



**PHASE I
GEO-ENVIRONMENTAL
DESK STUDY**

**Proposed Development
St James Court
St James Street
Liverpool
L1 0NB**

November 2017

Report Ref: 10/1004/001

Prepared on Behalf of:

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PHASE 1 GEO-ENVIRONMENTAL APPRAISAL REPORT ST JAMES COURT, LIVERPOOL

Report Reference: 10/1004/001

Date: November 2017

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EXECUTIVE SUMMARY

Client	Citipads Ltd
Location	Off St James Street in Liverpool. OS Grid Reference 335080, 389170.
Description	The site forms a roughly rectangular shaped parcel of land covering an area of 0.21 hectares and is currently occupied by three single storey light industrial units. Concrete covered car parking areas front onto Greenland Street to the south and New Bird Street to the north. A small area of grassed landscaping is present in the eastern part of the site adjacent to St James Street. The site is relatively flat lying but slopes gently to the west.
Development	The development is to include an 12 storey residential apartment block comprising 217 units with commercial premises on the lower ground floor and external car parking for 37 vehicles.
Site History	<p>The site was first developed in the mid-1800s with a number of small residential and commercial properties, along with an engineering works, foundry and garage, including a below ground tank, located in the north western and central northern parts of the site. A public house was also located in the south east. The site remained largely unchanged until WWII, following which the buildings were demolished and cleared. The site was redeveloped during the mid-1980s with a number of small industrial units and has not changed significantly since that time.</p> <p>It is noteworthy that following the war a number of buildings were shown as 'ruins' indicating the area was subject to bombing and the risk from unexploded ordnance should be considered prior to any intrusive works.</p> <p>Much of the surrounding area, particularly to the north, south and west has been heavily industrialised in the past with several timber yards, scrap yards, oil mills, garages, engineering works, chemical works and foundries all located within 250m.</p>
Geology	<p>Geological maps indicate that the site is underlain by superficial deposits comprising Glacial Till (clay, sand and gravel). In the central and eastern parts of the site the underlying bedrock comprises sandstone, siltstone and mudstone of the Tarporley Siltstone Formation with the western portion of the site underlain by sandstone of the Helsby Sandstone Formation.</p> <p>One historical BGS borehole record located 20m to the south east of the site recorded Made Ground to 1.0m underlain by firm sandy clay (Boulder Clay) to 4.5m giving way to hard red / brown shaley mudstone. The presence of any low permeability clay soil would provide a degree of protection to the underlying aquifers from any contamination within shallow soils.</p>
Mining	The site is not indicated to be affected by historic coal mining.
Environmental Setting	<p>The drift strata (Glacial Till) underlying the site are classified as a Secondary Undifferentiated Aquifer. The solid strata located beneath the central and eastern parts of the site (Tarporley Siltstone Formation) are also classified as a Secondary Undifferentiated Aquifer with the Helsby Sandstone located beneath the western area classified as a Principal Aquifer.</p> <p>The site is not located within a Groundwater Source Protection Zone, though two groundwater abstractions have been recorded 186m to the south and 251m to south relating to RC Brewery for boiler supply, drinking supply, cooking and washing. There are no surface water courses or other features within 250m.</p> <p>The site is located within a world heritage site buffer zone.</p>
Flood Risk	According to Environment Agency records the site is not located within an area at risk of flooding from rivers or seas. According to BGS Flood Data the site is however located in an area which has potential for groundwater flooding to occur at surface. This should be taken into consideration during the development of the drainage strategy.

Landfilling	<p>There are no historical landfill sites, BGS or Local Authority recorded landfill sites within 500m.</p> <p>One Licensed Waste Management Facility is present 165m to the west registered to 17-19 Parliament Street for metal recycling processes. The site is authorised to accept scrap metal, vehicles and white goods.</p> <p>The closest Registered Waste Transfer Site is 600m to the north at Suffolk Close. The site was operated by Liverpool City Council and received gully waste and street sweepings. The licence lapsed in 1991.</p> <p>The geological maps show known areas of Made Ground and Worked Ground (possible voids) in the local area. There are two areas of Made Ground located 260m to the south and 300m the east. A small area of Worked Ground is shown 130m to the south with a larger area 350m to the east.</p>
Unexploded Ordnance	<p>Due to significant changes to the site and surrounding area before and after World War II it can be assumed that the area may have been effected by bombing during the war. A UXO risk assessment should be carried out for the site to identify any risks.</p>
Foundations	<p>At this stage, given the anticipated ground conditions and high loadings associated with the multi-storey apartment blocks a piled foundation solution is likely to be required.</p> <p>It is likely that a large volume of obstructions will be present in the ground derived from former buildings slabs and relic foundations.</p>
Further Works	<p>The Phase 1 Risk Assessment and Preliminary Conceptual Site Model have identified potential contamination sources, pathways and receptors. We would therefore recommend the following Phase 2 investigations be undertaken as a minimum prior to development and to assist with discharge of planning conditions and to inform civil and structural design.</p> <ul style="list-style-type: none"> • Carry out a detailed Unexploded Ordnance Risk Assessment to see if a risk is present during intrusive works from UXO. • The drilling of boreholes in the location of proposed new structures to assess the nature and depth of any Made Ground soils present beneath the site. Selected boreholes should target the former engineering works, foundry and garage located in the north west and central northern areas. • Soil samples should be recovered and submitted for chemical testing to comprise a minimum of pH and metals, asbestos identification, speciated PAH and speciated TPH as an initial screening assessment. • The ground investigation should allow for excavations/boreholes to be taken through any Made Ground soils and into the underlying natural strata. In-situ testing should be carried out during drilling to assess the soil strength / density and provide adequate recommendations for foundation design. • Given the anticipated high loadings associated with the new structures and the relatively shallow nature of the bedrock, it is recommended that a small number of rotary cored boreholes are advanced into the bedrock with associated rock logging and laboratory analyses to allow detailed pile design. • We would recommend the installation of a minimum of three ground gas monitoring wells in the location of the proposed new structures (located just outside the building footprint) with provision for an initial 6 monitoring visits carried out over a 2 month period in general accordance with CIRIA Report C665.

