



Proposed CNG Fuelling Station, Watling Street, Hinckley



External Lighting Proposal

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Prepared by



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(Cover page: typical installation stock image)

Second Issue (05.05.2023):
Minor corrections to typos.

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Minor corrections to text.
CNG drawing references and images updated.

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Illumination levels on petrol station walls added – comment and images amended.

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Background layout revised – amended redline.
Lighting layout unchanged.
References in report updated to latest information, e.g. CNG latest drawings.

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Summary

This External Lighting Proposal describes the proposed layout and calculated results for the lighting scheme proposed by CNG Fuels for the construction of a new compressed natural gas vehicle fuelling facility comprising fuel pumps/forecourt, plant compound and associated equipment at Watling Street (A5), Hinckley, Leicestershire.

This report describes the lighting scheme and the calculated results achieved with all lighting switched on, i.e. worst case. Any lighting installed by others outside the site is not included in the calculation.

The proposed scheme is shown on the **CNG Fuels drawing 042-01-CNG-106 Revision B “Site Lighting Plan”**.

The calculated results are shown on **Synergy drawing 6518-LTG-001 Revision P4 “Proposed External Lighting Layout (With Calculated Illumination Levels)”**.

The results, described later in this document, show the illumination on the site and the surrounding areas.

The lighting levels at the pump locations and plant compound are designed by CNG Fuels in accordance with their normal practice, determined by safety and operational considerations, following a pattern used at many other sites.

The pump islands will be illuminated using task lighting during hours of darkness (normal operating conditions), but the plant compound lighting will only be used on occasion when maintenance work is taking place within.

The calculated results show that under normal operating conditions the lighting is concentrated around the task areas, the pumps, with a small amount overspill.

The 1 lux contour (bright moonlight) is almost completely contained within the site boundary.

The 0.1 lux and 0.3 lux contours (low moonlight) pass beyond the site boundary into the agricultural land, dropping to less than 0.1 lux within a few metres.

The lighting does not affect the adjacent roadways as the 0.1 lux contour does not reach the carriageway.

Under worst case conditions, with all the lighting switched on, the 1 lux contour just reaches the roadway and the 0.3 and 0.1 lux contours cross the roadway - but the roadway has street lighting which will be more significant than any small contribution from the CNG Fuels site.

The requirements of BSEN 12464-2 have been met for the reduction of obtrusive light for Environmental Zone E2, “low district brightness areas, such as industrial or residential rural areas” – overspill is below the required limits at the nearest building (the petrol station kiosk) and does not reach any other building, even with all the lighting switched on (assuming maintenance activity is taking place during darkness).

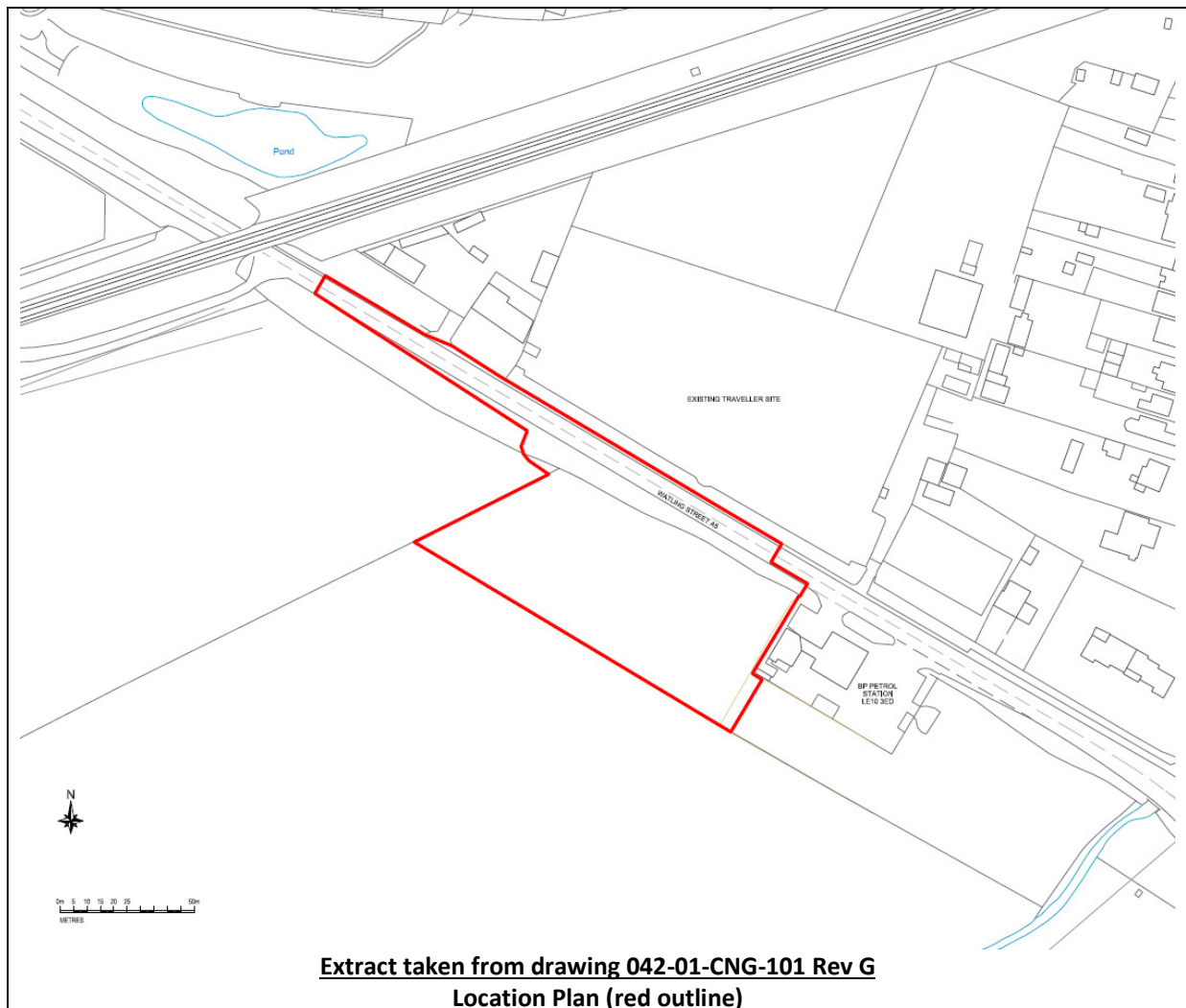
Luminaires have been selected to reduce direct upward light to low levels, within the requirements of BSEN 12464-2

(A small amount is produced by 4No battens at the trailer gates which are only switched on when personnel have to visit the site; the main operational lighting – 36No floodlights - are zero upward light.)

There are no environmentally sensitive areas noted. However, due to the proximity of nearby open countryside and wooded areas it is intended to use “warm white” LED light sources in keeping with the advice from the Bat Conservation Trust, with zero ultra violet and reduced blue light output. Tight beam control by the luminaires and careful aiming will produce minimal overspill.

