

NATURAL HISTORY MUSEUM ACCESS ROAD,
THAMES VALLEY SCIENCE PARK

LIGHTING STRATEGY

UNIVERSITY OF READING

14 OCTOBER 2024



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1.0 Introduction

Context

- 1.1. This Report has been prepared by Abley Letchford Partnership Limited, on behalf of the University of Reading, in relation to the development proposals for an Access Road from the Thames Valley Science Park to a new building proposed by the Natural History Museum (NHM) located in Shinfield.
- 1.2. The proposed access road benefits from a resolution to grant planning consent which was determined at Wokingham Borough Council's March 2024 planning committee (WBC Planning Application ref: 232995).
- 1.3. Whilst this application includes the construction of the Access Road and adjacent footway / cycleway, the Natural History Museum development is proposed as part of a separate planning application.

Draft Planning condition

- 1.4. Planning Condition 19 as listed within the planning decision notice states the following:

Prior to commencement of development, a 'lighting design strategy for biodiversity' shall be submitted to and approved in writing by the local planning authority. The strategy shall:

- a) Identify those areas/features on site that are particularly sensitive for bats and badgers and that are likely to cause disturbance in or around their breeding sites and resting places or along important routes used to access key areas of their territory, for example for foraging; and*
- b) Show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications) so that it can be clearly demonstrated that areas to be lit will not disturb or prevent the above species using territory or having access to their breeding sites and resting places.*

All external lighting shall be installed in accordance with the specifications and locations set out in the strategy, and these shall be maintained thereafter in accordance with the strategy. Under no circumstances should any other external lighting be installed without prior consent from the local planning authority.

- 1.5. This report provides details of the lighting strategy as well as liaison and coordination with the Ecology team as appropriate.

Development Proposals

- 1.6. The proposed development comprises a full planning application for the construction of an extension to the Thames Valley Science Park spine road to provide access to a proposed new building for the NHM. The proposals also include adjacent footways/cycleways and associated landscaping and SUDS features. A proposed layout of the Access Road is included in **Appendix 1** of this report.



- 1.7. As can be seen, a new section of 7.3m wide road will be provided running east from Cutbush Lane to provide access to the Natural History Museum building. Access will be achieved via a new roundabout at the north-western frontage of the Natural History Museum parcel with a secondary road running along its western perimeter to enable service and delivery activities to be undertaken at the rear of the building. A separate egress only junction onto the access road is then proposed at the north-eastern corner of the Natural History Museum site.
- 1.8. A reconfigured access track is provided on the northern side of the road corridor in order to maintain access to the University of Reading's holdings at Upperwood Farm. The proposals also include improved access arrangements for the existing British Museum facility located near to the interface with Cutbush Lane.
- 1.9. The access road will incorporate a high standard of footway and cycleway provision. This includes a 3m wide shared use footway / cycleway which is provided along its southern side, offset from the carriageway by a 3m wide planted verge. A 4m wide segregated footway / cycleway is also being provided on the northern side of the access road at its interface with Cutbush Lane.
- 1.10. The proposals will require a system of artificial lighting for safety, security, and amenity during the hours of darkness and low light levels. The Lighting Strategy shall be applied to ensure the potential for obtrusive light is suitably minimised in accordance with the predetermined obtrusive light limits within the Environmental Zone in which the Site is located, and with reference to the guidance within the Institution of Lighting Professionals (ILP) Guidance Note 8 (Bats and artificial lighting in the UK).

2.0 Standards and Policy

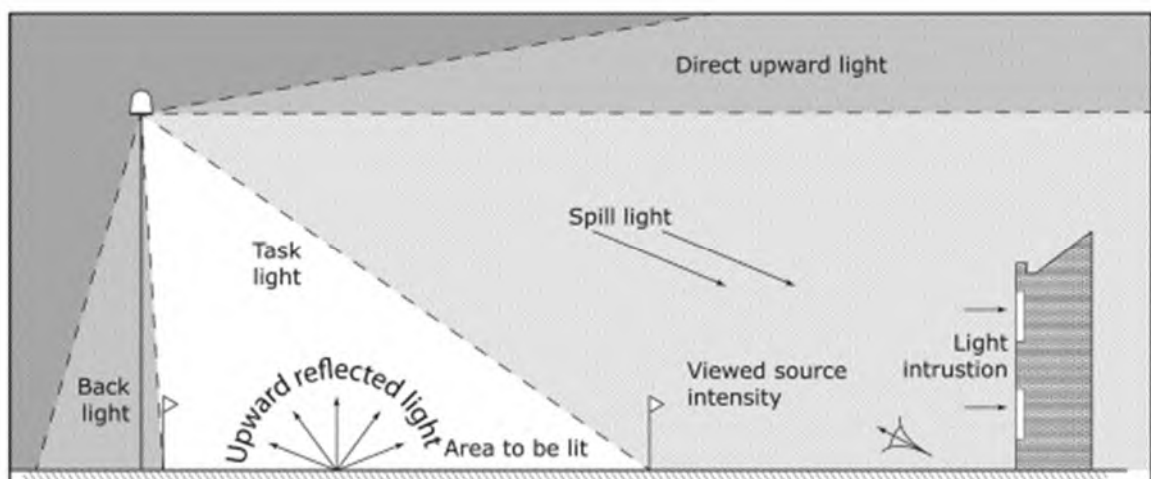
2.1. This chapter provides a review of policy relevant to the assessment and sources of information.

National Policies

- 2.2. Clean Neighbourhoods and Environment Act 2005 gives local authorities and the Environment Agency additional powers to deal with a wide range of issues by classifying artificial light emitted from defined premises as a statutory nuisance.
- 2.3. The CNEA 2005 amended paragraph 79(1)(fb) of the Environmental Protection Act 1990 to extend the statutory nuisance regime to include light nuisance stating the following: 'artificial light emitted from premises so as to be prejudicial to health or a nuisance'.
- 2.4. Guidance produced on Sections 101 to 103 of the CNEA 2005 by DEFRA (DEFRA, April 2006) extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with section 80(2) of the Environmental Protection Act 1990), requiring that the nuisance cease or be abated within a set timescale.
- 2.5. National Planning Policy Framework 2023 (NPPF) encourages good design with planning policies and decisions limiting the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes, and nature conservation.
- 2.6. Planning Practice Guidance 2019 – Light Pollution, gives advice on how to consider light within the planning system.

ILP Guidance Notes for the Reduction of Obtrusive Light - GN01:2021

- 2.7. The Lighting Strategy has been prepared utilising GN01:2021 which aims to limit the potential for obtrusive light to arise. The extract below, illustrates the types of obtrusive light to be considered.





- 2.8. It is recommended that Local Planning Authorities specify the environmental zones given in the table below for exterior lighting control within their development plan.

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

- 2.9. It is recommended that glare is kept to a minimum by ensuring that the main beam angle of all luminaires directed towards any potential observer is no greater than 70 degrees.

ILP Bats and Artificial Lighting at night – GN08:2023

- 2.10. The Lighting Strategy also utilises the above guidance notes which is intended to raise awareness of the impacts of artificial lighting on bats, and mitigation is suggested for various scenarios.
- 2.11. The guidance note suggest when selecting luminaires, the following should be considered:

- All luminaires should lack UV elements when manufactured. Metal halide, fluorescent source should not be used.
- LED luminaires should be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white spectrum (ideally <2700Kelvin) should be adopted to reduce blue light component.
- Luminaires should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats (Stone, 2012).
- The use of specialist bollard or low-level downward directional luminaires to retain darkness above can be considered. However, this often comes at a cost of unacceptable glare, poor illumination efficiency, a high upward light component and poor facial recognition, and their use should only be as directed by the lighting professional.
- Column height should be carefully considered to minimise light spill.
- Only luminaires with an upward light ratio of 0% and with good optical control should be used (Refer to Guidance for the Reduction of Obtrusive Light).
- Luminaires should always be mounted on the horizontal, i.e. no upward tilt.
- Any external security lighting should be set on motion-sensors and short (1 minute) timers.



