CHAPTER 4 – DESCRIPTION OF THE DEVELOPMENT

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List of Acronyms

APCR	Air Pollution Control Residue
Buttington ERF	Refers only to the ERF buildings and ancillary plant and buildings (forming part of the Development).
CHP	Combined Heat and Power
CEMP	Construction Environmental Management Plan
CEMS	Continuous Emissions Monitoring System
Development	All activities within the red line planning boundary (see Drawing ECL-BQ-000 in Technical Appendix TA1-1)
Development Site	The physical site on which the Development is to be located as defined by the red line planning boundary (see Drawing ECL-BQ-000 in Technical Appendix TA1-1)
DCS	Digital Control System,
DNS	Development of National Significance
DNO	Distribution Network Operator
ERF	Energy Recovery Facility
EMS	Environmental Management System

List of Acronyms (cont)

EPR	Environmental Permitting Regulations
ES	Environmental Statement
FGT	Flue Gas Treatment
IBA	Incinerator Bottom Ash
IED	Industrial Emissions Directive
Installation	Refers only to the ERF buildings and ancillary plant and buildings (forming part of the Development).
KEA	Key Environmental Aspect
NRW	Natural Resources Wales
ONS	Office of National Statistics
SUDS	Sustainable Urban Drainage Scheme

4. DESCRIPTION OF PROPOSED BUTTINGTON QUARRY ENERGY RECOVERY FACILITY

4.1. Introduction

4.1.1. This chapter of the ES provides a description of the Development. The Development includes the Buttington Energy Recovery Facility ("Buttington ERF or the Installation"), all ancillary buildings and infrastructure and the site access road. In addition to describing the individual elements of the physical Development, the chapter also includes a description of the construction methods, the layout and design of the Development and the operational processes.

4.2. Overview of the Buttington ERF

4.2.1. The ERF will use proven, highly regulated technology to extract energy from residual waste that would otherwise be sent to landfill. The technology provider, Hitachi Zosen Inova ("HZI") operates similar plants throughout Europe and within the United Kingdom.

4.2.2. The following information summarises the technical proposals. Further information on the technical aspects of the Development is included within the respective chapters of the ES and within the Environmental Permit application. The Environmental Permit application is not submitted to PINS as part of the DNS or EIA regulations, however, the application will be submitted to Natural Resources Wales ("NRW") in tandem with the DNS application in accordance with best practice guidance.

4.2.3. Further information on the architectural treatment and the iteration of the design is set out in the Design and Access Statement that accompanies the DNS submission.

4.2.4. The key elements of the ERF installation are:

- waste reception area including tipping hall;
- storage bunker;
- waste feed hopper;
- combustion line;
- boiler and water steam cycle;
- flue gas treatment;
- a single stack;
- bottom ash extraction and storage;
- steam turbine and generator;
- electrical transformers;
- air cooled condensers;
- and associated utilities infrastructure.

4.2.5. The plant will be configured as a CHP-ready plant and will export power to the National Grid and could have the capability of exporting heat to local users should there be sufficient future need for this.

4.2.6. The main process stages in the proposed Installation will be:

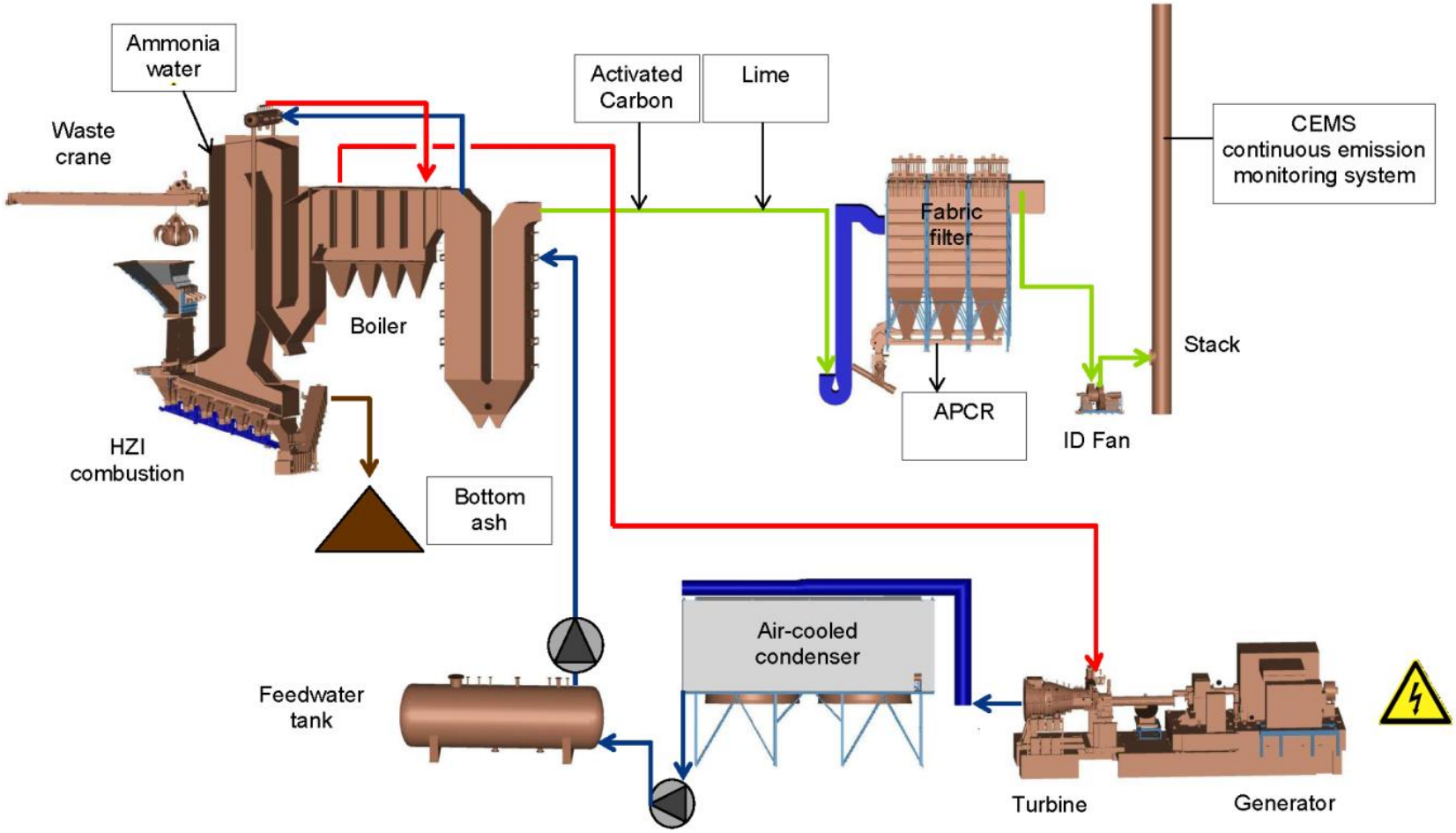
- waste reception, storage, crane and feed system;
- thermal combustion of the waste to produce steam for the production of electricity; and
- management of process products and outputs.

4.2.7. A simplified process flow diagram for the proposed arrangements is provided as Figure 4-1.

4.2.8. In addition, the ERF will also include:

- A dedicated site access road network;
- Weighbridge and weighbridge office;
- Car-parking areas;
- HGV parking areas;
- Substation and grid connection;
- Offices and ancillary rooms; and
- A detailed landscaping scheme.

Figure 1-1: Simplified Process Flow Diagram for ERW Process



4.3. The Physical Development

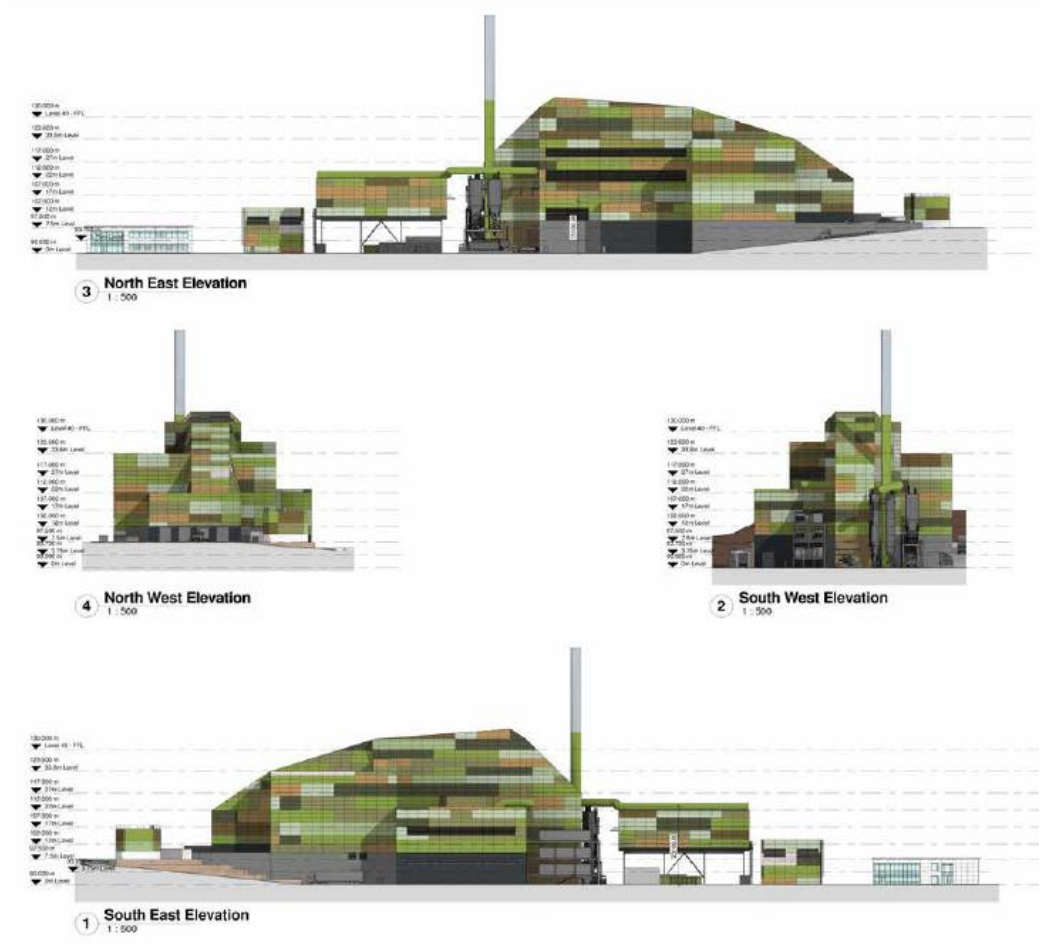
Main Building

4.3.1. The operational element of the Buttington ERF will be contained within a single building and a single stack: all wastes will be deposited within the building and there will be no external storage of material. The main building will contain the following features:

- Waste Reception Hall;
- Waste Bunker;
- Boiler Hall;
- Bottom Ash Storage;
- Flue Gas Treatment facility;
- Flue stack;
- Turbine Hall; and
- Bottom Ash (Storage and Loading) Hall.

4.3.2. The proposed site plan is shown on ECL Drawing ECL-BQ001 in Technical Appendix 4-1 with elevations drawings provided in Figure 4-2 (full elevations to scale are provided in the planning drawings submitted with the DNS application).

Figure 4-2: Elevations



4.3.3. The building will have a total length of 90.3m, with a further 64.4m to account for the air cooled condensers. The width ranges from a maximum of 56.65m to 21.7m at the narrowest part of the main building at the upper levels.

4.3.4. The height of the main building will also vary reflecting the operational heights required for the various elements of process equipment housed therein. The highest part of the main building will house the Boiler Hall which will measure circa 46m above ground level down to circa 33m for the roof of the tipping hall.

4.3.5. The principle material finishes for the building are as follows:

- tipping hall, boiler hall, flue gas treatment hall, turbine hall, incinerator bottom ash building – colour coated profiled cladding to walls and roof with translucent roof lights;
- air cooled condensers – colour coated profiled cladding;
- main stack - colour coated sectional cladding;
- store and workshop – colour coated profiled cladding the walls and roof, with translucent rooflights and colour coated roller shutter doors;
- office mess, gatehouse and canopy – colour coated profiled cladding the walls and roof;
- electrical building, substation and sprinkler tank building – fair faced brickwork with colour coated profiled cladding to the roof;
- transformer - insitu concrete blast wall;
- electrical houses – colour coated profiled cladding to walls and roof;
- chemical silos – colour coated cladding; and
- sprinkler tank – colour coated sectional cladding with colour coated profiled cladding to the roof.

4.3.6. A full tabulated schedule of all of the materials and finished that are to be included on the Development are provided in the Design and Access Statement (produced by Race Cottam Associates) submitted with this application.

4.3.7. The main stack will extend from within the main building envelope and will measure 70m in height and will be lit with Night Vision Goggle visible lighting (as requested by Welshpool Airport – email dated 30.8.2019).

Control and Administration Building

4.3.8. This houses the main control room for the Installation and includes changing rooms, locker and mess facilities for site operatives; and training, administration and management facilities for staff.

Gatehouse

4.3.9. The gatehouse is located adjacent to the HGV weighbridge at the stile entrance and will contain the weighbridge control room.

Access and Parking

4.3.10. Access and highway improvements will be made to the A458 to facilitate access to the Development approximately 170m to the north of the existing access currently serving Buttington Quarry. During the construction phase, the existing quarry access would be used until the new site access is constructed. The new access proposal includes a dedicated right turn ghost island facility and increased junction visibility (see Chapter 8 – Highways and Traffic for further information). The existing access would then be closed off, allowing access to the property known as Brookside only.

4.3.11. The Buttington ERF would provide 38 car parking spaced in total. This includes 2 disabled spaces and 4 with electric charging facilities. The number of parking spaces has been provided to accommodate the staffing levels and takes account of shift changes. Dedicated bays for motorcycles (10) and a bicycle shelter is provided.

4.3.12. Road safety measures will be incorporated into the road design at key points where mammals are likely to cross to minimise the risk of road mortality (e.g. low speed limit).

Drainage

4.3.13. The ERF will be served by a surface water drainage system which is fully described in Chapter 11 – The Water Environment and in Technical Appendix 11-2 – Surface Water Management Plan ("SWMP"). In summary, during the operational phase of the Development, surface water runoff will be managed as follows:

- runoff from the re-profiled quarry walls will be intercepted by filter drains at the toe of the slope, additional proposed measures to minimise suspended solids in runoff from the quarry walls include appropriate planting and the use of silt fences, as required;
- the area of carparking would be developed as permeable paving with sub-base storage;
- all site runoff would ultimately discharge to a final settlement/attenuation pond, with controlled discharge, at the pre-development Greenfield rate, to the tributary watercourse;
- all elements of the SWMP for the ERF have been designed to accommodate the 1:100 year rainfall event, with a 20% allowance for long-term climate change; and
- appropriate SUDS design is also provided within the SWMP for the site access road.

Lighting

4.3.14. The external lighting strategy may be found on Drawing 4052-ID-DR-1002 in Technical Appendix 4-2, together with the lighting calculations and risk assessment. In summary:

- lighting levels for each area have been designed in accordance with BSEN 12464-2 for outdoor work places;
- additional localised lighting will be required for ladders and platforms;
- lighting has been designed to be in keeping with a site in a rural location;
- luminaires have been selected to minimise the impact on bats;
- mounting heights have been selected to minimise lighting impacts;

- external backlight shields have been provided where required to minimise back spill;
- external lighting will operate all night with the exception of the ERF access road and firewater storage areas; and
- all external lighting will have primary photocell control to ensure it is not operational during daylight hours.

Utilities

4.3.15. The ERF will require connection to a number of utilities, including water, telecommunications and electricity.

4.3.16. Water for domestic purposes, for process water for the boiler feed water and for firefighting would be supplied from the 150mm distribution main that currently serves the wider quarry development. An extension from this would run beneath the access road to the ERF.

4.3.17. There are telecommunication lines currently running into the quarry which would be extended to the ERF.

4.3.18. There is no process effluent generated. Domestic foul water will be managed on an on-site package water treatment facility to avoid any reliance on public sewer systems.

4.3.19. There is an existing electricity connection from the local electricity supply network located within Buttington Quarry which provides power to businesses located within business park. This existing connection will be used to supply power during the construction phase.

4.3.20. Once operational the ERF will generate electricity, a minor proportion of this will be used to power and operate the facility, power will initially be provided to existing and new businesses on site to provide incentives for sustainable cost effective energy supply, with the remainder being exported to the National Grid. A new connection would be required to export electricity off site. The substation will be located within the Installation boundary, from where cabling will run underground to the base of the quarry void, prior to emerging to overhead cable to the electricity pylon as shown on ECL Drawing ECL.001.01.01-002 in Technical Appendix 4-1.

4.3.21. There is no requirement for a mains gas supply.

Security Fencing, Gates and CCTV

4.3.22. The Buttington ERF will be located within the quarry void, thus the quarry walls are an effective security barrier. A 2.4m boundary fence will run around the Installation with security gates to the staff and visitor carpark with security gates to the weighbridge.

4.3.23. Closed circuit television systems (CCTV) as required will be installed, maintained and operated in accordance with British Standard 7958:2005 – CCTV Management and Operation Code of Practice. CCTV cameras will be positioned at strategic locations to provide surveillance of the ERF access points, carparking areas and the quarry rim.

Cameras will be mounted on building walls, roofs, canopies and lighting columns as appropriate to provide full coverage of the Installation.

Landscaping

4.3.24. The landscaping proposals for the development are illustrated on Drawing BT1180-D2 which may be found in Technical Appendix 11-1. Landscaping proposals are fully described in Chapter 11.

Employment

4.3.25. In the construction phase there the Development will provide employment for approximately 309 workers. Once operational the ERF will provide permanent employment for up to 30 people, working in shifts to maintain 24-hour a day ,7-day per week cover. The majority of employees will be skilled operatives (electricians, fitters waste crane operatives etc), technical engineers (control and plant) and management (Facilities Manager, Maintenance Manager etc). Further information on the employment aspects of the Development may be found in Chapter 7 – Socioeconomic.

4.3.26. The ERF will be operated by a total daily staffing level of the order of 30 staff, broken down into a number of shifts. Peak day time staffing levels on site are predicted to occur during the early afternoon shift change period (13:00-14:00) when up to 40-60 staff could be present on site. The ERF could be expected to operate a three shift system to support 24 hour operation of the plant.

4.3.27. Up to 10 office / management staff could be expected to work a more traditional 08:00-17:00 weekday pattern.

4.4. Construction Phase

Introduction

4.4.1. The following section provides a summary of the key elements of the construction phase of the development. It is not intended to be prescriptive and the exact construction methods, phasing and programme will be determined by the appointed contractor.

Timetable

4.4.2. The timetable for the construction period will be dependent on the grant of planning permission for the proposed development and subsequent contract negotiations. The current programme of works is based on the assumption of a construction start date towards the early part of 2022.

4.4.3. The construction period is anticipated to take approximately 36 months thus the estimated date for the opening of the plant is early to mid 2025.

4.4.4. The core ground works including site clearance, earthworks, foundations and drainage will occur within the first five months. The erection of building frames and the main structural works will be staggered throughout the construction period. The first major structure to be erected will be the boiler hall and FGT building, which will begin immediately following the main ground works.

4.4.5. The final building structure to be completed will be the air cooled condensers. These structures will be erected between months 17 and 22, towards the end of the construction period.

4.4.6. Following completion of the structural building works, external hardstandings including roads and car parks will be completed along with lighting, signage and landscaping. All of the construction works will be managed within the site.

Construction Hours

4.4.7. The construction operations will generally be limited to 07:00 – 19:00hrs Monday to Friday and 07:00 – 12:00hrs Saturday. It is possible that some construction activities will be undertaken outside these hours e.g. during the internal fit out of buildings, delivery of abnormal loads. HGV movements will not be permitted outside the hours outlined above without prior agreement and operations will not exceed any noise limits imposed as part of the permission.

Access

4.4.8. A new access road will be constructed off the A458 trunk road, to the north of the existing quarry access as part of the construction activities. For the construction phase, traffic would enter the Development site from the existing quarry access.

4.4.9. The new access included within the planning application is of the same design as that approved under the extant planning consent P/2015/0439. A Section 73 application was submitted in April 2020 to extend this under reference 20/0575/REM. This application was awaiting determination at time of writing. Both the construction phase and operational phase access are shown on Bright and Associates Drawing BT1180-D1 Principal Access Routes in Technical Appendix 4.1.

4.4.10. The existing access to the Development site is a simple T-junction which has operated safely and securely with the level of traffic currently accessing the site.

4.4.11. The separate new access (circa 170m north of the existing access (see Paragraph 4.3.10)) to be created includes improvements such as a dedicated right turn ghost island facility and increased junction visibility. Furthermore, as part of the proposals, an approximate length of 375m of existing trunk road would be realigned to improve forward visibility and thus removing the significant bend along this stretch of the A458. These improvements bring the access to current highway design standards and eliminate the existing hazard of stationary vehicles waiting to turn right to access the quarry. Further detail and drawings of the new access may be found in the Transport Impact Assessment in Technical Appendix 8-1.

4.4.12. The new access proposed is identical to the previously approved access and once fully constructed and operational, the existing access to the site would then be closed.

Main Construction Activities

4.4.13. The construction activities are set out below in the likely construction sequence. However, it is expected that a number of the operations will overlap.

Site Preparation

4.4.14. The perimeter of the site will be secured for the duration of the construction works by either timber hoardings or Heras (or similar) fencing. A one way traffic system will be set up on site with a separate entrance and exit providing access to/from the internal site access road. The site entrance and exit will be gated and 24 hour manned security will operate throughout the construction period.

Re-profiling of the Quarry

4.4.15. To accommodate the ERF the base of the former quarry needs to be widened; it is intended that the existing north-western quarry face will remain largely unchanged. To enable widening of the existing quarry floor, it is proposed that the south-eastern quarry face will be excavated and reprofiled to accommodate the proposed development.

4.4.16. A slope stability assessment of the existing north-western quarry slope was completed by TerraFirma (Wales) Limited in February 2019 (ref. 14880/SS) to, "*Provide recommendations for the most viable future quarry configuration and how the long-term integrity all new quarry faces, and slopes may be maintained*" (see Technical Appendix 13-2).

4.4.17. The slope stability analysis confirmed that the existing 34° scree slope that forms the northwest quarry face is generally stable with only a very low risk of shallow instability. To protect the new development against any such minor scree slips, it has been recommended a 3m buffer zone is assigned between the base of the northwest quarry face and the new development area to protect against superficial spalling. The buffer zone should incorporate a shallow catch trench including suitable drainage measures and a catch fence. In addition, to reduce the effect of ravelling of the exposed surface it is recommended that erosion protection measures are also installed.

4.4.18. Weathering and spalling of the mudstone forming the south-eastern quarry face is also expected to generate scree as a result of weathering and ravelling with a gradient of 34°; any slope instability may be expected to be superficial. As such, the south-eastern slope will also require protection measures and a 3m buffer zone at the toe of the slope, as recommended in the northwest.

4.4.19. To minimise land take to the northeast and to maintain land for future employment use the south-eastern face will require a higher gradient slope. Following consideration of various options for reprofiling of the south-eastern quarry slope, the selected solution was to cut the in-situ mudstone to form an upper and lower face at an angle of 60°, and incorporating a 5m wide mid-height bench. It is also proposed to install drainage at the toe

of the upper face to prevent ponding of water on the bench, which could adversely affect stability of the lower face.

4.4.20. To widen the existing quarry floor and create the proposed south-eastern slope profile, material needs to be excavated from the existing in-situ mudstone. Proposed designs also indicate the north-western quarry face will require minor reprofiling, requiring some excavation and filling.

4.4.21. Excavated material will be re-used as part of the construction phase. The material shall be used as fill for a number of areas across the development area, including raising the current quarry bottom from approximately 89m AOD to 90m AOD. Further material will be used in re-profiling the north-western end of the quarry void.

4.4.22. Excavation of slopes will be completed using the current quarrying process using a top-down method of excavation. An excavator and dozer will take advantage of fractures within the in-situ mudstone using a combination of ripping and breaking techniques to loosen the material. This material will then be loaded into dump trucks for transport to temporary stockpiles, and ultimately recompacted into areas requiring placement of fill within the void.

4.4.23. Prior to commencement of any breaking, ripping, excavation and material hauling, a safe system of work will be documented and employed for the proposed works. This will ensure any personnel working the faces are not being put at risk. The method of working will ensure an adequate working area is maintained at all times and in areas where plant and personnel are working at height i.e. on the bench or close to the crest of the slope, appropriate risk mitigation measures shall be used. This may include for example elements such as edge protection bunding, banksmen to control vehicle movements and/or rock traps. Reference should be made to the guidance set out in Health and safety at quarries. Quarries Regulations 1999. Approved Code of Practice L118, and QNJAC Geotechnics, Face & Stockpile Operations Information Sheet 1, Guidance on Safe Face Management Operations in Quarries.

4.4.24. The TerraFirma Slope Stability Report included an earthworks assessment, which classified the excavated of mudstone material as Class 1A (well graded granular material). Class 1A material has a maximum particle size of 300mm, however material with a larger particle size is expected to result from excavation of the quarry faces. Where this occurs, the material shall be processed to conform to a Class 1A particle size requirements, or be re-classified and an appropriate method for reused determined. Where fill is to be placed against an existing slope, the existing slope will be reprofiled and any loose material scaled and removed before placement of the fill will be commenced. Verification of the placed fill will be undertaken by in-situ plate load tests across earthworks at the final finished level. This is particularly required beneath areas of any proposed buildings or the access road. This is to confirm the compaction works have been carried out in a satisfactorily manner and that excessive ongoing ground movement through settlement or consolidation will not occur in the long term.

Earthworks, Foundations and Piling

4.4.25. The construction will involve the excavation of materials at the site. The excavations will include creation of the void for the waste bunker, turbine condenser room and bottom ash bunker. Other excavated material will be generated from the piling and foundation works, development of external hard standing areas and utilities and drainage runs. The landscaping scheme includes the creation of an earth bund. The creation of these bunds, along with the use of the arisings in road construction and development of building platforms, will utilise the excavated material on site. Provisional site investigations indicate that the excavated material will be suitable for reuse as engineering fill or for landscaping operations.

Building Foundations

4.4.26. Foundations for the frame of the main building will consist of a combination of traditional raft, pad and piled foundations. Foundations for the ancillary buildings including the weighbridge, ACC, water pump house and substation are likely to be strip or pad footings. Building slabs will be cast in-situ and concrete will be delivered directly to the site via concrete mix lorry.

Erection and Cladding of Building Frames

4.4.27. The buildings are likely to be of steel frame construction with the external envelope formed from a combination of masonry blocks, cold rolled sheeting rails, metal cladding and polycarbonate cladding. The roofs of the buildings will be constructed of composite cladding panel. Steel work will be delivered to the site by HGV. The construction is likely to be undertaken using a series of mobile truck mounted cranes and a fixed tower crane.

Installation of Plant and Equipment

4.4.28. The installation of the main plant and equipment will be undertaken following the completion of the boiler hall and FGT facility. The installation will begin approximately 12 months after the start of construction and will take approximately 12 months. Commissioning of the plant will take a period of 7 months and will commence following installation of the main plant. The initial commissioning referred to as 'cold testing' will involve a series of tests prior to the burning of any waste at the Installation. The cold testing will ensure that all systems are in full working order prior to the thermal treatment of waste. Waste will then begin to be imported to the site to allow 'hot testing' of the plant to commence. Hot testing, optimisation of the plant and performance testing will take a period of 4 months after which the plant will be fully operational.

External Civil Engineering and Infrastructure (Roads, Car Parking Areas, Drainage and Utilities)

4.4.29. Much of the external civil engineering works will be undertaken towards the end of the main construction works in parallel with the installation of plant and the commissioning

period. The works will comprise the laying of access roads, the car park, external hard standing areas to the buildings and earthworks associated with the final landscape scheme. The laying and installation of drainage and utilities will be phased with much of the work being undertaken in the early phases of the project. Connections and finishing of service runs are likely to be undertaken towards the end of the construction phase. It is likely that the external grid connection works i.e. the construction of the cable route, cabling and any ancillary works e.g. reinforcement of substations will be undertaken by the DNO. This work will be undertaken in parallel with the plant installation and commissioning operations.

Site Compound and Operative Facilities

4.4.30. All laydown areas are shown on ECL Drawing ECL-BQ-001 in Technical Appendix 4-1, and will be used as follows:

- Laydown Areas 1 and 2 - likely to be utilised for site security, storage and car parking;
- Laydown Area 3: likely to be utilised for storage and as a fabrication area; and
- Laydown Area 4: likely to house the main office and welfare accommodation, as well as limited fabrication and storage facilities, and car parking.

4.4.31. Appropriate bunding and environmental protection measures will be implemented within the fuel and material storage areas situated within the construction site. The protection measures will be defined in the Construction Environmental Management Plan (ECL Document ECL.001.01.01/CEMP – see Technical Appendix 4-3). A wheel wash facility will be located at the construction site exit. It will be self- contained with an integral pump house and internal settlement collection tank and will comprise high-pressure water hoses and a power washer hand lance.

Mobile Plant

4.4.32. The following items will be the principal elements used during the construction period:

- tracked excavators (excavation and loading);
- articulated dump trucks;
- wheeled backhoe loaders;
- HGV wagons;
- Piling rigs;
- mobile cranes and telescopic handlers;
- tower cranes;
- rollers and vibratory compactors;
- generators and water pumps; and
- concrete mixer trucks.

Construction Environmental Management Plan (CEMP)

4.4.33. A CEMP will be developed for the construction period, the purpose of which will be to manage and report environmental effects of the project during construction. An outline CEMP has been provided as part of this ES and can be found in Technical Appendix 4-3 – Document Reference ECL Document ECL.001.01.01/CEMP. The outline CEMP describes

how environmental issues will be managed in accordance with relevant legislation, regulations and best practice guidance. It will be the responsibility of the main contractor to develop and enforce the CEMP. It is also envisaged that the CEMP will be secured by planning condition in accordance with standard practice.

4.5. Site Operations

Hours of Operation

4.5.1. The ERF will operate on a 24 hour a day, 7 days a week. This is necessary to ensure operational efficiency. Incoming waste and deliveries of consumables, together with export of bottom ash could take place for up to 12 hours on weekdays (7am – 7pm) and 5 hours on Saturdays (7am-12pm).

4.5.2. In accordance with standard practice the plant will be expected to shut down for planned short term periods to allow the carrying out of essential programmed maintenance work – albeit that waste deliveries will continue as required.

Vehicle Movements

4.5.3. Deliveries of waste are based on a 278 working day year (5.5 day week minus 8 public holiday days) and an average load of 15 tonnes per vehicle. Additionally, taking into account deliveries of consumables and the collection of Incinerator Bottom Ash ("IBA") residues and Air Pollution Control ("APCR") residues the average daily HGV levels attracted to Buttington ERF is expected to comprise 50 vehicular loads per day. A summary of the expected level of HGV traffic attracted to the Buttington ERF on a typical weekday is provided within Table 4-1.

Table 4-1: Likely Level Of HGV Traffic Attracted By The Development On A Typical Weekday

Development Aspect	Total	
	HGV Loads	Two Way HGV Movements
167,000 tonnes per annum of waste materials	40	80
IBA Residues	7	14
APCR Residues	1	2
Consumables	2	4

4.5.4. The development is likely to employ 30 staff members and based on data from the Office for National Statistics ("ONS") Method of Travel to Work survey (see Chapter 8 for further details), it is likely that there would be 22 vehicle arrivals in the morning and 22 departures in the evening. The remainder of vehicle movements would be via walking, public transport, cycling, commuting as passengers or other forms of transport.

Incoming Waste Reception, Handling and Storage Arrangements

4.5.5. All waste will be delivered to the Installation by road, after weighing, the delivery vehicles will be directed to the Waste Reception Hall which is accessed by means of a fast action roller-shutter door which will be operated automatically on the approach of a vehicle. Waste will be tipped into the waste bunker, and the vehicle will exit the Installation.

Waste Input

4.5.6. The Buttington ERF has been designed to accept up to 166,500 tonnes per year of non-hazardous, residual waste. In reality the plant will actually accept around 150,000 tonnes per annum. The difference in the figures is based on the difference between the maximum design capacity and what is operationally possible. The Buttington ERF has been designed to run 24 hours a day, 7 days a week at a maximum throughput of 18.95 tonnes per hour. Based on 8760 hours in a year, this would give a maximum throughput of 166,002 tonnes per annum (or 166,456.8 tonnes in a leap year). However, installations such as that proposed do not operate 8760 hours a year as there are always maintenance periods, hence most installations work on the basis of 7900 hours per year to give a throughput of 149,705 tonnes per annum.

4.5.7. For the purposes of this ES and the Development of National Significance ("DNS") application, a maximum parameter figure for the throughput of the Installation must be fixed for assessment purposed to ensure the most accurate assessment of impacts. Accordingly, a figure of 166,500 tonnes per annum will be used on a precautionary basis for the throughput for assessments such as the Transport Assessment to enable a "worst case" approach to be assessed.

Energy Recovery Process

4.5.8. The energy recovery process comprises the following elements:

- waste bunker
- feed hopper and chute;
- combustion chamber;
- selective non-catalytic reduction ("SNCR") denitrification system;
- boiler;
- demineralisation plant;
- boiler water conditioning;
- makeup water;
- steam turbine;
- power generator;
- air cooled condensers;
- grid connection; and
- district heating connection point.

4.5.9. **Waste Bunker** - the Installation has a single waste bunker which equates to a storage capacity of approximately 4,100 tonnes, which, in turn, equates to approximately five to seven days storage capacity and is water-retaining. The air from the bunker is continually extracted and used as combustion air (primary air) during normal operation. This produces

negative pressure in the bunker to prevent dust and odour being emitted to the external environment.

4.5.10. **Feed Hopper and Chute** - waste is loaded from the bunker into the grate feed hopper by an overhead gantry crane through a vertical shaft and is then transferred onto the grate by means of a feed ram. The feed hopper, which has a design throughput capacity of up to 24 tonnes/hour is equipped with a video camera that displays the level of waste in the control room at the crane operator station. The cranes are equipped with a weighing system so that the amount of waste fed onto the grate is recorded; the cranes can be operated in fully automatic, semi-automatic or manual operation modes.

4.5.11. **Combustion Chamber** - The combustion grate is an HZI-designed moving grate and comprises stationary and moving steps in alternating order on which the waste is dried, degassed and combusted at temperatures in excess of 850°C in line with the Industrial Emissions Directive ("IED") requirements. The residence time of the waste on the grate is approximately 60-70 minutes; rapid clearance of the grate takes approximately 30-45 minutes.

