THE CHRISTIE, TIERED CAR PARK, WITHINGTON, MANCHESTER

19/04/2021

DRAINAGE STRATEGY REPORT

The Alan Johnston Partnership LLP

Ref: TCP-AJP-XX-XX-RP-C-900100

Prepared By

Document Owner(s)	Project/Organization Role
John Murphy	Partner
Paul Layton	Associate
John Speers	Senior Civil Engineer

Project Closure Report Version Control

Version	Date	Author	Change Description
P01	01/04/2020	J.Speers	First Issue
P02	09/02/2021	J.Speers	Updated as per comments
P03	19/04/2021	J.Speers	Updated to suit latest layout & information

Record of Approval

Originator	Approved	Date
J.Speers	J.Murphy	01/04/2020
J.Speers	J.Murphy	09/02/2021
J.Speers	P.Layton	19/04/2021

Contents

1.0 INTRODUCTION **4**

2.0 SITE DESCRIPTION **4**

3.0 PROPOSED DEVELOPMENT **4**

4.0 DEVELOPMENT AND DRAINAGE STRATEGY **5**

4.1 Effect of Proposed Development 5

4.2 Existing Drainage Systems 5

4.3 Proposed Drainage Strategy 6

4.3.1 Surface Water Drainage 6

4.3.2 Foul Water Drainage 8

5.0 FUTURE MANAGEMENT & MAINTENANCE **9**

5.1 General Maintenance & Inspection Requirements 9

5.2 Inspection Chambers, Manholes and Catchpits 10

5.3 Pipes 10

5.4 Drainage Channels and Gullies 11

5.5 Vortex Flow Control Devices 11

5.6 Cellular Attenuation Tanks 12

5.7 Porous Paving 13

6.0 CONCLUSIONS **14**

Appendix A Site Location Plan 15

Appendix B Aerial Photo 16

Appendix C Topographic Survey 17

Appendix D Proposed Site Plan 18

Appendix E Pre & Post Development Impermeable Areas Drawing 19

Appendix F United Utilities Map & Existing Drainage Information 20

Appendix G GRM Soakaway Test Results 21

Appendix H Brownfield Runoff Calculations 22

Appendix I Drainage Strategy Drawing & Calculations 23

Appendix J Exceedance Flow Path Drawing & Exceedance Event Calculations 24

1.0 INTRODUCTION

This drainage strategy report has been prepared on behalf of The Christie NHS Foundation Trust in connection with the discharge of the drainage related planning conditions for planning application reference 117847/FO/2017. The planning application is for the construction of a new tiered car park. The proposed site is located on the existing Christie staff car parking area, to the east of Frith Road, Withington, Manchester.

The purpose of this report is to present the surface water and foul water outline drainage strategies for the site which have been developed by the Alan Johnston Partnership. To demonstrate how the specific drainage requirements are to be met, the report should be read in conjunction with the relevant drawings and supporting information, included within the appendices.

The drainage strategies outlined within this report, have been prepared in accordance with BS EN 752:2017 (Drain and sewer systems outside buildings), Sewers for Adoption, Building Regulations Approved Document H (Drainage and waste disposal), the National Planning Policy Framework and Planning Practice Guidance (Department for Communities and Local Government).

The site is located within Flood Zone 1, with a total site area under 1.0ha. Therefore, in accordance with DEFRA guidance, a Flood Risk Assessment (FRA) is not required. A review of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) identifies that the site is located within the Conurbation Core Critical Drainage Area (CDA).

However, based on guidance within the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA User Guide, only sites with an area greater than 0.5ha within a Critical Drainage Area require a Flood Risk Assessment. As the total site area is less than 0.5ha it has been deemed that an FRA is not required to support the planning application for this development.

2.0 SITE DESCRIPTION

The proposed development site is located to the on the existing Christie staff car parking area, to the east of Frith Road, Withington, Manchester at National Grid reference SJ 85174 92419. The location of the existing site is illustrated in Appendix A and the extent of the area to which the application relates is also shown on the aerial photo and existing site plan, both enclosed in Appendix B.

The proposed development site covers a total area of 1.565ha. As can be seen from the aerial photo, enclosed in Appendix B, this area currently consists of the existing Christie staff car parking area, the existing Christie student accommodation buildings and car park area and the existing access road. Therefore, the site is classified as a brownfield site. The site is bounded to the east and south by existing residential developments, to the north the existing highway Cotton Lane and to the west by existing Christie developments.

The main area of the site is fairly flat with levels sloping slightly from north-east to south-west, from approximately 37.20mAOD in the north-east to approximately 36.00mAOD in the south-west. The existing access road to the west of the main site slopes slightly from east to west from approximately 36.70mAOD in the east to approximately 35.60mAOD. The topographic survey is attached in Appendix C.

3.0 PROPOSED DEVELOPMENT

The proposed development consists of a new eight level decked car park structure, with associated landscaping and access road areas. To enable a viable scheme, the proposed site levels are constrained by the existing residential developments to the east and south, the existing highway to the north and the existing Christie development to the west. Therefore, site levels are likely to remain similar to the existing. A proposed site plan is attached in Appendix D.

4.0 DEVELOPMENT AND DRAINAGE STRATEGY

4.1 Effect of Proposed Development

As previously outlined in Section 2.0, the existing site covers a total area of 1.565ha and is a brownfield site. A comparison between the existing and proposed impermeable areas is included in Appendix E and as can be seen it indicates that the introduction of the new grasscrete parking areas and additional landscaped areas, will lead to a decrease in the overall impermeable areas.

As can be seen the majority of the 1.565ha existing site is either; to drain as per the existing scenario, is currently and/or is to remain as permeable or is to drain via porous paving (grasscrete) and is therefore classed as permeable. As such, only 0.763ha of the existing site and 0.720ha of the proposed site are classified as impermeable and are to be positively drained.

Total Development Site Area (ha)	Existing Impermeable Area (ha)	Proposed Impermeable Area (ha)
1.565	0.763	0.720

Therefore, the changes to the existing site will decrease the volume of impermeable areas and as such, the proposed development will lead to a decrease in the;

- Volume of surface water ponding on the site
- Volume of surface water runoff leaving the site or discharging into surrounding areas
- Peak discharge rate from the site.

Despite this, site-wide drainage systems are required to drain the surface water flows arising from the proposed development. Where possible, any existing drainage networks should be utilised. Appropriate design and construction of these systems as set out in Section 4.3 should ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

4.2 Existing Drainage Systems

As can be seen from the United Utilities map, attached in Appendix F, there is are no existing public sewers located within the site boundary. The only nearby public sewers are located within the surrounding highways, with a 375mm diameter public combined water sewer located on Cotton Lane to the north of the site and a 300mm diameter public combined water sewer located on Frith Road to the west of the site

However, as can be seen from the utility survey and as built drainage drawing for the adjacent site, both of which are also attached in Appendix F, there is existing private drainage across the site which drains the existing asphalt car park area and access roads. This is also confirmed within the Reid Jones Partnership Flood Risk Assessment (FRA), October 2017 which states that, *"some of the surface water from the car park drained to a combined sewer to the west of the site, with the remainder discharging to the surface water drains in the access road"* and that the remainder of the drainage *"was re-routed to connect to the existing drains in the access road at manhole S1."*

As such, the existing car park area all drains to the existing private drainage along the existing access road to the west of the existing asphalt car park.

4.3 Proposed Drainage Strategy

As outlined above in section 4.1, site-wide drainage systems are required to drain the surface water flows arising from the proposed development. The proposed drainage systems must ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

4.3.1 Surface Water Drainage

The Building Regulations - Approved Document H (2002) details a hierarchy of potential methods for disposing of surface water as shown below in order of preference:

- Discharge via infiltration
- Discharge to watercourse
- Discharge to sewer

Considering the hierarchy above, the surface water network for the proposed site should infiltrate where possible. The WYG Environment Geo-Environmental Factual and Interpretative Report, January 2020 indicates that the general strata consists of made ground to a maximum recorded depth of 1.20mbgl, underlain by glacial deposits comprising of stiff slightly sandy/gravelly clay to a maximum depth of 2.40mbgl. This is then underlain by sandstone bedrock, to a maximum recorded depth of 16.60mbgl.