- As a last resort, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.

British Standards

- 2.12. BS 5489-1:2020 – Code of Practice for the Design of Road Lighting – Lighting of Roads and Public Amenity Areas, gives recommendations for the design of lighting for all types of highways and public thoroughfare, including those specifically for pedestrians and cyclists.
- 2.13. This standard provides a solid point of reference for lighting designs but is often supplemented by local highway authority criteria.

Wokingham Borough Council Specification

- 2.14. The standard street lighting specification (including columns height) for this development project is contained within Wokingham BC Street Lighting - Design Process, Requirements and Specification Guide - V2 (November 2013), and supporting Appendices.
- 2.15. These documents, specifically Appendix A – V11 (June 2023) provides the pre-requisite column and luminaire types based upon the appropriate road type.



3.0 Sensitivity Receptors

- 3.1. The land adjacent to the proposed development will remain as agricultural fields and rural areas. Sensitive receptors to light are nearby built form (Upperwood Farm, British Museum and Shinfield Studios primarily) and local wildlife including bats (refer to EPR's Conservation Management Plan, dated July 2023).
- 3.2. A copy of EPR's Light Sensitive Habitats plan is included for reference in **Appendix 2** of this report.
- 3.3. The principal of the lighting design shall be sympathetic to these sensitive receptors; the lighting design will accord with the criteria set out below as well as other relevant guidance documents.
- 3.4. The Environmental Zone for the proposed development and immediate surrounding is E3: Suburban, Medium district brightness – Well inhabited rural and urban settlements, small town centres of suburban locations. (ILP Guidance Notes for the Reduction of Obtrusive Light - GN01:2021)
- 3.5. Therefore, where lighting is installed, this should be done in a manner which is sensitive to bats and general wildlife through the following:
 - *Low pressure sodium lighting will be used and light levels will be kept as low as possible (between 1 and 3 lux where possible).*
 - *Lighting will be directed to where it is needed (away from surrounding hedgerows and woodland to the west) through the design of the luminaire and by using accessories such as cowls or hoods.*
 - *The height of lighting columns will be kept as short as possible (ideally three metres or less).*



4.0 Lighting Strategy

- 4.1. This section defines the requirements for a lighting design to ensure it is fit for purpose and adheres to the sensitivity receptors attributed to the proposed development.
- 4.2. The Lighting Strategy has been prepared to ensure the lighting design associated with the development site is compliant with relevant British Standards, Local Authority Specification, ILP Lighting guidance.
- 4.3. Main area requiring lighting as follows:
 - Proposed Primary Street between Cutbush Lane East and the Natural History Museum including the access roundabout and the access road to the British Museum archive facility, are to be built to an adoptable standard.
- 4.4. It is envisaged, that the road network is built to an adoptable standard and likely to be offered to WBC for adoption under a S38 Agreement. The roads will be lit to WBC's adoptable specification and subject to further technical review as part the S38 submission.

Primary Street (between Cutbush Lane East and access roundabout) - Lighting Principles

	Description
Light Source	LED
Luminaire Type	Philips Luma Gen2 Micro 20 LED Micro
CCT of Light Source (Kelvin)	4000K
Luminaire Tilt	0 degree
Mounting Arrangement	Post top at 8m. (raise & lower columns for maintenance of lighting with accessibility issues)
Dimming regime	In accordance with ILP GN08/23 and WBC Requirements
Lighting Standard	BS 5489-1:2020 – Code of practice for the design of road lighting
Lighting Class	P4
Constraints/Restrictions	

Roundabout - Lighting Principles

	Description
Light Source	LED
Luminaire Type	Philips Luma Gen2 Micro 20 LED Micro
CCT of Light Source (Kelvin)	4000K
Luminaire Tilt	0 degree
Mounting Arrangement	Post top at 8m. (raise & lower columns for maintenance of lighting with accessibility issues)
Dimming regime	In accordance with ILP GN08/23 and WBC Requirements
Lighting Standard	BS 5489-1:2020 – Code of practice for the design of road lighting
Lighting Class	C5
Constraints/Restrictions	



Access Road (eastwards between Roundabout and Natural History Museum access)

- Lighting Principles

	Description
Light Source	LED
Luminaire Type	Philips Luma Gen2 Micro 20 LED Micro
CCT of Light Source (Kelvin)	4000K
Luminaire Tilt	0 degree
Mounting Arrangement	Post top at 8m. (raise & lower columns for maintenance of lighting with accessibility issues)
Dimming regime	In accordance with ILP GN08/23 and WBC Requirements
Lighting Standard	BS 5489-1:2020 – Code of practice for the design of road lighting
Lighting Class	P4
Constraints/Restrictions	

Access Road (southbound between Roundabout and Natural History Museum service yard)

- Lighting Principles

	Description
Light Source	LED
Luminaire Type	Philips Luma Gen2 Micro 20 LED Micro
CCT of Light Source (Kelvin)	4000K
Luminaire Tilt	0 degree
Mounting Arrangement	Post top at 6m. (raise & lower columns for maintenance of lighting with accessibility issues)
Dimming regime	In accordance with ILP GN08/23 and WBC Requirements
Lighting Standard	BS 5489-1:2020 – Code of practice for the design of road lighting
Lighting Class	P5
Constraints/Restrictions	

