



RIDGE

**NEW MULTI STOREY CAR PARK
MECHANICAL & ELECTRICAL
SERVICES PROPOSAL
COSTAIN MANCHESTER
7th January 2020**

**NEW MULTI STOREY CAR PARK
COSTAIN MANCHESTER**

7/01/2020

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CONTENTS

1. INTRODUCTION	4
2. STANDARDS	6
3. TECHNICAL PROPOSALS	7
3.1. Mechanical Services	7
3.1.1. Heating – Option for consideration	7
3.1.2. Fire Considerations	7
3.1.3. Part 'L'	8
3.1.4. BRE Environmental Assessment Method	8
3.2. Electrical Services	8
3.2.1. Extent of Works	8
3.2.2. Incoming Supplies	9
3.2.3. Mains Intake and Distribution Switchgear	10
3.2.4. Final Circuit Distribution Boards	10
3.2.5. Metering	11
3.2.6. Containment Systems	11
3.2.7. Final Circuit Cabling	11
3.2.8. Small Power	12
3.2.9. General Lighting	12
3.2.10. Emergency Lighting	18
3.2.11. Lighting Control Philosophy – Smart Scan	20
3.2.12. Fire Considerations	22
3.2.13. Information technology and security	23
3.2.14. Earthing and Bonding	25
3.2.15. Lightning Protection	25
3.2.16. Electric Car Charging Points	26
3.3. Key Risks	30
4. EXISTING UTILITIES RECORDS	31

1. INTRODUCTION

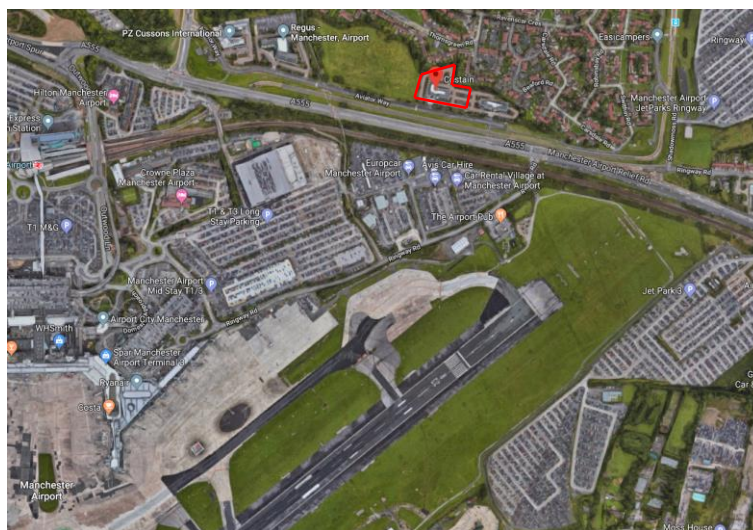
The purpose of this document is to demonstrate the proposed mechanical and electrical services to be utilised within proposed Multi Storey Car Park (MSCP). Details are provided on the following:

- Mechanical services
- Lighting Strategy
- Lighting Control Philosophy
- Small Power
- Fire Detection
- ICT
- CCTV
- Lightning Protection
- Electric Vehicle Charging Points (EVCP)

The premises of the new development is currently occupied by Costain Manchester. Costain is a British technology based construction and engineering company headquartered in Maidenhead.

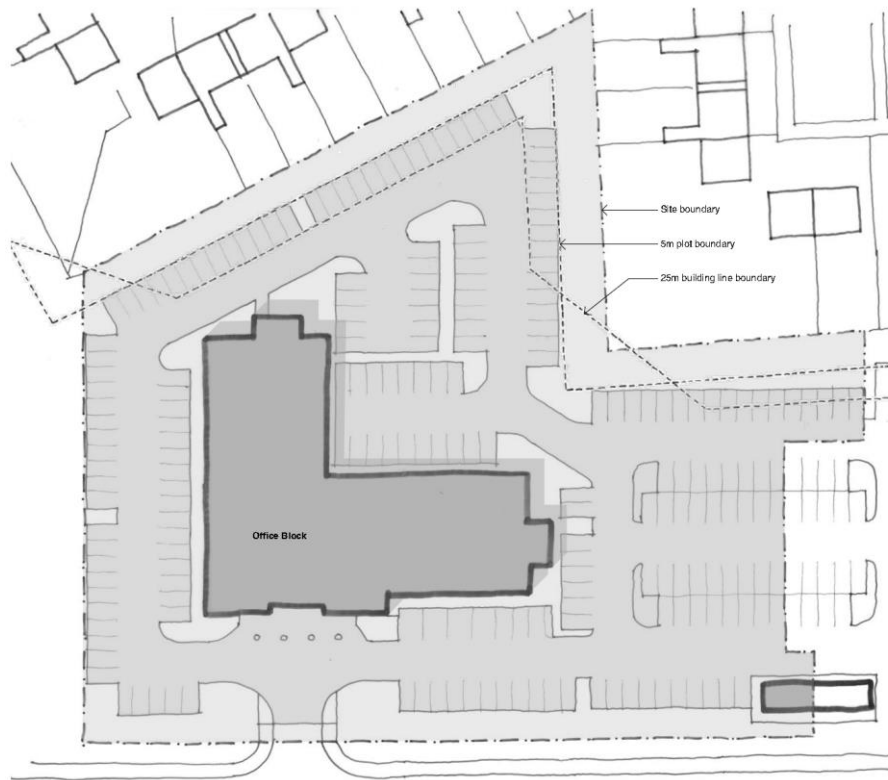


Site overview (Google Maps)

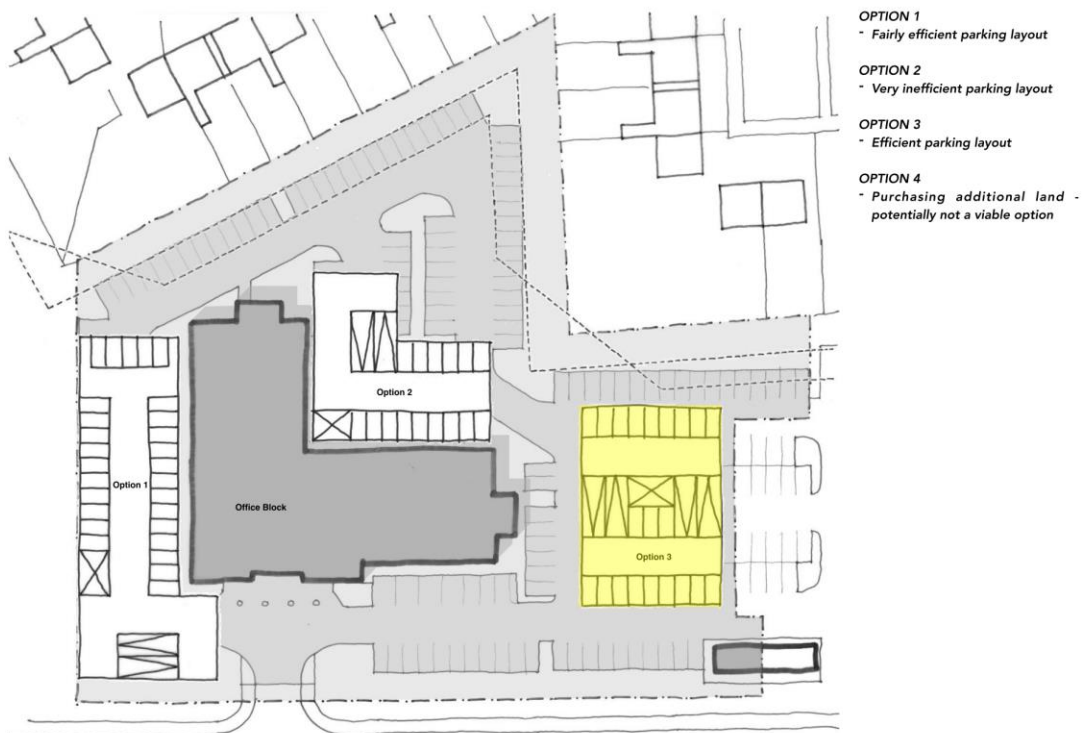


Site overview (Google Maps)

The new development is in close proximity to Manchester Airport



Existing site premises mark-up (from Feasibility Study by Maber)



Site Premises Mark-up (from Feasibility Study by Maber), Option 3 is the preferred.

2. Standards

The design and installation shall be carried out in strict compliance with the latest editions of the following documents, applicable to all relevant elements of the works.

- CIBSE Guides
- Local Planning Requirements
- IET Wiring Regulations 18th Edition (BS 7671)
- Guidance published by IEE and IET.
- BS EN 12464 Light and lighting. Lighting of work places.
- BS 5839-1-2017 Fire detection and fire alarm systems for buildings.
- BS 7346-7 2013 Components for smoke and heat control systems. Systems for covered car parks.
- BS 5489-1 2013 Code of practice for the design of road lighting.
- Electricity at Work Regulations 1989
- Control of Substances Hazardous to Health (COSHH) Regulations
- Health and Safety at Work Act
- Building Control Officer Requirements
- Building Regulations
- British Standards
- BSRIA Guides
- Construction (Design & Management) Regulations.
- The requirements of the local Regional Electricity Company.
- Recommendations advised by all relevant local authorities.
- Manufacturer's recommendations relating to performance of motors, switchgear, luminaires, wiring and any other items of equipment.
- Good working practice for standards of workmanship & quality of materials.
- All product and materials shall have product conformity certification (e.g. BSI Kitemark, BSI Safety Mark or CARES scheme) or product approval (e.g. British Board or Agreement Certificate)
- All products must have the recognised 'CE' mark attached.