The Reid Jones Partnership FRA, October 2017 indicates that due to the underlying strata infiltration drainage may be suitable across the site. However, Building Regulations Part-H states that no soakaways can be located within 5m of a building or road and therefore, assessing the proposed development site there are limited areas to locate a soakaway or other infiltration techniques 5m from a building or road.

The WYG Environment Geo-Environmental Factual and Interpretative Report, January 2020 also indicates a relatively shallow groundwater table across the site, at levels between 1.7mbgl – 3.4mbgl. As outlined within CIRIA Report C753, The SuDS Manual, a minimum distance of 1m should be maintained between the base of a soakaway and the maximum groundwater level and therefore the relatively shallow groundwater levels also restrict the use of soakaways.

Therefore, as a result of Building Regulations Part-H and groundwater restrictions, only infiltration drainage via porous surfaces, across the proposed car park areas is considered to be a viable option for the discharge of surface water, as this would, be 1m above the groundwater. However, additional BRE365 complaint soakaway testing has been completed by GRM (ref: GRM/P9324/SALR.1) in the areas of the proposed porous paving and it has indicated that due to the underlying impermeable strata, infiltration is not suitable for the proposed new areas of porous paving. The GRM letter report, GRM/P9324/SALR.1 is attached in Appendix G.

As the possibility of infiltration has been partially ruled out by the Building Regulations and site investigation restrictions, the intention for the development would be to discharge to watercourse. The nearest watercourse is Shaw Brook which is located approximately 385m north of the site. Due to the distance across various plots of third-party land and properties, discharging to watercourse has been deemed impractical.

Therefore, the only practical solution for discharge of the surface water is discharge to public sewer. As such, it is proposed that the surface water runoff from the proposed site will drain to public sewer via a connection to the existing private drainage network.

While every effort to utilise any suitable existing systems should be made, the drainage systems should be designed to suit the proposed site layout and topography which aims to provide an efficient design. In line with Sewers for Adoption (7th Edition), the requirements for the design of a new surface water drainage systems are as follows:

- Below ground piped drainage to be sized to accommodate the 1 in 2 year (50% AEP) design storm without surcharge.
- System to be designed not to flood any part of the site in a 1 in 30 year (3% AEP) design storm.

- For events in exceedance of the 1 in 30 year design storm and up to and including the 1 in 100 year event, site drainage and topography should be designed where practicable to route surface water run-off away from buildings to safe above-ground storage areas on site, thereby preventing this run-off from leaving the site and increasing flood risk elsewhere.

For each design case described above, the design storm is the critical storm duration for the site conditions. In the case of the 1 in 100 year design storm, a 40% increase in the peak rainfall intensity is applied to allow for the estimated worst case impacts of climate change. This is in accordance with new advice, issued by the Environment Agency, which updates previous climate change allowances outlined in the National Planning Policy Framework.

Suitable systems of below ground drainage will be required to contain as a minimum requirement, the 1 in 30 year event. Additionally, any surface water run-off from events that exceed the design capacity of the new drainage system, up to and including the 1 in 100 year (+40%) event, will be retained on-site in safe storage areas, away from buildings.

As the area consists mainly car park areas, in line with the requirements of Pollution Prevention Guidelines 3 (PPG3), measures to prevent oil and other contaminants being passed forward to the existing sewers are required. Therefore, an oil separator has been included in the proposed drainage design.

In line with common practice, it is proposed the surface water discharge from the proposed development should mimic that from the existing site.

It was envisaged that a minimum 50% betterment on the existing surface water brownfield runoff rate was to be applied, in line with Section 3.4.1 of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA User Guide.

Therefore, an assessment of the existing surface water run-off from the brownfield site has been completed using a simple three pipe network modelled in Micro Drainage. For the existing 0.763ha developed area of the site, using an existing impermeable area of 0.763ha, an existing 2-Year brownfield discharge rate of 107.2 L/s was generated. The brownfield runoff assessment is attached in Appendix H.

Therefore, applying a 50% reduction to offer improvement, the maximum surface water discharge rate for the site as a whole is **53.6 L/s**.

The planning decision notice, informative for condition no.5 section outlines that at least a 50% reduction in runoff rate compared to the existing rates is required. Therefore, it is deemed that the 50% betterment on the existing surface water brownfield runoff rate is to be applied, as this also complies with Section 3.4.1 of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA User Guide.

As such, the surface water drainage system is to be designed to restrict the discharge to 53.6 L/s, for all rainfall events up to and including a 1 in 100 year return period plus 40% climate change design storm.

As seen in the Drainage Strategy Drawing, attached in Appendix I, it is anticipated that the surface water runoff will be collected and conveyed to the north-west of the proposed tiered car park building. Here it will be restricted using a vortex flow control device to the required 53.6 L/s discharge rate, prior to discharging into the existing private drainage manhole S1.

As the surface water discharge is to be restricted, the surface water runoff will surcharge the proposed drainage network. Therefore, the attenuation storage will be provided in the form of a below ground cellular attenuation tank, with a vortex flow control device used to restrict the surface water runoff to the required rate of 53.6 L/s.

It is anticipated that due to lack of areas of sufficient size to safely store flooding at ground level, the proposed surface water drainage network and cellular attenuation tanks will be suitably sized to contain the surcharged runoff for all rainfall events up to and including the 1 in 100 year + 40% climate change rainfall event.

The surface water calculations which represent the surface water drainage indicated on the Drainage Strategy Drawing, attached in Appendix J, are also attached within Appendix I. The calculations show that there is no flooding for all rainfall events up to and including the 1 in 100 year + 40% climate change rainfall event.

As can be seen from the calculations, attached in Appendix I, a 127.7m^3 cellular attenuation tank and the proposed surface water network itself provide sufficient capacity to store the surcharged runoff for all rainfall events up to and including the 1 in 100 year + 40% climate change rainfall event, without any flooding.

As outlined below, all other SuDS techniques have been considered for this development;

SuDS Technique	Suitable for This Development?	Reasoning
Green Roof	×	Not suitable due to lack of available roof area.
Rainwater Harvesting	×	Impractical due to no demand for potable water.
Basins & Ponds	×	Unsuitable due to lack of available space.
Filter Strips & Swales	×	Unsuitable due to lack of available space and Building Regulations and groundwater restrictions.
Infiltration Techniques	×	Unsuitable due to BRE365 complaint soakaway results indicating infiltration not feasible and Building Regulations restrictions.
Permeable Surfaces	✓	Only non-infiltration techniques suitable due to BRE365 complaint soakaway results indicating infiltration not feasible.
Tanked Systems	✓	Suitable and incorporated.

Further investigations have indicated that the existing manhole S1 has an invert level of 34.18mAOD therefore a package pump station is required to drain the proposed drainage within the basement area of the car park into the surrounding drainage.

The surface water drainage strategy and discharge rate should be confirmed via more detailed discussions with United Utilities and the Lead Local Flood Authority prior to the commencement of any works.

The exceedance rainfall events have also been considered throughout the design of the surface water drainage system. As can been seen from the exceedance event calculations, attached in Appendix J, there is no flooding within the 1 in 200 year rainfall event but there is approximately 23m^3 of flooding within the 1 in 1000 year rainfall event.

It can be seen that the flooding will occur from the gullies/manholes in the car park areas to the south and east around the proposed building. Therefore, as indicated within the exceedance flow paths drawing, attached in Appendix J, the external ground levels around the proposed building shall fall away from the proposed building with any new levels being designed to ensure any exceedance flood routes, for events in excess of the 100 Year + 40% climate change event, exit towards the car park areas and access roads, for use in exceptional circumstances.