4.5.12. **SNCR** - An SNCR system has been included in the design to minimise oxides of nitrogen ("NO_x") emissions from the combustion process. In the SNCR process, the injected ammonia reduces NO_x emissions by chemically reducing the NO_x to nitrogen and water.

4.5.13. **Boiler** - the heat contained within the flue gas will be recovered by means of an integral water tube boiler.

4.5.14. **Steam Turbine** - the turbine will be used to convert the steam energy into kinetic energy and drive a generator to produce electrical power in a highly efficient manner. It has been designed to accept the total steam flow produced by the combustion water steam process.

4.5.15. **Air Cooled Condenser** - an air cooled condenser is provided. This is designed to condense the total amount of exhaust steam, including that from the turbine and allows for maximum flexibility against variations in thermal load and/or ambient variation.

4.5.16. **Grid Connection** – a new connection to the local electricity network would be required to export electricity off site. The substation will be located within the Installation boundary, from where cabling will run underground to the base of the quarry void, prior to overhead cable to the electricity pylon as shown on ECL Drawing ECL.001.01.01-002 in Technical Appendix 4-1.

4.5.17. **CHP** – the Installation will be CHP ready ("CHP-R"). In accordance with the EA definition[1], the term CHP-R in this context represents a plant which is initially configured to generate electrical power only but which is designed to be ready, with minimum modification, to supply heat in the future. The term 'minimum modification' represents an ability to supply heat in the future without significant modification of the original plant / equipment. Given the uncertainty of future heat loads, the initial electrical efficiency of a CHP-R plant (before any opportunities for the supply of heat are realised) should be no less than that of the equivalent non-CHP-R plant. The Buttington ERF has the provision of a high pressure steam bleed valve being incorporated on the upstream side of the turbine within the facility. No

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296450/LIT_7978_e06fa0.pdf

other district heating infrastructure is envisaged at this time due to lack of demand. However, this approach is consistent with the EA's CHP-R definition above.

Emissions Controls

4.5.18. Emissions controls from the Installation will comprise the following elements:

- flue gas treatment to remove NO_x, acid gases, particulate material, volatile metals and organic micropollutants;
- induced draught (ID) fan to discharge the treated flue gasses via the 70m high stack. It should be noted that the suitability of the stack height has been determined by dispersion modelling (see ECL report reference ECL.001.01.01/ADM in Technical Appendix 6-1). The stack will be equipped with the continuous emissions monitoring systems;
- discharge stack;
- duplicate continuous emissions monitoring systems to ensure that, in the event of a failure in the duty system, continuous monitoring of emissions to air will continue using the stand-by system; and
- odour control, the atmosphere control system will duct the air from the Waste Reception Hall into the combustion chamber to be used as combustion air within the combustion process.

Ancillary Controls

4.5.19. An emergency diesel generator is provided and this is designed to ensure a safe shutdown of process equipment in the case of a total loss of electrical power (main line from the grid and turbo-generator).

4.5.20. Fire protection systems will be installed to all required areas of the Installation. All systems will comply with the relevant British and European Standards and the relevant Codes of Practice. All fire prevention measures are detailed in the Fire Prevention Plan (ECL Document ECL.001.01.01/FPP) which will be submitted as part of the Environmental Permit Application.

4.5.21. The Installation will be operated and controlled via a comprehensive range of fully networked system management, control and safety measures and systems to ensure that the plant can be safely operated at maximum efficiency at all times. The proposed Main Control and Supervision System consists of a Distributed Digital Control System ("DCS") organised on several levels to monitor and control the Installation.

4.5.22. The combustion control system controls the feeding of fuel to the grate. It also includes the oxygen controller, which determines/corrects the combustion air flow to maintain optimum combustion conditions and maintain steam flow.

4.5.23. The boiler control system maintains the steam temperature of the boiler and controls the water level in the boiler drum to maintain the steam flow.

4.5.24. A comprehensive range of alarms and indicators is provided throughout the Installation. There will be no by-pass systems at the Installation that discharge directly to the main stack.

4.5.25. In the event of a major system failure, the Installation will have the capability of being closed down in a controlled manner through an integrated emergency stop procedure initiated in the Control Room.

4.6. Management of the ERF

Environmental Management

4.6.1. The site will be operated under an Environmental Permitting Regulations Permit ("EPR Permit"), issued and regulated by Natural Resources Wales ("NRW"). The EPR Permit will identify the potential for effects upon public amenity and ensure that management measures are adopted to minimise these effects to ensure that the Buttington ERF is operated in a sound environmental manner and does not give rise to unacceptable environmental impact.

4.6.2. In addition to the Environmental Permit the site will be managed in accordance with ISO 14001 (Environmental Management).

4.6.3. The potential impacts of the Buttington ERF are described in detail in each of the KEA Chapters. Where mitigation measures are required these have been described and are summarised in Chapter 16 of this ES.

Vermin and Pest Control

4.6.4. All waste will be delivered to the enclosed waste reception hall and deposited within waste bunker. Regular inspections of the site will ensure litter within and adjacent to the site that could attract vermin will be collected and disposed of.

4.6.5. The waste reception hall will be cleaned daily to ensure that material that could attract rodents or other pests does not accumulate.

4.6.6. **Odour**

4.6.7. Odours beyond the site boundary are unlikely on the basis that all operations occur within an enclosed building. Any odour within the waste reception hall will be prevented from escaping the reception hall and waste bunker as the air within the building is retained under negative pressure. This is achieved through the extraction of air from the tipping hall by forced draught fans which feed the combustion process.

4.6.8. Site operatives will be trained to operate a first in first out system, so that waste is not kept in the waste bunker for longer than two to three days.

4.6.9. In addition, anaerobic conditions within the refuse bunkers will be prevented by regular mixing of the waste by the crane operators.

4.6.10. No odours will be emitted from the main stack as all odorous compounds will be destroyed due to the high temperatures achieved (850°C) within the combustion process.

4.6.11. All deliveries of waste will be within enclosed or sheeted delivery vehicles. All delivery vehicles entering the site will be inspected by the gatehouse operator to ensure that they are appropriately enclosed. Any drivers failing to comply with site regulations will be warned and breaches reported in accordance with the Site's environmental management system.

Dust

4.6.12. Dust emissions from the Installation are unlikely to occur as all process operations are undertaken within enclosed buildings. Dust arising from vehicle movement during the operational phase is unlikely as all trafficked areas will be hard surfaced.

4.6.13. During prolonged periods of dry weather the site roads could be washed, if the potential for fugitive dust impacts resulting from traffic movements are identified by the Installation's Environmental Manager.

4.6.14. Bottom ash storage, handling and loading will occur within an enclosed building. The doors of the bottom ash processing building will remain closed at all times other than for access to vehicles collecting material for transport off-site.

Litter

4.6.15. The site will be operated to ensure it is kept in a clean and tidy condition. Good housekeeping measures will be defined within the Installation's EMS to prevent the release of litter from site operations and from the site boundary.

4.6.16. All vehicles delivering waste to the site will be required to be adequately covered, thus mitigating the escape of litter onto the public highway, or other areas outside the Installation boundary.

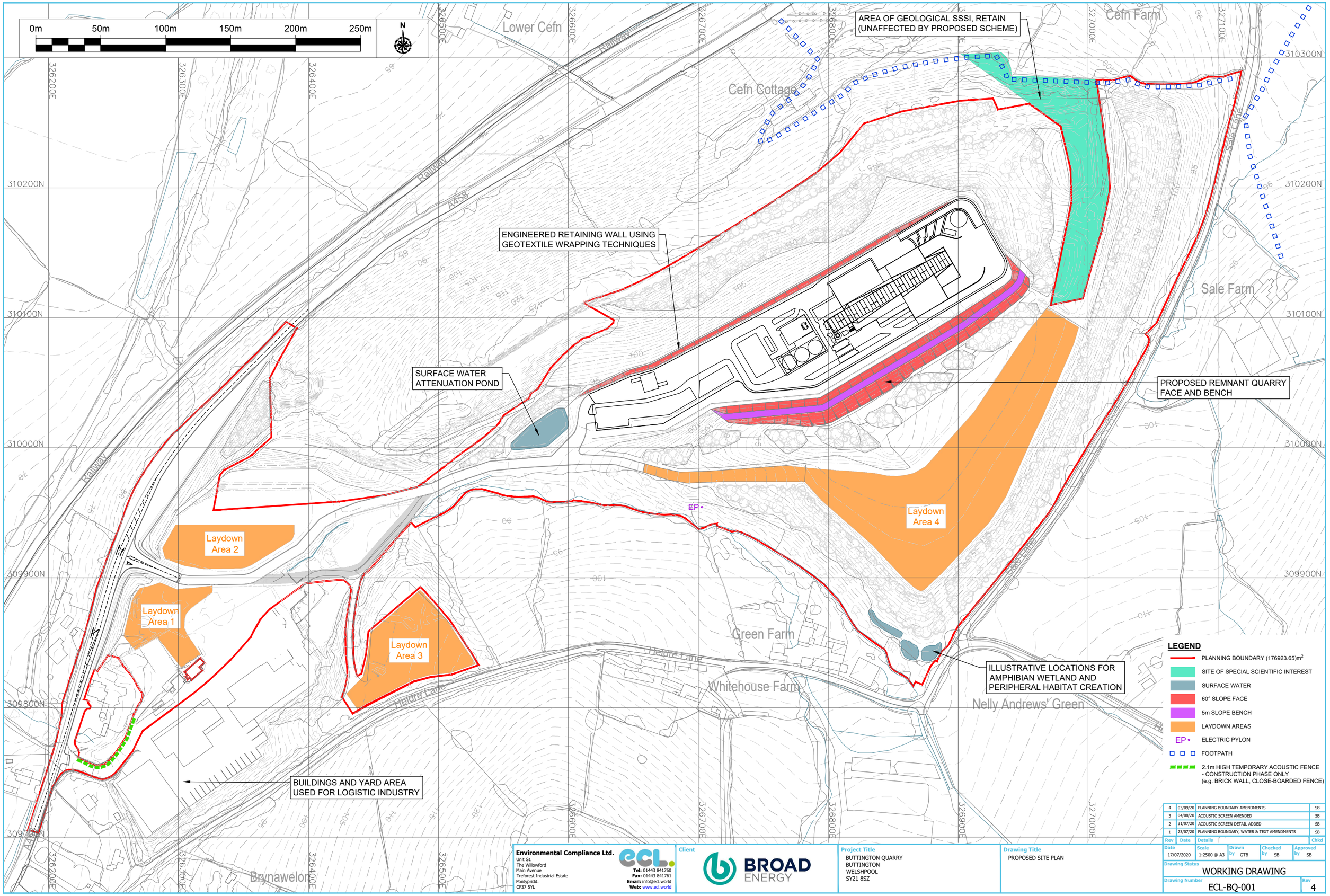
4.6.17. Drivers will only be allowed to un-sheet vehicles after entering the waste reception hall. If any drivers fail to comply with site regulations will be warned and breaches reported in accordance with the Installation's EMS. If repeated offences occur then drivers will be banned from accessing the site.

4.6.18. All unloading of waste will be undertaken within the confines of the waste reception hall, which, as described above will be controlled under negative air pressure. This will ensure litter cannot escape the building.

4.6.19. The Installation is located within a quarry, and also secured by a 2.4m high fence which will prevent litter from being blown beyond the site boundary. The internal and external boundaries of the Installation will be inspected daily and any litter will be collected and disposed of.

Technical Appendix 4-1
Drawings

- ECL-BQ-001: Proposed Site Plan
- ECL.001.01.01-002: Electricity Connection
- BT1180-D1V1: Access Plan



LEGEND

- PLANNING BOUNDARY (176923.65)m²
- SITE OF SPECIAL SCIENTIFIC INTEREST
- SURFACE WATER
- 60° SLOPE FACE
- 5m SLOPE BENCH
- LAYDOWN AREAS
- EP • ELECTRIC PYLON
- FOOTPATH
- 2.1m HIGH TEMPORARY ACOUSTIC FENCE - CONSTRUCTION PHASE ONLY (e.g. BRICK WALL, CLOSE-BOARDED FENCE)

Rev	Date	Details	Chkd
4	03/09/20	PLANNING BOUNDARY AMENDMENTS	SB
3	04/08/20	ACOUSTIC SCREEN AMENDED	SB
2	31/07/20	ACOUSTIC SCREEN DETAIL ADDED	SB
1	23/07/20	PLANNING BOUNDARY, WATER & TEXT AMENDMENTS	SB

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Client: BROAD ENERGY

Project Title: BUTTINGTON QUARRY, BUTTINGTON, WELSHPOOL, SY21 8SZ

Drawing Title: PROPOSED SITE PLAN

Date	Scale	Drawn by	Checked by	Approved by
17/07/2020	1:2500 @ A3	GTB	SB	SB

Drawing Status: WORKING DRAWING

Drawing Number: ECL-BQ-001 Rev: 4

0m 50m 100m 150m 200m 250m

N

LEGEND

- PLANNING BOUNDARY (176923.65)m²
- SITE OF SPECIAL SCIENTIFIC INTEREST
- CUSTOMER SUBSTATION
- BELOW GROUND CABLE
- ABOVE GROUND CABLE
- EP • ELECTRIC PYLON

Rev	Date	Details	Chkd
B	03/09/20	PLANNING BOUNDARY AMENDMENTS	SB
A	27/02/20	CHANGE OF SUBSTATION LOCATION	SB

Date	Scale	Drawn by	Checked by	Approved by
05/08/2019	1:2500 @ A3	GTB	SB	SB

Drawing Status: WORKING DRAWING

Drawing Number: ECL.001.01.01-002

Rev: B

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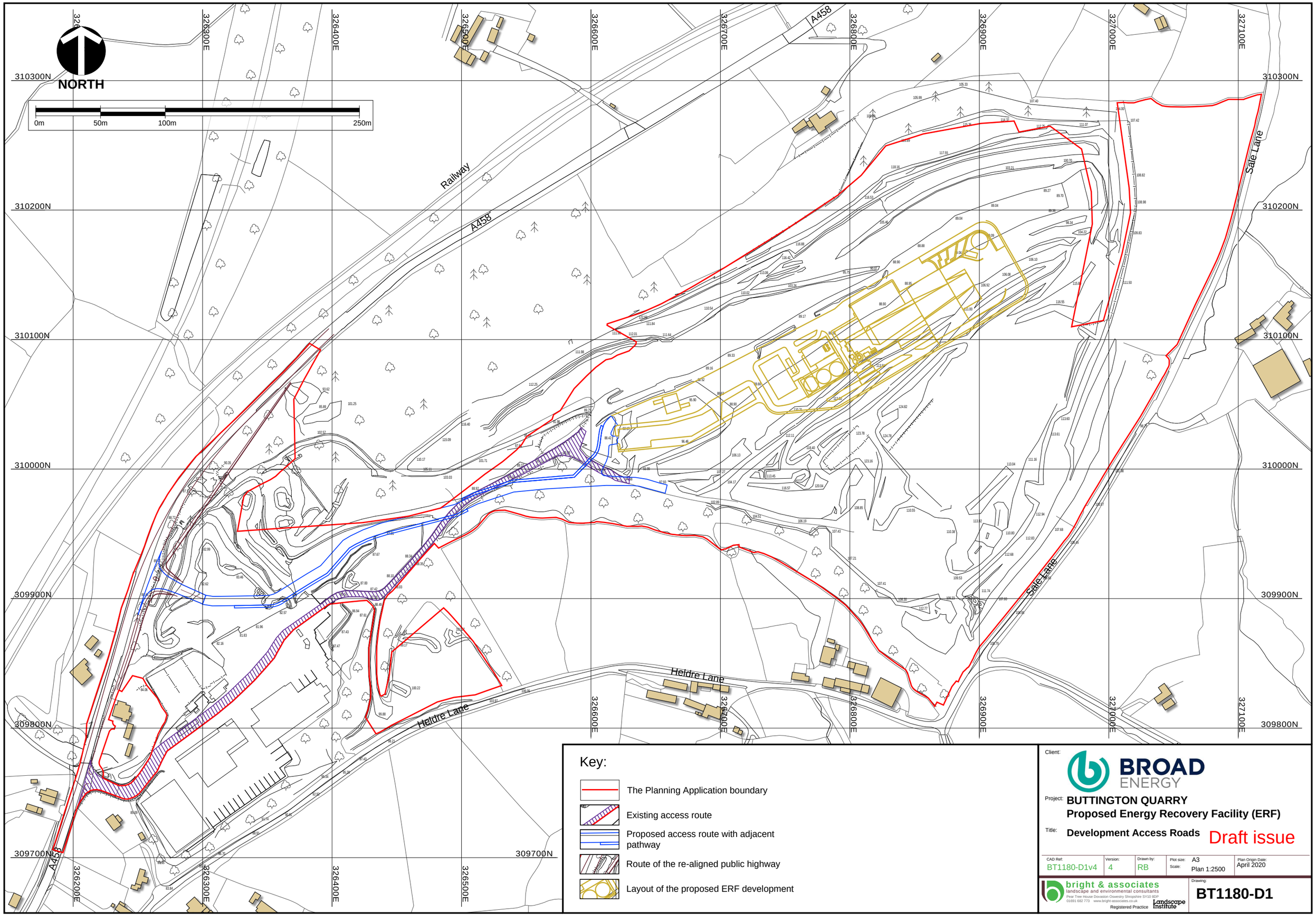
Client: BROAD ENERGY

Project Title: BUTTINGTON QUARRY, BUTTINGTON, WELSHPOOL, SY21 8SZ

Drawing Title: ELECTRICITY CONNECTION



Client: BROAD ENERGY

Project: **BUTTINGTON QUARRY**
Proposed Energy Recovery Facility (ERF)

Title: **Development Access Roads** Draft issue

CAD Ref:	Version:	Drawn by:	Plot size: / Scale:	Plan Origin Date:
BT1180-D1v4	4	RB	A3 / Plan 1:2500	April 2020

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Registered Practice Landscape Institute

Drawing: **BT1180-D1**

Technical Appendix 4-2

Lighting Strategy

- DRAWING: 4052-ID-DR-1001 (2 sheets)
- Lighting Calculations
- Lighting Risk Assessment

ISOLINE LEGEND

- = 0.2 LUX
- = 0.5 LUX
- = 1 LUX
- = 2 LUX
- = 4 LUX
- = 5 LUX
- = 10 LUX
- SITE BOUNDARY

LUMINAIRE LEGEND

- X1A — IP66 4000K LED LUMINAIRE POST TOP MOUNTED ON A 6M COLUMN. AS KINGFISHER ITALO 1 WITH STW OPTIC (3270 LUMENS/28W/ 700mA) OR EQUAL AND APPROVED
- X1B — IP66 4000K LED LUMINAIRE BUILDING MOUNTED AT 6M WITH 0.3M OUTREACH BRACKET, MOUNTED HORIZONTALLY WITH NO UPWARD TILT. AS KINGFISHER ITALO 1 WITH STW OPTIC (3270 LUMENS/28W/ 700mA) OR EQUAL AND APPROVED
- X2 — IP66 4000K LED LUMINAIRE POST TOP MOUNTED ON A 6M COLUMN. AS KINGFISHER ITALO 1 WITH S05 OPTIC (4930 LUMENS/44W/ 525mA) OR EQUAL AND APPROVED
- X3A — IP66 3000K LED LUMINAIRE POST TOP MOUNTED ON A 6M COLUMN. AS KINGFISHER ITALO 1 WITH STW OPTIC (3040 LUMENS/28W/ 700mA) C/W IP NODE, PIR, SIGNAL REPEATER AS REQUIRED. OR EQUAL AND APPROVED
- X3B — IP66 3000K LED LUMINAIRE POST TOP MOUNTED ON A 6M COLUMN. AS KINGFISHER ITALO 1 WITH STW OPTIC (3040 LUMENS/28W/ 700mA) C/W IP NODE, PIR, SIGNAL REPEATER AS REQUIRED. OR EQUAL AND APPROVED
- X4 — IP65 4000K LED WALL MOUNTED LUMINAIRE WITH DOWNWARD DIRECTIONAL DISTRIBUTION MOUNTED AT APPROX. 2M AFFL. AS KINGFISHER QUARTO WITH STREET OPTIC (727 LUMENS/ 8W) OR EQUAL AND APPROVED
- X5 — IP665 4000K LED HIGH BAY LUMINAIRE MOUNTED AT APPROX 7.5M AFFL. AS KINGFISHER HIGH BAY S, FACTORY LIMITED TO 50% OUTPUT (1103 LUMENS/ 40W @ FULL OUTPUT) OR EQUAL AND APPROVED
- X6A — IP66 4000K LED LUMINAIRE POST TOP MOUNTED ON A 6M COLUMN. AS KINGFISHER ITALO 1 WITH S05 OPTIC (3690 LUMENS/30W/ 525mA) OR EQUAL AND APPROVED
- X6B — IP66 4000K LED LUMINAIRE BUILDING MOUNTED AT 6M WITH 0.3M OUTREACH BRACKET, MOUNTED HORIZONTALLY WITH NO UPWARD TILT. AS KINGFISHER ITALO 1 WITH S05 OPTIC (3690 LUMENS/30W/ 525mA) OR EQUAL AND APPROVED
- X7 — IP66 3000K LED LUMINAIRE POST TOP MOUNTED ON A 6M COLUMN. AS KINGFISHER ITALO 1 WITH STW OPTIC (4800 LUMENS/39W/ 525mA) C/W IP NODE, PIR, SIGNAL REPEATER AS REQUIRED.OR EQUAL AND APPROVED
- ✳ — DENOTES LUMINAIRES AT THE BAT CROSSING POINT WHICH ARE TO HAVE EXTERNAL BACK SHIELDS FITTED AND TO BE SWITCHED OFF WHEN THE ROAD IS NOT IN USE. REFER TO NOTES.

9. MOUNTING HEIGHTS OF 6M HAVE PREDOMINANTLY BEEN UTILISED TO MINIMISE LIGHTING IMPACTS, WITH 8M MOUNTING HEIGHTS USED WHERE NECESSARY.

10. EXTERNAL BACK LIGHT SHIELDS TO BE PROVIDED AS INDICATED. THE EFFECT OF THESE BACKSHIELDS IS NOT REFLECTED BY THE ISOLINES ON THE DRAWING, AS PHOTOMETRIC DATA IS NOT AVAILABLE FOR THIS COMPONENT. HOWEVER, IT IS PREDICTED THAT BACK SPILL WILL BE DECREASED BY APPROXIMATELY 2-3 METRES WHEN CONSIDERING THE 0.5 LUX ISOLINE.

11. **CONTROL STRATEGY**

THE EXTERNAL LIGHTING SHOWN IS INTENDED TO OPERATE ALL NIGHT, DUSK TILL DAWN, WITH THE EXCEPTION OF THE ACCESS ROAD, AS DESCRIBED BELOW AND THE FIRE WATER STORAGE AREA WHICH WILL OPERATE AS REQUIRED FOR MAINTENANCE AND EMERGENCY SITUATIONS BY MANUAL OPERATION. ALL EXTERNAL LIGHTING SHALL HAVE PRIMARY PHOTOCELL CONTROL TO ENSURE IT IS NOT OPERATIONAL DURING DAYLIGHT HOURS.

IT IS INTENDED THAT LIGHTING ALONG THE ACCESS ROAD WHEN IT IS NOT IN USE WILL BE DIMMED DURING THE NIGHT TO 50%, WITH THE 3 LIGHTING COLUMNS AT THE BAT CROSSING POINT SWITCHED OFF. WHEN TRAFFIC/PEDESTRIANS ARE DETECTED BY THE BUILT IN PIRS (MOVEMENT DETECTORS) IN EACH LUMINAIRE, ALL LUMINAIRES WILL INCREASE THEIR OUTPUT/ SWITCH ON TO FULL BRIGHTNESS. LUMINAIRES CLOSEST TO THE ACCESS JUNCTION SHOULD OPERATE AT FULL OUTPUT DUSK TILL DAWN. A CONTROL SYSTEM WILL BE REQUIRED THAT INCLUDES A LITE IP NODE AND PIR SENSOR TO EACH LUMINAIRE (REFERENCES X3 AND X7). SIGNAL REPEATERS WILL BE REQUIRED TO LUMINAIRES ALONG THE ACCESS ROAD (EXPECTED TO BE 1 IN EVERY 3) TO ENSURE THE SIGNAL IS MAINTAINED THROUGHOUT THE LENGTH OF THE INSTALLATION. A COLLATOR WILL ALSO BE REQUIRED WHICH WILL NEED TO BE LOCATED EITHER IN THE GATEHOUSE OF OFFICE BUILDING, AND WILL EITHER BE CONNECTED A COMPUTER WITH INTERNET CONNECTION VIA AN RS232 PORT OR PROVIDED WITH ITS OWN 3G SIGNAL. ADDITIONAL SIGNAL REPEATERS WILL BE REQUIRED BETWEEN THE ACCESS ROAD AND THE COLLATOR LOCATION TO MAINTAIN THE SIGNAL.

THE CONTROL STRATEGY SHOULD BE DEVELOPED AT THE DETAILED/ TECHNICAL DESIGN STAGE. THE CONTROL SYSTEM, PARTICULARLY TO THE ACCESS ROAD, SHOULD BE TESTED AND COMMISSIONED TO ENSURE IT IS WORKING CORRECTLY TO ALLOW SAFE ACCESS AND EGRESS. IT SHOULD BE TESTED ON A REGULAR BASIS TO ENSURE CORRECT OPERATION IS MAINTAINED, INCLUDING CHECKING THAT PIRS ARE WORKING CORRECTLY.

12. THIS DRAWING REPRESENTS A LIGHTING STRATEGY PREPARED FOR THE PLANNING APPLICATION STAGE. LUMINAIRE POSITIONS ARE INDICATIVE AND WILL BE SUBJECT TO FINAL SITE LAYOUT AND DETAILED DESIGN.

13. REFER TO ACCOMPANYING DESIGNERS RISK ASSESSMENT FOR DETAILS OF DESIGN RISKS IDENTIFIED.

14. EMERGENCY LIGHTING DESIGN TO BE PROVIDED AT THE DETAILED / TECHNICAL DESIGN STAGE.

NOTES

1. LIGHTING LEVELS FOR EACH AREA HAVE BEEN DESIGNED IN ACCORDANCE WITH BS EN 12464-2 FOR OUTDOOR WORKPLACES FOLLOWING LIAISON WITH THE CLIENT AND DESIGN TEAM TO ASCERTAIN TYPE OF TASK OR ACTIVITY IN EACH AREA. SEE BELOW.

   MAIN VEHICULAR AND PEDESTRIAN ROUTES AROUND THE SITE - DEFINED AS TRAFFIC AREAS FOR SLOWLY MOVING VEHICLES (MX 10KMH) E.G. BIKES, TRUCKS AND EXCAVATORS - 10 LUX AVERAGE ILLUMINANCE AND 0.4 UNIFORMITY
   PEDESTRIAN ROUTES- 5 LUX AVERAGE ILLUMINANCE AND 0.25 UNIFORMITY
   CAR PARKING- DEFINED AS FOR MEDIUM TRAFFIC - 10 LUX AVERAGE ILLUMINANCE AND 0.25 UNIFORMITY
   ACCESS ROAD -DESIGNED TO A P4 CLASS IN ACCORDANCE WITH BS 5489 – 5 LUX AVERAGE ILLUMINANCE AND 1 LUX MINIMUM

2. ADDITIONAL LOCALISED LIGHTING WILL BE REQUIRED TO THE LADDERS AND PLATFORMS, PARTICULARLY TO THE TOP OF THE FLY ASH AND APCR SILOS TO BE USED IN EMERGENCY OR MAINTENANCE SITUATIONS. THIS ADDITIONAL LIGHTING WILL BE DESIGNED AT THE DETAILED/ TECHNICAL DESIGN STAGE WHEN DETAILED WORKING DRAWINGS ARE AVAILABLE. IT IS NOT PREDICTED THAT THIS LIGHTING WILL INCREASE THE PREDICATED LIGHT SPILL AS IT WILL BE LOCALISED, AND WILL OPERATE TEMPORARILY AS REQUIRED, RATHER THAN ALL NIGHT, IT WILL BE CONTROLLED EITHER BY MANUAL SWITCHING OR TIMED OPERATION TO SUIT THE SITE REQUIREMENTS.

3. ANY LIGHTING THAT MAY BE REQUIRED TO THE A458 ACCESS JUNCTION IS NOT INCLUDED IN THE SCOPE OF THIS EXTERNAL LIGHTING STRATEGY, AND SHOULD BE PROVIDED IN ACCORDANCE WITH LOCAL AUTHORITY REQUIREMENTS, AND COORDINATED WITH THE ACCESS ROAD DESIGN, AS REQUIRED.

4. AIRCRAFT WARNING LIGHTS ARE NOT SHOWN ON THIS STRATEGY, ALTHOUGH THEY ARE PROPOSED AS A SAFETY REQUIREMENT. REFER TO CHAPTER 4 OF THE EIA FOR FURTHER DETAILS.

5. LEVELS OF ILLUMINANCE ARE CALCULATED AND SHOWN HORIZONTALLY AT GROUND LEVEL. CALCULATIONS ARE BASED ON LUMINAIRES AT FULL OUTPUT/ MAINTENANCE FACTOR = 1 TO REPRESENT THE WORST CASE SCENARIO.

6. THE ENVIRONMENTAL LIGHTING ZONE FOR THE SITE IS ASSUMED TO BE E2, IN ACCORDANCE WITH A SITE LOCATED WITHIN A RURAL LOCATION. THE PROPOSED LIGHTING HAS BEEN DESIGNED TO THE PARAMETERS OF AN E2 ZONE, IN ACCORDANCE WITH ILP GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT GN01.

7. LUMINARES HAVE BEEN SELECTED THAT HAVE 3000K WARM WHITE LED LIGHT SOURCES FOR THE SITE ACCESS ROADS TO MINIMISE THE IMPACT ON BATS.

8. DOWNWARD DIRECTIONAL LUMNAIRES HAVE BEEN SELECTED, WITH UPWARD LIGHT RATIO'S OF 0% TO LIMIT THE IMPACT ON BATS, ON THE ENVIRONMENT AND TO COMPLY WITH THE REQUIREMENTS OF AN E2 ZONE.

Rev	Details	Drn / Chkd	Date
P01	FIRST ISSUE	MB SB	14/08/20

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Client: ENVIRONMENTAL COMPLIANCE LIMITED

Project: BUTTINGTON QUARRY

Drawing Title: EXTERNAL LIGHTING STRATEGY
FULL OUTPUT SHOWN
MF=1
SHEET 1 OF 2

Scale at: A0 @ 1:500

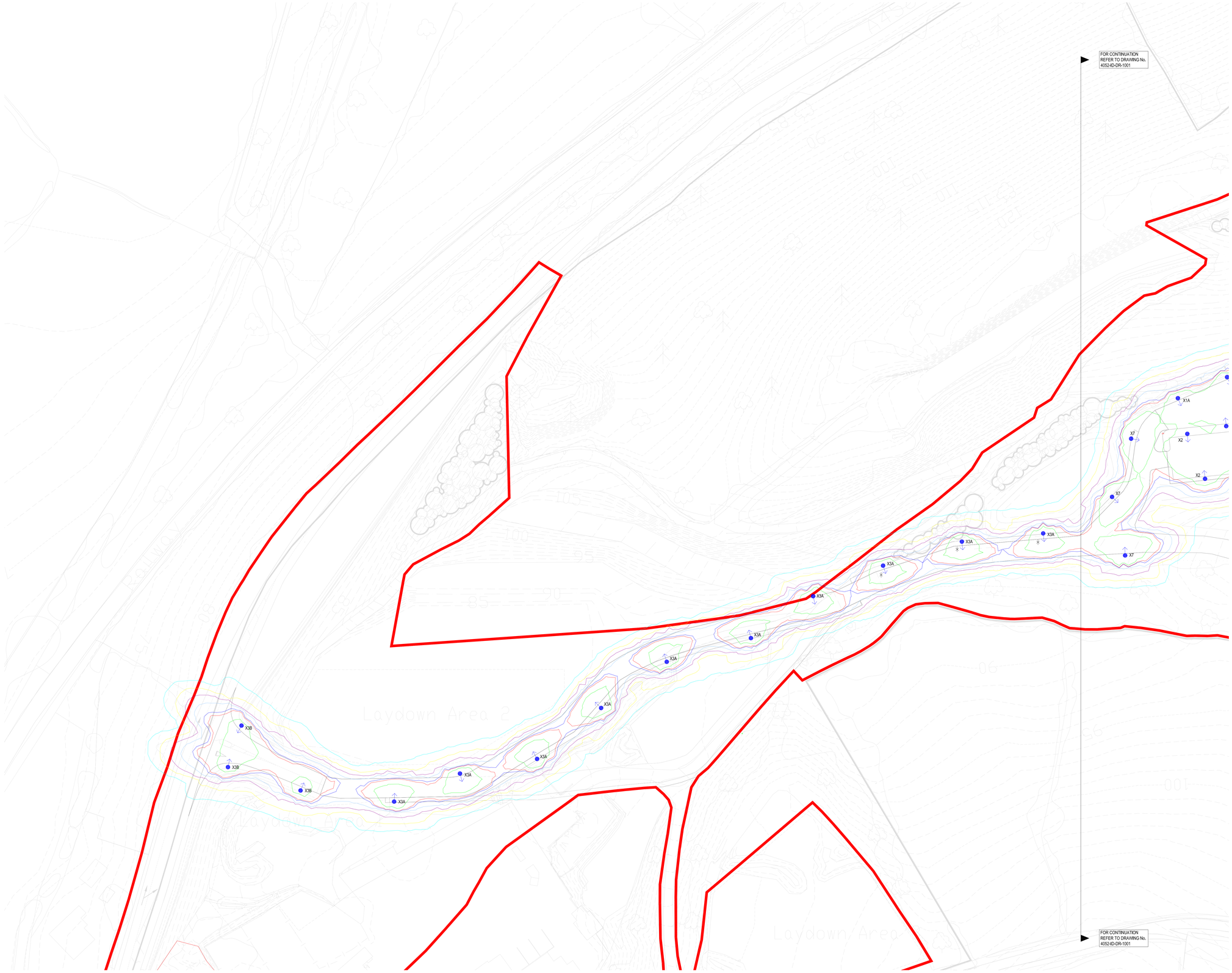
Discipline: LIGHTING

Drawing Number: 4052-ID-DR-1001

Status: PLANNING

Rev: P01

A0 - Do not scale



ISOLINE LEGEND

- = 0.2 LUX
- = 0.5 LUX
- = 1 LUX
- = 2 LUX
- = 4 LUX
- = 5 LUX
- = 10 LUX
- SITE BOUNDARY

LUMINAIRE LEGEND

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- ✳ — DENOTES LUMINAIRES AT THE BAT CROSSING POINT WHICH ARE TO HAVE EXTERNAL BACK SHIELDS FITTED AND TO BE SWITCHED OFF WHEN THE ROAD IS NOT IN USE. REFER TO NOTES.