The following documents / standards were also reviewed and applicable elements are presented within this report:

- Estates and Facilities Alert 02 July 2018 - Fire in multi-storey car parks (MSCPs) - Liverpool example
- NBS Design recommendations for multi-storey and underground car parks
- BPA Approved Operator Scheme Code of Practice Control and enforcement of parking on private land and unregulated public car parks
- Park Mark Safer Parking - New Build Car Park Guidelines For Car Park Designers, Operators and Owners
- Information File BAFSA Fire sprinkler systems in car parks 2010
- Design recommendations for multi-storey and underground car parks. 4th edition Institution of Structural Engineers, 2011

3. TECHNICAL PROPOSALS

3.1. Mechanical Services

3.1.1. Heating – Option for consideration

Underfloor heating is sometimes used, in particular on vehicle ramps to prevent skidding, although its effectiveness can be questionable.

General

The principal heating issue in car parks is associated with the melting of ice and snow particularly for exposed car park ramps and decks during prolonged cold spells. This can be achieved either by using heat to keep the surface temperature above freezing point or by reducing the freezing point by the use of chemicals. However, designing the car park so that there are no places where water can accumulate on roadway surfaces can eliminate a great deal of the problem.

Ramp heating

Exposed car park ramps and decks can suffer from ice and snow during extremely cold conditions or prolonged periods of bad weather. In the past, ramp heating has been recommended as a means of dealing with ice and snow. However, experience has shown that it is not particularly effective and should be considered only when other measures such as de-icing chemicals are not suitable. Installation and running costs can be high and, since the heating elements have to be buried in the ramp, any failure will require closure of the car park for maintenance access. If regular icing is expected, it is better to design ramps so that they are not open to the elements.

Open top floors

It is not feasible to provide heating to prevent snow accumulating on open top floors. However, suitably designed falls should permit melted snow to escape and prevent ice forming.

3.1.2. Fire Considerations

The requirement for hydrants, dry risers, hose reels and fire extinguishers should be agreed with the local fire authority. All fixtures and fittings that contribute to the essential safety of people using car parks and which are part of the basic fire resistance of the structure should be designed to be as vandal-resistant as possible.

Sprinklers

As the fuel source is often oil-based, the use and type of sprinklers for car parks have to be carefully considered. In addition, the unoccupied nature of car parks makes the sprinkler heads prone to vandal damage. Any sprinkler system installed must comply with standards such as BS 5306-2 and BS EN 12845.

In winter, some sprinkler systems can be rendered ineffective by freezing, unless pipework is insulated and trace-heated. A pre-action system can alleviate some of these problems as in normal operating conditions the pipework is not full of water. There is also less chance of accidental discharge in the event of damage to the heads.

Smoke Ventilation

It is presumed this would not be required as the car park is predominantly open, however this would need to be reviewed during design development.

3.1.3. Part 'L'

As car parks are classed as unoccupied buildings with no heating and cooling they do not fall into the scope of the Part L Regulations and a Simplified Building Energy Model (SBem) calculation is not required. However, designers should ensure that in these areas, lighting efficacies (LM/W) and specific fan power (w/(ltr/sec)) are within the requirements of Part L.

3.1.4. BRE Environmental Assessment Method

Car park areas are excluded from the BRE Environmental Assessment Method (BREEAM) assessments. This is because they are classed as un-occupied buildings.

3.2. Electrical Services

Environment

The electrical installation for any areas accessible to the public should be designed to resist weather, fumes and vandals. This will dictate the choice of corrosion-resistant materials designed to thwart the efforts of vandals. National codes of practice (e.g. the IEE Wiring Regulations) provide suitable guidance.

Design

Distribution boards should ideally be located outside vehicle/public areas. If a distribution board is located in exposed areas it should be enclosed within a suitable vandal-resistant enclosure. Distribution boards should be comprised of MCB protective devices.

Residual current devices (RCDs) should protect all socket outlets and lighting fixtures. Tripping current should not exceed 30mA.

Lifts and escalators (if required)

Designing lift and escalator installations is a specialised skill, since engineering, traffic flow and aesthetics need to be taken into account.

If a fire-fighting lift is required then a secondary power supply will be required. This can take the form of a second low voltage supply emanating from another sub-station transformer or a stand-by generator.

3.2.1. Extent of Works

The works include, but are not limited to, the following:

- Incoming Electricity (if required, not likely)
- Main electrical distribution

- Final circuit distribution
- Sub-main cabling
- Containment systems installation and associated support systems
- Final circuit cabling
- Small power installation
- Mechanical services power provision and containment (if required)
- General lighting installation
- Emergency lighting installation
- Lighting controls installation
- Fire alarm system installation
- Access control systems (if required)
- Intercom systems (if required)
- Lightning Protection
- Metering system
- Disabled Refuge Systems (if required)
- CCTV system
- Earthing & bonding
- Labelling
- Testing & commissioning
- Training
- Record documentation

3.2.2. Incoming Supplies

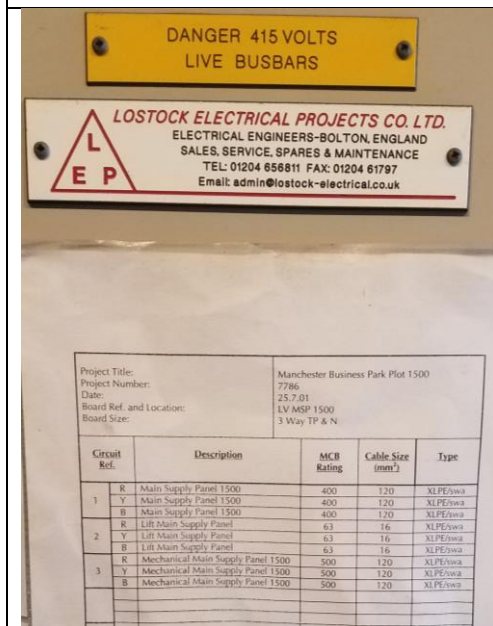
It is proposed to install the main LV switchboard within the proposed Car Park building fed from the existing substation building.

	Existing electrical substation building on site.
	Existing LV switchgear within substation building.



Suspected spare way within existing LV switchgear.

It appears that there is spare way available for new car park supply. We are awaiting confirmation from switchboard manufacturer. Investigation in Progress.



Existing LV switchgear distribution schedule.

3.2.3. Mains Intake and Distribution Switchgear

New LV Supplies shall be derived from the existing LV switchboard and shall terminate into the local distribution board as required. All above cabling shall be installed by the Electrical Contractor.

The LV switchboard will provide metered electrical supplies to the car park electrical distribution systems, separate supplies shall be installed to:

- Lighting and Power
- Lifts (if required)
- Mechanical Plant (if required)
- Electric Vehicle Charging (EVC)

3.2.4. Final Circuit Distribution Boards

Final circuit distribution board(s) are to serve the proposed equipment, as required.

Lighting and power to be supplied from local three phase or single phase distribution boards located in dedicated cupboard or riser.

The distribution boards shall comply with BS-EN-61439: Part 3:2012 and shall be type B complete with integral switch disconnector having a category of utilisation of AC-40.

Final circuit protective devices shall be type B, C & D MCB's to BS EN 60898 with a minimum breaking capacity of 10kA. Provide single pole RCBOs as required.

3.2.5. Metering

Full metering to each distribution board shall be provided to allow energy to be measured.

Separate sub-metering by the contractor as part of the LV installation shall be provided to:

- Landlords lighting
- Landlords power
- Mechanical Systems (if required)
- Comms / Data equipment
- Lifts (if required)
- EVC

Metering shall have the facility for pulsed and Modbus outputs connected to a central monitoring station (BMS) if required.

All metering to be in accordance with CIBSE Guide TM39.

3.2.6. Containment Systems

Consideration should be given to providing a galvanised trunking and conduit containment system. This system should be installed surface fixed directly to the building structure, using vandal-proof fixings. Careful planning of containment routes should be considered at the design stage allowing penetrations of beams and floor slabs to be co-ordinated. Twin compartment trunking systems should be specified to provide containment for band one and band two circuitry.

All containment to comply with BS EN 50085 and BS EN 50086.

Services run on each of the containment systems to be compatible and not give rise to mutual detrimental interference. Where necessary, segregation of services on the same containment network shall be achieved by dividers being provided.

3.2.7. Final Circuit Cabling

The installation shall be divided into separately controlled circuits, as required to maintain phase balance and phase distribution within the building, further subdividing where necessary to ensure compliance with BS 7671 (the IET Regulations).

The principle method of wiring unless indicated otherwise, shall utilise: -

- Lighting - LSZH singles within trunking / conduits.
- General Power - LSZH singles within trunking / conduits.
- Sub-Mains - XLPE/SWA/LSZH cables clipped to perforated steel cable tray.

3.2.8. Small Power

Electrical supplies, socket outlets, fused connection units and isolators shall be installed throughout all the areas of the works.

In addition to the above fused spurs and sockets shall be provided for control panels and ancillary equipment as required.

Power sockets are to be protected by RCBO's as required within I.E.T. Wiring Regulations.

3.2.9. General Lighting

During detailed design the following principles shall be followed:

- Lighting should be even, to eliminate shadows.
- White (or light-coloured) walls, floors and ceilings can reduce the quantity of luminaires needed.
- Lighting to BS 5489-1:2013 and BS EN 12464-1:2011.
- Anti-vandal cabling.
- Siting of lighting columns to avoid being used as climbing aids.

It is recommended that the lighting shall be designed in accordance with the British Standards as indicated in the following table.

A uniformity of 0.4 (minimum to average) should be achieved over most of the area at floor level.