4.3.2 Foul Water Drainage

As can be seen in the Drainage Strategy Drawing, attached in Appendix J, the only foul water drainage required is from 1no. cleaners sink, located to the north of the proposed building. As such, it is envisaged that this will be connected to the existing private foul water drainage located to the north-west of the proposed building.

The existing private foul water drainage to the north-west of the proposed building serves areas to the west of the site and as such needs to be maintained. As the existing private foul drainage falls under the footprint of the proposed building, it is anticipated that the drainage will be diverted around the proposed building, with the additional cleaner's sink connected to the proposed diversion. The proposed foul drainage and diversion are indicated on the Drainage Strategy Drawing, attached in Appendix J.

Further investigations are required to confirm that the existing private foul water drainage does in fact drain to the north of the site and discharges into the public combined water sewer, to the north of the site on Cotton Lane.

5.0 FUTURE MANAGEMENT & MAINTENANCE

The proposed drainage solution uses SUDS techniques in accordance with the CIRIA SUDS Manual C753. The surface water run-off from the proposed development is restricted using a vortex flow control device and the attenuated run-off is stored using a cellular attenuation tank. Grasscrete porous paving has also been incorporated, where possible.

It is envisaged that the following components have been or will be included within the drainage strategy for the proposed development:

- Inspection chambers, manholes and catchpits.
- Pipes.
- Drainage channels and gullies.
- Vortex flow control device.
- Cellular attenuation tank.
- Porous paving.

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented. It is assumed that the proposed drainage will remain private and therefore maintenance of the surface water drainage system will be the responsibility of The Christie NHS Foundation Trust or an on-site facilities management team.

As such, the maintenance of the specified SuDS should be included within the developments Operation and Maintenance Manual and should be detailed in accordance with the CIRIA SuDS Manual C753, as per the operation and maintenance guidance outlined below.

5.1 General Maintenance & Inspection Requirements

- No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.
- Maintenance/inspection work shall be carried out in a safe/planned manner.
- All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.
- Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped persons working in accordance with current statutory safe working policies.
- Drainage systems shall be inspected on a regular basis or should any problems be suspected. Any debris/defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/cleaning shall be actioned as soon as practicable.
- It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work;
    - Rodding – Manual/Mechanical with flexible rods.
    - Jetting – High pressure water jetting.
    - Plunging.

5.2 Inspection Chambers, Manholes and Catchpits

The appropriate health and safety equipment must be used when accessing manholes/catchpits. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access. The following operations should be carried out annually.

- Covers of inspection chambers and manholes shall be removed and the sides, benchings and channels cleared.
- Accumulated deposits of silt in inspection chambers, catchpits and manholes shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water. This should be completed in Autumn, after leaf fall.
- Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
- Covers of inspection chambers, manholes and catchpits shall be replaced, bedded in suitable grease or other sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

5.3 Pipes

Regular inspection and maintenance is important to identify areas which may have become obstructed/clogged and may not be draining correctly, as failure to do so would expose the development to a greater level of flood risk.

Pipes are proprietary products and therefore the materials used can vary across the site. As such, where used the manufacturer's recommendations should be followed. Access for maintenance of the pipes is provided through inspection chambers and manholes. The below table sets out the maintenace schedule for the pipe components of the proposed drianage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect for evidence of poor operation via water levels. If required take remedial action.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection should be provided as post construction CCTV survey.	N/A
	Inspect/check all inlets, outlets and overflows to ensure they are in good condition and operating as designed.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

5.4 Drainage Channels and Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating. The below stable sets out the maintenace schedule for the drainage channel and gullies components of the proposed drianage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Litter and debris removal.	Monthly or as required.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection including channel outlet boxes and gully sumps.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

5.5 Vortex Flow Control Devices

Regular inspection and maintenance is important to identify if the vortex flow control device has become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

Vortex flow control devices are proprietary products and therefore can vary from manufacturer to manufacturer. As such, where used the manufacturer's recommendations should be followed.

- Normally, little maintenance is required as there are generally a vortex flow control device has no moving parts.
- If blockages occur they tend to do so at the intake of the vortex flow control device.
- Vortex flow control devices are generally fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.
- The smaller type conical units, below the minimum recommended size, are also supplied with roding facilities or vortex suppressor pipes as standard.
- Following installation of the vortex flow control device it is vitally important that any extraneous material i.e. Building materials are removed from the unit and the chamber.
- After the system is made live, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. Units should also be inspected within 48 hours after large storms.

5.6 Cellular Attenuation Tanks

Regular inspection and maintenance is important to identify if the inlets/outlets have become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk. The maintenance requirements for cellular attenuation tanks are outlined within Table 21.3 of the CIRIA SUDS Manual C753. An extract of that table is given below to set out the maintenace schedule for the cellular attenuation tank component of the proposed drianage systems.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

5.7 Porous Paving

Regular inspection and maintenance is important to identify areas which may have become obstructed/clogged and may not be draining correctly, as failure to do so would expose the development to a greater level of flood risk.

Porous paving is a proprietary product and therefore the materials used can vary. As such, where used the manufacturer's recommendations should be followed. The maintenance requirements for porous paving are outlined within Table 20.15 of the CIRIA SUDS Manual C753. An extract of that table is given below to set out the maintenace schedule for the porous paving component of the proposed drianage systems.

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

It should be noted that the Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should as be supplied by the Main Contractor, where the construction of the drainage varies from the design construction status drawings.

6.0 CONCLUSIONS

- The WYG Environment Geo-Environmental Factual and Interpretative Report, January 2020 and the Reid Jones Partnership FRA, October 2017 indicate that due to the underlying strata infiltration drainage may be suitable across the site. However, Building Regulations Part-H states that no soakaways can be located within 5m of a building or road and therefore, assessing the proposed development site there are limited areas to locate a soakaway or other infiltration techniques 5m from a building or road.

- The WYG Environment Geo-Environmental Factual and Interpretative Report, January 2020 also indicates a relatively shallow groundwater table across the site, at levels between 1.7mbgl – 3.4mbgl. As outlined within CIRIA Report C753, The SuDS Manual, a minimum distance of 1m should be maintained between the base of a soakaway and the maximum groundwater level and therefore the relatively shallow groundwater levels also restrict the use of soakaways.

- Additional BRE365 complaint soakaway testing by GRM (ref: GRM/P9324/SALR.1) has also been undertaken and these indicate that due to the underlying impermeable strata, infiltration drainage is not viable. Therefore, the areas of the site to be drained via porous surfaces, will be non-infiltration techniques with perforated underdrains used to collect the runoff and convey it into the proposed surface water drainage network.

- As the possibility of infiltration has been ruled out by the soakaway test results and Building Regulations and groundwater restrictions, the intention for the development would be to discharge to watercourse. The nearest watercourse is Shaw Brook which is located approximately 385m north of the site. Due to the distance across various plots of third-party land and properties, discharging to watercourse has been deemed impractical.

- Therefore, the only practical solution for discharge of the surface water is discharge to public sewer. As such, it is proposed that the site will drain to public sewer via a connection to the existing private drainage network.

- Using the proposed vortex flow control device, the surface water discharge is to be restricted to the discharge rate of 53.6 L/s, during the 100 year plus 40% climate change design storm, to comply with the LLFA requirements. The surcharged runoff is to be stored using a below ground cellular attenuation tank and the proposed surface water drainage network itself. The network is to prevent any flooding for all rainfall events up to and including the 1 in 100 year + 40% climate change rainfall event.

- The only foul water drainage required is from 1no. cleaners sink, located to the north of the proposed building. As such, it is envisaged that this will be connected to the existing private foul water drainage located to the north-west of the proposed building.

