



MMA Environmental Lighting Impact Assessment

Merthyr Motor Auctions

MMA Environmental Lighting Impact Assessment

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MMA

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Executive Summary

Merthyr Motor Auctions (MMA) has operated under a planning restriction, since February 1997, that limits the operating hours of floodlighting on its lower yard area to between 08:00 and 16:00 on weekdays and Saturdays. In November 2015 the local planning authority approved the removal of this condition to allow the use of floodlighting without restriction in terms of hours. This decision was subject to judicial review April 2016, this resulted in the quashing of the decision on the following basis:

"43. In my judgement, what is required by the paragraph of PPW cited in the report is not just consideration of that aspect of light/glare, but the need to protect the natural environment, retain dark skies where appropriate, prevent glare and respect the amenity of neighbouring land uses. In my judgement that wider need was a material consideration which ought to have been weighed in the balance and, in that wider sense, it is not. To that very limited extent ground 1 is made out."

This Environmental Lighting Impact Assessment (ELIA) has been undertaken to address the above judgement and support the submission of an application for removal of the restriction, the existing Site and other on-site development are described in section 2 of this report.

This ELIA has been undertaken by competent lighting professionals and covers baseline conditions (existing lighting not including lower yard) and lighting impacts such as light spill, glare, and sky glow that may arise from additional (lower yard) lighting. The ELIA includes the magnitude of change in light conditions, and where appropriate assesses the significance of effects on sensitive receptors. Receptors considered include nearby communities.

The MMA Site is located 1.7 miles north-east of Merthyr Tydfil. The site is broken into two sections, there's a main yard with a large vehicle storage area (Flood Lighting is already present in this area with no restrictions), the auction building and a few smaller structures. and a lower yard currently used for storage (Lighting in this area is restricted to between 08:00 and 18:30) and includes a couple of small workshops.

The identification of receptors was carried out by assessing the area surrounding the lower yard during the day, and during the night with the main yard lights switched on. This helped to identify where the yard was visible from to take Viewpoint readings and where the most appropriate areas would be to take illuminance levels.

A baseline survey was carried out on the local area to make notes on existing lighting, establishing an environmental zone and taking pictures and illuminance level where applicable. In suburban areas on the edge of a town such as this, the Environmental Levels can vary between two Zones. The area around the lower yard varies between E2 and E3. If this is the case (as outlined in PLG04) the lower of the two gets selected making the area around the lower yard an E2 environmental Zone.

The additional mitigation outlined in section 5.3 will reduce the predicted effects to neutral for obtrusive light, Glare and Sky Glow. The overall result without mitigation would be minor adverse for the surrounding area.

The very high lighting levels at the Victoria street car park identified as part of the baseline assessment have a much greater adverse effect on sky glow in this area than the MMA lower yard site as shown in appendix A-A.1 and Appendix B-B1.

MMA lower yard has been assessed as Class 5 on the Bortle scale. This is a conservative estimate. Light pollution has also been classified towards the higher end of the spectrum by <https://www.lightpollutionmap.info>.

In conclusion, light pollution from the local town, will far outweigh any potential light pollution from the MMA lower yard site. Any light pollution from the Site will be negligible in comparison and near to invisible by the naked eye.

1. Introduction

- 1.1.1 Merthyr Motor Auctions (MMA) has operated under a planning restriction, since February 1997, that limits the operating hours of floodlighting on its lower yard area to between 08:00 and 16:00 on weekdays and Saturdays. In November 2015 the local planning authority approved the removal of this condition to allow the use of floodlighting without restriction in terms of hours. This decision was subject to judicial review April 2016, this resulted in the quashing of the decision on the following basis:

"43. In my judgement, what is required by the paragraph of PPW cited in the report is not just consideration of that aspect of light/glare, but the need to protect the natural environment, retain dark skies where appropriate, prevent glare and respect the amenity of neighbouring land uses. In my judgement that wider need was a material consideration which ought to have been weighed in the balance and, in that wider sense, it is not. To that very limited extent ground 1 is made out."

- 1.1.2 This Environmental Lighting Impact Assessment (ELIA) has been undertaken to address the above judgement and support the submission of an application for removal of the restriction, the existing Site and other on-site development are described in section 2 of this report.
- 1.1.3 This ELIA has been undertaken by competent lighting professionals and covers baseline conditions (existing lighting not including lower yard) and lighting impacts such as light spill, glare, and sky glow that may arise from additional lighting. The ELIA includes the magnitude of change in light conditions, and where appropriate assess the significance of effects on sensitive receptors. Receptors considered include nearby communities.
- 1.1.4 The reporting of this ELIA has been structured considering the Institute of Lighting Professionals' (ILP) PLG04 Guidance on Undertaking Environmental Lighting Impact Assessments [RD1] (abbreviated to 'PLG04' in this report).

1.2 Terminology

- 1.2.1 The following terminology concerning types of light pollution is relevant to the understanding of this assessment.
- 1.2.2 Obtrusive light: Obtrusive light (sometimes also referred to as light pollution) is light that hinders or bothers the human eye.
- 1.2.3 Glare: Glare is a result of light emitted from a source that is in sharp contrast to its surroundings.
- 1.2.4 Spill light: This is illuminance falling beyond the area that is being lit. Spill light is quantifiable and measurable and is used to define levels of light trespass.
- 1.2.5 Sky glow: This is the visible haze or glow seen above a lighting installation that reduces the ability to view the darkened night-time sky. Sky glow is a combination of light emitted upwards from a light source and reflected light cast downwards from the surface being illuminated reflecting off particles suspended in the atmosphere. The degree of sky glow experienced is dependent on weather conditions. When there is low cloud cover, more particles are present in the atmosphere to scatter the reflected light, increasing the appearance of sky glow. On a clear night, there are less particles present, reducing the appearance of sky glow.

2.1.1 This Section provides an overview of the MMA Site including receptors.

2.1.3 The area surrounding the lower yard does have Street lighting, lit industrial estates and a high street. The existing main yard is well lit. The high street lighting is to a higher level than the local residential roads and is located to the south west. The lit industrial estate is located to the north west, levels around the site can be found in section 4, with illuminance survey results in appendix B.

