, the top three 2017 transactions are at sub 4.00% NIY and approaching £2,691 per sq m (£250.00 per sq ft) capital value. This demonstrates the strength of the prime end of the market.

Land Values

6.19 Industrial sites in Park Royal represent some of the most expensive industrial land in the UK. The value of land in this area is underpinned by excellent communication links, an established and diverse occupier base, proximity to Central London and a large consumer base, all of which ensure strong tenant demand and high rental levels which are expected to continue to grow. This has led to particularly strong investor demand in the area and low yields.

6.20 There have been a limited number of site sales over the last few years but we are aware of the following two which are illustrative of the level of industrial land values being realised:

- VDC Distribution Centre, Fourth Way, Wembley - a site with an existing 60,854 sq ft building constructed in 2005 on a 1.28-acre site. Very high site density, building foot print was circa 30,000 sq ft. Sold for £6.3 million in August 2015 which equates to some £4.9m per acre as a developed site.
- Western Road, Park Royal – a 1.12 acre vacant site located to the south of Asda in Park Royal was being marketed for sale in 2017. We understand the freehold title over the site without the benefit of planning consent was under offer at £5.58 million which equated to approximately £4.65 per acre. The deal never completed as the seller, Asda, decided to hold onto the site with the view of marketing it again when prices on the estate have risen further.

- Shurgard Self-Storage purchased the unit previously known as Scancon House, located directly opposite the subject site, on the north side of the North Circular, in November 2014 at a price of £2,650,000. Shurgard then developed a self-storage facility. We understand the overall site area to be approximately 0.62 acres, thus giving a site price of approximately £4,300,000 per acre but would comment that self-storage operators are generally able to utilise sites more intensively and thus are prepared to pay premium prices for suitable opportunities.

6.21 In a market where there is minimal capital appreciation, investors are seeking performance through rental growth and are therefore targeting the industrial sector due to its excellent recent rental growth performance and future prospects. As highlighted above, Park Royal is a location which is particularly well positioned to benefit from the weight of capital targeting industrial accommodation with strong rental growth prospects.

APPRAISAL SUMMARY

Industrial Scheme (Option 1)

PHASE		Months	Start Date	End Date
Phase 1	Pre-construction	24	Mar 2018	Feb 2020
	Construction	15	Mar 2020	May 2021
	Post Development	6	Jun 2021	Nov 2021
Total		**45**		

GROSS DEVELOPMENT VALUE		
Level 1 - (92,355 sq ft)	£16.50 psf, 18 months' rent free @ 4.5%	£31,700,000
Level 2 – (42,383 sq ft)	£21.00 psf, 12 months' rent free @ 4.5%	£18,930,000
Net Development Value (after purchaser's costs @ 6.8%)		**£47,400,000**

DEVELOPMENT COSTS		
Construction	134,738 GIA @ £126 psf	£16,980,000
Site Preparation Works	Indicative Average Case Cost as per Arcadis report for removal of landfill material to an elevation of approx. 2.5m above surrounding ground surface level.	£31,400,000
Contingencies	5.0%	£2,420,000
CIL		£440,000
Professional Fees	10.0%	£4,840,000
Developer's Contingency	5.0%	-
Letting & Disposal Costs		£1,325,000
Sub Total		**£57,405,000**
Finance	@ 5.50%	£3,410,000
Profit	12.5% on cost	£5,270,000
Total		**£66,085,000**
Residual Land Value	(negative land value)	**-£18,665,000**

6.22 Adopting the inputs and assumptions as set out in the tables above results in a residual site value of **negative £18.7m**. A printout of the appraisal together with a more detailed cost breakdown is attached as part of Appendix D.

6.23 We have undertaken a sensitivity analysis varying the construction costs and rent, but on the inputs the estimated rental values would have to increase by more than 10% and the construction costs reduce by more than 20% for the scheme to become viable.

Rent	Construction Cost				
	-20%	-10%	0%	+10%	+20%
-20%	-£22.21 m	-£24.02 m	-£25.84 m	-£27.67 m	-£29.51 m
-10%	-£18.64 m	-£20.43 m	-£22.23 m	-£24.04 m	-£25.87 m
0	-£15.11 m	-£16.88 m	**-£18.66 m**	-£20.49 m	-£22.26 m
+5%	-£11.62 m	-£13.37 m	-£15.14 m	-£16.10 m	-£18.69 m
+10.0%	-£8.16 m	-£9.90 m	-£11.65 m	-£13.40 m	-£15.16 m

Industrial Scheme (Option 2)

PHASE		Months	Start Date	End Date
Phase 1	Pre-construction	24	Mar 2018	Feb 2020
	Construction	15	Mar 2020	May 2021
	Post Development	6	Jun 2021	Nov 2021
Total		**45**		

GROSS DEVELOPMENT VALUE		
Level 1 - (58,529 sq ft)	£18.50 psf, 12 months' rent free @ 4.5%	£23,025,000
Level 2 – (103,011 sq ft)	£15.00 psf, 18 months' rent free @ 4.5%	£32,145,000
Net Development Value (after purchaser's costs @ 6.8%)		**£51,655,000**

DEVELOPMENT COSTS		
Construction	161,540 GIA @ £126 psf	£20,355,000
Site Preparation Works	Indicative Average Case Cost as per Arcadis report for removal of landfill material to an elevation of approx. 2.5m above surrounding ground surface level.	£31,400,000
Contingencies	5.0%	£2,590,000
CIL		£525,000
Professional Fees	10.0%	£5,175,000
Developer's Contingency	5.0%	-
Letting & Disposal Costs		£1,420,000
Sub Total		**£61,465,000**
Finance	@ 5.50%	£3,570,000
Profit	12.5% on cost	£5,740,000
Total		**£70,775,000**
Residual Land Value	(negative land value)	**-£19,115,000**

6.24 Adopting the inputs and assumptions as set out in the tables above results in a residual site value of **negative £19.1m**, again, a printout of the appraisal together with a more detailed cost breakdown is attached as part of Appendix D. The resultant residual site value is not that dissimilar to Option 1. A sensitivity analysis suggests similar results that the estimated rental values would have to increase by more than 10% and the construction costs reduce by more than 20% for the scheme to become viable.

Rent	Construction Cost -20%	-10%	0%	+10%	+20%
-20%	-£22.59 m	-£24.76 m	-£26.95 m	-£29.16 m	-£31.37 m
-10%	-£18.70 m	-£20.85 m	-£23.01 m	-£25.19 m	-£27.38 m
0	-£14.85 m	-£16.98 m	**-£19.12 m**	-£21.27 m	-£23.43 m
+5%	-£11.05 m	-£13.15 m	-£15.27 m	-£17.39 m	-£19.53 m
+10.0%	-£7.30 m	-£9.37 m	-£11.46 m	-£13.56 m	-£15.68 m

INDUSTRIAL CONCLUSIONS

6.25 As previously mentioned, the subject site would be regarded as the prime location within Park Royal for an industrial scheme, were the land to become available. The prominence of the site coupled with the direct access to the road networks makes it an ideal industrial location. Given the shape and configuration of the site it would not be possible to deliver a scheme that fully utilises the whole 9.46 acres. Our approach has been to divide the site into two areas having regard to the potential levels at the site, with the northern part of the site providing smaller units and the main body of the site providing a large distribution / warehouse unit.

6.26 In considering industrial uses at the property we are mindful of OPDC's planning policy to encourage intensification of uses and also the need to accommodate waste uses. We have run an appraisal assuming a 180,000 sq ft two storey distribution warehouse facility. The resultant residual value is negative £27.2 m, again this is more as a result of the site clearance costs rather than the scheme itself. Additional storeys may add value.

6.27 As an additional site intensification test, we have run appraisals assuming a 10%, 20%, 30% and 40% increase in the accommodation provided. As highlighted by the table provided below, the sensitivity shows that as the quantum of accommodation increases so does the residual site value, albeit still being negative. In order to achieve a positive site value, the accommodation would need to increase by a minimum of 120%, again the site remediation costs impact heavily on the viability of any potential scheme.

Unit	Base (Sq ft)	10% (Sq ft)	20% (Sq ft)	30% (Sq ft)	40% (Sq ft)
Unit 1	58,529	64,382	70,235	76,088	81,941
Unit 2	103,011	113,312	123,613	133,914	144,215
Residual	**-£19,100,000**	**-£17,400,000**	**-£15,700,000**	**-£14,000,000**	**-£12,300,000**

6.28 It would be possible to accommodate a waste use on the site. The detailed design would be dependent upon the type of waste use facility being proposed. Often such uses take standard industrial space and then incur expenditure adapting the premises to their own particular requirements. The value of such facilities is often more reflected in the planning and waste consents as opposed to the buildings themselves which have been adapted by the operators. We are therefore of the view that an appraisal for a waste use would result in a similar site value to that of an industrial use.

BUSINESS PARK / OFFICE SCHEME

BUSINESS PARK / OFFICE SCHEME

7.1 The Business Park scheme consist of the following elements;

- Units A – C provide 500,300 sq ft (46,750 sq m) of office accommodation over 5 storeys
- Business Park Tower providing 376,700 sq ft (35,000 sq m) of office accommodation over 15 storeys
- Business Park services building providing 26,900 sq ft (2,500 sq m) of accommodation and car parking spaces.



7.2 The plan and supporting notes can be found at **Appendix D**

7.3 The offices are set within a landscaped park area with potentially part of the mound area retained as a feature. Vehicular access is via the existing road off Abbey Road with the potential for some car parking at lower ground levels. There could be a possibility of a mix of uses with say a car showroom located on the prominent north western corner of the site fronting the North Circular.

MARKET COMMENTARY

OCCUPATIONAL MARKET OVERVIEW

7.4 Park Royal is located within the Thames Valley region insofar as office accommodation is concerned. A total of 907,383 sq ft was acquired for occupation across the Thames Valley region during H2 2017, boosting the full year total to 1.6 million sq ft. This was 15% higher than 2016 and marginally below the five-year average. Whilst there was a lack of large deals overall in the South East over 2017, encouragingly H2 saw a positive rally with eight deals above 40,000 sq ft, six of which were in the Thames Valley. The largest two deals in H2 (both above 50,000 sq ft) were FM Global Insurance's acquisition of 56,903 sq ft at Voyager Place, Maidenhead and a co-working provider's acquisition of 52,023 sq ft at 12 Hammersmith Grove, Hammersmith.

7.5 Approximately 362,098 sq ft of office space was under offer in the Thames Valley region at the end of 2017, up 30% from the end of 2016. Although the majority of current demand is in the sub-20,000 sq ft size band, momentum of strategic large requirements is expected to build in 2018 due to the large number (49) of lease expiries and breaks for occupiers in space of 50,000 sq ft+ before the end of 2021.

7.6 There was 7.4 million sq ft of available office space in the Thames Valley at the end of 2017, a decrease of 10% from the end of 2016. Grade A office space accounted for 3.9 million sq ft of this total, 19% higher than the five-year average. 2017 saw the peak of the development cycle with 1.7 million sq ft of new office development delivered to the Thames Valley region. A significant slowdown is now anticipated, with approximately 430,000 sq ft across three schemes due to complete in 2018.

7.7 Rents in the Thames Valley generally remained stable in 2017 although record levels were set in specific locations such as Reading, Slough and Maidenhead, driven by the delivery of new stock. In 2018, there may be pressure on rents with more generous incentive packages (already starting to happen) in those locations which have seen a substantial increase in Grade A space.

OCCUPATIONAL MARKET EVIDENCE

7.8 Given the majority of land use in Park Royal is industrial, the office market is relatively thin. We have provided a schedule of rental evidence from the last six months that covers Park Royal and the wider Thames Valley market.

Address	Size (Sq ft)	Rent (Per sq ft)	Lease Term (Years)	Tenant
200 First Central, London, NW10	22,991	£30.00 (24 months' rent free)	12	Regus (UK) Limited
7 Chiswick Park. London, W4	28,107	£55.00 (30 months' rent free)	15	CCTV Limited
Voyager Place, Maidenhead, SL6	59,903	£32.50	15	FM Global Insurance
12 Hammersmith Grove, London, W6	52,023	£55.00	20	Co-working provider
184 Shepherds Bush Road, London, W6	45,997	£52.50	14	Co-working provider
Kennet Place, Reading, RG1	42,120	£29.50	3	The Instant Group
Maxis 2, Western Road, Bracknell, RG12	41,846	£24.00	10	Panasonic Plc
Maxis 2, Western Road, Bracknell, RG12	23,800	£24.00	5	JDA

OPINION OF RENTAL VALUE

7.9 In forming our opinion of rental value we have discounted any evidence from Chiswick Park, despite also being located in close proximity to the North Circular, we are of the view that Chiswick Park is a more desirable location due to its superior transport links, accessibility and general amenities including its proximity to Chiswick town centre.

7.10 The letting at 200 First Central provides the most comparable transaction due to its close proximity to the subject property. However, the First Central scheme has proved difficult to let with only three deals since 2010, and 49,587 sq ft of accommodation still available at a quoting rent of £36.00 per sq ft. This is illustrative of the lack of demand for office space in Park Royal. It is assumed that any proposed office scheme at the subject site would be a discount to the quoting rent of First Central due to inferior transport links and the scheme lacking a 'sense of place'.

7.11 With the above in mind, we have adopted the following rental packages within our appraisals;

Block	Rent	Rent Free	Marketing / Letting Void
Building A, B, C	£30.00	24 months	18 months
Tower Building	£32.50	24 months	18 months
Building Park Services	£30.00	12 months	18 months

INVESTMENT MARKET

7.12 The 2017 South East office market ended positively with 25 deals transacting or exchanging in December alone, totalling £740m and showcasing sustained appetite and value perception. Sizable H2 deals included Frasers Property International's £175m (6.80%) purchase of Farnborough Business Park and Spelthorne Borough Council's £170m (5.25%) acquisition of 12 Hammersmith Grove. With nine recorded purchases, their combined activity represented 24% of the £4.11bn year total, just 3% below the record 2015 level.

7.13 Over H2 2017 £3bn transacted, just shy of 2016 volumes (£3.23bn). This significant uptick on H1, following April's announcement of a June general election was little surprise given there was £1.5bn worth of stock either marketed or under offer at the half year point.

7.14 2017 will be remembered for its similarities to 2016, with uncertainty shrouding the market and 2016's new entrants, overseas investors and local authorities, making an ever-deepening impression. Local authority (£743m/31 transactions) and overseas (£1.63bn/24 transactions) investment volumes grew 48% and 57% respectively year-on-year. Investment from institutions was also up 53% year-on-year (though still down 61% on 2015) and property companies largely the same. Collectively this meant the buyer pool widened. Across the year CBRE recorded 125 different buyers, with only seven of these acquiring more than two assets.

7.15 We expect current sentiment to last in 2018. Best in class assets will continue to attract the interest of larger institutions with focused strategies and overseas investors. This could lead to the prime South-East yield of 5.25% hardening, as seen in the likes of Manchester and Birmingham, should the stock present itself. It is also anticipated that a high volume of secondary stock will be sold to take advantage of the large diverse buyer pool. This includes enduring demand from developers looking to extract value from permitted development rights on office properties with vacant possession/short term income.

APPRAISAL SUMMARY

7.16 The table below provides a summary of the key value inputs that have been applied in undertaking the residual appraisal of the Business Park / Office scheme;

Phase		Months	Start Date	End Date
Phase 1 & 2	Pre-construction	24	Mar 2018	Feb 2020
(Building B & C)	Construction	24	Mar 2020	Feb 2022
	Post Development	18	Mar 2022	Aug 2023
Phase 3	Pre-construction	36	Mar 2018	Feb 2021
(Building A)	Construction	24	Mar 2021	Feb 2023
	Post Development	18	Mar 2023	Aug 2024
Phase 4	Pre-construction	48	Mar 2018	Feb 2022
(Tower)	Construction	24	Mar 2022	Feb 2024
	Post Development	18	Mar 2024	Aug 2025
Total		**90**		

GROSS DEVELOPMENT VALUE		
Building A – C (Inc Business Park Services)	£30.00, 24 months' rent free @ 5.0%	£218,465,000
Tower	£32.50, 24 months' rent free @ 5.0%	£166,590,000
Net Development Value (after purchaser's costs @ 6.8%)		**£360,535,000**

DEVELOPMENT COSTS		
Construction	906,872 sq ft GIA @ £240 psf	£217,650,000
Site Preparation Works	Indicative Average Case Cost as per Arcadis report for removal of landfill material to an elevation of approx. 2.5m above surrounding ground surface level.	£31,400,000
Contingencies	5.0%	£12,455,000
CIL		£2,950,000
Professional Fees	12.0%	£29,885,000
Developer's Contingency	5.0%	-
Letting & Disposal Costs		£10,085,000
Sub Total		**£304,425,000**
Finance	@ 5.50%	£33,725,000
Profit	20% on cost	£60,090,000
Total		**£398,240,000**
Residual Land Value	(negative land value)	**-£37,700,000**

7.17 Adopting the inputs and assumptions as set out in the tables above results in a residual site value of **negative £37m**. A printout of the appraisal together with a more detailed cost breakdown is attached as part of Appendix E.

SENSITIVITY

7.18 We have undertaken sensitivity analysis on the construction costs and rental values as summarised in the table below:

		Construction Cost				
		-10%	-5%	0%	+5%	+10%
Rent Rate	-10%	-£38.00 m	-£49.59 m	-£61.31 m	-£73.14 m	-£85.06 m
	-5%	-£26.64 m	-£37.85 m	-£49.42 m	-£61.14 m	-£72.96 m
	0	-£15.64 m	-£26.49 m	**-£37.70 m**	-£49.26 m	-£60.97 m
	+5%	£5.00 m	-£15.50 m	-£26.34 m	-£37.54 m	-£49.10 m
	+10%	£5.03m	-£4.86 m	-£15.36m	-£26.19 m	-£37.39 m

7.19 The sensitivity analysis illustrates that construction costs would need to decrease by say 10% and rental values increase by 5% before a positive site value is achieved.

CONCLUSION

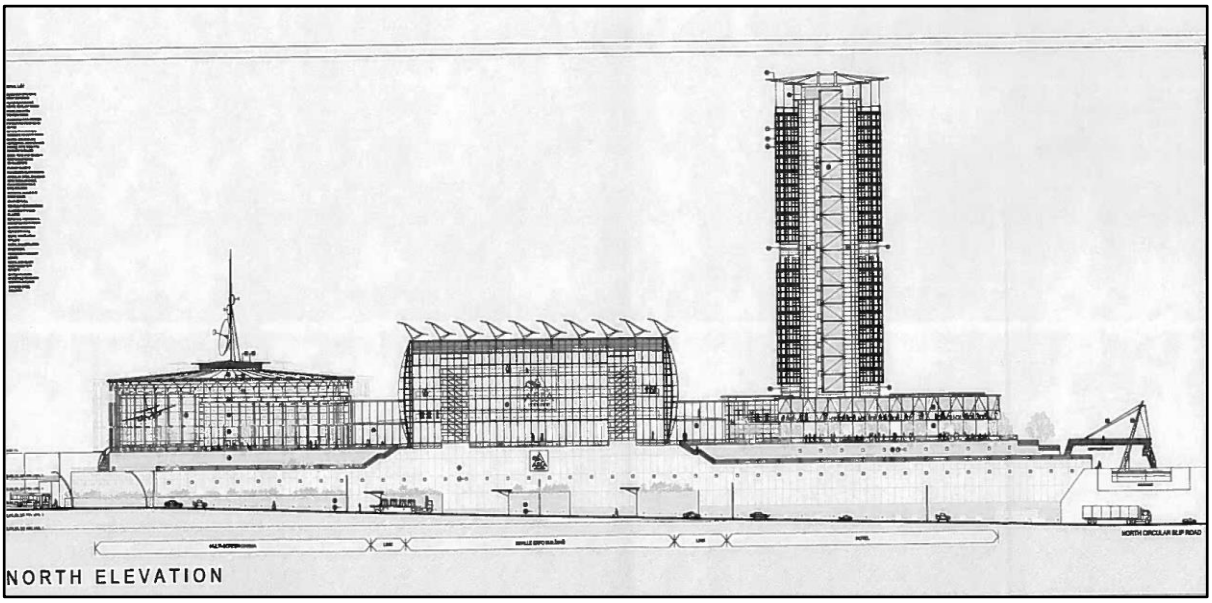
7.20 Park Royal has a very limited office market. First Central provides the closest and most comparable scheme to the subject site, although it is in a more desirable location and benefits from being part of larger scheme surrounded by considerable amounts of 'green space' and public realm, all of which contribute to making a 'sense of place'. However, as previously mentioned, First Central has struggled to let since first launching in 2010 and c.50,000 sq ft is still available.

7.21 Regardless of the proposed massing scheme for the subject site, we are of the view that there are fundamental issues with the location and surroundings uses that will hinder the performance of any office scheme. Being located between a refuse and recycling centre and the North Circular, with poor access to Stonebridge Park station, limited available on-site car parking and minimal local amenities, an office scheme would struggle to attract occupiers. Taking into consideration the performance of First Central and the subject site being in an inferior location in comparison, together with the costs associated with site clearance, we conclude that it would not be viable to deliver an office scheme in this location.

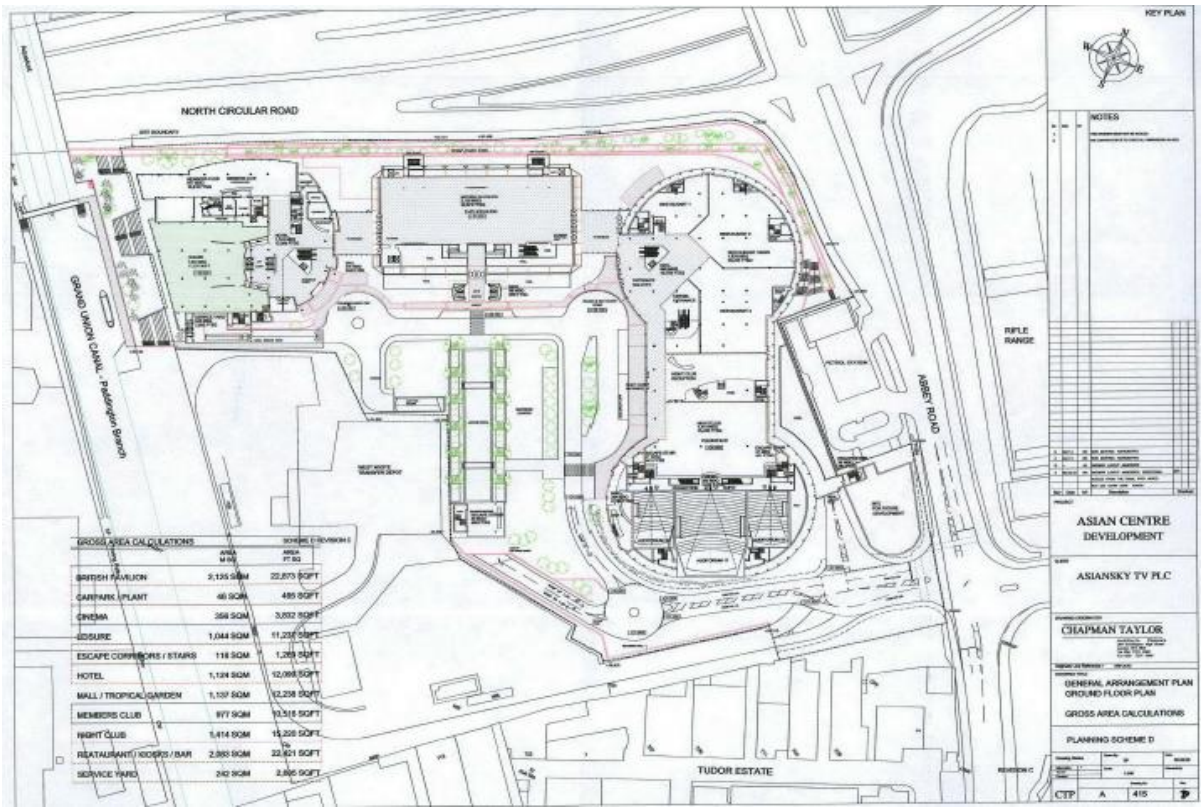
EXTANT CONSENT

8.1 As previously mentioned, the site has an extant planning consent, dated September 1993, for the removal of tipped spoil and erection of an Asian Centre comprising hotel, television centre, social community and leisure facilities (including open space and a canal footbridge) with a service road and car parking.