Proposed Areas

Standard - Area	Park Mark Guide	Design recommendations for multi-storey and underground car parks (Fourth edition) March 2011 (Lux)
Parking bays, access lanes	Refers to: BS 5489-1 BS 12464-1 BS 52661	75 (av) 50(min)
Ramps, corners, intersections		300 (av) 120(min)
Entrance/exit zones (vehicular)		75 (av) night 300 (av) day
Pedestrian area, stairs, lifts		100 (av) 50 min
Disabled parking		300 (av)
Roof level parking in Rural Zones E1 and E2		15 (av) 6 min
Roof level parking in Urban Zones E3 and E4		30 (av) 12 min

The following aspects have been taken into consideration when performing the lighting calculations to ensure the proposed luminaires are appropriate for the scheme.

Uniform Glare Rating (UGR)

The discomfort or impairment of vision experienced when parts of the visual field (e.g. sky or lamps) are excessively bright in relation to the general surroundings.

Colour Rendering Index (CRI)

The effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant.

LED Luminaires

LEDs have developed significantly now exceeding the performance of even the best fluorescent solutions. Volume increases have reduced costs, making them the ideal choice in many more applications.

Working Plane

This is where most of the work will be done on the floor, this is where the illumination levels are measured because that's where the lighting levels are needed.

Lux

Lux is the standard unit of measurement for illuminance, 1 lux is the equivalent of 1 lumen per square metre.

General

Lighting should be sufficient to assist the safe movement of vehicles and pedestrians. It should also be of a standard that will help reduce vandalism and crime, i.e. luminaires with steel bodies, polycarbonate diffusers with non-standard screws should be considered.

Although some car parks may benefit from being partially day lit, it will usually be necessary to provide lighting for continuous use, at least in some areas. It may be possible to make use of daylight for part of the year. The lighting controls and luminaires can be designed to allow advantage to be taken of available daylight, thus reducing operational costs.

Colour recognition and the overall efficiency of lighting systems can be improved by painting walls, floors and ceilings of car parks.

A multi-storey car park can form a major part of the night-time scene in an area and care is needed both to make the structure aesthetically acceptable by means of appropriate lighting and to ensure that light pollution and obtrusive light are kept to a minimum. Avoiding lighting pollution is particularly difficult on open top decks. Environmental zones have been defined from city-centre locations to national parks and similar, with recommended maximum luminances for each. Further advice should be sought from local authorities due to close proximity to Manchester Airport.

Access ramps and routes and parking bays

A uniformity of 0.4 (minimum to average) should be achieved over most of the area at floor level. One cost-effective approach may be to position luminaires directly over the access routes, since this also helps provide directional guidance for motorists. However, this can cause problems if not supplemented by appropriate extra luminaires, since parked vehicles will cause heavy shadows around the perimeter of the building, providing areas where criminals and vandals can hide and making it difficult to see pedestrians leaving or arriving at their vehicles.

There is a need for particular care in lighting areas where pedestrian and vehicular routes intersect. Vehicle headlights may cause glare for pedestrians and it is therefore essential that the lighting is sufficient to enable them to move safely and be seen by drivers.

In addition to providing light on the road surface, care should be taken to ensure that vertical surfaces such as columns are well lit, especially at corners, bends, junctions and the building perimeter. Additional lighting should be provided at pedestrian entrance and exit areas.

Entrances and exits

By day, exterior illuminances can reach 50,000lux and can vary widely. Illuminances in entrances and exits by day should therefore be sufficient to minimise the adaptation required of drivers. It may be appropriate to provide for illuminances of up to 1,000lux. However, at night the interior of the car park may be at a higher illuminance than the street outside. Appropriate controls will therefore be required to adjust the lighting to suit the external conditions. If space is available, daylight louvres over the entrances/exits of the car park can be used to reduce the illuminance contrast. Consideration should be given to providing luminaires by entrances and exits of the same colour group as external lighting, thus reducing colour contrast.

Barriers and obstructions

Care is needed to ensure that obstructions in the vehicle route are adequately lit for safe driving.

Barriers such as those for traffic calming, e.g. speed humps and rising barriers, should be adequately lit for safe driving.

Any other obstructions in the roadway should be specifically lit to ensure that they are not a hazard to drivers. The direction of lighting should ensure a distinct difference in luminance between the obstacle and its background.

Open top floors

When providing lighting for open top floors of multistorey car parks, care should be taken not to provide excessive spill light and light pollution. Although it may appear attractive to mount luminaires at low level, it is difficult to meet uniformity requirements and much light will inevitably be projected upwards, while vehicles will cause problems with shadowing. If column-mounted luminaires are used, types should be chosen with no upward light output. Generally, hinged columns should be considered for ease of maintenance. Care should also be taken that light from this area does not cause nuisance to occupiers of adjacent buildings, particularly in residential areas. Luminaires with good cut off angles should be specified.

Pedestrian areas

Design should follow the recommendations of the relevant national standards.

Any pedestrian areas that will be regularly used by staff should be considered as part of the workplace and lit appropriately.

Particular requirements will apply to staircases, especially where they form part of designated emergency exit routes.

Equipment considerations

Car parks are aggressive environments and all electrical equipment should be chosen carefully to ensure it is suitable. Matters that may need consideration are:

- vandalism,
- weather resistance,
- resistance to de-icing salt used on roads,
- resistance to petroleum compounds
- and minimal maintenance.

Signs

Positions of signage should be considered at the early design stage so that cable routes for lighting can be incorporated. Internal signs should be positioned for maximum visibility; often the sides of structural beams will provide suitable positions.

The internal lighting system should be designed to take into account the locations of all non-illuminated signs. The locations of these signs should be agreed at the lighting design stage. The lighting system should be designed to allow the artificial lighting system to illuminate these signs. Consideration should be given to mounting height and associated issues with glare.

Proposed Luminaires

1. Type A – Thorlux Thoroproof LED

The 1500mm 30W surface mounted LED luminaire. Luminaire to consist of robust and durable extruded aluminum body with die-cast ends finished full polyester, non-yellowing white. Smooth polycarbonate cover has high resistance to corrosion. Luminaire to be IP65 rated and to be complete with wireless 'smart' control capabilities - as Thorlux Thoroproof 'SMART TR' LED Acrylic.



(Thorlux Thoroproof LED as installed)



(Thorlux Thoroproof LED Luminaire)

2. Type B – Thorlux Wall Mounted Starbeam

The 31W 3700lm IP66 LED luminaire with cast aluminium body, wiring box and polycarbonate cover wall mounted at a height of 3.5m AFFL - as Thorlux Starbeam SMART Area Distribution.



(Thorlux Starbeam LED as installed)



(Thorlux Starbeam LED Luminaire)

3. Type C – Thorlux Realta LED

The 62W 3700lm IP66 wall mounted led luminaire with cast aluminium body, wiring box and polycarbonate cover fixed to side of building at 3.5m above finished floor level. Luminaire to be complete with wireless 'smart' control capabilities – as Thorlux Realta LED SMART

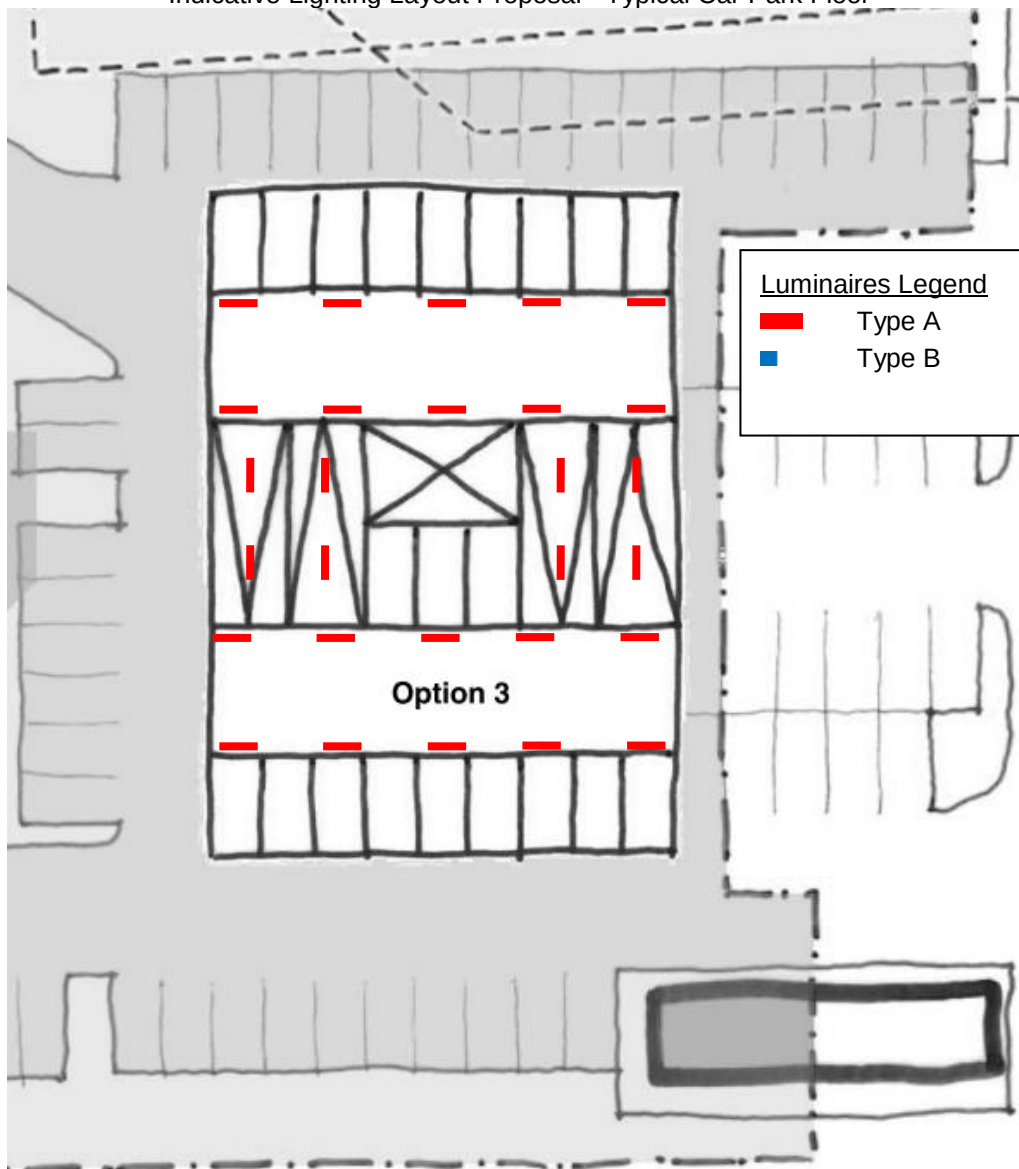


(Thorlux Realta LED as installed)