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Drawing No. 10/1004/001
FCH Drawings

Site Location Plan
Proposed Layout Plans

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Appendix I	Drawings
Appendix II	Historical Maps & Building Plans
Appendix III	Geological Maps
Appendix IV	Site Sensitivity Maps
Appendix V	Environmental Datasheets

1.0 INTRODUCTION

1.1 Background

Clancy Consulting Limited has been instructed by Citipads Ltd to carry out a Phase 1 Geo-Environmental Appraisal for a site located off St James Street in Liverpool. A site location plan is presented in Appendix I.

We understand that the site is being considered for redevelopment to include an 12 storey residential apartment block comprising 217 units with commercial premises on the lower ground floor and external car parking for 37 vehicles.

Proposed site layout plans are presented in Appendix I.

1.2 Objectives

The objectives of the study are summarised below:

- Provide a review of the sites land use history by reference to ordnance survey maps of the area.
- Assess the environmental setting, geology, hydrology, hydrogeology, mining and subsidence history of the site and surrounding area.
- Consider the potential risk to end users of the site from hazardous ground gas.
- Develop a detailed 'preliminary risk assessment' and 'conceptual site model' with regard to potential contamination sources, pathways and receptors.
- Consider potential geotechnical and structural constraints.
- Provide recommendations regarding the requirement for further investigations, if required, to satisfy the Local Planning Authority

1.3 Limitations of the Study

Clancy Consulting Limited cannot be held responsible for any omissions, misrepresentation, errors or inaccuracies with the supplied third party report information. The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information or improved practices and changes in legislation may require a reinterpretation of the report in whole or in part.

Clancy Consulting Limited reserve the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use of Citipads Limited for the objectives discussed previously only, and is confidential to them.

The report may not be relied upon by any other party without prior written consent of Clancy Consulting Limited. Those using this information in subsequent assessments or evaluations do so at their own risk.

2.0 DESK STUDY

2.1 Sources of Information

Background information was sought from the following sources:

- Ordnance Survey historical maps (selected copies included in Appendix II).
- British Geological Survey (BGS) Sheets (Appendix III).
- Environment Agency Groundwater Vulnerability Maps (Appendix IV).
- Environmental datasheets (Appendix V).

2.2 Site Setting and Description

The site is located off St James Street in Liverpool at OS Grid Reference 335080, 389170. The site forms a roughly rectangular shaped parcel of land covering an area of 0.21 hectares and is currently occupied by three single storey light industrial units. Concrete covered car parking areas front onto Greenland Street to the south and New Bird Street to the north. A small area of grassed landscaping is present in the eastern part of the site adjacent to St James Street. The site is relatively flat lying but slopes gently to the west.

The site is located within a mixed commercial and residential area with a number of light industrial units located to the north west, south and west and residential properties to the north, south east and east.

2.3 Site History

In order to investigate the development history and previous land uses at the site and surrounding area, historical Ordnance Survey (OS) maps were examined. Selected copies of the maps are presented in Appendix II.

The Table below is not intended to provide a comprehensive review of all the changes which have occurred at the site and instead provides a summary of the most salient points relating to the development history of the site. The most significant historical land uses are highlighted in bold text for ease of reference.

Table 1 – Site History

Date(s)	Site	Surrounding Land
1850 - 1851	The central and western parts of the site are developed with buildings , though the quality of the map is such that their use is unclear.	The surrounding area is entirely developed though the exact nature of the land use is unknown since the quality of the maps is poor. Liverpool Docks are shown roughly 400m to the west and St James Cemetery is located 350m to the east.
1890 - 1894	<p>The site is now completely developed, with an engineering works encroaching into the north western corner and a public house in the south eastern corner.</p> <p>The engineering works is shown to include a foundry operated by Dunlop Bell & Co.</p> <p>The remaining areas appear to be developed with residential properties or small commercial premises.</p>	Much of the area is developed with residential properties , particularly to the north, south and east. An engineering works is present adjacent to the western boundary with warehouses and an 'engine works' 40m to the west. A number of 'works' , mills , breweries , saw mills , timber yards , iron works and foundries are also present within 200m of the site boundary to the north west, west and south west.

Date(s)	Site	Surrounding Land
1908	The engineering works in the north west and public house in the south east are no longer shown, though the buildings are still present on-site.	The surrounding area remains largely unchanged. An oil and grease works is now shown 100m to the north west with a bottle works and oil mill 250m to the west.
1927-1928	No significant changes.	A small iron works is now shown 250m to the south.
1938	No significant change.	No significant change.
1953-1957	The site has been completely demolished apart from two small buildings in the south eastern corner.	Many building in the immediate area have been demolished , including the engineering work to the west. A larger number of new warehouses , mills and works are now present within 250m. Most notable is the presence of a rubber factory 20m to the north, chemical works 100m to the north, transport depot 20m to the south, foundry 40m to the south, printing works 50m to the south east and small printing works and paper mill 120m to the east.
1965-1969	A public house is again shown in the south eastern part of the site, with an adjacent building shown as a 'ruin'.	A number of buildings located within 50m of the northern and southern site boundaries are shown as 'ruins'. A new engineering works has been developed immediately west of the site.
1977	The public house and ruined buildings in the south east have been demolished and cleared.	The foundry and printing works 40m to 50m south of the site have been demolished . Large areas to the east and north east are being redeveloped with university buildings and accommodation .
1984-1993	The site has been developed with a number of small industrial units with public footpaths shown crossing the eastern part of the site.	A small scrap yard is present 20m to the south. Many of the other industrial land uses in the surrounding area have been redeveloped as depots and warehouses . A large scrap yard is located 240m to the west and a large brewery is present 120m to the south. The residential development to the west for student homes has expanded.
1996 - 2017	No significant change.	No significant change.

In addition to the OS maps we have procured historical building plans for the site dating from 1890 to 1969. There appears to be some discrepancy between these plans and the OS maps, where the site land use and dates do not match. However, there is evidence that a garage with a "sunken petrol tank" was present in the central northern part of the site. Also of note is the presence of a garage and petrol / oil depot within 20m of the southern and south western site boundaries along with a service station with "sunken tanks" located 20m to the east.