8.2 The plan below shows the north elevation of the consented scheme.



8.3 The proposed ground floor uses and layout are illustrated on the plan below:



8.4 The extant scheme is primarily a leisure scheme and we have reviewed its content with our colleagues in CBRE's Specialist Markets Team. They have advised that it would neither be possible nor appropriate to develop certain elements of the extant scheme. In particular, they advise that it would not be possible to obtain a casino licence within the London Borough of Brent.

8.5 If the extant consent were to be built out the main competition would be derived from the existing Park Royal leisure park located off the A40 near Hanger Lane. This scheme provides a cinema, restaurants and gym. It is considered that there would be little appetite from occupiers to take space at the subject site due to the leisure park being an established location that benefits from superior transport links. Furthermore, CBRE's Agency colleagues advise that since the 1990's there has not been any demand for out-of-town night clubs or gentleman's clubs therefore making the proposed scheme redundant.

8.6 Insofar as a hotel is concerned, as mentioned above, the local market is potentially reaching saturation with a number of schemes proposed, most better located in Park Royal or Wembley with better access to public transport.

8.7 Having regard to the input from CBRE's Specialist Markets Team we have concluded that the extant consent would not be viable due to a lack of demand and high levels of competition from the neighbouring Park Royal leisure park and better located hotels. We acknowledge that the motive for ownership and the development of some leisure uses, such as football clubs, does not always hinge upon the end scheme being a viable proposition. There is therefore always a possibility of a philanthropic individual or organisation proceeding with a scheme which is not viable in terms of traditional market value considerations.

CONCLUSIONS

9.1 We would recommend that if possible, the tip should be investigated further as some of the site clearance assumptions may be prudent. Arcadis consider that the removal of a substantial proportion of the tipped material would be required, principally due to an assumed requirement to tie-in any levels on site with those in the immediate surrounds, to a greater or lesser degree. This assumed requirement is planning-led and subject to approval of the regulatory authorities it may be possible to retain a greater proportion of the tipped material. In addition, the proportion of material that could feasibly be retained on site is likely to be affected by the composition of the tipped material and specifically the degree and nature of associated contamination and its engineering properties. However, without further due diligence, it would be inappropriate at this stage to adopt any other site clearance costs than those advised by Arcadis.

9.2 We have undertaken indicative appraisals on residential, industrial and office and residential master plan schemes. However, due to the upfront costs required for site clearance and preparation works our initial conclusion is that none of the schemes are viable (with the exception of a residential scheme indicating 100% units for private sale, although we have some reservations as such a scheme would be contrary to planning policy and there may be issues on funding given the ground conditions). We have had regard to the cost estimates and timescales provided in the Arcadis report dated February 2016 and taken the indicative average costs at £48.0m to remove the landfill and match surrounding surface elevations for a residential scheme and £31.4m for the removal of landfill material to approx. 2.5m above surrounding ground surface levels for the commercial led schemes.

9.3 Due to the level of contamination on the site and the associated remediation costs none of the land uses or scale of developments explored prove to be viable. We have summarised our views on the main potential uses below:

▪ Residential	Unsure if housebuilders would have the appetite to build on the former Twyford tip, adjoining a heavily trafficked road with associated fumes / noise and being situated next to a fully operational waste transfer site. Also there may be difficulties in securing funding e both to a developer and potential future occupiers for mortgage purposes. The site is poorly connected to public transport with access to Stonebridge Park via a footbridge over the North Circular. CVs anticipated to be at a discount to developments nearby, say £550 per sq ft max.
▪ Industrial	Great location with good prominence. Can accommodate a range of smaller units, say 3,000 to 10,000 sq ft perhaps in a terrace, with a single larger unit. Potential for site intensification with multi-storey industrial concept. Potential for waste uses.
▪ Business Park / Offices	Not an office / business park location, poor public transport links, would require large amount of car parking facilities. First Central 200 scheme struggles to let with max 75% let. Concern regarding lack of demand.
▪ Hotel	Limited appeal. Local market potentially reaching saturation with a number of schemes proposed, most better located in Park Royal off the A40 with better access to public transport.
▪ Student Accommodation	Limited appeal, similar concerns to residential in respect of location, environment, lack of amenities, walk to train station and not a student hub
▪ Retail	Potential as an ancillary use at ground floor.

- Car Showroom — Potential for location on prominent corner of the site but as part of a mixed use scheme.

9.4 The table below summarises the residual site values generated by each appraisal:

Scheme	Residual Land Appraisal
Extant	N/A
Residential (50% affordable)	-£26,950,000
Residential (35% affordable)	-£19,000,000
Residential;(35% affordable) Revised Site Clearance Costs	£-£17,950,000
Residential (50% affordable) & Hotel Scheme	-£41,000,000
Residential (50% affordable) – Revised Site Clearance Costs	-£28,600,000
Industrial (Option 1)	-£18,700,000
Industrial (Option 2)	-£19.100,000
Industrial (Multi-storey)	-£31,100,000
Business Park / Office	-£37,700,000

9.5 The degree of negative value ranges from negative c £19m for an industrial scheme, negative £37m for an office / business park scheme and negative £27m for the residential scheme with 50% affordable (ignoring the scheme which includes a hotel). Whilst we have run some sensitivities on the appraisals, with the quantum of upfront site clearance and preparation costs the residual site values demonstrate relatively little sensitivity to any other inputs. We conclude therefore that having regard to the level of contamination and site clearance costs, in the absence of any additional enabling funding, no land use or scale of development appears to be viable.

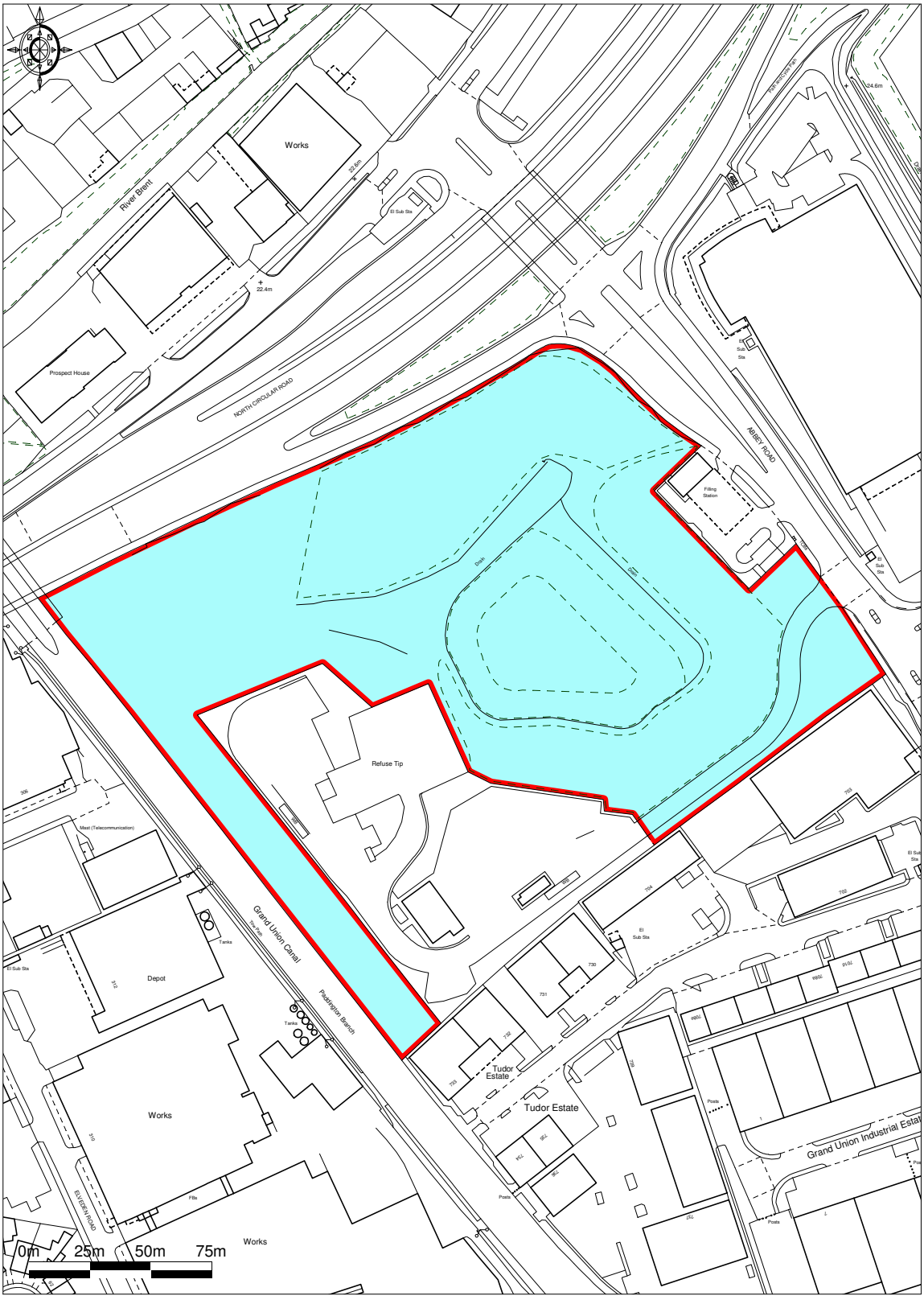
9.6 However, having undertaken the exercise, our initial view is that industrial uses would be most appropriate for the Abbey Road site if a solution could be identified to the site clearance / preparation and funding thereof. The current land designation as Strategic Industrial Land does therefore appear to be appropriate for the site.

APPENDICES

APPENDIX A

LOCATION PLANS

Abbey Road, London NW10

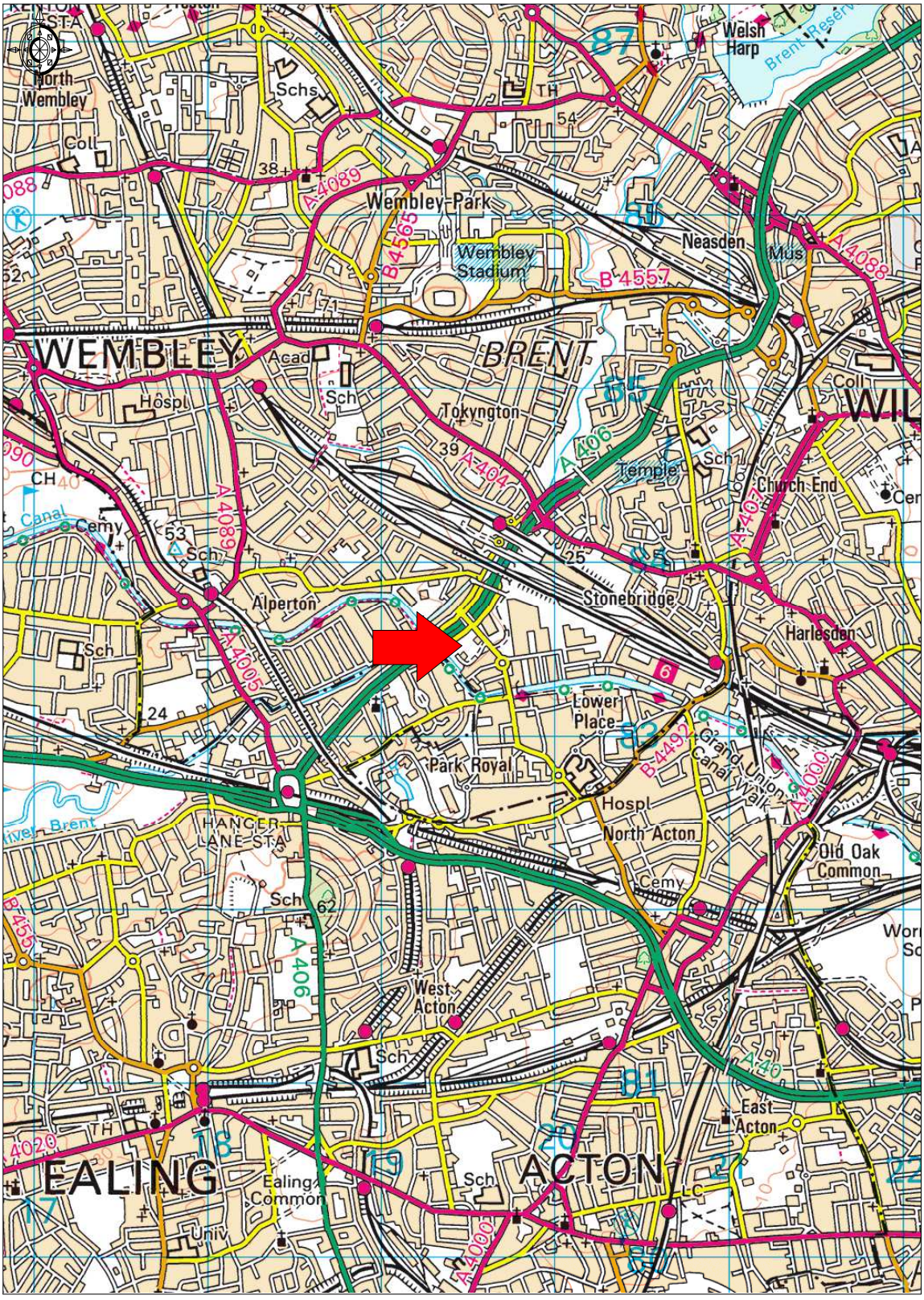


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This plan is published for convenience of identification only and although believed to be correct its accuracy is not guaranteed and does not form any part of a contract.

Location Plan,
Abbey Road, London NW10



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This plan is published for convenience of identification only and although believed to be correct its accuracy is not guaranteed and does not form any part of a contract.

Situation Plan,
Abbey Road, London NW10



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This plan is published for convenience of identification only and although believed to be correct its accuracy is not guaranteed and does not form any part of a contract.

APPENDIX B

PHOTOGRAPHS



View across the canal (west elevation)



Junction of Abbey Road & the North Circular (north east elevation)



View north along Abbey Road



Access road to the subject site



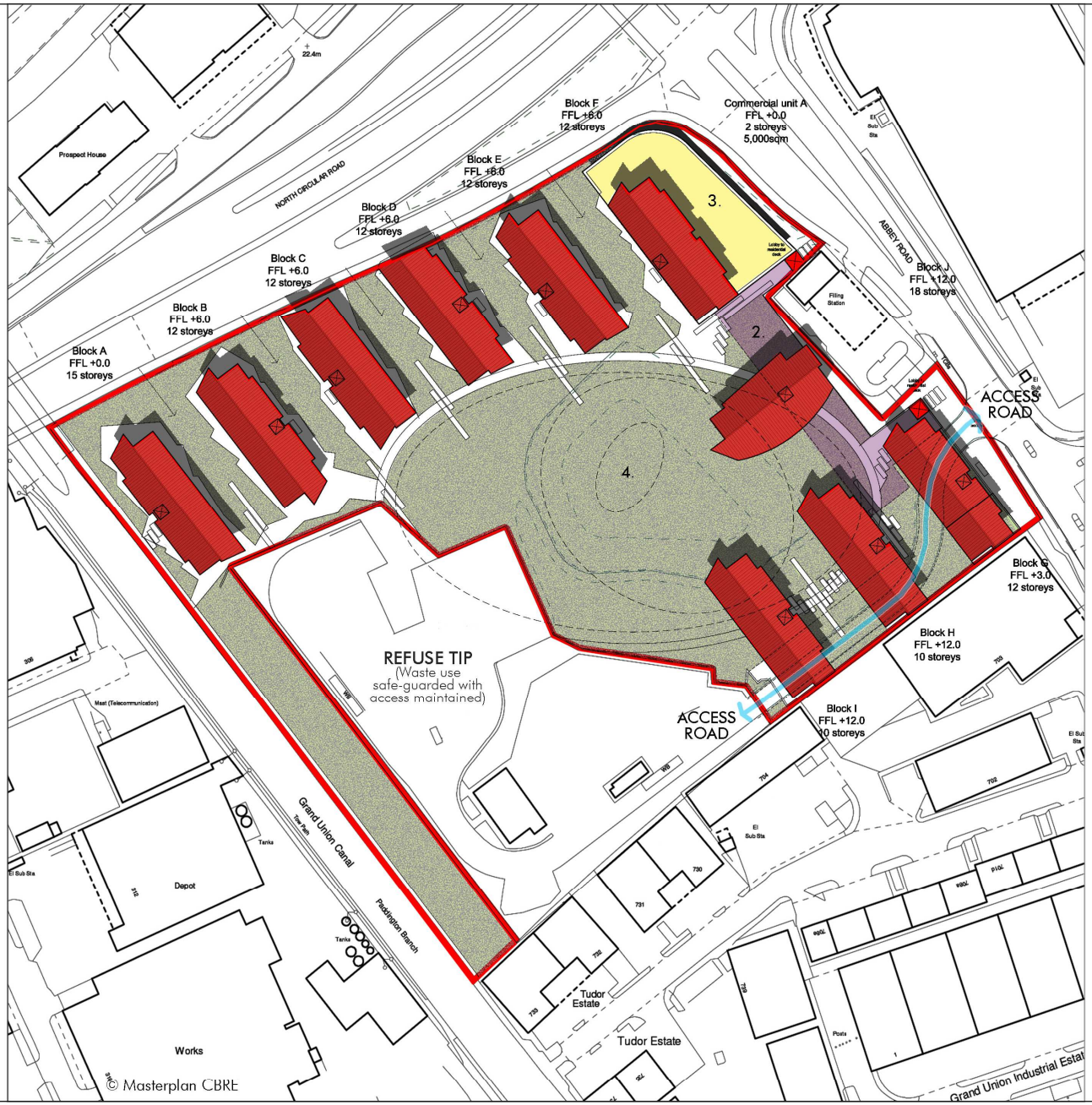
Esso garage to the east of the site



Access road to the site

APPENDIX C

RESIDENTIAL ANALYSIS



NOTES

(All areas are stated as GEA sqm; indicative areas only).

Study area:

1. All Residential 118,750sqm (c.1,250 units; mix of 1Bd/ 2Bd/ 3Bd); c. 330dus/ha.

2. Services building to serve all residential: parking, cycle store, refuse storage, etc; gstreet acess and lobby to residential buildings (c.3,450sqm; 2-storeys); access off common junction.

3. Commercial 5,000sqm (facing Abbey Road; access off common junction).

4. Masterplan creates central (domed) landscape parklands over existing landfill mound to address POS requirement. Land adjacent to Grand Union Canal part of POS.

5. Block F could be a strategic location for hotel c. 200keys (currently allowed as residential).

General:
a. Refuse tip safe-guarded; existing access junction and road alignment to refuse tip to be maintained. Road placed in undercroft with provision for head clearance to permit large vehicles.

b. Junction capacity to site not known.

100m

Indicative only; should not be scaled

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OPDC
OLD OAK AND
PARK ROYAL
DEVELOPMENT
CORPORATION

PROJECT: LAND AT ABBEY ROAD
TITLE: **DEVELOPMENT OPTIONS APPRAISAL: Residential**

v01 Client comments
CLIENT: The Old Oak and Park Royal Development Corporation (OPDC) I February 2018 I Dwg: SK1/v01 I Peter Dijkhuis

CBRE
St Martin's Court I 10 Paternoster Row I London EC4M 7HP I DD. 020 7182 3379

BUILDING CONSULTANCY - INTERNAL CONSULTING, VALUATION & ADVISORY SERVICES
MIXED-USE DEVELOPMENT & MULTI-ACTIVITY SITES - INDICATIVE BUILDING COST ASSESSMENT

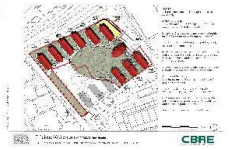
CBRE

SITE ADDRESS & CLIENT: Land at Abbey Road, London NW10 (London Borough of Brent)

The Site is a brownfield site of approximately 3.83 hectares adjacent to the North Circular Road, Park Royal, NW10. A number of scenarios for development are considered and this estimate relates to the development of the land for ***RESIDENTIAL*** *use.*
Due to the site's former use, a number of challenges exist with regards to exsiting ground conditions including, but not limited to, contamination, landfill and potentially hazardous material, existing site levels and site contours. A waterway is located adjacent to the site and therefore development will consider prevention of pollution.
The Arcadis Report HIGH LEVEL LIABILITIES ASSESSMENT dated February 2016 provides signfiicant detail on this point.
This high level assessment is based on the details noted on CBRE Devekopment Option Appraisal dated February 2018 Dwg. SK3v00

Proposed GIA FT2	1,337,427
Proposed GIA M2	124,250
Proposed NIA FT2	N/A
Proposed NIA M2	N/A

ACTIVITY DESCRIPTION		AREA (M2)	RATE (£/M2)	RATE (£/Ft2)	SUB-TOTAL	FEES (@ 12%)	TOTAL
1.0	Site Preparation and Facilitating Works - Arcadis 'Average Case Sc.2'			-	48,100,000	5,772,000	53,872,000
2.0	Residential Blocks A to F	71,250	2,143.00	199.09	152,689,000	18,323,000	171,012,000
3.0	Residential Blocks G to I	30,400	2,143.00	199.09	65,148,000	7,818,000	72,966,000
4.0	Residential Block J	17,100	2,571.60	238.91	43,975,000	5,277,000	49,252,000
5.0	Commercial Unit(s)	5,500	1,559.00	144.83	8,575,000	1,029,000	9,604,000
6.0	External Works and Landscaping	-		-	13,520,000	1,623,000	15,143,000
7.0	Activity 7	-		-	-	-	-
8.0	Activity 8	-		-	-	-	-
	TOTAL	124,250			332,007,000	39,842,000	371,849,000



Cost £/m2 (Excluding Ground Remediation)	2,285	274	2,559
Cost £/Ft2 (Excluding Ground Remediation)	212	25	238
Total Cost £/m2	2,672	321	2,993
Total Cost £/Ft2	248	30	278

This approximate estimate is prepared with the intention of providing guidance only and represents the opinion of the named advisor only
This advice does not constitute an Order of Cost Estimate (OCE) or Formal Cost Plan (FCP) as defined by the RICS New Rules of Measurement (NRM).
The costs are based on a combination of in-house benchmark data, project costs, published indicies and BCIS costs

This Indicative Building Cost Assessment excludes (among other things) the following:

- Value Added Tax
- Legal fees & land acquistion
- Section 106 & 278 Agreements, planning obligations and Community Infrastructure Levy
- Costs payable to other tenants & neighbours due to disruption
- Highways works & footbridges

Prepared by: M Rahim ACIOB AssocRICS
Director, Building Consultancy

Reference: MR_020318_JA

Date: 2nd March 2018

CBRE

Indicative Building Cost Assessment (Part 2)

Checklist of Information Provided for Review

The following records the outline basis of the information provided for review in connection with the preparation of this Building Cost Estimate. For full details of the recommended Schedule of Information Requirements for the Preparation of Order of Cost Estimates and Formal Cost Plans, please refer to RICS New Rules of Measurement (NRM Part 1)

Property Details:

Client Name & Property Title: Old Oak and Park Royal Development Corporation

Property Address: Land at Abbey Road, London NW10.