4.5. A copy of the Street Lighting Layout for this application is contained within **Appendix 3**.



5.0 Conclusion

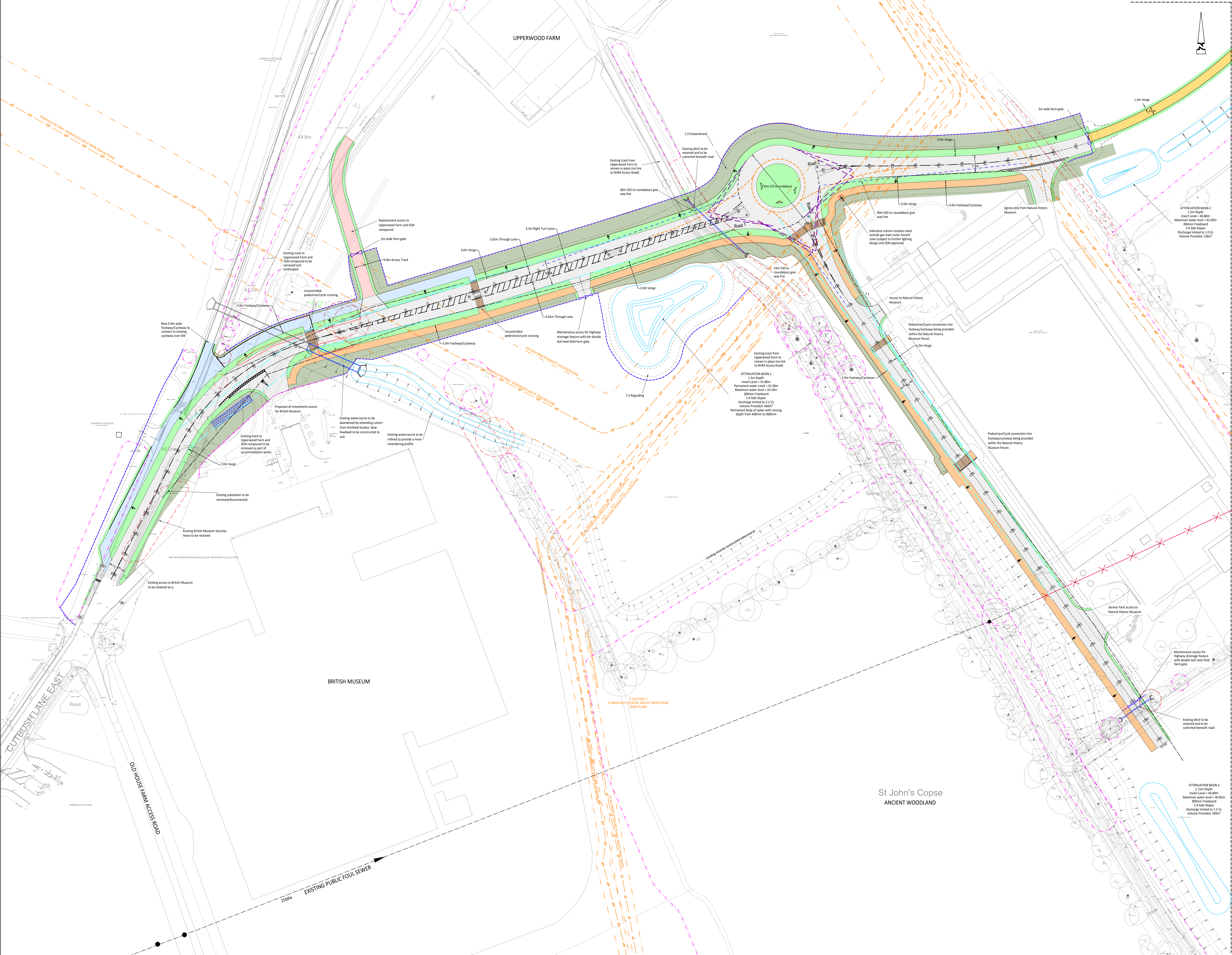
- 5.1. The Lighting Strategy outlines the criteria for the lighting design of the proposed development to ensure that the lighting is fit for purpose, whilst maintaining sensitivity towards the environment through compliance with relevant British Standards and Guidance.
- 5.2. The Site is not located within a sensitive landscape designation. As noted, the Thames Basin Heaths Special Protection Area (SPA) lies approximately 5.5 kilometres from the site. Longmoor Bog SSSI lies approximately 3km to the south-east and Lodge Wood and Sandford Mill SSSI just under 5km to the north-east. The closest designation is Bramshill SSSI which lies within 5 kilometres of the site boundary, forms part of the Thames Basin Heaths SPA.
- 5.3. In terms of closer views to the site, in order to ensure that the potential for obtrusive light is minimised, it is necessary to restrict the mounting heights of the luminaires, tilt angle, colour temperature and lumen output of exterior light sources to those specified in **Section 4**.
- 5.4. The exterior lighting outlined in the Lighting Strategy shall comply with the requirements for an E3 Environmental Zone as per ILP Guidance Notes for the Reduction of Obtrusive Light - GN01:2021.
- 5.5. Compliance with the Lighting Strategy will allow a safe and sensitive level of light for wayfinding and guidance at night, whilst limiting obtrusive light to a negligible level and in compliance with ILP GN01:2011 and GN08:2023, which seeks to limit light spill onto sensitive boundaries.



Appendices



Appendix 1 – General Arrangement Layout



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This drawing should not be reproduced without consent.

NOTES:
1. Do not scale.
2. Refer to all other Project Drawings and supporting notes.
3. Positions of existing services/utility undertakes apparatus adjacent to or crossing proposed excavations are to be checked by the contractor prior to starting work.
4. This drawing is to be read in conjunction with and checked against all other drawings, Engineering details, Specification and any structural, Geotechnical or other specialist document provided.
5. Any anomaly or contradiction between any of the above is to be reported to the Engineer.
6. This drawing is schematic for clarity only, positions of pipe runs and manholes may vary on site due to site conditions.
7. Traffic management and safety measures shall comply in all respects to Chapter 8 of the Traffic Signs Manual published by HMG. The Contractor shall submit his proposals for the approval of the Engineer and Local Highway Authority prior to commencing any work.
8. The Contractor shall contract all utilities companies prior to commencing and excavation. It is the Contractor's responsibility to locate the exact position of all underground and overhead services, cables, pipes etc prior to the excavations and to take all necessary protective measures.
9. The Contractor shall make good any damage caused to fences, kerling, surfacing, road signs etc at his own expense as instructed by the Highway Authority.
10. The Contractor shall indemnify the Client, Engineer and Local Authority against damage to any highway authority property, statutory undertakers plant and any costs associated with the disruption of services and the repair/replacement of the damaged plant. No work on site shall commence until written evidence of the above indemnity has been submitted to and accepted by the Engineer.
11. Highway Inspector to be present during inspections/CIR testing.
12. The Contractor shall maintain access to all properties affected by the works.
13. Street lighting positions to be pegged on site and agreed by the Local Authority PRIOR to erection commencing.

KEY:

- PROPOSED ASPHALT CARRIAGEWAY - REFER TO SPEC 1
- PROPOSED ASPHALT FOOTWAY - REFER TO SPEC 2
- PROPOSED ASPHALT CYCLEWAY - REFER TO SPEC 2
- PROPOSED VERGE
- PROPOSED LANDSCAPING (FOR FUTURE DETAILS ON EXTENTS AND TYPES REFER TO LANDSCAPING PLANTING PLANS)
- PROPOSED ACCESS TRACK CONSTRUCTION - REFER TO SPEC 3
- PROPOSED TEMPORARY ACCESS TRACK - REFER TO SPEC 4
- IMPRINT TARMAC SURFACE AT PEDESTRIAN CROSSING
- PROPOSED TACTILE CORDUROY PAVING (TACTILE TO BE 20x100mm BLOCK TYPE)
- SUOS BASIN
- POST AND 3 RAIL TIMBER FENCE
- V MESH SECURITY FENCING TO MATCH EXISTING
- FORWARD VISIBILITY SPLAY
- 2.4 x 70m JUNCTION VISIBILITY
- 70m PEDESTRIAN VISIBILITY
- ROUNDABOUT VISIBILITY SPLAY
- ROUNDABOUT DEFLECTION
- ROAD 2 ROAD NAME AND CHANAGE
- EXISTING GAS MAINS
- GAS MAIN EXCLUSION ZONE
- TREE ROOT PROTECTION ZONES
- TREE TO BE REMOVED FOR DEVELOPMENT
- EXISTING STREET LIGHTING
- LEAF STEEL FIELD FARM GATE
- PROPOSED STREET LIGHTING

PR	08/24	Updated following WRC comments, block paving replaced with imprint surfacing, crossfall adjusted around bend with kerbs amended to suit, cycle lane join carriageway removed with safety added to cycleway and lighting column relocated out of roundabout control zone	SM	SM
PS	07/24	Fence line adjusted west side of Cutbush Lane	SM	SM
PA	07/24	BM access updated with design amended to suit	LC	SM
PR	05/24	Amended following design team review	LC	SM
P2	04/24	Amended following review	AS	SM
PL	03/24	First issue	KLW	LA