NOTES

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   - CAR PARKING -DEFINED AS FOR MEDIUM TRAFFIC - 10 LUX AVERAGE ILLUMINANCE AND 0.25 UNIFORMITY
   - ACCESS ROAD -DESIGNED TO A P4 CLASS IN ACCORDANCE WITH BS 5489 - 5 LUX AVERAGE ILLUMINANCE AND 1 LUX MINIMUM
2. ADDITIONAL LOCALISED LIGHTING WILL BE REQUIRED TO THE LADDERS AND PLATFORMS, PARTICULARLY TO THE TOP OF THE FLY ASH AND APCR SILOS TO BE USED IN EMERGENCY OR MAINTENANCE SITUATIONS. THIS ADDITIONAL LIGHTING WILL BE DESIGNED AT THE DETAILED TECHNICAL DESIGN STAGE WHEN DETAILED WORKING DRAWINGS ARE AVAILABLE. IT IS NOT PREDICTED THAT THIS LIGHTING WILL INCREASE THE PREDICATED LIGHT SPILL AS IT WILL BE LOCALISED, AND WILL OPERATE TEMPORARILY AS REQUIRED, RATHER THAN ALL NIGHT. IT WILL BE CONTROLLED EITHER BY MANUAL SWITCHING OR TIMED OPERATION TO SUIT THE SITE REQUIREMENTS.
3. ANY LIGHTING THAT MAY BE REQUIRED TO THE A458 ACCESS JUNCTION IS NOT INCLUDED IN THE SCOPE OF THIS EXTERNAL LIGHTING STRATEGY, AND SHOULD BE PROVIDED IN ACCORDANCE WITH LOCAL AUTHORITY REQUIREMENTS, AND COORDINATED WITH THE ACCESS ROAD DESIGN, AS REQUIRED.
4. AIRCRAFT WARNING LIGHTS ARE NOT SHOWN ON THIS STRATEGY, ALTHOUGH THEY ARE PROPOSED AS A SAFETY REQUIREMENT. REFER TO CHAPTER 4 OF THE EIA FOR FURTHER DETAILS.
5. LEVELS OF ILLUMINANCE ARE CALCULATED AND SHOWN HORIZONTALLY AT GROUND LEVEL. CALCULATIONS ARE BASED ON LUMINAIRES AT FULL OUTPUT/ MAINTENANCE FACTOR = 1 TO REPRESENT THE WORST CASE SCENARIO.
6. THE ENVIRONMENTAL LIGHTING ZONE FOR THE SITE IS ASSUMED TO BE E2. IN ACCORDANCE WITH A SITE LOCATED WITHIN A RURAL LOCATION. THE PROPOSED LIGHTING HAS BEEN DESIGNED TO THE PARAMETERS OF AN E2 ZONE, IN ACCORDANCE WITH ILP GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT GN01,
7. LUMINARES HAVE BEEN SELECTED THAT HAVE 3000K WARM WHITE LED LIGHT SOURCES FOR THE SITE ACCESS ROADS TO MINIMISE THE IMPACT ON BATS.
8. DOWNWARD DIRECTIONAL LUMINAIRES HAVE BEEN SELECTED, WITH UPWARD LIGHT RATIO'S OF 0% TO LIMIT THE IMPACT ON BATS, ON THE ENVIRONMENT AND TO COMPLY WITH THE REQUIREMENTS OF AN E2 ZONE.
9. MOUNTING HEIGHTS OF 6M HAVE PREDOMINANTLY BEEN UTILISED TO MINIMISE LIGHTING IMPACTS, WITH 8M MOUNTING HEIGHTS USED WHERE NECESSARY.
10. EXTERNAL BACK LIGHT SHIELDS TO BE PROVIDED AS INDICATED. THE EFFECT OF THESE BACKSHIELDS IS NOT REFLECTED BY THE ISOLINES ON THE DRAWING, AS PHOTOMETRIC DATA IS NOT AVAILABLE FOR THIS COMPONENT. HOWEVER, IT IS PREDICTED THAT BACK SPILL WILL BE DECREASED BY APPROXIMATELY 2-3 METRES WHEN CONSIDERING THE 0.5 LUX ISOLINE.
11. **CONTROL STRATEGY**

    THE EXTERNAL LIGHTING SHOWN IS INTENDED TO OPERATE ALL NIGHT, DUSK TILL DAWN, WITH THE EXCEPTION OF THE ACCESS ROAD, AS DESCRIBED BELOW AND THE FIRE WATER STORAGE AREA WHICH WILL OPERATE AS REQUIRED FOR MAINTENANCE AND EMERGENCY SITUATIONS BY MANUAL OPERATION. ALL EXTERNAL LIGHTING SHALL HAVE PRIMARY PHOTOCELL CONTROL TO ENSURE IT IS NOT OPERATIONAL DURING DAYLIGHT HOURS.

    IT IS INTENDED THAT LIGHTING ALONG THE ACCESS ROAD WHEN IT IS NOT IN USE WILL BE DIMMED DURING THE NIGHT TO 50%, WITH THE 3 LIGHTING COLUMNS AT THE BAT CROSSING POINT SWITCHED OFF. WHEN TRAFFIC/PEDESTRIANS ARE DETECTED BY THE BUILT IN PIRS (MOVEMENT DETECTORS) IN EACH LUMINAIRE, ALL LUMINAIRES WILL INCREASE THEIR OUTPUT/ SWITCH ON TO FULL BRIGHTNESS. LUMINAIRES CLOSEST TO THE ACCESS JUNCTION SHOULD OPERATE AT FULL OUTPUT DUSK TILL DAWN. A CONTROL SYSTEM WILL BE REQUIRED THAT INCLUDES A LITE IP NODE AND PIR SENSOR TO EACH LUMINAIRE (REFERENCES X3 AND X7). SIGNAL REPEATERS WILL BE REQUIRED TO LUMINAIRES ALONG THE ACCESS ROAD (EXPECTED TO BE 1 IN EVERY 3) TO ENSURE THE SIGNAL IS MAINTAINED THROUGHOUT THE LENGTH OF THE INSTALLATION. A COLLATOR WILL ALSO BE REQUIRED WHICH WILL NEED TO BE LOCATED EITHER IN THE GATEHOUSE OF OFFICE BUILDING, AND WILL EITHER BE CONNECTED A COMPUTER WITH INTERNET CONNECTION VIA AN RS232 PORT OR PROVIDED WITH ITS OWN 3G SIGNAL. ADDITIONAL SIGNAL REPEATERS WILL BE REQUIRED BETWEEN THE ACCESS ROAD AND THE COLLATOR LOCATION TO MAINTAIN THE SIGNAL.

    THE CONTROL STRATEGY SHOULD BE DEVELOPED AT THE DETAILED/ TECHNICAL DESIGN STAGE. THE CONTROL SYSTEM, PARTICULARLY TO THE ACCESS ROAD, SHOULD BE TESTED AND COMMISSIONED TO ENSURE IT IS WORKING CORRECTLY TO ALLOW SAFE ACCESS AND EGRESS. IT SHOULD BE TESTED ON A REGULAR BASIS TO ENSURE CORRECT OPERATION IS MAINTAINED, INCLUDING CHECKING THAT PIRS ARE WORKING CORRECTLY.
12. THIS DRAWING REPRESENTS A LIGHTING STRATEGY PREPARED FOR THE PLANNING APPLICATION STAGE. LUMINAIRE POSITIONS ARE INDICATIVE AND WILL BE SUBJECT TO FINAL SITE LAYOUT AND DETAILED DESIGN.
13. REFER TO ACCOMPANYING DESIGNERS RISK ASSESSMENT FOR DETAILS OF DESIGN RISKS IDENTIFIED.
14. EMERGENCY LIGHTING DESIGN TO BE PROVIDED AT THE DETAILED / TECHNICAL DESIGN STAGE.

Rev	Details	Drn / Chkd	Date
P01	FIRST ISSUE	MB / SS	14/08/20

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Client: ENVIRONMENTAL COMPLIANCE LIMITED

Project: BUTTINGTON QUARRY

Drawing Title: EXTERNAL LIGHTING STRATEGY
FULL OUTPUT SHOWN
MF=1
SHEET 2 OF 2

Scale at: A0 @ 1:500

Discipline: LIGHTING

Drawing Number: 4052-ID-DR-1002

Status: PLANNING

Rev: P01

A0 - Do not scale

Buttington Quarry

Installation : External Lighting Strategy

Project number	:	4052
Customer	:	ECL
Processed by	:	BB
Date	:	13.08.2020

Table of contents

Table of contents

1 Luminaire data

1.1 AEC ILLUMINAZIONE SRL, X2 - Italo 1- S05 - 49... (!44.5w (3 modul...)

1.1.1 Data sheet

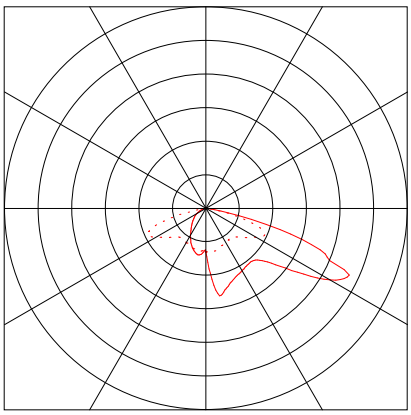
Manufacturer: AEC ILLUMINAZIONE SRL

!44.5w (3 module) 525mA Italo 1 with S05 Optic **X2 - Italo 1- S05 - 4930**

Luminaire data		
Luminaire efficiency	:	100%
Luminaire efficacy	:	112.05 lm/W
Classification	:	A20 ↓100.0% ↑0.0%
CIE Flux Codes	:	27 61 96 100 100
UGR 4H 8H	:	38.5 / 35.3
Power	:	44 W
Luminous flux	:	4930 lm

Equipped with		
Quantity	:	1
Designation	:	
Colour	:	
Luminous flux	:	4930 lm

Dimensions : 220 mm x 120 mm x 1 mm



1 Luminaire data

1.2 AEC ILLUMINAZIONE SRL, X1 - ITALO 1 0F3 STW 4... (!28w (1 module)...)

1.2.1 Data sheet

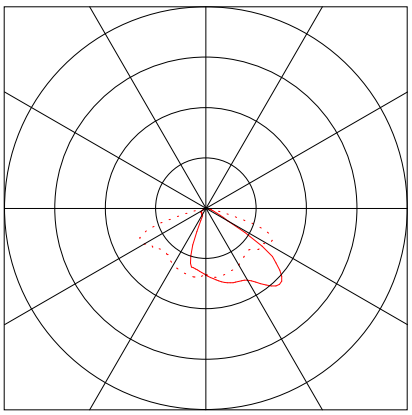
Manufacturer: AEC ILLUMINAZIONE SRL

!28w (1 module) 700mA Italo 1 with STW Optic **X1 - ITALO 1 0F3 STW 4.7-1M**

Luminaire data		
Luminaire efficiency	:	100%
Luminaire efficacy	:	116.79 lm/W
Classification	:	A40 ↓100.0% ↑0.0%
CIE Flux Codes	:	38 76 98 100 100
UGR 4H 8H	:	34.7 / 40.3
Power	:	28 W
Luminous flux	:	3270 lm

Equipped with		
Quantity	:	1
Designation	:	
Colour	:	
Luminous flux	:	3270 lm

Dimensions : 110 mm x 60 mm x 1 mm



1 Luminaire data

1.3 Kingfisher Lighting Ltd, X4 -LED Quarto.... (!7.5w LED Quarto bulkh...)

1.3.1 Data sheet

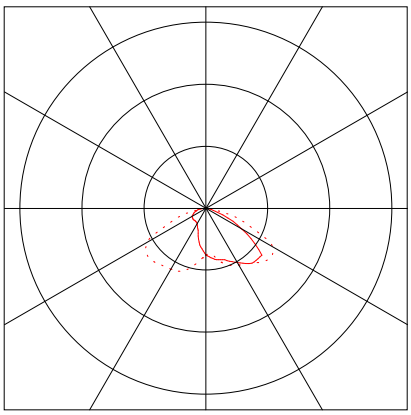
Manufacturer: Kingfisher Lighting Ltd

!7.5w LED Quarto bulkhead with street optic **X4 -LED Quarto.**

Luminaire data		
Luminaire efficiency	:	99.9%
Luminaire efficacy	:	90.78 lm/W
Classification	:	A30 ↓100.0% ↑0.0%
CIE Flux Codes	:	30 68 95 100 100
UGR 4H 8H	:	25.5 / 28.3
Power	:	8 W
Luminous flux	:	726.3 lm

Equipped with		
Quantity	:	1
Designation	:	7.5w LED
Colour	:	
Luminous flux	:	727 lm

Dimensions : 175 mm x 175 mm x 1 mm



1 Luminaire data

1.4 AEC ILLUMINAZIONE SRL, X6 - ITALO 1 0F2H1 S05... (!30.5w (2 modul...)

1.4.1 Data sheet

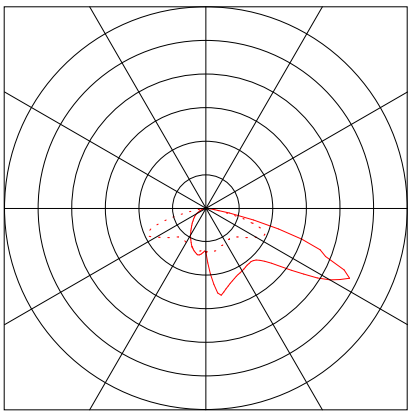
Manufacturer: AEC ILLUMINAZIONE SRL

!30.5w (2 module) 525mA Italo 1 with S05 Optic **X6 - ITALO 1 0F2H1 S05 4.5-2M**

Luminaire data		
Luminaire efficiency	:	100%
Luminaire efficacy	:	123 lm/W
Classification	:	A20 ↓100.0% ↑0.0%
CIE Flux Codes	:	27 61 96 100 100
UGR 4H 8H	:	39.9 / 36.7
Power	:	30 W
Luminous flux	:	3690 lm

Equipped with		
Quantity	:	1
Designation	:	
Colour	:	
Luminous flux	:	3690 lm

Dimensions : 220 mm x 60 mm x 1 mm



1 Luminaire data

1.5 Kingfisher Lighting Ltd, X5 - High Bay S- limit... (!40w 90x100° LE...)

1.5.1 Data sheet

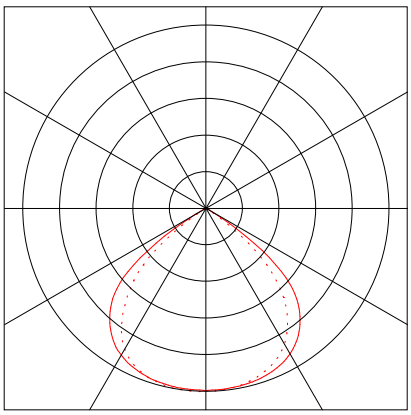
Manufacturer: Kingfisher Lighting Ltd

!40w 90x100° LED High Bay S **X5 - High Bay S- limited to 50% output**

Luminaire data		
Luminaire efficiency	:	100%
Luminaire efficacy	:	27.58 lm/W
Classification	:	A50 ↓99.7% ↑0.3%
CIE Flux Codes	:	70 99 100 100 100
UGR 4H 8H	:	21.1 / 20.2
Power	:	40 W
Luminous flux	:	1103 lm

Equipped with		
Quantity	:	1
Designation	:	40w LED
Colour	:	
Luminous flux	:	1103 lm

Dimensions : 230 mm x 79 mm x 1 mm



1 Luminaire data

1.6 AEC ILLUMINAZIONE SRL, X3 - ITALO 1 0F3 STW 3... (!28w (1 module)...)

1.6.1 Data sheet

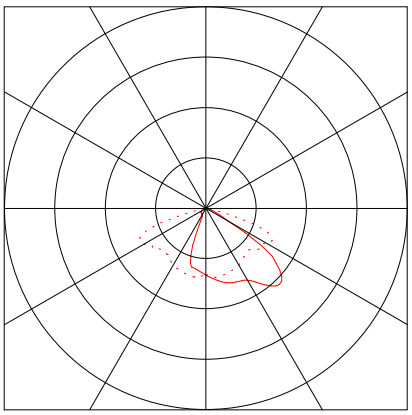
Manufacturer: AEC ILLUMINAZIONE SRL

!28w (1 module) 700mA Italo 1 with STW Optic **X3 - ITALO 1 0F3 STW 3.7-1M- 3000K**

Luminaire data		
Luminaire efficiency	:	100%
Luminaire efficacy	:	108.57 lm/W
Classification	:	A40 ↓100.0% ↑0.0%
CIE Flux Codes	:	38 76 98 100 100
UGR 4H 8H	:	34.5 / 40.0
Power	:	28 W
Luminous flux	:	3040 lm

Equipped with		
Quantity	:	1
Designation	:	
Colour	:	
Luminous flux	:	3040 lm

Dimensions : 110 mm x 60 mm x 1 mm



1 Luminaire data

1.7 AEC ILLUMINAZIONE SRL, X7 - ITALO 1 0F3 STW 3... (!39w (2 module)...)

1.7.1 Data sheet

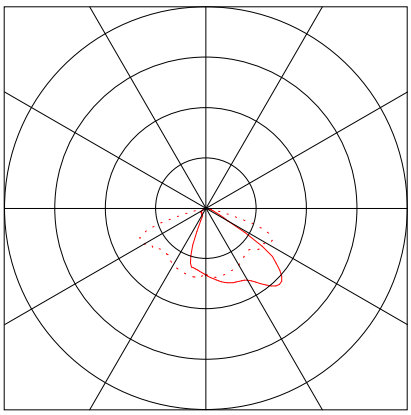
Manufacturer: AEC ILLUMINAZIONE SRL

!39w (2 module) 525mA Italo 1 with STW Optic **X7 - ITALO 1 0F3 STW 3.5-2M- 3000K**

Luminaire data		
Luminaire efficiency	:	100%
Luminaire efficacy	:	123.08 lm/W
Classification	:	A40 ↓100.0% ↑0.0%
CIE Flux Codes	:	38 76 98 100 100
UGR 4H 8H	:	33.6 / 39.2
Power	:	39 W
Luminous flux	:	4800 lm

Equipped with		
Quantity	:	1
Designation	:	
Colour	:	
Luminous flux	:	4800 lm

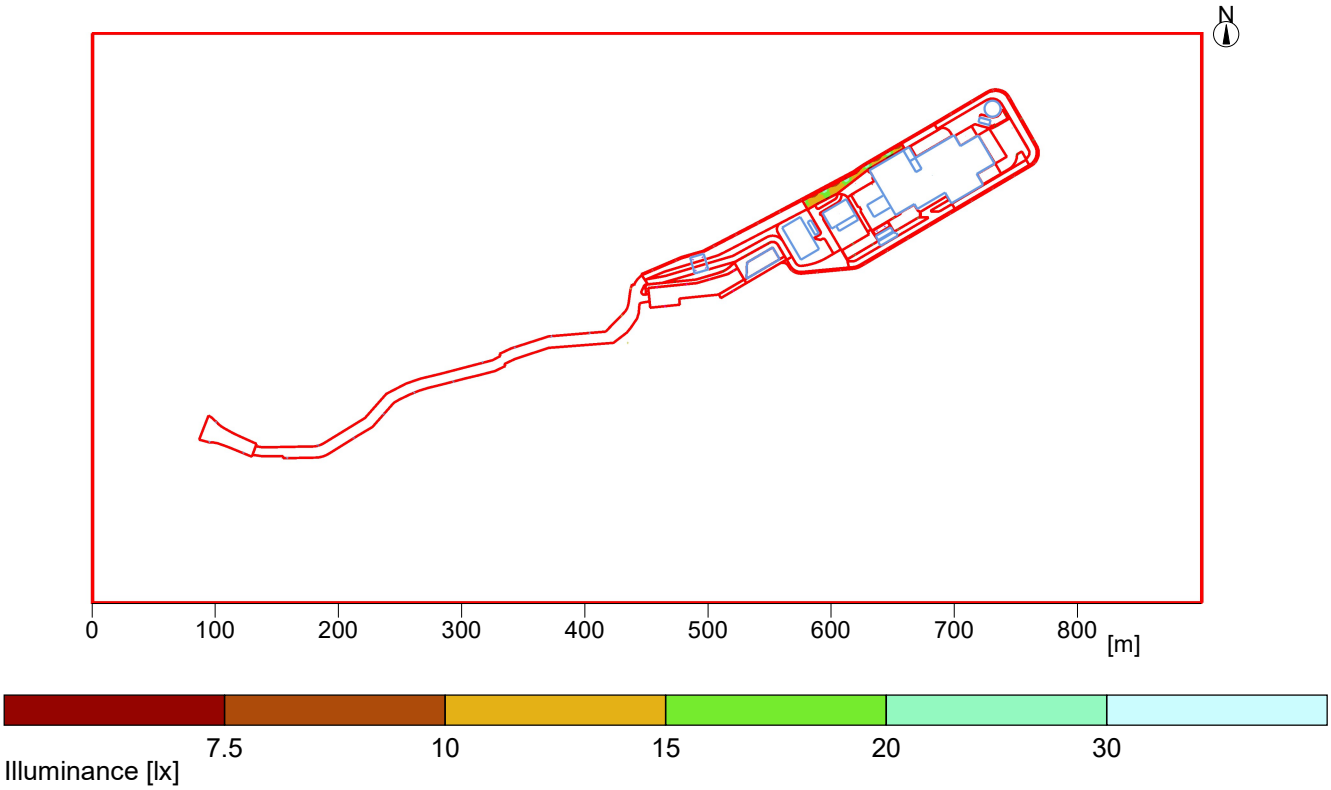
Dimensions : 220 mm x 60 mm x 1 mm



2 Site

2.1 Summary, Site

2.1.1 Result overview, Site Road 2A



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	13.3 lx
Minimum illuminance	Emin	5.9 lx
Maximum illuminance	Emax	22.2 lx
Uniformity Uo	Emin/Em	1:2.26 (0.44)
Diversity Ud	Emin/Emax	1:3.77 (0.27)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2 Site

2.1 Summary, Site

2.1.1 Result overview, Site Road 2A

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

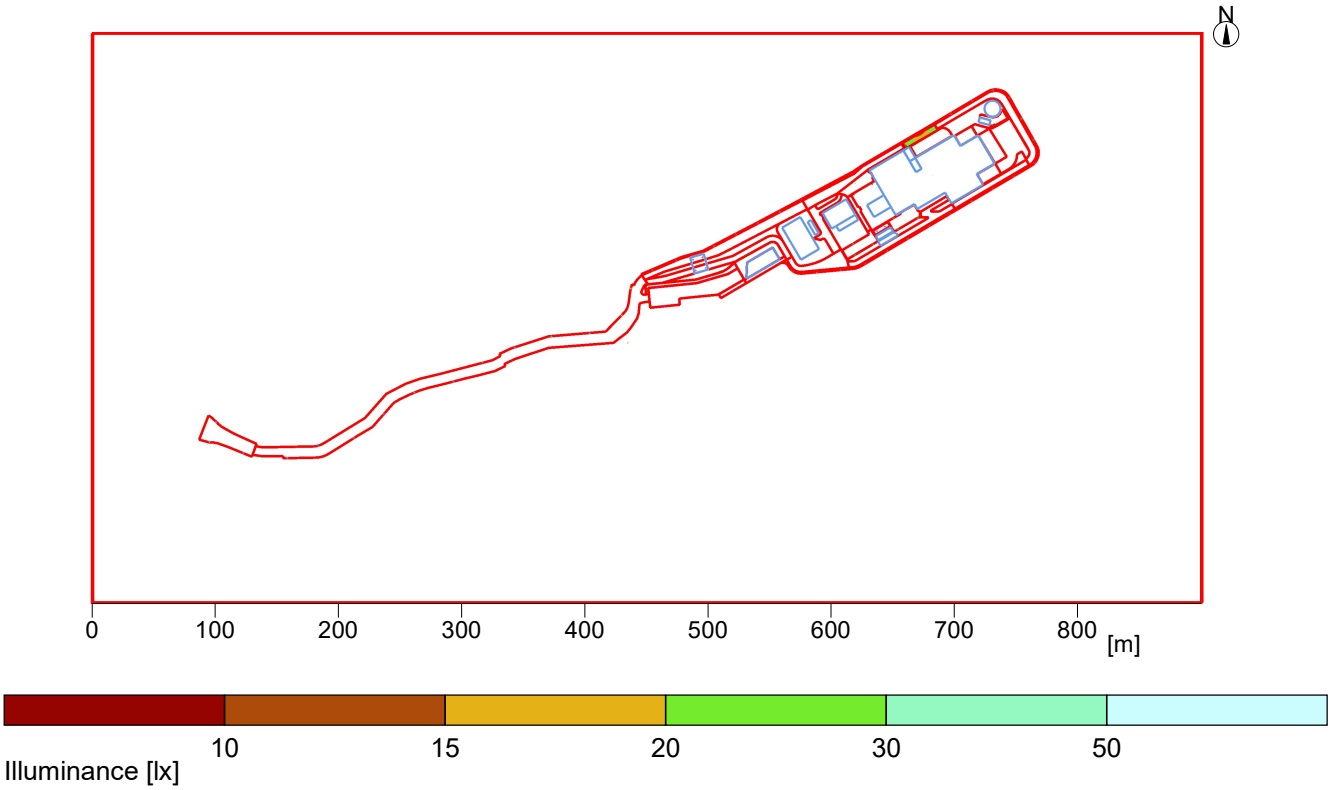
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.2 Result overview, Site Road 2B



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	18.5 lx
Minimum illuminance	Emin	7.6 lx
Maximum illuminance	Emax	26.7 lx
Uniformity Uo	Emin/Em	1:2.45 (0.41)
Diversity Ud	Emin/Emax	1:3.53 (0.28)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.2 Result overview, Site Road 2B

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

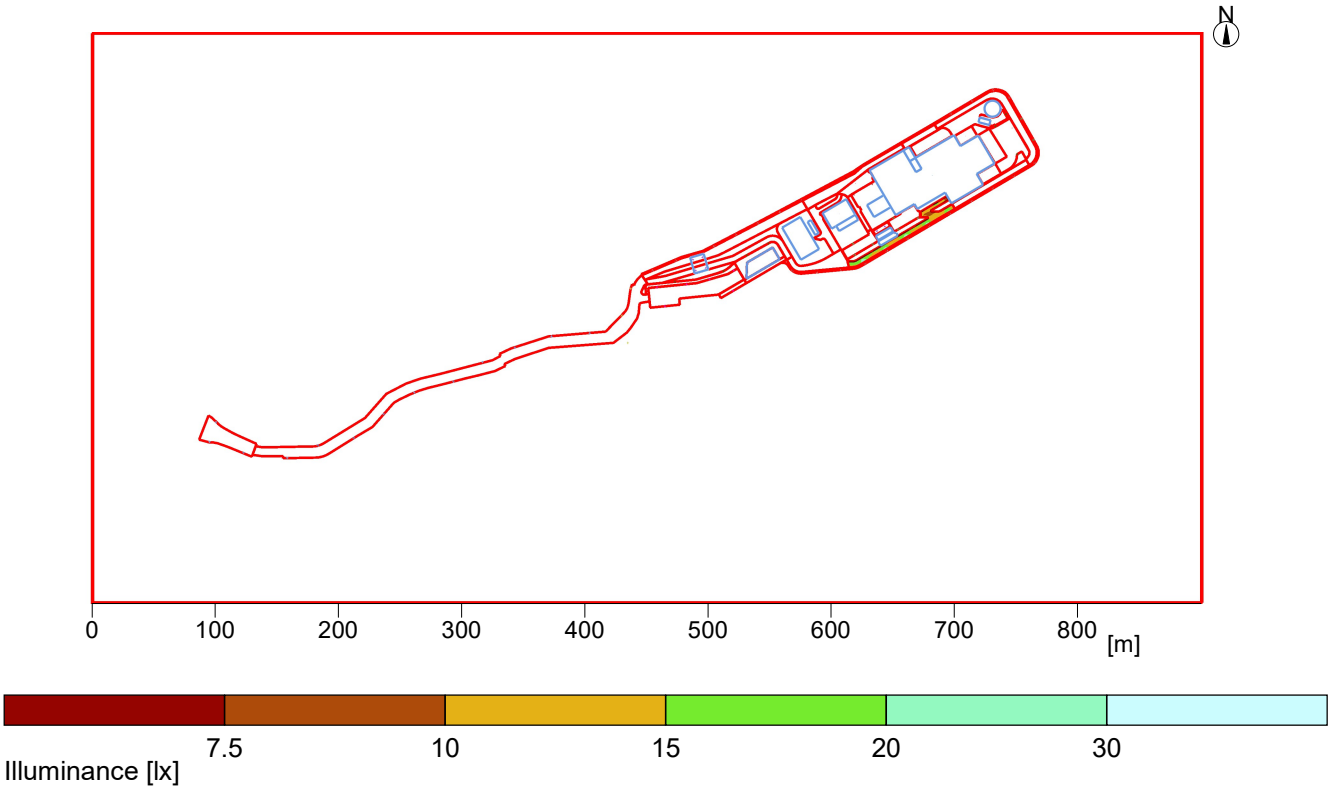
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.3 Result overview, Site Road 3



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	14 lx
Minimum illuminance	Emin	5.6 lx
Maximum illuminance	Emax	23 lx
Uniformity Uo	Emin/Em	1:2.5 (0.4)
Diversity Ud	Emin/Emax	1:4.12 (0.24)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.3 Result overview, Site Road 3

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

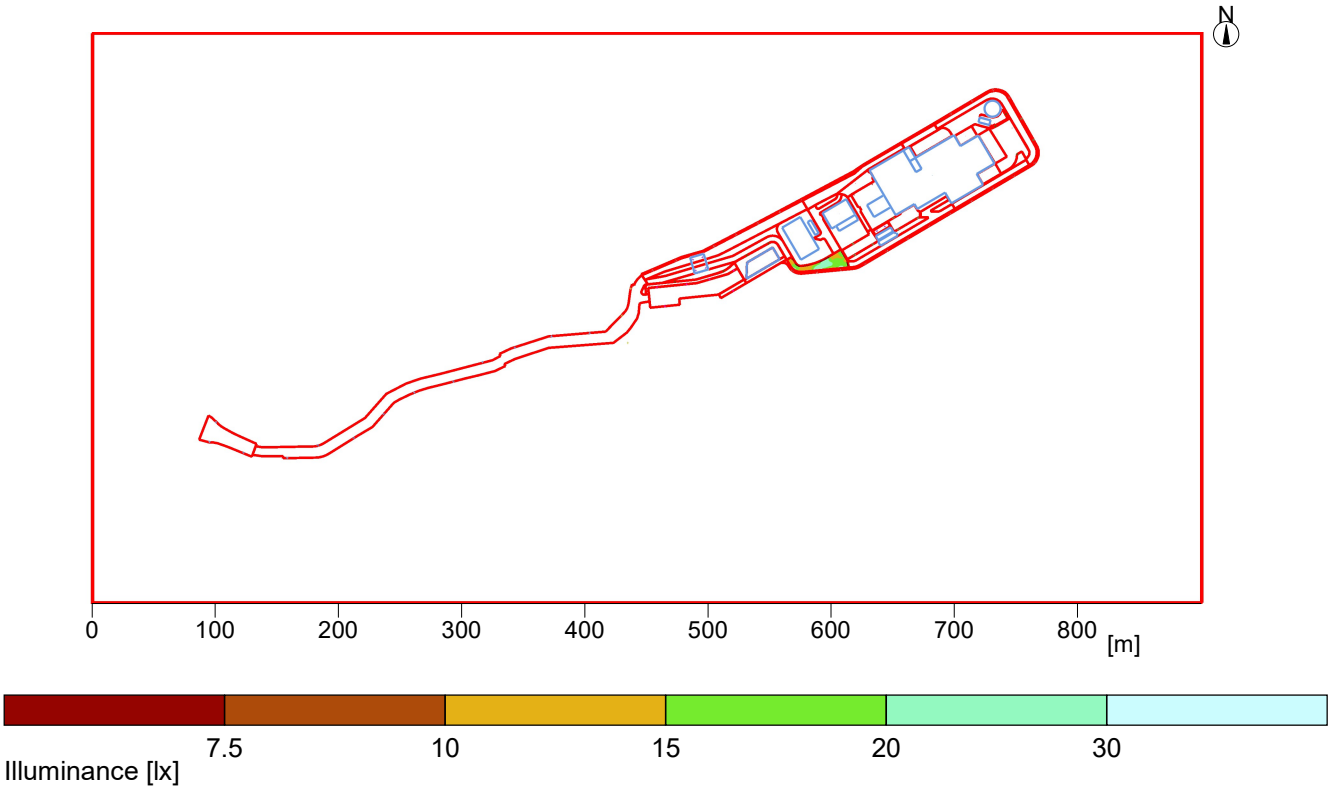
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.4 Result overview, Site Road 4



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	16 lx
Minimum illuminance	Emin	7.6 lx
Maximum illuminance	Emax	27.1 lx
Uniformity Uo	Emin/Em	1:2.1 (0.48)
Diversity Ud	Emin/Emax	1:3.56 (0.28)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6	Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
	Luminaire name	: X2 - Italo 1- S05 - 4930
	Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm
5 41	Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
	Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
	Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.4 Result overview, Site Road 4