- The existing private foul water drainage to the north-west of the proposed building serves areas to the west of the site and as such needs to be maintained. As the existing private foul drainage falls under the footprint of the proposed building, it is anticipated that the drainage will be diverted around the proposed building, with the additional cleaner's sink connected to the proposed diversion.

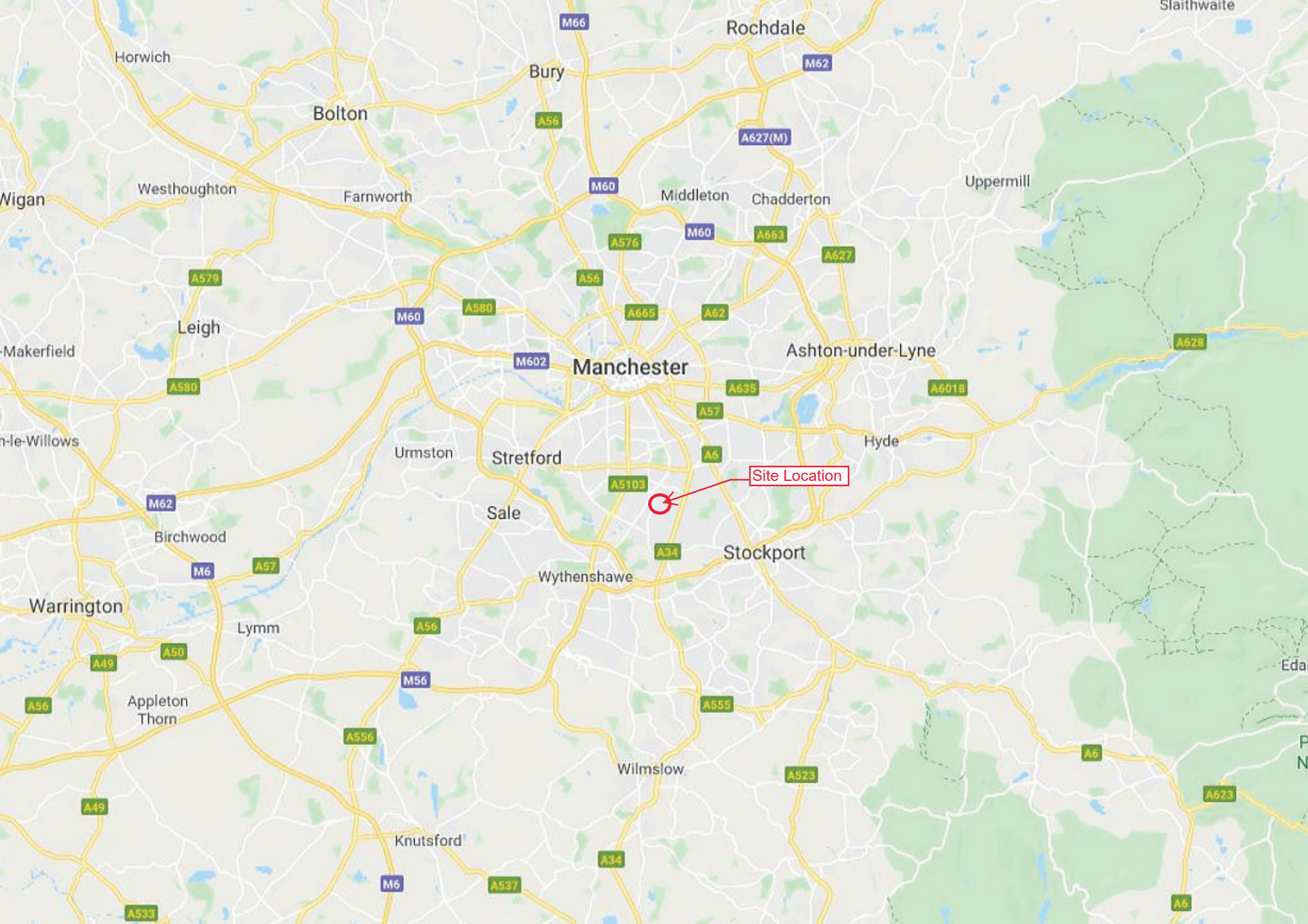
- Further investigations are required to confirm that the existing private foul water drainage does in fact drain to the north of the site and discharges into the public combined water sewer, to the north of the site on Cotton Lane.

- The external ground levels around the proposed building shall fall away from the proposed building with any new levels being designed to ensure any exceedance flood routes, for events in excess of the 100 Year + 40% climate change event, exit towards the car park areas and access roads, for use in exceptional circumstances.

- Further investigations, including a survey of the existing drainage connection manhole should be completed to confirm the exact location, size and condition of the existing outfall manhole. The investigations should determine if the existing manhole is suitable for re-use.

- Further detailed discussions with the Lead Local Flood Authority and United Utilities should be completed to ensure agreement of the surface water discharge rate and the overall approach.