Client: UNIVERSITY OF READING

Project: THAMES VALLEY SCIENCE PARK PRIMARY INFRASTRUCTURE

Site: NHM ACCESS ROAD GENERAL ARRANGEMENT SHEET 1

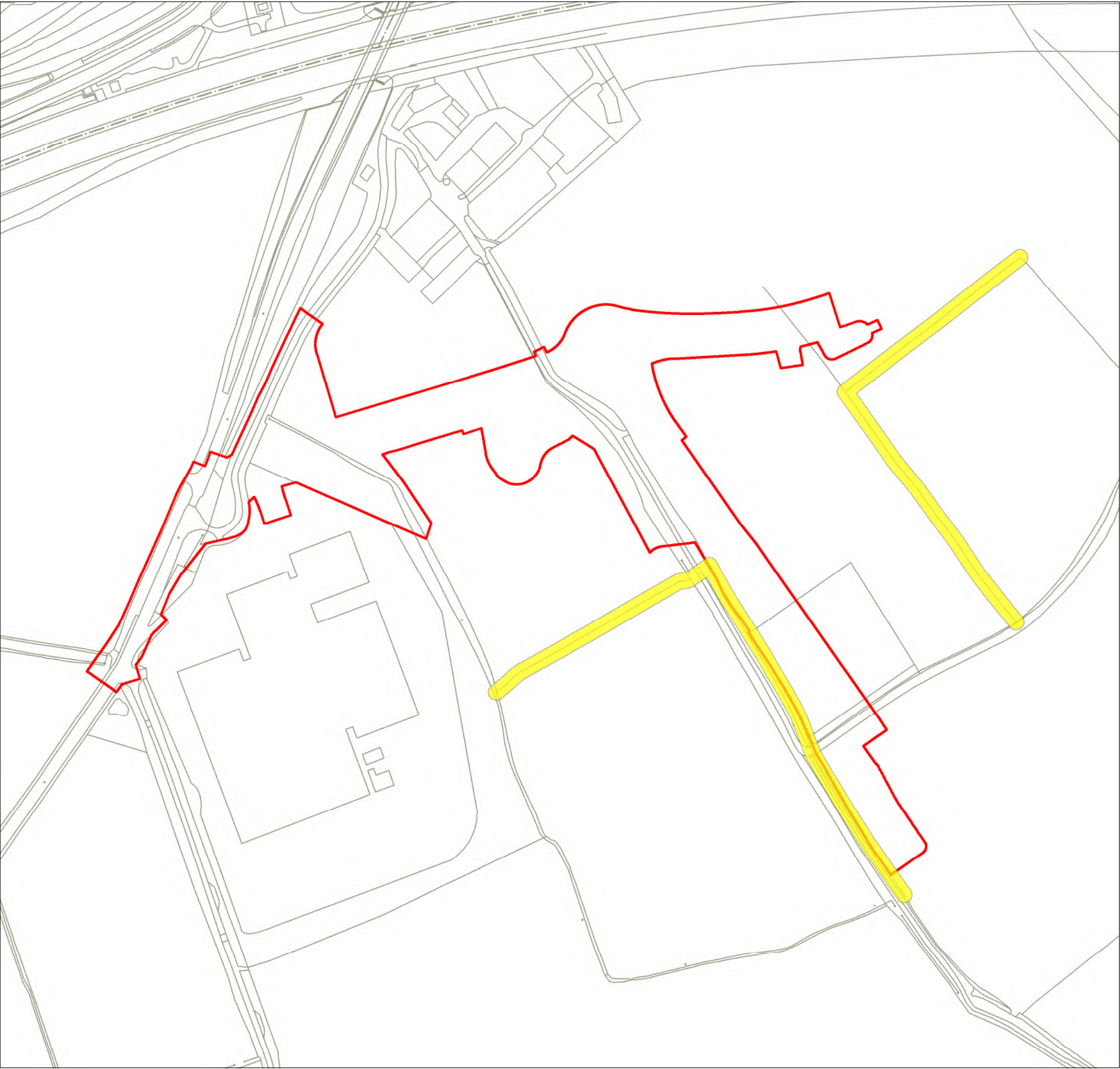
Scale: 1:500 @ A0 Date: MAR 2024 Drawn: KLW Checked: LA

Overseer: HD065-101 Reviewer: P6

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Appendix 2 – Light Sensitive Habitats