1. Description of Building and Building Use (Uniclass Definition): ✓
2. Site Address (Region/Town/Postcode): ✓
3. Building Dimensions/Number of Storeys (Specifiy Gross/Nett Internal Area): ✓
4. Details of Building Heating, Ventilation and Cooling Strategy: ✗
5. Building Age / Year of Development: ✓
6. Building Lifespan: ✗
7. Details of any Site Particular Conditions: ✓
8. Indicative Environmental and Sustainability Strategy: ✗
9. Roof Plans and Building Sections: ✗
10. Photographs and/or Building Survey Report: ✗
11. Descriptions of External Works: ✗
12. Number of car-parking spaces and whether above or below ground: ✗
13. Specific Structural/Civil/Highways Engineering Works and Services (State Excluded/Included): ✗
14. Number of lifts and central service cores: ✗
15. Order of Cost Estimate or Formal Cost Plan prepared by Consultant or other 3rd Party: ✗

Additional notes relating to Item 15:

.....

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16. Additional information notes: ✗

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Overall scoring for provision of Information Requirements: **LOW /~~MEDIUM~~ /~~HIGH~~**

Opinion on overall alignment with expected parameters: **N/A**

Notes & Clarifications:

1) The foregoing advice represents the opinion of the named advisor only. This advice does not constitute an Order of Cost Estimate (OCE) or Formal Cost Plan (FCP) as defined by RICS (New Rules of Measurement).

2) This appraisal excludes any allowances for VAT, legal fees, site acquisition and disposal, costs payable to tenants and/or neighbours as a result of disruption and highways/statutory authority charges unless specifically stated to the contrary.

Abbey Road, Park Royal
OPDC
Residential Scheme

Development Appraisal
Prepared by JA/CM
Licensed Copy
22 March 2018

APPRAISAL SUMMARY

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Abbey Road, Park Royal
OPDC
Residential Scheme

Summary Appraisal for Merged Phases 1 2 3

Currency in £

REVENUE

Sales Valuation	**Units**	**ft²**	**Rate ft²**	**Unit Price**	**Gross Sales**
Blocks ABC - Private	1	159,522	550.00	87,737,320	87,737,320
Blocks ABC - Intermediate	1	111,666	365.00	40,757,944	40,757,944
Blocks ABC - Affordable Rent	1	47,857	249.00	11,916,343	11,916,343
Blocks DEFG - Private	1	196,335	550.00	107,984,360	107,984,360
Blocks DEFG - Intermediate	1	137,434	365.00	50,163,556	50,163,556
Blocks DEFG - Affordable Rent	1	58,901	249.00	14,666,299	14,666,299
Blocks HIJ - Private	1	310,864	550.00	170,975,200	170,975,200
Blocks HIJ - Intermediate	1	108,802	365.00	39,712,876	39,712,876
Blocks HIJ - Affordable Rent	1	46,630	249.00	11,610,770	11,610,770
Totals	**9**	**1,178,011**			**535,524,669**

Rental Area Summary	**Units**	**ft²**	**Rate ft²**	**Initial MRV/Unit**	**Net Rent at Sale**	**Initial MRV**
Blocks DEFG Commercial	1	43,056	30.00	1,291,680	1,291,680	1,291,680
Totals	**1**	**43,056**			**1,291,680**	**1,291,680**

Investment Valuation

Blocks DEFG Commercial					
Market Rent	1,291,680	YP @	5.0000%	20.0000	
(1yr 6mths Rent Free)		PV 1yr 6mths @	5.0000%	0.9294	24,010,488
					24,010,488

GROSS DEVELOPMENT VALUE				**559,535,157**
Purchaser's Costs		6.80%	(1,528,758)	
				(1,528,758)
NET DEVELOPMENT VALUE				**558,006,399**
NET REALISATION				**558,006,399**
OUTLAY				
ACQUISITION COSTS				
Residualised Price (Negative land)			(26,949,091)	
				(26,949,091)

CONSTRUCTION COSTS

Construction	**ft²**	**Rate ft²**	**Cost**	
Blocks DEFG Commercial	53,820 ft²	212.00 pf²	11,409,840	
Blocks ABC - Private	199,403 ft²	212.00 pf²	42,273,436	
Blocks ABC - Intermediate	139,582 ft²	212.00 pf²	29,591,384	
Blocks ABC - Affordable Rent	59,821 ft²	212.00 pf²	12,682,052	
Blocks DEFG - Private	245,419 ft²	212.00 pf²	52,028,828	
Blocks DEFG - Intermediate	171,793 ft²	212.00 pf²	36,420,116	
Blocks DEFG - Affordable Rent	73,626 ft²	212.00 pf²	15,608,712	
Blocks HIJ - Private	388,580 ft²	212.00 pf²	82,378,960	
Blocks HIJ - Intermediate	136,003 ft²	212.00 pf²	28,832,636	
Blocks HIJ - Affordable Rent	58,287 ft²	212.00 pf²	12,356,844	
Totals	**1,526,334 ft²**		**323,582,808**	**323,582,808**

Contingency	5.00%	18,584,140	
Developers Contingency	5.00%	16,179,140	
Site Preparation Works		48,100,000	
			82,863,281
Section 106 Costs			
CIL - Mayoral		2,253,125	
			2,253,125
PROFESSIONAL FEES			
Professional Fees	12.00%	44,601,937	
			44,601,937
MARKETING & LETTING			
Marketing		1,500,000	

Abbey Road, Park Royal
OPDC
Residential Scheme

Letting Agent Fee	10.00%	129,168	
Letting Legal Fee	5.00%	64,584	
			1,693,752
DISPOSAL FEES			
Sales Agent Fee	1.00%	5,580,064	
Sales Legal Fee	0.50%	2,790,032	
			8,370,096
FINANCE			
Debit Rate 5.500%, Credit Rate 0.000% (Nominal)			
Total Finance Cost			28,589,415
TOTAL COSTS			**465,005,322**
PROFIT			
			93,001,076

Performance Measures

Profit on Cost%	20.00%
Profit on GDV%	16.62%
Profit on NDV%	16.67%
Development Yield% (on Rent)	0.28%
Equivalent Yield% (Nominal)	5.00%
Equivalent Yield% (True)	5.16%
IRR	18.81%
Rent Cover	72 yrs
Profit Erosion (finance rate 5.500%)	3 yrs 4 mths

APPENDIX D

INDUSTRIAL ANALYSIS



NOTES

(All areas are stated as GEA sqm; indicative areas only)

Study area:

1. Industrial/ Logistic shed Unit 1 (blue) - footprint 7,800sqm; office building 780sqm (2-storey), shed could include mezzanine at 10%; will require retaining walls and ramp to create level yard, docking + circulation space.

2. Industrial/ Logistic shed Unit 2 (purple) footprint 3,150sqm; mezzanine at 10% - 315sqm; will require retaining walls to create level yard + circulation space.

3. Provision for admin/ entry control building; 400sqm (2-storey).

4. Assumes considerable re-profiling of landfill- and part removal from site.

General:

a. Refuse tip safe-guarded; existing access junction and road alignment to refuse tip to be maintained. Road placed in undercroft with provision for head clearance to permit large vehicles.

b. Junction capacity to site not known.

100m

Indicative only; should not be scaled

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OPDC
OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

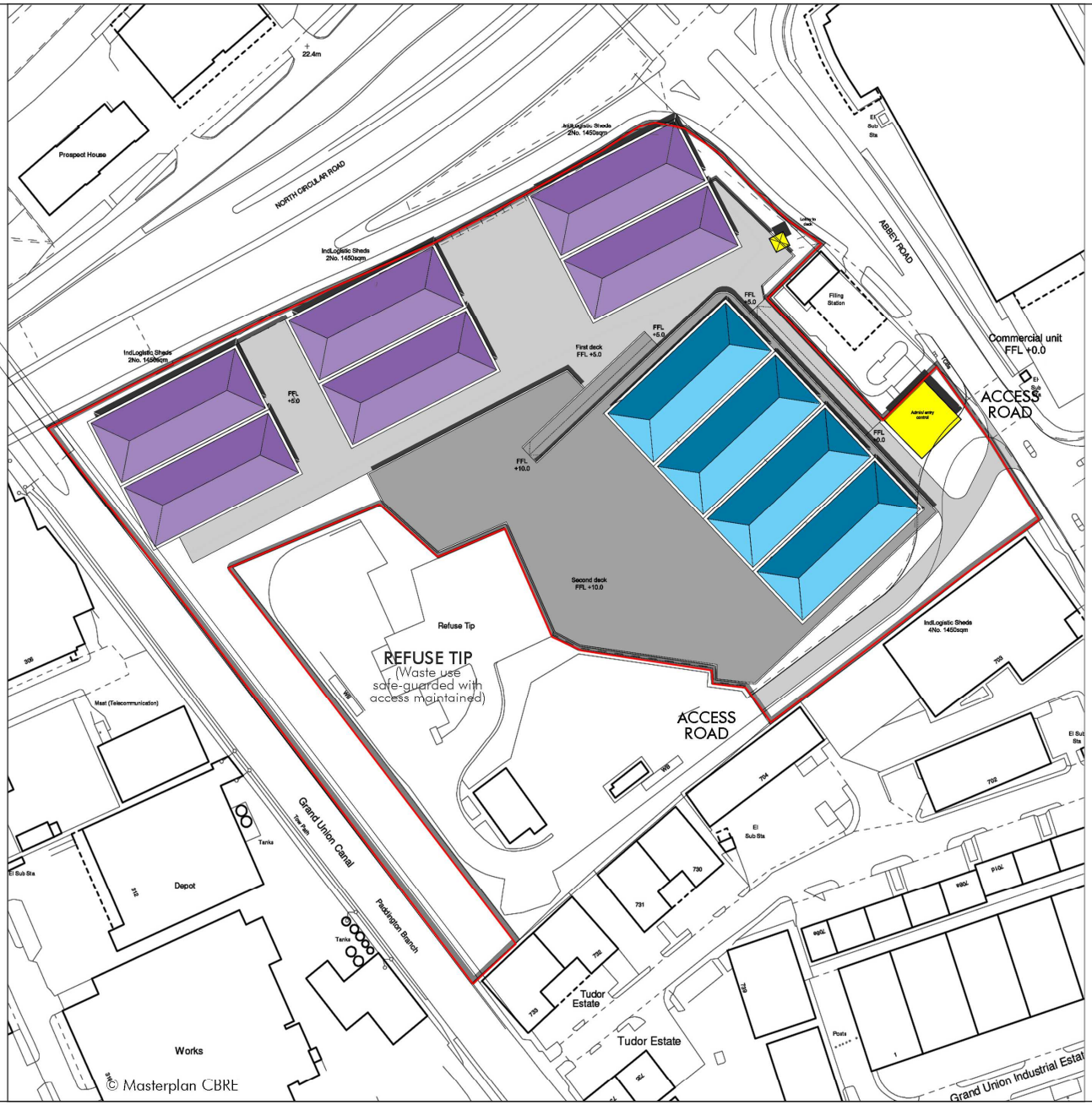
PROJECT: LAND AT ABBEY ROAD

TITLE: **DEVELOPMENT OPTIONS APPRAISAL: Industrial 2**

v02 Client parking
v01 Client comments

CLIENT: The Old Oak and Park Royal Development Corporation (OPDC) I February 2018 I Dwg: SK4/v02 I Peter Dijkhuis

CBRE
St Martin's Court I 10 Paternoster Row I London EC4M 7HP I DD. 020 7182 3379



NOTES

(All areas are stated as GEA sqm; indicative areas only)

Study area:

1. Industrial/ Logistic sheds - Level 1 (purple) footprint 8,700sqm (set at level FFL +5.0; will require retaining walls and ramp to create level yard + circulation space).

2. Industrial/ Logistic sheds - Level 2 (blue) footprint +10.0; will require retaining walls and ramp to create level yard + circulation space).

3. Provision for admin/ entry control building and retail: c.1,450sqm.

General:

a. Refuse tip safe-guarded; existing access junction and road alignment to refuse tip to be maintained. Road placed in undercroft with provision for head clearance to permit large vehicles.

b. Junction capacity to site not known.

100m

Indicative only; should not be scaled

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OPDC
OLD OAK AND
PARK ROYAL
DEVELOPMENT
CORPORATION

PROJECT: LAND AT ABBEY ROAD

TITLE: **DEVELOPMENT OPTIONS APPRAISAL: Industrial**

v02 Cleint parking
v01 Client comments

CLIENT: The Old Oak and Park Royal Development Corporation (OPDC) I February 2018 I Dwg: SK2/v02 I Peter Dijkhuis

CBRE

St Martin's Court I 10 Paternoster Row I London EC4M 7HP I DD. 020 7182 3379

BUILDING CONSULTANCY - INTERNAL CONSULTING, VALUATION & ADVISORY SERVICES
MIXED-USE DEVELOPMENT & MULTI-ACTIVITY SITES - INDICATIVE BUILDING COST ASSESSMENT

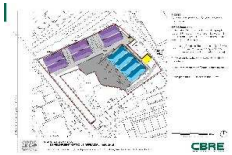
CBRE

SITE ADDRESS & CLIENT: Land at Abbey Road, London NW10 (London Borough of Brent)

The Site is a brownfield site of approximately 3.83 hectares adjacent to the North Circular Road, Park Royal, NW10. A number of scenarios for development are considered and this estimate relates to the development of the land for ***INDUSTRIAL & LOGISTICS*** *use.*
Due to the site's former use, a number of challenges exist with regards to exsiting ground conditions including, but not limited to, contamination, landfill and potentially hazardous material, existing site levels and site contours. A waterway is located adjacent to the site and therefore development will consider prevention of pollution.
The Arcadis Report HIGH LEVEL LIABILITIES ASSESSMENT dated February 2016 provides signfiicant detail on this point.
This high level assessment is based on the details noted on CBRE Devekopment Option Appraisal dated February 2018 Dwg. SK3v00

Proposed GIA FT2	171,686
Proposed GIA M2	15,950
Proposed NIA FT2	N/A
Proposed NIA M2	N/A

ACTIVITY DESCRIPTION		AREA (M2)	RATE (£/M2)	RATE (£/Ft2)	SUB-TOTAL	FEES (@ 12%)	TOTAL
1.0	Site Preparation and Facilitating Works - Arcadis 'Average Case'			-	31,400,000	3,768,000	35,168,000
2.0	Industrial & Logistics Units, Level 1	8,700	1,038.00	96.43	9,031,000	1,084,000	10,115,000
3.0	Industrial & Logistics Units, Level 2	5,800	878.00	81.57	5,093,000	612,000	5,705,000
4.0	Administration Building	1,450	1,559.00	144.83	2,261,000	272,000	2,533,000
5.0	Retaining Walls and Ramping	-		-	3,277,000	394,000	3,671,000
6.0	External Works and Landscaping	-		-	1,967,000	237,000	2,204,000
7.0	Activity 7	-		-	-	-	-
8.0	Activity 8	-		-	-	-	-
	TOTAL	15,950			53,029,000	6,367,000	59,396,000



Cost £/m2 (Excluding Ground Remediation)	1,356	163	1,519
Cost £/Ft2 (Excluding Ground Remediation)	126	15	141
Total Cost £/m2	3,325	399	3,724
Total Cost £/Ft2	309	37	346

This approximate estimate is prepared with the intention of providing guidance only and represents the opinion of the named advisor only
This advice does not constitute an Order of Cost Estimate (OCE) or Formal Cost Plan (FCP) as defined by the RICS New Rules of Measurement (NRM).
The costs are based on a combination of in-house benchmark data, project costs, published indicies and BCIS costs

This Indicative Building Cost Assessment excludes (among other things) the following:

- Value Added Tax
- Legal fees & land acquistion
- Section 106 & 278 Agreements, planning obligations and Community Infrastructure Levy
- Costs payable to other tenants & neighbours due to disruption
- Highways works & footbridges

Prepared by: M Rahim ACIOB AssocRICS
Director, Building Consultancy

Reference: MR_020318_JA

Date: 2nd March 2018

CBRE

Indicative Building Cost Assessment (Part 2)

Checklist of Information Provided for Review

The following records the outline basis of the information provided for review in connection with the preparation of this Building Cost Estimate. For full details of the recommended Schedule of Information Requirements for the Preparation of Order of Cost Estimates and Formal Cost Plans, please refer to RICS New Rules of Measurement (NRM Part 1)

Property Details:

Client Name & Property Title: Old Oak and Park Royal Development Corporation

Property Address: Land at Abbey Road, London NW10.

1. Description of Building and Building Use (Uniclass Definition): ✓
2. Site Address (Region/Town/Postcode): ✓
3. Building Dimensions/Number of Storeys (Specifiy Gross/Nett Internal Area): ✓
4. Details of Building Heating, Ventilation and Cooling Strategy: ✗
5. Building Age / Year of Development: ✓
6. Building Lifespan: ✗
7. Details of any Site Particular Conditions: ✓
8. Indicative Environmental and Sustainability Strategy: ✗
9. Roof Plans and Building Sections: ✗
10. Photographs and/or Building Survey Report: ✗
11. Descriptions of External Works: ✗
12. Number of car-parking spaces and whether above or below ground: ✗
13. Specific Structural/Civil/Highways Engineering Works and Services (State Excluded/Included): ✗
14. Number of lifts and central service cores: ✗
15. Order of Cost Estimate or Formal Cost Plan prepared by Consultant or other 3rd Party: ✗

Additional notes relating to Item 15:

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.....

.....

16. Additional information notes: ✗

.....

.....

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.....

Overall scoring for provision of Information Requirements: **LOW /~~MEDIUM~~ /~~HIGH~~**

Opinion on overall alignment with expected parameters: **N/A**

Notes & Clarifications:

1) The foregoing advice represents the opinion of the named advisor only. This advice does not constitute an Order of Cost Estimate (OCE) or Formal Cost Plan (FCP) as defined by RICS (New Rules of Measurement).

2) This appraisal excludes any allowances for VAT, legal fees, site acquisition and disposal, costs payable to tenants and/or neighbours as a result of disruption and highways/statutory authority charges unless specifically stated to the contrary.