[illegible]

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3. Method of assessment

3.1 Guidance

3.1.1 1.3.1 The following documents provide the principal guidance which has informed the approach to the ELIA:

- ILP. 2013. Guidance on Undertaking Environmental Lighting Impact Assessments [RD1] (PLG04).
- ILP. 2011. Guidance Notes for the Reduction of Obtrusive Light GN01:2011 [RD3].
- ILP. 2007. Technical Report 28. Guidelines for Measurement of Lighting Performance on Site [RD4].
- Snowdonia National Park Authority. October 2016. Supplementary Planning Guidance, Guidance Note 14, Obtrusive Lighting (Light Pollution) [RD5].

3.2 Study Area and approach

3.2.1 There is no specific guidance for determining a study area for an ELIA. The study area applied for this ELIA incorporates an area of no more than 500m in any direction away from the site. This is due to the geography and the hilly nature of the area.

3.2.2 The identification of receptors was carried out by assessing the area surrounding the lower yard during the day, and during the night with the main yard lights switched on. This helped to identify where the yard was visible from to take Viewpoint readings and where the most appropriate areas would be to take illuminance levels.

3.2.3 To assess the effects of additional lighting on receptors, it is important to understand the existing sources of light pollution in the area, therefore, baseline levels have been taken.

3.3 Baseline Survey

3.3.1 A baseline survey was carried out on the local area to make notes on existing lighting, establishing an environmental zone and taking pictures and illuminance level where applicable. The locations identified were first visited in the day to investigate any safety concerns and take daytime photos before returning at night to take some additional photos for comparison. See appendix A for Photos. Levels were taken whilst the roads and areas were free from obstruction as objects can reflect light and cause shadows that will make results inaccurate

3.4 Illuminance measurements

3.4.1 The lighting equipment around the different survey locations varied in height, type and spacing. Lighting levels on roads were taken in a TR28 Test grid formation (3x5 Grid using Kerb edges and centreline of road. Either between two columns or around a single column), see examples in Figure 2 overleaf. For footpaths 5 points at equal distances along a chosen length were taken.

3.4.2 A summary of results can be found in section 5.1 and Actual results for each site can be found in Table 3.

- 3.4.3 The measurements for all surveys were taken on a calibrated light meter (Light meter: Hagner E2X, Calibrated on 3rd Jan 2017)

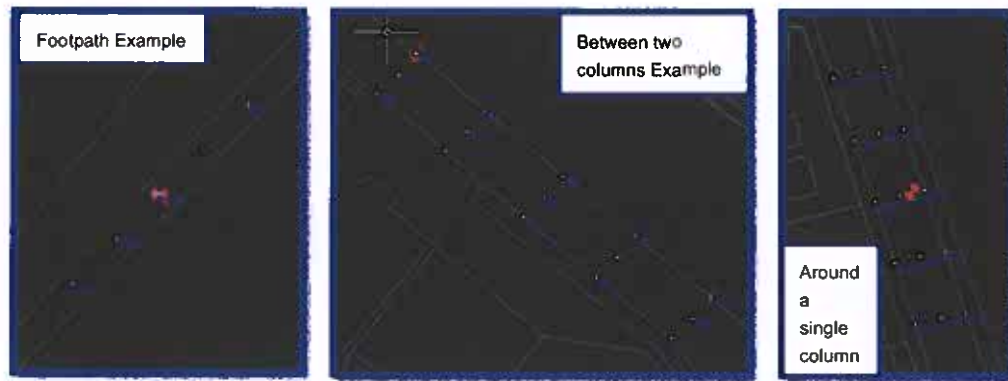


Figure 2. Lux Level Measurements Examples

3.5 Survey conditions

- 3.5.1 Most of the illuminance level measurements were taken whilst the roads, footways, pedestrian crossings and car parking areas were free of vehicles and pedestrians.
- 3.5.2 The Weather was dry and around 0-3°C, Visibility was good, and the sky was mostly clear from cloud

3.6 Environmental Zones

- 3.6.1 The identification of ambient night-time Environmental Zones is crucial to the process of lighting assessment [RD1]. The concept of Environmental Zones was introduced in the 1990s by the Commission Internationale de l'Eclairage and has since been updated by the ILP in 2011 [RD1].
- 3.6.2 Table 1 sets out the range of Environmental Zones. The classification of Environmental Zones enables an appropriate lighting limit for those areas to be determined.

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, International Dark Skies Award Dark Sky Parks
E1	Natural	Intrinsically Dark	National Parks, AONBs, etc.
E2	Rural	Low District Brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium District Brightness	Small town centres or suburban locations
E4	Urban	High District Brightness	Town/city centres with high levels of night-time activity

Table 1. Environmental Zones

3.6.3 In cases such as this one where the Planning Authority has not set environmental zones, the lighting professional can make decisions on the nature of the area and explain reasoning.

3.6.4 In suburban areas on the edge of a town such as this, the Environmental Levels can vary between two Zones. The area around the lower yard varies between E2 and E3. If this is the case (as outlined in PLG04) the lower of the two gets selected making the area around the lower yard an E2 environmental Zone.

3.7 Calculating potential Light Levels

3.7.1 Lighting Reality Pro software (version 1.8) has been adopted to calculate the illuminance contours (light spill). It is the latest version and conforms to all major international standards, such as EN13201:2015 and BS5489:2013 (www.lightingreality.com). This is one of the standard software packages used in industry to simulate lighting designs.

3.8 Assessment Criteria

3.8.1 The assumption in this assessment is that any increase in light is adverse. However, it should be noted that there could be circumstances where some people might find an increase in light in some locations to be beneficial, for example, for reasons of safety and crime reduction.

3.8.2 The degree of change (magnitude) has been assessed using a seven-point scale set out in Table 2. This relates to the scale of change predicted at the assessment locations, irrespective of the sensitivity of the location or presence of sensitive receptors. The scale is based on guidance in PLG04 [RD1].

Nature of Change	Magnitude Level	Criteria
Beneficial	Major/Substantial	Substantial improvement in night environment and/or reductions in glare, spill light and sky glow.
	Moderate	Noticeable improvement in night environment and/or reductions in glare, spill light and sky glow.
	Minor	Slight improvement in night environment and/or reductions in glare, spill light and sky glow.
Neutral	None	Barely perceptible change in lighting or overall effects balancing out.
Adverse	Minor	Slight increase in visibility of lighting, glare and sky glow.
	Moderate	Noticeable increase in visibility of lighting, glare and sky glow.
	Major/Substantial	Substantial problems with increase in visibility of lighting, glare and sky glow.