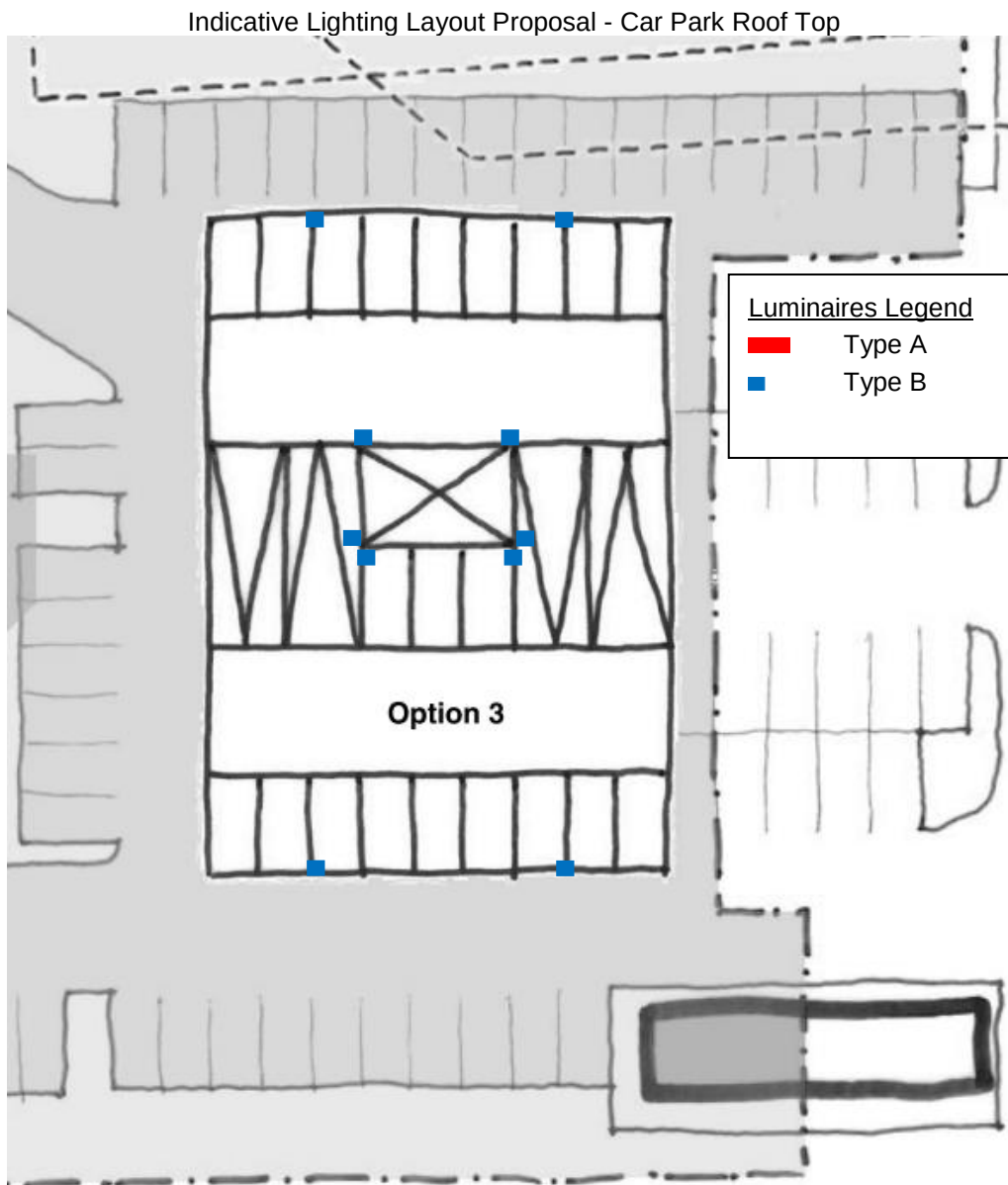
(Thorlux Realta LED Luminaire)

Indicative Lighting Layout Proposal - Typical Car Park Floor



Luminaires Legend

- Type A
- Type B



3.2.10. Emergency Lighting

Emergency lighting should be in the form of illuminated emergency legend panels and various emergency luminaires. System types vary from central battery to self-contained systems. Consideration on system selection should be given to ongoing system servicing and maintenance balanced against the effect of carrying out this maintenance within the car park.

Emergency lighting lux level shall comply with CIBSE and British Standards, and / or as below:

- 1 lx - escape routes to each final exit and outside the building to a place of safety
- 0.5 lx - open area lighting

Proposed Luminaires

1. Type EM1 – Thorlux Mini-8

The 4W LED surface mounted emergency luminaire to consist of off-white polycarbonate body, Clear linear prismatic cover, Scanlight AT emergency test operation, Three hour maintained operation. Legend kit as per Architects fire escape strategy, complies with M.O.D. JSP482 Chapter 8 Document for 'Category C' areas and fitted with 4000K LEDs – As Thorlux Mini-8



(Thorlux Mini-8 LED Luminaire)

2. Type EM2 – Thorlux Emergency LED Surface

The 4W LED surface mounted emergency luminaire to consist of white (RAL9016) fire-retardant polycarbonate body, 3-hour non-maintained emergency operation, full communication Scanlight AT compatibility, status indicator shows operational condition and die-cast heat sink for long LED life – As Thorlux Emergency LED Surface Area



(Thorlux Emergency LED Surface Luminaire)

3.2.11. Lighting Control Philosophy – Smart Scan

Even if a car park is designed for continuous operation and requires permanent artificial lighting, it will still be necessary to provide lighting controls to enable maintenance to be carried out on specific areas. To minimise the cost of running lighting it may, if a significant amount of daylight enters the building, be worth considering daylight-linked control by means of photocells.

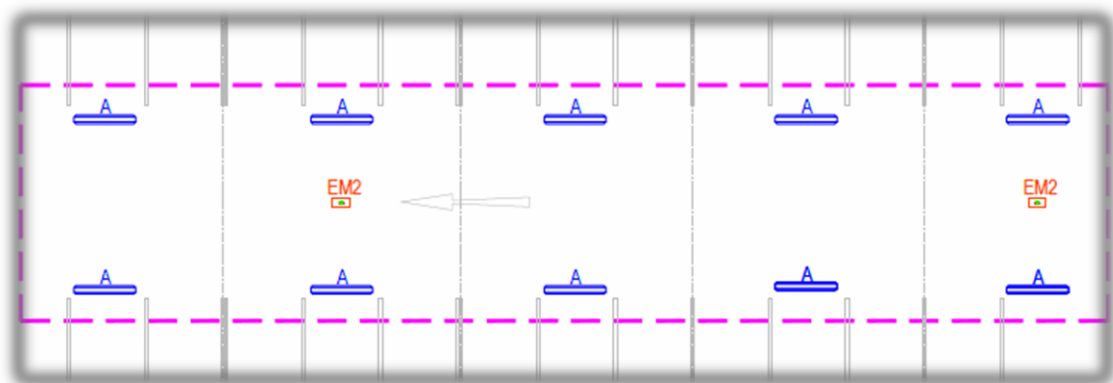
The selection of control devices should be carefully considered to prevent false actuation by external weather conditions.

It is recommended that controlled luminaires are not fitted on ramps or in exit and entry areas.

Each luminaire shall be equipped with an 'intelligent' electronic sensor providing movement detection, light level sensing and an infra-red receiver for programming and remote control. Luminaires shall be capable of being linked together to form motion groups. Linking shall be possible using a two core bus or wirelessly using an 868/922 MHz transceiver.



Movement detected by one sensor will be signalled to all other sensors in its group. No bus power supply or other ancillary control devices will be required to facilitate such operation. Sensors shall be capable of 'absence' mode operation in conjunction with an infra-red handset.



Each sensor shall provide individual dimming of the luminaire and maintain a set illumination level. Grouped dimming shall not be acceptable for daylight control. Sensors shall be fully programmable and reconfigurable using a hand held infra-red programmer. The programmer shall be capable of reading back and displaying current sensor settings and power/maintenance monitoring information from individual luminaires. Monitoring can be reset by the user. Sensors to be capable of operating DALI and DSI digital ballasts.

Emergency luminaires shall be self-test with built in wireless capability, operating on the same wireless network as the standard intelligent luminaires. Tests can be initiated using an infra-red programmer as well as retrieving emergency operational status information. The system shall be monitored by a central wireless Gateway. This device will upload system status and energy performance to a website for users to view in a graphical format. Wireless connectivity Luminaires shall be capable of being inter-connected wirelessly.