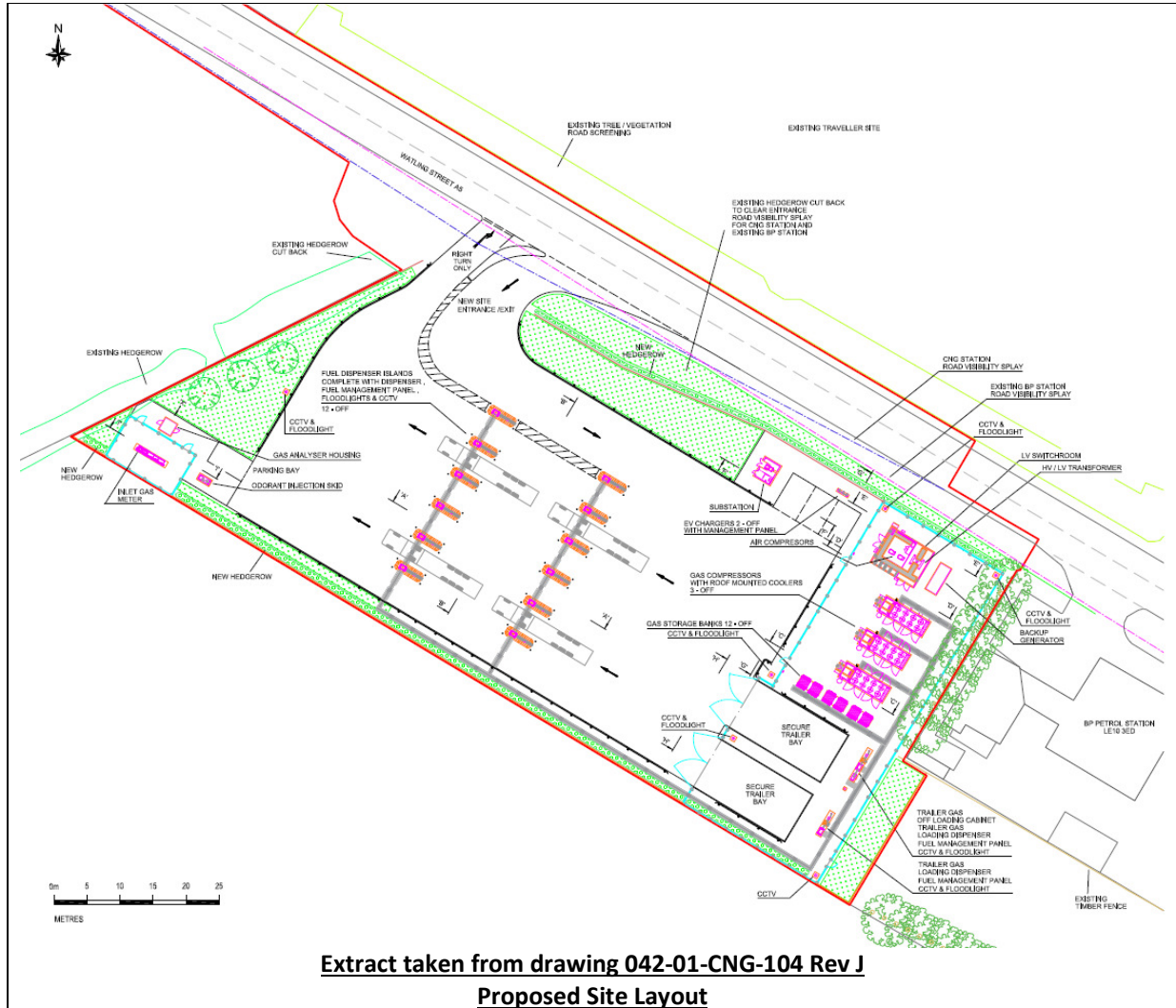
Description of the Site and Surrounding Areas

It is proposed to construct a compressed natural gas (CNG) vehicle fuelling facility for use by commercial vehicles, on land adjacent to Watling Street, Hinckley.



The proposed development will consist of:

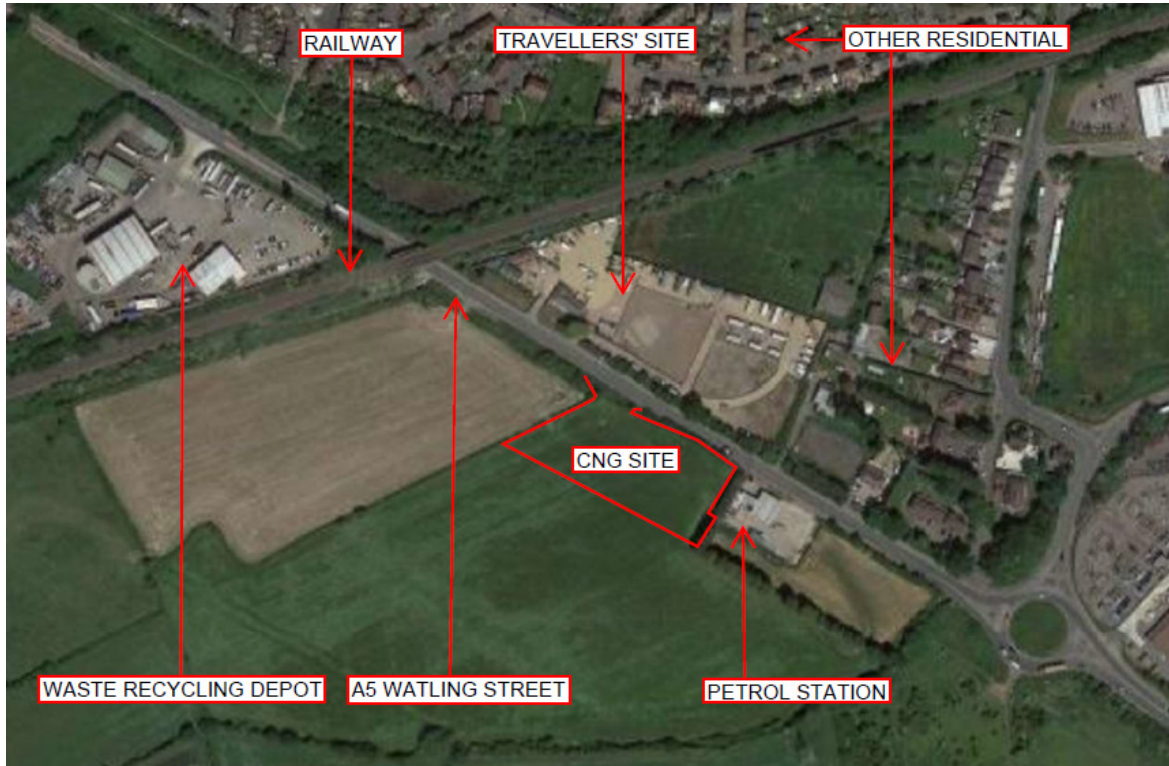
- A drive-through forecourt area with 12No fuel islands (2No rows of 6).
- 5No car parking spaces for service personnel (including 2No with electric vehicle chargers).
- Electricity substation in an enclosure.
- Incoming gas valve and meter in a fenced compound.
- Fenced equipment compound containing:
 - 2No trailer parking bays.
 - 2No fuel dispenser islands serving the trailer parking.
 - 6No fuel storage cylinder banks.
 - 3No gas compressors, with 3No air coolers above.
 - Electrical switchroom.
 - Backup generator.