Abbey Road, Park Royal
OPDC
Industrial Scheme Option One

Development Appraisal
Prepared by JA/CM
Licensed Copy
22 March 2018

APPRAISAL SUMMARY

LICENSED COPY

Abbey Road, Park Royal
OPDC
Industrial Scheme Option One

Summary Appraisal for Phase 1

Currency in £

REVENUE

Rental Area Summary	**Units**	**ft²**	**Rate ft²**	**Initial MRV/Unit**	**Net Rent at Sale**	**Initial MRV**
Unit 1	1	92,355	16.50	1,523,858	1,523,858	1,523,858
Units 2 (sub-divisions)	1	42,383	21.00	890,043	890,043	890,043
Totals	**2**	**134,738**			**2,413,901**	**2,413,901**

Investment Valuation						
Unit 1						
Market Rent	1,523,858	YP @	4.5000%	22.2222		
(1yr 6mths Rent Free)		PV 1yr 6mths @	4.5000%	0.9361	31,699,865	
Units 2 (sub-divisions)						
Market Rent	890,043	YP @	4.5000%	22.2222		
(1yr Rent Free)		PV 1yr @	4.5000%	0.9569	18,927,018	
					50,626,882	

GROSS DEVELOPMENT VALUE				**50,626,882**
Purchaser's Costs		6.80%	(3,223,434)	
				(3,223,434)
NET DEVELOPMENT VALUE				**47,403,448**
NET REALISATION				**47,403,448**
OUTLAY				
ACQUISITION COSTS				
Residualised Price (Negative land)			(18,666,487)	
				(18,666,487)
CONSTRUCTION COSTS				
Construction	**ft²**	**Rate ft²**	**Cost**	
Unit 1	92,355 ft²	126.00 pf²	11,636,730	
Units 2 (sub-divisions)	42,383 ft²	126.00 pf²	5,340,258	
Totals	**134,738 ft²**		**16,976,988**	**16,976,988**
Contingency		5.00%	2,418,849	
Site Preparation Works			31,400,000	
				33,818,849
Section 106 Costs				
CIL - Mayoral			438,111	
				438,111
PROFESSIONAL FEES				
Professional Fees		10.00%	4,837,699	
				4,837,699
MARKETING & LETTING				
Marketing			250,000	
Letting Agent Fee		10.00%	241,390	
Letting Legal Fee		5.00%	120,695	
				612,085
DISPOSAL FEES				
Sales Agent Fee		1.00%	474,034	
Sales Legal Fee		0.50%	237,017	
				711,052
FINANCE				
Debit Rate 5.500%, Credit Rate 0.000% (Nominal)				
Land			(3,557,318)	
Construction			6,965,417	
Total Finance Cost				3,408,099
TOTAL COSTS				**42,136,395**
PROFIT				

Abbey Road, Park Royal
OPDC
Industrial Scheme Option One

5,267,052

Performance Measures

Profit on Cost%	12.50%
Profit on GDV%	10.40%
Profit on NDV%	11.11%
Development Yield% (on Rent)	5.73%
Equivalent Yield% (Nominal)	4.50%
Equivalent Yield% (True)	4.63%
IRR	16.27%
Rent Cover	2 yrs 2 mths
Profit Erosion (finance rate 5.500%)	2 yrs 2 mths

Abbey Road, Park Royal
OPDC
Industrial Scheme Option Two

Development Appraisal
Prepared by JA/CM
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22 March 2018

APPRAISAL SUMMARY

LICENSED COPY

Abbey Road, Park Royal
OPDC
Industrial Scheme Option Two

Summary Appraisal for Phase 1

Currency in £

REVENUE

Rental Area Summary	**Units**	**ft²**	**Rate ft²**	**Initial MRV/Unit**	**Net Rent at Sale**	**Initial MRV**
Level 1 (sub-divisions)	1	58,529	18.50	1,082,787	1,082,787	1,082,787
Level 2	1	103,011	15.00	1,545,165	1,545,165	1,545,165
Totals	**2**	**161,540**			**2,627,952**	**2,627,952**

Investment Valuation					
Level 1 (sub-divisions)					
Market Rent	1,082,787	YP @	4.5000%	22.2222	
(1yr Rent Free)		PV 1yr @	4.5000%	0.9569	23,025,763
Level 2					
Market Rent	1,545,165	YP @	4.5000%	22.2222	
(1yr 6mths Rent Free)		PV 1yr 6mths @	4.5000%	0.9361	32,143,111
					55,168,874
GROSS DEVELOPMENT VALUE				**55,168,874**	
Purchaser's Costs		6.80%	(3,512,625)		
				(3,512,625)	
NET DEVELOPMENT VALUE				**51,656,249**	
NET REALISATION				**51,656,249**	
OUTLAY					
ACQUISITION COSTS					
Residualised Price (Negative land)			(19,115,849)		
				(19,115,849)	
CONSTRUCTION COSTS					
Construction	**ft²**	**Rate ft²**	**Cost**		
Level 1 (sub-divisions)	58,529 ft²	126.00 pf²	7,374,654		
Level 2	103,011 ft²	126.00 pf²	12,979,386		
Totals	**161,540 ft²**		**20,354,040**	**20,354,040**	
Contingency		5.00%	2,587,702		
Site Preparation Works			31,400,000		
				33,987,702	
Section 106 Costs					
CIL - Mayoral			525,260		
				525,260	
PROFESSIONAL FEES					
Professional Fees		10.00%	5,175,404		
				5,175,404	
MARKETING & LETTING					
Marketing			250,000		
Letting Agent Fee		10.00%	262,795		
Letting Legal Fee		5.00%	131,398		
				644,193	
DISPOSAL FEES					
Sales Agent Fee		1.00%	516,562		
Sales Legal Fee		0.50%	258,281		
				774,844	
FINANCE					
Debit Rate 5.500%, Credit Rate 0.000% (Nominal)					
Land			(3,627,794)		
Construction			7,198,864		
Total Finance Cost				3,571,070	
TOTAL COSTS				**45,916,663**	
PROFIT					

Abbey Road, Park Royal
OPDC
Industrial Scheme Option Two

5,739,586

Performance Measures

Profit on Cost%	12.50%
Profit on GDV%	10.40%
Profit on NDV%	11.11%
Development Yield% (on Rent)	5.72%
Equivalent Yield% (Nominal)	4.50%
Equivalent Yield% (True)	4.63%
IRR	16.71%
Rent Cover	2 yrs 2 mths
Profit Erosion (finance rate 5.500%)	2 yrs 2 mths

APPENDIX E

BUSINESS PARK ANALYSIS



NOTES

(All areas are stated as GEA sqm; indicative areas only).

Study area:

1. Business Park units A-C 46,750sqm (5 storeys).

2. Business Park Tower 35,000sqm (15 storeys).

3. Business park services building and parking (2 storeys) 2,500sqm.

4. Masterplan creates central (domed) landscape parklands over existing landfill mound to address POS requirement. Land adjacent to Grand Union Canal part of POS.

General:

a. Refuse tip safe-guarded; existing access junction and road alignment to refuse tip to be maintained. Road placed in undercroft with provision for head clearance to permit large vehicles.

b. Junction capacity to site not known.

100m

Indicative only; should not be scaled

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OPDC
OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

PROJECT: LAND AT ABBEY ROAD

TITLE: **DEVELOPMENT OPTIONS APPRAISAL: Business Park**

v01 Client comments

CLIENT: The Old Oak and Park Royal Development Corporation (OPDC) I February 2018 I Dwg: SK3/v01 I Peter Dijkhuis

CBRE

St Martin's Court I 10 Paternoster Row I London EC4M 7HP I DD. 020 7182 3379

BUILDING CONSULTANCY - INTERNAL CONSULTING, VALUATION & ADVISORY SERVICES
MIXED-USE DEVELOPMENT & MULTI-ACTIVITY SITES - INDICATIVE BUILDING COST ASSESSMENT

CBRE

SITE ADDRESS & CLIENT: Land at Abbey Road, London NW10 (London Borough of Brent)

The Site is a brownfield site of approximately 3.83 hectares adjacent to the North Circular Road, Park Royal, NW10. A number of scenarios for development are considered and this estimate relates to the development of the land for ***OFFICE*** *use.*
Due to the site's former use, a number of challenges exist with regards to exsiting ground conditions including, but not limited to, contamination, landfill and potentially hazardous material, existing site levels and site contours. A waterway is located adjacent to the site and therefore development will consider prevention of pollution.
The Arcadis Report HIGH LEVEL LIABILITIES ASSESSMENT dated February 2016 provides signfiicant detail on this point.
This high level assessment is based on the details noted on CBRE Devekopment Option Appraisal dated February 2018 Dwg. SK3v00

Proposed GIA FT2	906,867
Proposed GIA M2	84,250
Proposed NIA FT2	N/A
Proposed NIA M2	N/A

ACTIVITY DESCRIPTION		AREA (M2)	RATE (£/M2)	RATE (£/Ft2)	SUB-TOTAL	FEES (@ 12%)	TOTAL
1.0	Site Preparation and Facilitating Works - Arcadis 'Average Case'			-	31,400,000	3,768,000	35,168,000
2.0	Business Park Units A to C	46,750	2,330.00	216.46	108,928,000	13,072,000	122,000,000
3.0	Business Park Tower	35,000	2,674.00	248.42	93,590,000	11,231,000	104,821,000
4.0	Business Park Services Building & Parking	2,500	2,102.00	195.28	5,255,000	631,000	5,886,000
5.0	External Works and Landscaping	-		-	10,389,000	1,247,000	11,636,000
6.0	Activity 6	-		-	-	-	-
7.0	Activity 7	-		-	-	-	-
8.0	Activity 8	-		-	-	-	-
	TOTAL	84,250			249,562,000	29,949,000	279,511,000



Cost £/m2 (Excluding Ground Remediation)	2,589	311	2,900
Cost £/Ft2 (Excluding Ground Remediation)	241	29	269
Total Cost £/m2	2,962	355	3,318
Total Cost £/Ft2	275	33	308

This approximate estimate is prepared with the intention of providing guidance only and represents the opinion of the named advisor only
This advice does not constitute an Order of Cost Estimate (OCE) or Formal Cost Plan (FCP) as defined by the RICS New Rules of Measurement (NRM).
The costs are based on a combination of in-house benchmark data, project costs, published indicies and BCIS costs

This Indicative Building Cost Assessment excludes (among other things) the following:

- Value Added Tax
- Legal fees & land acquistion
- Section 106 & 278 Agreements, planning obligations and Community Infrastructure Levy
- Costs payable to other tenants & neighbours due to disruption
- Highways works & footbridges

Prepared by: M Rahim ACIOB AssocRICS
Director, Building Consultancy

Reference: MR_020318_JA

Date: 2nd March 2018

CBRE

Indicative Building Cost Assessment (Part 2)

Checklist of Information Provided for Review

The following records the outline basis of the information provided for review in connection with the preparation of this Building Cost Estimate. For full details of the recommended Schedule of Information Requirements for the Preparation of Order of Cost Estimates and Formal Cost Plans, please refer to RICS New Rules of Measurement (NRM Part 1)

Property Details:

Client Name & Property Title: Old Oak and Park Royal Development Corporation

Property Address: Land at Abbey Road, London NW10.

1. Description of Building and Building Use (Uniclass Definition): ✓
2. Site Address (Region/Town/Postcode): ✓
3. Building Dimensions/Number of Storeys (Specifiy Gross/Nett Internal Area): ✓
4. Details of Building Heating, Ventilation and Cooling Strategy: ✗
5. Building Age / Year of Development: ✓
6. Building Lifespan: ✗
7. Details of any Site Particular Conditions: ✓
8. Indicative Environmental and Sustainability Strategy: ✗
9. Roof Plans and Building Sections: ✗
10. Photographs and/or Building Survey Report: ✗
11. Descriptions of External Works: ✗
12. Number of car-parking spaces and whether above or below ground: ✗
13. Specific Structural/Civil/Highways Engineering Works and Services (State Excluded/Included): ✗
14. Number of lifts and central service cores: ✗
15. Order of Cost Estimate or Formal Cost Plan prepared by Consultant or other 3rd Party: ✗

Additional notes relating to Item 15:

.....

.....

.....

16. Additional information notes: ✗

.....

.....

.....

.....

Overall scoring for provision of Information Requirements: **LOW /~~MEDIUM~~ /~~HIGH~~**

Opinion on overall alignment with expected parameters: **N/A**

Notes & Clarifications:

1) The foregoing advice represents the opinion of the named advisor only. This advice does not constitute an Order of Cost Estimate (OCE) or Formal Cost Plan (FCP) as defined by RICS (New Rules of Measurement).

2) This appraisal excludes any allowances for VAT, legal fees, site acquisition and disposal, costs payable to tenants and/or neighbours as a result of disruption and highways/statutory authority charges unless specifically stated to the contrary.

Abbey Road, Park Royal
OPDC
Business Park Scheme

Development Appraisal
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22 March 2018

APPRAISAL SUMMARY

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Abbey Road, Park Royal
OPDC
Business Park Scheme

Summary Appraisal for Merged Phases 1 2 3 4

Currency in £

REVENUE

Rental Area Summary	**Units**	**ft²**	**Rate ft²**	**Initial MRV/Unit**	**Net Rent at Sale**	**Initial MRV**
Building C	1	111,004	30.00	3,330,113	3,330,113	3,330,113
Building B	1	111,004	30.00	3,330,113	3,330,113	3,330,113
Business Park Services	1	22,874	30.00	686,205	686,205	686,205
Building A	1	155,402	30.00	4,662,045	4,662,045	4,662,045
Tower	1	282,563	32.50	9,183,281	9,183,281	9,183,281
Totals	**5**	**682,845**			**21,191,756**	**21,191,756**

Investment Valuation						
Building C						
Market Rent	3,330,113	YP @	5.0000%	20.0000		
(2yrs Rent Free)		PV 2yrs @	5.0000%	0.9070	60,410,204	
Building B						
Market Rent	3,330,113	YP @	5.0000%	20.0000		
(2yrs Rent Free)		PV 2yrs @	5.0000%	0.9070	60,410,204	
Business Park Services						
Market Rent	686,205	YP @	5.0000%	20.0000		
(1yr Rent Free)		PV 1yr @	5.0000%	0.9524	13,070,571	
Building A						
Market Rent	4,662,045	YP @	5.0000%	20.0000		
(2yrs Rent Free)		PV 2yrs @	5.0000%	0.9070	84,572,245	
Tower						
Market Rent	9,183,281	YP @	5.0000%	20.0000		
(2yrs Rent Free)		PV 2yrs @	5.0000%	0.9070	166,590,136	
					385,053,361	

GROSS DEVELOPMENT VALUE				**385,053,361**
Purchaser's Costs		6.80%	(24,516,506)	
				(24,516,506)
NET DEVELOPMENT VALUE				**360,536,854**
NET REALISATION				**360,536,854**
OUTLAY				
ACQUISITION COSTS				
Residualised Price (Negative land)			(37,698,628)	
				(37,698,628)
CONSTRUCTION COSTS				
Construction	**ft²**	**Rate ft²**	**Cost**	
Building C	148,005 ft²	240.00 pf²	35,521,200	
Building B	148,005 ft²	240.00 pf²	35,521,200	
Business Park Services	26,910 ft²	240.00 pf²	6,458,400	
Building A	207,202 ft²	240.00 pf²	49,728,480	
Tower	376,750 ft²	240.00 pf²	90,420,000	
Totals	**906,872 ft²**		**217,649,280**	**217,649,280**
Contingency		5.00%	12,452,464	
Site Preparation Works			31,400,000	
				43,852,464
Section 106 Costs				
CIL Mayoral			2,948,750	
				2,948,750
PROFESSIONAL FEES				
Professional Fees		12.00%	29,885,914	
				29,885,914
MARKETING & LETTING				
Marketing			1,500,000	
Letting Agent Fee		10.00%	2,119,176	

Abbey Road, Park Royal
OPDC
Business Park Scheme

Letting Legal Fee	5.00%	1,059,588	
			4,678,763
DISPOSAL FEES			
Sales Agent Fee	1.00%	3,605,369	
Sales Legal Fee	0.50%	1,802,684	
			5,408,053
FINANCE			
Debit Rate 5.500%, Credit Rate 0.000% (Nominal)			
Total Finance Cost			33,722,814
TOTAL COSTS			**300,447,410**
PROFIT			
			60,089,445

Performance Measures

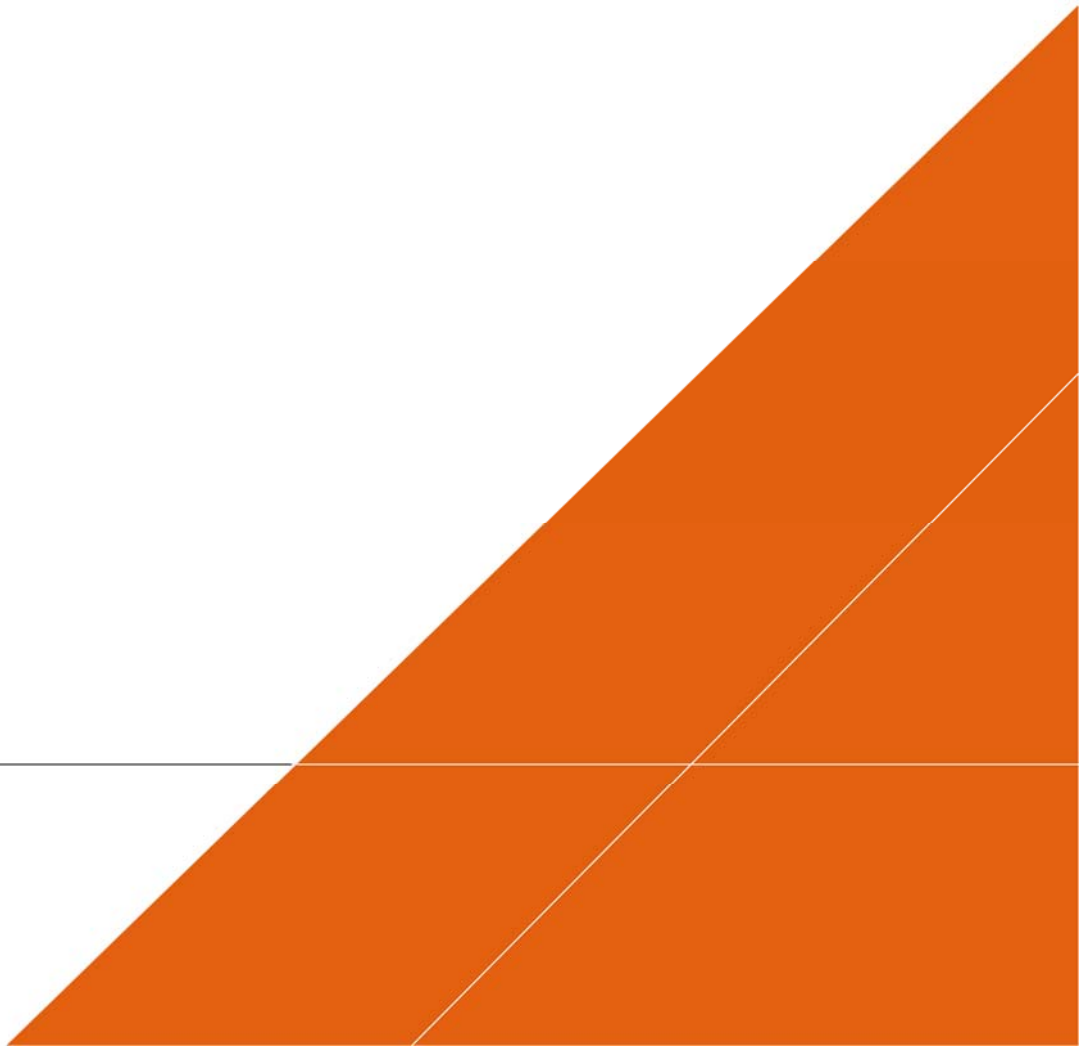
Profit on Cost%	20.00%
Profit on GDV%	15.61%
Profit on NDV%	16.67%
Development Yield% (on Rent)	7.05%
Equivalent Yield% (Nominal)	5.00%
Equivalent Yield% (True)	5.16%
IRR	14.43%
Rent Cover	2 yrs 10 mths
Profit Erosion (finance rate 5.500%)	3 yrs 4 mths

ARCADIS Design & Consultancy for natural and built assets

HIGH LEVEL LIABILITIES ASSESSMENT

Land at Abbey Road, NW10

FEBRUARY 2016



Incorporating

EC HARRIS BUILT ASSET CONSULTANCY

Hyder

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High Level Liabilities Assessment

Land at Abbey Road, NW10

Author	Jon Weston / Pamela Welburn
Checker	David Wills / Bryony Billson
Approver	Katy Baker
Report No	3444110001_02
Date	FEBRUARY 2016

Legally Privileged and Confidential

VERSION CONTROL

Version	Date	Author	Changes
01 – Draft for discussion	19 February 2016	Jon Weston Pamela Welburn	First Issue
02 -	07 April 2016	Bryony Billson	Minor text amendments

This report dated 19 February 2016 has been prepared for Old Oak and Park Royal Development Corporation (the "Client") in accordance with the terms and conditions of appointment dated 19 February 2016 (the "Appointment") between the Client and **Arcadis (UK) Limited** ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

Executive Summary

Arcadis (UK) Ltd (Arcadis) has been instructed by the Old Oak and Park Royal Development Corporation (OPDC) to undertake a high level liabilities assessment of the potential abnormal redevelopment costs associated with environmental issues for land at Abbey Road, NW10, London, UK (the Site). The Site potentially forms part of the Old Oak Common Opportunity Area, and is a brownfield site of approximately 3.83 hectares adjacent to the North Circular Road, Park Royal, NW10. The Site comprises two areas of land: the "Main Site", comprising the former "Twyford Tip" landfill, and the "Canalside Site", to the west of the "Main Site". The former landfill is now present on the Main Site as a large land raise in comparison with the surrounding land. The waste material, based on the available data, was found to be variable in content, with a potential for up to 70% of the material to include an organic content.

The objective of the works presented in this document is to undertake a high level assessment of the potential abnormal redevelopment costs and liabilities associated with the Site, based on the environmental conditions as understood from the available site data. Arcadis understands that the outcome of this phase of works could in future be used by OPDC to make an informed decision on the feasibility of pursuing a grant application to fund site remediation costs, therefore supporting OPDC's regeneration aspirations for the area.

It is considered that any proposed redevelopment at the Site would need to tie in with the surrounding land elevation. Arcadis believes that it is a possibility that final site levels could be slightly higher relative to the surrounding land, however, this would require consultation with the Local Authority.

Therefore, in order to estimate the potential costs associated with redeveloping the Site, three different development scenarios were considered in this study:

1. Removal of all landfill material and replacement with imported engineered fill material to match surrounding ground surface elevation;
2. Removal of landfill material to match surrounding ground surface elevations, some waste to be retained on Site where it falls below surrounding ground elevations;
3. Removal of landfill material to an elevation approximately 2.5m above surrounding ground surface elevations; it should be noted that this scenario would require retaining walls to be put in place.

Based on the estimated number of lorry movements involved with implementing Option 1 and the associated cost and timescale it was considered unviable. This option was therefore not considered further.

The remaining two scenarios were assessed to identify likely key development constraints which could lead to abnormal costs (e.g. removal of waste material, retaining wall construction, piled foundations). Cost ranges were assigned to the development constraints, using bench-marked data, where available, to give a high level, indicative best case, average case and worst case estimate of redevelopment costs for the purpose of business case development.

The following indicative cost range has been developed for the two Scenarios:

Scenario	Indicative Best Case Cost	Indicative Average Case Cost	Indicative Worst Case Cost
2	£32.8 Million	£48.1 Million	£67.6 Million
3	£21.5 Million	£31.4 Million	£44.1 Million

All options would be subject to gaining regulatory approval for the development platform height.

In order to reduce uncertainties in the assessment and allow a suitable redevelopment scenario to be developed, further data collection would be required. Recommendations for this work are made within this document.

However, it is clear that the key to redeveloping the Site will be to retain and re-use as much of the waste material as possible. This is likely to be dictated by what will be achievable from a planning perspective with

respect to the finished Site levels, and potentially what would be deemed acceptable in terms of lorry movements in the neighbourhood to remove waste from the Site.

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APPENDIX B

Indicative Cost Estimate Sheets

1 Introduction

1.1 General

Arcadis (UK) Ltd (Arcadis) has been instructed by the Old Oak and Park Royal Development Corporation (OPDC) to undertake a high level liabilities assessment of the potential abnormal redevelopment costs for land at Abbey Road, NW10, London, UK (the Site). The location of the Site is presented on Figure 1.

A Specification of Requirements was prepared by OPDC and this specification formed the basis of the works undertaken by Arcadis, which were detailed in our proposal dated 18 December 2015 titled *High Level Liabilities Assessment – Land at Abbey Road, NW10,* and subsequently instructed by email by Davena Wilson (OPDC) on 11 January 2016.

1.2 Background

The Old Oak Common Opportunity Area has been identified as having the potential to deliver 24,000 new homes and 55,000 new jobs over the next 20 to 30 years. The Site potentially forms part of this area and is a brownfield site of approximately 3.83 hectares adjacent to the North Circular Road, Park Royal, NW10. The Site comprises two areas of land: the former "Twyford Tip" landfill comprising the 3.3 ha "Main Site", and the 0.53 ha of the "Canalside Site", which is a rectangular portion of land oriented north-west to south-east immediately adjacent to the Grand Union Canal, to the west of the "Main Site".

Based on information presented in the OPDC specification, the Site is currently within the freehold ownership of Ashia Centur Ltd.

1.3 Objectives

The objective of the works presented in this document is to undertake a high level assessment of the potential abnormal redevelopment costs and liabilities associated with the Site. Arcadis understands that the outcome of this phase of works could in future be used by OPDC to make an informed decision on the feasibility of pursuing a grant application to fund site remediation costs, therefore supporting OPDC's regeneration aspirations for the area.