2.4 Unexploded Ordnance (UXO)

From a review of the sites development history there have been changes to the site and surrounding areas before and after World War II with ruins noted and areas of demolished buildings both on site and within the immediate surrounding area. It can therefore be assumed that this part of Liverpool was subject to bombing during the war and that there is a potential risk of unexploded ordnance being present. We would therefore recommend that a detailed UXO Risk Assessment report being obtained prior to any intrusive works being carried out.

2.5 Geology

The 1:50,000 British Geological Survey (BGS) scale map for the area (096 Liverpool) indicates that the site is underlain by superficial deposits comprising Glacial Till (clay, sand and gravel).

In the central and eastern parts of the site, the superficial deposits are anticipated to be underlain by solid bedrock comprising sandstone, siltstone and mudstone of the Tarporley Siltstone Formation with the western portion of the site underlain by sandstone of the Helsby Sandstone Formation.

One historical BGS borehole record is located 20m to the south east of the site. The borehole record shows the presence of Made Ground to 1.0m underlain by firm sandy clay (Boulder Clay) to 4.5m giving way to hard red / brown shaley mudstone which was proven to a depth of 29m.

No worked ground or Made Ground is recorded within the immediate vicinity of the site.

A fault is present approximately 25m to the east of the site trending north / south.

Copies of the geological maps are attached in Appendix III.

2.6 Soil Geochemistry

According to the BGS National Geoscience Information Service no elevated background concentrations of arsenic, cadmium, chromium, lead or nickel are anticipated in the natural soils beneath the site.

2.7 Mining & Ground Stability

According to Coal Authority records the site is not located in an area affected by coal mining.

The nearest recorded mineral extraction site relates to a former sandstone quarry 405m to the north east.

2.8 Hydrogeology

According to the Environment Agency groundwater vulnerability maps the drift strata (Glacial Till) underlying the site are classified as a Secondary Undifferentiated Aquifer. The solid strata located beneath the central and eastern parts of the site (Tarporley Siltstone Formation) are also classified as a Secondary Undifferentiated Aquifer with the Helsby Sandstone located beneath the western area classified as a Principal Aquifer.

The site is not located within a Groundwater Source Protection Zone.

Two groundwater abstraction points have been identified within 1km, the nearest of which is registered to RC Breweries Ltd for a boiler supply 186m to the south. A second abstraction also operated by RC Breweries is located 251m south for drinking supply, cooking and washing.

2.9 Hydrology

The nearest surface water feature is Liverpool Docks located 400m to the west. There are no tertiary water courses, inland rivers recorded or lakes / reservoirs recorded near to the site.

There are no recorded surface water abstractions within 500m of the site.

There are no surface water discharge consents or pollution incidents recorded which may have any adverse impact of the proposed development site.

2.10 Flood Risk

According to Environment Agency records the site is not located within an area at risk of flooding from rivers or seas. According to BGS Flood Data the site is however located in an area which has potential for groundwater flooding to occur at surface. This should be taken into consideration during the development of the drainage strategy.

Copies of the flood risk, groundwater vulnerability and hydrological site sensitivity maps are included in Appendix IV.

2.11 Radon Risk Potential

The Radon Guidance on protective measures for new dwellings indicates that the site is not in an area affected by radon. Basic radon gas protective measures are therefore not required.

2.12 Landfill Sites

There are no historical landfill sites, BGS or Local Authority recorded landfill sites within 500m. The nearest is located 595m to the west at Queens Dock No. 2 and was licenced to accept inert and industrial waste. The licence was active between 1984 and 1987. There are several other landfill sites registered along the docklands area though these are considered far enough away from the proposed development site so as not to have any adverse impact.

One Licensed Waste Management Facility is present 165m to the west registered to 17-19 Parliament Street for metal recycling processes. The site is authorised to accept scrap metal, vehicles and white goods.

The closest Registered Waste Transfer Site is 600m to the north at Suffolk Close. The site was operated by Liverpool City Council and received gully waste and street sweepings. The licence lapsed in 1991.

The geological maps show known areas of Made Ground and Worked Ground (possible voids) in the local area. There are two areas of Made Ground located 260m to the south and 300m to the east. A small area of Worked Ground is shown 130m to the south with a larger area 350m to the east.

2.13 Industrial Land Uses

The environmental datasheets show there are trade directory entries for a printers, tyre depot and upholstery cleaners at the site. In the immediate surrounding area there are also several recycling centres, a lighting manufacturer, pallet distributor, precision engineering works and garage services, though many of these are now shown as being inactive.

One pollution incident is recorded within 250m of the site dated May 2013 relating asbestos waste. This was classed as a Category 2 – Significant Incident and was located 202m to the south.

There are no Local Authority Pollution Prevention and Control permits recorded within 250m of the site. The closest is 369m south west registered to RS Clare & Co associated with bitumen and tar processes. The license has been revoked.

A comprehensive list of the waste management and industrial sites located within 1km of the site are presented in the Environmental Datasheets in Appendix V

2.14 Sensitive Land Uses

A site is located within Liverpool Maritime Mercantile City world heritage site buffer zone.

3.0 PHASE 1 RISK ASSESSMENT

3.1 General

The “suitable for use” approach is adopted for the assessment of contaminated land and remedial measures are only undertaken where unacceptable risk to human health or the environment can be proven when taking into account the proposed use of the site and environmental setting.

A risk assessment process should be carried out to determine potential hazards to human health and the environment and be based on the “source” “pathway” “receptor” principal. For a potential risk to be present there must be a viable pollutant linkage whereby a contamination source may impact upon a receptor. The absence of one or more of these key components (source, pathway or receptor) prohibits a viable pollution linkage being formed

3.2 Preliminary Conceptual Site Model

In accordance with CLR11 “Model Procedures for the Management of Land Contamination” (2004) and BSI 10175 “Code of Practice for Investigation of Potentially Contaminated Land” (2011), a Preliminary Conceptual Site Model was developed to identify potential contamination sources, migration pathways and receptors within the study area.