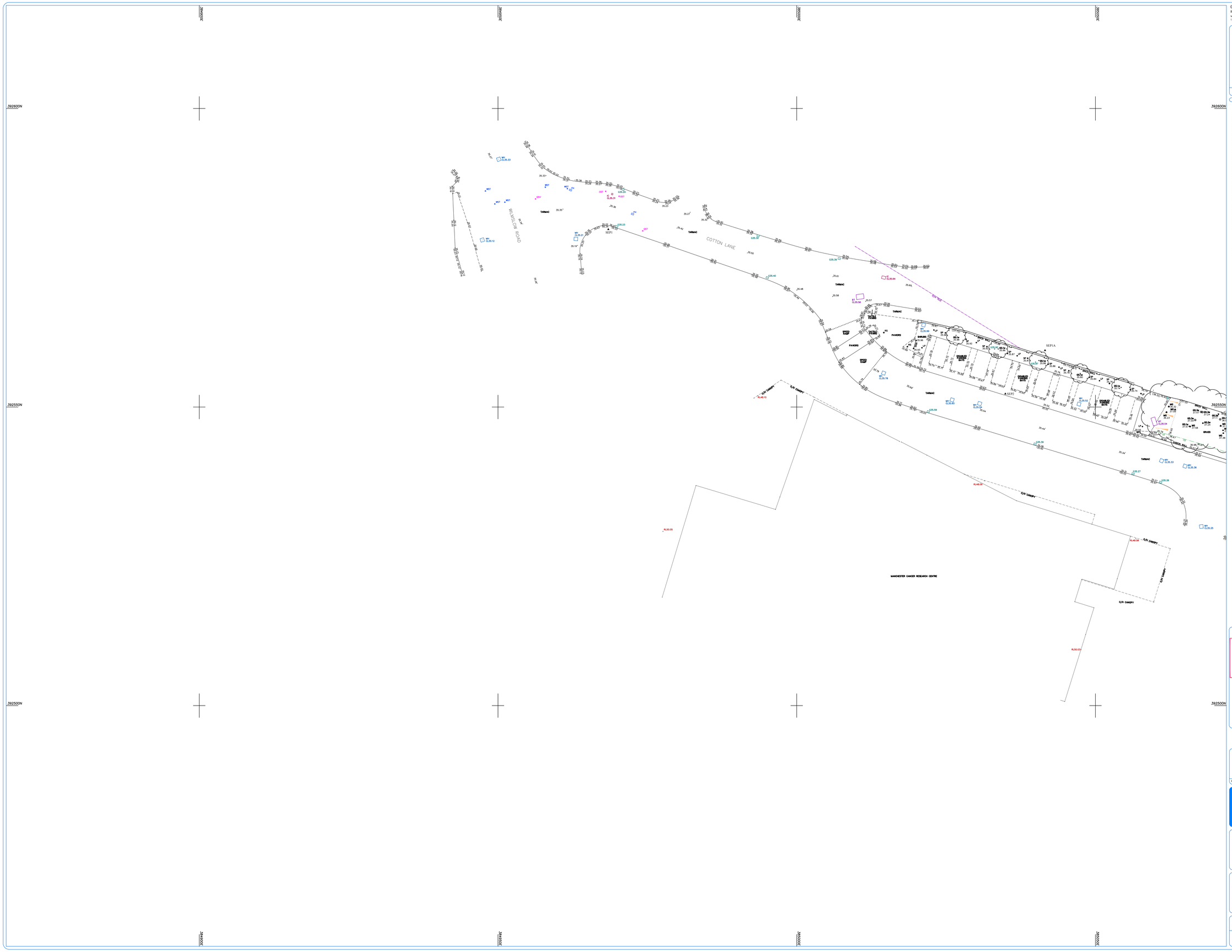
Appendix A Site Location Plan


Site Location
Manchester
Rochdale
Bury
Bolton
Horwich
Wigan
Westhoughton
Farnworth
Middleton
Chadderton
Uppermill
Slaithwaite
Leigh
Makerfield
Ashton-under-Lyne
Hyde
Urmston
Stretford
Sale
Stockport
Wythenshawe
Birchwood
Warrington
Lymm
Appleton Thorn
Wilmslow
Knutsford
M66
M62
M60
M602
M6
M56
A56
A627(M)
A576
A663
A627
A579
A580
A665
A62
A635
A57
A6018
A628
A6
A5103
A34
A50
A49
A555
A523
A556
A537
A533
A623

Appendix B Aerial Photo

Appendix C Topographic Survey

© Survey & Engineering Projects Ltd. 2017
Reproduction in whole or in part by any means is prohibited without the prior permission of Survey & Engineering Projects Ltd.
T: (0161) 7129633 F: (0161)8172556 W: www.sep96.com E: info@sep96.com



N

PLAN GRID NORTH

File Name: S14066-T_2D.dwg

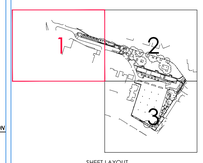
LEGEND

AV	AIR VALVE	LBY	LIFEBUOY
BB	BELISHA BEACON	MH	MANHOLE
BOL	BOLLARD	MKR	MARKER
BS	BUS STOP	MP	MOORING POINT
BSH	BUSH/SHRUB	MR	MOORING RING
BW	BIN	NB	NOTICE BOARD/ WALL
BY	BUS STATION	NP	NAME PLATE
CC	CONTROL COVER	OB	OFFICE BOX
CB	CONTROL BOX	PB	POST OFFICE BOX
CE	CAR CHARGING STATION	PG	PYLON
CFP	CONCRETE POST	PP	POWER PUMP
COL	COLUMN	PT	POST
COM	COMMUNICATIONS COVER	RE	RODDING EYE
CP	CAT PROTECTION	RG	RAIL GUARD
DC	DRAINAGE CHANNEL	RS	ROAD SIGN
DP	DOWN PIPE	RTW	RETAINING WALL
DS	DOG STOP	SDP	SURFACE DRAIN PIPE
EC	ELEC. INSPECTION COVER	SAP	SAPLING
EG	GATES (ELEC.)	SGP	SIGN POST
ELB	ELECTRIC BOX	SGV	SIGHT V. LEVEL
EP	EARTH POST	TB	TOP OF BANK
EP	ELECTRICITY POLE	TBL	TOP OF BOLLARD
FFL	FINISHED FLOOR LEVEL	TCB	TELEPHONE CALL BOX
FG	FIRE GATE (ELEC.)	TL	TRAFFIC LIGHT
FP	FUEL POST	TLB	TRAFFIC LIGHT BOX
G	GULLY	TLP	TRAFFIC LIGHT POST
GBP	GATE BOLLARD LIGHT	TP	TELEGRAPH POLE
GP	GATE POST	VP	VENT PIPE
GSP	GAS TAP	WP	WATER COVER
GV	GAS VALVE	WO	WASH OUT
IC	INSPECTION COVER	WST	WATER STOP TAP
KL	KERBS (LEVEL)	WV	WATER VALVE
LC	LOOP CAMERA	VCB	VIRT. CAPTIV. CALL
LGD	LADDER GUARD	GCM	GRID CONVERGENCE
LP	LAMP POST		
FNL	FALLAGE		DRIP LINE
R/W	WIRE MESH		WATER COURSE
R/W	RAILWAY WIRE		KERB
S/P	STAY PANEL		EDGE
P/W	POST AND WIRE		SURFACE CHANGE
P/R	POST AND RAIL		WALL
U/R	WOW RAIL		BOTTOM BANK
C/R	CLOSE BOARDED		BUILDING
TOB	TOP OF BANK		OVER HEAD CANOPY
(TOF,BS)	TOP OF FEATURE BESIDE		OVER HEAD ELECTRICAL
A	STATION		OVER HEAD TELECOM
BH	BOREHOLE		HEDGE
	BATTER		

NOTES:

All levels relate to O.S. (Newlyn) Datum, Established using network RTK.
Survey plotted on a plane local grid, orientated to National Grid.

SURVEY STATIONS			
Name	Easting	Northing	Height
SEP1	384968.467	392579.703	35.348
SEP2	385004.983	392524.284	36.611
SEP3	385008.750	392516.104	36.931
SEP4	385115.705	392319.823	37.187
SEP5	385146.372	392461.095	36.822
SEP6	385167.915	392445.247	36.969
SEP7	385205.874	392445.248	37.084
SEP8	385222.438	392446.462	36.770
SEP9	385241.812	392447.813	37.271
SEP10	385247.815	392448.803	37.271
SEP11	385255.023	392509.429	37.170
SEP12	385257.763	392514.104	36.893
SEP13	385156.760	392524.404	36.842
SEP14	385129.474	392532.837	36.493



SHEET LAYOUT

0 2m 4m 8m 12m 16m

SCALE BAR

REV	DATE	DESCRIPTION

SURVEY & ENGINEERING PROJECTS

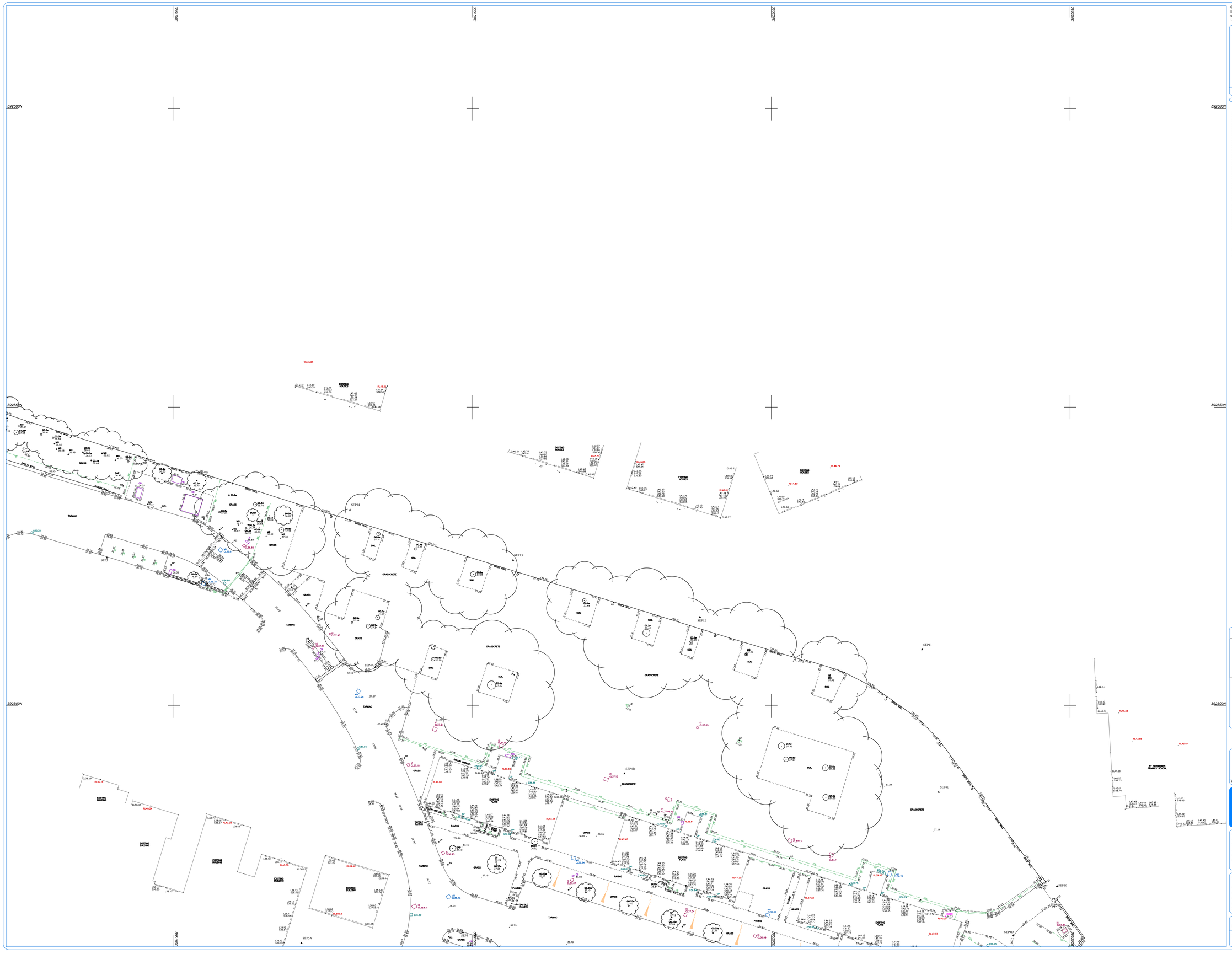
Client
AFL Architects
St Georges House
56 Peter Street
Manchester
M2 3NQ