Table 2. Change Magnitude

3.9 Dark Skies

- 3.9.1 The sky in the area surrounding the MMA lower yard site has been assessed and given level according to the Light Pollution Map and Bortle Scale, this is a nine level (9 being the highest and 1 the lowest) numeric scale that measures sky brightness in a given location, it quantifies the clarity of objects in the sky and the interference caused by light pollution. The area around the MMA is Currently class 5 ((Suburban sky) see Figure 3 below, site highlighted in red)



Figure 3. Light Pollution Map

4. Baseline Lighting Conditions – Lighting Assessment

4.1 Baseline Illuminance Surveys

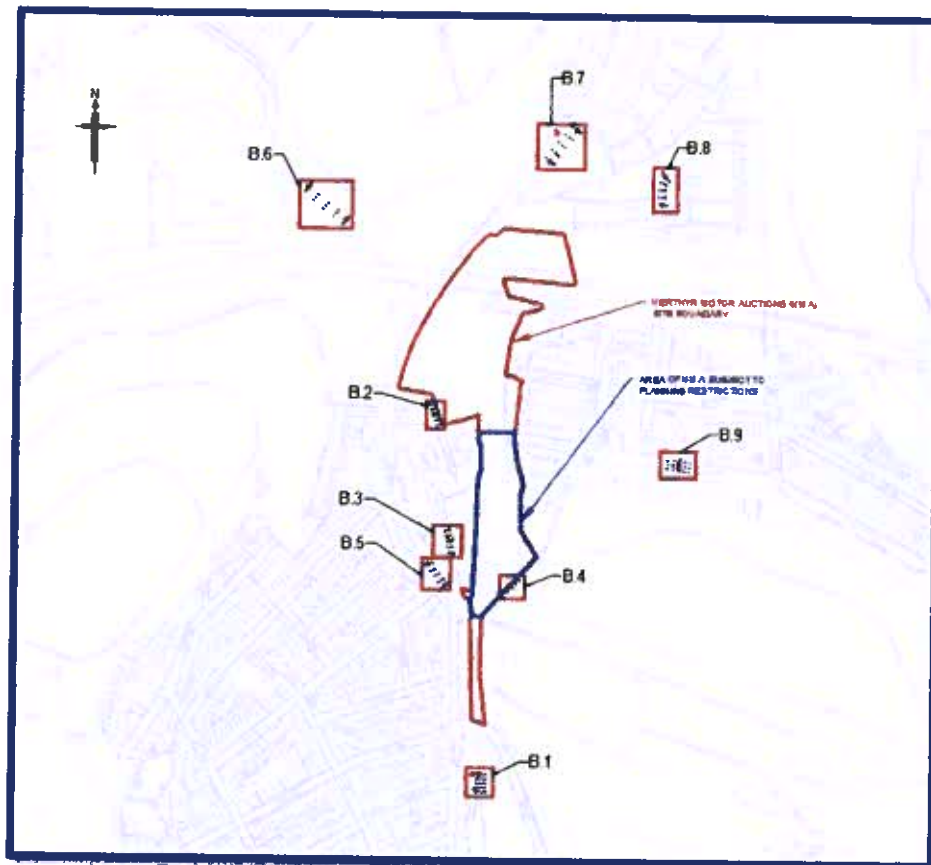


Figure 4. Lux Survey Location Map

4.1.1 Illuminance levels (Lux Levels) were taken in 8 receptor locations around the area of the lower yard (See Figure 4 for Locations), the results of these surveys can be seen in in table 3 below. For information on locations refer to Appendix B and Figure 4.

Location	AV	Uni	REF
Victoria street carpark	24.80	60.48%	B.1
Llewellyn Street north	8.00	37.50%	B.2
Llewellyn Street South	6.67	30.00%	B.3
Foot Path	16.60	48.19%	B.4
Pant Road	6.87	43.69%	B.5
Vaynor Road	9.60	20.83%	B.6
Pant road North	13.60	29.41%	B.7
Yr Hafod	7.73	25.86%	B.8
Barracks Row	7.60	39.47%	B.9

Table 3. Lux Level Survey Results

4.2 Baseline Viewpoint surveys

4.2.1 Information on Baseline survey and levels for viewpoints can be found in Appendix A Please see figure 5 below for map of viewpoint locations.