The site has had a long and varied development history and the following potential contamination sources have been identified:

- General Made Ground associated with the construction and subsequent demolition of the historical buildings on site and in the surrounding area.
- Possible contamination associated with former engineering works, foundry and garage in the north western and central northern parts of the site.
- Possible hydrocarbon contamination associated with the former below ground (sunken) tank in the garage area.
- Possible deep Made Ground associated with the buried tank and cellars / basements in the former residential properties and public house.
- Possible migration of mobile contamination from nearby off-site sources including garages, engineering works, timber yards, foundries, chemical works and mills. Of particular note are the garage and petrol / oil depot 20m to the south and south west and the historic service station and tanks 20m to the east.
- Potential generation of hazardous ground gas from any Made Ground soils on site or in the surrounding area.
- Potential for Unexploded Ordnance (UXO) beneath the site.

Based on the information available to date we would consider the primary contaminants of concern to include metals, hydrocarbons (PAHs and TPHs), asbestos and hazardous ground gas from filled ground both on and off-site.

Potential pollutant pathways include:

- Dermal contact.
- Inhalation of particulates.
- Migration of leachable contaminants.
- Migration of hazardous ground gases into new structures.
- Acidic ground conditions affecting building infrastructure.

The following contamination receptors have been identified:

- Future site users.
- Construction workers.
- Controlled waters (Secondary & Principal Aquifers).
- Buildings and infrastructure.

A preliminary risk assessment can be carried out using guidance outlined in Section 6.3 of CIRIA Document C552 "Contaminated Land Risk Assessment – A Guide to Good Practice" (2001).

For a risk to be present there must be a viable pollutant linkage whereby a contamination source can impact on a receptor via a pathway. To carry out the risk assessment an estimate must be made of the potential severity of the risk and the likelihood of the risk occurring. The following Tables set out the criteria for this principal.

Table 2 - Severity of Risk

Severity	Description
Severe	Acute risk to human health likely to result in 'significant harm' i.e. very high concentrations of contamination or ground gases. Catastrophic damage to building i.e. by explosion from high gassing sites or VOC concentrations. Major pollution of controlled waters i.e. surface watercourses and Principal aquifers, source protection zones. Short term damage to ecosystems.
Medium	Long term risk to human health likely to result in 'significant harm' i.e. elevated concentrations of contaminants or ground gases. Pollution of sensitive controlled watercourses i.e. Principal or Secondary Aquifers. Significant effects on sensitive ecosystems or species.
Mild	Pollution of non-sensitive waters i.e. smaller surface watercourses or unproductive strata. Significant damage to crops, buildings, structures or services i.e. by explosion from sites with medium gassing potential, elevated concentrations of contaminants.
Minor	Non-permanent human health effects i.e. requirement for protective equipment during site works to mitigate health effects. Damage to non-sensitive ecosystems or species. Minor damage to buildings, structures or services.

Table 3 - Probability of Risk Occurring

Probability	Description
High Likelihood	Pollutant linkage may be present that appears very likely in the short term and risk is almost certain to occur in long term or evidence of harm to receptor exists.
Likely	Pollutant linkage may be present and is likely that the risk will occur over the long term.
Low Likelihood	Pollutant linkage may be present and there is a possibility of the risk occurring although no certainty that it will do so.
Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur even in the long term are improbable.

Table 4 - Comparison of Risk & Probability

Probability	Severity			
	Severe	Medium	Mild	Minor
High Likelihood	Very High	High	Moderate	Moderate/Low
Likely	High	Moderate	Moderate/Low	Low
Low Likelihood	Moderate	Moderate/Low	Low	Very Low
Unlikely	Moderate/Low	Low	Very Low	Very Low

A summary of potential pollutant linkages and perceived risks for this site are outlined in the Table below:

Table 5 - Pollutant Linkages & Perceived Risk

Sources of Contamination	Pathways	Receptors	Risk
Possible inorganic and organic contaminants and asbestos from demolition of former buildings and historic site use. Possible hydrocarbons from engineering works, foundry and garage.	Inhalation and dermal contact of soil particles during site construction works and by future end users.	Current site users	Very Low
		Future site users	Low / Medium
		Construction workers during development	Low / Medium
Migration of mobile contaminants from off-site sources, i.e. garages, tanks, mills, timber yards and works etc Potential generation of hazardous gas from Made Ground on site and in surrounding area.	Potential movement of mobile contaminants through underlying strata to controlled waters.	Principal Aquifer (solid strata)	Low
		Future Site Users	Low
		Construction Workers During Development	Low
	Migration of ground gases into proposed new structures at the site.	Building Infrastructure	Low

4.0 CONCLUSIONS

The historical OS maps dating back to 1850 indicate that the site was first developed with a number of small residential and commercial properties, along with an engineering works, foundry and garage, including a below ground tank, located in the north western and central northern parts of the site. A public house was also located in the south east. The site remained largely unchanged until WWII, following which the buildings were demolished and cleared. The site was redeveloped during the mid-1980s with a number of small industrial units and has not changed significantly since that time.

It is noteworthy that following the war a number of buildings were shown as 'ruins' indicating the area was subject to bombing and the risk from unexploded ordnance should be considered prior to any intrusive works.

Much of the surrounding area, particularly to the north, south and west has been heavily industrialised in the past with several timber yards, scrap yards, oil mills, garages, engineering works, chemical works and foundries all located within 250m.

Given the development history of the site and surrounding area it is possible that some ground contamination will be present beneath the site. Made Ground soils could be of significant depth locally if basements and cellars were present associated with former dwellings, the public house in the south east and the buried tank in the north of the site. Organic contamination could also be present, particularly in the north west and central northern areas where the former works, garage and foundry were located. Asbestos may be present in the Made Ground soils associated with the demolition of former buildings.

Geological maps indicate that the site is underlain by superficial deposits comprising Glacial Till (clay, sand and gravel). In the central and eastern parts of the site the underlying bedrock comprises sandstone, siltstone and mudstone of the Tarporley Siltstone Formation with the western portion of the site underlain by sandstone of the Helsby Sandstone Formation.