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

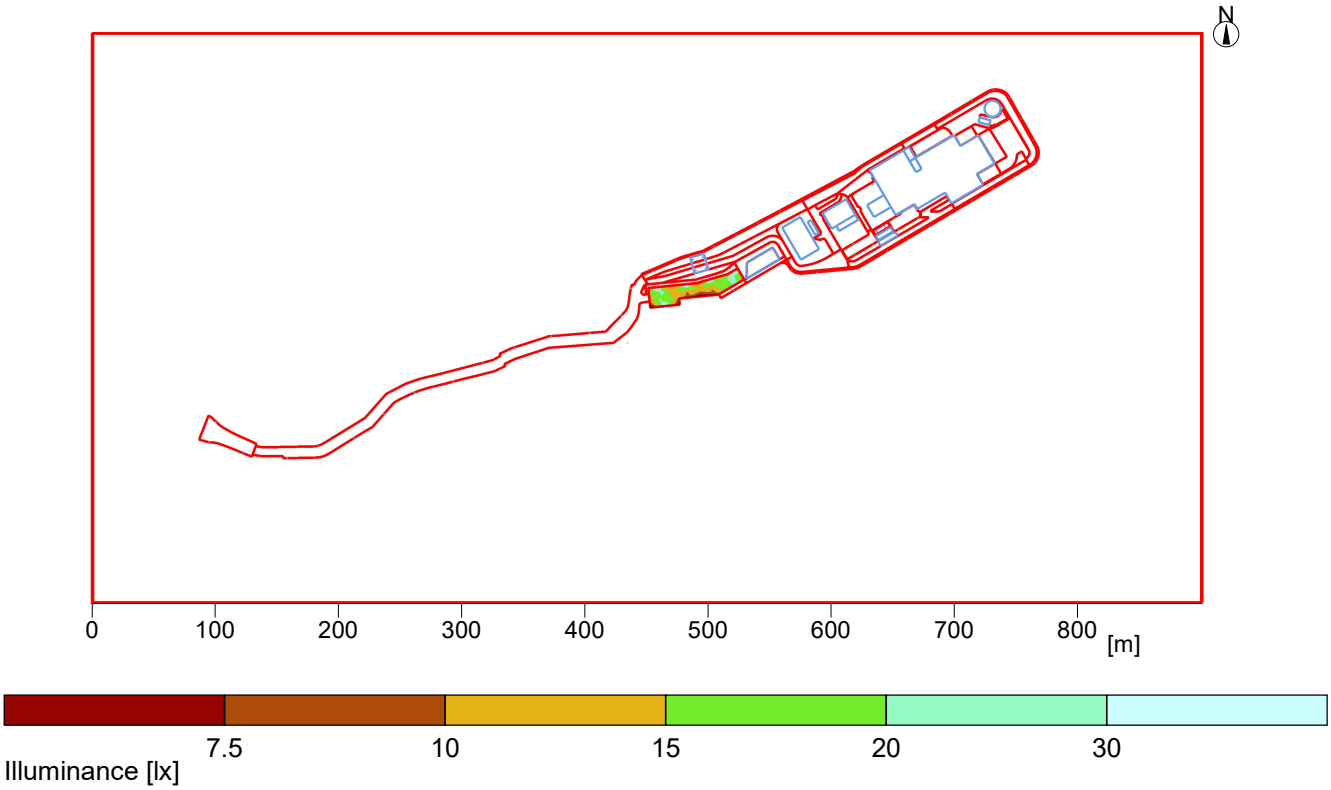
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.5 Result overview, Car Park



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	14.7 lx
Minimum illuminance	Emin	4 lx
Maximum illuminance	Emax	31.2 lx
Uniformity Uo	Emin/Em	1:3.66 (0.27)
Diversity Ud	Emin/Emax	1:7.8 (0.13)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6	Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
	Luminaire name	: X2 - Italo 1- S05 - 4930
	Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm
5 41	Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
	Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
	Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.5 Result overview, Car Park

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

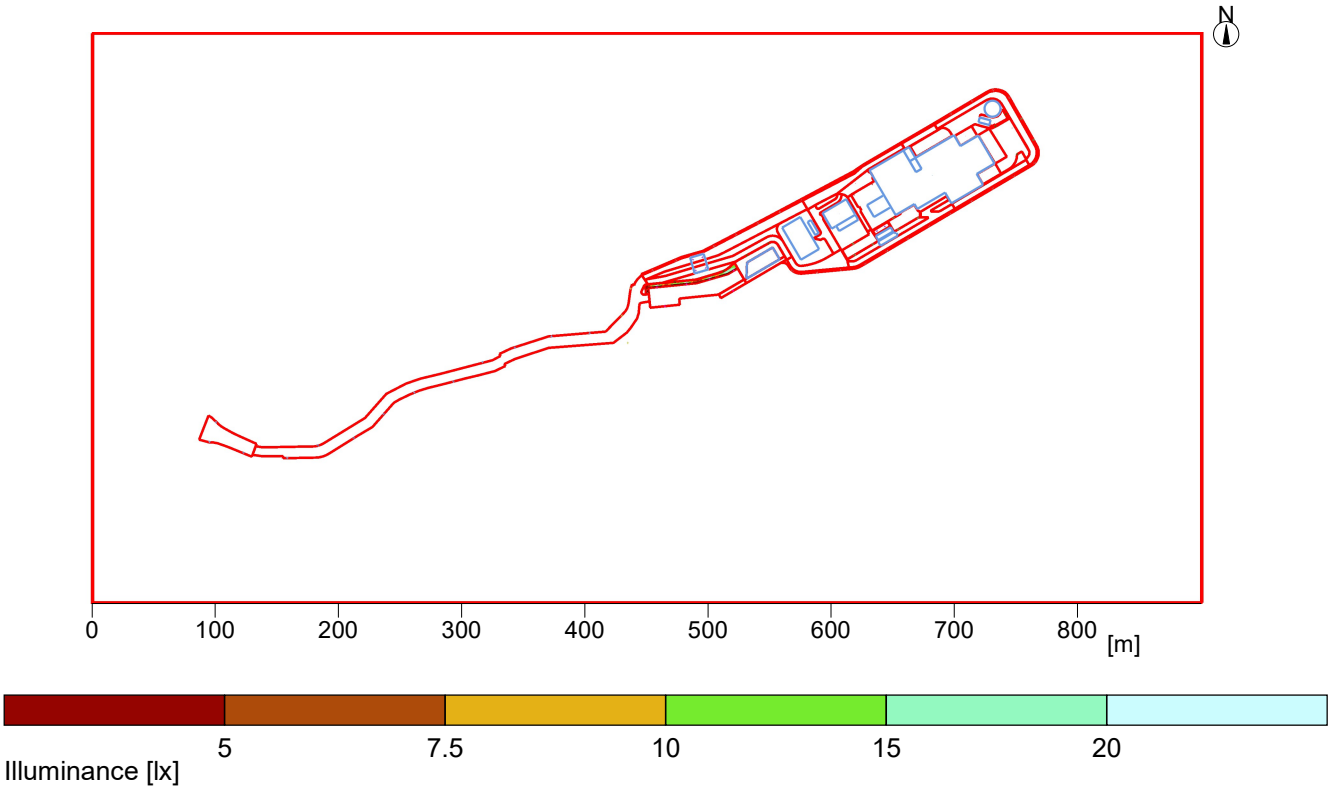
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.6 Result overview, Footpath 1



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	10.8 lx
Minimum illuminance	Emin	3.8 lx
Maximum illuminance	Emax	18.4 lx
Uniformity Uo	Emin/Em	1:2.83 (0.35)
Diversity Ud	Emin/Emax	1:4.82 (0.21)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.6 Result overview, Footpath 1

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

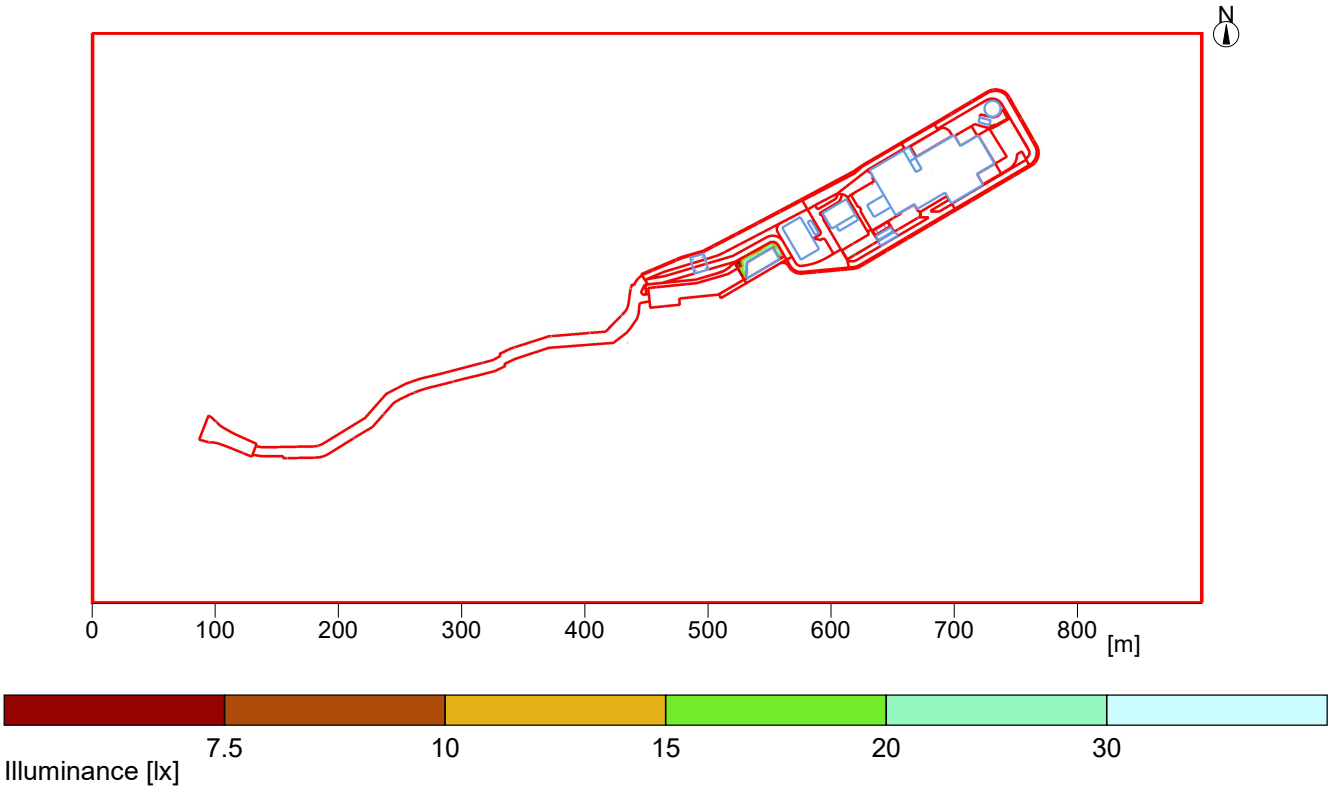
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.7 Result overview, Footpath 2



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	16 lx
Minimum illuminance	Emin	4.2 lx
Maximum illuminance	Emax	35 lx
Uniformity Uo	Emin/Em	1:3.81 (0.26)
Diversity Ud	Emin/Emax	1:8.35 (0.12)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.7 Result overview, Footpath 2

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

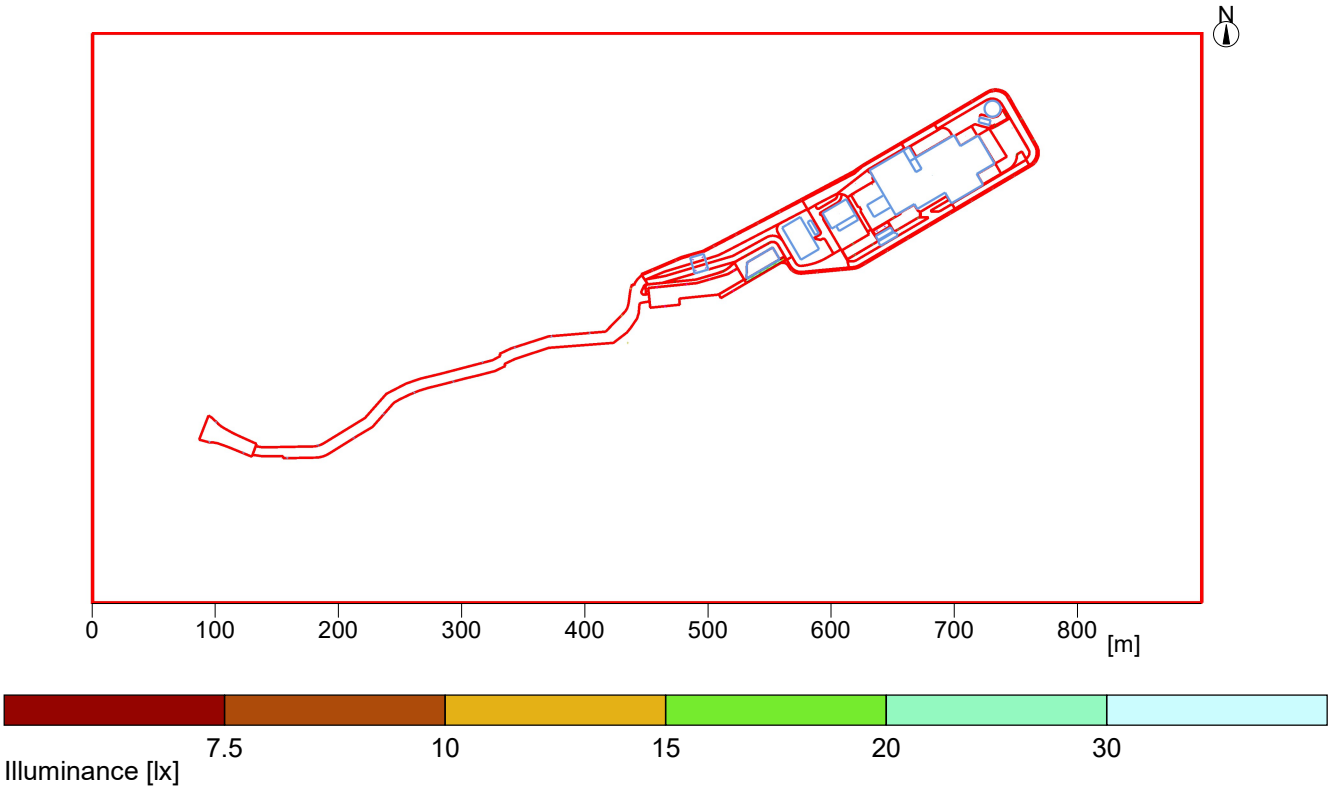
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.8 Result overview, Footpath 3



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	17 lx
Minimum illuminance	Emin	7.7 lx
Maximum illuminance	Emax	33 lx
Uniformity Uo	Emin/Em	1:2.22 (0.45)
Diversity Ud	Emin/Emax	1:4.31 (0.23)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.8 Result overview, Footpath 3

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

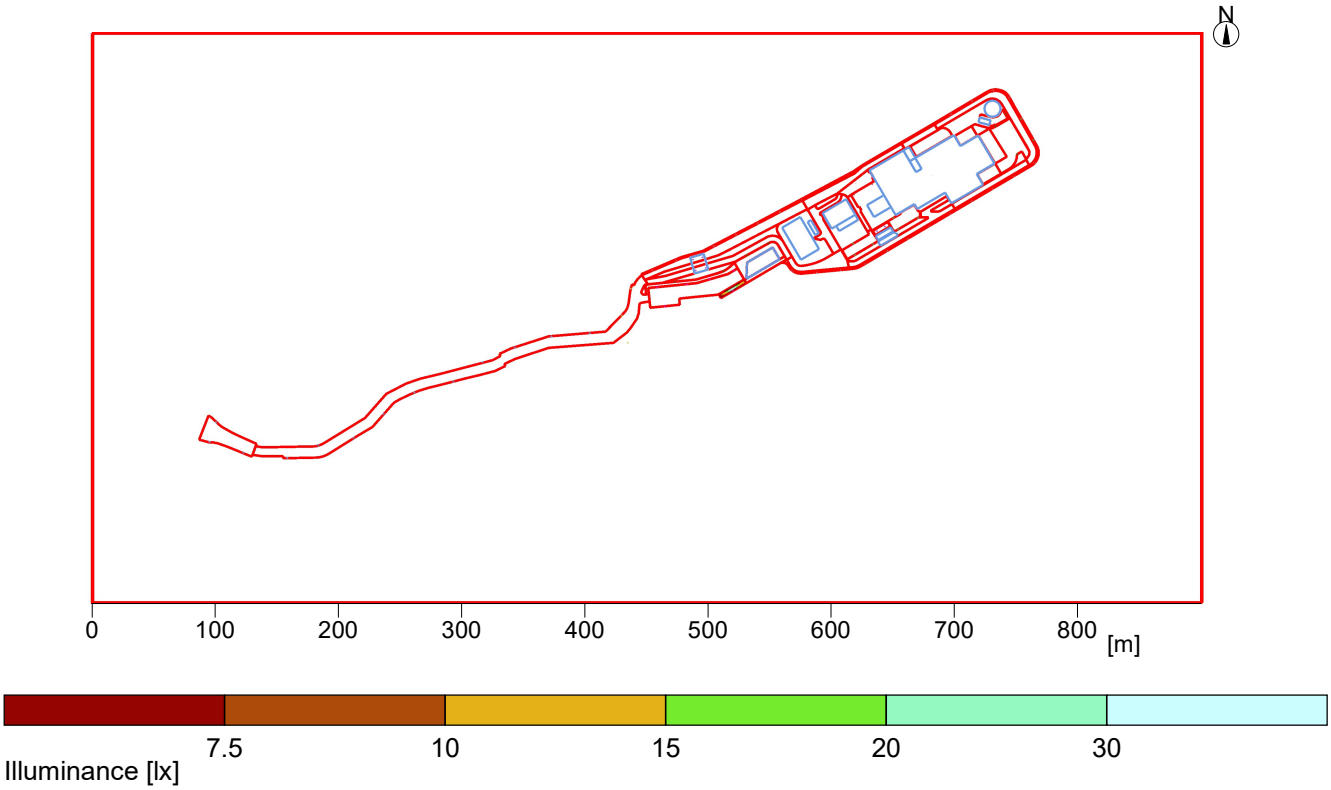
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.9 Result overview, Footpath 4



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	14.9 lx
Minimum illuminance	Emin	4.3 lx
Maximum illuminance	Emax	30.1 lx
Uniformity Uo	Emin/Em	1:3.49 (0.29)
Diversity Ud	Emin/Emax	1:7.04 (0.14)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.9 Result overview, Footpath 4

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

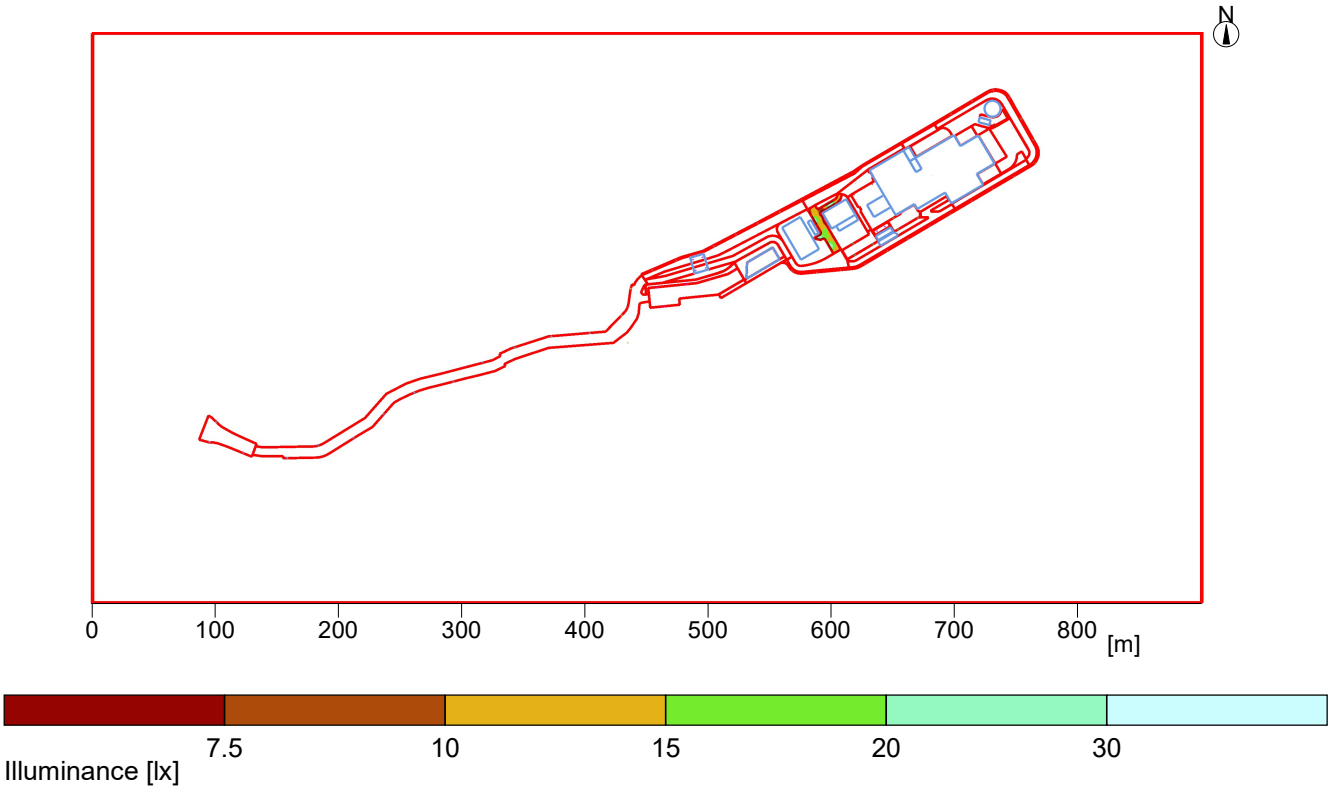
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.10 Result overview, Internal Road 1



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	13.6 lx
Minimum illuminance	Emin	5.5 lx
Maximum illuminance	Emax	33.6 lx
Uniformity Uo	Emin/Em	1:2.49 (0.4)
Diversity Ud	Emin/Emax	1:6.15 (0.16)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.10 Result overview, Internal Road 1

8 25 
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13 
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3 
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

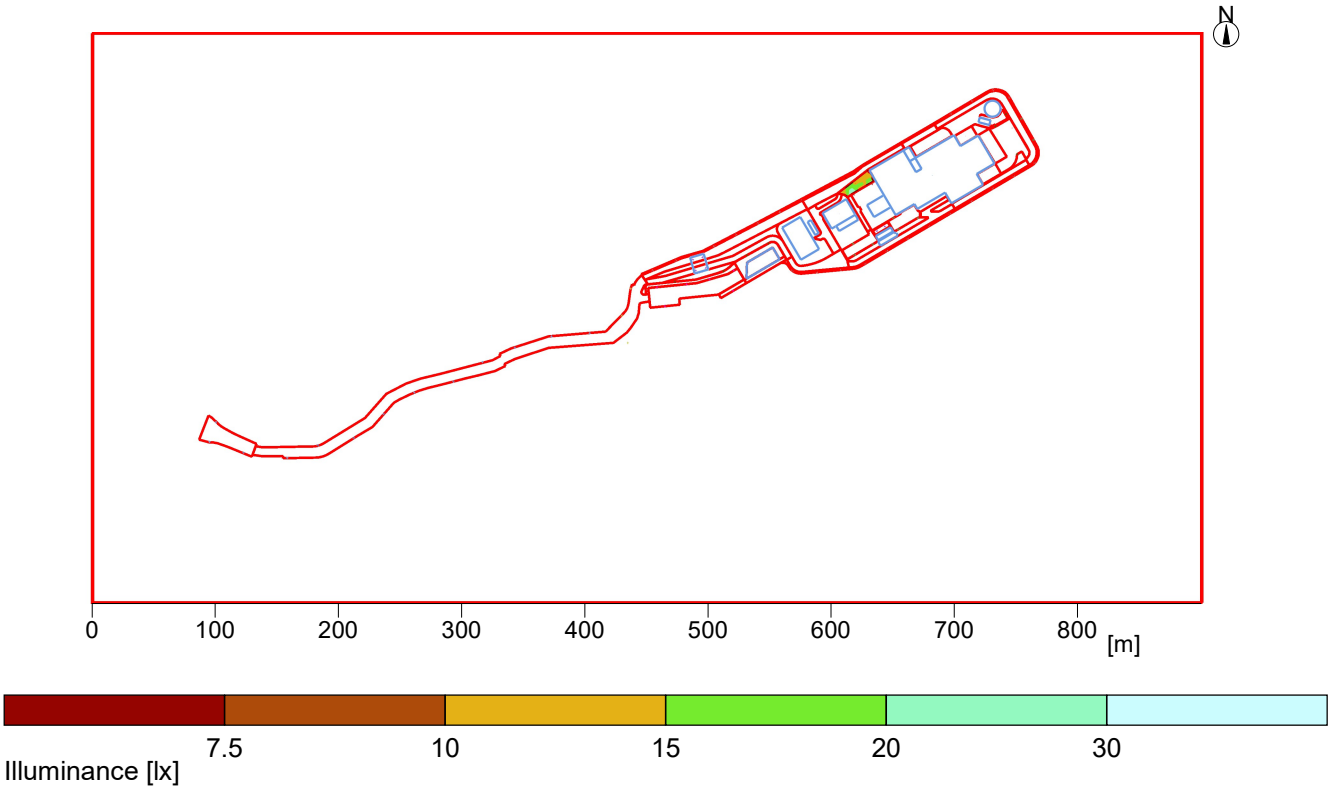
Kingfisher Lighting Ltd

7 28 
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6 
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.11 Result overview, IBA area



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	14.7 lx
Minimum illuminance	Emin	9.8 lx
Maximum illuminance	Emax	29 lx
Uniformity Uo	Emin/Em	1:1.51 (0.66)
Diversity Ud	Emin/Emax	1:2.97 (0.34)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.11 Result overview, IBA area

8 25 
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13 
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3 
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

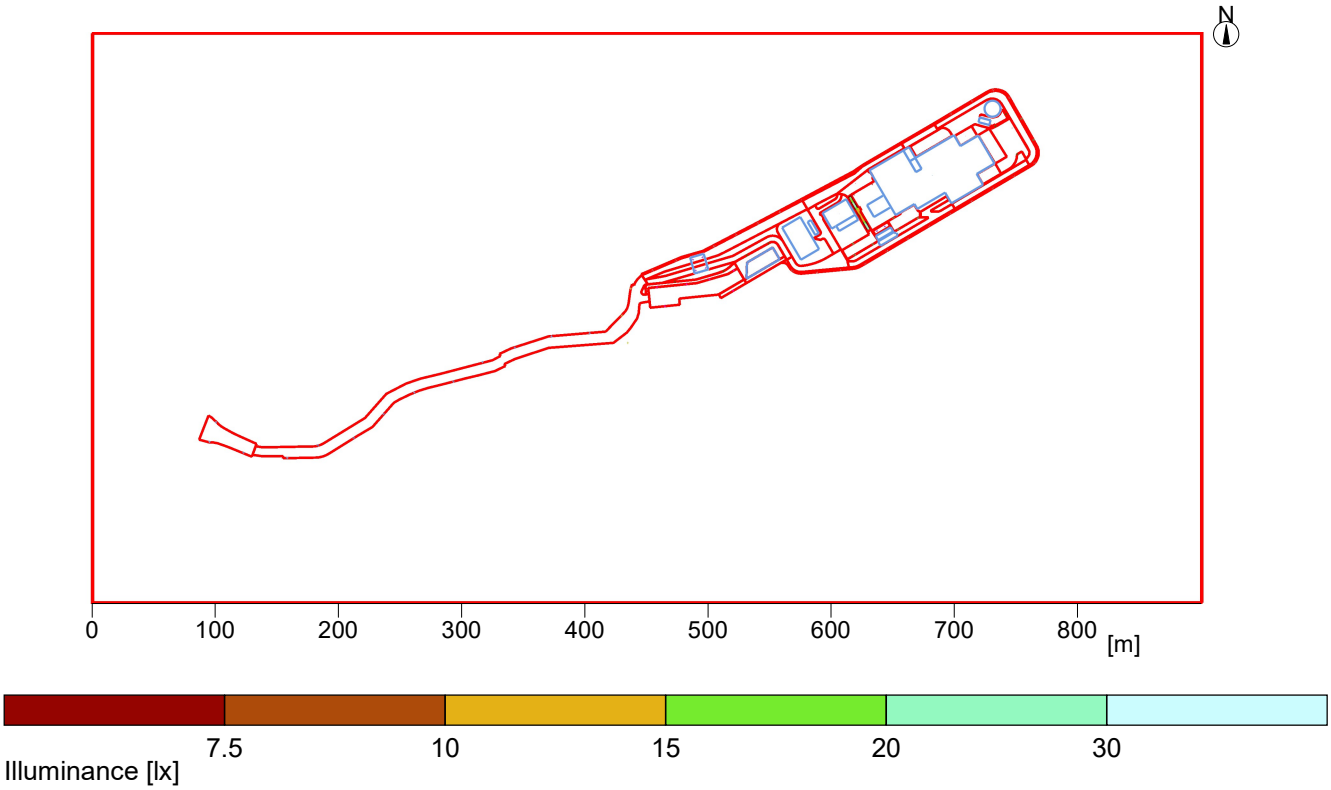
Kingfisher Lighting Ltd

7 28 
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6 
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.12 Result overview, Internal Road 3



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	16 lx
Minimum illuminance	Emin	7 lx
Maximum illuminance	Emax	25.7 lx
Uniformity Uo	Emin/Em	1:2.28 (0.44)
Diversity Ud	Emin/Emax	1:3.64 (0.27)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.12 Result overview, Internal Road 3

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

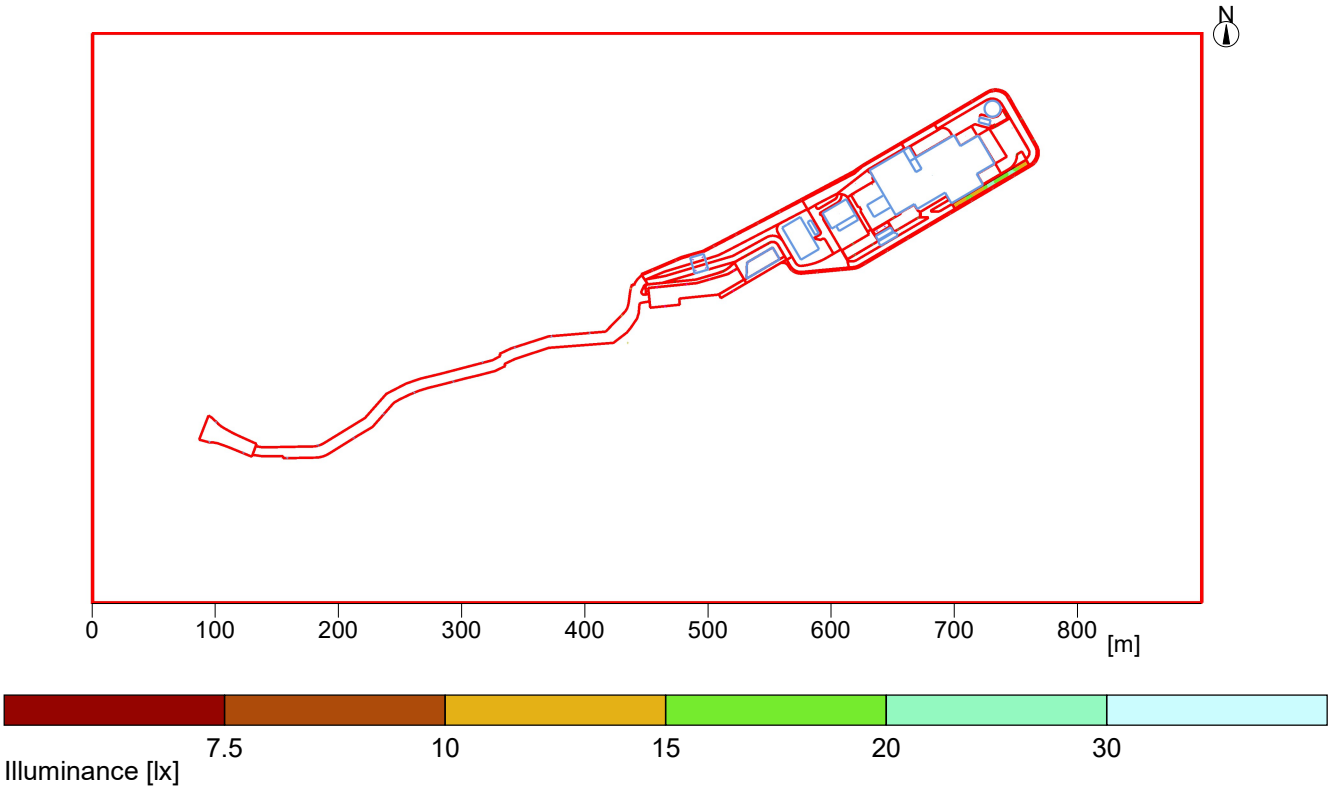
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.13 Result overview, Site Road 6



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	15.3 lx
Minimum illuminance	Emin	8 lx
Maximum illuminance	Emax	25.6 lx
Uniformity Uo	Emin/Em	1:1.91 (0.52)
Diversity Ud	Emin/Emax	1:3.2 (0.31)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6	Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
	Luminaire name	: X2 - Italo 1- S05 - 4930
	Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm
5 41	Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
	Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
	Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.13 Result overview, Site Road 6

8 25 
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13 
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3 
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