In consideration of the potential liabilities, further secondary objectives include:

- Quantification of the potential financial risk associated with the possible environmental liabilities. This in part is based on reasonable assumptions regarding likely conditions where there is an absence of site-specific data.
- Identification of key development constraints associated with three potential development platforms at the Site:
    1. Full site clearance to create a level platform;
    2. Partial clearance and off-site disposal, to allow re-profiling and creation of the development platform; and
    3. Limited re-profiling including treatment/management of contamination allowing retention of material.
- Provision of high level cost estimates for the highest ranking constraints.
- Assessment of the continued suitability of a remediation strategy developed by Intergeo Environmental Technology (1999), and estimation of the associated costs.
- Commencement of discussions with the Regulators, in the first instance London Borough of Brent, to determine the regulatory status of the landfill, and whether the licensing or regulatory requirements have been fully discharged to date.

1.4 Scope of Work

The works presented in this report comprise:

- Task 1 – Review of available data and preparation of an outline Conceptual Site Model (CSM);
- Task 2 – Establish contact with the Regulatory Authority;
- Task 3 – Identify key likely development constraints associated with the Site;
- Task 4 – Ranking of the identified key development constraints;
- Task 5 – Preparation of high level indicative cost ranges for the highest ranking constraints;
- Task 6 – Reporting.

1.5 Reliability/Limitations of Information

This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report and previous work. Reference should be made to the notes on Study Limitations presented in Section 7.

Whilst this report and the opinions contained here are accurate to the best of Arcadis' knowledge and belief, Arcadis cannot guarantee the completeness or accuracy of any descriptions or conclusions based on information supplied by third parties.

Users of this report should be aware that data interpolation is required whenever engineering and related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in line with best practice may fail to detect certain conditions. The environmental and geological conditions that Arcadis interprets to exist between sampling points may differ from those that actually exist. Passage of time, natural occurrences and activities near the Site may substantially alter discovered conditions.

It is not the intent of this report to satisfy any specific detailed planning conditions that may be imposed by the planning authorities or to provide approval for redevelopment of the Site.

1.6 Exclusions

This assessment is focussed on issues concerning ground contamination, engineering geology, geotechnics and earthworks with attention also given to potential changes in levels for flood risk mitigation purposes.

There are also a number of other issues which can result in ground related development costs which have not been considered due to the absence of studies, however, there are other external authorities and stakeholders which have the potential to influence the development costs:

- Drainage/Utilities – no assessment has been made as to the existing location or capacity of utilities supplies (e.g. telecoms/water/gas/drainage) and whether these would represent a constraint/cost for redevelopment.
- Traffic/Highways issues – no assessment has been made of any highways issues which could impact on the type of development or associated costs for a developer.
- Ecological issues – no assessment has been made as to the potential ecological issues associated with the Site. There are likely to be a number of surveys required to establish the current ecological habitat and whether there are invasive species such as Japanese knotweed, but assuming no protected or invasive species are present, it was considered reasonable to rank these as lower cost items.
- Heritage issues – no assessment has been made of the potential for the Site to be of archaeological importance. Additional surveys may be required, but this has been considered likely to be a lower cost item based on the previous use of the land.

There will be other planning and developer costs which would impact on the value of the Site which are outwith this assessment (e.g. Community Infrastructure Levy (CIL)), and which have not been considered.

It should be highlighted that the assessment is therefore based on a partially characterised Site, based on desk study information and limited past intrusive investigation data from 1999.

1.7 User Reliance

There are neither third party rights nor benefits conferred under this report. Use of this report is strictly limited to OPDC and its direct and indirect subsidiaries, which are the sole parties to whom Arcadis intends to confer any rights. Any reliance on the contents of this report by any other party is the sole responsibility of that party.

2 Review of Existing Information

2.1 Previous Works

OPDC has provided the following reports which provide details of previous investigation works undertaken by Intergeo Environmental Technology on behalf of Ram Developments:

- Site Investigation and Proposal for the Remediation of the Landfill Site (Twyford Tip) on the North Circular Road, Park Royal, NW10, London (Project Number: GB007, Report Date: April 1999)
- Additional Proposal for the Remediation of the Landfill Site (Twyford Tip) on the North Circular Road, Park Royal, NW10, London (Project Number; GB 007/1, Report Date: May 1999)

The Intergeo Site Investigation report indicates that other historical investigations were undertaken at the Site. Borehole logs available on the British Geological Society (BGS) website (http://mapapps.bgs.ac.uk/geologyofbritain/home.html) provide borehole records from the historical report: Site Investigation at Twyford Tip, North Circular Road, Brent, Terrasearch Ltd, 1979; and the information obtained from those borehole records, as presented by the BGS, is considered within this document. However, Arcadis did not have access to the full report, and the only complete reports reviewed were the two detailed above. Further borehole information, also available from the BGS website, was collected as part of the investigation for the widening of the North Circular roadway. These exploratory holes were progressed in February 1981 by Norwest Holst.

Additional information was also identified in the publically available report prepared by Wessex Archaeology on behalf of Ashia Centur Ltd.

- Archaeological Investigation. Land at Former Twyford Tip, Abbey Road, London. (Report reference 66040.02, Report date: May 2007)

This report provided the results of a shallow investigation undertaken at the Site in order to provide evidence that development works had already commenced.

During a previous phase of works, Arcadis undertook an initial desk-based assessment of the Site, with a site walkover undertaken on 27 March 2014. This work was reported in the following document, and the data collected is considered in this current (2016) phase of works:

> Northfields Industrial Estate and Twyford Tip, Brent, Initial Review R2 Letter Report, [Arcadis Doc. Ref. 27710101] 9 April 2014.

2.2 Site History

The following developmental history of the Site has been collated from a review of historical map extracts and environmental records contained in publicly accessible databases.

Maps show that by 1896 significant ground work activities had occurred creating steep slopes within the Site. The map symbols would indicate these ground works were associated with clay pits, however, other references indicate gravel extraction. Given the natural geology anticipated to be present beneath the Site it is considered more likely that the excavations were associated with gravel extraction. Ground work activities continued through the 1930s, with mapping symbols indicating gravel extraction.

During the 1930s, buildings associated with the Stonebridge Works, which was located to the south of the Site, were extended to the north and were present immediately to the south of the Site. At this time the North Circular was also constructed to the northwest of the Site.

By the mid-1960s the majority of the Site area was indicated to be a refuse tip extending off-site to the northeast. In the 1970s the central section of the Site continued to be identified as a refuse tip. Various works buildings had been constructed immediately to the south of the Site including printing works and cabinet works.

In the 1990s the North Circular was widened and an access bridge constructed to the northeast of the Site linking northern and southern sides of the North Circular.

The 2013 map indicated that the Site was no longer an active landfill site but remained as a large land raise in comparison to surrounding land.

2.3 Current Site Use

The Site is predominantly undeveloped, with a petrol filling station adjacent to the eastern boundary of the Site, and a council refuse and recycling centre adjacent to the "Main Site" to the south-west. The Tudor Estate, adjacent to the south, is an area of industrial and commercial properties. Immediately beyond the waste site to the west, the Canalside portion of the Site is located adjacent to the Grand Union Canal. To the north the Site is bound by the North Circular (A406), beyond which the River Brent is present, flowing to the south-west.

The Intergeo report (April 1999) details that the Site comprises a land raise with the majority of the Site rising steeply on all sides from the surrounding ground levels. Within the raised levels there are two distinct levels. Prior to the widening works for the North Circular and Abbey Roads, the construction of the southbound slip road from Abbey Road, and the construction of the Esso service station on Abbey Road; the Site was understood to be of a single level. The second level is believed to originate from the placement of further material on top of the landfilled waste. This was apparently undertaken by cutting into the landfill waste to allow the North Circular widening works to be undertaken and the service station to be constructed. This has further increased the level of the land raise relative to surrounding areas.

Information from maps of the surrounding area indicates the level of the canal, located to the southwest of the Site, to be approximately 30m above Ordnance Datum (AOD). At the junction of Abbey Road with the North Circular slip road (i.e. immediately to the north of the Site) the ground elevation is indicated to be approximately 22.5m AOD. The North Circular appears to be in a cutting immediately to the north of the Site, and the canal is indicated to pass over the top of the North Circular. The Intergeo report indicates the north of the Site to be at an approximate level of 19m AOD. It is presumed that this measurement relates to the level of the North Circular at the point where it passes under the canal. It should be noted that it is the slip road that forms the north-western boundary of the Site and that the level of the slip road generally decreases from east to west. However, the canal, which is elevated above the North Circular, forms the south-western Site boundary with a level of approximately 30m AOD. At spot heights along the access road forming the southern boundary of the Site, ground elevations are indicated to be approximately 25 to 27.5m AOD. It should be noted that information related to off-site levels was limited and therefore some interpretation has been used to estimate these levels.

The topographical survey included within the Intergeo report indicates that the waste mound appeared to have two distinct levels. The first level was indicated to range between 36 and 38m AOD and the second, higher, level between 41.5 and 41.8m AOD.

2.4 Ground Conditions

Based on previous data collected during the intrusive investigations the ground conditions beneath the Site have been found to comprise a variable thickness of landfill waste material, overlying the remnants of the Taplow Gravel Formation, resting upon the London Clay. There was no evidence of alluvial deposits in the exploratory holes reviewed as part of this assessment. Details of different units encountered are included in the following subsections.

2.4.1 Waste Materials

A landfill cover layer was encountered in several of the exploratory holes. However, the cover layer varied in thickness across the whole of the landfilled area with some areas having no cover and other areas having up to 1.5m (Intergeo boreholes BH5 and BH6). The cover layer, where present, predominantly comprised materials described as firm to stiff light brown clay.

Based on the previous investigations the waste material was found to comprise a variable mixture of many different material types and included both cohesive and granular materials with mentions of the following; ash, clinker, coke, coal, slag, brick, concrete, bone, glass, wood, paper, fibrous materials, rubber, leather, plastics, cloth, metal fragments.

The general description of the waste material indicated that much of the waste could be regarded as having a high organic content. Some materials were described as organic clays while others appeared to have a significant proportion of wood and paper. Waste materials with high organic contents can be problematic as they are not normally geotechnically suitable for reuse and are difficult to dispose of. A review of the historical borehole logs has suggested that approximately 70% of the waste could comprise materials with a high organic content. Some materials (e.g. granular materials) may be able to have the organic component screened out, whereas other materials would be very difficult to screen on Site. An assessment has indicated that, based on the limited information available, it may not be possible to adequately screen approximately 30% of the waste to remove the organic component.

The waste material was identified in all of the exploratory holes located on the Site with a maximum thickness of 19.6m recorded in WS6, within the central part of the Site. It appears that the thickness is generally dictated by the elevation of the waste mound with a relatively uniform basal elevation presumably as a result of the gravel extraction. The basal part of the waste material often included materials that were described as ‘reworked’ materials. This is likely to comprise Taplow Gravel material with a high clay component that was not suitable as a gravel aggregate. Several of the exploratory holes also indicated that there was a cohesive layer at the base of the waste material. However, this layer was not encountered at all locations and the thickness and quality was found to be variable.

It should be noted that while each previous investigation was reasonably consistent in describing the waste material throughout that one investigation, there were significant differences in the waste description between the different companies. This creates uncertainty regarding the constitution of the waste and which historical data sets can be relied upon. Much of the subsequent cost assessment is based on the waste description and as such it is important that accurate waste descriptions are obtained in order to ensure that future cost estimates are based on reliable data.

2.4.2 Taplow Gravel Formation

Material consistent with the Taplow Gravel Formation was encountered in several exploratory hole locations, beneath the waste materials at the Site. The Taplow Gravel Formation was generally described as grey/brown/orange medium to coarse gravel with variable sand and silt and clay component. The thickness of the Taplow Gravel ranged from 0.3 to 3.0m indicating that only the basal part of the Taplow Gravel Formation remained present beneath the Site. Only two exploratory holes had a thickness of Taplow Gravel greater than 2m and these were both from the same investigation. It is considered possible that this may have been due to interpretation, resulting in one investigation classifying these deposits as reworked materials and another as *in situ* deposits.

The Taplow Gravel Formation is classified as a Secondary (A) Aquifer.

2.4.3 London Clay Formation

The London Clay Formation was encountered in the base of several historical intrusive locations at a relatively consistent elevation across the Site. The London Clay was described generally as a stiff becoming very stiff grey/brown clay with grey mottling.

The London Clay Formation is classified as Unproductive Strata.

2.4.4 Groundwater

Perched groundwater was identified in the historical intrusive investigations within the waste mass. The locations of groundwater strikes and seepages varied across the Site with no consistent water level or water body identified. The Intergeo investigation makes reference to 'wet areas' which presumably means deposits that were noted to be wet. Again these 'wet areas' were not consistent indicating that there was no continuous water body. The Intergeo report did indicate that groundwater appeared to be more predominant within the basal part of the landfill and within the Taplow Gravel Formation.

The historical boreholes logs prepared by Intergeo are ambiguous with respect to how the monitoring wells were installed and in particular where the screened sections of the wells are located. It is assumed that the monitoring wells have all screened the waste material and not the Taplow Gravel Formation but this is not known for sure. Therefore, it is not possible to draw conclusions with respect to the groundwater presence and quality within the Taplow Gravel Formation.

2.5 Environmental Site Condition

The Site has historically been used as a local authority landfill facility which accepted unknown wastes for an unknown period of time. Limited historical sampling occurred during the intrusive investigations with only the results associated with the Intergeo report available for review.

Limited soils testing was undertaken including the reported analysis of 16 samples for sulphate, phenol, total Polycyclic Aromatic Hydrocarbons (PAH) and metals. Additional testing was undertaken on 4 of the 16 samples for cyanide. Concentrations of note were for copper (maximum concentration 3,270mg/kg), lead (maximum concentration 4,460mg/kg), zinc (maximum concentration 11,880mg/kg) and the PAH screen (maximum concentration 1,600mg/kg).

A total of 41 soil sample results for Total Petroleum Hydrocarbons (TPH) were reported. Analysis was undertaken by a non-dispersive infrared spectrometer. Reported concentrations ranged from 25mg/kg to 23,000mg/kg in the samples analysed.

Four of the soil samples collected during the Intergeo investigation were leached using the using the National River Authority Leaching Test (Single Cycle, 24 hour duration and 10 parts water to one part soil). The leachate created was analysed for sulphate, phenol, total PAH, PCBs, metals and cyanide. There were no concentrations of note reported.

Four groundwater samples were collected form monitoring wells installed by Intergeo from WS7, WS10, WS24 and WS25. The laboratory results were not presented but the report text indicated a maximum concentration of TPH of 2.9 mg/l.

2.6 Ground Gas Regime

2.6.1 Permanent Ground Gas

The Intergeo intrusive investigation undertook gas screening from 31 of the installations placed within the waste mass. They were monitored at least once prior to reporting the findings.

Methane was identified in all the locations screened with a maximum reported concentration of 43.5% v/v. Elevated concentrations of carbon dioxide and depressed concentrations of oxygen were also noted where methane had been identified. This is considered consistent with the degradation of organic rich landfilled waste materials at the Site.

Details of short term suction tests undertaken at 7 locations within the landfilled material indicate that, due to relatively the low resistance determined, the material was considered to be relatively permeable. The measured concentrations of methane extracted were not observed to drop significantly during the suction tests. Intergeo suggested that that prior to any waste extraction/removal processes gas abstraction and treatment would need to be undertaken in order to reduce the explosive risk and odour nuisances associated with the landfill gas.

It should be noted that the suction tests would result in collection of gas from the more granular horizons within the waste material and would be less likely to collect gas from the more clay rich

materials. Due to the relatively low resistance determined, the suction tests indicate that a proportion of granular materials at the Site are likely to be interconnected. However, the waste descriptions indicate that a significant amount of organic clay rich deposits are present within the landfill material and given the organic nature of these deposits this is considered to be a primary source of the gas at the Site. Abstracting gas from these types of deposit may not be feasible and pockets of gas are likely to remain. In addition, preferentially collecting air from the surface of the landfill is also considered to be highly likely given that there is no uniform clay cap across the landfill.

2.6.2 Volatile Organic Compounds

Gas samples were taken by Intergeo during drilling from the 41 exploratory holes by abstracting the gas by use of a syringe attached to an extraction lance which penetrated the borehole by 1.5m. The carbon dioxide concentrations were monitored and the sample was taken once the carbon dioxide level stabilised.

The samples were analysed (using a GC-FID and GC-ECD) for the presence of aliphatic hydrocarbons (n-alkanes C5-C10) and aromatic hydrocarbons (benzene, toluene, ethylbenzene, and xylene (BTEX) compounds) with a detection limit of 2mg/m^3. One of the samples screened had detectable concentrations of n-Pentane and n-Hexane at concentrations of 7.0 and 2.4mg/m^3 respectively. The other remaining samples were reported to be below the limit of detection.

Samples were also screened for chlorinated hydrocarbons. While the report indicated that there were no concentrations of chlorinated hydrocarbons recorded above the detection limit, the detection limit was not indicated.

2.7 Geotechnical Site Condition

The historical investigations carried out to date have concentrated on the assessment of environmental conditions including the extent of the waste materials within the Site and therefore limited geotechnical information is available. While site specific detailed geotechnical information is not considered essential for the purposes of this assessment it should be noted that this information will be required for detailed design and assessment of any future development strategy.

2.8 Local Authority Information

Arcadis has contacted Brent Council, and Juhaina Junaid, Enforcement Officer, provided the following information related to the Site:

- Brent Council, in accordance with the Contaminated Land Inspection Strategy; is in the process of investigating contaminated land within London Borough of Brent.
- The Site is associated with a potentially contaminative land use, however, to date it is a low priority for inspection – the Council cannot give information related to when the Site is likely to be inspected.
- The site does not form an entry on the Contaminated Land Register.
- The information held by the Council was reported to Arcadis to include the following historical information:
    - The Site is part of the historical Twyford Tip, which was used as a landfill between the 1930s and 1962, receiving domestic and industrial waste;
    - The Abbey Road was constructed through the Twyford Tip in an approximately north-south direction, the western part of the former Twyford Tip forming the Site;
    - The part of the former Twyford Tip lying to the east of Abbey Road was remediated by the Buckingham Group in 2004 and is now occupied by Prologis House. The remediation is reported to have comprised the removal of putrescible waste and processing and placement of the remaining suitable material.
- Brent Council noted that planning permission for an Asian Centre had been granted.

- The Council does not have any current data on site conditions, but does hold a copy of the Intergeo report dated 1999 previously assessed as part of this review.

It was further noted that a contaminated land assessment will be required under planning regulations, should there be a proposal for redevelopment or change to the site. This requirement should be satisfied by the site assessment, which does form one of the development constraints further considered in Section 4 of this report.

2.9 Adjacent Site Redevelopment Strategy

Historical maps indicate that the landfill site was at one point much larger than it is today and occupied an area of land to the northeast of the current Site boundary. This included an area of land to the northeast of Abbey Road. Documents available on the internet indicate that remediation of this area of land was undertaken by Buckingham Group for ProLogis approximately 10 years ago. The documents indicate that this adjacent site was approximately 1/3rd of the size of the remaining Twyford Tip (i.e. the Main Site) and it was estimated to have included 103,000m^3 of made ground material which required treatment. It is understood that the waste at this site was also mounded above the surrounding ground levels and therefore required materials to be excavated off-site. The remediation strategy comprised excavating, sorting and reuse of suitable materials and off-site disposal of unsuitable materials. The initial estimate of the quantity of unsuitable materials present on the adjacent site was 40,000m^3 (i.e. 40%). The final volume of unsuitable materials encountered is not known.

To protect off-site migration of any leachate or by-products associated with the remaining landfilled material a cut-off trench was installed. This cut through the remaining Taplow Gravel Formation into the London Clay below, creating an impermeable barrier to prevent liquid migration off site.

2.10 Existing Site Redevelopment Strategy

After completion of the Intergeo investigation report from April 1999, Intergeo prepared a second report titled “Additional Proposal for the Remediation of the Landfill Site (Twyford Tip) on the North Circular Road, Park Royal, MW10, London” which was issued to Ram Developments in May 1999.

This additional proposal report was prepared after a meeting between the Asian Centre, AMEC and Intergeo, where a shorter time scale for remediation was reportedly requested by the client. Details of the general remediation concept were included in the Intergeo investigation report which suggested an overall duration of 12 months, which was then reduced following the meeting. The following provides a review of the final remediation strategy only.

Intergeo proposed an option for bioventing the landfilled material to reduce the identified concentrations of methane and associated odours. This was also considered to potentially enhance the breakdown of the organic material and reduce the volume of waste materials that would need to be removed from the Site.

Following the use of bioventing and reduction in the methane concentrations the landfilled waste would be excavated and removed. There is little detail regarding what would happen to the waste materials following excavation. There is a brief discussion around differentiating the waste into different categories to reduce the overall costs and transportation distances.

One key aspect to this remediation approach was the suggestion by Intergeo that the overall waste mass could be reduced by at least 10% due to the acceleration of degradation of organic compounds under aerobic conditions. Arcadis consider that it would have been very unlikely that this sort of volume reduction could be achieved. This is due to the fact that the bioventing would preferentially target the more granular horizons to treat the gas that will have accumulated in these deposits. The majority of the organic component of the landfill appears to be associated with clay rich materials. The creation of aerobic conditions within the granular layers would do little to accelerate degradation of the organics in the more clay rich deposits.

Intergeo also indicated that the mass of the waste material would be reduced by reducing the moisture content. Arcadis consider that this is likely to be a viable option for the more granular materials but that moisture reduction of the more clay-rich materials is unlikely to be achieved in a shortened duration. Given that the granular materials are more likely to be suitable for reuse and the clay-rich materials are likely to be the most problematic at the Site, requiring off-site disposal, this is unlikely to significantly affect the mass of waste requiring off-site disposal. It should be noted that the Intergeo did not include details of how the recovered water would be treated, other than stating that it would not be suitable for disposal via the sewer and suggesting that the recovered water could be sprayed over the landfill for re-infiltration. Other than this being considered very poor practice it does not seem to fulfil the remediation objectives of reducing the water content of the waste mass.

In addition, it should be noted that this proposal was put forward in 1999, and that the landfill waste would have continued to degrade in the following 17 years since these investigation works. It is possible that the conditions within the waste material could have changed significantly, and therefore the investigation and remediation proposal are no longer considered to represent the current situation at the Site.

3 Conceptual Site Model

The Conceptual Site Model (CSM) is a key stage in understanding the potential development constraints for the Site, as it forms the basis of understanding the current Site condition, the potentially viable development platforms, and the works required to prepare each of the development platforms.

The CSM is also a key stage in identifying potential liabilities associated with the Site, as the CSM will define potential Source-Pathway-Receptor linkages (or pollutant linkages) arising from the Site.