One historical BGS borehole record located 20m to the south east of the site recorded Made Ground to 1.0m underlain by firm sandy clay (Boulder Clay) to 4.5m giving way to hard red / brown shaley mudstone. The presence of any low permeability clay soil would provide a degree of protection to the underlying aquifers from any contamination within shallow soils.

Regarding hazardous ground gas risk the site has been developed since the mid-1800s. Made Ground deposits are anticipated to be present beneath the site. Made Ground depths are likely to be variable but we would expect roughly 1.0m of filled ground to be present in most areas with locally deeper fill reaching up to 2.5m to 3.0m potentially if basements were present in historical buildings. The filled ground is likely to be predominantly granular in nature but may contain old timbers and organic material which could have the potential to generate hazardous ground gases.

Whilst no registered landfill sites or other significant areas of filled ground have been identified within 250m given the relatively sensitive proposed end use (i.e. residential) we would consider that gas monitoring would be prudent at the site to assess ground gas concentrations prior to any development.

At this stage, given the anticipated ground conditions and high loadings associated with the multi-storey apartment blocks a piled foundation solution is likely to be required.

The drift strata (Glacial Till) underlying the site are classified as a Secondary Undifferentiated Aquifer. The solid strata located beneath the central and eastern parts of the site (Tarporley Siltstone Formation) are also classified as a Secondary Undifferentiated Aquifer with the Helsby Sandstone located beneath the western area classified as a Principal Aquifer.

The site is not located within a Groundwater Source Protection Zone, though two groundwater abstractions have been recorded 186m to the south and 251m to south relating to RC Brewery for boiler supply, drinking supply, cooking and washing. There are no surface water courses or other features within 250m.

According to Environment Agency records the site is not located within an area at risk of flooding from rivers or seas. According to BGS Flood Data the site is however located in an area which has potential for groundwater flooding to occur at surface. This should be taken into consideration during the development of the drainage strategy.

Based on the desk study information the environmental setting of the site is considered to be of 'low' to 'medium' risk with the underlying Secondary and Principal Aquifers recognised as the most sensitive environmental receptors. The proposed development which is to include residential apartment blocks with commercial premises on the lower ground floor can be considered a 'medium' risk in terms of human health.

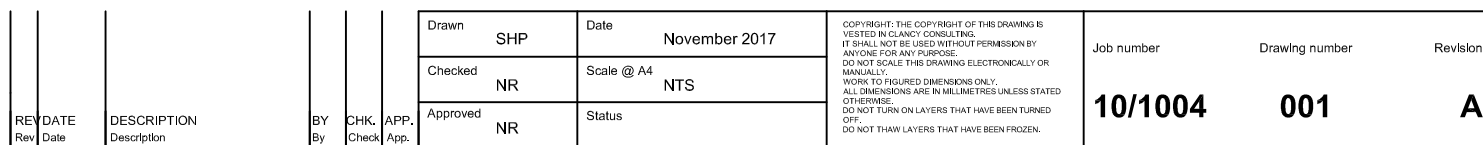
5.0 RECOMMENDATIONS & FURTHER WORKS

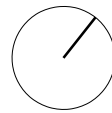
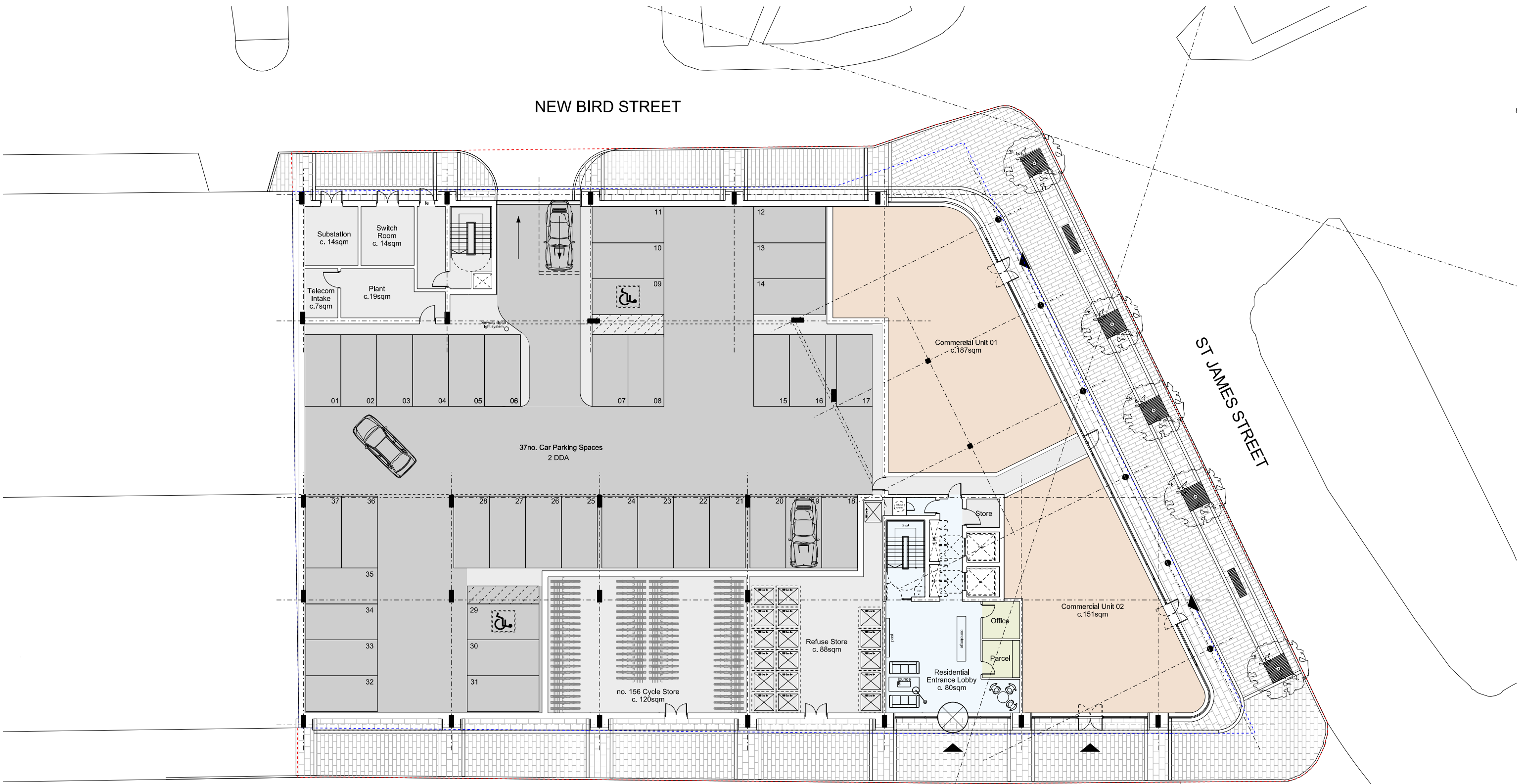
The Phase 1 Risk Assessment and Preliminary Conceptual Site Model have identified potential contamination sources, pathways and receptors. We would therefore recommend the following Phase 2 investigations be undertaken as a minimum prior to development and to assist with discharge of planning conditions and to inform civil and structural design.