The system shall work on a mesh networking principle and be capable of adding link addresses across a building providing a corridor hold function. The link addressing shall be independent from the group addressing. The system shall be capable of setting automatic scenes which will maintain an illumination level expressed as a percentage of the standard light level setting.

Each function shall have a status LED which will display the current system status. When the area is vacated the whole system should automatically revert to 'ECO' energy saving mode.

Emergency luminaires shall be self-contained LED type, capable of communicating status via the wireless mesh network to the Gateway. System test times and other parameters shall be programmed via the website, this information shall be automatically downloaded to the Gateway. The Gateway shall control all emergency testing and reporting automatically. Website system monitoring all luminaires shall report status to the Gateway once per day. This will include failure status and energy performance data. These records shall be uploaded to a website periodically where the data will be stored securely and displayed in graphical format.



3.2.12. Fire Considerations

General Principles

Fire spread from vehicle to vehicle is the major concern when considering fire loading in an enclosed car park. The loading will depend on:

- number and mix of vehicles in the car park at the time of a fire
- the proximity of one car to another
- the height of the ceiling
- degree of ventilation in the affected area
- the presence of sprinklers.

Recent researches into the growth and spread of fires in car parks revealed that there is a risk of fire spreading from car to car, particularly where early intervention by the fire brigade is not possible.

Fire hazard should be assessed with input from a specialist in this field.

Fire safety provisions for a new car park will need to comply with the requirements of the building control body. The principles that must be addressed are:

- means of escape
- structural integrity
- prevention of fire spread (both internal and external)
- facilities for fire-fighting
- ventilation and smoke control.

In multi-storey car parks, the fire safety measures required will be governed by the following factors:

- volume of the building and/or fire compartment
- height of the building
- provision for ventilation
- provisions for adequate smoke control
- distance from the boundary or the distance to other buildings
- use category of other parts of the same building or adjacent buildings, and the separation provided
- accessibility around the car park to fire-fighting appliances and provision of fire-fighting equipment within the car park, including dry/wet rising mains for the use of the fire brigade
- spacing and adequacy of fire-protected pedestrian escape routes
- special zoning requirements.

The area of fire engineering and provision of equipment generally requires specialist input and advice.

Specific Risks

The risk of cars catching fire is greatest immediately after their arrival in the car park.

Unfortunately arson cannot be entirely ruled out and measures to improve the general security of car parks help to reduce the possibility of fire through this cause. Supervision and routine maintenance to ensure that no rubbish or other materials are stored in car parks is essential. The advice of the fire authority should always be obtained on fire prevention measures.

In multi-storey car parks, a number of aspects must be taken into account to control the effects of fire. These include:

- early detection of a fire to safeguard people in the building as well as property

- educating staff who work in the building
- fire warning notices
- reducing fire hazards
- frequent risk assessments
- compartmentalising areas of high fire risk
- providing CCTV
- general security
- measures to limit spread of fire and smoke
- fire suppression systems.

Automatic Fire Alarms

Within all enclosed areas (if any) Fire alarm system shall be designed in line with Fire Strategy (FS) Document requirements and in line with BS 5839-1 *Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises*

The system design will vary dependent upon building design, usage and occupancy and the associated risks.

Cabling can be contained within a common galvanised steel trunking system, clipped direct (not recommended) or tied to a galvanised steel cable tray or basket. The installation of a cable tray or basket could be prone to vandalism and again is not recommended.

The planning of cable and containment routes should be carried out at an early stage during the building design to minimise the effect on structure.

3.2.13. Information technology and security

Crime-related issues are well covered by the Safer Parking Scheme publication, Park Mark Safer Parking Scheme – New Build Car Park Guidelines for car park designers, operators and owners.

Early consideration should be given to the requirements for cable routes for data cables since the form of construction and the limited headroom will otherwise make it difficult to provide suitable routes. All such cable routes should be in galvanised steel trunking and galvanised steel conduit to allow access for later changes. Care is needed to ensure that trunking can accommodate the minimum bending radius of the various cables likely to be used. There will usually be a requirement for cable routes:

- from control equipment to signs at entrances and exits
- from control rooms to street ducts leading to nearby road signs (e.g. car park full)
- for telecommunication operators' lines.

There may also be a requirement for power supplies and control signals for illuminated rooftop advertising signs.

CCTV

Car park design should include passive surveillance features (refer to Secured by Design publications) and minimise obstructions e.g. columns, for natural surveillance

System to comply with the CCTV Code of Practice, and register with the Information Commissioner, if filming/recording public areas. System shall also comply with the Data Protection Act 1998.

All cabling is to be contained within galvanised steel conduit and trunking. The system design should be agreed to allow a co-ordinated containment detail to be produced, so that the position of structural holes can be determined.

Cameras can have pre-set alarm functions linked to e.g. help points. The CCTV system specification should be designed in conjunction with the lighting systems and to the requirements of the Park Mark Safer parking Scheme assessment guidelines.

The provision of trunking to serve CCTV and help point positions can be a particularly difficult aspect, since they will usually be at mid or high level and will require careful route planning. It is therefore essential to settle the positions of help points early in the design.

In view of the speed of development of CCTV technology and the likelihood that the initial installation will be replaced early in the life of the building, long-term best value may well be provided by a comprehensive high-level 'ring main' trunking route with regularly spaced junction boxes from which short links can be made to future camera positions.

Particular care is needed to make such high-level trunking vandal-resistant. Power and data lines should be separated electrically, preferably by separate trunking routes. Alternatively, they can run parallel in multicompartment steel trunking, provided that suitable cable types are used. Where possible, power and data cables should cross at right-angles.

Provision for future developments

It is impossible to predict the future except that it will be different. The wise designer will advise the client to install spare cable routes during construction for future use by applications not yet considered. In addition, IT equipment has a very short life. Where possible, it is better to provide duplicate cable routes between control rooms, barrier equipment, etc., so that a new IT system can be installed while the old remains operational. Once the changeover has taken place, the original cabling can be stripped out without affecting the new system, and the cable routes made available for future changes.

Although the types of cable for IT installations are constantly changing, fibre-optic cabling is increasingly being used. The basic requirement for cable routes giving physical protection and electrical shielding are unlikely to change. Fortunately, it appears that in general the physical volume of data cables is not increasing significantly even though the amount of data being transmitted escalates with each new technology.

Induction loops (if required)

Parking structures for automobiles may use inductive loops to track traffic (occupancy) in and out or may be used by access gates or ticketing systems to detect vehicles.

The positions of induction loops should be decided early so that they can be laid during construction. Slots in decks for induction loops should not be cut after construction, as they can weaken the concrete, reduce cover and even damage reinforcement.

Where possible, induction loops should be laid in conduit with accessible junction boxes, so that they can be replaced in the event of faults without having to cut into the deck.

3.2.14. Earthing and Bonding

Earthing and Bonding shall be installed in accordance with BS 7671 (IET wiring regulations), BS 7430; Electricity Supply Regulations; and Local Electricity Supply Authority Requirements.

Earth bonding should also be applied to a steel frame structure and ductwork systems.

3.2.15. Lightning Protection

A Lightning Protection system shall be installed in accordance with BS EN 62305 to the specialist design.

The system shall consist of an air termination network, down conductors and earth termination network and shall be bonded to the main earthing terminal in accordance with BS 7671 and BS EN 62305.

Although not usually the highest buildings in an area, multi-storey car parks should be equipped with appropriate lightning protection. Guidance on design is contained in a European code of practice - BS EN 62305: Code of practice for protection of structures against lightning (4 parts), which also contains information on protecting IT equipment against lightning strikes.

Lightning protection can take various forms but will usually consist of a network of copper tapes linking air terminations to buried copper earthing rods. It may be possible to make use of steelwork within the concrete structure as an alternative to copper tapes, but great care is needed to ensure that all relevant joints between reinforcing rods are bonded and of low impedance. It will in any case probably be necessary to bond the lightning protection system to the reinforcement. Bond is also required to other metalwork within the 'separation distance' of the lightning protection network. This will always include the utility services.

3.2.16. Electric Car Charging Points

Based on the current site authorised supply capacity it is possible to install 3No 7.4kW 1-phase AC Fast Chargers for the Staff / Clients to use.

This utilises the spare power capacity currently available of 36kVA (less carpark lighting and power assumed as approx. 10kVA)

Below is a consumption chart which shows the monthly maximum demands. The Available Capacity at Manchester site is currently set at 241KVA.

Month	Consumption Day	Consumption Night	Total Consumption	Maximum demand	Available capacity	% of day use	% of night use	Load factor
Dec-18	61046	17714	78760	169	241	77.51%	22.49%	63.84%
Jan-19	62996	17631	80627	170	241	78.13%	21.87%	64.97%
Feb-19	58603	15897	74500	169	241	78.66%	21.34%	60.39%
Mar-19	64863	17675	82538	166	241	78.59%	21.41%	68.11%
Apr-19	62101	18698	80799	167	241	76.86%	23.14%	66.28%
May-19	61954	18791	80745	177	241	76.73%	23.27%	62.49%
Jun-19	63198	18971	82169	175	241	76.91%	23.09%	64.32%
Jul-19	68318	19509	87826	197	241	77.79%	22.21%	61.07%
Aug-19	70377	19851	90228	192	241	78.00%	22.00%	64.37%
Sep-19	68407	20084	88491	185	241	77.30%	22.70%	65.52%
Oct-19	68890	21407	90296	205	241	76.29%	23.71%	60.34%
November	50910	15206	66116	177	241	77.00%	23.00%	51.17%
Totals:	761663	221433	983096	205	241	77.48%	22.52%	54.74%

Electricity North West have confirmed that the existing authorised supply capacity of 241 kVA can be increased to 341 kVA at no extra cost. This would allow to increase the number of car charging points to a total of 18No., that can be provided within new car park development.