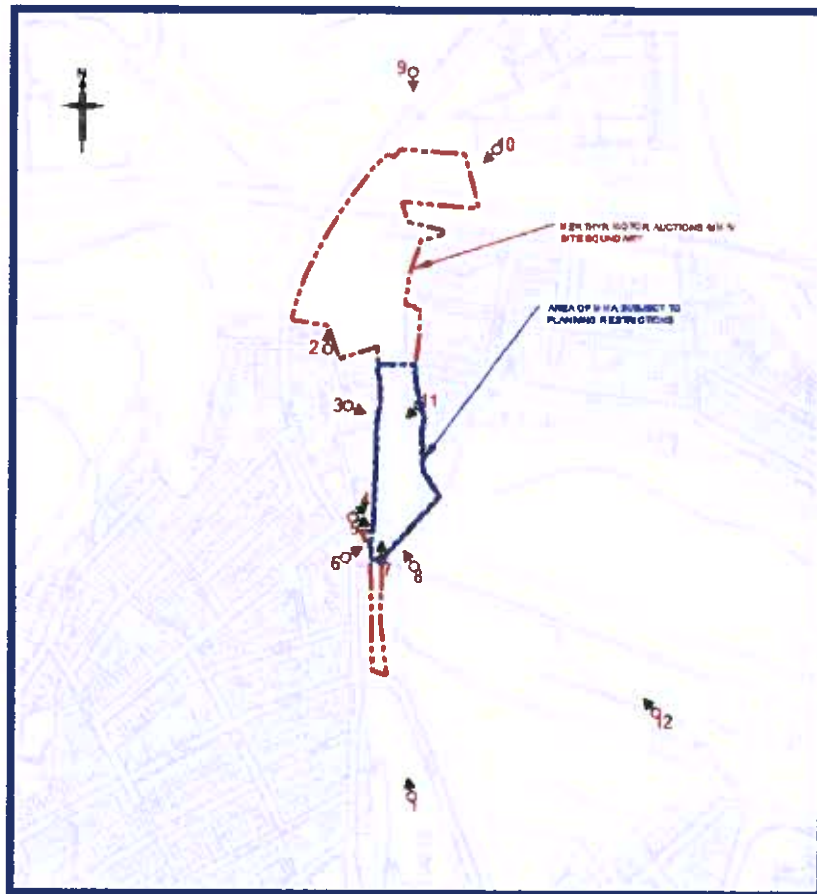


Figure 5. Map of Viewpoint points

4.3 Proposed Development

- 4.3.1 Illuminance Levels within lower yard have been calculated using Lighting reality, the details including Type, height and angle of the twin Head LED lighting in the lower yard has been obtained (see Appendix C) and simulated to look at light intrusion into nearby residence/public areas, as well as to see how the additional lighting will affect surrounding areas.
- 4.3.2 The Lighting levels in the lower yard produced by Lighting reality simulation can be seen in Figure 6 below.
- 4.3.3 The simulation shows the lighting in the lower yard is mostly contained to the yard boundary, there is a negligible amount of back light into properties and a small amount of light intruding onto the footpath that runs along the boundary of the site.

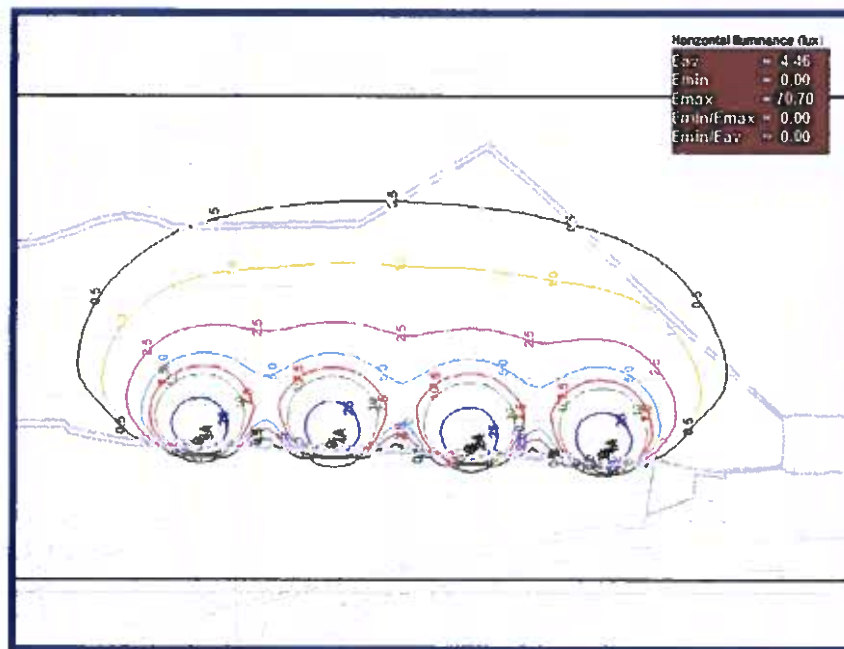


Figure 6. Lighting Reality calculation

5. Residual Effects

5.1 Illuminance

- 5.1.1** The average illuminance level measures by Jacobs in the surrounding areas shows the average LUX level in the areas selected to be 11.27 Lux, as shown in the lighting reality simulation in section 4.3 the average level in the lower yard is 4.46, this means the lighting levels in the lower yard are lower than the lux levels from the baseline surveys.

5.2 Viewpoint survey Residual effects

- 5.2.1** The identification of Receptors was carried out by looking into the area surrounding the lower yard in the day, and at night with the yard lights switched off. This helped to identify where the yard was visible from to take Viewpoint readings. See Appendix A for baseline descriptions and Photographs taken from viewpoints.

- 5.2.2** Examples of additional lighting mitigation can be found in appendix D

Viewpoint	Summary of baseline Lighting condition	Description of potential effect	Nature of effect	Significance of effect	Additional Mitigation	Post Mitigation magnitude of effect
1: Charity book shop	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Minor	Obtrusive light: None visible Glare: None visible Spill Light: None visible Sky Glow: Small Amount visible	Luminaires to have Cow/Back shield installed	Neutral
2: Llewellyn Street North	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Neutral	N/A	Obtrusive light: None visible Glare: None visible Spill Light: None visible Sky Glow: None Visible	-	-
3: Llewellyn Street South	E2 Rural: Low district brightness Village or relatively dark	Adverse	Minor	Obtrusive light: None visible Glare: None visible	Luminaires to have Cow/Back shield installed	Neutral

Viewpoint	Summary of baseline lighting condition	Description of potential effect	Nature of effect	Significance of effect	Additional Mitigation	Post Mitigation magnitude of effect
	outer suburban location			Spill Light: None visible Sky Glow: Small amount Visible		
4: Back view of LED's 1	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Minor	Obtrusive light: None visible Glare: None visible Spill Light: None visible Sky Glow: Small amount Visible	Luminaires to have Cowl/Back shield installed	Neutral
5: Back view of LED's 2	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Moderate	Obtrusive light: None visible Glare: LED lighting visible and stand out in surroundings Spill Light: None visible Sky Glow: Small amount Visible	Luminaires to have Cowl/Back shield installed	Neutral
6: High Street Corner	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Minor	Obtrusive light: None visible Glare: None Visible Spill Light: None visible Sky Glow: Small amount Visible	Luminaires to have Cowl/Back shield installed	Neutral

Viewpoint	Summary of baseline Lighting condition	Description of potential effect	Nature of effect	Significance of effect	Additional Mitigation	Post Mitigation magnitude of effect
7: MMA Pedestrian foot path	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Moderate	Obtrusive light: Clearly visible Glare: Clearly visible Spill Light: None visible Sky Glow: clearly visible	Luminaires to have Cowl/Back shield installed	Neutral
8: New Site	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Moderate	Obtrusive light: clearly visible Glare: clearly visible Spill Light: None visible Sky Glow: clearly Visible	Luminaires to have Cowl/Back shield installed	Adverse Minor
9: Mound North	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Neutral	N/A	Obtrusive light: Not visible Glare: Not visible Spill Light: None visible Sky Glow: none visible	Luminaires to have Cowl/Back shield installed	Neutral
10: The Hafod	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Natural	N/A	Obtrusive light: Not visible Glare: Not visible Spill Light: None visible Sky Glow: None Visible	Luminaires to have Cowl/Back shield installed	Neutral