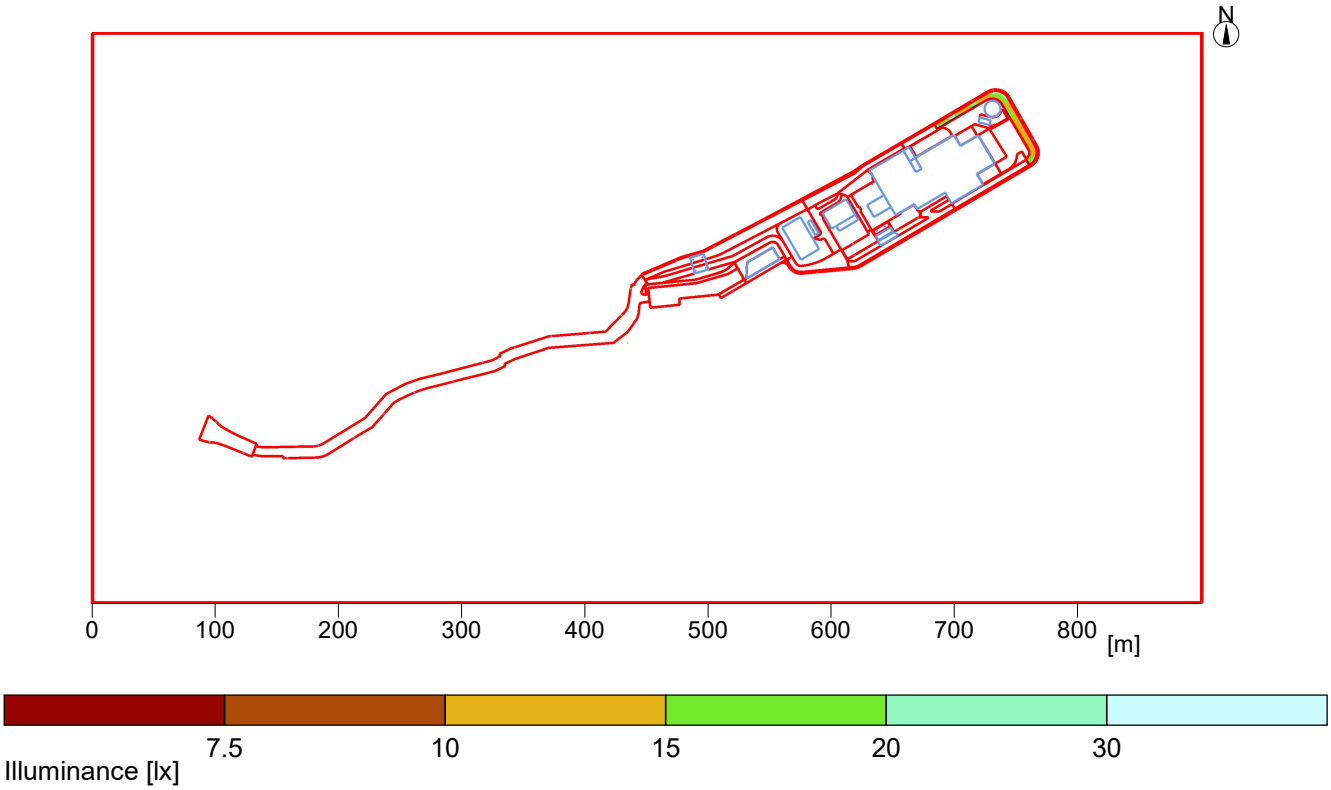
Kingfisher Lighting Ltd

7 28 
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6 
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.14 Result overview, Site Road 7



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	14.4 lx
Minimum illuminance	Emin	8.3 lx
Maximum illuminance	Emax	24 lx
Uniformity Uo	Emin/Em	1:1.72 (0.58)
Diversity Ud	Emin/Emax	1:2.88 (0.35)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.14 Result overview, Site Road 7

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

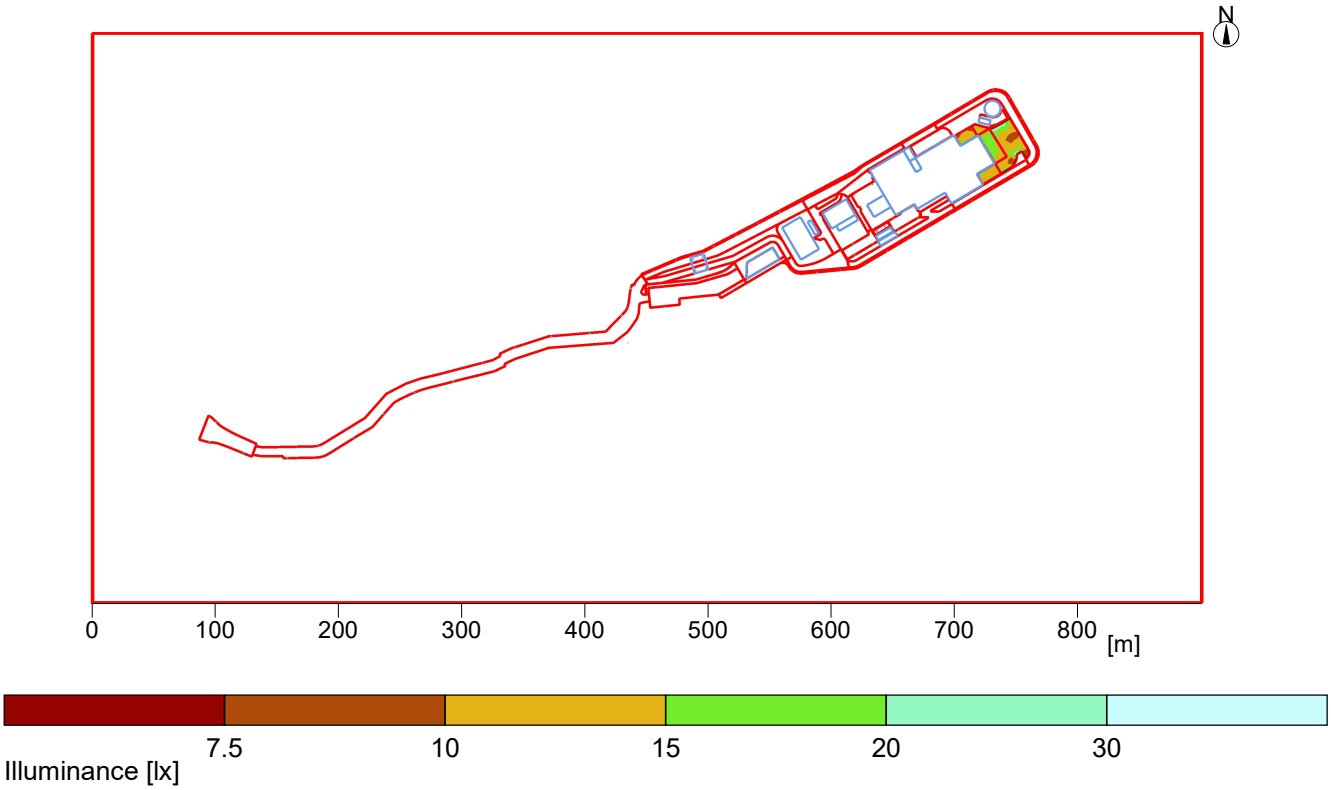
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.15 Result overview, Turning area



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	13.1 lx
Minimum illuminance	Emin	7.2 lx
Maximum illuminance	Emax	28.1 lx
Uniformity Uo	Emin/Em	1:1.82 (0.55)
Diversity Ud	Emin/Emax	1:3.92 (0.25)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.15 Result overview, Turning area

8 25 
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13 
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3 
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

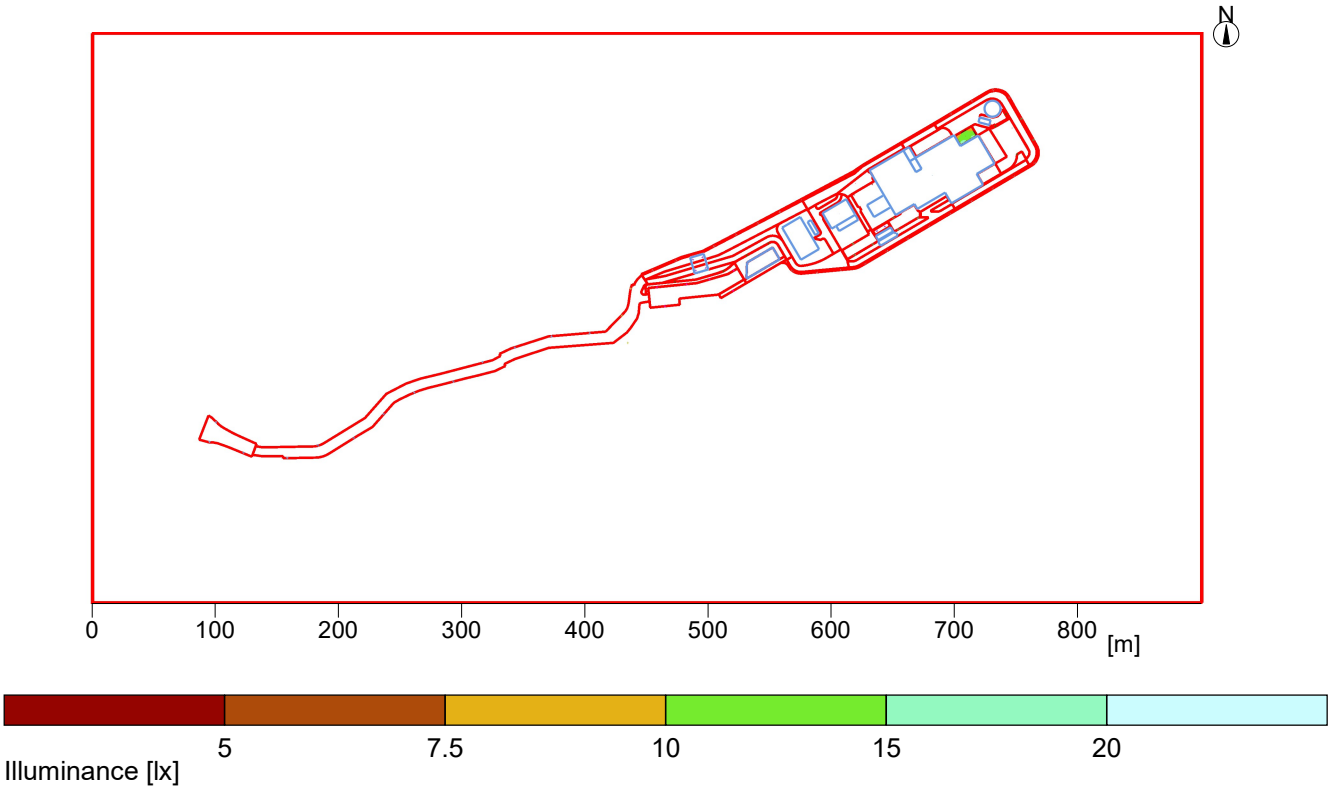
Kingfisher Lighting Ltd

7 28 
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6 
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.16 Result overview, Turning area- section A



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	11.2 lx
Minimum illuminance	Emin	6.9 lx
Maximum illuminance	Emax	15.9 lx
Uniformity Uo	Emin/Em	1:1.62 (0.62)
Diversity Ud	Emin/Emax	1:2.29 (0.44)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.16 Result overview, Turning area- section A

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

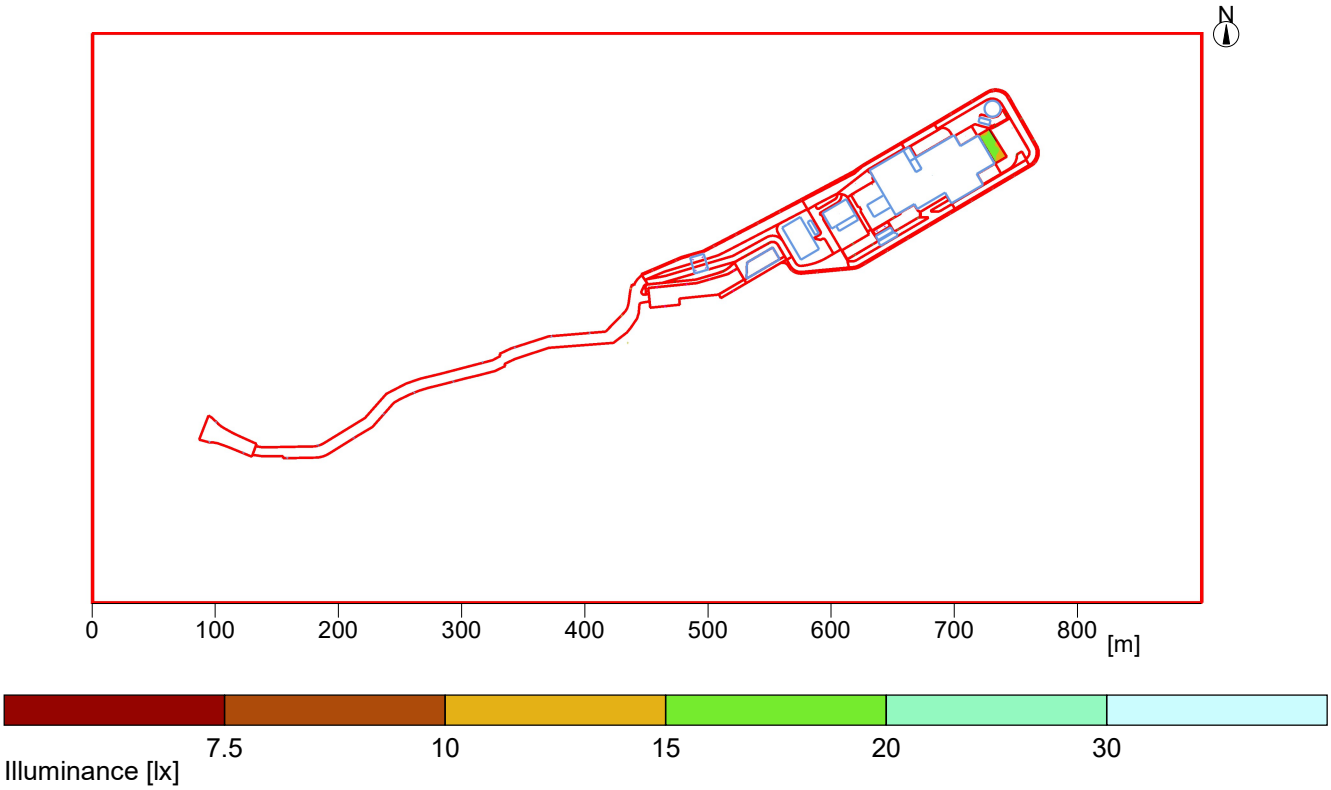
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.17 Result overview, Turning area- section B



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	14.6 lx
Minimum illuminance	Emin	6.7 lx
Maximum illuminance	Emax	18.7 lx
Uniformity Uo	Emin/Em	1:2.19 (0.46)
Diversity Ud	Emin/Emax	1:2.8 (0.36)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.17 Result overview, Turning area- section B

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

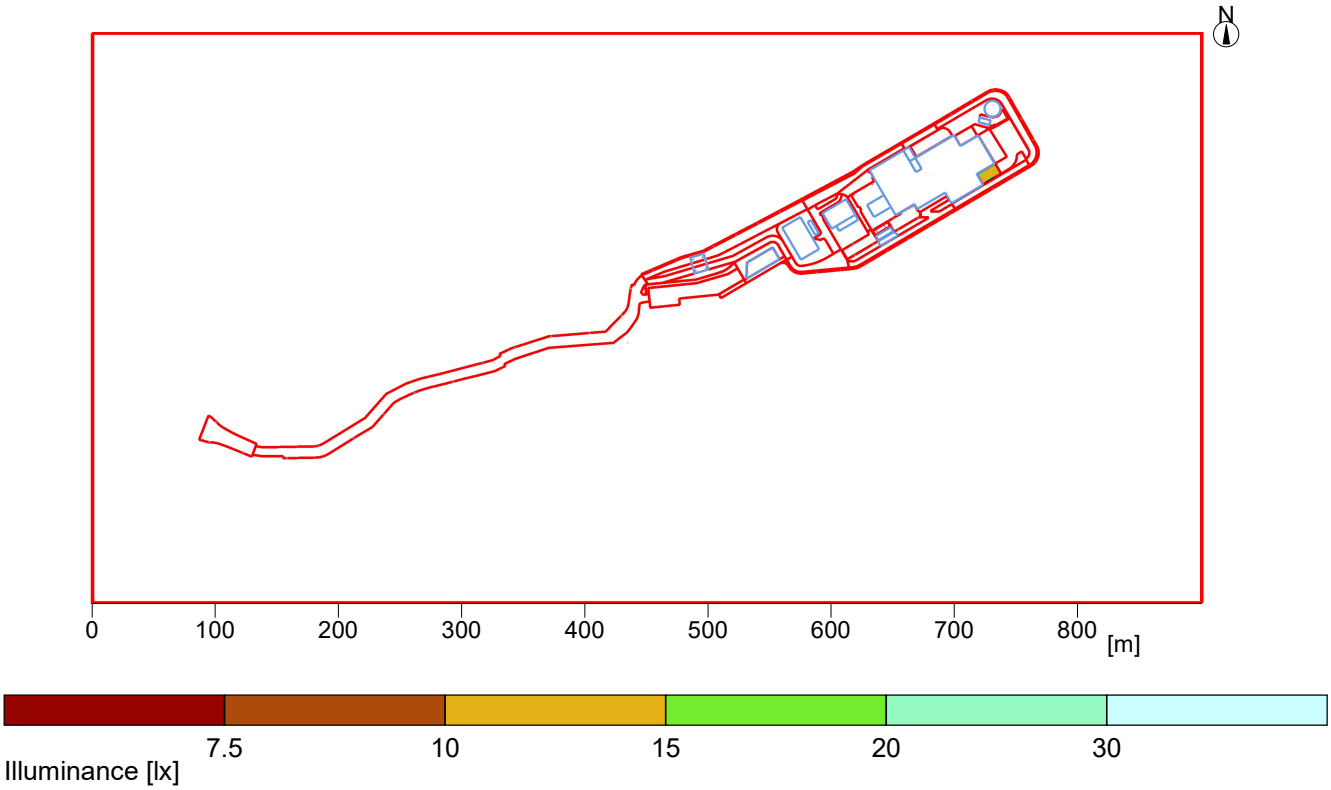
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.18 Result overview, Turning area - section C



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	12.8 lx
Minimum illuminance	Emin	7.6 lx
Maximum illuminance	Emax	17.7 lx
Uniformity Uo	Emin/Em	1:1.69 (0.59)
Diversity Ud	Emin/Emax	1:2.35 (0.43)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.18 Result overview, Turning area - section C

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

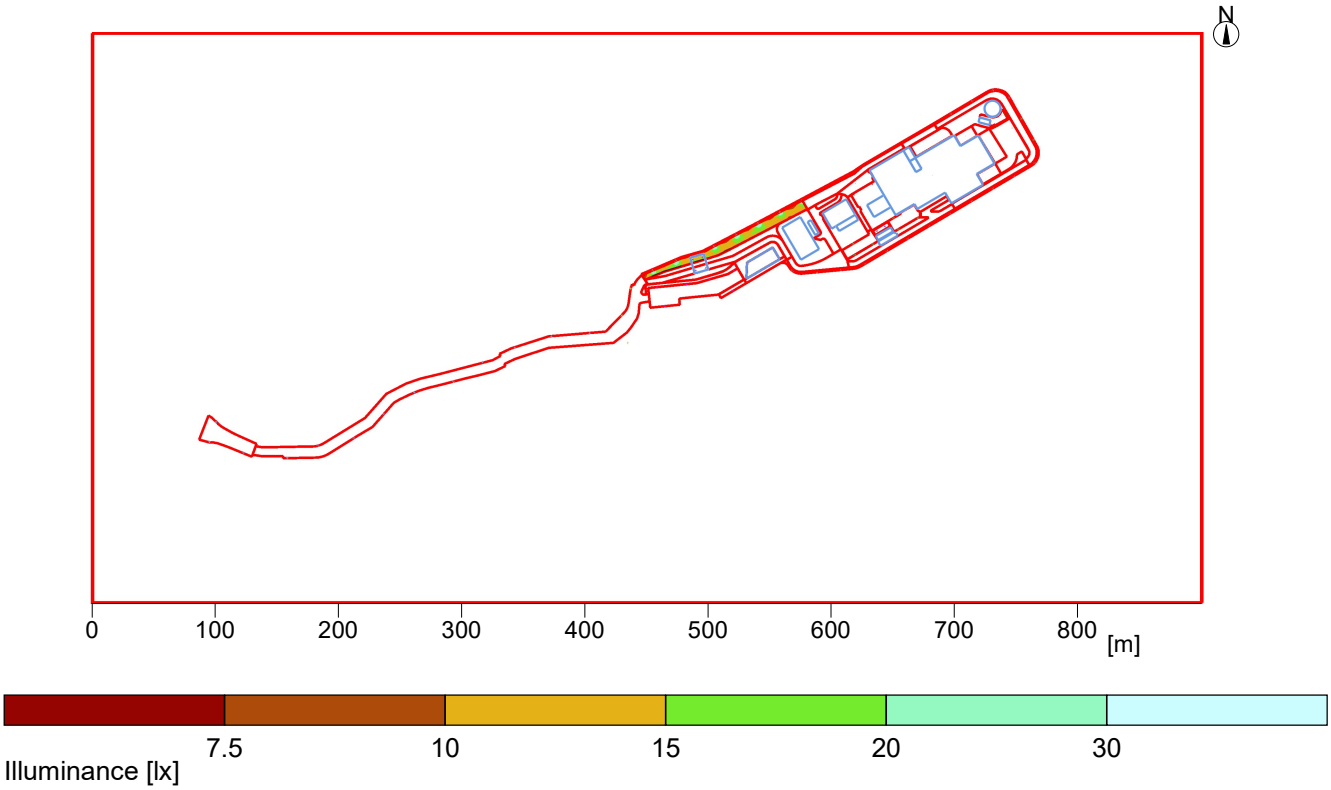
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.19 Result overview, Site Road - 1



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	13.3 lx
Minimum illuminance	Emin	5.7 lx
Maximum illuminance	Emax	22.8 lx
Uniformity Uo	Emin/Em	1:2.34 (0.43)
Diversity Ud	Emin/Emax	1:4 (0.25)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.19 Result overview, Site Road - 1

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

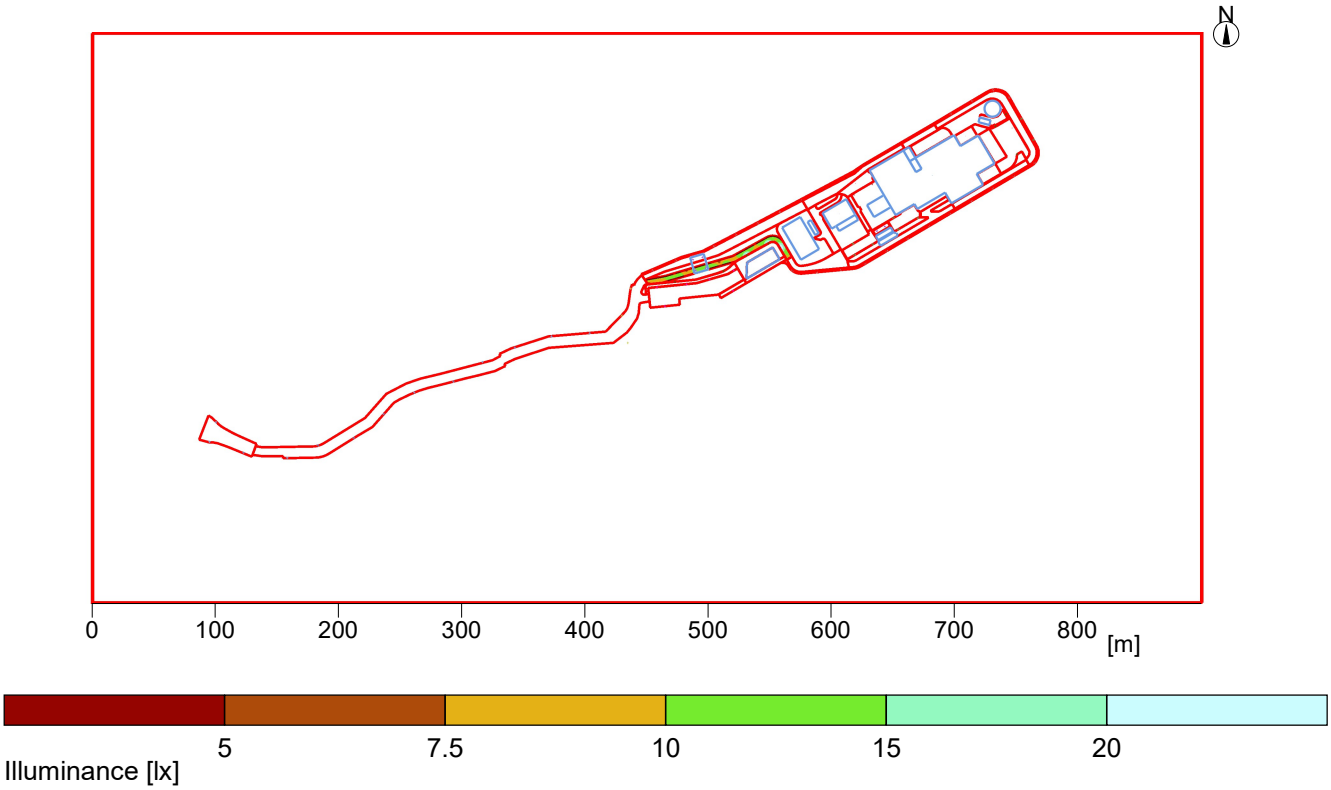
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.20 Result overview, Site Road - 5



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	11 lx
Minimum illuminance	Emin	5.6 lx
Maximum illuminance	Emax	22.6 lx
Uniformity Uo	Emin/Em	1:1.97 (0.51)
Diversity Ud	Emin/Emax	1:4.05 (0.25)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.20 Result overview, Site Road - 5

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

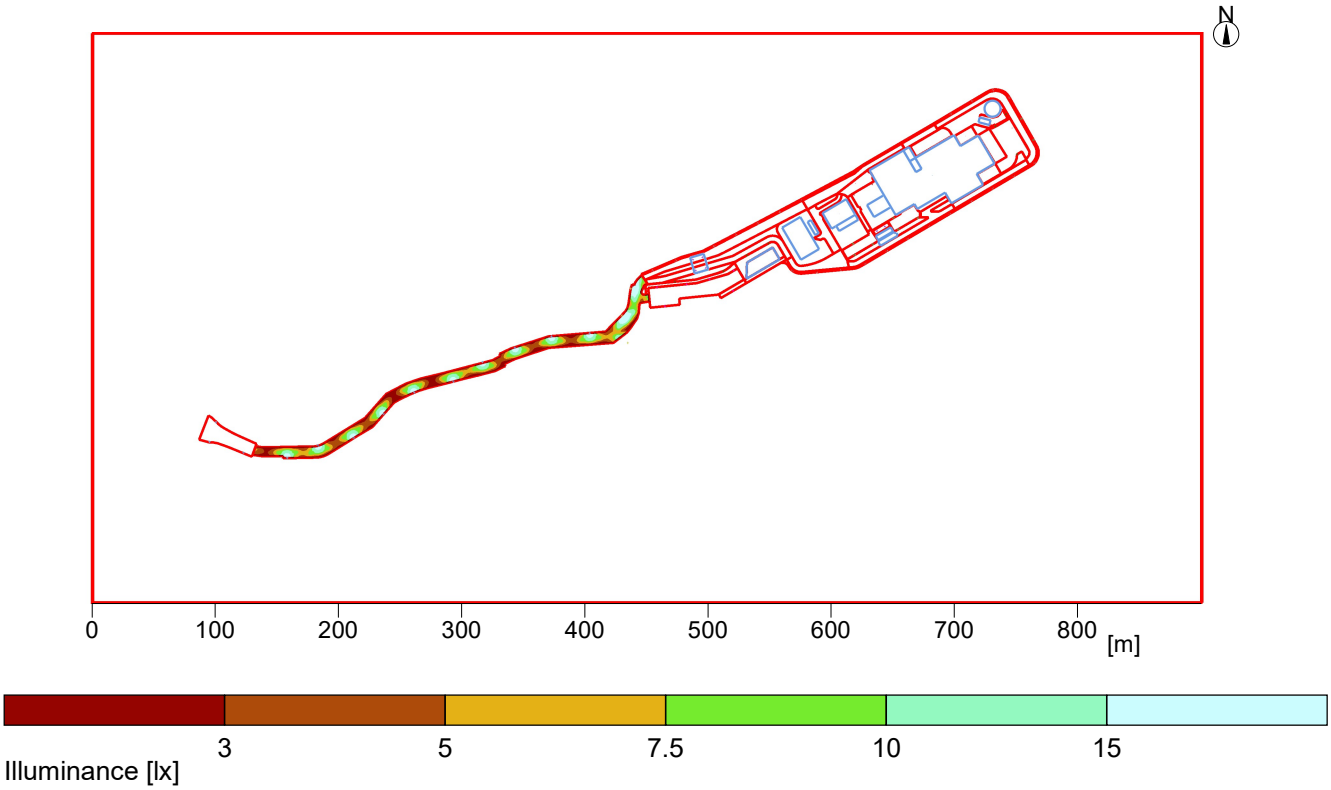
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.21 Result overview, Access Road - U1



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	7.1 lx
Minimum illuminance	Emin	1 lx
Maximum illuminance	Emax	31.1 lx
Uniformity Uo	Emin/Em	1:7.02 (0.14)
Diversity Ud	Emin/Emax	1:30.6 (0.03)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6	Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
	Luminaire name	: X2 - Italo 1- S05 - 4930
	Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm
5 41	Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
	Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
	Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.21 Result overview, Access Road - U1

8 25
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

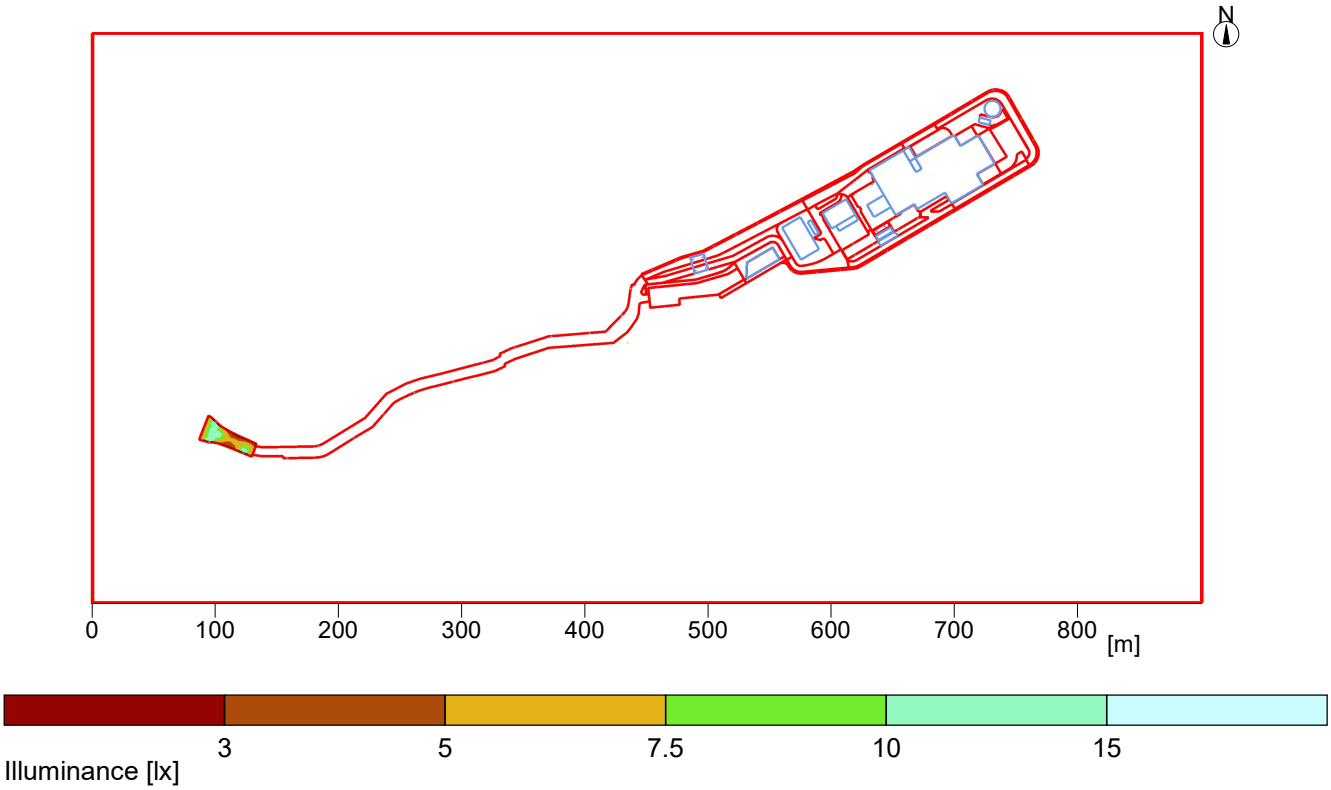
Kingfisher Lighting Ltd

7 28
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.22 Result overview, Access Road - U2



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	6.9 lx
Minimum illuminance	Emin	1.9 lx
Maximum illuminance	Emax	11.5 lx
Uniformity Uo	Emin/Em	1:3.69 (0.27)
Diversity Ud	Emin/Emax	1:6.16 (0.16)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.22 Result overview, Access Road - U2

8 25 
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13 
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3 
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

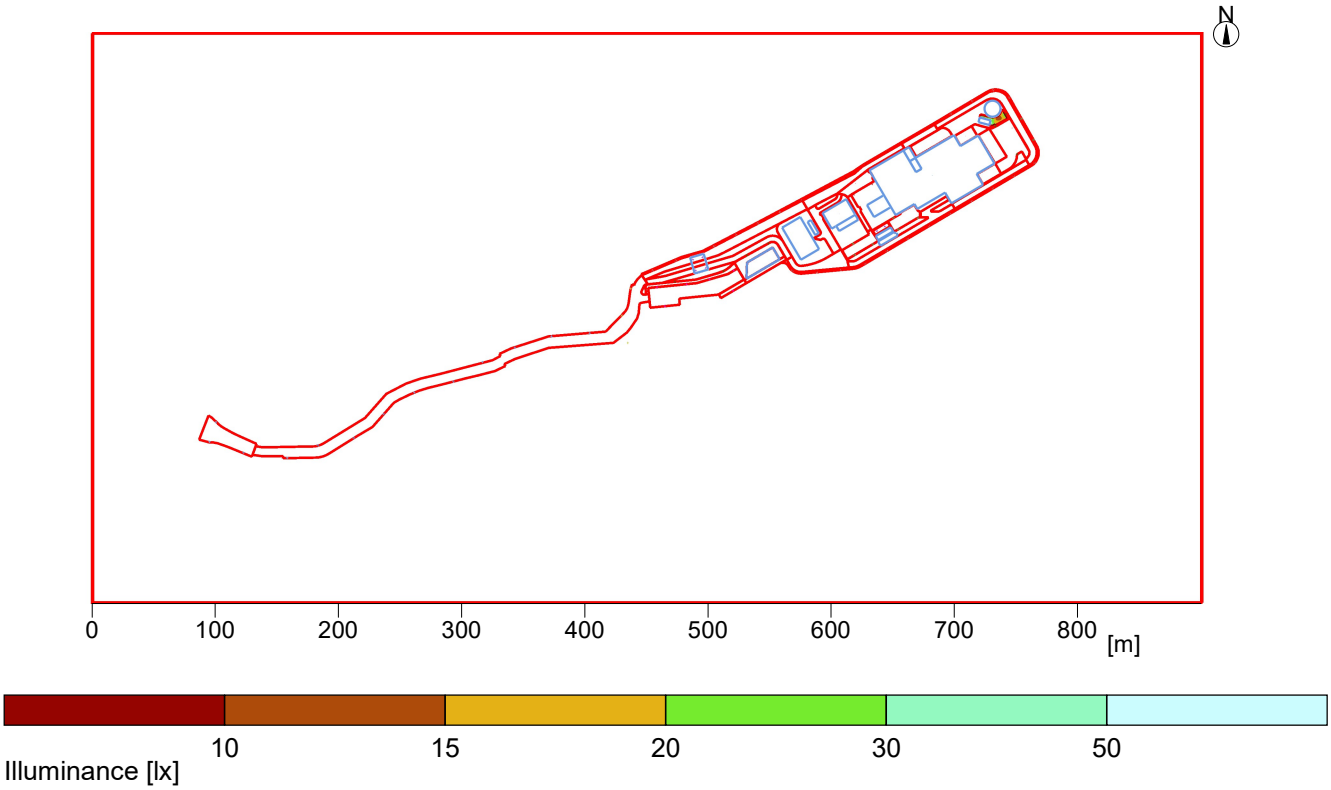
Kingfisher Lighting Ltd

7 28 
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6 
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.23 Result overview, Fire Water Stoarge Area