The following sections detail the development of the CSM, which comprises assessment of:

- The current Site conditions, including a ground model detailing the likely thickness and profile of the waste;
- The quantity and nature of the waste materials (the source);
- The potential pathways for migration of contamination;
- An understanding of the potential receptors associated with the Site;
- A summary of the data gaps remaining at the Site, which give rise to uncertainties in the conceptualisation and, as noted in OPDCs specification for the works, give rise to significant ranges in likely development costs.

In order to understand the likely volume of the waste a ground model was developed, which uses the available borehole data and ground elevation data to profile the Site and therefore provide an estimate of the waste volume. Three models were prepared, as summarised below, and which are further referred to in the following sections of this document:

1. Ground model showing the depth to the base of the landfill material from its existing surface (based upon the available data), this model provides the waste volume estimate in m3 (presented as Figure 2);

Following the preparation of the ground model, two further models were prepared to aid in understanding of the relevant material volumes and material movements associated with the potentially viable development platforms at the Site:

2. Model showing the levels of the landfill material relative to the surrounding land – this provides data to assist in the assessment of cut/fill volumes when considering the potential requirement to return the Site to original (pre-excavation) levels and the viability of doing so (presented as Figure 3). In this model, where the surface level of the waste falls below the surrounding levels this is termed a “fill” level as material is required to *fill* back to level, and where the surface elevation of the waste is above the surrounding levels this is termed a “cut” level as material is required to be *cut* away to return the Site to level. Where waste is present below the surrounding ground levels it could potentially be retained on site. However, neither the cut nor fill scenario consider the suitability for reuse of the material and further waste categorisation and screening would be required to understand the volume of the material that could be reused and therefore the net material movements;
3. Model showing the levels of the landfill material relative to an assumed acceptable ground level for the eventual Site redevelopment platform at 2.5m higher than the existing elevation of the surrounding land [based on the surrounding land and land uses and professional judgement of what is likely to be accepted for the final development of the Site] – this scenario allows for the possibility that the Site may not be returned to original levels, and the model provides data to assess the potential cut/fill volumes under this scenario (presented as Figure 4). Again, the model is concerned solely with material levels and volumes and does not consider the suitability for re-use – therefore it does not provide an estimate of net material movements.

3.1 Development of Ground Model

Review of Ordnance Survey maps and on-line sources of information has indicated that the elevation of the surrounding land is approximately the same as the ground level around the waste mound along the boundary of the Site. There do not appear to be any retaining walls surrounding the Site. Surrounding site levels are in the order of 22.5m AOD along the north-western edge of the Site, 25m AOD along the north-eastern site boundary and 27.5m AOD along the access road immediately to the south-east of the Site.

Given the irregular shape of the Site and level and use of the surrounding land it is considered that there is only limited scope to increase final Site levels above the surrounding ground level. There could be more scope to increase Site levels if the council refuse and recycling centre (located immediately to the south of the Site) was incorporated into the developable land.

The review of historical boreholes has indicated that there is only very limited data available regarding the thickness of the landfill material. Only 10 of the 41 window sample holes carried out by Intergeo in 1999 fully penetrated the waste material. All ten of these window sample holes were located around the edge of the landfill and therefore no data is available regarding the thickness of the landfill in the central part of the Site.

Additional borehole logs were obtained from the BGS website. These included six boreholes from the Terrasearch 1979 investigation and four boreholes from the investigation for the North Circular by Norwest Holst in 1981. These boreholes have also been reviewed.

The information provided from the borehole logs has been used to develop a ground model for the Site. It should be noted that the ground elevations on several of the boreholes did not match the elevation plan presented within the Intergeo investigation report. There are two possible reasons for this:

- First is that the boreholes are not located accurately on Intergeo plan or that the ground elevation has changed since the drilling of the boreholes;
- Intergeo have speculated that this was because the profile of the waste material was altered after the construction of the Esso Service Station and the widening of the North Circular.

For this reason the Arcadis ground model has used the elevations shown on the Intergeo plan to model the existing ground surface. The elevations for the base of the landfill material have been based on the ground elevation shown on the individual borehole logs. This is considered to be the most appropriate method of using the historical data.

3.2 Quantity of Waste Materials

The results of the landfill modelling can be seen on Figure 2. It should be noted that there is no information available along the north-western and western extents of the Site and as such the modelling is limited to the coloured area. The modelling indicates that there is approximately 275,000m^3 of waste material located within that area. An adjustment has then been made to take into account the extents of the landfill where there is no information currently available. This was done by assuming that there is an approximate thickness of 5m of waste material within this area. This gives an overall landfill waste volume of approximately 300,000m^3 which is not dissimilar to the quantity calculated by Intergeo.

Further modelling, presented on Figure 3, has indicated that to achieve a finished level that is equivalent to surrounding ground levels approximately 200,000m^3 will need to be removed from site. Figure 3 provides an indication of the cut and fill required from existing levels to achieve these finished levels. Given that the overall volume of waste was calculated to be 300,000m^3 this gives a net volume of 100,000m^3 remaining on site.

It can be clearly seen how the waste materials are steeply banked at the edges of the Site with a central plateau within the centre. For any future excavation works to commence a safe working area would need to be identified and based on the lateral extents of the waste material present this may need to be off-site. The steep banking would also causes issues relating to any working areas located on top of the waste materials and the stability of the sides of the waste.

It should also be noted that these drawings are based on data that was collected over 10 years ago. There could have been further degradation and settlement of the waste materials creating both an uneven surface but also potential voids within the waste materials.

3.3 Lateral Extent of Taplow Gravel

The review of the available investigation information has indicated that there is a limited thickness of Taplow Gravel remaining *in situ* beneath the landfill. Where granular, the Taplow Gravel may have the potential to support some lateral migration of contaminants in groundwater. However, it is not known if the Taplow Gravel is laterally present in all locations beneath the landfill, and it is known that in some locations it has a high clay content.

The cross sections of the Site, presented as Figure 5, indicate that North Circular may have been constructed at a level that is below the basal level of the Taplow Gravel indicating that there may not be a viable pathway within the Taplow Gravel for the off-site migration of contaminants to the northwest. However, it is possible that the Taplow Gravel extends under the canal and therefore there is the potential for a pathway to exist, albeit of limited thickness beneath the canal.

The previous works on the neighbouring Site, located to the northeast of the Site, removed the active pathway through the Taplow Gravel, by installing a cut off trench or wall that created an impermeable barrier preventing liquid migration off-site.

Given the limited presence of Taplow Gravels beneath the Site, and given that the adjacent council refuse and recycling centre is at a lower elevation than the bulk of the land raise; the adjacent active waste site is considered unlikely to be a significant source of impacts to the Site.

3.4 Potential Pathways

Following the review of the available information from previous intrusive investigation potential pathways for waste materials or substances associated with the waste materials can be identified.

3.4.1 Direct Contact

Many of the contaminants identified during the investigations carried out to date present a potential risk to human health receptors (future Site users) via the direct contact pathway. This should not present a significant risk in the Site's current condition as the majority of the waste present within the Site is considered to be covered by capping materials. In locations where this capping is thin or not deemed to be present there is the possibility that the waste material could be contacted directly.

During redevelopment of the Site, direct contact pathways will present a potential risk for ground workers and remediation operatives. The risk will need to be carefully managed during any remediation works.

With respect to the end use of the Site it is considered that the direct contact pathway will be broken by the presence of the buildings and hardstanding. A clean cover system in areas of soft landscaping could be designed to effectively manage the direct contact pathway.

3.4.2 Inhalation

The potential pathway for inhalation can include both the inhalation of dust particles and of contaminant vapours. The inhalation of dust can be controlled in a similar manor to the direct contact pathway described above. Of particular concern could be the presence of asbestos fibres within the landfill material. It is not known at this stage whether asbestos is present within the waste material and this will require further investigation and analysis.

Contaminants in a gaseous form (e.g. carbon dioxide, methane and VOCs) can present a more complex risk as there is the potential for gases to migrate through the subsurface and accumulate into buildings. This not only presents a risk via the inhalation pathway to users of the affected buildings but for certain gases can also present an explosive risk (e.g. methane, hydrocarbon vapours).

During any redevelopment work the release of vapours and gases will need to be carefully monitored and controlled. All excavations will need to be treated as confined spaces with continuous gas monitoring undertaken and appropriate control measures. Excavation works have the potential to change the gas regime at the Site and therefore care will need to be taken not to enhance the migration of gases to neighbouring properties.

With respect to end users of the Site it is considered that the vapour intrusion pathway could be adequately controlled via the use of an engineered barrier such as the use of low permeability gas membranes in the proposed buildings. It should be noted that the design will depend on the final gassing regime at the Site on completion of any remediation works and will probably be dependent upon the amount of organic material that remains at the Site.

3.4.3 Off-Site Migration

The Site is a large area that is built up relative to the surrounding land. During periods of heavy rain, water could run off the raised areas or infiltrate into the waste, potentially moving laterally through the waste (particularly where unconsolidated) and emerging elsewhere at the base of the waste mound. There was reported to be a concrete lined drain running along the top of the lower tier of waste considered to act as a surface run off drain during periods of heavy rain. This ends in an outlet ditch on the north end of the Site. This process could leach elements/compounds from the waste materials and result in either surface run-off or leaching of contaminants to groundwater.

The identification of the Taplow Gravel Formation below the landfilled waste material provides a potential pathway for off-site migration of contaminants via leaching of contaminants to groundwater. There is limited information available to assess the quality of groundwater within the Taplow Gravel Formation and therefore it is not known if the waste materials presents a significant risk.

However, it should be noted that the cross-sections have indicated that the North Circular may be constructed at a level beneath the base of the Taplow Gravel Formation and therefore there may not be a viable pathway for off-site migration to the northwest of the Site. The cross-sections indicate that there may be a pathway present within the Taplow Gravel Formation to the southwest beneath the canal. However, given the limited extent of the Taplow Gravel Formation beneath the Site (due to the gravel excavation) this pathway may or may not be present.

Given that there is likely to be limited connectivity to off-site receptors it is considered that it would be prudent to manage potential preferential pathways during redevelopment works. This could be via the installation of a clay cut-off barrier placed around the perimeter of the Site, similar to the one installed at the adjacent site.

3.4.4 Other Potential Pathways

Previous investigations have shown that the landfill waste is producing detectable concentrations of methane. This is considered a significant greenhouse gas and the uncontrolled release to the atmosphere should be identified as a potential migration route for significant amounts of harmful gasses.

There have been limited geotechnical investigations regarding the stability of the raised levels where landfilling operations have taken place. There is potential that the slopes or landfilled waste material could become unstable. This could lead to instability and land slippage off-site.

3.5 Data Gap Assessment

Based on the review of the historical data provided and located during this High Level Liabilities Review, various data gaps were identified which create large uncertainties which would impact on future cost planning.

The data gaps identified are outlined below:

- Accurate or comparable description of the different waste materials present on the Site to assist in determining which materials may be suitable for reuse and to make an assessment of the proportion of different types of material that may be present within the landfill.

- There have been no representative samples taken to assess the presence or absence of asbestos within the landfilled waste. The presence of visible asbestos containing materials as well as asbestos fibres within the waste material can have a significant effect on the waste classification and the monetary rate of disposal. There would also be impacts on how the waste would have to be managed on-site during any works and preventing off-site migration of any asbestos fibres.
- Very limited analysis of the solid waste has been undertaken previously. A maximum of 41 samples were collected over 15 years ago and analysed for a limited suite of compounds. This data is currently being used to determine the classification of approximately 300,000m^3 of waste material. There is limited data for Volatile Organic Compounds, Semi Volatile Organic Compounds, Polycyclic Aromatic Hydrocarbons, Total Organic Carbon, Chemical Waste, Biological Waste and the combustibility of the waste materials.
- There is no current data that would be acceptable to receiving landfill sites or waste treatment facilities to allow them to accept the waste. Recent representative samples would need to be assessed, analysed and screened to determine how to classify the waste. This should include testing such as Loss on Ignition, Total Organic Carbon and Waste Acceptance Criteria (WAC) testing.
- There is no current data with regards to release of leachate from the landfilled waste. It is also not known if the leachate is currently being collected and controlled or whether this is being released off-site.
- There is no consistent data with regards to the perched water and groundwater elevations across the Site. Therefore it is not possible to determine if there is a continuous groundwater body beneath the Site and whether there is the potential for groundwater to flow off-site. The environmental quality of the groundwater is also not known, and therefore whether this presents a significant risk to off-site receptors.
- The current permanent ground gas regime at the Site is not known. The last gas monitoring was undertaken approximately 17 years ago and therefore is unlikely to be representative of today's condition. Gas monitoring will be required in order to understand the risks presented during any remediation works. Further gas monitoring may be required after completion of the remediation works to determine the gas protection measures that would need to be installed into future buildings.
- The geotechnical properties of the waste and associated materials is not known. The geotechnical condition of the waste is required to enable an assessment of which materials are suitable for reuse during any remediation works.
- A Detailed Quantitative Risk Assessment will be required to determine suitability for reuse criteria for the Site.

4 Key Development Constraints and Ranking

4.1 Potential Development Scenarios

The main development constraint associated with the Site will be the off-site disposal of the waste material in order to create a level building platform. The ground elevation of the surrounding land appears to range from 30m AOD adjacent to the canal, to the west of the Site, to 25m AOD adjacent to the petrol filling station to the east of the Site. The maximum height of the mound located on the Site is reported to be 41.8m AOD.

It is considered that any proposed redevelopment at the Site would need to tie in with the surrounding land elevation. There is a possibility that site levels could be raised, however, this would require consultation with the Local Authority planning department as it may be considered that this proposed development would dominate and not tie in with the local area. It should be noted that raising of ground levels above the surrounding area would result in the need for retaining structures to be installed in order to maximise the development platform.

Three different development scenarios have been considered:

1. Removal of all landfill material and replacement with imported engineered fill material to match surrounding ground surface elevation (30m AOD adjacent to canal, 22.5m AOD adjacent to North Circular and 25m AOD adjacent to petrol filling station) – this scenario requires the removal of all waste shown on Figure 2;
2. Removal of landfill material to match surrounding ground surface elevations as detailed above, some waste is retained on Site where it falls below surrounding ground elevations;
3. Removal of landfill material to an elevation of between 32.5m AOD and 27.5m AOD. This is approximately 2.5m above surrounding ground surface elevations, and it is considered that this development platform may be considered acceptable for future redevelopment of the Site by the planning authority, while reducing the volume of waste material requiring off-site disposal. However, this will need to be discussed with the relevant planning authority as there is no guarantee that they will accept this position.

The ground model has indicated that to achieve a site elevation that approximately matches the surrounding land would require approximately 200,000m^3 of material to be removed from the Site. In addition, in order to remove all of the waste material from Site (Option 1 detailed above) a further 100,000m^3 of material would need to be removed and replaced with a clean imported material to match surrounding levels. Raising ground level by approximately 2.5m above surrounding land would result in only requiring approximately 120,000m^3 of material requiring off-site disposal

All of the options described above would result in a significant quantity of material requiring off-site disposal and therefore a high number of vehicle movements. At present, the only access road to the Site is that forming the southern boundary of the Site, which is also the access road for the adjacent council refuse and recycling centre. It is understood that the recycling centre will be required under the London Waste Strategy for the near to medium future, and therefore it will be necessary to manage use of the access road such that continued access can also be provided to the recycling centre. Should shared use of the access road not be viable, the requirement for a haul road onto the site will form a significant development constraint. At present, as there is only one access road to the site, access and vehicle manoeuvring on site are already constrained by the single access and egress point.

The number of vehicle movements will have a significant impact on the duration of the construction project. The following table provides an estimation of the number of vehicle movements required for each option and the likely project duration. This is based on the following assumptions:

- Landfill material has bulk density of 1.7 megagram per cubic metre (Mg/m^3)
- Each lorry load can transport 19 tonnes of waste material
- Daily lorry movements limited to 20 to allow for Site constraints (many more than this could result in congestion issues on surrounding roads as lorries wait to get onto Site)

- Lorry movements limited to 5 days per week.

Option	Quantity of Material Requiring Off-site Disposal (m^3)	Quantity of Material to be Brought onto Site (m^3)	Approximate number of Lorry Movements	Approximate Earthworks Duration (weeks)	Approximate Earthworks Duration (years)
1	300,000	100,000	35,800	358 weeks	6.9 years
2	200,000	0	17,900	179 weeks	3.5 years
3	120,000	0	10,800	108 weeks	2.1 years

The project duration can potentially be reduced by supplying more lorries to transport the waste material. However, there are other issues that will need to be taken into account such as the time to unload at the facility (including other users), distance to the receiving facility, the number of trips that can be made in a day as well as on-site constraints. For example, having too many lorries involved can result in congestion issues in the surrounding area, as the supply of lorries will not be 'uniform' throughout the day. This is because the lorries will all arrive to be loaded at the start of the day and their transport time to the receiving site will generally be the same, meaning that their return to the site will also be around the same time.

It is considered that the number of lorry movements involved with Option 1 and the associated timescale makes this option unviable. **This option has therefore not been considered any further**. The key to redeveloping the Site will be to retain and re-use as much of the waste material as possible. However, this is likely to be dictated by what will be achievable from a planning perspective with respect to the finished Site levels.

It is considered that the presence of the Grand Union Canal adjacent to the western boundary of the Site also provides a transport option for the removal of waste from the site. Use of waste barges would require the construction of an engineered wharf and loading platform, with on-Site temporary haul roads also required to take waste across the Site to the wharf. However, should redevelopment of the Site be planned, this option should be further considered as a means to reduce lorry movements from the Site. Similarly to the lorries, barges would be constrained in access to the Site but their use within a wider strategy would represent a more sustainable option than purely road-based transport. It is considered unlikely that a solely water-course driven removal solution would be viable.

4.2 Potential Redevelopment Strategy

In order to minimise costs and duration it is essential that as much material as possible is retained and reused on Site. However, it is important to ensure that any material that is excavated is not regarded as a waste on the completion of the works. There are several different permits/systems available, which essentially require that the following four factors have been satisfied:

1. Volume – that the volume used is the amount justifiably required. To use more waste than is required is considered illegal landfilling and may be subject to enforcement action.
2. Certainty of Use – that the use of the waste materials is definitely required. Materials cannot be stockpiled on Site “just in case”. Where use is not certain the waste should be consigned from Site.
3. No Risk to Human Health or the Environment – where materials are being reused on Site, suitability for reuse criteria will need to be derived to ensure that human health and environmental receptors are protected. Information as to how these criteria were devised is also required.

4. Suitability – it must be demonstrable that the material is fit for purpose i.e. that it is an appropriate substitution for material that would otherwise have been imported to fulfil the same function.

The investigation carried out to date has supplied some information. However, there is insufficient information at this stage to enable a full remediation strategy to be developed. Therefore further investigation will be required in order to determine:

- Which materials are chemically and geotechnically suitable for reuse;
- Whether treatment would enable further materials to be reused; and
- The waste classification of any materials requiring off-site disposal.

The biggest problem is likely to be associated with the soft organic cohesive materials. These types of material are unlikely to be geotechnically suitable, and as they are likely to be the primary source of ground gas at the Site would preferentially be taken off-site. However, the high organic content would mean that these types of material could be difficult to dispose of, particularly if classified as hazardous waste. It is considered that some form of pre-treatment may be required at the facility, prior to disposal, in order to enable the waste to be acceptable for disposal.

A number of assumptions have had to be made in order to develop the outline redevelopment strategy for the Site. Further investigation and assessment will be required in order develop a full strategy for the Site.

The following provides an outline strategy for the redevelopment of the Site:

1. Further Site investigation and consultancy work to develop remediation strategy, undertake waste classification, determine suitability for reuse criteria.
2. Complex sort of excavated materials:
    a. Oversize materials such as brick, concrete, metal either crushed and reused on Site or taken off-site for recycling.
    b. Soft organic clays and sands and paper waste - unlikely to be suitable for reuse and likely to require off-site disposal. Further information required in order to classify the waste and determine if pre-treatment is required.
    c. Screening of other unsuitable materials such as wood, timber and other organics.
    d. Testing and removal of materials with high levels of contaminants above the suitability for reuse criteria.
3. Removal of unsuitable and excess materials from Site.
4. Treatment prior to disposal of groundwater abstracted during excavation.
5. Installation of a clay barrier around the northern, eastern and western sides of the Site in order to ensure that there is no significant pathway for groundwater migration through the remnants of the Taplow Gravel that may be present beneath the Site.
6. Reuse of suitable materials to create level building platform. This is likely to involve compaction and possibly lime modification in order to support roads and areas of hardstanding. However, the materials are unlikely to be suitable as a structural fill material capable of supporting buildings.
7. Depending upon the finished Site levels there may be the need to install retaining walls around the perimeter of the Site.
8. Piled foundations for the proposed buildings.
9. Installation of gas protection measures into buildings. It is difficult to determine the level of protection that will be required at this stage as it is envisaged that the majority of the source

material will be removed from Site. However, it is likely that as a minimum, a low permeability gas membrane will need to be incorporated into the floor construction of proposed buildings.

A further limiting factor is the space available to sort, stockpile and treat the excavated materials on Site. The large mound of material means that to create a compound and treatment area on Site would require an initial cut of material before the compound can be set up. There will also be very limited space for the stockpiling of materials that are suitable for reuse. This could result in materials that are deemed suitable for reuse being moved off-site just because there is no space for them to be stored. A possible solution would be to incorporate the council reuse and recycling centre land within the Site and use this area as the treatment compound. This would be the preferred solution but may not be viable. A potential second option would be to use the lower elevation land beyond the recycling centre as a treatment zone, but this would still rely on access through the recycling centre.

4.3 Potential Development Constraints

Based on the above redevelopment strategy, the following potential development constraints have been identified:

1. Consultancy work - additional Site Investigation (SI), DQRA, development of remediation strategy, negotiation with Local Authority (LA) and Environment Agency (EA), Materials Management Plan (MMP) and other associated documents and permits.
2. Ecology and invasive species - surveys and mitigation measures.
3. Archaeology.
4. Unexploded ordnance (UXO) risk assessment and mitigation measures.
5. Vegetation clearance.
6. Excavation of existing capping materials and stockpiling for reuse.
7. Excavation, complex sorting, crushing, reuse and off-site disposal of materials.
8. Treatment of groundwater abstracted during excavation.
9. Asbestos monitoring and control measures during excavation works.
10. Precautionary measures required to control odours and gas emissions.
11. Lime modification of some materials to enable reuse.
12. Installation of clay layer to ensure that there are no off-site preferential pathways.
13. Retaining structures - depending upon finished levels
14. Piled foundations
15. Gas protection measures in buildings
16. Upgrade of water supply pipes
17. Clean cover system in soft landscaping areas
18. Clean backfill in service trenches

Several of the items outlined above will have negligible costs when compared with the cost for off-site disposal of large quantities of waste material. In order to concentrate on estimating the costs for the significant items a screening exercise was carried out. Items where the costs are likely to be less than £10,000 have not been costed in detail. These items have been included on the final cost estimation table but only in indicating that the cost is likely to be less than £10,000. However, it would be prudent to include an allowance for these items in any future cost estimate or provisioning exercise undertaken for redevelopment of the Site.

