

Westpoort Data Centre

Onderzoek externe verlichting

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Datum 02/12/2022

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Classificatie ☐ Vertrouwelijk

Revisie	Gegevens revisie / type afgifte	Pagina's.	Document voorbereid door			Document gecontroleerd door		
			Naam	Handtekening	Datum	Naam	Handtekening	Datum
0.1	WABO Vergunning	Alle			02/12/2022			02/12/2022

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1.0 Inleiding

Het doel van dit document is het samenvatten van de voorafgaande berekening van de externe verlichting voor de Westpoort Data Centre-locatie. Het berekeningsmodel is specifiek aangepast om ervoor te zorgen dat de verlichtingsinrichting van de locatie voldoet aan de EIA-vereiste. Het rekenmodel is aangepast om ervoor te zorgen dat de verlichtingslay-out van de locatie voldoet aan het lokale bestemmingsplan.

Gebieden die in dit onderzoek zijn meegenomen zijn oranje gemarkeerd in de onderstaande plattegrond:

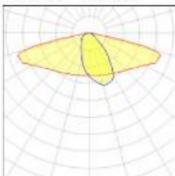
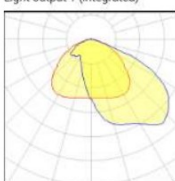
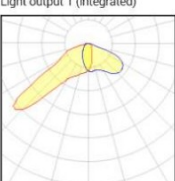


(Bron: Google Maps)

De berekening van de externe verlichting is uitgevoerd met DIALux 4.13.

2.0 Armaturen

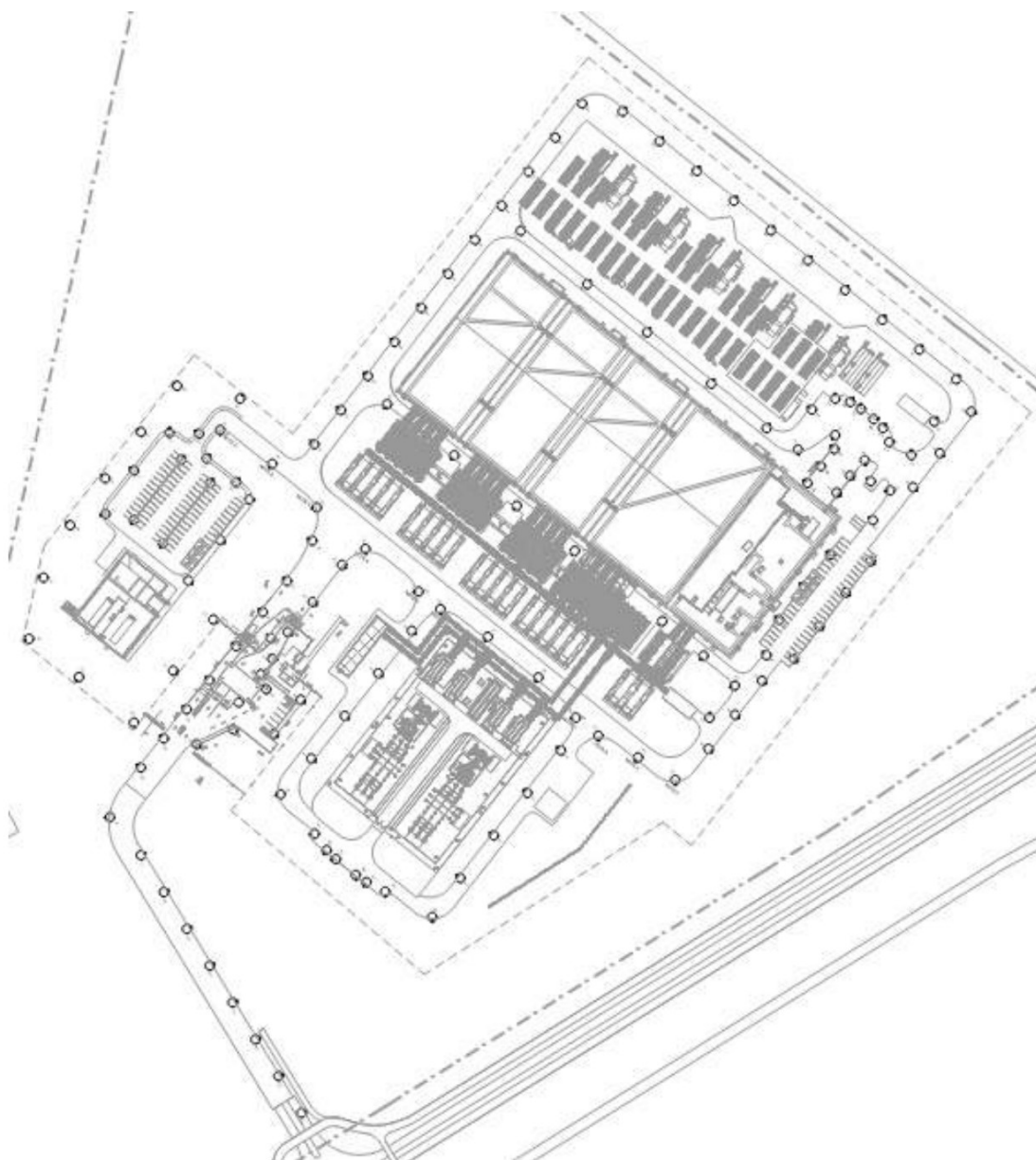
De armaturen die voor de berekening worden gebruikt, zijn wegverlichtingsarmaturen van LUG™ Light Factory. Zie bijlage A voor meer informatie.