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	19.1 lx
Minimum illuminance	Emin	10.2 lx
Maximum illuminance	Emax	41.1 lx
Uniformity Uo	Emin/Em	1:1.88 (0.53)
Diversity Ud	Emin/Emax	1:4.04 (0.25)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.23 Result overview, Fire Water Stoarge Area

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

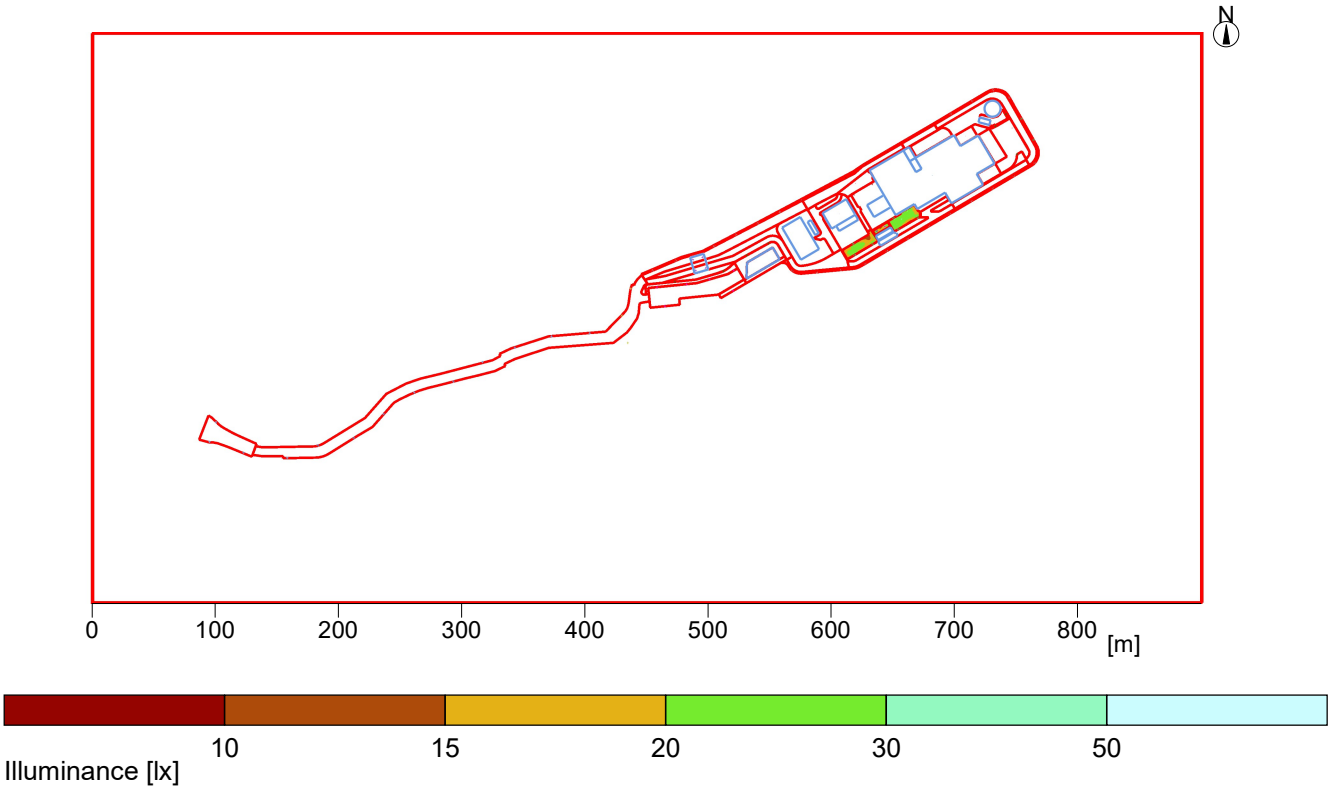
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.24 Result overview, Internal Road 4



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	19.9 lx
Minimum illuminance	Emin	9.9 lx
Maximum illuminance	Emax	29.5 lx
Uniformity Uo	Emin/Em	1:2.02 (0.5)
Diversity Ud	Emin/Emax	1:2.99 (0.33)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.24 Result overview, Internal Road 4

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

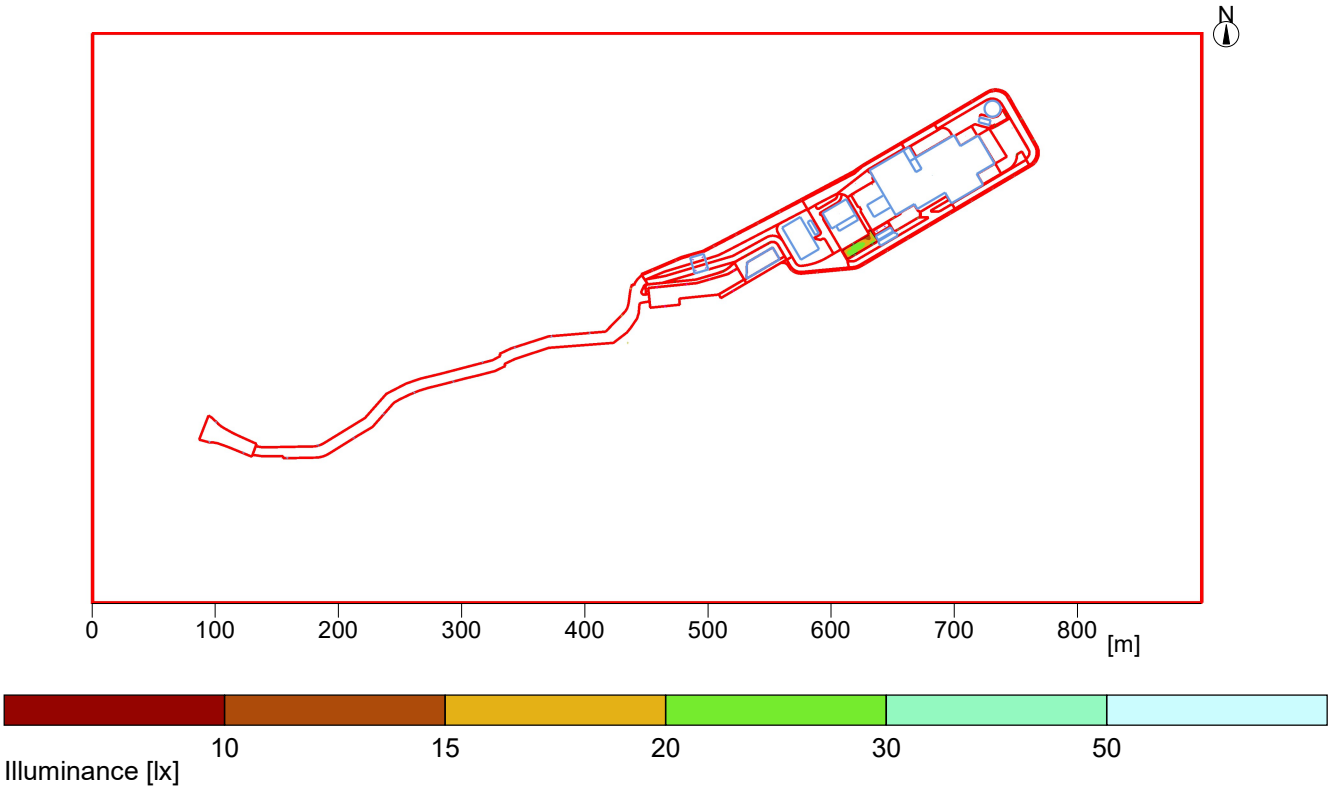
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.25 Result overview, Int Road 4A



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	18.5 lx
Minimum illuminance	Emin	10.6 lx
Maximum illuminance	Emax	29.6 lx
Uniformity Uo	Emin/Em	1:1.75 (0.57)
Diversity Ud	Emin/Emax	1:2.79 (0.36)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.25 Result overview, Int Road 4A

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

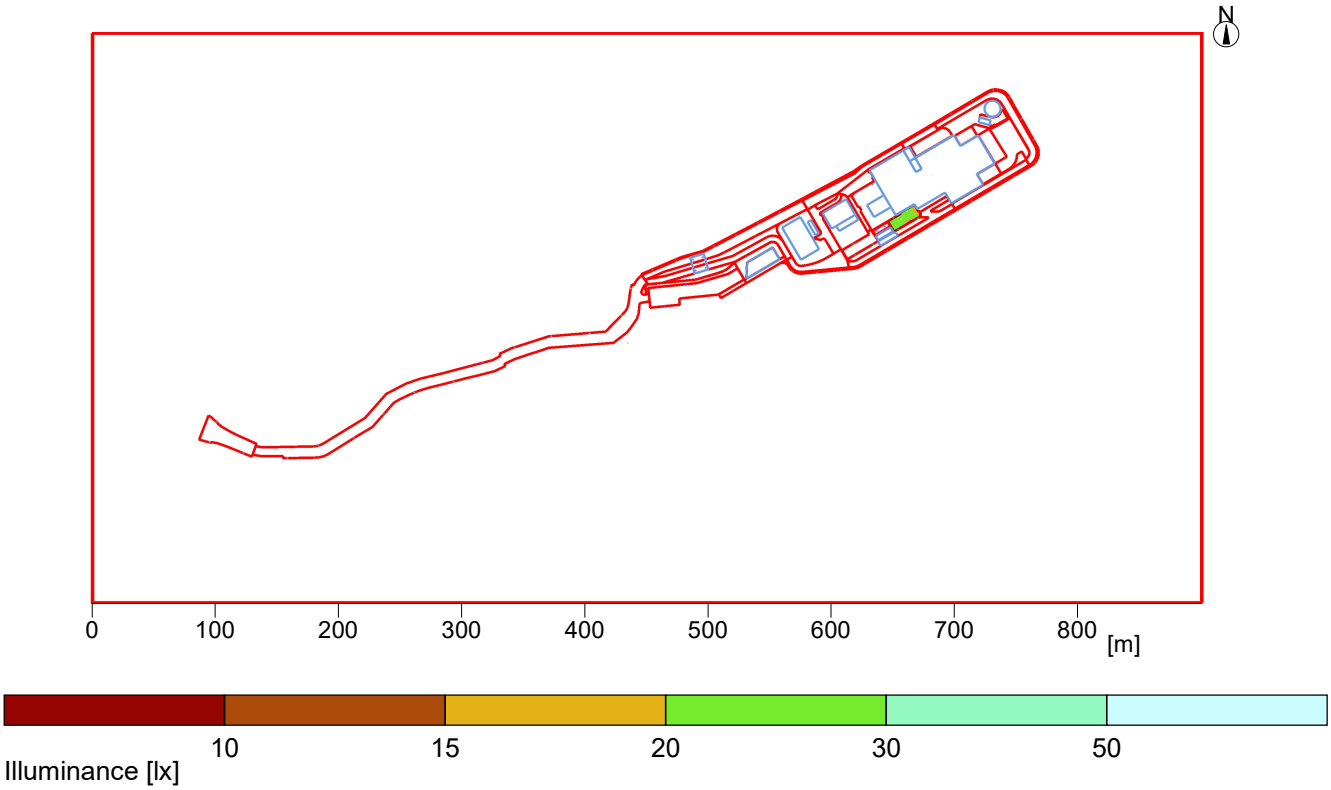
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.26 Result overview, Int Road 4B



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	21.8 lx
Minimum illuminance	Emin	9.4 lx
Maximum illuminance	Emax	30.2 lx
Uniformity Uo	Emin/Em	1:2.32 (0.43)
Diversity Ud	Emin/Emax	1:3.21 (0.31)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.26 Result overview, Int Road 4B

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

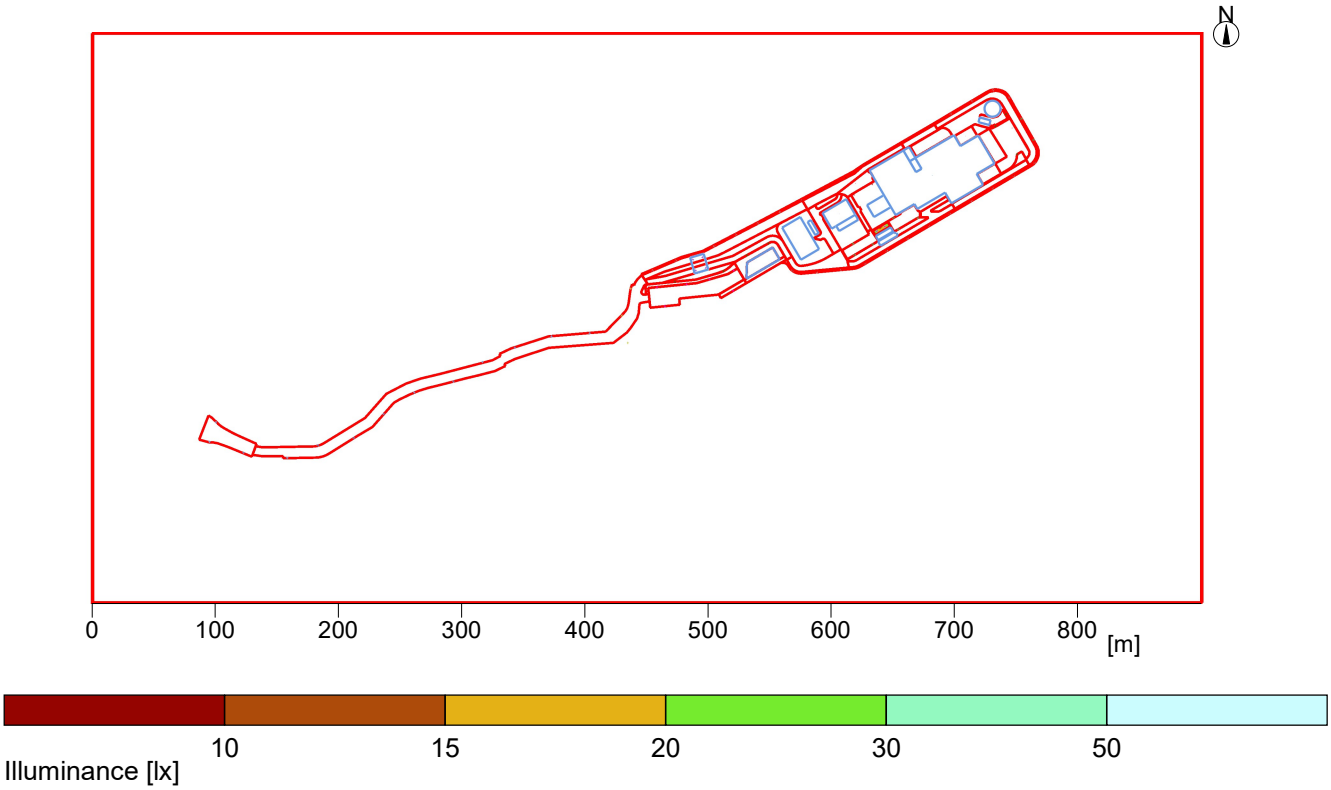
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.27 Result overview, Measuring area 33



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	17.8 lx
Minimum illuminance	Emin	12.7 lx
Maximum illuminance	Emax	25.4 lx
Uniformity Uo	Emin/Em	1:1.41 (0.71)
Diversity Ud	Emin/Emax	1:2 (0.5)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.27 Result overview, Measuring area 33

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

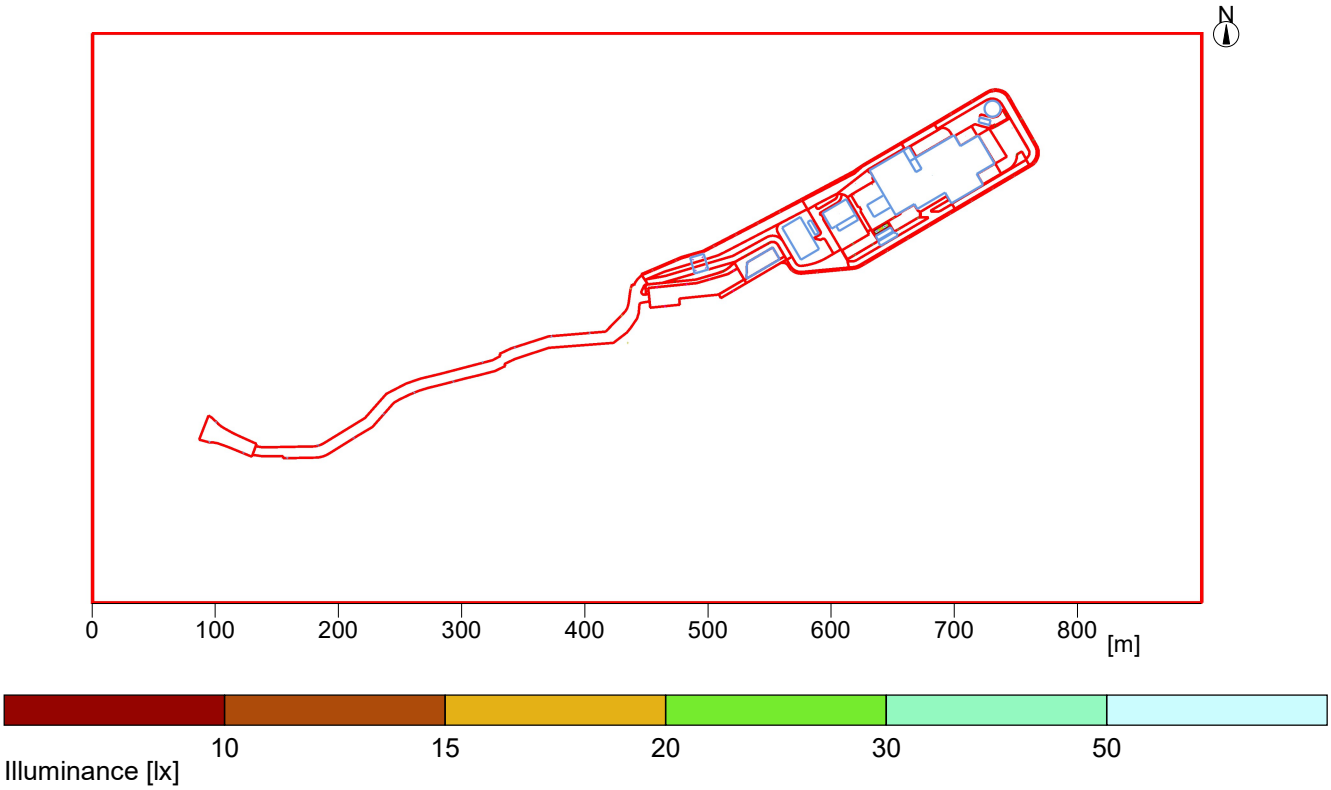
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.28 Result overview, Measuring area 34



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	4.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	21.9 lx
Minimum illuminance	Emin	9.5 lx
Maximum illuminance	Emax	36.3 lx
Uniformity Uo	Emin/Em	1:2.3 (0.43)
Diversity Ud	Emin/Emax	1:3.82 (0.26)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6	Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
	Luminaire name	: X2 - Italo 1- S05 - 4930
	Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm
5 41	Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
	Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
	Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.28 Result overview, Measuring area 34

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

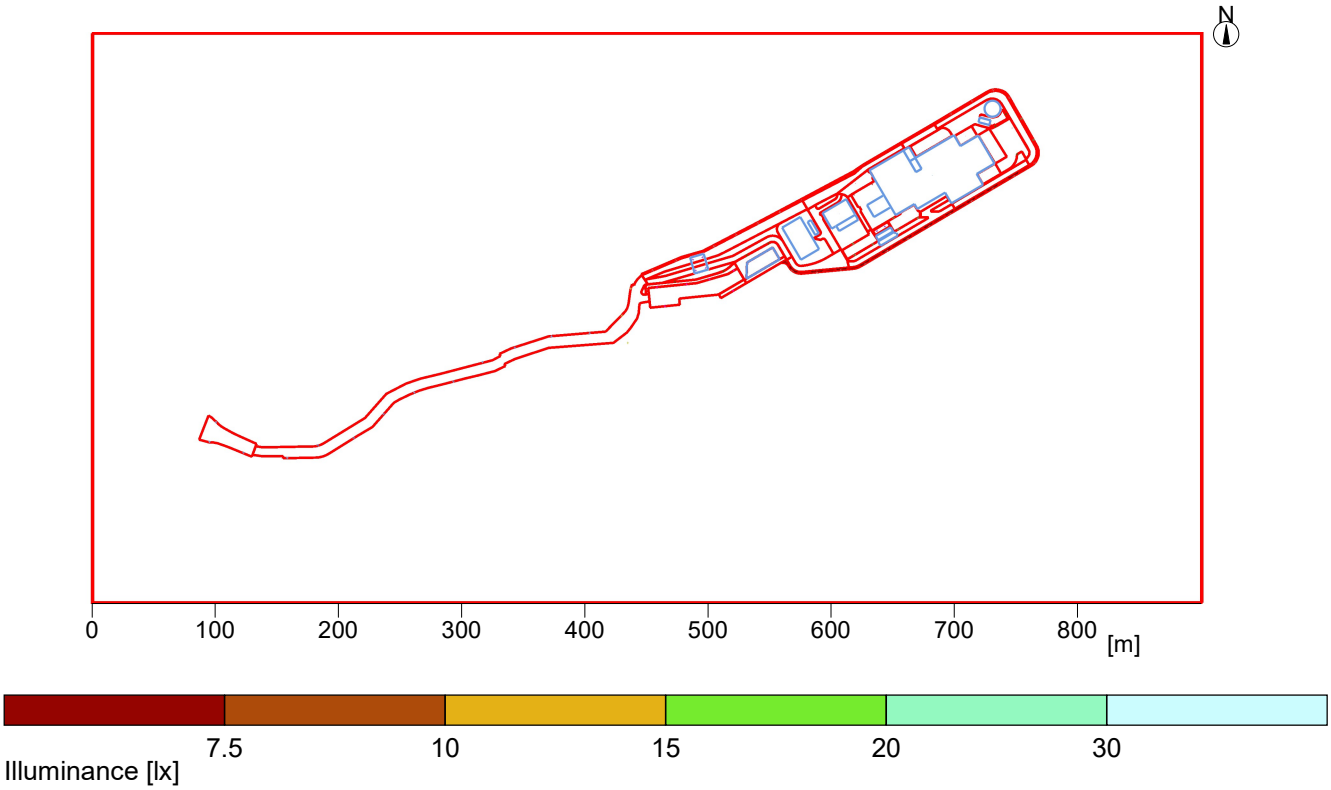
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.29 Result overview, Perimeter path 1



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	13.5 lx
Minimum illuminance	Emin	5.7 lx
Maximum illuminance	Emax	26.8 lx
Uniformity Uo	Emin/Em	1:2.39 (0.42)
Diversity Ud	Emin/Emax	1:4.73 (0.21)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.29 Result overview, Perimeter path 1

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

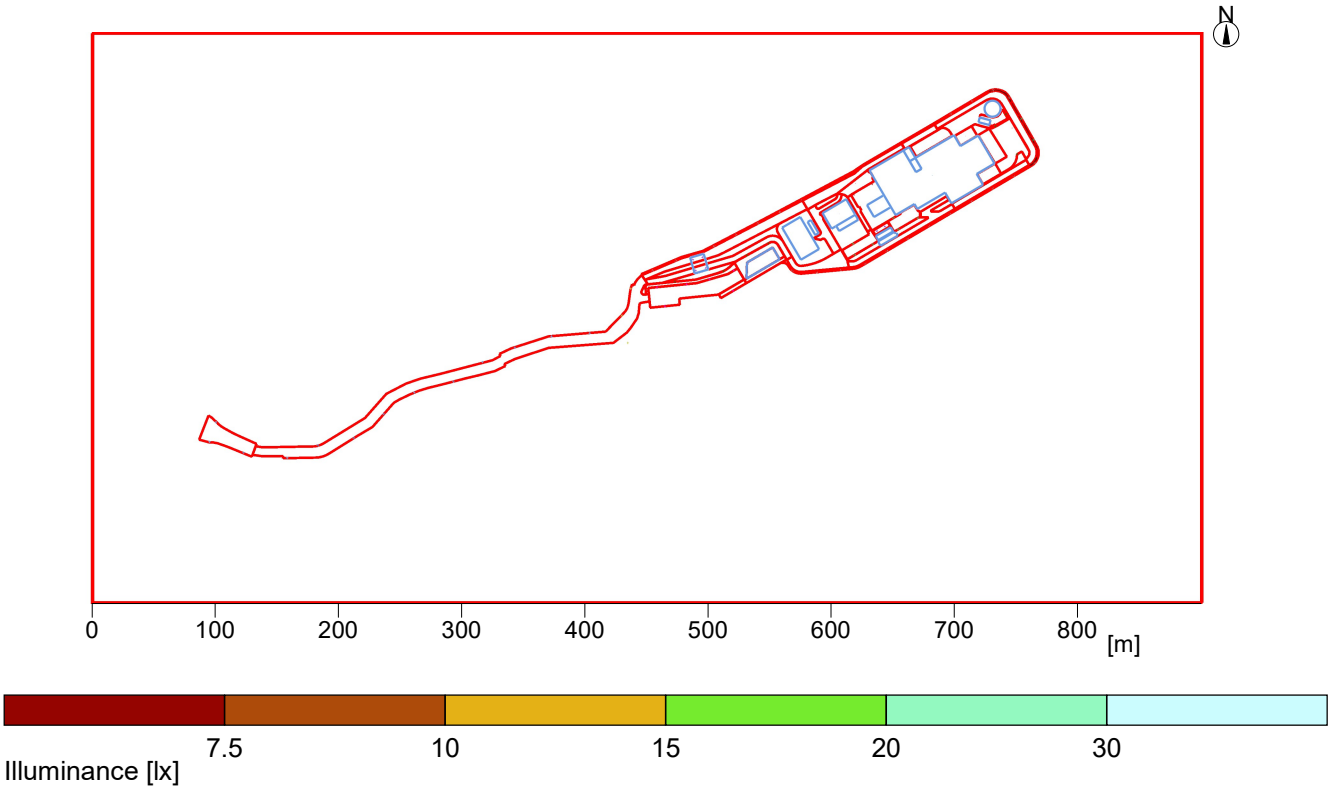
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.30 Result overview, Perimeter path 2



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	13.8 lx
Minimum illuminance	Emin	5 lx
Maximum illuminance	Emax	23.7 lx
Uniformity Uo	Emin/Em	1:2.77 (0.36)
Diversity Ud	Emin/Emax	1:4.76 (0.21)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6	Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
	Luminaire name	: X2 - Italo 1- S05 - 4930
	Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm
5 41	Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
	Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
	Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.30 Result overview, Perimeter path 2

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

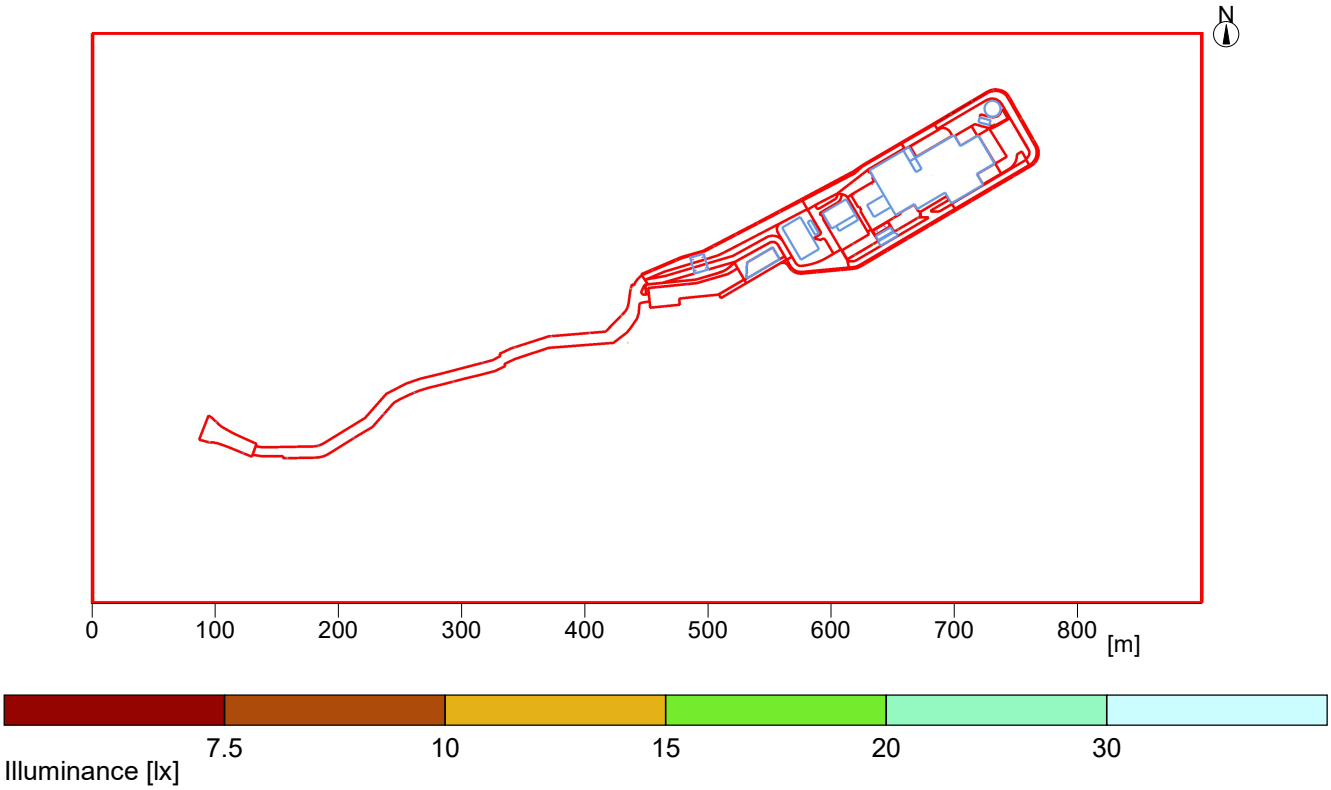
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.31 Result overview, Perimeter path 3



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	12.9 lx
Minimum illuminance	Emin	6.4 lx
Maximum illuminance	Emax	23.2 lx
Uniformity Uo	Emin/Em	1:1.99 (0.5)
Diversity Ud	Emin/Emax	1:3.6 (0.28)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.31 Result overview, Perimeter path 3

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

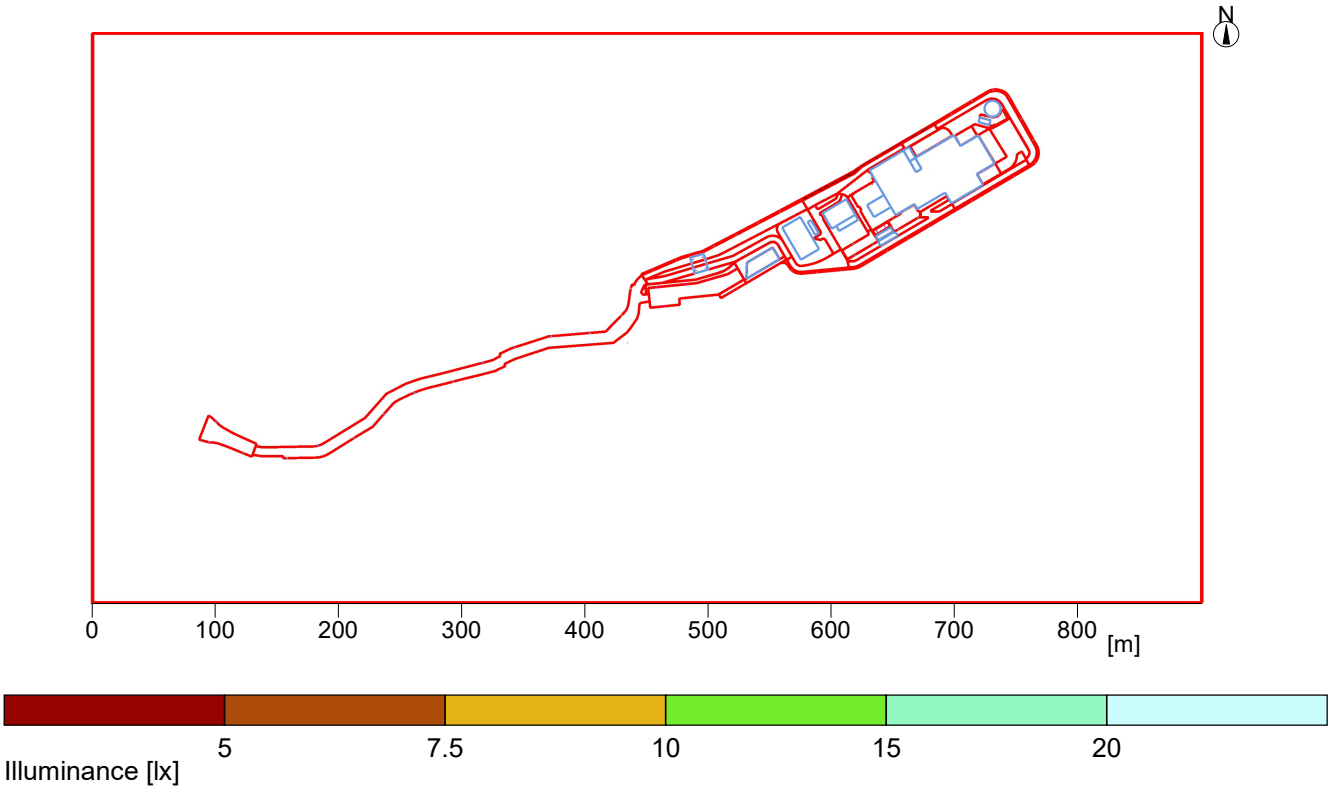
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.32 Result overview, Perimeter path 4