Charging can take several hours from 'fast chargers', but many EV drivers often just need a 'top-up' charge and may plug in for an hour or so. The occupancy of the charger is therefore of unpredictable duration and require a flexibility of use.

Times are based on a 24 kWh battery being charged to 80%

	MAXIMUM POWER OUTPUT FROM EVSE (KILOWATTS)	EXAMPLE CHARGING TIME (HRS:MIN)	INPUT VOLTAGE (VOLTS)	MAXIMUM CURRENT (AMPS)	MODE
AC	2.3kW	8hrs 20mins	230 1-phase AC	10	2 / 3
	3kW	6hrs 30mins	230 1-phase AC	13	2 / 3
	3.7kW	5hrs 15mins	230 1-phase AC	16	(2) 3
	7.4kW	2hrs 35mins	230 1-phase AC	32	(2) 3
	14.5kW	1hr 20mins	400 3-phase AC	21	3
	22kW	55mins	400 3-phase AC	32	3
	43kW	30mins	400 3-phase AC	63	3
DC	20kW	1hr	400 3-phase AC	40	4
	50kW	25mins	400 3-phase AC	100	4
	100kW	15mins	400 3-phase AC	200	4

- The mode 2 options in brackets for 3.7kW and 7.4kW is only available using the BS EN 60309-2 plug and socket system.
- Time calculations are theoretical. Nevertheless the figures above are calculated for an 80% charge and provide a reasonable comparison.
- Battery sizes vary significantly between vehicles, and charge times will vary accordingly – a battery twice as big will take twice as long to charge at the same rate.

Typical charger location

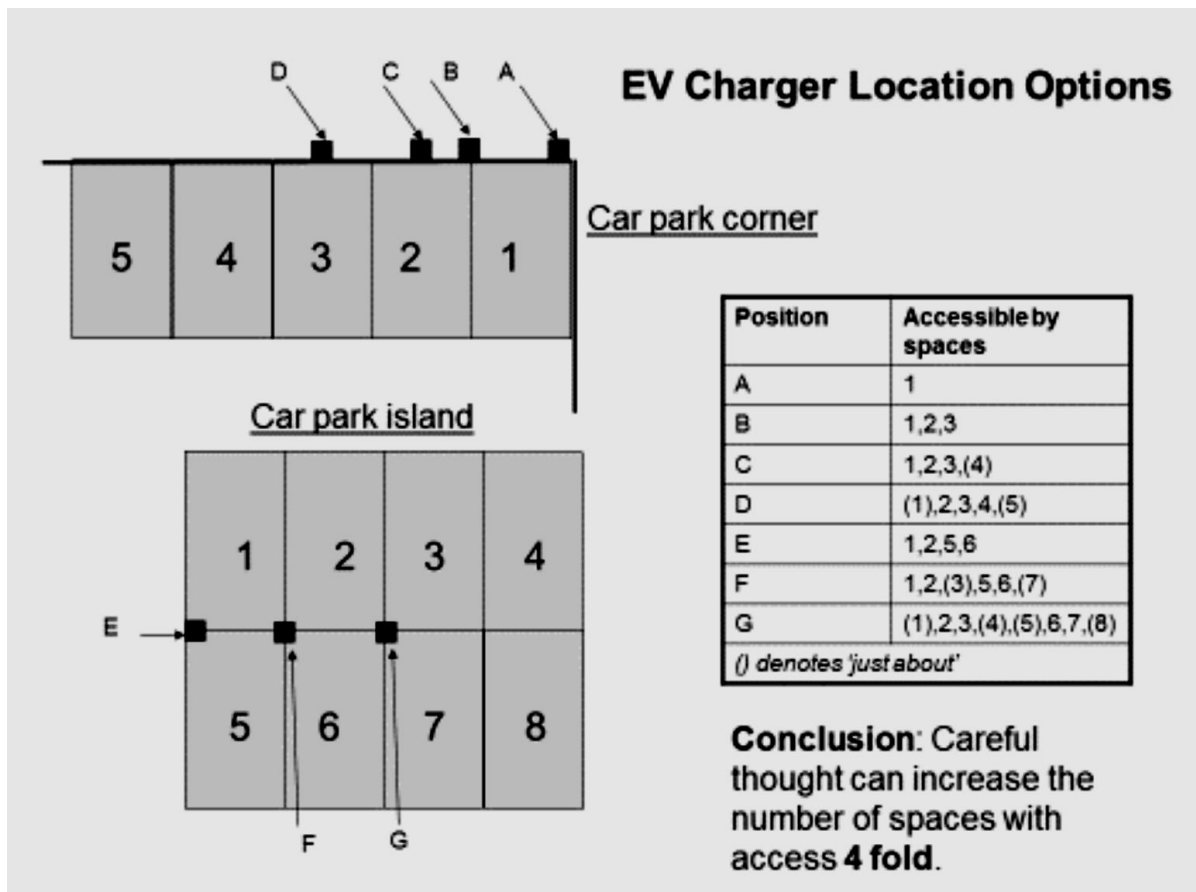
A well placed charger will be able to serve many users, a poorly sited one will be a complete waste of money and cause frustration for users and embarrassment for the provider. Careful consideration of location is key and the following may make the siting a success:

Most chargers can service EV spaces within 5m or so. They may only be able to service two at a time due to the number of sockets on them, but they can serve more than 2 spaces sequentially if properly placed.

Maximising the numbers of spaces that can access a charge point is a critically important role. As shown below it is possible to have an enormous effect on the usability of the charger simply by placement within the car-park.

EV charger shall not be placed into corner of the car park which then make them less usable than need be the case. By placing chargers in a corner the range of the cable is limited to one side of the charger.





Trip hazards.

Avoid wall-mounting units where there is a pathway.



Impact protection

Impact protection is more necessary for pedestal units than wall mounted.

Signage

At the charge bay it is preferable that any sign used should be so placed as to be in the eye-line of the driver parking in the space. This will help reduce the opportunity of the defence of ignorance from any inappropriate use.

Regrettably some Internal Combustion Engine (ICE) vehicle drivers ignore markings in their desire to park. ICE drivers can park anywhere as can EV drivers if they don't need a charge. However, consideration needs to be shown to EV drivers whilst charging infrastructure is comparatively rare. In order to ensure that this courtesy is shown it may be necessary to compel 'non-charging' drivers to keep spaces vacant. There is therefore an advantage in ensuring that the '*Electric Vehicle Only*' marking is visible in the space even when parked in. This may help use peer pressure to prevent inconsiderate use of the space. There is an as yet unresolved issue of EV drivers using charge point spaces when not strictly necessary. Any EV that is not plugged in should be treated the same way as an ICE vehicle. It would therefore be more useful to paint '*Charging Electric Vehicles Only*' on spaces to make it clear to EV users that this is not an EV parking space, but an EV charge point.



Canopy

Dedicated canopy for charge point (if outside) should be considered by an Architect. to protect the motorist whilst refuelling.

Prime Spaces

There is no need to place EV charge points in preferential locations near entrances to facilities. Such spaces will generally be of more value for disabled spaces and using them for EV charging is likely to generate resentment and so should be avoided.

3.3. Key Risks

Insufficient capacity available in local 400 V electricity grid to supply the new development

Based on Client accepting and securing the increased supply capacity and accepting ongoing connection charges.

Delays to connection of utilities

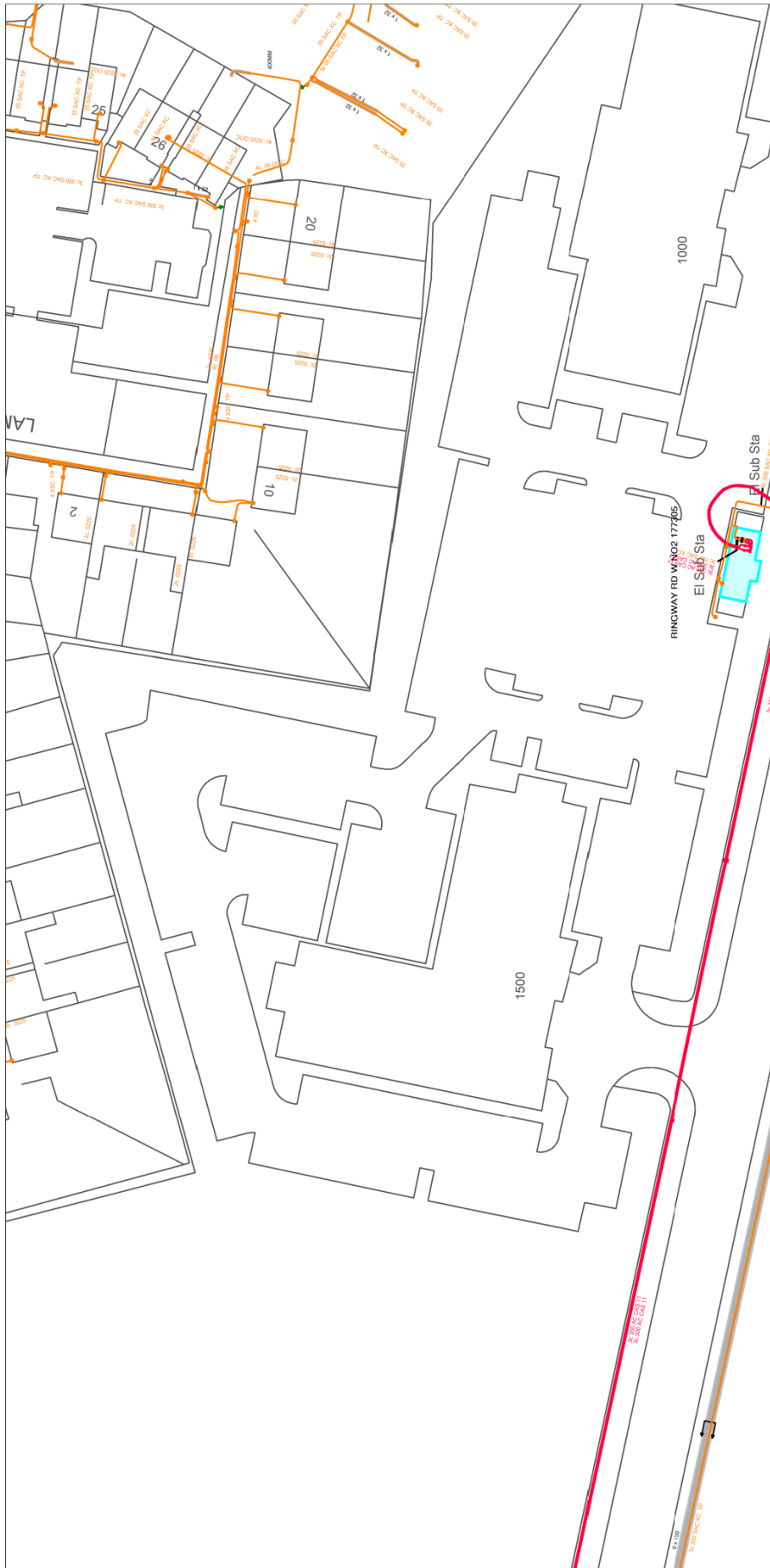
The lead in time for the connection of electricity can be significant especially if the utilities companies need to undertake feasibility studies before providing a firm proposal. It is recommended that initial applications to the various utility companies are made very early in the project and included as an agenda item at all project progress meetings.