Viewpoint	Summary of baseline Lighting condition	Description of potential effect	Nature of effect	Significance of effect	Additional Mitigation	Post Mitigation magnitude of effect
11: Wern Street	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Moderate	Obtrusive light: clearly visible Glare: Clearly visible Spill Light: None visible Sky Glow: clearly visible	Luminaires to have Cowl/Back shield installed	Neutral
12: Old Factory	E2 Rural: Low district brightness Village or relatively dark outer suburban location	Adverse	Minor	Obtrusive light: Not visible Glare: Not visible Spill Light: None visible Sky Glow: small amount visible	Luminaires to have Cowl/Back shield installed	Neutral

Table 4. Viewpoint Survey Table

5.3 Mitigation

- 5.3.1** Back light shields should be applied on all four lighting columns within the lower MMA yard. Back shields provide a physical barrier which blocks any backward lighting from a luminaire that is not required. Shields should also be implemented to reduce the effect of light visible from a distance (upward light/sky glow). Some examples of shields are provided in appendix D. Due to the degree of tilt and minimal upward light E2 zones require a barn door shield should be applied to stop upward light and reduce sky glow.

6. Conclusion

6.1.1 In this report the effects that would result from lifting the curfew (operational hours 08:00-18:30) and bringing the hours of operation in line with the existing lighting in the main yard of the MMA Site have been assessed.

6.1.2 With additional mitigation outlined in section 5.3 will reduce the predicted effects to neutral for obtrusive light, Glare and Sky Glow (these results are summarised in Table 4 of this report). The overall result without mitigation would be minor adverse for the surrounding area.

6.1.3 Recommendation for lower yard:

- Fit backlight shields onto all four columns
- Fit cowl/barndoor shields onto each of the eight floodlights to stop upward light

With these mitigations applied, the lower yard will not be contributing to additional light pollution in the area.

6.1.4 The very high lighting levels at the Victoria street car park are part of the baseline assessment have a much greater adverse effect on sky glow in this area than the MMA lower yard site as shown in appendix A-A.1 and Appendix B-B1.

6.1.5 MMA lower yard has been assessed as Class 5 on the Bortle scale. This is a conservative estimate. Light pollution has also been classified towards the higher end of the spectrum by <https://www.lightpollutionmap.info>. Light pollution from the local town, will far outweigh any potential light pollution from the MMA lower yard site. Any light pollution from the Site will be negligible in comparison and near to invisible by the naked eye.

Appendix A. Viewpoint Photos

A.1 REF 1 - Charity book shop.

A.1.1 Accessibility/Land Description

This Viewpoint is located to the south of the MMA site in a small park situated next to a charity shop.

The viewpoint is shielded from the MMA Site by trees. There is existing lighting on the car park and high street nearby.



Figure 7. Viewpoint 1 daytime



Figure 8. Viewpoint 1 Night with MMA lower yard Lighting



Figure 9. Viewpoint 1 Night Without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of obtrusive light, Glare and a noticeable amount of sky glow. The main contributors to this were the High street and the car park. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.2 REF 2 - Llewellyn Street North

A.2.1 Accessibility/Land Description

This Viewpoint is located to the west of the MMA site on a road called Llewellyn Street. The viewpoint overlooks the main yard in the MMA site. There is existing lighting on the Street and within the Main Yard.



Figure 10. Viewpoint 2 daytime



Figure 11. Viewpoint 2 Night with MMA lower yard Lighting



Figure 12. Viewpoint 2 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a Noticeable amount of obtrusive light, Glare and sky glow with a small amount of Spill light. The main contributor to this is the Main MMA yard. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.3 REF 3 - Llewellyn Street South

A.3.1 Accessibility/Land Description

This Viewpoint is located to the west of the MMA site on a road called Llewellyn Street. The viewpoint overlooks the lower yard in the MMA site. There is existing lighting on the Street.



Figure 13. Viewpoint 3 Daytime



Figure 14. Viewpoint 3 Night with MMA lower yard Lighting



Figure 15. Viewpoint 3 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of sky glow. The main contributor to this is the Main MMA yard. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.4 REF 4 - Back view of LED's 1

A.4.1 Accessibility/Land description

This Viewpoint is located to the west of the MMA site on a road called Llewellyn Street. The viewpoint overlooks the lower yard in the MMA site. There is existing lighting on the Street.



Figure 16. Viewpoint 4 Daytime



Figure 17. Viewpoint 4 Night with MMA lower yard Lighting



Figure 18. Viewpoint 4 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of sky glow. The main contributor to this is the Main MMA yard. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.5 REF 5 - Back view of LED's 2

A.5.1 Accessibility/Land description

This Viewpoint is located to the west of the MMA site on a road called Llewellyn Street. The viewpoint overlooks the lower yard in the MMA site. There is existing lighting on the Street.



Figure 19. Viewpoint 5 daytime



Figure 20. Viewpoint 5 Night with MMA lower yard Lighting



Figure 21. Viewpoint 5 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of sky glow. The main contributor to this is the Main MMA yard. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.6 REF 6 - High Street Corner

A.6.1 Accessibility/Land description

This Viewpoint is located to the South-west of the MMA site on a high street. The viewpoint overlooks the lower yard in the MMA site. There is significant existing lighting on the Street.