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	11.1 lx
Minimum illuminance	Emin	3.1 lx
Maximum illuminance	Emax	24.1 lx
Uniformity Uo	Emin/Em	1:3.65 (0.27)
Diversity Ud	Emin/Emax	1:7.91 (0.13)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.32 Result overview, Perimeter path 4

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

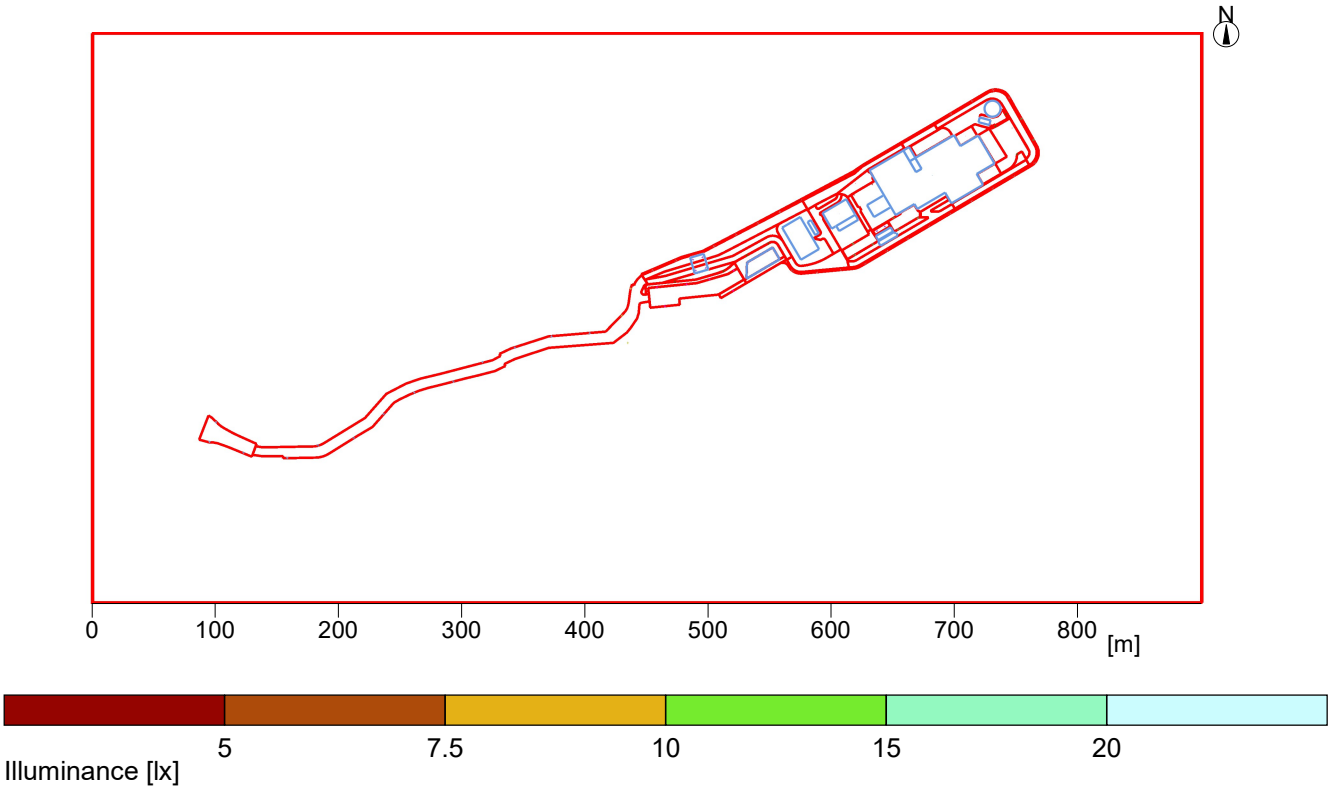
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.33 Result overview, Perimeter path 5



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	10.7 lx
Minimum illuminance	Emin	3.9 lx
Maximum illuminance	Emax	20.8 lx
Uniformity Uo	Emin/Em	1:2.77 (0.36)
Diversity Ud	Emin/Emax	1:5.38 (0.19)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.33 Result overview, Perimeter path 5

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

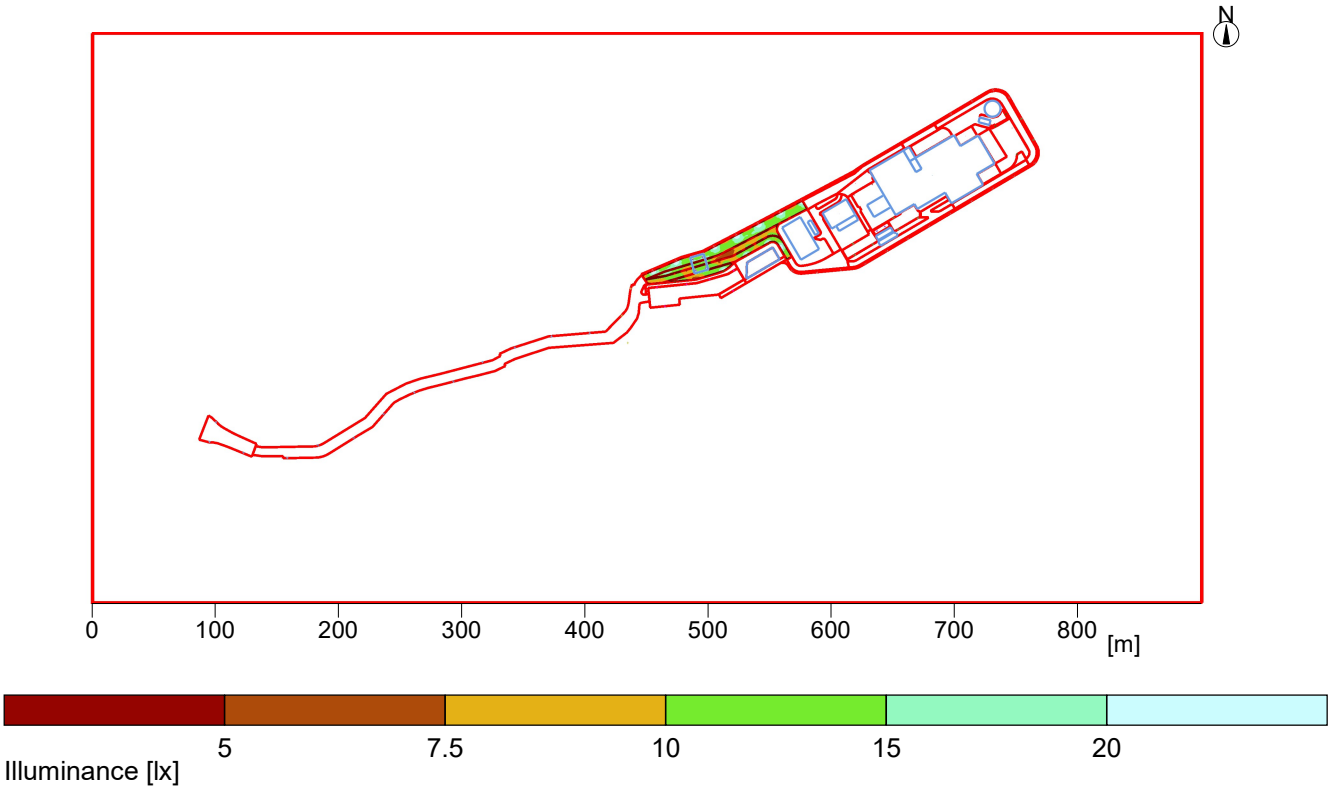
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.34 Result overview, Entrance area total



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	11.8 lx
Minimum illuminance	Emin	5.3 lx
Maximum illuminance	Emax	23.1 lx
Uniformity Uo	Emin/Em	1:2.22 (0.45)
Diversity Ud	Emin/Emax	1:4.33 (0.23)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.34 Result overview, Entrance area total

8 25

Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13

Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3

Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28

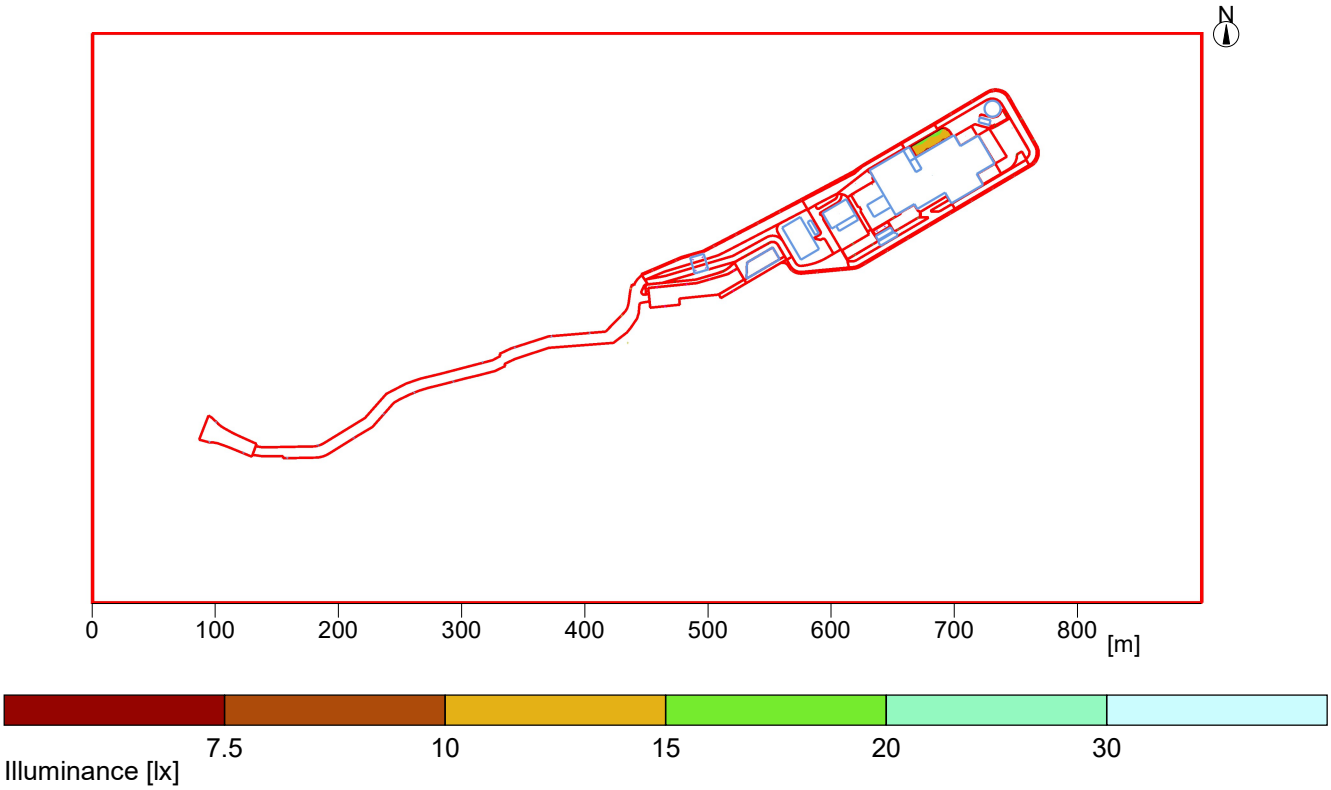
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6

Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.35 Result overview, Access Area



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.80
Total luminous flux of all lamps	336794 lm
Total power	3107 W
Total power per area (415939.53 m²)	0.01 W/m²
Upward light ratio (ULR)	0.00

Illuminance

Average illuminance	Em	12.7 lx
Minimum illuminance	Emin	5.6 lx
Maximum illuminance	Emax	21.4 lx
Uniformity Uo	Emin/Em	1:2.28 (0.44)
Diversity Ud	Emin/Emax	1:3.86 (0.26)

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

The ULR value has been calculated without obstruction by other objects.

2.1 Summary, Site

2.1.35 Result overview, Access Area

8 25 
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13 
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3 
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

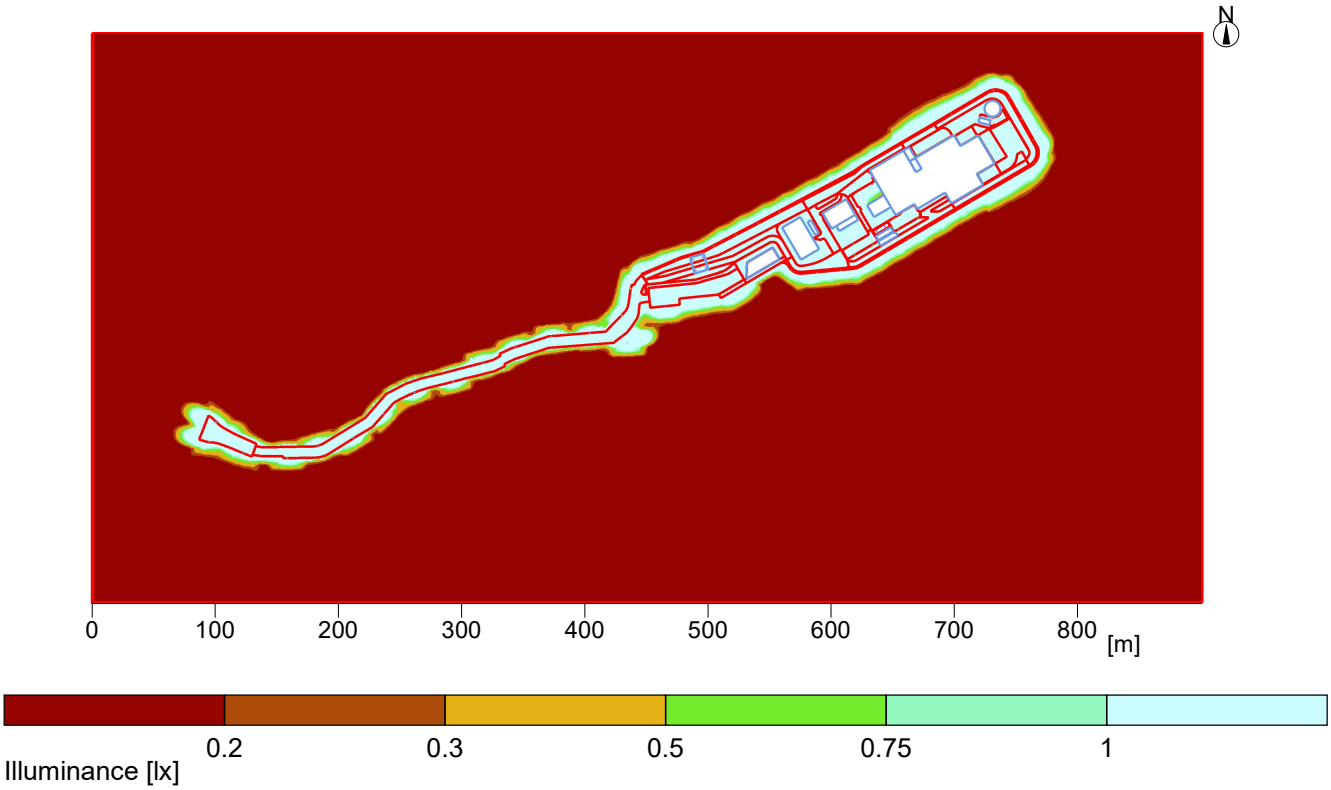
Kingfisher Lighting Ltd

7 28 
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6 
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

2.1 Summary, Site

2.1.36 Result overview, Evaluation area 1



General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.80
Total luminous flux of all lamps	336794.00 lm
Total power	3107.0 W
Total power per area (415939.50 m²)	0.01 W/m² (1.24 W/m²/100lx)

Evaluation area 1	**Reference plane 1.1**
	Horizontal
Em	0.6 lx
Emin	0 lx
Emin/Em (Uo)	---
Emin/Emax (Ud)	---
Upward light ratio (ULR)	0.00
Position	0.00 m

Type No.\Make

AEC ILLUMINAZIONE SRL

2 6

Order No.	: !44.5w (3 module) 525mA Italo 1 with S05 Optic
Luminaire name	: X2 - Italo 1- S05 - 4930
Equipment	: 1 x L-IT1-0F2H1-4000-525-3M 44 W / 4930 lm

5 41

Order No.	: !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name	: X1 - ITALO 1 0F3 STW 4.7-1M
Equipment	: 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3270 lm

2.1 Summary, Site

2.1.36 Result overview, Evaluation area 1

8 25 
Order No. : !30.5w (2 module) 525mA Italo 1 with S05 Optic
Luminaire name : X6 - ITALO 1 0F2H1 S05 4.5-2M
Equipment : 1 x L-IT1-0F2H1-4000-525-2M-70-25 30 W / 3690 lm

10 13 
Order No. : !28w (1 module) 700mA Italo 1 with STW Optic
Luminaire name : X3 - ITALO 1 0F3 STW 3.7-1M- 3000K
Equipment : 1 x L-IT1-0F3-4000-700-1M-70-25 28 W / 3040 lm

12 3 
Order No. : !39w (2 module) 525mA Italo 1 with STW Optic
Luminaire name : X7 - ITALO 1 0F3 STW 3.5-2M- 3000K
Equipment : 1 x L-IT1-0F3-4000-525-2M-70-25 39 W / 4800 lm

Kingfisher Lighting Ltd

7 28 
Order No. : !7.5w LED Quarto bulkhead with street optic
Luminaire name : X4 -LED Quarto.
Equipment : 1 x 7.5w LED 8 W / 727 lm

9 6 
Order No. : !40w 90x100° LED High Bay S
Luminaire name : X5 - High Bay S- limited to 50% output
Equipment : 1 x 40w LED 40 W / 1103 lm

illume DESIGN

Designers Risk Assessment

PROJECT:	Buttington Quarry	**PREPARED BY:**	Bonnie Brooks
PROJECT No.:	4052	**REVIEWED BY:**	Michael Brooks

NOTES

1. This Risk Assessment relates to lighting engineering services only.
2. This Risk Assessment relates to exceptional items only and not the normal risks associated with any construction project.
3. This Risk Assessment has been prepared at the Planning Application stage of the project, and should be reviewed and updated at the Detailed/ Technical Design stage.
4. This Risk Assessment relates to specific risks identified, which a suitably qualified and experienced Electrical Contractor would be familiar with and should therefore be used for installation, maintenance, and commissioning.

HAZARD No.:	DATE RAISED	ACTIVITY	HAZARD	PERSONS AT RISK	RISK REDUCTION PROPOSAL	ACTION REQ'D BY	RESIDUAL HAZARD
1	01/08/19	Installation of cabling and lamp posts.	Contaminated ground.	Installation operatives, construction team	The Contractor shall undertake testing and inspection prior to work being undertaken.	Contractor	Risk remains, management measures will reduce likelihood.
2	01/08/19	Electrical wiring and installation	Risk of electrocution, risk of burns, fire risk.	Installation/ Maintenance Operatives, site operatives	The works shall be undertaken in accordance with the procedures detailed in Health & Safety at Work Act. The Electrical Contractor shall prepare a full method statement for the work presented and fully agreed with	Contractor	Some minimal residual hazard will remain as the original hazard.

HAZARD No.:	DATE RAISED	ACTIVITY	HAZARD	PERSONS AT RISK	RISK REDUCTION PROPOSAL	ACTION REQ'D BY	RESIDUAL HAZARD
					the Clients representative prior to commencing the works.		
3	01/08/19	Manual handling of the equipment.	Risk of injury to personnel.	Installation Operatives	The Contractor shall provide method statements identifying safe systems of works and methods of manual handling.	Contractor.	Hazard remains, likelihood reduced.
4	01/08/19	Installation at heights	Risk of falls from height and dropping materials from height.	Installation operatives, site operatives	All works to be undertaken by access equipment operated by trained personnel, Working area to be cordoned off, no materials stored on the working platform with only materials being installed allowed on the platform.	Contractor/ Sub-con.	Risk remains, management measures will reduce likelihood.
5	01/08/19	Installation of cabling and lamp posts.	Unidentified below ground services	Installation Operatives	Appoint a suitably qualified operative to undertake a Ground Penetrating Radar Survey to identify any below ground services.	Contractor/ Sub-con.	Hazards remain reduced likelihood.

HAZARD No.:	DATE RAISED	ACTIVITY	HAZARD	PERSONS AT RISK	RISK REDUCTION PROPOSAL	ACTION REQ'D BY	RESIDUAL HAZARD
					Provide RAMS, undertake works in accordance with the Health & Safety at Work Act.		
6	01/08/19	Installation of cabling and lamp posts	Overhead cabling	Installation Operatives	All overhead cables to be redirected below ground prior to commencement of construction. Full details of any relocations to be obtained. RAMS to be provided.	Contractor/ Sub-con.	Hazards remain, likelihood reduced.
7	01/08/19	Fixing of equipment to building.	Installations may affect the structural integrity of the building.	Installation Operatives/ site operatives	Ensure no holes are formed, no chases are drilled and no damage is done to affect the structural integrity of the building without prior written agreement from the project Structural Engineer.	Contractor	Some minimal residual hazard will remain as the original hazard.
8	01/08/19	Working near highways or areas with traffic for installation and maintenance purposes	Vehicular and pedestrian traffic.	Installation/ Maintenance Operatives	All Staff are suitable qualified to undertake the works. Columns should be installed with doors orientated such that an operative working in the base compartment faces oncoming traffic.	Contractor	Hazards remain reduced likelihood.

HAZARD No.:	DATE RAISED	ACTIVITY	HAZARD	PERSONS AT RISK	RISK REDUCTION PROPOSAL	ACTION REQ'D BY	RESIDUAL HAZARD
					Appropriate traffic management must be used for any works on columns. All fixed columns should be in locations which can be reasonable accessed by a suitable Mobile Elevating Work Platform (MEWP). Columns on footpaths should be raise and lower type column. Provide RAMS, undertake works in accordance with the Health & Safety at Work Act.		
9	01/08/19	Lighting levels designed to British Standard recommendations following liaison with the Client and Design Team to ascertain type of task or activity in each area	Slips, trips, falls, accidents, vehicular collisions	Site operatives	Client will undertake Risk Assessment to ensure levels of lighting provided are adequate for the site and tasks, and determine any additional measures required to reduce associated hazards	Client	Same hazards remain reduced likelihood.

HAZARD No.:	DATE RAISED	ACTIVITY	HAZARD	PERSONS AT RISK	RISK REDUCTION PROPOSAL	ACTION REQ'D BY	RESIDUAL HAZARD
10	01/08/19	Loss of power and lighting	Slips, trips, falls, vehicular collisions	Site operatives, Site Visitors	Lighting to be served by multiple circuits. Emergency lighting to be provided at the detailed/ technical design stage, in accordance with the Fire Risk Assessment for the site.	Contractor/ Designer at Technical Design Stage	Hazards remain reduced likelihood.
11	14/08/20	Ecological Constraints- Levels of illuminance along the site access road has been reduced and designed in accordance with BS 5489 for a road lighting class P4 to reduce impact onto ecological sensitive areas. A control system is also proposed so that certain luminaires along the access road can be switched off when not in use to create a dark crossing point for bats	Slips, trips, falls, vehicular collisions	Site operatives, Site Visitors	The control system should be tested and commissioned to ensure it is working correctly to allow safe access and egress. It should be tested on a regular basis to ensure correct operation is maintained including checking that PIRs are working correctly.	Client, Contractor	Hazards remain reduced likelihood.

HAZARD No.:	DATE RAISED	ACTIVITY	HAZARD	PERSONS AT RISK	RISK REDUCTION PROPOSAL	ACTION REQ'D BY	RESIDUAL HAZARD
12	14/08/20	Additional localised lighting will be required to the ladders and platforms, particularly to the top of the Fly ash and APCR silos to be used in emergency or maintenance situations.	Slips, trips, falls	Site operatives	This additional lighting should be designed at the detailed/ technical design stage when detailed working drawings are available.	Client/ Contractor/ Designer at Technical Design Stage	Hazards remain reduced likelihood.
13	14/08/20	Any lighting that may be required to the A458 access junction is not included in the scope of this external lighting strategy.	Slips, trips, falls, vehicular collisions	Site operatives, Site Visitors	Any lighting required to the access junction to be provided in accordance with Local Authority requirements and to be coordinated with the Access Road lighting design.	Client/ Contractor/ Designer at Technical Design Stage	Hazards remain reduced likelihood.

Technical Appendix 4-3:
Construction Environmental Management Plan

ECL Ref: ECL.001.01.02/ES
DATE August 2020
ISSUE: FOR CONSULTATON

ENERGY RECOVERY FACILITY AT BUTTINGTON QUARRY

OUTLINE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

BUTTINGTON QUARRY, BUTTINGTON, WELSHPOOL, POWYS, SY21 8SZ

ECL Ref: ECL.001.01.02/CEMP
ISSUE: FOR CONSULTATION
August 2020

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APPENDICES

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ACRONYMS/TERMS USED IN THE TEXT

Broad Energy	**Broad Energy (Wales) Limited**
C&I	**Construction and Industrial**
CEMP	**Construction Environmental Management Plan**
CMS	**Construction Method Statement**
Development Site	**The physical site on which the Development is to be located as defined by the red line planning boundary (see Drawing ECL-BQ-000 in Technical Appendix TA1-1 of the ES)**
ECL	**Environmental Compliance Limited**
EIA	**Environmental Impact Assessment**
ERF	**Energy Recovery Facility**
ES	**Environmental Statement**
EWI	**Environmental Work Instructions**
GCN	**Great Crested Newt**
GPP	**Guidance on Pollution Prevention**
HZI	**Hitachi Zosen Inova**
LBAP	**Local Biodiversity Action Plan**
LNR	**Local Nature Reserve**
NNR	**National Nature Reserve**
NRW	**Natural Resources Wales**
OMH	**Open Mosaic Habitat**
PAWS	**Plantation on Ancient Woodland Sites**
PCC	**Powys County Council**
PPE	**Personal Protective Equipment**
PPG	**Pollution Prevention Guidance**
Ramsar	**Ramsar Convention on Wetlands of International Importance**
RQC	**River Quality Grade**
SAC	**Special Area of Conservation**
SPA	**Special Protection Area**
SPZ	**Source Protection Zone**

ACRONYMS/TERMS USED IN THE TEXT (CONT.)

SSSI	**Site of Special Scientific Interest**
SWMP	**Site Waste Management Plan**

1. INTRODUCTION

1.1. Project Description

1.1.1. Environmental Compliance Limited ("ECL") has been commissioned by Broad Energy (Wales) Limited ("Broad Energy") to prepare an Outline Construction Environmental Management Plan ("CEMP") relating to the proposed Buttington Quarry Energy Recovery Facility ("ERF"), hereafter referred to as the "Development", located at Buttington Quarry, Buttington, Welshpool, Powys, SY21 8SZ (referred to as the "Development Site").

1.1.2. The proposal relates to a purpose designed and built ERF that will thermally process non-hazardous municipal waste together with non-hazardous commercial and industrial waste ("C&I"). All of the wastes accepted would have been previously treated in materials recovery facilities, consequently, would have little, if any, recyclates to be recovered. It is proposed that up to 167,000 tonnes of waste would be accepted per annum.

1.1.3. The Development will comprise the following elements:

- a waste reception hall and bunker;
- an ERF to recover the energy and heat from the residual waste; and
- facilities to manage the products and outputs from the ERF.

1.1.4. This document outlines the measures required for environmental management at the pre-construction stage. Site specific method statements will be developed by the main contractors which will give greater detail on the exact measures to be implemented in order to comply with the conditions set out in this CEMP.

1.1.5. It was agreed with the Development Planning Team at Natural Resources Wales ("NRW") on 12th December 2018 that a high level Outline CEMP including a Site Waste Management Plan ("SWMP") detailing the general measures to address all relevant environmental issues would be sufficient at the pre-construction stage for submission with the Environmental Impact Assessment ("EIA") prior to the detailed CEMP being produced following appointment of the Principal Construction Contractor. This document therefore constitutes the Outline CEMP and SWMP.

1.2. Requirement for a Construction Environmental Management Plan

1.2.1. If left uncontrolled, the construction phase of the ERF could result in potential impacts on the environment and local community. Both Broad Energy and the Principal Construction Contractor (to be appointed) will have key responsibilities in ensuring that any environmental impacts are controlled appropriately.

1.2.2. As outlined in Chapter 4 of the Environmental Statement ("ES"), a CEMP will be produced prior to the commencement of construction activities. The CEMP will clearly set out the methods of managing environmental issues for all parties involved with the construction works. This document presents the high level Outline CEMP and details the general mitigation measures that will be employed during the construction phase of the development.

1.2.3. The following are included and addressed in the CEMP:

- environmental aspects register;
- project organisation and responsibilities;
- project communication and co-ordination;
- training;
- operational control;
- checking and corrective action;
- environmental control measures
- Site Waste Management Plan; and
- complaints procedure.

1.3. Scope of Mitigation

1.3.1. This CEMP considers mitigation measures and arrangements for the following environmental aspects:

- safety;
- general environmental controls (including waste);
- air quality;
- noise and vibration;
- water pollution;
- construction traffic;
- parking arrangements;
- ground conditions;
- ecology; and
- waste production.

1.4. Monitoring and Review

1.4.1. It should be noted that, as a contractor has not yet been appointed to undertake the works, this CEMP may be subject to revision following the selection of contractors and commencement of works on site.

1.4.2. The contract documentation for the construction works will include any such revision(s) of the CEMP and will ensure that there is a requirement on the contractor to comply with the actions and mitigations set out in this document. Any such revisions will be agreed with Powys County Council ("PCC") and NRW.

1.4.3. The construction period is expected to last approximately thirty-six months. Accordingly, periodic reviews of the CEMP during the construction phase are considered to be required and will be undertaken every six months.

2. ENVIRONMENTAL ASPECTS REGISTER

2.1. Introduction

2.1.1. An assessment has been undertaken to identify the sensitive environmental features which could potentially be affected by the construction works. The list of features is provided in Table 1 in Section 2.3. of this document and provides the relevant information for the preparation of the necessary Construction Method Statement(s) which may be required prior to construction.

2.1.2. An Environmental Aspects Register has then been complied which references the mitigation measures required for the protection of the environmental features/receptors identified in this section. The Environmental Aspects Register is presented in Appendix I of this Outline CEMP. The Register will be used to inform the Principal Construction Contractor when preparing its statement of works.

2.2. Screening of Potential Receptors

Site Location

2.2.1. The Development Site is located on the A458 Shrewsbury to Welshpool Road (at NGR: 326690, 310106) and the general site context is shown in Figure 1. The planning boundary (red outline) is shown in Figure 2.