The site is located within the Golden Logistics Triangle, immediately on the southern side of the A5 Watling Street.

Surrounding properties are:

- To the north west, north and north east (across Watling Street): Travellers' site and other residential, screened by trees and vegetation.
- To the east: a petrol filling station, immediately adjacent.
- To the south and west: agricultural land, immediately adjacent.
- A railway line to the north and west, no closer than approximately 120m away, and beyond that is a waste recycling depot.



Site outline in red (approximate, for location only).

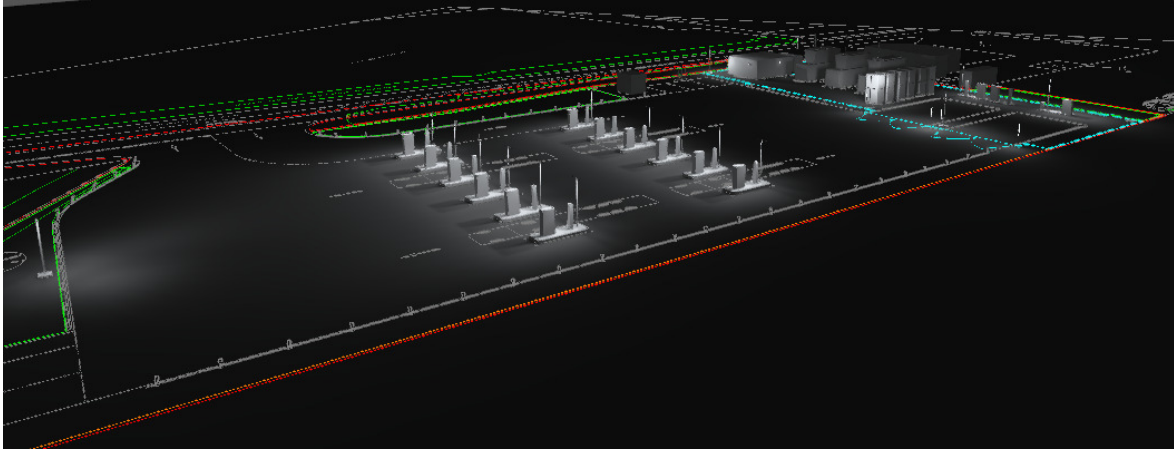
Location of the proposed CNG Site and surrounding area – aerial view

Refer also to drawings from CNG Fuels Ltd:

042-01-CNG-101 Rev G	Location Plan
042-01-CNG-102 Rev D	Existing Site Plan
042-01-CNG-103 Rev J	Proposed Site Block Plan
042-01-CNG-104 Rev J	Proposed Site Layout
042-01-CNG-105 Rev E	Proposed Site Elevations
042-01-CNG-106 Rev I	Proposed Site Lighting Plan

Proposal

Lighting Arrangement



The lighting scheme follows a standard arrangement which has been utilised by CNG Fuels Ltd at other refuelling stations to provide suitable task lighting for safe operation, consisting of:

The lighting arrangement is shown on the CNG drawing 042-01-CNG-106 and Synergy drawing 6518-LTG-001.

Fuel islands:

- 1No lighting column per fuel island, 4m high, mounted on the island (4.25m above ground level to the top), total 12No islands.
- A T-bracket at the top of the column, with 2No LED floodlights installed, one to each side of the island but not extending past the edges of the plinth (as the front page image).
Note that the island is also protected by steel bollards placed beyond the corners of the plinth.
- The floodlights are aimed downwards to illuminate the area between the fuel dispensing equipment and the lorry beside the island.
These shall be angled with one at 10° and one at 30° above the horizontal, to illuminate the pump area.

Forecourt area:

- 1No lighting column, covering the area in front of the pumps.

Equipment compound and electrical compound, containing the compressors, storage facility, electrical switchroom, diesel generator and trailer parking:

Lighting in this area is only used when works are taking place and will normally be switched off.

- Lighting to the equipment compound, consisting of 3No lighting columns, 4m tall with 2No floodlights, generally towards the perimeter of the compound and aimed back into the compound.
- Lighting to the trailer loading area, consisting of 1No 4m column on each of the 2No dispenser island, with 2No floodlights each (similar to the forecourt fuel islands).
- Local access lighting in the area of the electrical switchroom in the compound, consisting of 3No circular bulkhead luminaires with “eyelid” shield to the upper part, mounted on the external wall of the switchroom.
- Vertically mounted LED strip lights, 4No (one on each side of the 2No trailer loading bay gates), and 1No 4m column with 2No floodlights at the just inside the gates.

- Emergency lighting is provided at the pedestrian exit gates from the equipment compound. These are non-maintained (normally not illuminated) and have not been included in the illumination level calculation.

The remainder of the CNG site is not lit, including the access roads and the electrical ring main unit and gas meter compound.

There is existing lighting to nearby surrounding areas:

- Local Authority street lighting extending from the roundabout and reaching as far as the CNG site, consisting of LED streetlights on 10m high columns. The streetlighting ends opposite the CNG site with a column opposite, backing onto the Travellers' site.
- Amenity lighting to the Travellers' site, typically streetlighting on low columns (estimated to be 5-6m tall)
- Floodlighting to the forecourt and under-canopy lighting to the adjacent petrol filling station.

Target Lighting Levels

The lighting design has been carried out by CNG Fuels according to their usual arrangement to provide adequate lighting at the fuelling point, illuminating the fuel pump and the point of connection to the vehicle, plus safe movement around the pumps for the driver.

This allows safe connection of the refuelling pipe, operation of the controls and reading meters/notices on the pump.

The calculated values around the pumps are shown.

This document also gives the calculated lighting levels at the site perimeter created by the scheme presented by CNG Fuels to demonstrate the effect on the surrounding areas.

This shows how the scheme avoids excessive overspill of light from the site illuminating the surrounding areas.

Moonlight is typically considered to be 0.25-1 lux (Bat Conservation Trust/Institute of Lighting Professionals (BCT/ILP) Guidance Note 08/18 Bats and Artificial Lighting in the UK) (the lower limit is rounded up to 0.3 lux for the calculation).