Figure 22. Viewpoint 6 daytime

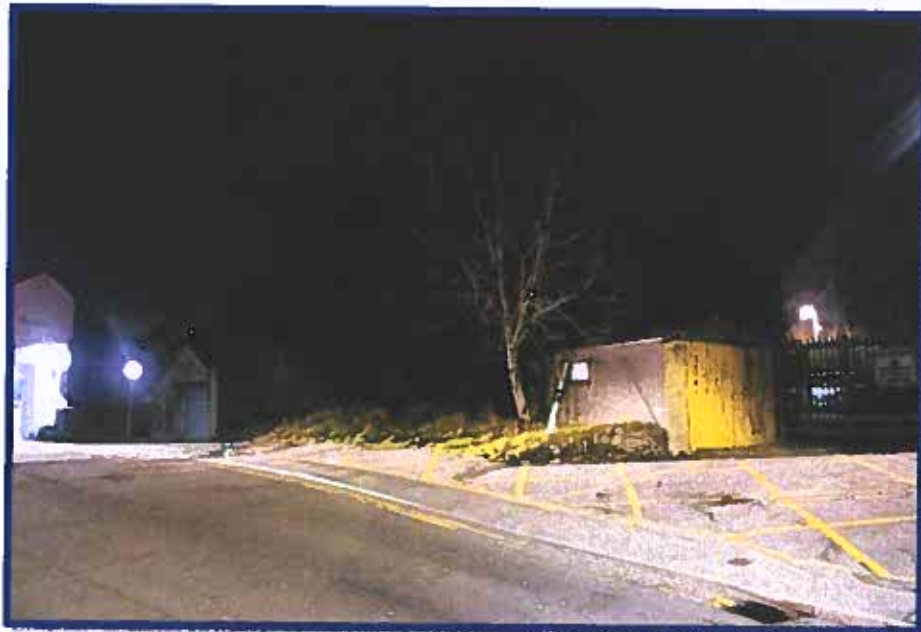


Figure 23. Viewpoint 6 Night with MMA lower yard Lighting



Figure 24. Viewpoint 6 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of sky glow and some glare from a nearby footpath light. The main contributor to this is the existing lighting on the high street. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.7 REF 7 - MMA Pedestrian foot path

A.7.1 Accessibility/Land description

This Viewpoint is located to the South of the MMA site on a footpath that runs along the boundary of the lower yard. The viewpoint overlooks the lower yard in the MMA site. There is a small amount of lighting on the footpath.



Figure 25. Viewpoint 7 Daytime



Figure 26. Viewpoint 7 Night with MMA lower yard Lighting



Figure 27. Viewpoint 7 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of sky glow and some glare from a nearby footpath light. The main contributor to this is the footpath lighting. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.8 REF 8 – New Site

A.8.1 Accessibility/Land description

This Viewpoint is located to the South east of the MMA site outside a footpath that runs along the boundary of the lower yard this is the location the new site will be. The viewpoint overlooks the lower yard in the MMA site. There is a small amount of lighting on the footpath.



Figure 28. Viewpoint 8 daytime



Figure 29. Viewpoint 8 Night with MMA lower yard Lighting



Figure 30. Viewpoint 8 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of sky glow from the main MMA site and a small amount of glare from a nearby footpath light. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.9 REF 9 – Mound North

A.9.1 Accessibility/Land description

This Viewpoint is located to the North east of the MMA site on a small field across the road from the main entrance. The viewpoint overlooks the lit upper yard of the MMA site. There is significant street lighting in the area.



Figure 31. Viewpoint 9 daytime



Figure 32. Viewpoint 9 Night with MMA upper and lower yard Lighting



Figure 33. Viewpoint 9 Night without MMA upper and lower yard Lighting

Night visit to this area without MMA upper and lower yard lighting showed a small amount of sky glow and a small amount of glare from a nearby Road Lighting. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.10 REF 10 – The Hafod

A.10.1 Accessibility/Land description

This Viewpoint is located on a small residential road to the North east of the MMA site. The viewpoint overlooks the lit upper yard of the MMA site. There is street lighting in the area.



Figure 34. Viewpoint 10 daytime



Figure 35. Viewpoint 10 Night with MMA upper and lower yard Lighting



Figure 36. Viewpoint 10 Night without MMA upper and lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a small amount of sky glow and a small amount of glare from a nearby Road Lighting. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.11 REF 11 – Wern Street

A.11.1 Accessibility/Land description

This Viewpoint is located on a small residential road to the North east of the MMA lower Yard site. The viewpoint overlooks the lower yard of the MMA site. There is street lighting and a high street in view.



Figure 37. Viewpoint 11 daytime



Figure 38. Viewpoint 11 Night with MMA lower yard Lighting



Figure 39. Viewpoint 11 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a noticeable amount of sky glow and a small amount of glare from a nearby Road Lighting and a well lit high street. Currently E2 Environmental Zone Based on lighting in surrounding area.

A.12 REF 12 – Old Factory

A.12.1 Accessibility/Land description

This Viewpoint is located on an Abandoned steel works footpath to the South east of the MMA site.

The viewpoint overlooks the lower yard of the MMA site. There is no lighting in the nearby area.



Figure 40. Viewpoint 12 Daytime



Figure 41. Viewpoint 12 Night with MMA lower yard Lighting



Figure 42. Viewpoint 12 Night without MMA lower yard Lighting

Night visit to this area without MMA lower yard lighting showed a Small amount of sky glow. Currently E2 Environmental Zone Based on lighting in surrounding area.