5 Indicative Cost Estimate

In order to provide an indication of the likely costs for each of the identified development constraints a number of assumptions have been required. This section provides details of these assumptions and should be read in conjunction with the indicative cost estimate sheets provided as Appendix 2. As discussed in Section 4, redevelopment scenario 1 has been discounted due to the high number of lorry movements required. Indicative cost estimate sheets have therefore only been provided for redevelopment scenarios 2 and 3.

For each item a cost range has been determined. This is based on a number of different assumptions as explained in the following section. In each case a worst case and best case estimate has been calculated together with a likely case. It should be noted that this is based on the information available at the time of writing this report. Subsequent investigation could provide information that would determine the final cost to be outside of this calculated range.

For some items experience has indicated that the associated costs are likely to be less than £10,000. These items have not been estimated in any detail. The following items are included in the indicative cost estimate sheets for completeness with a cost estimation of <£10,000 for the indicative worst case costs:

1. Ecology and habitat surveys
2. Archaeological surveys
3. UXO risk assessment and mitigation measures
4. Vegetation clearance
5. Excavation of existing capping material and stockpiling for reuse
6. Upgrade of water supply pipes to be contaminant resistant
7. Clean cover system in soft landscaped areas (this assumes that there will be minimal landscaped areas within the proposed development)
8. Clean backfill to services

5.1 Consultancy Items

It is considered that the following consultancy items will be required in order to develop a redevelopment strategy for the Site:

1. Additional geotechnical and environmental site investigation including ground gas assessment
2. A DQRA to determine suitability for reuse criteria for the Site
3. Development of remediation strategy and associated documentation and permits (including but not limited to Remediation Options Appraisal Report (ROAR), Remediation Implementation Plan (RIP), MMP, Mobile Treatment Licence deployment forms)
4. Geotechnical design and earthworks specification
5. Liaison with LA and EA to agree strategy
6. Full time supervision of remediation works together with validation sampling, material tracking and preparation of verification report.

5.2 Excavation, Complex Sort and Reuse of Materials

The modelling of the landfill has indicated that there is approximately 300,000 m^3 of waste material located on the Site, which is very similar to the volume calculated by previous consultants. However, it should be noted that this is based on a limited number of exploratory hole locations that fully penetrated the waste material, therefore, the worst case estimate has been based on a total volume of waste material of 360,000 m^3 (i.e. an additional 20%).

The cost estimate has assumed that all of the waste material will be excavated and that suitable material will be reused on Site. Costs have been based on an earthworks programme of:

- 179 weeks for Scenario 2
- 108 weeks for Scenario 3

As discussed in Section 4.1 the programme duration has been calculated based on the number of lorry movements required to transport the excess waste material off-site. This has resulted in a relatively slow rate of excavation and materials processing. The rates used for the processing are therefore higher than would routinely be used on 'normal' earthworks sites. This conservative approach is deemed necessary due to the very limited space on Site available for stockpiling, processing and excavating etc.

The cost estimate has taken into account the:

- Excavation of the material;
- Basic screening of the material at excavation face to segregate out soft organic cohesive materials and other obviously unsuitable materials;
- Screening of material to remove metal, oversize material, wood/timber fragments and other materials not suitable for reuse;
- Crushing of oversize materials; and
- Placement and compaction of materials deemed suitable for reuse.

At this time it is not known if asbestos is present in the landfill. Given the history of the Site and mixed nature of the waste it is considered likely that asbestos fibres may be present, and therefore allowance has been made to control potential fibre release (detailed further in Section 5.4). However, no allowance has been made in order to physically remove fragments of Asbestos Containing Materials (ACM). It should also be noted that the presence of asbestos within the waste material could classify the waste as hazardous and also limit the number of places where the waste can be taken for either treatment or disposal. The assessment has assumed that asbestos is not present within the waste material at concentrations that would classify the waste as hazardous or limit the disposal options available.

5.3 Off-Site Disposal of Unsuitable Material

At present there is insufficient data available in order to classify the waste. This therefore results in a large amount of uncertainty with respect to the costs involved with disposal of the waste material. The historical exploratory hole logs indicate that a significant proportion of the waste material has an organic component and/or included organic fragments such as wood, timber or paper. Materials with a high organic component tend to be geotechnically unsuitable (due to their high compressibility) and can generate permanent ground gases such as carbon dioxide and methane. Therefore there would be a need to preferentially screen out materials with a high organic content and dispose off-site in order to retain materials that are more geotechnically suitable for reuse on the Site.

Materials with high organic content can be problematic to dispose of particularly if concentrations of other contaminants (such as metals and PAHs) classify the waste as hazardous. There is currently a limit of 6% Total Organic Carbon (TOC) on hazardous waste destined for disposal to landfill. Wastes that are classified as hazardous with a high organic component are therefore unlikely to be able to be disposed of to landfill without some form of pre-treatment in order to reduce the organic content. An allowance for pre-treatment has been made but final costs will depend upon the exact composition of the waste.

Arcadis has contacted some waste contractors who have given some outline cost estimates. However, it should be noted that there was insufficient information to even provide an initial waste classification and therefore the rates have been based on indicative waste descriptions and likely classifications. Testing will be required to determine what a viable disposal route would be and associated rates.

For this initial indicative costing exercise the following has been assumed:

- Off-site removal of 200,000m^3 of material for scenario 2 and 120,000m^3 of material for scenario 3.
- A bulk density of 1.8 Mg/m^3 has been assumed for the indicative worst case scenarios and of 1.7 Mg/m^3 for the best and average case scenarios. The bulk density is used to convert the landfill volume to a mass.
- Transport of the waste material of £20/tonne has been assumed.
- For the worst case scenarios a cost of disposal of £135/tonne has been assumed with a pre-treatment cost of £10/tonne.
- For the best case scenarios it is assumed that the waste material can be treated at a treatment centre in order to reduce the amount that requires disposal to landfill. It is not known if this option will be viable and will require waste contractors undertaking their own treatability studies. However, on the assumption that the materials can be treated, an outline rate of £60/tonne has been applied.
- For the average case scenario it is assumed that 50% of the waste material will be disposed of at the higher rate and 50% at the lower rate.

5.4 Control of Odours, Dust, Asbestos and Gas Emissions

It is anticipated that during the excavation works there is the potential for odours and dust produced as well as gas emissions and potential asbestos fibre release. All of these aspects will need to be controlled in order to protect groundworkers as well as neighbouring residents.

The previous consultants suggested that remediation undertaken prior to excavation would reduce odours and gas emissions to acceptable concentrations. While the remediation proposed would assist in reducing odours and gas emissions it is very unlikely that these could be reduced to an extent that control measures would not be required during the excavation. The primary purpose of the remediation described by Intergeo was to enhance or speed up the degradation of the organic material within the landfill. The last intrusive investigation at the Site was undertaken in 1999 and therefore the landfill has had another 17 years for degradation to naturally take place. Relying on data of this age is not appropriate for ascertaining the types of control measures that would be required today.

For the purposes of this assessment it is assumed that only asbestos air monitoring will be required on a part time basis and that a decontamination unit is available to prevent waste material from being transported into site cabins on site workers' boots etc. No allowance has been made for the removal and disposal of asbestos containing materials.

For the purpose of this assessment it is assumed that the following will be required:

- Provision of dust suppression spray;
- Perimeter odour control;
- Asbestos air monitoring two days per week;
- Decontamination unit.

Specialised Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE) has not been allowed for.

5.5 Treatment of Groundwater During Excavation Works

During the excavation works, groundwater within the landfill will need to be controlled. The inflow of water into open excavations is unlikely to be significant given the limited extent of the Taplow Gravel and the underlying London Clay. However, it is considered that a treatment system will need to be on

site for the duration of the excavation works. An initial allowance of £2,500 per week has been made. However, the exact cost will depend upon the type of treatment required and volumes of water involved.

5.6 Lime Modification

An allowance has been made in order to modify some of the materials for reuse with lime. The purpose of the lime modification is to reduce the moisture content to enable the materials to be compacted at their optimum moisture content. The assessment has assumed that for the indicative worst case 20% of soils for reuse will require modification, for the indicative likely case 10%, and for the indicative best case 5%. It should be noted that the rate assumed allows for lime modification only. No allowance has been made for full lime stabilisation of soils.

5.7 Installation of Clay Cut-Off Barrier

The review of the available investigation information has indicated that there is a limited thickness of Taplow Gravel remaining *in situ* beneath the landfill. It is not known if this is laterally present in all locations and it is known that in some locations it has a high clay content. Cross-sections have been prepared through the landfill which suggest that the North Circular is constructed at a level where the subbase will comprise London Clay. This means that there is unlikely to be an off-site pathway for contaminants through the Taplow Gravel. However, in order to ensure that there are no preferential off-site pathways through the Taplow Gravel a clay cut-off barrier around the perimeter of the Site has been allowed for. It is assumed that the barrier will only need to be installed along the northern, eastern and western sides of the Site to an assumed depth of 2m bgl.

5.8 Retaining Structures

For Scenario 3, where Site levels have been raised by 2.5m, a retaining wall will need to be constructed around the perimeter of the Site. For the purpose of this indicative costing exercise it is assumed that the retaining wall will be 800m long and of timber crib construction.

5.9 Piled Foundations

It is considered that the made ground selected for reuse at the Site will be suitable as a general fill material suitable for supporting roads and areas of hardstanding but will not be suitable as a structural fill material. Therefore future buildings will need to be supported on piled foundations. For both scenarios it is assumed that 40% of the Site will be covered by commercial buildings. For Scenario 2 it is considered that piles to support the likely light to moderate loads from small industrial units will be in the order of 15m long. For Scenario 3 it is assumed that the piles will be in the order of 18m long to take into account the additional made ground thickness.

For the likely and best case scenarios it is assumed that there is sufficient crushed concrete material available from Site-won sources to construct the piling mat.

It should be noted that pile design has not been undertaken and that further investigation will be required in order to collect the geotechnical information required to confirm the required pile depths for the proposed structures.

5.10 Gas Protection Measures

Even though the Site redevelopment strategy preferentially removes materials that are likely to generate ground gas it is considered likely that some residual risk from re-use of the made ground will remain. Therefore, allowance has been made to install a low permeability gas membrane into the proposed buildings and provide simple passive venting below the floor. It is assumed that 40% of the Site will be covered by the building footprints.

6 Conclusion

As part of the high level assessment of the potential abnormal costs three different redevelopment scenarios have been considered. Scenario 1 was deemed to be unviable due to the quantity of lorry movements required to transport the waste off-site. High level indicative costs were therefore developed for the following remaining redevelopment scenarios:

Scenario 2: Removal of landfill material to match surrounding ground surface elevations;

Scenario 3: Removal of landfill material to an elevation that is approximately 2.5m above surrounding ground surface elevations.

The following indicative cost range has been developed for the two Scenarios:

Scenario	Indicative Best Case Cost	Indicative Average Case Cost	Indicative Worst Case Cost
2	£32.8 Million	£48.1 Million	£67.6 Million
3	£21.5 Million	£31.4 Million	£44.1 Million

It is noted that the cost ranges derived represent a relatively high cost for remediation and redevelopment of the Site (£7million to £22.5million per hectare) when compared to other brownfield sites or generalised benchmarking data, for example the Homes & Communities Agency's March 2015 *Guidance on dereliction, demolition and remediation costs* (£540,000 to £1.23million per hectare for a comparable site). This is due to the significant challenge represented by the high volume of mixed waste present, combined with the access limitations and other development constraints identified at the Site. As noted below, it is considered likely that collecting additional site data would provide further certainty in the cost ranges, however, it is unlikely that the best case cost would be significantly improved. The indicative cost ranges have been developed in consideration of bench marking data from similar brownfield redevelopments, including remediation of a former chemical-pharmaceutical landfill in south-east London also carried out via waste sorting and segregation. A review of likely sources of funding indicates that it is unlikely that "non-payback" funding could be obtained from the European Union or other sources. It may be possible to access sources of financing for redevelopment works, however, it is Arcadis' experience that these funding sources are accompanied by stringent qualification criteria.

There is a wide range in the cost estimates. This is mainly due to the wide variation in the cost for off-site disposal of the waste material. At present there is insufficient information to classify the waste and therefore a number of assumptions have had to be made. There is also a significant cost difference between scenarios 2 and 3. Essentially the more material that can be retained and reused on the Site the lower the overall redevelopment cost is likely to be. Further assessment will be required in order to provide a better indication of the quantity of material that will be suitable for reuse. However, it is considered that finished Site levels will form a fundamental part in the decision making process and overall financial viability of the project. Scenario 3 considers the development of a construction platform that is approximately 2.5m above the surrounding ground level. Finished levels will be a matter for the LA planning department to approve to ensure that the development fits in with the surrounding area.

In order to enable the cost assessment to be refined and a suitable redevelopment scenario to be developed, further investigation and assessment of the Site will be required.

7 Study Limitations

IMPORTANT. This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by Arcadis (UK) Limited (Arcadis), with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with Old Oak and Park Royal Development Corporation (the 'Client'). Arcadis does not accept responsibility for any matters outside the agreed scope.

2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.

3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Arcadis are unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have unpublished, more stringent objectives. Further work may be required by these parties.

4. All work carried out in preparing this report has used, and is based on, Arcadis' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice, pending changes in legislation, of which Arcadis is aware, have been considered. Following delivery of the report, Arcadis have no obligation to advise the Client or any other party of such changes or their repercussions.

5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6. Whilst this report and the opinions made are correct to the best of Arcadis' belief, Arcadis cannot guarantee the accuracy or completeness of any information provided by third parties.

7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have been received.

8. This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of changes in the condition of the site since the time of the investigation.

9. The content of this report represents the professional opinion of experienced environmental consultants. Arcadis does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on-site.

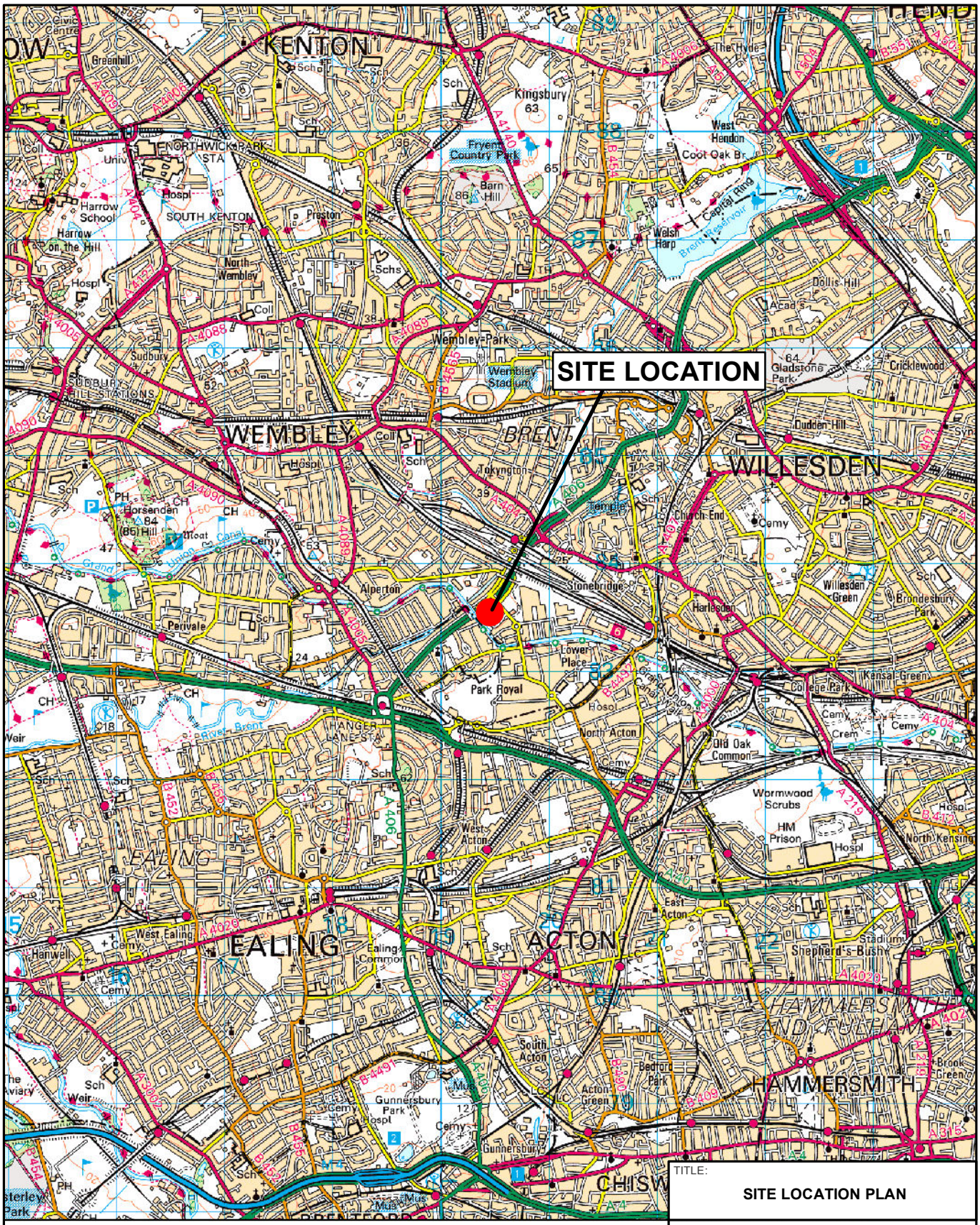
12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

13. Unless otherwise stated, samples from the site (soil, groundwater, building fabric or other samples) have NOT been analysed or assessed for waste classification purposes.

APPENDIX A

Figures

Figure 1 – Site Location Plan
Figure 2 – Depth to Base of Landfill Material
Figure 3 – Cut and Fill Model for Redevelopment Scenario 2
Figure 4 – Cut and Fill Model for Redevelopment Scenario 3
Figure 5 – Cross Section Schematic



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LEGEND	NOTES
SITE LOCATION	SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE.

0 0.2 0.4 0.8 1.2 1.6 2 Kilometres

N

TITLE: **SITE LOCATION PLAN**

SITE : **ABBEY ROAD**

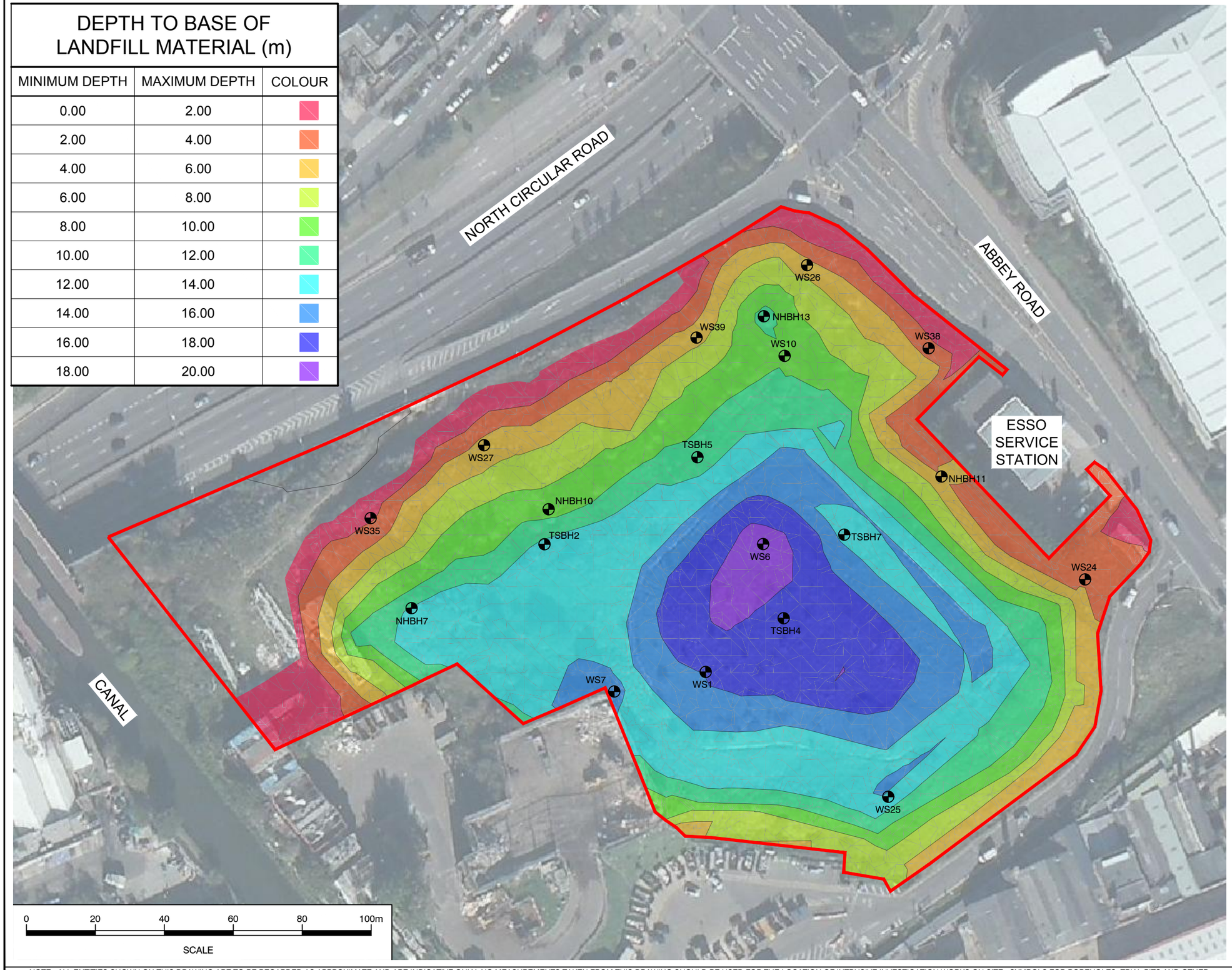
CLIENT : **OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION**

PROJECT :	**34441100**	**FIGURE 1**	
DATE :	17/02/16	DRAWN BY :	RJM
DRG No. :	3444110002 GIS		
SCALE :	**1 : 50,000**	PRINT :	**A4**

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DEPTH TO BASE OF LANDFILL MATERIAL (m)

MINIMUM DEPTH	MAXIMUM DEPTH	COLOUR
0.00	2.00	
2.00	4.00	
4.00	6.00	
6.00	8.00	
8.00	10.00	
10.00	12.00	
12.00	14.00	
14.00	16.00	
16.00	18.00	
18.00	20.00	