Presence of underground services

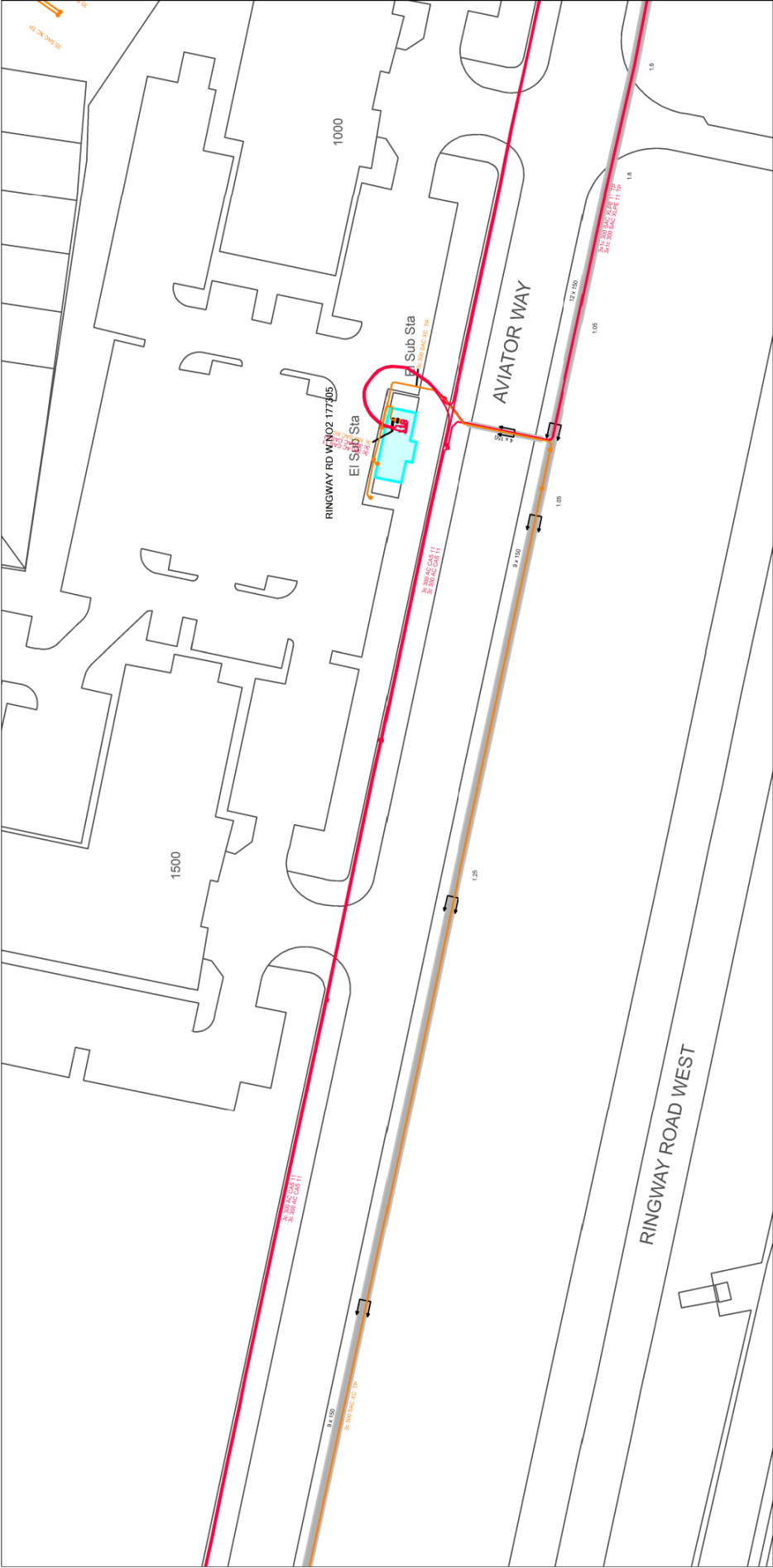
We have obtained existing records drawings as appended. These have not identified any services on site, however GPRS survey would be required to ensure the site is clear