Appendix B. Lux Level Survey Photos

B.1 Victoria Street carpark



Figure 43. Daytime Lux survey 1



Figure 44. Night-time Lux Survey 1

Location	AV	Uni	REF
Victoria street carpark	24.80	60.48%	B.1

B.2 Llewellyn Street north



Figure 45. Daytime Lux survey 2



Figure 46. Night-time Lux survey 2

Location	AV	Uni	REF
Llewellyn Street north	8.00	37.50%	B.2

B.3 Llewellyn Street South



Figure 47. Daytime Lux Survey 3



Figure 48. Night-time Lux survey 3

Location	AV	Uni	REF
Llewellyn Street South	6.67	30.00%	8.3

B.4 Foot Path



Figure 49. Daytime Lux Survey 4



Figure 50. Night-time Lux Survey 4

Location	AV	Uni	REF
Foot Path	16.60	48.19%	B.4

B.5 Pant Road



Figure 51. Daytime Lux Survey 5



Figure 52. Night-Time Lux Survey 5

Location	AV	Uni	REF
Pant Road	6.87	43.69%	B.5

B.6 Vaynor Road



Figure 53. Daytime Lux Survey 6



Figure 54. Night-Time Lux Survey 6

Location	AV	Uni	REF
Vaynor Road	9.60	20.83%	B.6

B.7 Pant road North



Figure 55. Daytime Lux Survey 7



Figure 56. Night-time Lux Survey 7

Location	AV	Uni	REF
Pant road North	13.60	29.41%	B.7

B.8 Yr Hafod



Figure 57. Daytime Lux Survey 8



Figure 58. Night-Time Lux Survey 8

Location	AV	Uni	REF
Yr Hafod	7.73	25.86%	B.8

B.9 Barracks Row



Figure 59. Daytime Lux Survey 9



Figure 60. Night-Time Lux Survey 9

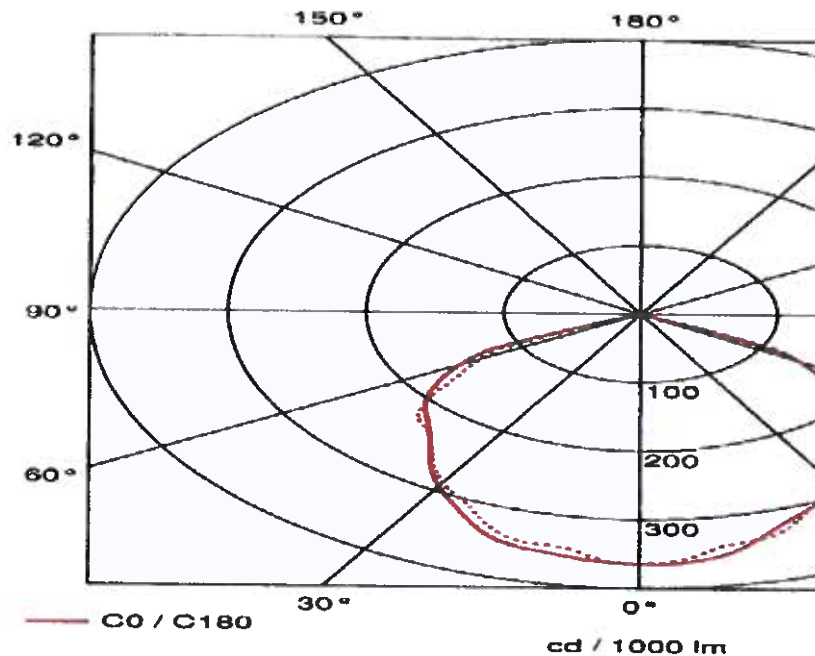
Location	AV	Uni	REF
Barracks Row	7.60	39.47%	B.9

Appendix C. Existing Lighting Within Lower Yard

Object :
 Installation :
 Project number :
 Date : 13.01.2011

Luminaire data

NDN/70/LED/757 (INDN/70/LED/757)
LDC



Manufacturer :
 Order number : INDN/70/LED/757
 Luminaire name : NDN/70/LED/757
 Equipment : 1 x LED 5700K 0 W / 4250 lm
 Dimensions : L 253 mm x W 253 mm x H 48 mm
 File name : NDE50W.idt

Relux1

Object
Installation
Project number
Date : 13.01.2011



NDN/70/LED/757 (INDN/70/LED/757)

Data sheet

INDN/70/LED/757

NDN/70/LED/757

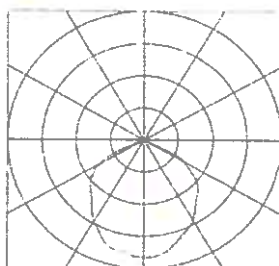
Luminaire data

Luminaires efficiency : 84.04% (A50)
↓ 100.0% ↑ 0.0%

Control gear :
System power : 57.3 W
Length : 253 mm
Width : 253 mm
Height : 48 mm

Equipped with

Number of : 1
Designation : LED 5700K
Power : 0 W
Colour :
Luminous flux : 4250 lm



Product

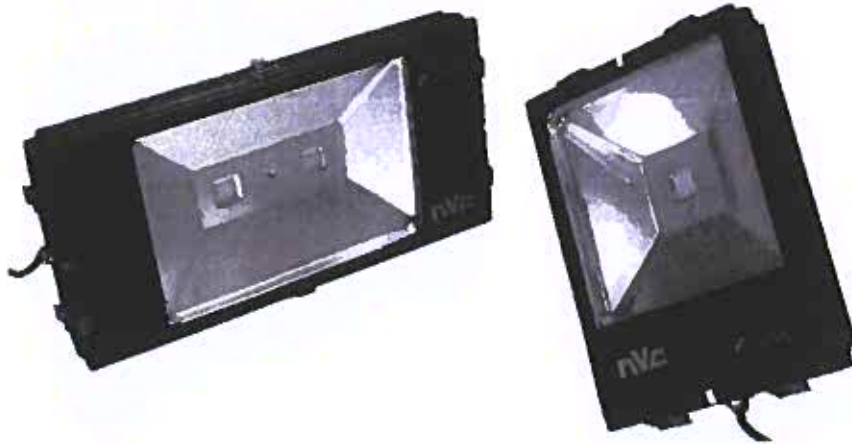
136

EXTERIOR LIGHTING

EXTERIOR LIGHTING

DENVER

DENVER (DN)



IP65 aluminium 70W and 140W LED floods.

APPLICATIONS

- General purpose flood lighting
- Industry and warehouses
- Situations where maintenance is expensive or impractical
- Cold stores to -40°C

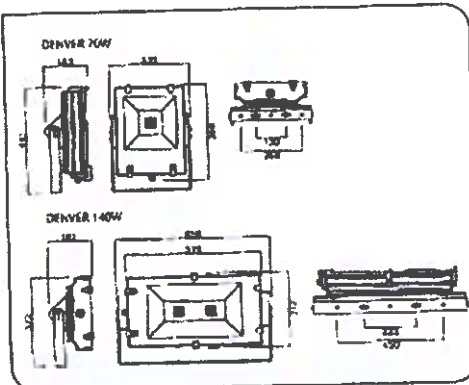
SPECIFICATION

- LED 70W & 140W with integral driver
- Mounting bracket allows flexible installation
- Guaranteed for 2 years from date of installation
- Suitable for 110v and 230v operation
- Suitable for use to -40°C

CONSTRUCTION

- Aluminium extruded body with diecast end caps
- Toughened glass cover fully sealed and tamper proof
- Pre-wired with 10m of 3 x 1.5mm HD7 Flex

	Weight	Wingtip
70W	7.40kg	0.3m ²
140W	11.2kg	0.8m ²



NDN/70N/LED/757 DENVER 70W LED FLOOD
NDN/140N/LED/757 DENVER 140W LED FLOOD

LED v Metal Halide - How do they compare?