The isolux contours for 0.1 lux (the outer limit of the effect of the lighting scheme) and 0.3 lux and 1 lux (moonlight) are shown on the isolux drawing, as well as the higher levels of illumination in the task areas.

Although there are no designated wildlife areas, due to the proximity of fields it is still proposed to apply the advice from the ILP/BCT Guidance Note 08-18: to limit overspill and use a warm white light source.

Obtrusive Light

The maximum permitted obtrusive light is given in BSEN 12464 Part 2, Table 2, to control obtrusive light "to minimize problems for people, flora and fauna".

The **Environmental Zone** is chosen for this area is "**E2: low district brightness areas, such as industrial or residential rural areas**".

Zone E2 permits a maximum of 5 lux illuminance on neighbouring properties pre-curfew, 1 lux post-curfew (where a curfew applies) and no more than 5% of total lighting flux directed above the horizontal.

Lighting Equipment Selection Criteria

Luminaires have been chosen to conform to the following requirements:

Efficacy: high efficacy/low energy luminaires, by use of LED light sources. Values in excess of 100 lumens per circuit Watt are typical of LED luminaires.
Light output: the design of luminaires shall be chosen to provide good control of light (i.e. tight beam control) to create minimal stray light, and shall be aimed at the activity area only.
Zero direct upward light: the luminaires for main area lighting shall be constructed with recessed LEDs, and aimed downwards, to achieve zero direct upward light.
Location: location of luminaires shall further reduce the overspill: they shall be only used at the task area (fuel islands/cabinets and access lighting).
Colour rendering: good colour rendering, CRI Ra>70, allows better visual acuity at lower lighting levels.
Colour temperature: colour temperature of 3000K (“warm white”) where possible. Although there are no environmentally sensitive areas noted (woodlands or wildlife corridors) luminaires shall still comply with BCT/ILP requirements. 3000K is slightly higher than the guidelines in the BCT/ILP Guidance Note 08/18 (which prefers 2700K). However, the intention of the BCT advice is to limit UV and the blue component of light which may attract insects and affect the feeding pattern of bats, which was a historic problem caused by metal halide or mercury vapour discharge lamps. The use of LED light sources allows a slightly higher colour temperature whilst still complying with the BCT advice, i.e. the “warm white” LEDs are designed to have zero UV (in the 100-400nm wavelength) and much reduced blue component (<550nm wavelength). 2700K LEDs are more typical of domestic lighting and not readily available in commercial/industrial luminaires, but 3000K is widely available and acceptable to the BCT.
Other measures: baffles or shields shall be used where necessary to further reduce overspill into environmentally sensitive areas. (The calculation demonstrates that light overspill is minimal without using baffles for this scheme).

Proposed luminaires

(1) Floodlight (floodlights on 4m poles: 12No twin-headed poles in the pump area, 1No twin-headed pole to the forecourt, 5No twin-headed poles in the plant/trailer compound compound)

Disano Lighting "1982 Micro Rodio asymmetric" floodlight, graphite colour.

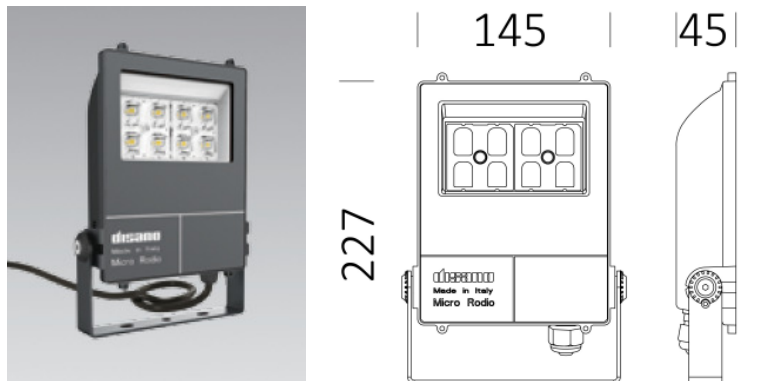
(CNG Fuels standard luminaire for this type of installation, as used on other sites).

3000K colour temperature LEDs, 28W total load, 2900 lumen output.

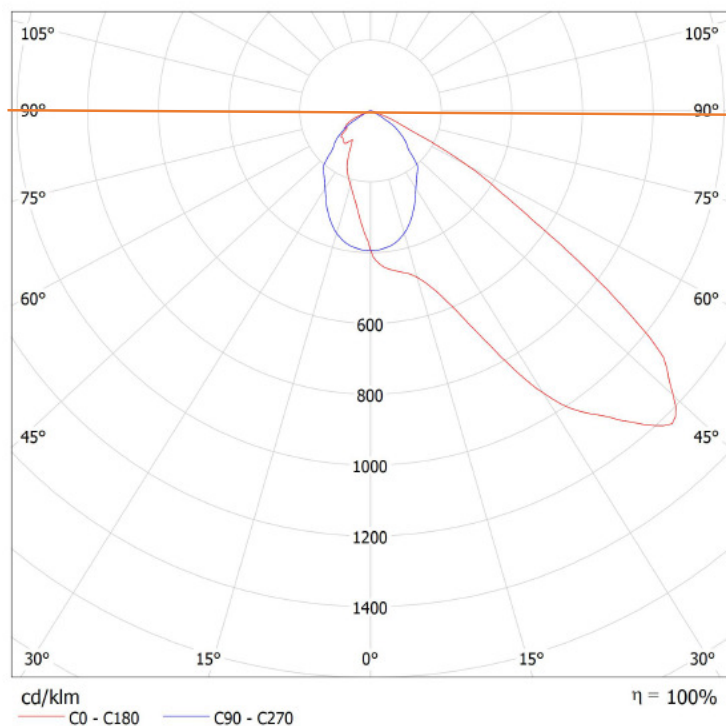
(Disano Lighting reference 414870-39)

The polar chart indicates that there is narrow sideways throw of light (blue curve, to minimise illumination to the perimeter) but good forward throw (red curve, to illuminate the pump/vehicle area).

The light output on the polar chart does not rise above the 60° angle, allowing up to 30° elevation without going above the horizontal (i.e. to achieve zero direct upward light).