- Carry out a detailed Unexploded Ordnance Risk Assessment to see if a risk is present during intrusive works from UXO.
- The drilling of boreholes in the location of proposed new structures to assess the nature and depth of any Made Ground soils present beneath the site. Selected boreholes should target the former engineering works, foundry and garage located in the north west and central northern areas.
- Soil samples should be recovered and submitted for chemical testing to comprise a minimum of pH and metals, asbestos identification, speciated PAH and speciated TPH as an initial screening assessment.
- The ground investigation should allow for excavations/boreholes to be taken through any Made Ground soils and into the underlying natural strata. In-situ testing should be carried out during drilling to assess the soil strength / density and provide adequate recommendations for foundation design.
- Given the anticipated high loadings associated with the new structures and the relatively shallow nature of the bedrock, it is recommended that a small number of rotary cored boreholes are advanced into the bedrock with associated rock logging and laboratory analyses to allow detailed pile design.
- We would recommend the installation of a minimum of three ground gas monitoring wells in the location of the proposed new structures (located just outside the building footprint) with provision for an initial 6 monitoring visits carried out over a 2 month period in general accordance with CIRIA Report C665

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APPENDIX I
DRAWINGS





-  - Residential Entrance Lobby
-  - Residential BOH
-  - Commercial (Uses TBC)
-  - Plant, Refuse, Cycle Store.

GREENLAND STREET

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Rev_C_SN_2017.11.24_DEP landscaping added.
 Rev_B_SN_2017.11.10_General updates to suit Omega Fire comments.
 Rev_A_SN_2017.08.04_General updates.

Project Title
 St James Court, Liverpool

Drawing Title
 Lower Ground Floor Plan

Client
 CitiPads

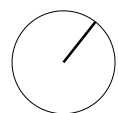
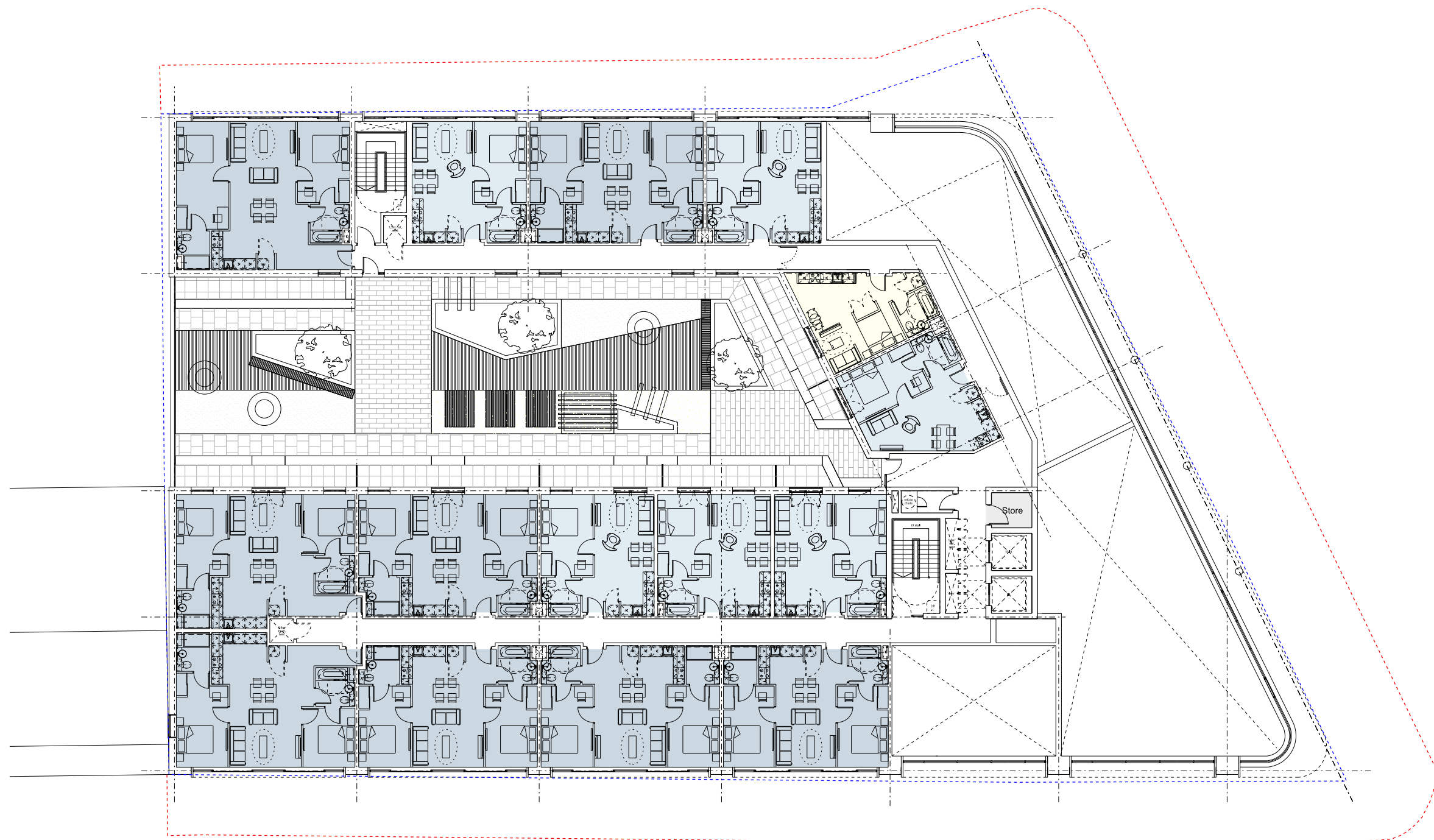
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 SN April 2017