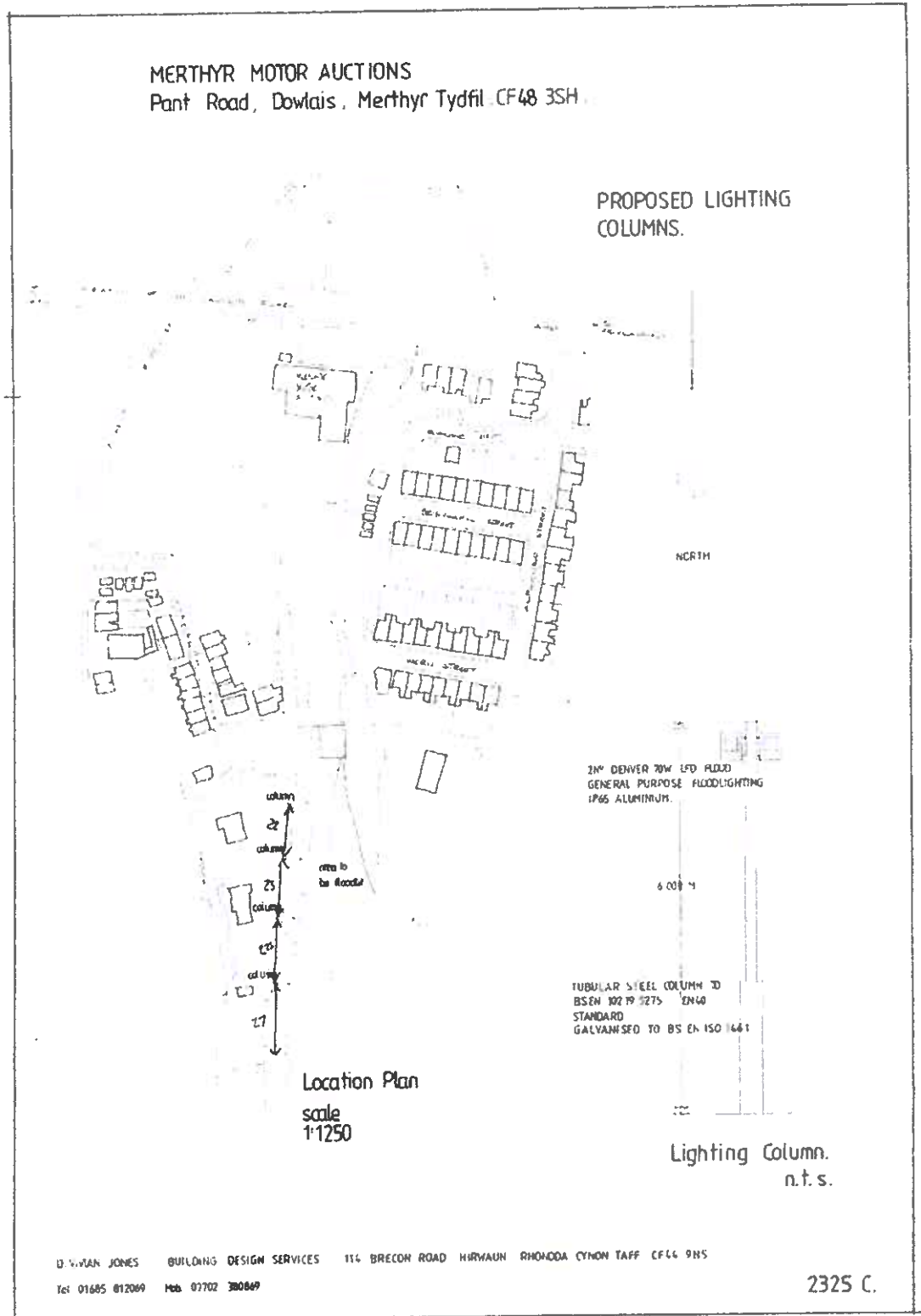
DENVER 70W light output is similar to 150W metal halide.

DENVER 140W light output is similar to 250W metal halide.

For more detail, please consult your NVC sales engineer.



www.nvcuk.com | +44 (0)121 457 6340



Appendix D. Examples of additional lighting mitigation

6.1.6 There are a number of adaptations that can be used to further limit light spill and/or glare from luminaires. These include:

- cowls/hoods;
- shields.

6.1.7 Figure 60 shows a luminaire with cowl, and figure 61 shows a luminaire with hood. Cowls and hoods help direct light spill downwards, reducing light spill and glare.



Figure 61. Symmetrical variable aim luminaire with cowl



Figure 62. Double Asymmetric luminaire with a hood

6.1.8 Similar to cowls and hoods, shields help control the direction of light and reduce glare. Figures 62,63 and 64 show three different types of shield used on fixed position and variable position luminaires respectively.



Figure 63. Fixed position luminaire with shield [RD3]

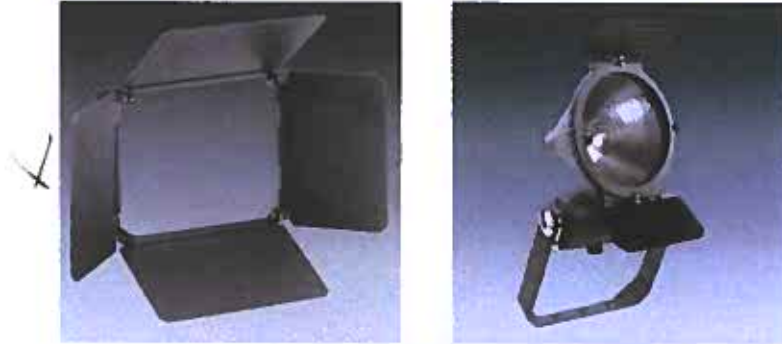


Figure 64. Symmetrical variable aim luminaire with 'barn door' shields



Figure 65. Column back shield