Project Title
Topographical Survey of Land at:
Christie Car Park
Cotton Lane
Manchester
M20 4QE
Sheet 1 of 3

Surveyed	Drawn	Checked
D.Balmer	B.Brady	D.Balmer

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	Apr 17	S14066-T	01	A0	--

© Survey & Engineering Projects Ltd. 2017
Reproduction in whole or in part by any means is prohibited without the prior permission of Survey & Engineering Projects Ltd.
T: (0161) 7129633 F: (0161) 7233566 W: www.sep96.com E: info@sep96.com



NOTES:
All levels relate to O.S. (Newlyn) Datum, Established using network RTK.
Survey plotted on a plane local grid, orientated to National Grid.

SURVEY STATIONS			
Name	Easting	Northing	Height
SEP1	384868.867	392579.793	35.348
SEP2	385004.983	392574.194	36.611
SEP3	385006.192	392552.291	37.101
SEP4	385115.758	392519.823	37.181
SEP5	385146.372	392461.065	36.822
SEP6	385147.815	392447.147	37.084
SEP7	385220.874	392445.248	37.084
SEP8	385222.438	392446.462	36.772
SEP9	385224.179	392447.812	37.271
SEP10	385247.813	392449.803	37.271
SEP11	385255.023	392509.429	37.171
SEP12	385257.164	392511.121	37.171
SEP13	385156.765	392524.404	36.842
SEP14	385129.474	392532.837	36.493

SHEET LAYOUT

0 2m 4m 8m 12m 16m
SCALE BAR

REV	DATE	DESCRIPTION

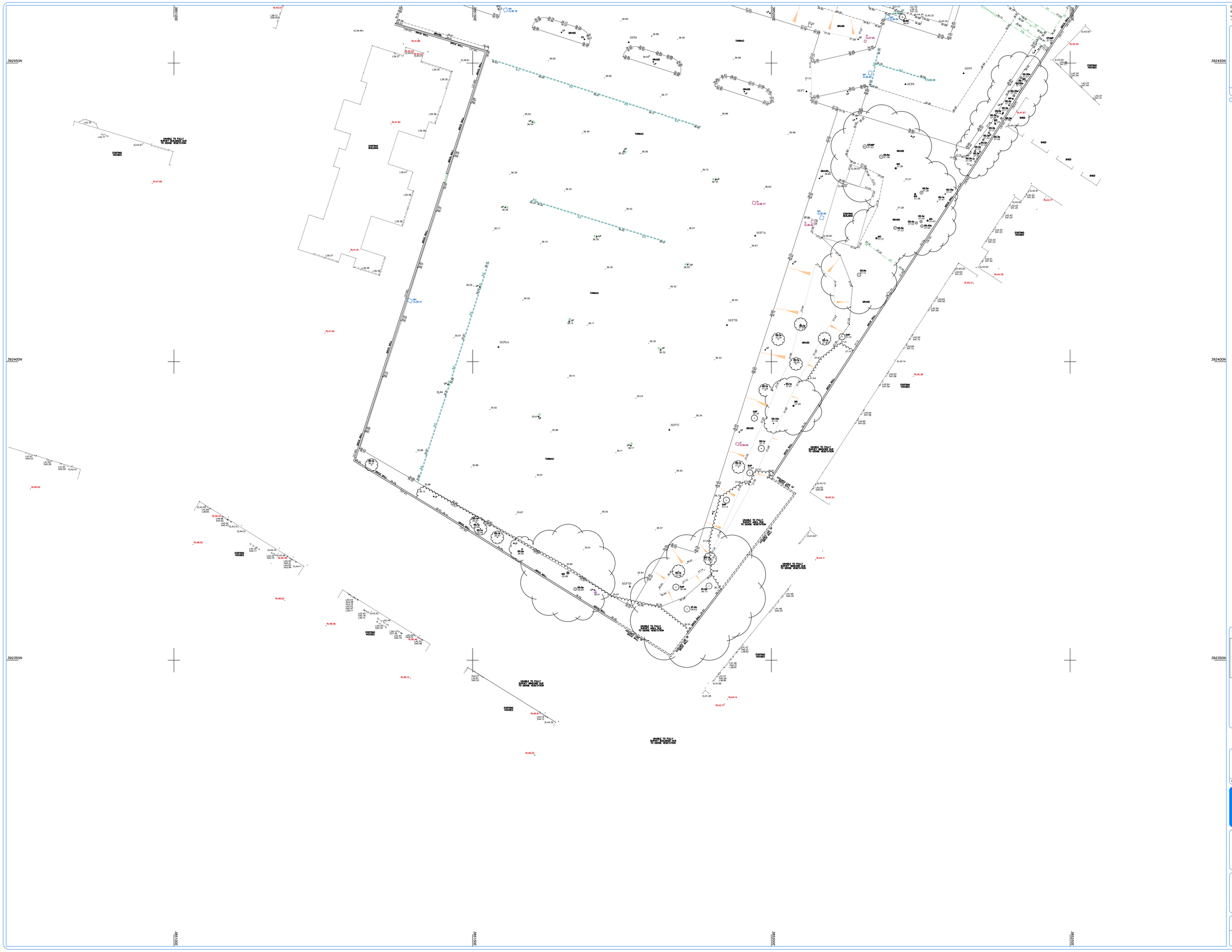
SURVEY & ENGINEERING PROJECTS

Client
AFL Architects
St Georges House
56 Peter Street
Manchester
M2 3NQ

Project Title
Topographical Survey of Land at:
Christie Car Park
Cotton Lane
Manchester
M20 4QE
Sheet 2 of 3

Surveyed	Drawn	Checked
D.Balmer	B.Brady	D.Balmer

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	Apr 17	S14066-T	02	A0	--



© Survey & Engineering Projects Ltd. 2017
Reproduction in whole or in part by any means is prohibited without the prior permission of Survey & Engineering Projects Ltd.
T: (01495) 729933 F: (01495) 722556 W: www.sepltd.com E: info@sepltd.com