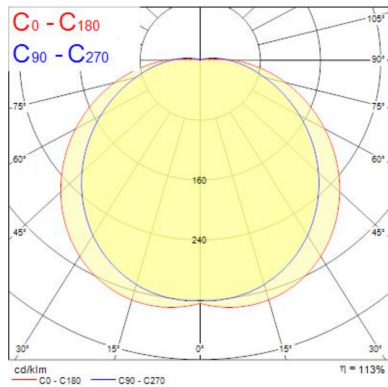


Luminaire: Disano 1982 Micro Rodio - asymmetric Disano 1982 LED CLD CELL graphite
Lamps: 1 x leds8_1982_525



- (2) Circular wall bulkhead with “eyelid” cover (3No in the plant compound on the switchroom walls and 3No on 1m high posts beside the pathway between the gas coolers)

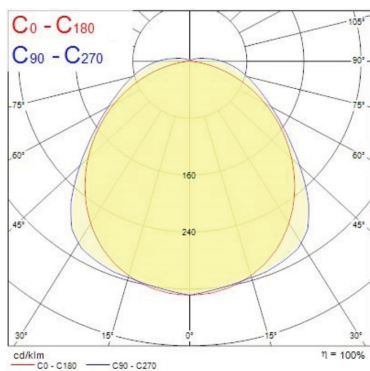
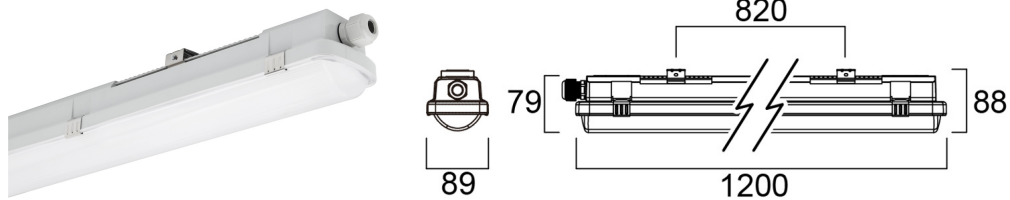
e.g. Sylvania Lighting “Start Surface” 0098209 with eyelid cover 0049033, IP66, polycarbonate.
3000K colour temperature LEDs, 14W total load, 1450 total lumen output.



It is assumed that there is zero upward light, due to the upper eyelid cover.

- (3) Weatherproof LED batten luminaire, 1200mm (4No at the lorry gates into the compound, one on each vertical gatepost)

e.g. Sylvania Lighting “Resisto” 0010208, IP66, polycarbonate.
3000K colour temperature LEDs, 21W total load, 2800 lumen output.



Because the luminaires are mounted vertically it is assumed that 50% of the light output will be directed upwards whenever the gate post lighting is switched on (worst case).

(4) Emergency bulkhead luminaire, non-maintained (2No within the compound)

Eterna emergency bulkhead, EMLED3NM, polycarbonate, IP65.

2W/150 lumens when operating on battery during mains failure.

Legend set to be applied when used as a Fire Exit sign.



Overall Efficacy and Upward Light

With all luminaires switched on, but emergency luminaires in standby (off) mode.

Description	Quantity	Total Lumens	Total Circuit Wattage	Upward light
Floodlights, 2900 lumens at 28W	36No	104,400	1008	0 (all aimed downward)
Circular wall bulkhead, 1450 lumens at 14W	3No	4,350	42	0 (eyelid shield)
LED weatherproof batten, 2800 lumens at 21W	4No	11,200	84	5,600 (assumed 50%)
Emergency bulkhead, non-maintained mode, 1W charging	2No	None (in standby, non illuminated)	5	0
TOTAL		119,950 lumens	1139 W	5,600 lumens (4.7%)

Total installed circuit wattage: 1139 Watts

Total installed lumen output: 119,950 lumens

Average efficacy: 105.3 lumens/cctW

Direct upward light is 4.7% of total installed lumens only when the plant compound is switched on.

Permitted direct upward light for Environmental Zone E2 is 5%.

In normal operations only the pump islands and forecourt will be switched on, which give out zero direct upward light.

LED Colour Temperature

In order to minimise the effect of the lighting on wildlife the Bat Conservation Trust recommends “warm white” light sources with zero ultra violet (UV) and reduced blue light content.

This is to avoid the problem caused by older generation floodlighting, typically using metal halide lamps which had a high UV and blue content, attracting insects and other food sources to the site.

The elimination of UV and reduction of blue light is achieved by the use of LED light sources.

LEDs have zero UV light output (i.e. below 400nm wavelength), and low blue content (warmer colours making up the main output).

However, the preferred colour temperature of 2700K is a typical domestic light source and not readily available in commercial/industrial luminaires.

Advice from the Bat Conservation Trust accepts the readily available 3000K as a near substitute (BCT/ILP Guidance Note 08/18, section 2 item 6) – the spectrum charts below show that this is very similar to 2700K, with only a slightly higher blue content.

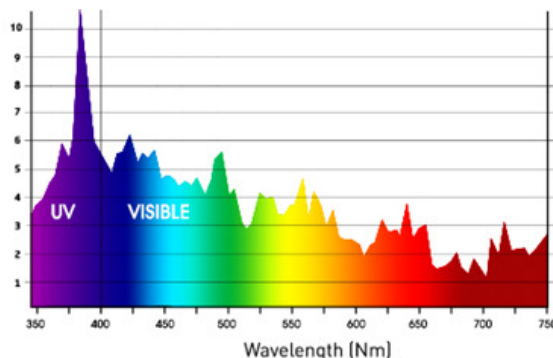
3000K luminaires will be used for the main lighting – the floodlights. These are to be permanently lit during hours of darkness at the fuel pumps, and only for access during works in the plant compound.

Other luminaires in the compound and at the gate posts shall also be 3000K colour temperature, but only illuminated when necessary to carry out infrequent maintenance works or trailer loading.

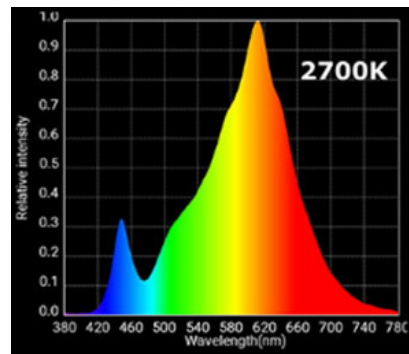
The charts below demonstrate the blue content of the different LED colour temperatures.

The area under the graph in the blue zone is small compared to the area in the green to red zones.

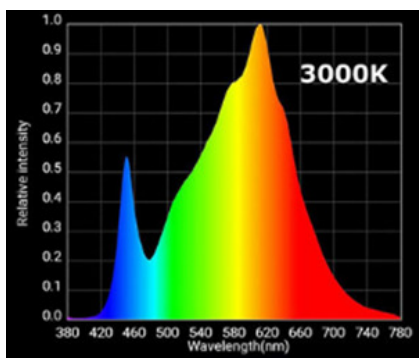
By comparison the blue area of an old style metal halide lamp makes up a significant proportion of the output.



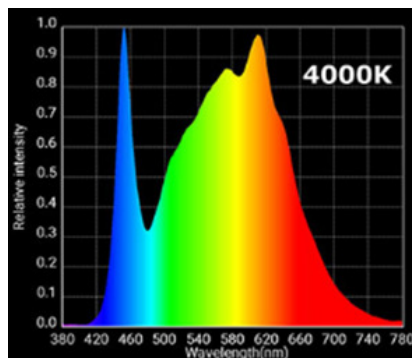
Metal halide (for comparison)



2700K LED (preferred but less available)



3000K LED (proposed for this scheme)



4000K LED (for comparison)

Lighting Control

The lighting control shall be as follows.