Scale
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Project No.
 P17-003

Drawing No.
 02-03-001_C

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- Studio



- 1-Bedroom Apartment



- 2-Bedroom Apartment

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Rev_E_SN_2017.11.24_DEP landscaping added.
Rev_D_SN_2017.11.10_General updates following Omega Fire comments.
Rev_C_SN_2017.11.01_General updates.
Rev_B_SN_2017.10.17_General updates.
Rev_A_SN_2017.08.04_General updates.

Project Title
St James Court, Liverpool

Drawing Title
Upper Ground Floor Plan

Client
CitiPads

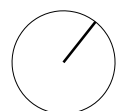
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Project No.
P17-003

Drawing No.
02-03-002_E

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- Studio



- 1-Bedroom Apartment



- 2-Bedroom Apartment

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Rev_D_SN_2017.11.10_General updates following Omega Fire comments.
Rev_C_SN_2017.11.01_General updates.
Rev_B_SN_2017.10.17_General updates.
Rev_A_SN_2017.08.04_General updates.

Project Title
St James Court, Liverpool

Drawing Title
First - Seventh Floor Plan

Client
CitiPads

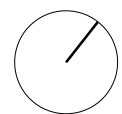
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SN April 2017

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Project No.
P17-003

Drawing No.
02-03-003_D

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- Studio



- 1-Bedroom Apartment



- 2-Bedroom Apartment

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Rev_F_SN_2017.11.25_DEP landscaping added.
Rev_E_SN_2017.11.10_General updates following Omega Fire comments.
Rev_D_SN_2017.11.01_General updates.
Rev_C_SN_2017.10.17_General updates.
Rev_B_SN_2017.08.09_Amended to include roof terraces.
Rev_A_SN_2017.08.04_General updates.

Project Title
St James Court, Liverpool

Drawing Title
Eighth Floor Plan

Client
CitiPads

Drawn By Date
SN April 2017

Scale
1:250@A3

Project No.
P17-003

Drawing No.
02-03-004_F

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Rev_F_SN_2017.11.24_DEP landscape added.
 Rev_E_SN_2017.11.10_General updates following Omega Fire comments.
 Rev_D_SN_2017.11.01_General updates.
 Rev_C_SN_2017.10.17_General updates.
 Rev_B_SN_2017.08.09_Amended to include roof terraces.
 Rev_A_SN_2017.08.04_General updates.

Project Title
 St James Court, Liverpool

Drawing Title
 Ninth Floor Plan

Client
 CitiPads

Drawn By Date
 SN April 2017

Scale
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Project No.
 P17-003

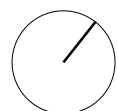
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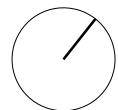
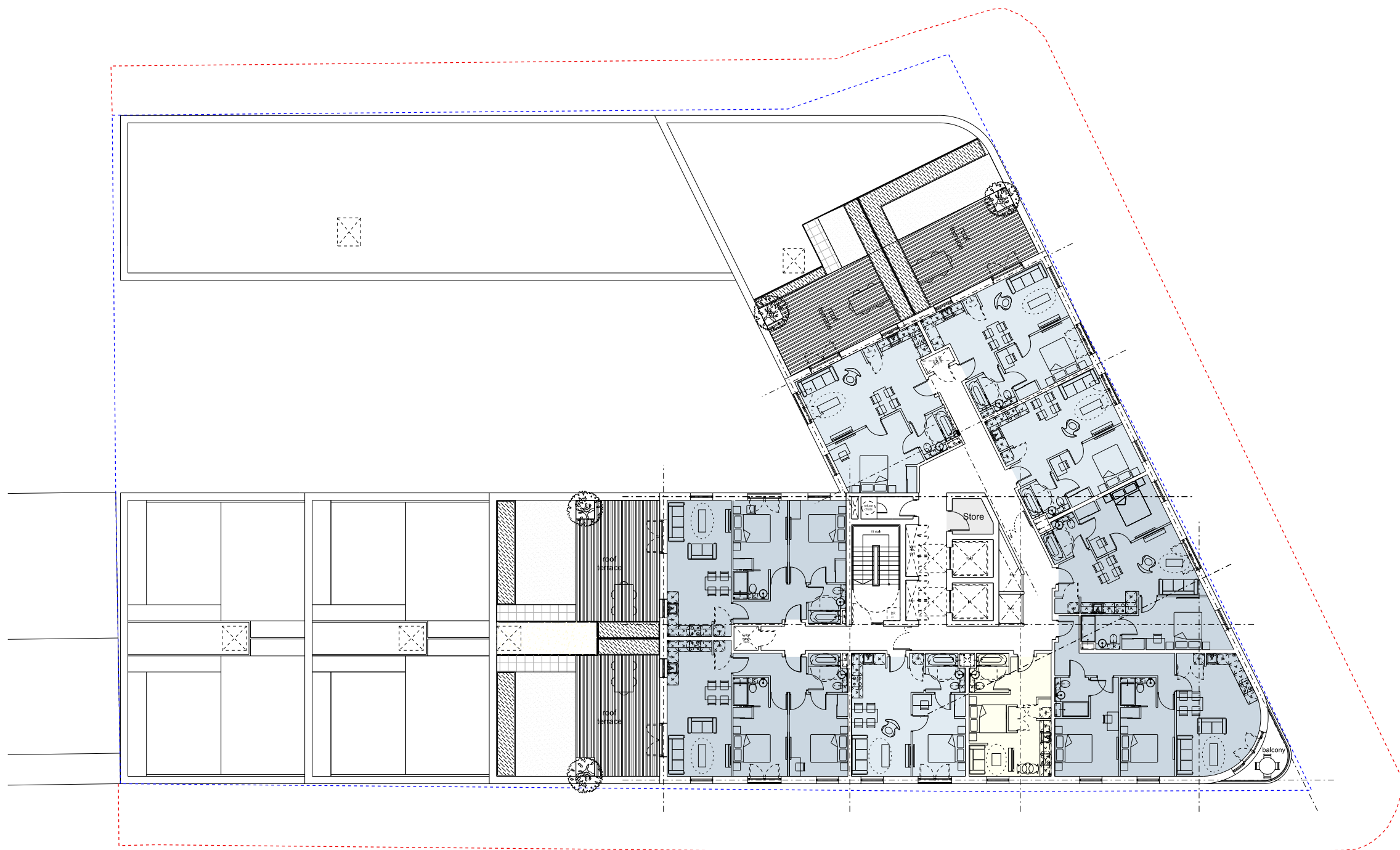
- Studio