MAP X Light Sensitive Habitats

KEY

Site boundary

Light sensitive habitats

SCALE: 1:2,350 at A3

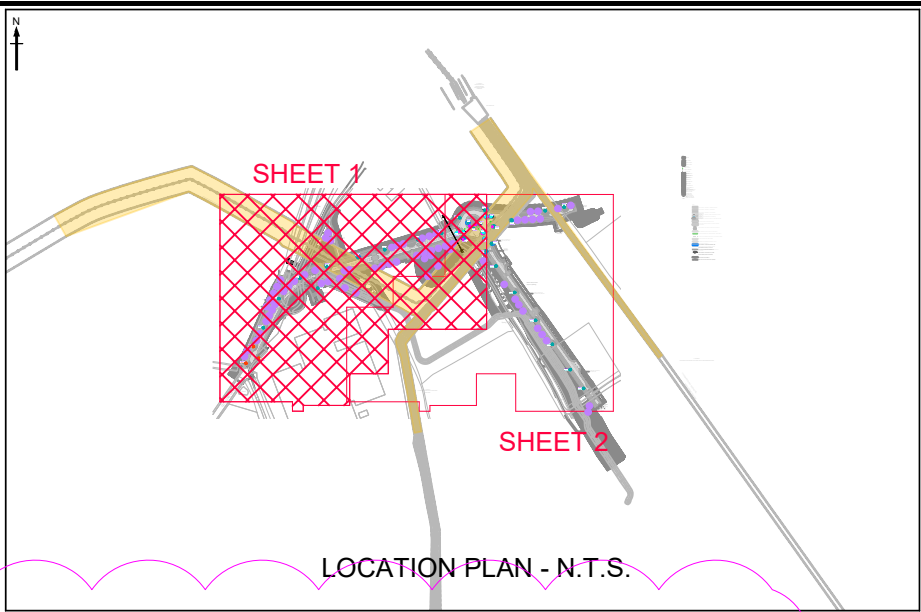


CLIENT: University of Reading
PROJECT: TVSP - NHM Access Road
DATE: 25 July 2024

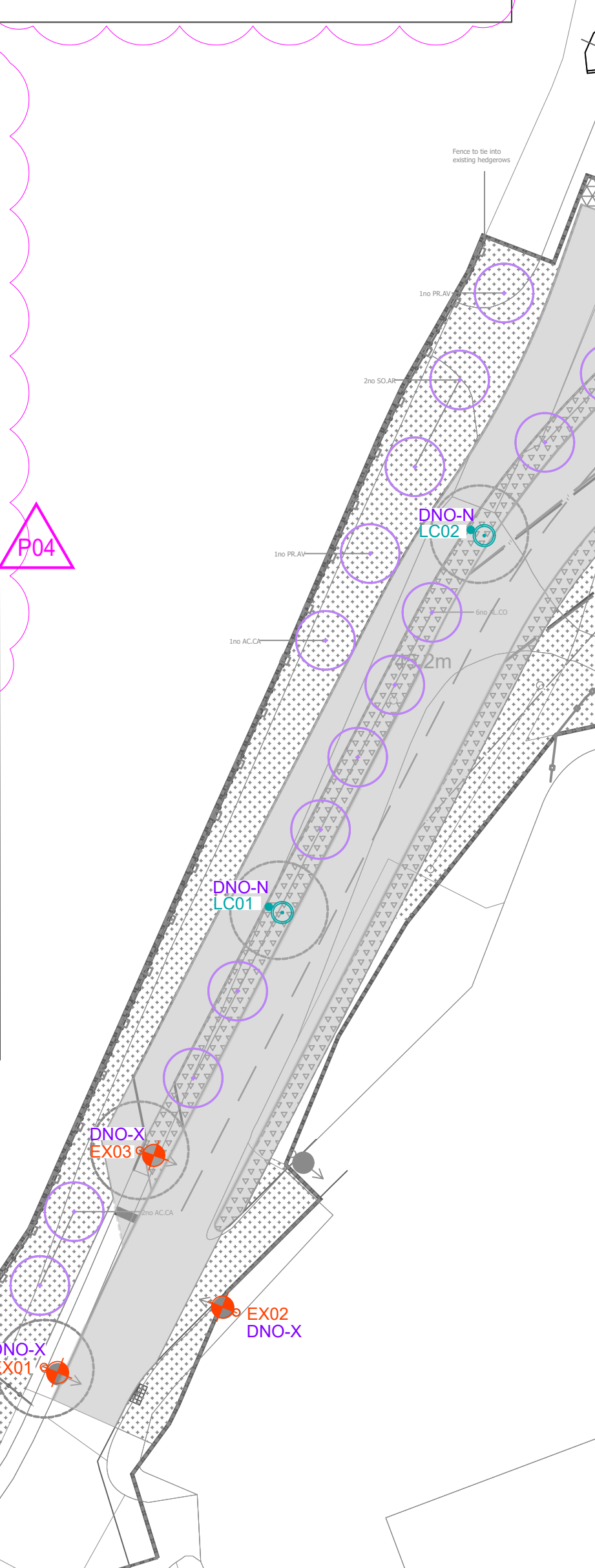


Appendix 3 – Street Lighting Layout

KEY CONTINUED		DESCRIPTION
QTY.	SYMBOL	
6		COLUMN REF: PROPOSED 6m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 MICRO BGP702 LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX:3.60 klm LANTERN MOUNTING: 6m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER:PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 21W
3		PROPOSED 'KEEP LEFT' ILLUMINATED SIGN WITH SIMMONSIGNS 'LUA' 6W LED. EXACT SIGN SPECIFICATION TO BE SPECIFIED BY OTHERS
6		PROPOSED GLASDON REBOUND SIGNMASTER WITH BASE, 7W LED LIGHT TRAY. BOLLARD LOCATION DESIGNED BY OTHERS
		EXISTING OPERATIONAL LIGHTING COLUMN TO REMAIN IN SITU.
	EX0#	EXISTING INDICATIVE COLUMN ID NUMBERS.
	LC0#	PROPOSED INDICATIVE COLUMN ID NUMBERS
	DNO-X	EXISTING DNO SUPPLY
	DNO-N	NEW DNO SUPPLY
	PCN-N	PRIVATE CABLE NETWORK
6		EARTH ELECTRODE AND INSPECTION CHAMBER
		PROPOSED ROUTE OF TWO 100mm TWIN WALL CABLE DUCT WITH "STREET LIGHTING EMBOSSED EVERY METRE ON TWO SIDES. MINIMUM 500mm DEPTH OF COVER IN FOOTWAYS AND 750mm IN CARRIAGEWAY. DUCT TO BE OVERLAID WITH YELLOW PVC MARKER TAPE APPROXIMATELY 250mm ABOVE CABLE DUCT.
		PROPOSED ROUTE OF TWO 50mm TWIN WALL CABLE DUCT WITH "STREET LIGHTING EMBOSSED EVERY METRE ON TWO SIDES. MINIMUM 500mm DEPTH OF COVER IN FOOTWAYS AND 750mm IN CARRIAGEWAY. DUCT TO BE OVERLAID WITH YELLOW PVC MARKER TAPE APPROXIMATELY 250mm ABOVE CABLE DUCT.
5		PROPOSED DRAWPIT 450mm X 450mm WITH A LID IN ACCORDANCE TO BS EN 124 D400.
3		600mm X 600mm MODULAR TWIN WALLED ACCESS CHAMBER FOR 100mm DUCT ACCESS AND WITH REMOVABLE D400 COVER RATED TO BS EN 124:2015.
	HP	EXISTING HIGH PRESSURE UNDERGROUND GAS PIPELINE
	IP	EXISTING INTERMEDIATE PRESSURE UNDERGROUND GAS PIPELINE
	MP	EXISTING MEDIUM PRESSURE UNDERGROUND GAS PIPELINE
		GAS EASEMENT
		UNDERGROUND GAS MAIN IN THE VICINITY.



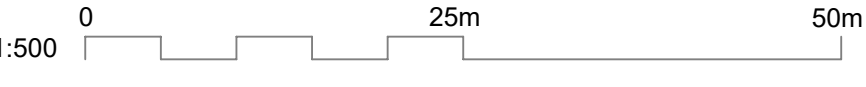
KEY PROPOSED CONT.		DESCRIPTION
QTY.	SYMBOL	
1		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 BGP702 MICRO LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX:6.60 klm LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER:PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 40W



IS BEEN SE TO A HP GAS	11.10.24	JP	AE	AL
D NUMBERING CHANGED - DUCT UPDATED	23.05.2024	SW	AE	AL
Hall Farm - Spine NHM Spine Road ING COLUMNS O - KEY	24.04.2024	SW	AE	AL
	17.04.2024	SW	AE	AL
N	DATE	CAD	CHKD	APPD

NOT FOR CONSTRUCTION

PRELIMINARY DESIGN.
LOCATIONS TO BE CHECKED AGAINST STATS PRIOR TO INSTALLATION.



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE TO THE DESIGN RISK ASSESSMENT 3399-DFL-HLG-XX-RA-EO-13001).

CONSTRUCTION:

CONTRACTOR TO BE CAUTIOUS AND AWARE OF UNDERGROUND INTERMEDIATE, HIGH AND MEDIUM PRESSURE GAS MAINS IN THE VICINITY OF THE SCHEME. LC11 IS LOCATED IN VERY CLOSE PROXIMITY TO THE UNDERGROUND INTERMEDIATE GAS MAIN AND SHOULD BE CAREFULLY REVIEWED BY A COMPETENT PERSON PRIOR TO CONSTRUCTION. LOCATION OF B05, B08, S01, S03, B03, B04 AND LC11 ARE WITHIN THE GAS MAIN EASEMENTS. THE UNDERGROUND GAS MAIN OWNER **MUST** BE CONSULTED PRIOR TO CONSTRUCTION.

CONTRACTOR TO BE CAUTIOUS AND AWARE OF SLOPED GROUND IN THE VICINITY OF THE SCHEME.

MAINTENANCE/CLEANING:

AS PER CONSTRUCTION

USE:

AS PER CONSTRUCTION

DECOMMISSIONING/DEMOLITION:

AS PER CONSTRUCTION

THE CONTRACTOR IS TO SATISFY HIMSELF OF ALL UNDERGROUND NETWORKS PRIOR TO ANY DIGGING. THE CONTRACTOR IS TO MAINTAIN CABLE NETWORKS OF ALL EQUIPMENT THAT IS NOT PART OF THE WORKS BUT MAY BE FROM EQUIPMENT ASSOCIATED WITH THE WORKS.

Notes

- THIS IS AN AUTOCAD DRAWING AND SHOULD NOT BE AMENDED BY HAND.
- THE EXISTING LOCATIONS ARE APPROXIMATE AND THEIR ACCURACY CANNOT BE GUARANTEED.
- ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.
- DRAWING TO BE READ IN CONJUNCTION WITH OTHER CONTRACT DOCUMENTS.
 - 3399-DFL-HLG-XX-CA-EO-13001 [LIGHTING CALCULATION]
 - 3399-DFL-HLG-XX-CA-EO-13002 [LIGHTING CALCULATION]
 - 3399-DFL-HLG-XX-RP-EO-13001 [DESIGN SUMMARY REPORT]
 - 3399-DFL-HLG-XX-RA-EO-13001 [RISK ASSESSMENT]
 - 3399-DFL-HLG-XX-DR-EO-13001 [LIGHTING LAYOUT]
 - 3399-DFL-HLG-XX-SC-EO-14001 [ELECTRICAL SCHEMATIC]
- THIS DRAWING MUST NOT BE SCALED.
- COLUMN LOCATIONS TO BE CHECKED AGAINST UTILITY DRAWINGS FOR CONFLICTS BY A COMPETENT ENGINEER.
- CONTRACTOR SHOULD SATISFY THEMSELVES THAT ANY UTILITY DRAWINGS AFFECTING THE SCHEME ARE ACCURATE AND UP TO DATE PRIOR TO COMMENCEMENT.
- ALL LIGHTING INSTALLATIONS AND EQUIPMENT TO BE TO WOKINGHAM BOROUGH COUNCIL ADOPTABLE STANDARDS.
- COLUMNS ARE TO BE POSITIONED AS SET OUT ON THIS DRAWING.
- IF COLUMNS CANNOT BE INSTALLED AS SET OUT IN THIS DRAWING, THEN THE DESIGNER WILL HAVE TO BE CONSULTED FOR NEW COLUMN POSITIONS.