Pump Islands and forecourt, 13No lighting columns:

Lighting to be switched automatically to come on **during hours of darkness**. The lighting shall be controlled by photocell sensor.

Permanent lighting is a safety requirement by CNG Fuels.

To mitigate against this the lighting shall be installed as task lighting to the pump area, aimed to avoid overspill outside the boundary as much as possible and avoid any direct upward light.

Plant compound and trailer area, 3No lighting columns and 3No wall mounted luminaires:

Lighting to be manually switched on **only when maintenance activity occurs** during hours of darkness.

Emergency lighting to be non-maintained.

Trailer compound, 1No lighting column and 4No gatepost luminaires to the trailer area, 2No columns at the pumps:

Lighting to be manually switched on **only when maintenance activity occurs** during hours of darkness.

Note:

The site is generally unstaffed – maintenance activity is infrequent and will take place during daylight hours wherever possible.

Calculated Results and Conclusion

The drawing 6518-LTG-001 Rev P4, Proposed External Lighting Layout (With Calculated Illumination Levels), shows the proposed lighting column and luminaire positions and the lighting levels achieved using the chosen equipment.

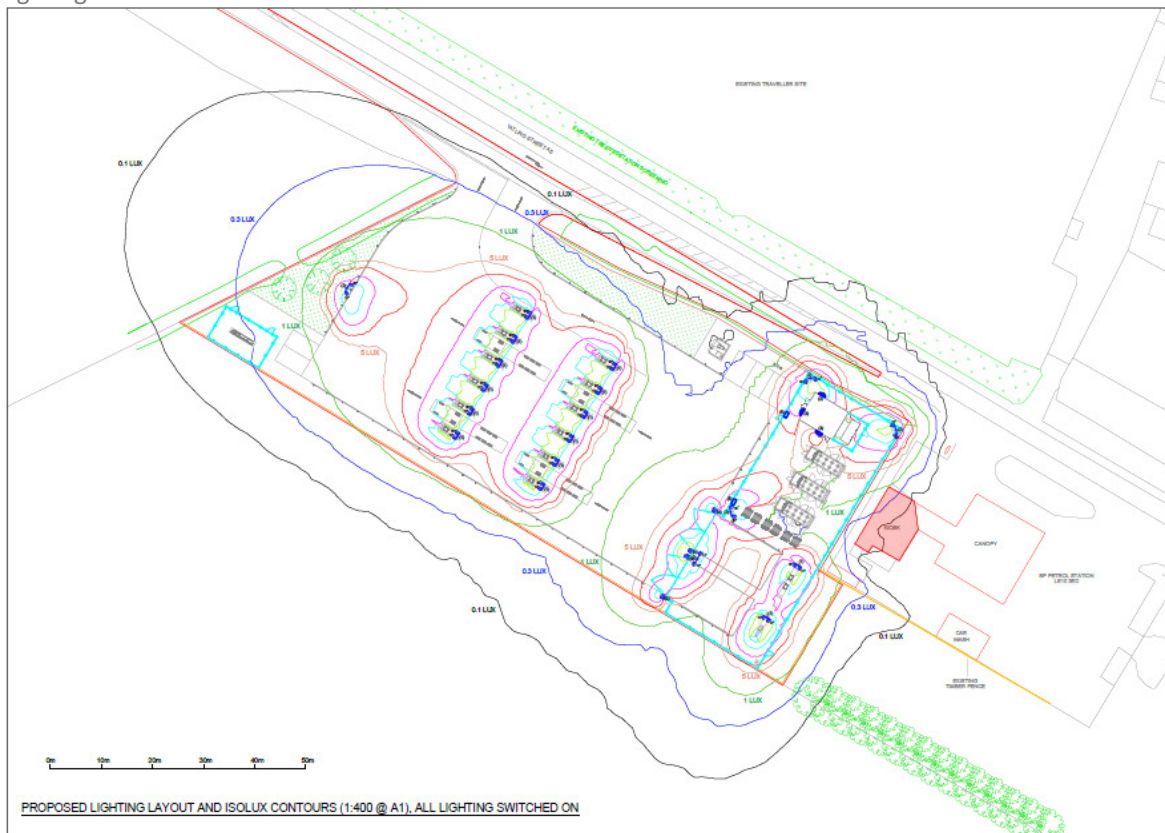
The calculations and isolux drawing show the predicted lighting levels on the CNG Fuels site using the standard CNG lighting arrangement, achieving a minimum of 75 lux at the pumps.

This shows the effect of all lighting switched on, i.e. worst case – normally only the pump islands are illuminated.

In the worst case, with the maximum amount of lighting switched on, there is some overspill from the floodlighting in the corners of the plant and trailer compound (RHS of the drawing).

However, this reduces to less than moonlight (0.3 – 1 lux) within a few metres.

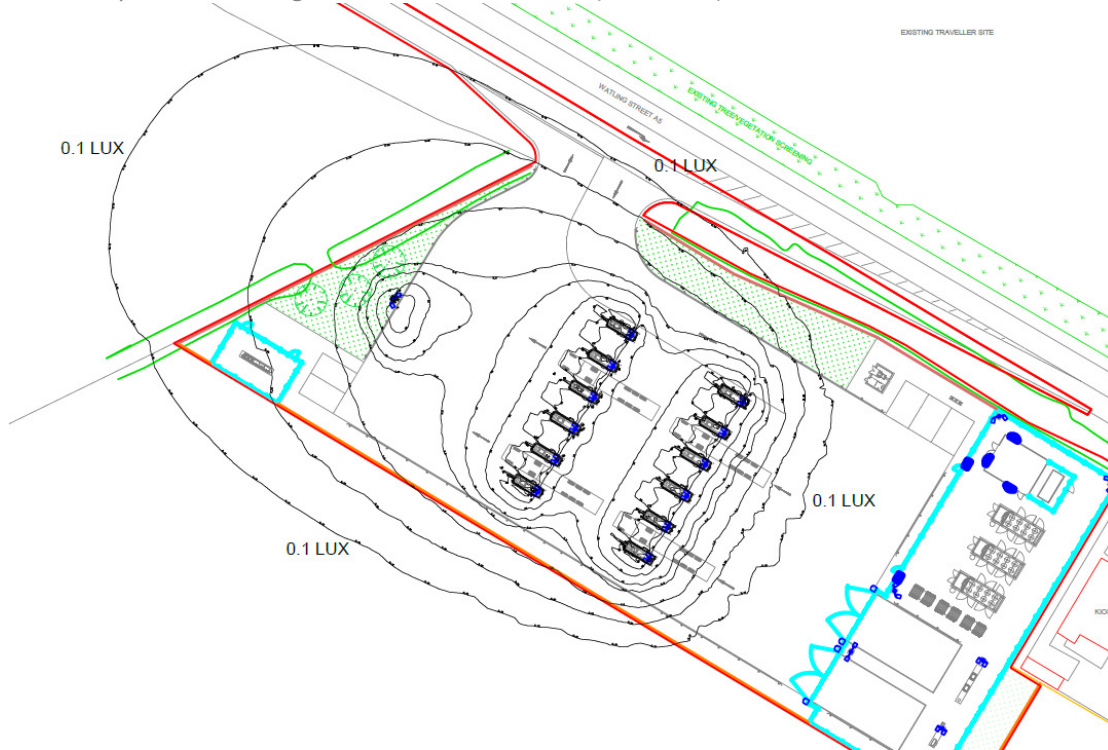
The 0.3 lux and 0.1 lux contours reach Watling Street, but will be much less than the existing street lighting.