Figure 1: Site Context

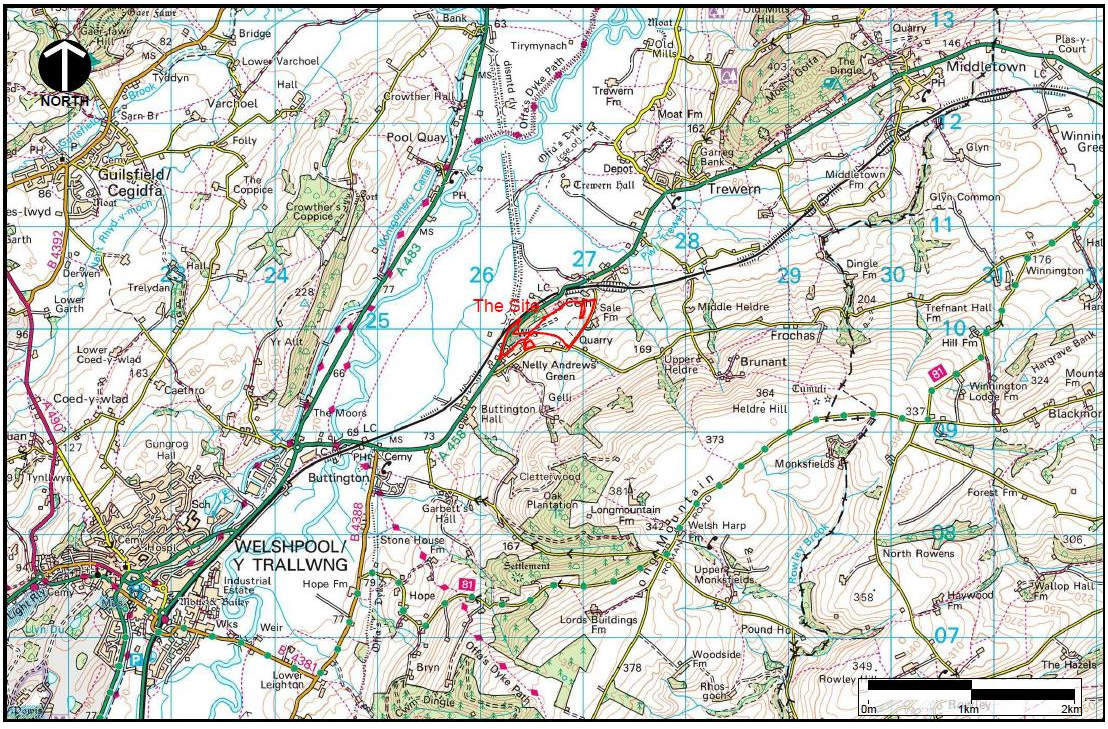
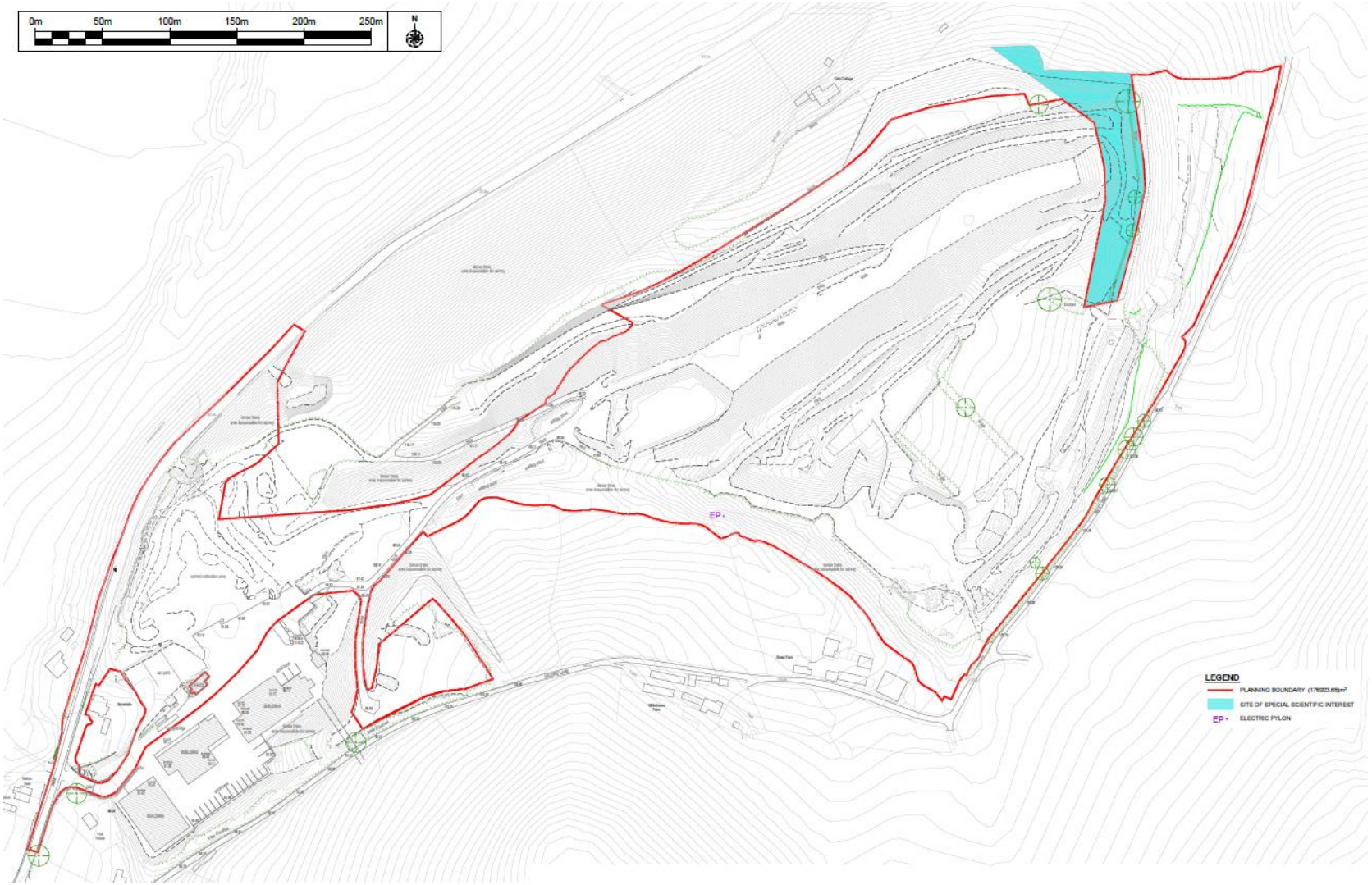


Figure 2: Planning Boundary



2.2.2. The Development will be located within Buttington Quarry, with the Development Site occupying an area of approximately 18ha. The quarry itself occupies a total land area of 24 hectares and is bounded by the A458 to the northwest, Sale Lane to the east and Heldre Lane to the south (both being unclassified roads). The Welshpool-Shrewsbury railway line runs immediately northwest of the A458, towards the northernmost point of the quarry crossing under the A458 and for a short section runs between the A458 and the Development Site boundary. The quarry is accessed from the A458 and is located within the landownership of the quarry.

2.2.3. The Development Site is surrounded by open countryside with the village of Buttington located approximately 2km to the south-west and Trewern approximately 1.5km to the north-east. Directly to the north-east of the Site is an outlying area of Trewern known as Cefn. This comprises an additional area of sporadic isolated houses and a larger area of residential development, including a school (Buttington Trewern County Primary School).

Hydrology

2.2.4. The closest primary river is the River Severn located approximately 1.2km to the west of the Development Site. The River Severn stretches approximately 354km in length and flows from the Cambrian Mountains in mid Wales to the Bristol Channel via Shropshire, Worcestershire and Gloucestershire. According to the Envirocheck Report, the River Severn has a River Quality Grade ("RQG") of A ('Very Good') with a flow of less than 40 cumecs[1].

Groundwater

2.2.5. The glaciofluvial superficial deposits found beneath the Development have been categorised as an undifferentiated layered secondary aquifer with intergranular flow. A lower permeability Secondary (B) Aquifer sits below these deposits.

2.2.6. The Lle Geo-Portal for Wales indicates that the Development is not within a Groundwater Source Protection Zone ("SPZ")[2].There are no groundwater abstraction licences within 500m of the Development.

Sensitive Ecological Designations and Development Site Ecology

2.2.7. A review of the area using the Lle Geo-Portal for Wales[3] was undertaken to identify any sensitive ecological designations in the surrounding area.

2.2.8. The Development is not located within 10km of a Site Protection Areas ("SPA"). Midland Meres and Mosses Phase 1, a Ramsar Convention on Wetlands of International Importance ("Ramsar") site, lies within 8km of the site. The air quality assessment has also considered Phase 2 of this RAMSAR site which is within 15km.

[1] Envirocheck Report, Landmark Information Group, Dated March 2019.
[2] Lle-Portal for Wales, 'Source Protection Zone' mapping tool, Natural Resources Wales, available online at: https://lle.gov.wales/catalogue/item/SourceProtectionZonesSPZMerged/?lang=en, accessed February 2020.
[3] Lle Geo-Portal for Wales, Natural Resources Wales, available at: http://lle.gov.wales/home, accessed February 2020.

2.2.9. However, the Development is located within 10km of two Special Area of Conservation ("SAC") sites;

- Granllyn – located approximately 4.5km north west; and
- Montgomery Canal – located approximately 1.39km to the west of the Development.

2.2.10. Additionally, a search of Sites of Special Scientific Interest ("SSSI") within 2km of the Development Site was undertaken. Buttington Brickworks is designated as a SSSI for its geological interest and is located within the north east region of the Development Site, but is excluded from the planning boundary.

2.2.11. Additionally, Montgomery Canal described above is also designated as a SSSI and Moel Y Golfa SSSI is located approximately 1.88km north east of the Development Site.

2.2.12. The Development Site is not located within 2km of any National Nature Reserves ("NNR") or Local Nature Reserves ("LNR").

2.2.13. Ancient woodland is located within the north west region of the Development Site within the planning boundary and is categorised as; ancient woodland of unknown category, restored ancient woodland and plantation on ancient woodland site. The ancient woodland will not be affected by the Development, and will be retained to provide ecological habitat and visual screening. There are a number of ancient woodland sites which are located within 2km of the Development and are shown in Figure 10.2 in Technical Appendix 10.2 in Chapter 10 - Ecology.

2.2.14. Regarding the ecological conditions at the Development Site, most of the area on which the Buttington ERF is to be constructed is of negligible ecological value with extremely limited scope to support protected species. This comprises the existing quarry void, access tracks and laydown areas which are dominated by compacted bare or sparsely vegetated ground, along with recently felled woodland at the proposed new access off the A458.

2.2.15. The remainder includes ephemeral/short perennial and tall ruderal vegetation, scattered scrub and areas of semi-improved neutral grassland which together meet the criteria for Open Mosaic Habitat on previously developed land ("OMH"), a Section 7 priority habitat. Two existing settlement lagoons also represent priority habitat (ponds) due to the presence of a small population of great crested newt ("GCN").

2.3. Identified Sensitive Receptors

2.3.1. Following the screening assessment detailed in Section 2.2. above, Table 1 provides a list of those receptors which could potentially be at risk from construction impacts.

2.3.2. Any receptors that are greater that 5km from the site are not considered to be at risk from construction impacts.

Table 1: Identified Sensitive Receptors

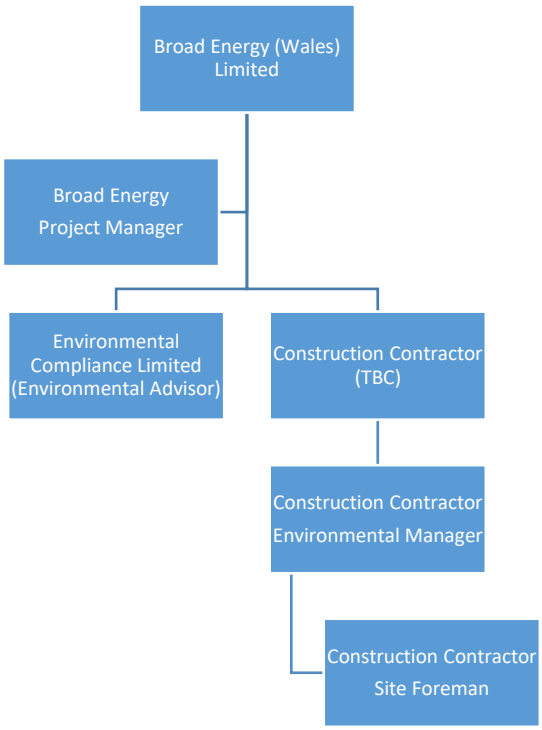
Receptor Category	Receptor	Distance from Site (km)	Direction
Ecological	Gaciofluvial superficial deposits - undifferentiated layered secondary aquifer with intergranular flow with a lower permeability Secondary (B) Aquifer beneath	Onsite	Underlies the Site
	Buttington Brickworks Site of Special Scientific Interest ("SSSI")	Within the north east region of the Development Site, but is excluded from the planning boundary	NE
	Ancient Woodland	Onsite	NW
		Twelve locations within 2km of the Development Site – See Figure 10.2 in Chapter 10 Ecology.	N, E, S & W
	OMH and Lagoons supporting GCN	Onsite	n/a
	River Severn	1.2	W
	Montgomery Canal – Special Area of Conservation SAC and SSSI	1.39	NE
	Moel Y Golfa SSSI	1.88	NE
	Granllyn SAC	4.5	NW
Human/Industrial	Border Hardcore Limited	Adjacent	SW
	Logistics and Distribution Buildings	Adjacent	SW
	A458 Road Network	Adjacent, running parallel to site	SW to NE
Human/Residential	Cefn Cottage	0.14	N
	Cefn – including Buttington Trewern County Primary School	0.67	NE
	Trewern	1.5	NE
	Buttington Village	2.00	SW
Commercial	Green Farm	0.27	SE
	Whitehouse Farm	0.28	SW
	Lower Cefn Farm	0.29	NW
	Cefn Farm	0.42	NE
	Sale Farm	0.44	SE
	Heldre Lane	0.65	SW

3. PROJECT ORGANISATION AND RESPONSIBILITIES

3.1. Construction Management Structure

3.1.1. Figure 3 details a generic construction project team. Descriptions of their individual responsibilities are provided in Section 3.2. It should be noted that this structure may be revised following appointment of the Principal Construction Contractor.

Figure 3: Construction Management Structure



3.2. Project Responsibilities

Broad Energy Project Manager

3.2.1. The Broad Energy Project Manager will have overall responsibility for monitoring the performance of the project against any statutory requirements and the agreed mitigation measures. Responsibilities will include:

- reviewing the CEMP with the appointed Principal Construction Contractor and agreeing any changes/identify areas for improvement;
- ensuring that all contractors and sub-contractors are aware of their environmental obligations and mitigation measures to be employed throughout the works;
- reviewing the Construction Method Statement(s) with regard to the environmental aspects; and
- providing a main point of contact between Broad Energy and the Principal Construction Contractor.

Construction Contractor Environmental Manager

3.2.2. The Construction Contractor Environmental Manager will have the responsibility for co-ordinating and managing all environmental activities involved in the construction works. Responsibilities will include:

- reviewing the CEMP with the Broad Energy Project Manager and agreeing any changes/identify areas for improvement;
- developing Construction Method Statement(s), work instructions and any other relevant specialist procedures;
- identifying environmental competence requirements of staff and providing training where required;
- monitoring the construction activities and ensuring that the mitigation measures identified in the CEMP are adhered to;
- liaising with the Broad Energy Project Manager;
- carrying out weekly site inspections and completing any associated reporting requirements;
- management of any environmental monitoring programmes;
- assisting in responding to any complaints;
- in the event of an environmental incident, ensuring that the correct procedures are adhered to; and
- undertaking environmental audits of any subcontractors and suppliers, as required.

Construction Contractor Site Foreman

3.2.3. The Construction Contractor Site Foreman will be responsible for:

- providing information on waste management/reduction procedures, as relevant;
- implementing and ensuring the effective operation of relevant environmental controls on site;
- responding to any environmental incidents such as spills;
- immediately reporting activities which have or could lead to environmental incidents; and
- completing a daily site log.

Environmental Advisor (Environmental Compliance Ltd)

3.2.4. The Environmental Advisor will be available on an ‘as and when required’ basis to support the Project Team. Their role may include:

- acting as the main point of contact between the regulatory authorities and Broad Energy and its contractors on any environmental issues;
- providing any environmental training required;
- maintaining a watching brief;
- assisting in responding to any complaints.

3.3. Project Communication and Co-ordination

3.3.1. Periodic meetings will be held between the Broad Energy Project Manager and members of the Project Team to discuss ongoing environmental performance and the need for improvements (where applicable), results of inspections and any complaints received.

3.4. Environmental Training

3.4.1. A training plan will be developed if required and provided as a revision to this CEMP. The training plan will identify competency requirements for all staff with environmental responsibilities and will detail any training requirements that may be necessary. Toolbox talks covering specific environmental controls will be provided as and when required. The Environmental Advisor will advise the Construction Contractor Environmental Manager on any necessary training requirements and will provide any such training

3.5. Operational Control

3.5.1. This Outline CEMP provides the overall project strategy for the management of environmental issues. However, the main contractor once appointed will be required to produce Construction Method Statements ("CMSs") which will address the environmental management issues at a site level. The CMSs will provide an environmental manual for use by management and construction staff involved in the works. They will address all the environmental aspects that are specific to each activity during the construction phase.

3.5.2. Environmental Work Instructions ("EWIs") are the most detailed form of environmental controls and will provide "hands on" directions for on-site staff. EWIs are related to specific environmental aspects and provide clear and concise instructions to site personnel dealing with situations such as:

- controls and requirements of the CEMP and CMSs;
- adverse weather conditions;
- environmental incidents;
- complaints; and
- general good site practice.

3.5.3. Site works will be audited against the requirements of the CEMP by the Site Foreman. Any mitigation measures that have been agreed with the statutory authorities or those that are part of the planning conditions will be put into place prior to any works being undertaken.

3.5.4. CMSs and EWIs prepared by the Construction Contractor Environmental Manager will be reviewed by the Broad Energy Project Manager and, where required, the Environmental Advisor.

3.6. Checking and Corrective Action

3.6.1. Daily inspections of the site and the construction works will be undertaken by the Site Foreman to minimise the risk of any potential environmental damage and to ensure compliance with the CEMP.

3.6.2. It is the responsibility of all site personnel to immediately report any environmental incidents to the Site Foreman.

3.6.3. The Construction Contractor Environmental Manager will undertake monthly inspections and complete an assessment of the project's environmental performance. Following such inspections, a summary report will be submitted to the Broad Energy Project Manager.

4. ENVIRONMENTAL CONTROL MEASURES

4.1. Safety During Construction

4.1.1. All works shall be capable of being constructed, installed, commissioned, operated and maintained in full compliance with all relevant Health and Safety at Work orders, all related Acts, Regulations, Codes and Statutory Instruments. This will include Broad Energy's own Safety Rules and Permit-to-Work System.

4.2. General Environmental Control Measures During Construction

4.2.1. General provisions to reduce the environmental impact of the construction activities will include the following:

- all contractors will be required to keep all plant and materials and all equipment connected with the construction of the works in good order and clean and tidy;
- all contractors will remove any waste materials from the site to a permitted waste facility in accordance with the requirements of all relevant environmental legislation; the Principle Construction Contractor will be required to obtain any necessary permits from NRW for the disposal of any such waste arisings;
- any excavated material generated during the construction of the facility will be reused on site, where appropriate;
- the disposal of excess concrete on any part of the construction site will be strictly prohibited;
- on completion of works, all contractors will be required to leave the construction area in a neat, clean and orderly condition;
- individual contractors are required to provide sanitary facilities that will be adequate for their construction personnel;
- all temporary offices/welfare facilities associated with construction of the development will comply with the Safety, Health and Welfare Regulations, on completion of works, contractors will remove all such facilities entirely and restore the surface of the land to a satisfactory state;
- the main site gate will be locked, and security guards will be provided to patrol the site during non-working hours;
- all internal haul roads will be covered by tarmac or concrete; and
- all wheel and vehicle-washing will occur within contained drainage areas to prevent the spread of contaminants.

4.2.2. Pollution Prevention Guidance ("PPG") documents are being reviewed and replaced by the Guidance for Pollution Prevention ("GPPs") series. The new GPPs and existing PPGs which are yet to be withdrawn are listed below. The GPPs detail good environmental practice and environmental regulatory guidance for Wales. These guidance documents will be adhered to ensuring that all construction works are undertaken in an environmentally responsible manner:

- GPP2: Above Ground Oil Storage Tanks;
- GPP4: Treatment and Disposal of Wastewater where there is No Connection to the public foul sewer;
- GPP5: Works and maintenance in or near water;
- GPP8: Safe storage and disposal of used oils;
- GPP13: Vehicle washing and cleaning;

- PPG18: Managing Fire Water and major spillages;
- GPP21: Pollution incident response planning;
- GPP22: Dealing with spills;
- GPP26: Safe storage – drums and intermediate bulk containers (due consideration given, however, at time of writing the Outline CEMP, this GPP has not been reviewed by NRW);
- PPG27: Installation, decommissioning and removal of underground storage tanks.

4.3. Air Quality

4.3.1. The effects of construction dust are likely to be limited to areas downwind within 100m of dust generating activities and are predicted to remain within the boundary of the Buttington Quarry site. However, in order to prevent any detrimental effects on air quality, the following mitigation measures will be implemented to minimise the potential for fugitive dust emissions:

- the Buttington Brickworks SSSI will be fenced off and construction activities will be set back from the area;
- site access roads will be watered as necessary using a water bowser and surfaces kept in good order and cleaned as required;
- all vehicles carrying loose aggregate and workings will be sheeted at all times;
- dampening of exposed soil and loose material stock piles will be carried out as necessary;
- observation of wind speed and direction will be carried out to determine the potential for dust nuisance to occur at sensitive receptors to the east of the proposed facility prior to conducting potential dust-generating activities; potential dust-generating activities will be avoided during periods of high winds;
- stockpiles of soils and materials will be located in sheltered areas of the site, where practicable;
- windbreak netting will be placed around stockpiles of material sensitive to wind disturbance;
- the use of construction equipment designed to minimise dust generation;
- establishment and enforcement of an appropriate speed limits on roads carrying construction vehicles to minimise dust emissions;
- frequent washdown of roads and made surfaces;
- regular inspection of local highways will take place to monitor the deposition of dust leaving the site;
- wheel washing facilities for vehicles leaving the site if required;
- drop-heights for friable materials will be minimised; and
- completed earthworks will be vegetated as soon as practicable.

4.4. Noise and Vibration

4.4.1. Restriction of construction hours to non-sensitive times of day is anticipated to form part of the planning consent conditions and will be strictly adhered to.

4.4.2. In accordance with BS5228, best practical means will be employed to control the noise generation (e.g. using equipment that is regularly maintained, where practicable use equipment fitted with silencers or acoustic hoods).

14.1.1. In consideration of the likely highest levels of construction noise, the following mitigation measures are proposed:

- restriction of construction hours to non-sensitive times of day would normally form part of the planning consent conditions;
- sensible routing of the construction plant to avoid the nearest residential properties (where practicable);
- careful choice of piling rigs to minimise noise as practicable (e.g. use of continuous flight auger piling);
- careful choice of road breaker and compressor during grid and water connection works to minimise noise;
- avoid un-necessary plant operation and revving of plant or vehicles;
- locate plant away from nearest sensitive receptors or in locations which provide good screening in the direction of sensitive receptors;
- installation of the acoustic screen along the entrance relative to Brookside property via a 2.1m high close-boarded fence or solid screen of minimum mass of 12kg/m2 (the location of this is shown on ECL Drawing ECL-BQ-001 – Proposed Site Plan provided in Appendix 4-1 of the ES; and
- use of broadband noise reverse alarms (where practicable) on mobile plant.

4.5. Water Pollution

4.5.1. Construction activities will be carried out in accordance with GPP5: Works and maintenance in or near water.

4.5.2. Silted water can arise from excavations, exposed ground, stockpiles and plant/wheel washing. Water containing silt will not be pumped directly into surface water drains.

4.5.3. Elements of the final Surface Water Management Plan will be constructed at the earliest opportunity to provide management of site drainage; however, appropriate temporary measures will be introduced to limit the suspended solids content discharging off site.

4.5.4. These measures will include:

- minimising stockpiling of materials and the use of covers or temporary bunds, as required;
- promoting rapid stabilisation/revegetation of final surfaces;
- introducing silt fences at the top of unvegetated slopes; and
- introducing a Sitlbuster® settlement unit prior to off-site discharge.

4.5.5. The location and duration of the use of the above mitigation measures will be dependent on the phase of works and weather conditions.

4.5.6. Special care is to be taken during deliveries, especially when fuels and hazardous materials are being handled. All deliveries will be supervised by a responsible person. Storage tank levels will be checked before delivery to prevent overfilling and that the product is delivered to the correct tank. The spill response procedure is detailed in Section 4.8. of this Outline CEMP.

4.5.7. Many of the materials which will be used in the construction phase, such as oil, chemicals, cement, lime, cleaning materials and paint have the potential to cause environmental

harm. These will be properly stored at all times and in bunded areas if required.

4.5.8. Mobile plant will only be refuelled in a designated area away from any drains or watercourses; a suitable spill kit will be available in this location.

4.5.9. Hoses and valves will be regularly checked for signs of wear, will be turned off and securely locked when not in use and will be fitted with auto-cut-offs.

4.5.10. Suitable provision will be made for the washing out of concrete mixing plant or ready mix concrete lorries so that washings do not flow into any drain, watercourse or seep into the ground.

4.6. Construction Traffic

4.6.1. During the construction phase, the existing quarry access will be used until the new site access is constructed. The new access proposal includes a dedicated right turn ghost island facility and increased junction visibility. The existing access would then be closed off, allowing access to the property known as Brookside only. All vehicles will be brought into site forwards and leave forwards, where possible. If a vehicle has to reverse, in or out of the site, banks men will be used to control them.

4.6.2. All traffic movements will be undertaken via trunk roads. To ensure this is adhered to a Traffic Routing Plan will be included in all contract documentation. There will be contractual obligations which will be based on the following: any contractor found using alternative routes, in the first instance, be given a warning by the Broad Energy Project Manager, a second offence will result in the imposition of a financial penalty, and in the third and final instance, their contract will be terminated (the exact conditions will be finalised within contract documentation).

4.6.3. Wheel wash and road sweeper facilities will be utilised and a construction/HGV management plan will be implemented.

4.6.4. Additionally, a traffic management plan will be prepared and implemented during the construction of the new access junction. This will ensure that temporary road works accord with guidelines and minimise delays for passing traffic.

4.7. Parking Arrangements

4.7.1. Parking facilities for construction vehicles and private transportation will be located within the Development Site. Vehicles will not be permitted to queue on adopted highways.

4.8. Ground Conditions

4.8.1. During the construction phase, risks to construction workers, local residents and the environment from any imported soils or aggregate will be mitigated by:

- review of chemical test certificates for intended imported materials to ensure only materials deemed uncontaminated when compared to regulatory soil thresholds are considered for import;

- independent sampling and testing of soils or aggregate once received on site and results compared to regulatory soil thresholds to confirm only intended soils have been imported and that these are acceptable;
- compilation of all testing and assessment data for imported soils and aggregate in the form of a soils validation report; and
- removal of any materials found to be unsuitable

4.8.2. If previously undetected made ground is identified on site during the construction period the following mitigation measures will be employed:

- inspection, sampling and testing of soils by a geo-environmental engineer;
- undertake a quantitative human health and environmental risk assessment and comparison to laboratory test results to regulatory soil thresholds to determine whether soils are contaminated; and
- removal of any materials found to be unsuitable for retention on site.

4.8.3. The construction contractors will be responsible for implementing measures to control or prevent run-off of construction materials or leaks and spills. This will include:

- preparing drainage plan;
- store all oils, fuels and chemicals in a fully bunded area;
- carry out any activities (such as refuelling) that could cause pollution (leaks/spills) in a designated area, away from surface water or boreholes. Where possible, it should drain to the foul sewer;
- use settlement ponds to remove silty water; and
- implement an emergency procedure plan – see Spill Response Procedure below.

4.8.4. The appointed Construction Contractor will provide Method Statements and Risk Assessments to deal with these matters. During the ground works, the contractor will comply with all current Health and Safety regulations.

4.8.5. Discharge of waste materials/waters will be regulated in accordance with any relevant Environmental Permit.

4.8.6. Based on chemical test data from site soils an assessment has been made in accordance with publication BRE Special Digest 1:2005 Concrete in Aggressive Ground to the risk to concrete from the chemical agents in the ground. This confirms that all buried concrete should as a minimum conform to Class AC-1 to resist chemical attack.

Spill Response Procedure

4.8.7. In the event of a spill or loss of containment of potentially polluting substances, the following procedure will be followed:

- notify Construction Contractor Site Foreman immediately and raise the alarm of a spill in the immediate area;
- Personal Protective Equipment (“PPE”) should be worn appropriate to the material spilled;
- appropriate spill control material will be retrieved and used to first contain and absorb the spill according to the Material Safety Data Sheet (“MSDS”). This may include the use of booms to create a barrier to capture the spill and prevent further spreading. The loose spill control material should then be distributed over the

entire spill area, working from the outside, circling to the centre. This reduces the chance of splashing or spreading of the spill;

- if any drains are in the immediate vicinity, deploy drain covers to prevent any material entering the drainage network;
- when the material has been absorbed, place the contaminated materials into an appropriate container and label and store in a secure ventilated area;
- contact the Construction Contractor Environmental Manager to arrange for appropriate disposal; and
- undertake the necessary incident investigation and reporting and in the case of a major spill where spillages are 200 litres or greater, NRW shall also be informed.

4.9. Ecology

Buttington Brickwork SSSI

4.9.1. The Buttington Brickwork SSSI must be protected during the construction phase and not damaged by the construction of screening embankments and drainage. It will be fenced off and tool box talks given about its importance and the need to protect it.

4.9.2. A site visit with NRW and Hitachi Zosen Inova ("HZI") execution team was planned for March 2020 to discuss any mitigation measures for the construction phase. Unfortunately due to COVID-19 travel restrictions, this visit has been postponed. This section of the CEMP will be updated accordingly following the meeting once any further mitigation measures for construction have been discussed and agreed.

Site Construction and Enabling Works – Ancient Woodland

4.9.3. In order to prevent dust deposition on Plantation on Ancient Woodland Sites ("PAWS") and restored ancient woodland, standard air quality measures will be implemented, such as damping down and careful positioning of stockpiles (see Section 4.3. of this CEMP).

Ground Works and Movement of Vehicles and Heavy Plant - Powys Local Biodiversity Action Plan Habitat

4.9.4. There is potential for damage/degradation to Powys Local Biodiversity Action Plan ("LBAP") habitat resulting from adjacent road construction and pollution events associated with reprofiling and plant/vehicle movement. The pollution response procedure is detailed in Section 4.8 above and will be followed in the unlikely event of spillage or loss of containment.

4.9.5. Additionally, temporary fencing will be installed along the banks of the sections of open watercourse.

4.9.6. A traffic management plan and protocols for adverse weather conditions will be prepared by the Construction Contractor.

External Lighting Overnight – Bats

4.9.7. Avoidance of night working during the active season will prevent light spill onto habitats directly adjacent to and outside the Development site used for foraging and commuting by bats (particularly woodland edge).

Vegetation Removal – Breeding Birds

4.9.8. Removal of scrub may affect low numbers of nests if present due to the limited extent of suitable habitat, therefore, Scrub removal within the development footprint will be undertaken in winter. If this is not possible, ecologist will search area prior to clearance and put in place mitigation as required.

Vegetation Removal and Groundworks, Storage of Equipment Overnight – Badgers and Hedgehogs

4.9.9. Any deep excavations left open overnight present a hazard to badgers and hedgehogs which may fall in while foraging/moving across the site. There is also some potential for injury on equipment such as wire or chemicals left in areas accessible to these species overnight. As such, a means of escape from open excavations will be provided and good site housekeeping practices will be implemented to remove injury hazards overnight.

Removal of Lagoons, Ground Works and Movement of Vehicles and Heavy Plant – Great Crested Newts and Reptiles

4.9.10. Site preparation and construction activity such as vegetation removal, groundworks and movement of heavy plant carries a risk of killing or injuring individual great crested newts or reptiles. A European Protected Species Mitigation Licence ('EPSML') and associated method statement will be produced for removal of the existing settlement lagoons and surrounding terrestrial habitat. This will set out measures to mitigate the risk of harm to individual newts and reptiles during construction. This will include ecological supervision during pond and terrestrial habitat removal and appropriate fencing to exclude newts from the construction area (if required). Creation of a series of new, dedicated ponds and an appropriate HMP will ensure no net loss of habitat quantity or quality for great crested newts.

4.9.11. Additionally, suitable road safety measures e.g. low speed limit will be incorporated into the road design at key points where mammals are likely to cross to minimise the risk of road mortality.

4.10. Site Waste Management Plan

4.10.1. A detailed SWMP will be prepared to help manage and reduce the amount of waste produced during construction projects.

4.10.2. The construction work proposed is provided in Section 1 whilst the location of the Development Site is provided in Section 2.

4.10.3. Waste management and reduction has been incorporated into the concept and design of the project. Decisions to minimise the quantity of waste produced such as:

- reusing materials where possible; and
- careful selection of type of material to be used and forecasting and planning to ensure no material wastage.

4.10.4. During the pre-construction phase, overall responsibility of the SWMP is held by Broad Energy, however, the responsibility will be transferred to the Principal Construction Contractor when appointed. Broad Energy and the Principal Construction Contractor will sign a declaration that they will handle materials efficiently and manage waste in accordance with all relevant environmental legislation and duty of care requirements.

4.10.5. The Principal Construction Contractor as part of the detailed SWMP will identify the types and quantities of waste expected to be produced in the course of the project. Each aspect of the project will be analysed to identify and quantify the associated materials and waste produced. This will include estimating waste production tonnages and identifying waste management actions and setting realistic targets of the waste which can be reused, recycled or disposed of.

4.10.6. Segregation methods will be implemented for key recyclates, such as paper, cardboard, metal, glass and plastics. Waste recording and reporting will be undertaken throughout the project.

4.10.7. The Construction Contractor will evaluate the best options for recycling and disposing of all the types of waste to be produced.

4.10.8. All waste will be stored and disposed of responsibility applying the waste hierarchy. Mixing of different waste types will be prohibited. All waste transfer notes ("WTN") will be held for two years whilst all consignment notes will be held for at least three years.

4.10.9. The Construction Contractor will be responsible for ensuring registered waste carriers are used to transport the waste and all sites receiving the waste have the appropriate Environmental Permit, licence or registered exemption. These details will be recorded in the detailed SWMP.

5. COMPLAINTS AND RECORDS

5.1. Response to Complaints

5.1.1. Any complaints received in the construction phase of the development will be dealt by Broad Energy's Project Manager. If and when an incident occurs or a complaint is received, the circumstances will be investigated, and appropriate short-term and long-term actions will be taken and followed up.

5.1.2. A Complaints Log will be kept in a site diary which will be maintained throughout the construction phase.

5.1.3. Information regarding the nature of the complaint will be used to assess what action (if any) is required and subsequent investigation of the complaint will either confirm, fail to confirm or further characterise the incident.

5.1.4. In the first instance, the complaint will be screened, taking into account the following information:

i. the quality and source of the complaint (e.g. local commercial undertakings, local residents etc.);

ii. the number of complaints from different sources or individuals;

iii. the frequency of complaints, e.g. is it a one-off event or a regular occurrence?

iv. knowledge of potential sources within the site (cross - referenced with details of any abnormal conditions, the wind direction relative to where the complaint was received from, distance of the complaint to the site); and

v. knowledge of potential sources other than the Installation (cross referenced to the wind direction relative to where the complaint was received from, distance of the complaint to the site).

Points (iv) and (v) relate to determining whether the complaint is attributable to the Broad Energy construction site, rather than other potential sources in the area.

5.2. Record Keeping

5.2.1. Records will be kept in the site diary and by the Broad Energy Project Manager.

5.2.2. The type of information that will be retained will relate to:

- sensitive receptors, in particular the type of receptors, location relative to the source(s) and an assessment of the impact on the receptors;
- an overview of any complaints received, what they relate to (source/operation) and any remedial action taken; and
- identification of any circumstances or conditions, which compromise the ability to prevent or minimise annoyance, and a description of the actions that will be taken to minimise the impact.

APPENDIX I
REGISTER OF ENVIRONMENTAL ASPECTS

Register of Environmental Aspects

Potential Effect	Nature of Effect	Mitigation/Enhancement Measures	Potential Receptors
Reduced air quality – emissions arising from vehicle operations	Temporary Direct	See Section 4.3. of this CEMP	Identified human receptors
Reduced air quality – generation of dust during site development	Temporary Direct		Those receptors identified within the Site Boundary. Effects of construction dust are likely to be limited to areas downwind within 100m of dust generating activities, and are predicted to remain within the boundary of the Buttington Quarry site.
Increase in noise during construction activities	Temporary Direct	See Section 4.4. of this CEMP	Identified human receptors
Detrimental impact on water features	Temporary	See Section 4.5. of this CEMP	Aquifer River Severn Montgomery Canal SAC and SSSI
Spillage from potentially polluting materials	Temporary	See Section 4.8. of this CEMP	
Detrimental impact on ground conditions	Temporary		
Detrimental impact on ecological conditions	Temporary	See Section 4.9. of this CEMP	All ecological receptors identified
Waste production during construction activities	Temporary Direct	See Section 4.10 of this CEMP	Those receptors identified within the Development Site boundary