N

PLAN GRID NORTH

File Name: S14066-T-2D.dwg

LEGEND

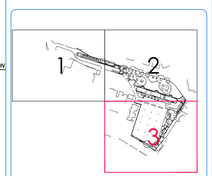
AV	AIR VALVE	LBY	LITTERBUY
BB	BELISHA BEACON	MH	MANHOLE
BOL	BOLLARD	MKR	MARKER
BS	BUS STOP	MP	MILE POST
BM	BENCH MARK	MP	MOORING POINT
BR	BUS STATION	NP	NATURAL POND
BS	BUS STOP	NP	NAME PLATE
CB	CATCH PIT COVER	OP	OPTICAL POST
CB	CONTROL BOX	PO	POST OFFICE BOX
CC	CAR CHARGING STATION	PYL	PYLON
CCTV	CCTV CAMERA POST	PU	PUBLIC PUMP
COL	COLUMN	PST	POST
COM	COMMUNICATIONS COVER	RE	RODDING EYE
CP	CONC. PADDLE	RG	RAIL GUARD
DC	DRAINAGE CHANNEL	RS	ROAD SIGN
DP	DOWN PIPE	RTW	RETAINING WALL
DS	DOWN SPOUT	SDP	SURFACE DRAIN PIPE
EC	ELEC. INSPECTION COVER	SAP	SAPLING
EG	GATES LEVEL	SGP	SIGN POST
ELB	ELECTRIC BOX	SGV	SIGHT LEVEL
EP	EARTH ROD	TA	TOUR ANCHOR
EP	ELECTRICAL POLE	TB	TELEPHONE BOLLARD
FFL	FINISHED FLOOR LEVEL	TCB	TELEPHONE CALL BOX
FH	FIRE HYDRANT	TL	TRAFFIC LIGHT
FP	FUEL POST	TL	TRAFFIC LIGHT
G	GULLY	TLB	TRAFFIC LIGHT BOX
GLP	GARDEN LIGHT	TP	TELEPHONE POLE
GP	GATE POST	TP	TELEGRAPH POLE
GSP	GAS TAP	VP	VENT PIPE
GV	GAS VALVE	WC	WATER COVER
IC	INSPECTION COVER	WO	WASH OUT
KL	KERBS LEVEL	WSP	WATER STOP TAP
LB	LETTER BOX	WT	WATER TANK (ABV)
LBD	LADDER	WVT	VALVE (WATER) (ABV)
LP	LIGHT PUMPS	WVT	VALVE (WATER) (GRTS)
LP	LAMP POST		
PAL	PALISADE		DRIP LINE
WM	WIRE MESH		WATER COURSE
R/W	RAILWAY WAGON		AERIAL
C/P	CONC. PANEL		CABLE
P/W	POST AND WIRE		SURFACE CHANGE
P/R	POST AND RAIL		WALL
W/R	WOOD RAIL		TOP BANK
C/R	ROCK WALL		BOTTOM BANK
CLS	CLOSE BOARDED		BUILDING
TOP	TOP OF FEATURE		OVER HEAD CANOPY
(OHE/E)	OVER HEAD ELECTRICAL		OVER HEAD ELECTRICAL
(OHT/E)	OVER HEAD TELECOM		OVER HEAD TELECOM
S	STATION		
B	BOREHOLE		HEDGE
	BATTER		

NOTES:

All levels relate to O.S. (Newlyn) Datum, Established using network RTK.
Survey plotted on a plane rectangular grid, orientated to National Grid.

SURVEY STATIONS

Name	Easting	Northing	Height
SEP1	380468.467	392579.793	35.349
SEP2	380504.183	392574.284	36.611
SEP3	380508.762	392552.124	36.931
SEP4	380519.708	392519.823	37.181
SEP5	380546.372	392461.065	36.823
SEP6	380577.193	392443.247	36.904
SEP7	380520.874	392445.248	37.084
SEP8	380522.438	392446.462	36.772
SEP9	380527.812	392447.813	37.271
SEP10	380247.812	392468.802	37.271
SEP11	380225.023	392509.429	37.170
SEP12	380217.763	392522.404	36.493
SEP13	380196.760	392524.404	36.493
SEP14	380129.474	392532.837	36.493



SHEET LAYOUT

0 2m 4m 8m 12m 16m
SCALE BAR

REV	DATE	DESCRIPTION

SURVEY & ENGINEERING PROJECTS

Client
AFL Architects
St Georges House
56 Peter Street
Manchester
M2 3NQ

Project Title
Topographical Survey of Land at:
Christie Car Park
Cotton Lane
Manchester
M20 4QE
Sheet 3 of 3

Surveyed	Drawn	Checked
D.Balmer	B.Brady	D.Balmer

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	Apr 17	S14066-T	03	A0	--

Appendix D Proposed Site Plan

© 2015 AFL ARCHITECTS (v5.0)

NOTES
All dimensions and levels to be checked on site

Any descrepancies are to be reported to the Architect before any work commences

This drawing shall not be scaled to ascertain any dimensions, work to figured dimensions only

This drawing shall not be reproduced without express written permission from AFL Architects Ltd.

DISCLAIMER
When this drawing is issued in CAD, it is an uncontrolled version issued for information only, to enable the recipient to prepare their own documents/drawings for which they are solely responsible.

SOFTWARE INTEROPERABILITY
AFL prepared this drawing using Autodesk REVIT Architecture.

AFL does not accept liability for any loss or degradation of any information held in the drawing resulting from the translation from the original file format to any other file format or from the recipients reading of it in any other programme.

Indicative Shrub Schedule

Species	Spread or height (cm)
Abelia grandiflora	30 - 45
Allium Purple Sensation	n/a
Amelanchier lamarckii	90-120
Berberis thunbergii Rose Glow	30-40
Berginia cordifolia 'Purpurea'	20-30 (s)
Buddleia davidii 'Black Knight'	90-120
Carex ormithosa Evergold	
Ceanothus thyrsiflorus repens	30-45 (s)
Choisya ortune Aztec Pearl	45-60
Clematis 'Paul Forges'	1.75-2.0m
Cornus alba Sibirica	60-90
Cornus stolonifera Flaviramea	45-60
Crocosmia 'Citronella'	n/a
Euonymus ortune 'Silver Queen'	20-30 (s)
Geranium Johnson's Blue	
Hamamelis mollis Pallida	90-120
Hebe albicans	20-30
Hebe 'Mrs Winder'	20-30
Hebe rakiensis	30-45
Hedera helix 'Plattensee'	1.75-2.0m
Lavandula angustifolia 'Hidcote'	20-30
Lonicera henryi	1.75-2.0m
Lonicera nitia Mai Green	45-60 (s)
Miscanthus sinensis 'Gracillimus'	
Pennisetum alopecuroides 'Hameln'	
Philadelphus coronarius Aureus	45-60
Phormium Bronze Baby	60-90
Rosa alba Meidiland*	30-45
Salix lanata	30-45 (s)
Sambucus nigra purpurea	60-90
Trachelospermum jasminoides	1.75-2.0m
Viburnum bodnantense Dawn	90-120
Viburnum davidii	30-45 (s)
Vitis coignetiae	1.75-2.0m
Wisteria sinensis 'Prolific'	1.75-2.0m

Indicative Semi-Mature Tree Schedule

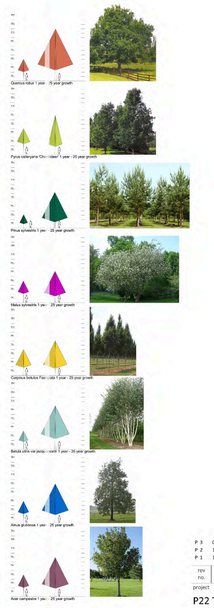
Species	Girth or height (cm)
Betula utilis 'jacquemontii'	350-400
Carpinus betulus Fastigiata	30-35
Pinus sylvestris	250-300
Pyrus calleryana 'Chanticleer'	30-35