Under normal operating conditions the plant compound lighting will not be switched on.

Under these conditions the overspill is less than 1 lux (less than moonlight), mainly into the agricultural land (west and south side in the image below).

The overspill onto Watling Street is less than 0.1 lux (north side).



There is a small amount of direct upward light, 4.7% of the total installed lumen output for the site, which will only occur when the compound lighting is switched on (BS EN 12464-2 for Environmental Zone E2 allows 5%).

There is no direct upward lighting in normal operation when only the pump islands are switched on.

Overspill reaching neighbouring buildings is less than the Zone E2 pre-curfew limit (5 lux) at the closest building (the rear of the petrol station kiosk) only when the equipment compound lighting is switched on, and does not reach any other buildings under normal operating conditions.

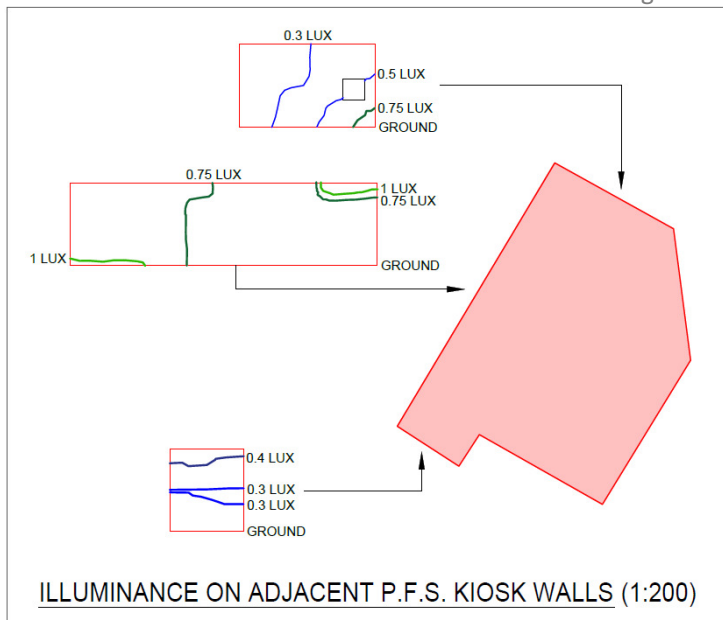
The illumination level just reaches 1 lux on the rear wall of the kiosk, which is the Zone E2 post-curfew limit, should a curfew be applied.

The north east wall containing a window is less than 1 lux.

This will be considerably reduced by any trees on the site perimeter shielding the rear of the kiosk.

Under normal operating conditions, with only the pump islands and forecourt illuminated the kiosk receives no light from the CNG site.

The calculated illumination levels on the kiosk walls facing the site are shown on the drawing:

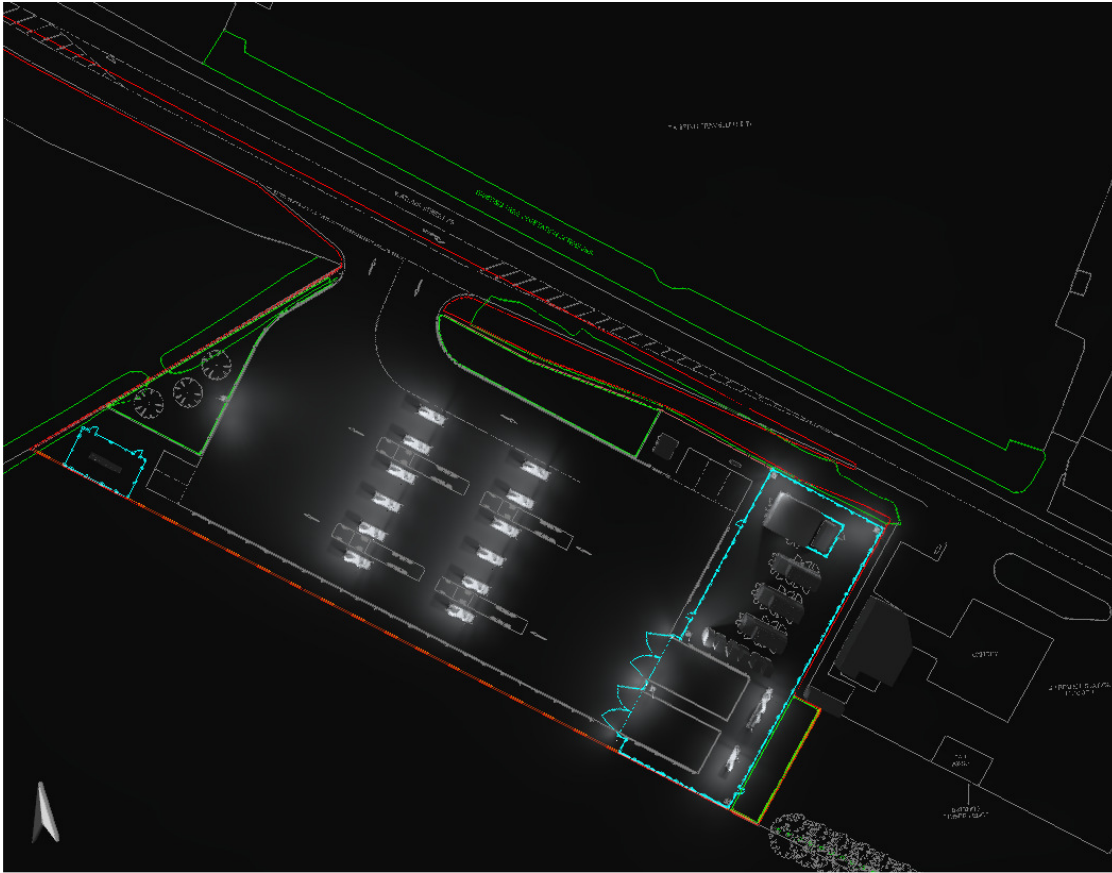


The nearest residential buildings on the north side of Watling Street are not affected.