- COLUMN NUMBERING SHOWN IS FOR REFERENCE PURPOSES ONLY. FINAL NUMBERING SHOULD BE AGREED WITH WOKINGHAM BOROUGH COUNCIL BEFORE CONSTRUCTION.
- ALL WORKS SHOULD BE CARRIED OUT BY SUITABLY QUALIFIED AND COMPETENT PERSONS IN ACCORDANCE WITH BUT NOT LIMITED TO, G39 'WORKING IN THE VICINITY OF DNO EQUIPMENT', 'WORKING AT HEIGHT REGULATIONS', 'ELECTRICITY AT WORK REGULATIONS', 'SAFE DIGGING PRACTICES HSG47 'AVOIDING DANGER FROM UNDERGROUND SERVICES' AND 'CODE OF PRACTICE FOR ELECTRICAL SAFETY AND HIGHWAY ELECTRICAL OPERATIONS.
- COLUMNS SHALL BE INSTALLED WHEREVER PRACTICABLE SO THAT A MAINTENANCE OPERATIVE WORKING ON EQUIPMENT IN THE BASE COMPARTMENT OF THE COLUMN WILL FACE ONCOMING TRAFFIC.
- IF STREET LIGHTING COLUMNS REQUIRE SIGNS TO BE ATTACHED, THIS SHOULD BE CONFIRMED WITH THE MANUFACTURER AT TIME OF ORDER TO ENSURE THAT THE COLUMN CAN TAKE THE ADDITIONAL WEIGHT AND WINDAGE IN ACCORDANCE WITH PD 6547:2004+A1:2009.
- ALL LANTERNS TO BE FACTORY FITTED WITH TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING
- ALL ILLUMINATED SIGNS AND BOLLARD TO BE CONTROLLED USING A TELENESA TELECELL.
- IT IS NOT RECOMMENDED THAT SIGNS BE ATTACHED TO PASSIVE SAFE COLUMNS.
- PLEASE SEE DRAWING 'BASEPLATE 177 DETAIL' FOR ADDITIONAL INFORMATION ON FLANGE PLATED COLUMNS.

KEY PROPOSED		DESCRIPTION
QTY.	SYMBOL	
3		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 MICRO BGP702 LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 5.80 klm LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 5 LANTERN OPTIC REF: DW50 DRIVER:PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. DRIVES:WATTAGE: 34W
10		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 MICRO BGP702 LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 5.80 klm LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER:PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. DRIVES:WATTAGE: 34W
3		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN [PASSIVE SAFE] PASSIVE SAFE COLUMN CODING: 100 LE C S SE BD 0 LANTERN REFERENCE: PHILLIPS LUMA GEN2 BGP702 MICRO LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX:6.60 klm LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER:PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 40W
1		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN WITH FLANGE PLATED BASE [LOCATION DESIGNED BY OTHERS] LANTERN REFERENCE: PHILLIPS LUMA GEN2 BGP702 MICRO LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 6.60 klm LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER:PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 40W

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ABLEY LETCHFORD PARTNERSHIP
Consulting Engineers

NATIONAL HISTORY ACCESS ROAD

LIGHTING LAYOUT

DESIGNED	CAD	CHECKED	APPROVED
CM	SW	AE	AL
FIRST CREATED	SHEET	SCALE	SHEET SIZE
APR 2024	1 of 2	1:500	A1
DRAWING NUMBER	PROJECT	CORROSION	VOLUME
	3399-DFL-HLG-XX-DR-EO-13001		
NUMBER	3399	STATUS	REVISION
		S3	P04

- Notes**
- THIS IS AN AUTOCAD DRAWING AND SHOULD NOT BE AMENDED BY HAND.
 - THE EXISTING LOCATIONS ARE APPROXIMATE AND THEIR ACCURACY CANNOT BE GUARANTEED.
 - ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.
 - DRAWING TO BE READ IN CONJUNCTION WITH OTHER CONTRACT DOCUMENTS.
 - 3399-DFL-HLG-XX-CA-EO-13001 [LIGHTING CALCULATION]
 - 3399-DFL-HLG-XX-CA-EO-13002 [LIGHTING CALCULATION]
 - 3399-DFL-HLG-XX-RP-EO-13001 [DESIGN SUMMARY REPORT]
 - 3399-DFL-HLG-XX-RA-EO-13001 [RISK ASSESSMENT]
 - 3399-DFL-HLG-XX-DR-EO-13001 [LIGHTING LAYOUT]
 - 3399-DFL-HEL-XX-SC-EO-14001 [ELECTRICAL SCHEMATIC]
 - THIS DRAWING MUST NOT BE SCALED.
 - COLUMN LOCATIONS TO BE CHECKED AGAINST UTILITY DRAWINGS FOR CONFLICTS BY A COMPETENT ENGINEER.
 - CONTRACTOR SHOULD SATISFY THEMSELVES THAT ANY UTILITY DRAWINGS AFFECTING THE SCHEME ARE ACCURATE AND UP TO DATE PRIOR TO COMMENCEMENT.
 - ALL LIGHTING INSTALLATIONS AND EQUIPMENT TO BE TO WOKINGHAM BOROUGH COUNCIL ADOPTABLE STANDARDS.
 - COLUMNS ARE TO BE POSITIONED AS SET OUT ON THIS DRAWING.
 - IF COLUMNS CANNOT BE INSTALLED AS SET OUT IN THIS DRAWING, THEN THE DESIGNER WILL HAVE TO BE CONSULTED FOR NEW COLUMN POSITIONS.