KEY

- BOREHOLE LOCATION
- SITE BOUNDARY

N
W E
S

NOTES

VOLUME OF LANDFILL MATERIAL: **275,000m³**

REV	DATE	COMMENT	CAD

TITLE: DEPTH TO BASE OF LANDFILL MATERIAL

SITE: ABBEY ROAD

CLIENT: OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

PROJECT: 34441100 | FIGURE 2

DATE: 18/02/16 | DRAWN: BNB | REV: -

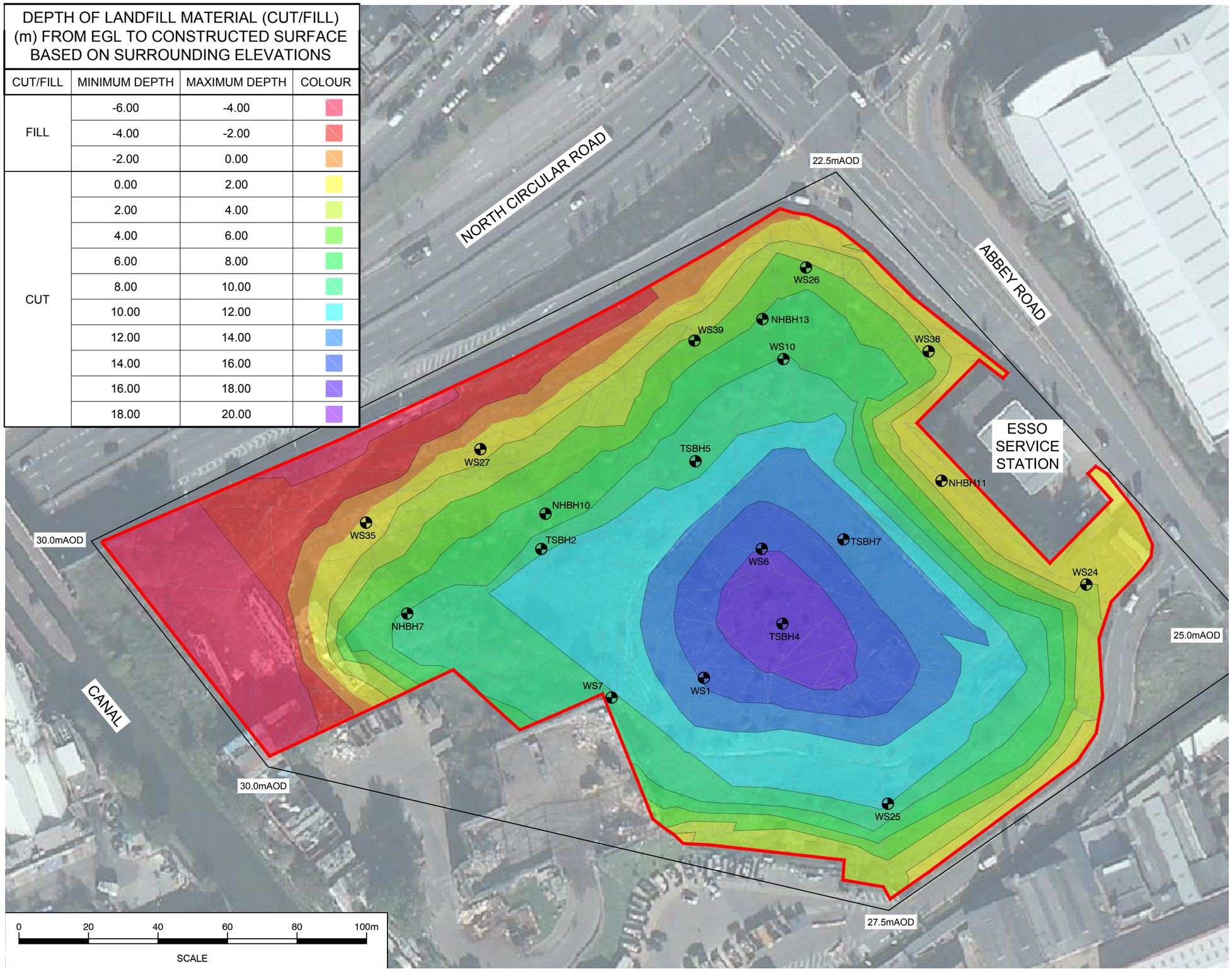
DRG.No.: 3444110003-CAD | PRINT: A3

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NOTE: ALL ENTITIES SHOWN ON THIS DRAWING ARE TO BE REGARDED AS APPROXIMATE AND ARE INDICATIVE ONLY. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS UK IN CASE OF ANY QUERY

DEPTH OF LANDFILL MATERIAL (CUT/FILL) (m) FROM EGL TO CONSTRUCTED SURFACE BASED ON SURROUNDING ELEVATIONS

CUT/FILL	MINIMUM DEPTH	MAXIMUM DEPTH	COLOUR
FILL	-6.00	-4.00	
	-4.00	-2.00	
	-2.00	0.00	
CUT	0.00	2.00	
	2.00	4.00	
	4.00	6.00	
	6.00	8.00	
	8.00	10.00	
	10.00	12.00	
	12.00	14.00	
	14.00	16.00	
	16.00	18.00	
	18.00	20.00	



KEY

- BOREHOLE LOCATION
- SITE BOUNDARY

N W E S

NOTES

VOLUME OF LANDFILL MATERIAL

CUT: **212,000m³**

FILL: **17,000m³**

EGL = Existing Ground Level at the Site

REV	DATE	COMMENT	CAD

TITLE: CUT AND FILL MODEL FOR REDEVELOPMENT SCENARIO 2

SITE: ABBEY ROAD

CLIENT: OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

PROJECT: 34441100 | FIGURE 3

DATE: 18/02/16 | DRAWN: BNB | REV: -

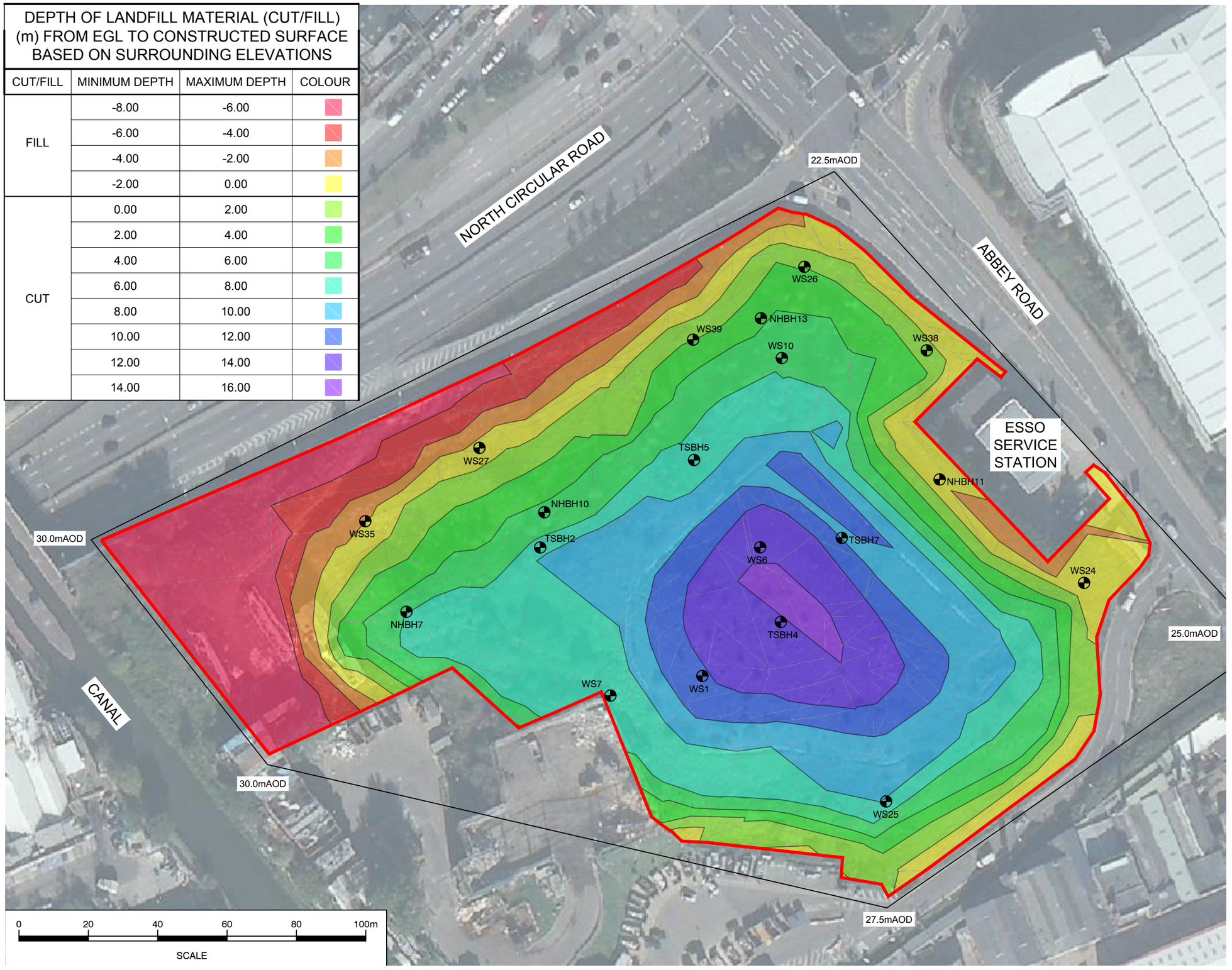
DRG.No.: 3444110003-CAD | PRINT: A3

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DEPTH OF LANDFILL MATERIAL (CUT/FILL) (m) FROM EGL TO CONSTRUCTED SURFACE BASED ON SURROUNDING ELEVATIONS

CUT/FILL	MINIMUM DEPTH	MAXIMUM DEPTH	COLOUR
FILL	-8.00	-6.00	
	-6.00	-4.00	
	-4.00	-2.00	
	-2.00	0.00	
CUT	0.00	2.00	
	2.00	4.00	
	4.00	6.00	
	6.00	8.00	
	8.00	10.00	
	10.00	12.00	
	12.00	14.00	
	14.00	16.00	



KEY

- BOREHOLE LOCATION
- SITE BOUNDARY

N
W
E
S

NOTES

VOLUME OF LANDFILL MATERIAL

CUT: **151,000m³**

FILL: **35,000m³**

EGL = Existing Ground Level at the Site

REV	DATE	COMMENT	CAD

TITLE: CUT AND FILL MODEL FOR REDEVELOPMENT SCENARIO 3

SITE: ABBEY ROAD

CLIENT: OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

PROJECT: 34441100 | FIGURE 4

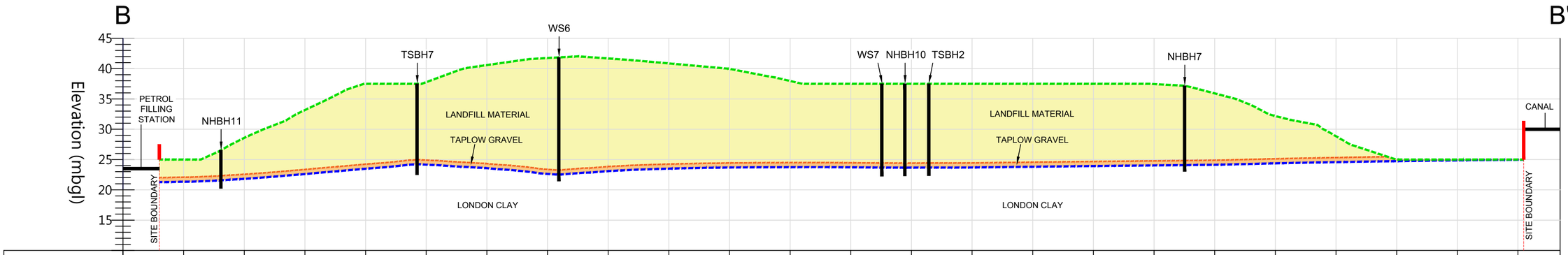
DATE: 18/02/16 | DRAWN: BNB | REV: -

DRG.No.: 3444110003-CAD | PRINT: A3

ARCADIS Design & Consultancy for natural and built assets

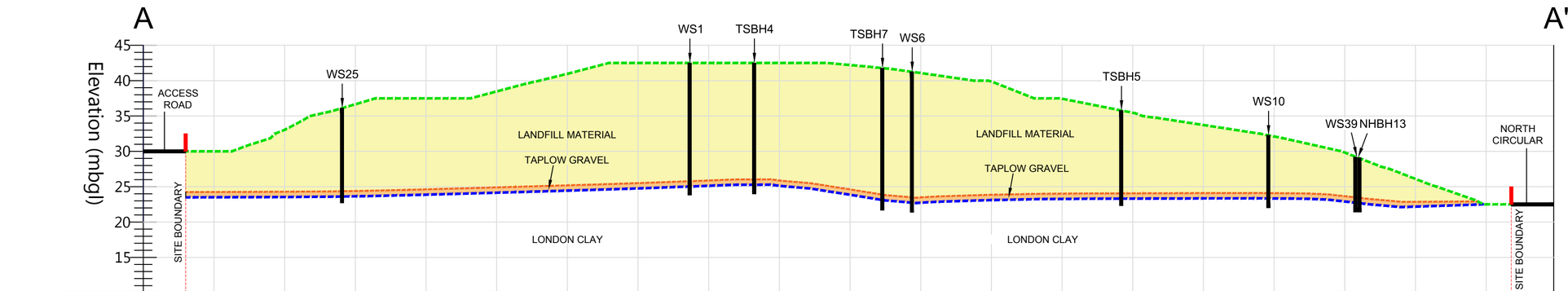
NOTE: ALL ENTITIES SHOWN ON THIS DRAWING ARE TO BE REGARDED AS APPROXIMATE AND ARE INDICATIVE ONLY. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS UK IN CASE OF ANY QUERY

CROSS SECTION B-B'



Chainage	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	230.000	236.944
Surface Elevation (OGL)		25.000	28.578	33.166	37.500	37.772	40.590	41.753	41.682	40.865	39.969	37.967	37.500	37.500	37.500	37.500	37.500	37.460	35.918	32.171	28.848	25.000	25.000	25.000	

CROSS SECTION A-A'



Chainage	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	199.559
Surface Elevation (OGL)		30.000	33.048	36.662	37.500	38.477	40.965	42.500	42.500	42.500	42.210	41.078	39.862	37.443	35.462	33.726	32.108	29.834	26.100	22.500	



KEY

- GROUND SURFACE (OGL)
- SURFACE OF TAPLOW GRAVEL
- SURFACE OF LONDON CLAY

NOTES

.

REV	DATE	COMMENT	CAD

TITLE: CROSS SECTION SCHEMATIC

SITE: ABBEY ROAD

CLIENT: OLD OAK AND PARK ROYAL DEVELOPMENT CORPORATION

PROJECT: 34441100 | FIGURE 5

DATE: 18/02/16 | DRAWN: BNB | REV: -

DRG.No.: 3444110004-CAD | PRINT: A2

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APPENDIX B

Indicative Cost Estimate Sheets

Item	Scope	Indicative Best Case Cost	Indicative Average Case Cost	Indicative Worst Case Cost	Comments
1	**Consultancy Items**				
1.1	Additional geotechnical and environmental site investigations including ground gas.	£80,000	£100,000	£120,000	
1.2	Detailed Quantitative Risk Assessment	£5,000	£10,000	£15,000	
1.3	Development of remediation strategy and associated documents and permits (ROAR, RIP, MMP, deployment forms etc.) and regulatory liaison	£25,000	£30,000	£40,000	
1.4	Geotechnical design and earthworks specification	£10,000	£15,000	£20,000	
1.5	Supervision of remediation works, validation testing and preparation of verification report	£440,000	£480,000	£580,000	Assumes full time supervision of earthworks by environmental consultant during 179 week earthworks programme.
	Sub Total	**£560,000**	**£635,000**	**£775,000**	
2	**Contracting Items: Geotechnical and Environmental**	**Indicative Best Case Cost**	**Indicative Average Case Cost**	**Indicative Worst Case Cost**	**Comments**
2.1	Ecology and habitat surveys*	<5,000	<5,000	<10,000	
2.2	UXO risk assessment and mitigation measures*	<5,000	<5,000	<10,000	
2.3	Vegetation clearance*	<5,000	<5,000	<10,000	
2.4	Excavation of existing capping material and stockpiling for reuse*	<5,000	<5,000	<10,000	
2.5	Excavation, complex sort of materials into materials suitable for reuse and those requiring off-site disposal and compaction of suitable materials.	£2,780,000	£3,630,000	£4,660,000	Worst case scenario assumes total excavation volume of 360,000m3, likely case 300,000m3 (i.e. all of the landfill) and best case limiting excavation to 250,000m3. Includes crushing of 5% of excavated material for reuse.
2.6	Off-site disposal of unsuitable material	£28,000,000	£42,000,000	£60,000,000	Assuming off-site disposal of 200,000 m3 of material and retaining approximately 100,000m3 of material for reuse. Best case scenario assumes bulk density of 1.7 and treatment off-site at a rate of £80 per tonne including transport. Worst case scenario assumes bulk density of 1.8 and off-site hazardous waste disposal at a rate of £165 per tonne (including transport, pre-treatment, landfilling) Average case assumes bulk density of 1.7 and 50% at rate of £80 per tonne and 50% at rate of £165 per tonne.
2.7	Asbestos control measures during excavation, sorting and replacement of materials	£250,000	£310,000	£380,000	Assumes 179 week earthworks programme
2.8	Control of odours and gas emissions	£90,000	£110,000	£140,000	Assumes 179 week earthworks programme
2.9	Treatment of groundwater during excavation works	£360,000	£450,000	£540,000	Assumes 179 week earthworks programme
2.10	Lime modification	£30,000	£60,000	£110,000	Likely case assumes 10% of material requires lime modification, worst case 20% and best case 5%.
2.11	Installation of clay layer around site perimeter to ensure no off-site preferential pathways	£100,000	£120,000	£150,000	Assuming 600m long barrier 2m deep
2.12	Installation of retaining structures	N/A	N/A	N/A	Not required for this scenario
2.13	Upgrade of water supply pipes*	<5000	<5000	<5000	
2.14	Piled foundations	£530,000	£600,000	£660,000	Best and average cases assume that there is sufficient material from on-site sources to construct the piling mat. Assumed pile length of 15m and 40% of site covered with buildings
2.15	Installation of gas protection measures within new buildings	£120,000	£140,000	£170,000	Assumes that 40% of the site is covered by building footprint.
2.16	Clean cover system in soft landscaped areas*	<5000	<5000	<10000	
2.17	Clean backfill to services*	<5000	<5000	<10000	
	Sub Total	**£32,260,000**	**£47,420,000**	**£66,810,000**	
	Total*	**£32,820,000**	**£48,055,000**	**£67,585,000**	

* Items for which the associated costs are likely to be less than £10,000 have not been estimated in any detail, and are not included in the estimated total.

Item	Scope	Indicative Best Case Cost	Indicative Average Case Cost	Indicative Worst Case Cost	Comments
1	**Consultancy Items**				
1.1	Additional geotechnical and environmental site investigations including ground gas.	£80,000	£100,000	£120,000	
1.2	Detailed Quantitative Risk Assessment	£5,000	£10,000	£15,000	
1.3	Development of remediation strategy and associated documents and permits (ROAR, RIP, MMP, deployment forms etc.) and regulatory liaison	£25,000	£30,000	£40,000	
1.4	Geotechnical design and earthworks specification	£10,000	£15,000	£20,000	
1.5	Supervision of remediation works, validation testing and preparation of verification report	£280,000	£310,000	£380,000	Assumes full time supervision of earthworks by environmental consultant during 108 week earthworks programme.
	Sub Total	**£400,000**	**£465,000**	**£575,000**	
2	**Contracting Items: Geotechnical and Environmental**	**Indicative Best Case Cost**	**Indicative Average Case Cost**	**Indicative Worst Case Cost**	**Comments**
2.1	Ecology and habitat surveys*	<5,000	<5,000	<10,000	
2.2	UXO risk assessment and mitigation measures*	<5,000	<5,000	<10,000	
2.3	Vegetation clearance*	<5,000	<5,000	<10,000	
2.4	Excavation of existing capping material and stockpiling for reuse*	<5,000	<5,000	<10,000	
2.5	Excavation, complex sort of materials into materials suitable for reuse and those requiring off-site disposal and compaction of suitable materials.	£2,340,000	£3,870,000	£4,900,000	Worst case scenario assumes total excavation volume of 360,000m3, likely case 300,000m3 (i.e. all of the landfill) and best case limiting excavation to 250,000m3. Includes crushing of 5% of excavated material for reuse.
2.6	Off-site disposal of unsuitable material	£17,000,000	£25,000,000	£36,000,000	Assuming off-site disposal of 120,000 m3 of material and retaining approximately 180,000m3 of material for reuse. Best case scenario assumes bulk density of 1.7 and treatment off-site at a rate of £80 per tonne including transport. Worst case scenario assumes bulk density of 1.8 and off-site hazardous waste disposal at a rate of £165 per tonne (including transport, pre-treatment, landfilling) Average case assumes bulk density of 1.7 and 50% at rate of £80 per tonne and 50% at rate of £165 per tonne.
2.7	Asbestos control measures during excavation, sorting and replacement of materials	£160,000	£190,000	£230,000	Assuming a 108 week earthworks programme.
2.8	Control of odours and gas emissions	£60,000	£70,000	£90,000	Assuming a 108 week earthworks programme.
2.9	Treatment of groundwater during excavation works	£220,000	£270,000	£330,000	Assuming a 108 week earthworks programme.
2.10	Lime modification	£50,000	£100,000	£200,000	Likely case assumes 10% of material requires lime modification, worst case 20% and best case 5%.
2.11	Installation of clay cut-off barrier around site perimeter to ensure no off-site preferential pathways	£100,000	£120,000	£150,000	Assuming 600m long barrier 2m deep
2.12	Installation of retaining structures	£440,000	£550,000	£660,000	Assuming 800m timber crib retaining wall 2.5m high
2.13	Upgrade of water supply pipes*	<5000	<5000	<5000	
2.14	Piled foundations	£600,000	£660,000	£730,000	Best and average cases assume that there is sufficient material from on-site sources to construct the piling mat. Assumed pile length of 18m and 40% of site covered with buildings
2.15	Installation of gas protection measures within new buildings	£120,000	£140,000	£170,000	Assumes that 40% of the site is covered by building footprint.
2.16	Clean cover system in soft landscaped areas*	<5000	<5000	<10000	
2.17	Clean backfill to services*	<5000	<5000	<10000	
	Sub Total	**£21,090,000**	**£30,970,000**	**£43,460,000**	
	Total*	**£21,490,000**	**£31,435,000**	**£44,035,000**	

* Items for which the associated costs are likely to be less than £10,000 have not been estimated in any detail, and are not included in the estimated total.

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