4. EXISTING UTILITIES RECORDS

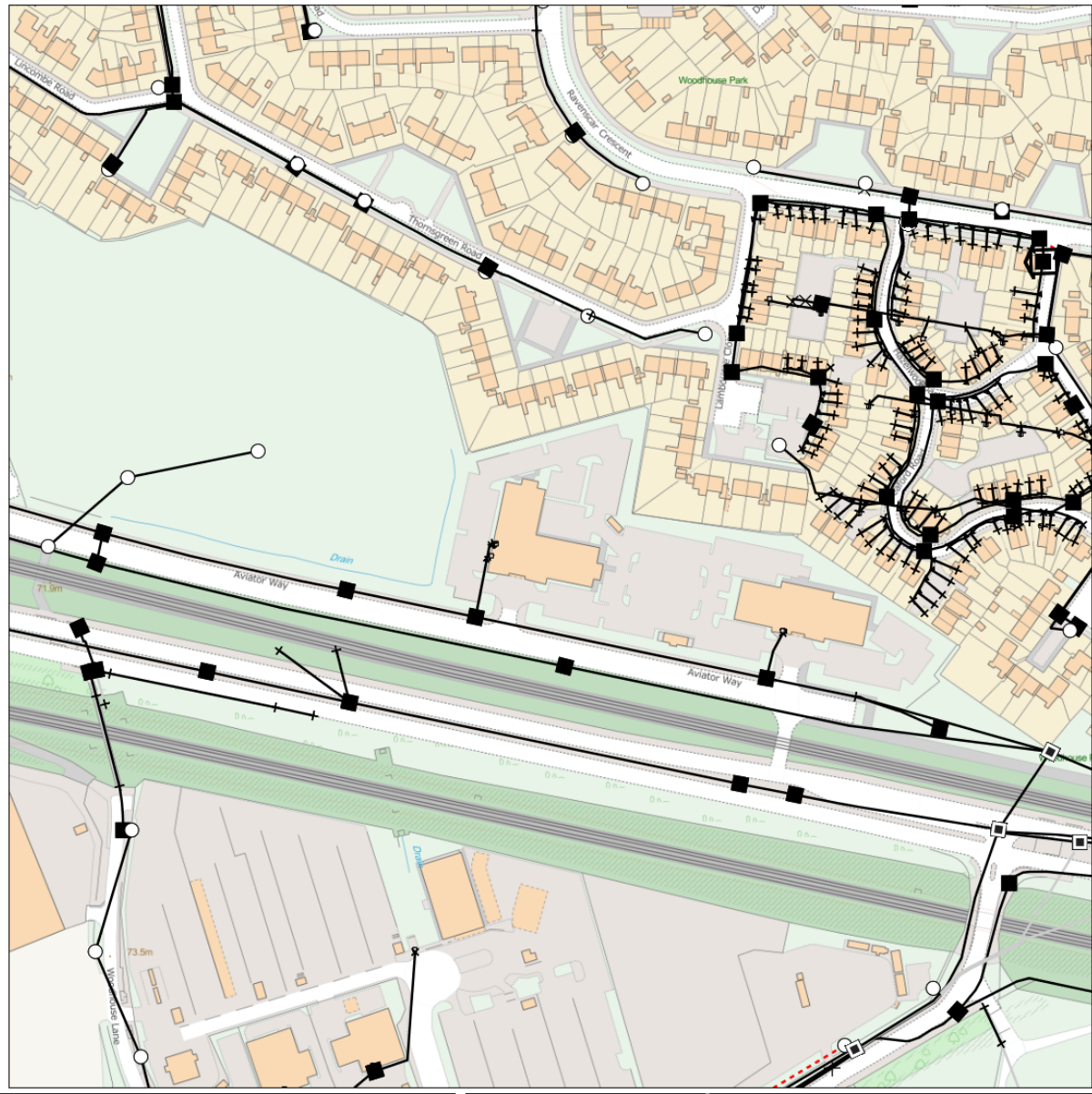
ELECTRICITY



ELECTRICITY



Maps by email Plant Information Reply



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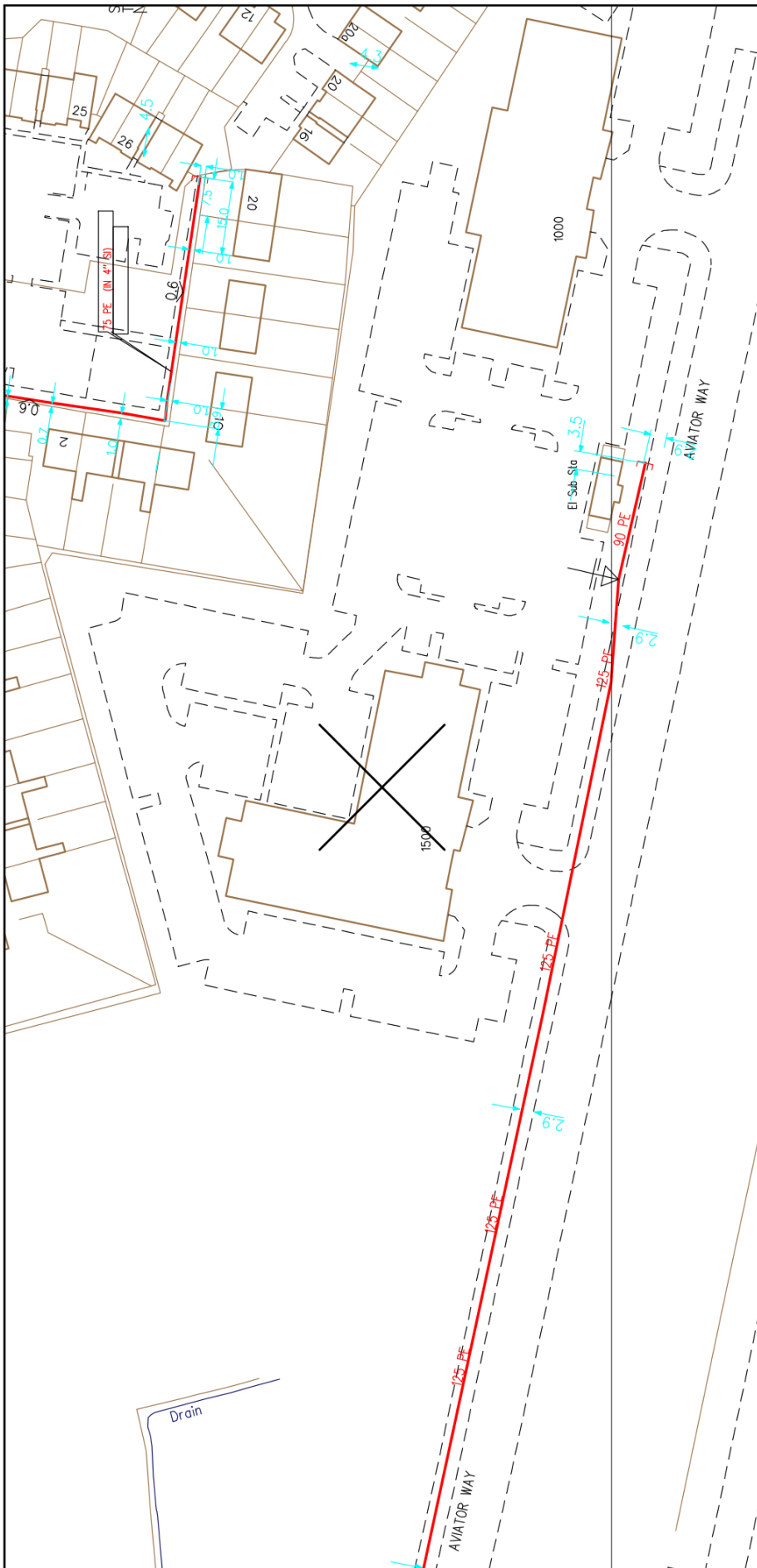
KEY TO BT SYMBOLS

	Planned	Live	Change Of State	+	Hatchings	
PCP			Split Coupling		Built	
Pole			Duct Tee		Planned	
Box			Building		Inferred	
Manhole			Kiosk		Duct	
Cabinet			Other proposed plant is shown using dashed lines. BT Symbols not listed above may be disregarded. Existing BT Plant may not be recorded. Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.			
	Pending Add	In Place	Pending Remove	Not In Use		
Power Cable						
Power Duct				N/A		

BT Ref : RIE09314P
Map Reference : (centre) SJ8279285544
Easting/Northing : (centre) 382792,385544
Issued : 25/11/2019 09:31:48

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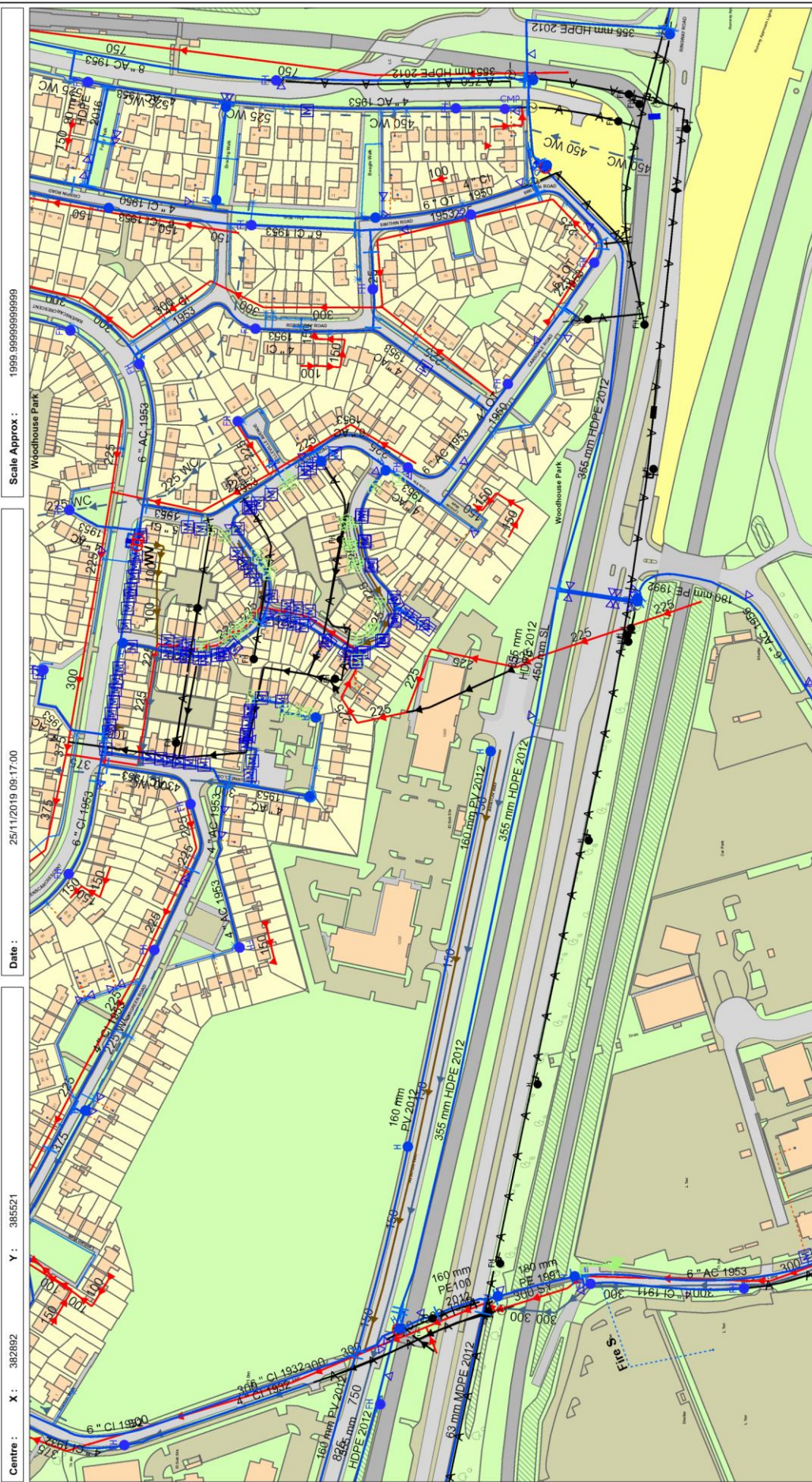
GAS



SCALE: Not to scale USER ID: aporter DATE: 25/11/2019 EXTRACT DATE: 10/06/2019 MAP REF: SJ8285 CENTRE: 382792, 385544	LP MAINS MP MAINS IP MAINS LHP MAINS		Some examples of Part Items: 	This plan shows those pipes owned by Cadent Gas Ltd in their role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HSG47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue. Further information on all DRAs can be determined by calling the DR4 hotline on 01455 892426 (9am-5pm) A DR4 is where a potential error has been identified within the asset record and a process is currently underway to investigate and resolve the error as appropriate.	Local Machine This plan is reproduced from or based on the OS map by Cadent Gas Ltd, with the sanction of the controller of HM Stationery Office. Crown Copyright Reserved.
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WATER

United Utilities Maps for SafeDig



Extract from maps of United Utilities' Underground Assets

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private service pipes may be shown by a blue broken line. United Utilities Water will not accept liability for any damage caused by the actual position being different from those shown.

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