Indicative ONS Tree Schedule

Species	Girth or height (cm)
Acer campestre	16-18
Alnus glutinosa	16-18
Cornus sanguinea	60-90
Corylus avellana	90-120
Crataegus monogyna	90-120
Euonymus europaeus	90-120
Ilex aquifolium	60-90
Malus sylvestris	16-18
Quercus robur	16-18
Viburnum opulus	60-90

Legend

- Proposed Tiered Car Park Surface Finish
- External Grasscrete Finish
- External Asphalt Road Finish
- External Grassed Area
- External Paved Area
- Existing Trees - Retained
- Existing Trees - Removed
- Proposed car park trees with root zone system
- Proposed native tree buffer planting
- Proposed ornamental shrub planting
- Proposed climbing plants with stainless steel tension wire support system
- Semi-native shrub buffer planting
- Proposed native mix hedge



rev no.	rev date	rev by	description
P 3	04.09.17	SEH	PLANNING ISSUE
P 2	18.08.17	SEH	Issued for Planning Package
P 1	10.08.17	RO	Issued for sign off

project
P22 Tiered Car Park

location
The Christie

Employer
Interserve

client
Christie

AFL Architects
1st Floor
St Georges House
56 Peter Street
Manchester UK
M2 3NQ

t: +44(0)161 236 6263
f: +44(0)161 236 6484

w: www.afl-architects.com
e: mail@afl-uk.com

twitter.com/AFLArchitects

key plan

drawing title
Proposed Landscape Plan

AFL job number 163409 | scale @ A0 | drawn SEH | checked GR | rev date 04.09.17

Reg purpose	status	rev
PLANNING		P 3

Sub-project	origin	zone	level	type	role	S-digit no.
163409-AFL-	00-00-	DR-A-	20138			

Appendix E Pre & Post Development Impermeable Areas Drawing

PRE-DEVELOPMENT
IMPERMEABLE AREAS = 7,629m²

POST-DEVELOPMENT
IMPERMEABLE AREAS = 7,203m²

ALL REMAINING AREAS INSIDE THE 15,647m2 SITE BOUNDARY ARE EITHER EXISTING PERMEABLE AREAS, IMPERMEABLE AREAS TO DRAIN AS PER THE EXISTING SCENARIO OR PERMEABLE AREAS TO INFILTRATE VIA GRASSCRETE PAVING AREAS.

REV	DATE	DESCRIPTION	BY	CHK	APP

DRAWING STATUS:
INFORMATION

CLIENT:
THE CHRISTIE NHS FOUNDATION TRUST

ARCHITECT:
IBI GROUP

PROJECT:
THE CHRISTIE
P22 TIERED CAR PARK

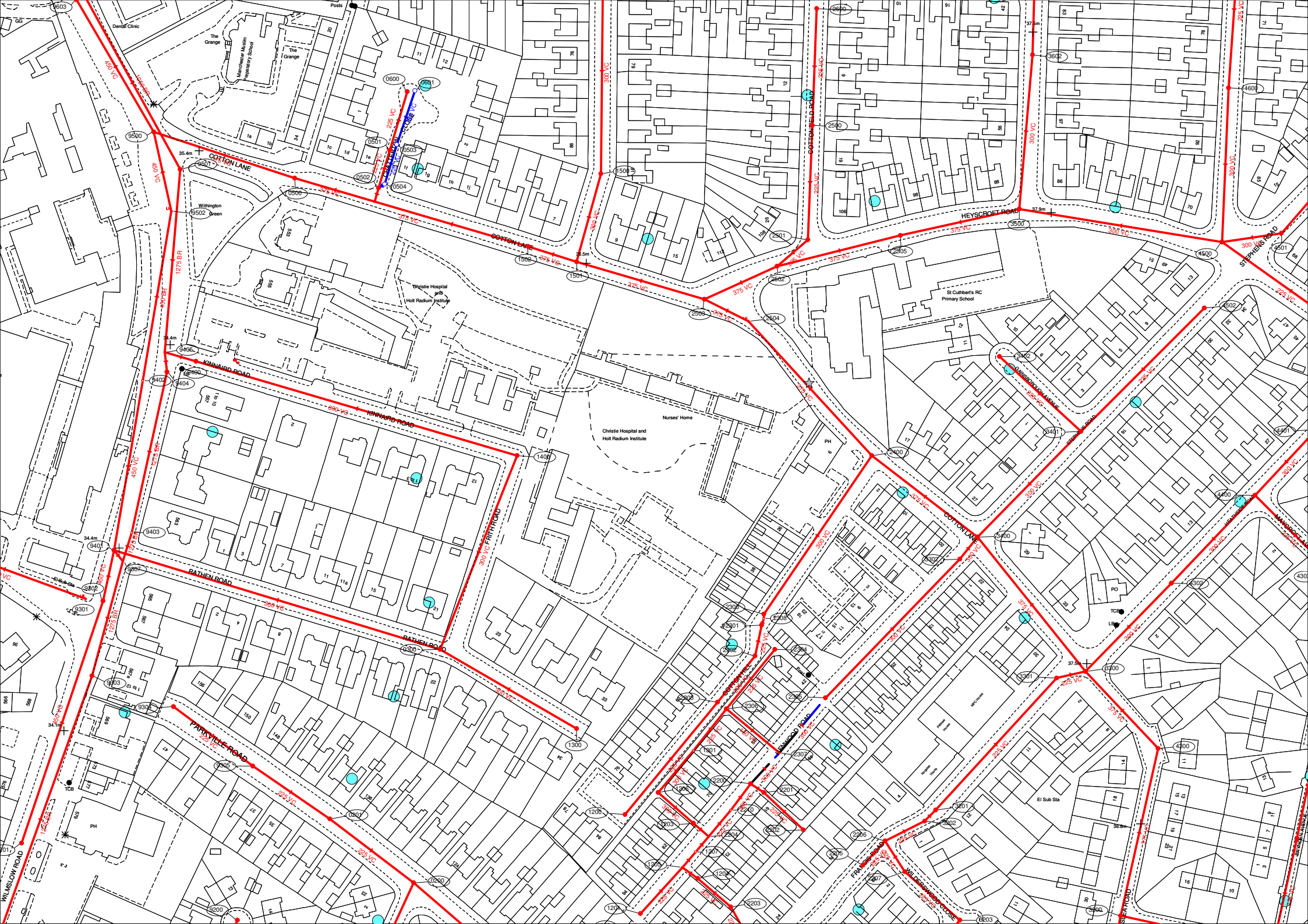
TITLE:
PRE & POST DEVELOPMENT
IMPERMEABLE AREAS

STATUS:	PROJECT No.	PROJECT	ORIGINATOR	VOL/SYS	LEVEL	TYPE	ROLE	DRAWING No.	REV:
S2	218-310	CCP -	AJP -	ZZ -	XX -	SK -		**C - 0001**	**P01**

SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:500	JRS	JRS	JMM	JMM	MAR 2020

alan johnston partnership LLP
CONSULTING STRUCTURAL & CIVIL ENGINEERS
1 Dale Street,
Liverpool L2 2ET
Tel: 0151 227 1462
Fax: 0151 225 1187
E-Mail: Mail@ajpstructeng.com

Appendix F United Utilities Map & Existing Drainage Information



COTTON LANE
KINNAIRD ROAD
RATHEN ROAD
PARKVILLE ROAD
WILMSLOW ROAD
FRITH ROAD
COTTONFIELD ROAD
HEYSCROFT ROAD
STEPHENS ROAD
MAYCROFT AVE
WILDERSWOOD CLOSE
FRANCIS ROAD
Dental Clinic
The Grange
Manchester Muslim Preparatory School
Withington Green
Christie Hospital and Holt Radium Institute
Nurses' Home
St Cuthbert's RC Primary School
El Sub Sta
PH
PO
TCB
LB