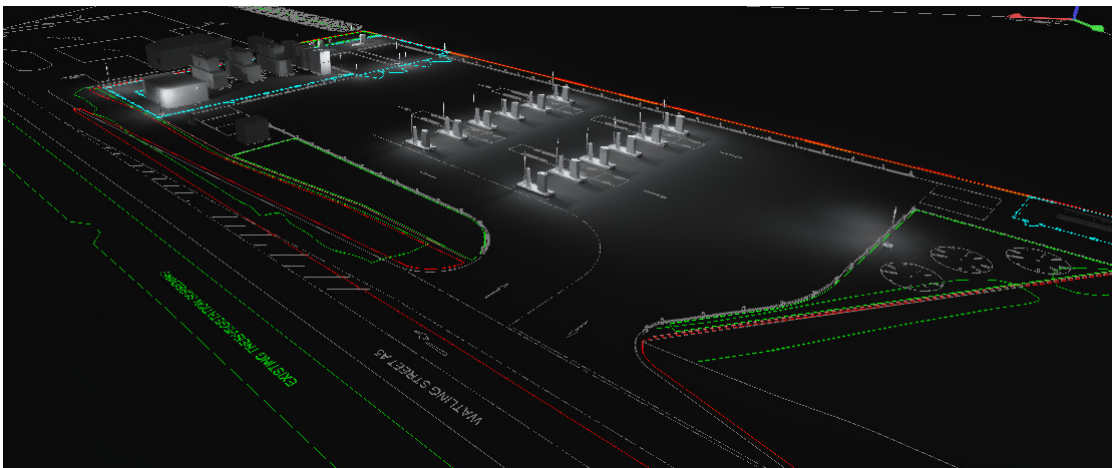
The railway line is not affected.

Although not required, all lighting has been chosen to reduce the effect on wildlife, by using warm white LED light sources (3000K colour temperature) with zero UV and reduced blue component of light to avoid attracting insects.

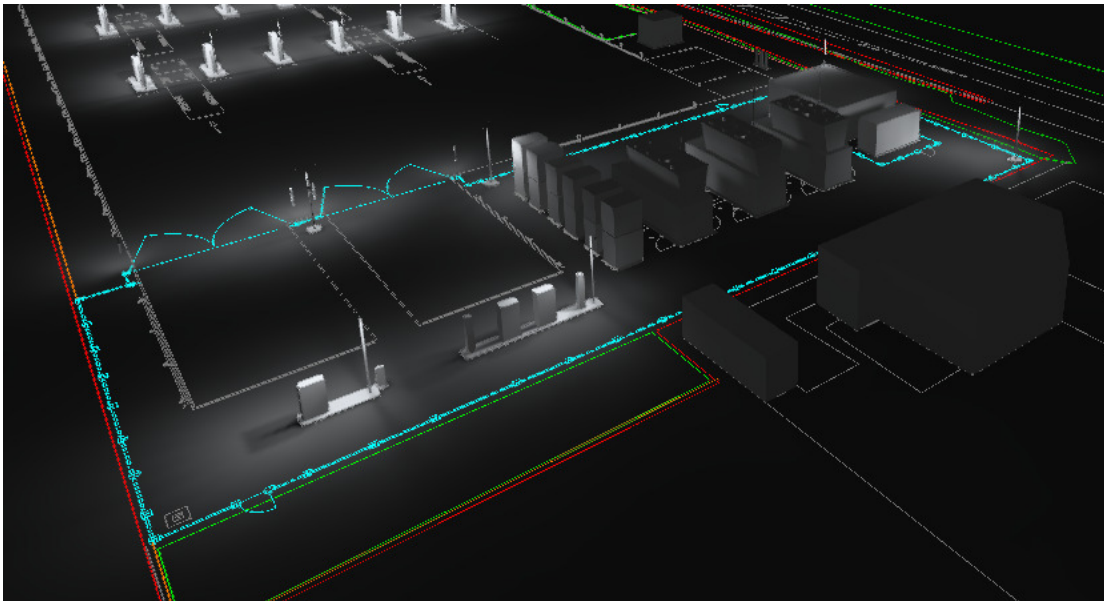
CGI views of the site from the calculation results (images are shown with ALL luminaires illuminated, worst case):



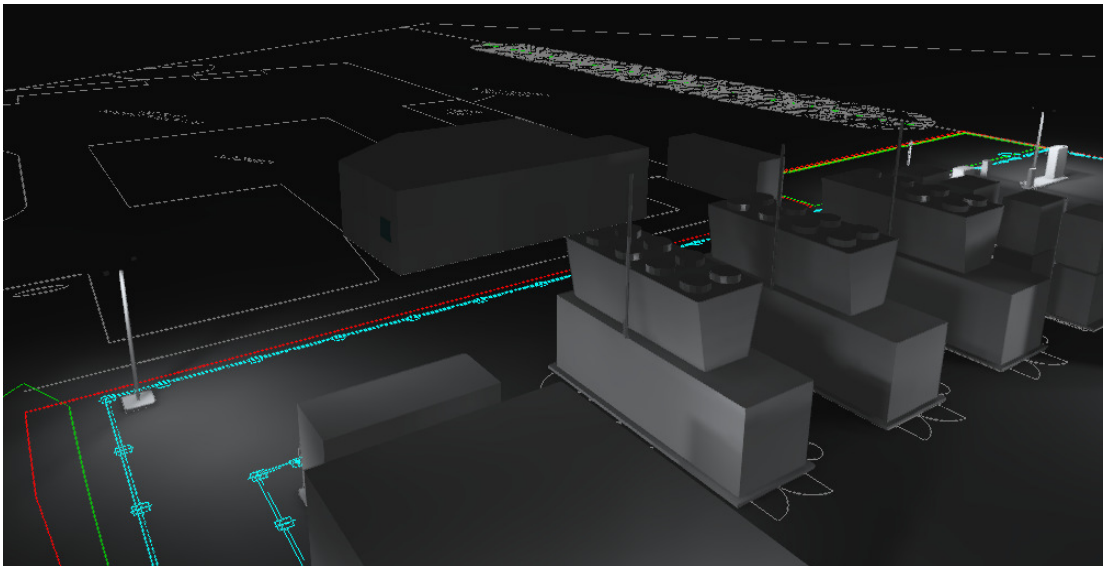
Overhead view



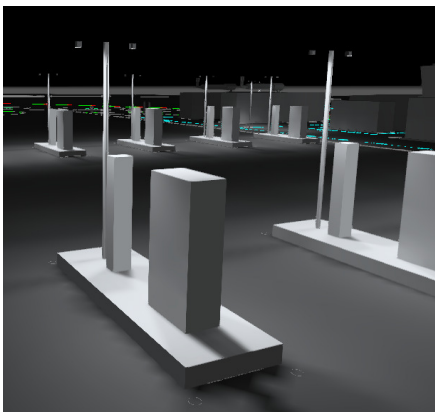
View from watling Street entrance



Plant compound



Plant compound looking towards the PFS kiosk



Typical pump arrangement