- 1-Bedroom Apartment



- 2-Bedroom Apartment



- Studio



- 1-Bedroom Apartment



- 2-Bedroom Apartment

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Rev_F_SN_2017.11.24_DEP landscape added.
Rev_E_SN_2017.11.10_General updates following Omega Fire comments.
Rev_D_SN_2017.11.01_General updates.
Rev_C_SN_2017.10.17_General updates.
Rev_B_SN_2017.08.09_Amended to include roof terraces.
Rev_A_SN_2017.08.04_General updates.

Project Title
St James Court, Liverpool

Drawing Title
Tenth Floor Plan

Client
CitiPads

Drawn By Date
SN April 2017

Scale
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Project No.
P17-003

Drawing No.
02-03-006_F

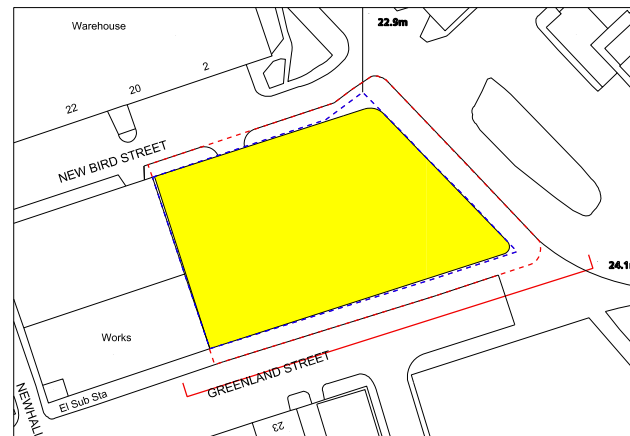
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Key

1. Cladding - PPC ribbed aluminium panel, colour to be Bronze.
2. Cladding - PPC aluminium panel, colour to be Limestone.
3. PPC aluminium panel with perforations, secret fixed colour to be Bronze.
4. PPC aluminium surrounds, colour to be confirmed.
5. Frameless glass balconies.
6. PPC Aluminium Windows, colour to be confirmed.
7. PPC Aluminium doors, colour to be confirmed with Juliet balconies fixed to the window reveal.
8. PPC Capless Aluminium Curtain Walling with silicon joints and aluminium doors. colour to be confirmed
9. Opaque Glazing colour to be confirmed
10. PPC Aluminium Louvers, colour to be confirmed
11. Stone - Granite

Key Plan.



----- Outline of approved scheme ref:15F/2835

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RevD_SN_2017.11.24_General updates, DEP landscape added.
RevC_SN_2017.11.08_General updates, notes added.
RevB_SN_2017.11.01_General updates.
RevA_SN_2017.10.13_General updates.

Project Title
St James Court, Liverpool

Drawing Title
Greenland Street Elevation

Client
CitiPads

Drawn By Date
SN April 2017

Scale
1:300@A3

Project No.
P17-003

Drawing No.
02-05-001D

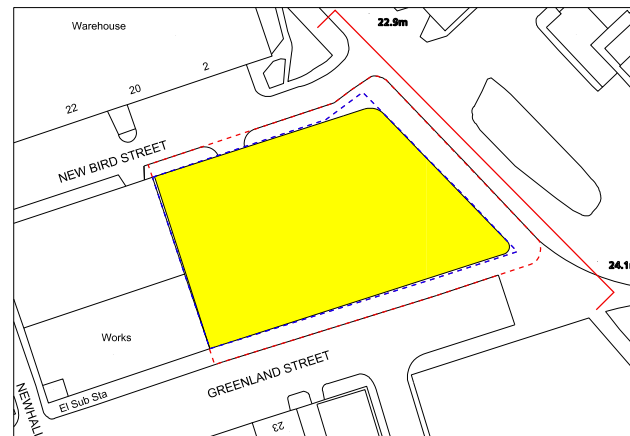
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Key

1. Cladding - PPC ribbed aluminium panel, colour to be Bronze.
2. Cladding - PPC aluminium panel, colour to be Limestone.
3. Columns to be finished in aluminium, colour to be Bronze.
4. PPC aluminium surrounds, colour to be confirmed.
5. Frameless glass balconies.
6. PPC Aluminium Windows, colour to be confirmed.
7. PPC Aluminium doors, colour to be confirmed with Juliet balconies fixed to the window reveal.
8. PPC Capless Aluminium Curtain Walling with silicon joints and aluminium doors. colour to be confirmed
9. Opaque Glazing colour to be confirmed
10. PPC Aluminium Louvers, colour to be confirmed
11. Stone - Granite

Key Plan.



----- Outline of approved scheme ref:15F/2835

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Rev B_SN_2017.11.27_General updates, DEP landscape added.
Rev A_SN_2017.10.13_General updates.

Project Title
St James Court, Liverpool

Drawing Title
St James Street Elevation

Client
CitiPads

Drawn By Date
SN April 2017

Scale
1:300@A3

Project No.
P17-003

Drawing No.
02-05-002B

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