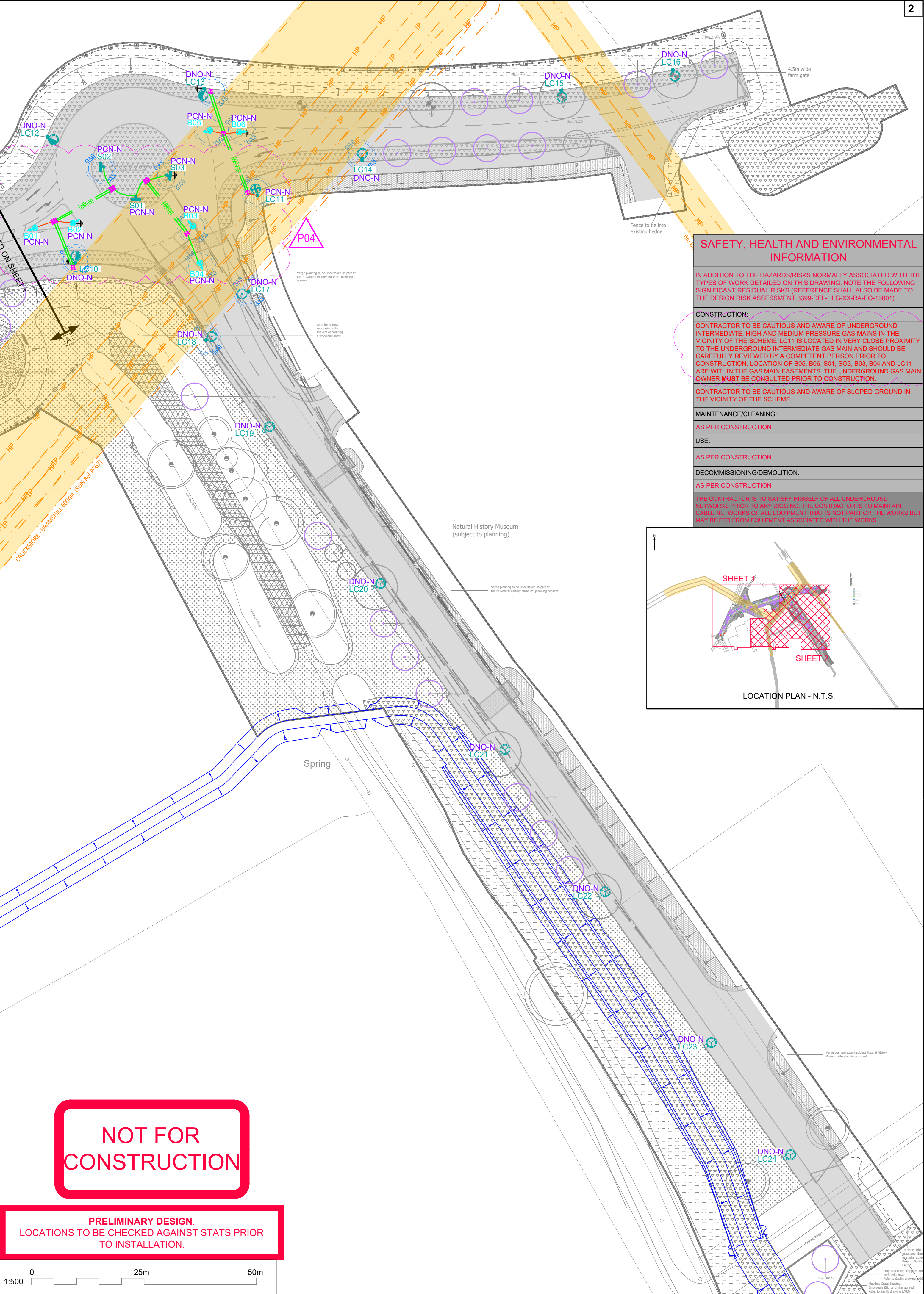
QTY.	SYMBOL	DESCRIPTION
6		COLUMN REF: PROPOSED 6m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 MICRO BGP702 LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 3.60 km LANTERN MOUNTING: 6m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER: PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 21W
3		PROPOSED 'KEEP LEFT' ILLUMINATED SIGN WITH SIMMONSIGNS 'LUA' 6W LED. EXACT SIGN SPECIFICATION TO BE SPECIFIED BY OTHERS
6		PROPOSED GLASDON REBOUND SIGNMASTER WITH BASE, 7W LED LIGHT TRAY. BOLLARD LOCATION DESIGNED BY OTHERS
		EXISTING OPERATIONAL LIGHTING COLUMN TO REMAIN IN SITU.
		EXISTING INDICATIVE COLUMN ID NUMBERS.
		PROPOSED INDICATIVE COLUMN ID NUMBERS
		EXISTING DNO SUPPLY
		NEW DNO SUPPLY
		PRIVATE CABLE NETWORK
6		EARTH ELECTRODE AND INSPECTION CHAMBER
		PROPOSED ROUTE OF TWO 100mm TWIN WALL CABLE DUCT WITH 'STREET LIGHTING EMBOSSED EVERY METRE ON TWO SIDES. MINIMUM 500mm DEPTH OF COVER IN FOOTWAYS AND 750mm IN CARRIAGEWAY. DUCT TO BE OVERLAID WITH YELLOW PVC MARKER TAPE APPROXIMATELY 250mm ABOVE CABLE DUCT.
		PROPOSED ROUTE OF TWO 50mm TWIN WALL CABLE DUCT WITH 'STREET LIGHTING EMBOSSED EVERY METRE ON TWO SIDES. MINIMUM 500mm DEPTH OF COVER IN FOOTWAYS AND 750mm IN CARRIAGEWAY. DUCT TO BE OVERLAID WITH YELLOW PVC MARKER TAPE APPROXIMATELY 250mm ABOVE CABLE DUCT.
5		PROPOSED DRAWPIT 450mm X 450mm WITH A LID IN ACCORDANCE TO BS EN 124 D400.
3		600mm X 600mm MODULAR TWIN WALLED ACCESS CHAMBER FOR 100mm DUCT ACCESS AND WITH REMOVABLE D400 COVER RATED TO BS EN 124:2015.
		EXISTING HIGH PRESSURE UNDERGROUND GAS PIPELINE
		EXISTING INTERMEDIATE PRESSURE UNDERGROUND GAS PIPELINE
		EXISTING MEDIUM PRESSURE UNDERGROUND GAS PIPELINE
		GAS EASEMENT
		UNDERGROUND GAS MAIN IN THE VICINITY.

QTY.	SYMBOL	DESCRIPTION
1		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 BGP702 MICRO LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 6.60 km LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER: PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 40W

- COLUMN NUMBERING SHOWN IS FOR REFERENCE PURPOSES ONLY, FINAL NUMBERING SHOULD BE AGREED WITH WOKINGHAM BOROUGH COUNCIL BEFORE CONSTRUCTION.
- ALL WORKS SHOULD BE CARRIED OUT BY SUITABLY QUALIFIED AND COMPETENT PERSONS IN ACCORDANCE WITH BUT NOT LIMITED TO, G39 'WORKING IN THE VICINITY OF DNO EQUIPMENT', 'WORKING AT HEIGHT REGULATIONS', 'ELECTRICITY AT WORK REGULATIONS', 'SAFE DIGGING PRACTICES HSG47 'AVOIDING DANGER FROM UNDERGROUND SERVICES' AND 'CODE OF PRACTICE FOR ELECTRICAL SAFETY AND HIGHWAY ELECTRICAL OPERATIONS.
- COLUMNS SHALL BE INSTALLED WHEREVER PRACTICABLE SO THAT A MAINTENANCE OPERATIVE WORKING ON EQUIPMENT IN THE BASE COMPARTMENT OF THE COLUMN WILL FACE ONCOMING TRAFFIC.
- IF STREET LIGHTING COLUMNS REQUIRE SIGNS TO BE ATTACHED, THIS SHOULD BE CONFIRMED WITH THE MANUFACTURER AT TIME OF ORDER TO ENSURE THAT THE COLUMN CAN TAKE THE ADDITIONAL WEIGHT AND WINDAGE IN ACCORDANCE WITH PD 6547:2004+A1:2009.
- ALL LANTERNS TO BE FACTORY FITTED WITH TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING
- ALL ILLUMINATED SIGNS AND BOLLARD TO BE CONTROLLED USING A TELENESA TELECELL.
- IT IS NOT RECOMMENDED THAT SIGNS BE ATTACHED TO PASSIVE SAFE COLUMNS.
- PLEASE SEE DRAWING 'BASEPLATE 177 DETAIL' FOR ADDITIONAL INFORMATION ON FLANGE PLATED COLUMNS.

QTY.	SYMBOL	DESCRIPTION
6		EARTH ELECTRODE AND INSPECTION CHAMBER
		PROPOSED ROUTE OF TWO 100mm TWIN WALL CABLE DUCT WITH 'STREET LIGHTING EMBOSSED EVERY METRE ON TWO SIDES. MINIMUM 500mm DEPTH OF COVER IN FOOTWAYS AND 750mm IN CARRIAGEWAY. DUCT TO BE OVERLAID WITH YELLOW PVC MARKER TAPE APPROXIMATELY 250mm ABOVE CABLE DUCT.
		PROPOSED ROUTE OF TWO 50mm TWIN WALL CABLE DUCT WITH 'STREET LIGHTING EMBOSSED EVERY METRE ON TWO SIDES. MINIMUM 500mm DEPTH OF COVER IN FOOTWAYS AND 750mm IN CARRIAGEWAY. DUCT TO BE OVERLAID WITH YELLOW PVC MARKER TAPE APPROXIMATELY 250mm ABOVE CABLE DUCT.
5		PROPOSED DRAWPIT 450mm X 450mm WITH A LID IN ACCORDANCE TO BS EN 124 D400.
3		600mm X 600mm MODULAR TWIN WALLED ACCESS CHAMBER FOR 100mm DUCT ACCESS AND WITH REMOVABLE D400 COVER RATED TO BS EN 124:2015.
		EXISTING HIGH PRESSURE UNDERGROUND GAS PIPELINE
		EXISTING INTERMEDIATE PRESSURE UNDERGROUND GAS PIPELINE
		EXISTING MEDIUM PRESSURE UNDERGROUND GAS PIPELINE
		GAS EASEMENT
		UNDERGROUND GAS MAIN IN THE VICINITY.

S3	P04	POSITION OF LC11 UPDATED, POSITION HAS BEEN DESIGNED BY OTHERS AND REMAINS CLOSE TO A HIGH PRESSURE GAS MAIN	11.10.24	JP	AE	AL
S3	P03	SPECIFICATION, POSITION QUANTITIES AND NUMBERING OF ALL PROPOSED LIGHTING COLUMNS CHANGED - DUCT ROUTES, ELECTRICAL ELEMENTS AND KEY UPDATED ACCORDINGLY	23.05.2024	SW	AE	AL
S3	P02	BACKGROUND MODELS UPDATED (98048 - Hall Farm - Spine Road, Planting Plan, rev20240416) AND (ALP - NHM Spine Road Design A) - LC05 & LC06 REMOVED - REMAINING COLUMNS NOT RE-NUMBERED - 5 X COLUMNS MOVED - KEY UPDATED ACCORDINGLY	24.04.2024	SW	AE	AL
S3	P01	FIRST ISSUE - FOR COMMENT & REVIEW	17.04.2024	SW	AE	AL
STATUS	REV	AMENDMENT DESCRIPTION	DATE	CAD	CHKD	APPD



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE TO THE DESIGN RISK ASSESSMENT 3399-DFL-HLG-XX-RA-EO-13001).

CONSTRUCTION:
CONTRACTOR TO BE CAUTIOUS AND AWARE OF UNDERGROUND INTERMEDIATE, HIGH AND MEDIUM PRESSURE GAS MAINS IN THE VICINITY OF THE SCHEME. LC11 IS LOCATED IN VERY CLOSE PROXIMITY TO THE UNDERGROUND INTERMEDIATE GAS MAIN AND SHOULD BE CAREFULLY REVIEWED BY A COMPETENT PERSON PRIOR TO CONSTRUCTION. LOCATION OF B05, B06, B01, S03, B03, B04 AND LC11 ARE WITHIN THE GAS MAIN EASEMENTS. THE UNDERGROUND GAS MAIN OWNER MUST BE CONSULTED PRIOR TO CONSTRUCTION.

CONTRACTOR TO BE CAUTIOUS AND AWARE OF SLOPED GROUND IN THE VICINITY OF THE SCHEME.

MAINTENANCE/CLEANING:

AS PER CONSTRUCTION

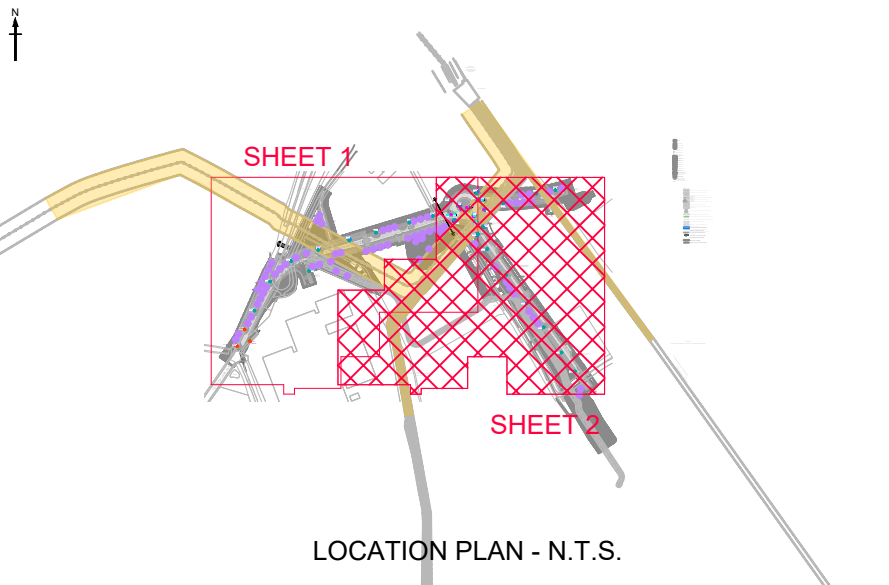
USE:

AS PER CONSTRUCTION

DECOMMISSIONING/DEMOLITION:

AS PER CONSTRUCTION

THE CONTRACTOR IS TO SATISFY HIMSELF OF ALL UNDERGROUND NETWORKS PRIOR TO ANY DIGGING. THE CONTRACTOR IS TO MAINTAIN CABLE NETWORKS OF ALL EQUIPMENT THAT IS NOT PART OF THE WORKS BUT MAY BE FED FROM EQUIPMENT ASSOCIATED WITH THE WORKS.



KEY PROPOSED

QTY.	SYMBOL	DESCRIPTION
3		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 MICRO BGP702 LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 5.80 km LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 5 LANTERN OPTIC REF: DW50 DRIVER: PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. DRIVES: WATTAGE: 34W
10		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN LANTERN REFERENCE: PHILLIPS LUMA GEN2 MICRO BGP702 LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 5.80 km LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER: PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. DRIVES: WATTAGE: 34W
3		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN [PASSIVE SAFE] PASSIVE SAFE COLUMN CODING: 100 LE C S SE BD 0 LANTERN REFERENCE: PHILLIPS LUMA GEN2 BGP702 MICRO LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 6.60 km LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER: PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 40W
1		COLUMN REF: PROPOSED 8m CONICAL TAPERED ALUMINUM STREET LIGHTING COLUMN WITH FLANGE PLATED BASE [LOCATION DESIGNED BY OTHERS] LANTERN REFERENCE: PHILLIPS LUMA GEN2 BGP702 MICRO LIGHT SOURCE REF: 20 LED NEUTRAL WHITE [4000K] FLUX: 6.60 km LANTERN MOUNTING: 8m POST TOP LANTERN INCLINATION: 0 LANTERN OPTIC REF: DW50 DRIVER: PHILLIPS XITANIUM LED DRIVER (DALI STANDARD) CONTROL: TELENESA 5-PIN NEMA TELECELL WITH INTEGRAL DIMMING MODULE & GPS POSITIONING. WATTAGE: 40W

DESIGNERS

DFL
LIGHTING DESIGN. ELECTRICAL. SMART CITIES. ENERGY REDUCTION. LIGHTING IMPACT.

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CLIENT

ABLEY LETCHFORD PARTNERSHIP
Consulting Engineers

PROJECT

NATIONAL HISTORY ACCESS ROAD

DRAWING TITLE

LIGHTING LAYOUT

DESIGNED	CAD	CHECKED	APPROVED
CM	SW	AE	AL
FIRST CREATED	SHEET	SCALE	SHEET SIZE
APR 2024	2 of 2	1:500	A1
DRAWING NUMBER	PROJECT	CORROSION	VOLUME
	3399-DFL-HLG-XX-DR-EO-13002		
JOB NUMBER	STATUS	REVISION	
3399	S3	P04	

Transport
Development Planning
Sustainable
Deliver
Trusted
Enable
Site Appraisal
Hydrology
Highways
Civil Engineering
Successful
Travel Planning
Support
Drainage
Dynamic
Masterplanning
Flood Risk Assessment
Infrastructure Design

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