URBINO LED 55W 6450LM 4000K IP66 O59 - FOR LOCAL ROADS GRAY 130222.5L041.351 LUG   IP 66 IK 09 	Light output 1 (integrated)  <table><tr><td>Lamp type</td><td>LED</td><td>CCT</td><td>4000 K</td></tr><tr><td>Nominal lamp power</td><td>55 W</td><td>CRI</td><td>70</td></tr><tr><td>Total flux</td><td>6450 lm</td><td>LOR</td><td>100%</td></tr><tr><td>Luminous efficacy</td><td>117 lm/W</td><td>Total power</td><td>55 W</td></tr></table>	Lamp type	LED	CCT	4000 K	Nominal lamp power	55 W	CRI	70	Total flux	6450 lm	LOR	100%	Luminous efficacy	117 lm/W	Total power	55 W
Lamp type	LED	CCT	4000 K														
Nominal lamp power	55 W	CRI	70														
Total flux	6450 lm	LOR	100%														
Luminous efficacy	117 lm/W	Total power	55 W														
Mounting mode Pole top mounted Shape and measurements Length: 550 mm Width: 250 mm Height: 100 mm Adjustability Tilttable Design Colour of housing: Silver gray	Electric System power: 55 W Appliance Class: I Protection IP: 66 IK: 09																
URBINO LED 68W 10200LM 4000K IP66 O38 - FOR AREA LIGHTING GRAY 130222.5L771.181 LUG   IP 66 IK 09 	Light output 1 (integrated)  <table><tr><td>Lamp type</td><td>LED</td><td>CCT</td><td>4000 K</td></tr><tr><td>Nominal lamp power</td><td>68 W</td><td>CRI</td><td>70</td></tr><tr><td>Total flux</td><td>10200 lm</td><td>LOR</td><td>100%</td></tr><tr><td>Luminous efficacy</td><td>150 lm/W</td><td>Total power</td><td>68 W</td></tr></table>	Lamp type	LED	CCT	4000 K	Nominal lamp power	68 W	CRI	70	Total flux	10200 lm	LOR	100%	Luminous efficacy	150 lm/W	Total power	68 W
Lamp type	LED	CCT	4000 K														
Nominal lamp power	68 W	CRI	70														
Total flux	10200 lm	LOR	100%														
Luminous efficacy	150 lm/W	Total power	68 W														
Mounting mode Pole top mounted Shape and measurements Length: 550 mm Width: 250 mm Height: 100 mm Adjustability Tilttable Design Colour of housing: Silver gray	Electric System power: 68 W Appliance Class: I Protection IP: 66 IK: 09																
URBINO TWILIGHT LED 36W 4250LM 3000K IP66 O6L - FOR PEDESTRIAN CROSSINGS, 130222.5L432.091.985 LUG   IP 66 IK 08 	Light output 1 (integrated)  <table><tr><td>Lamp type</td><td>LED</td><td>CCT</td><td>3000 K</td></tr><tr><td>Nominal lamp power</td><td>36 W</td><td>CRI</td><td>70</td></tr><tr><td>Total flux</td><td>4250 lm</td><td>LOR</td><td>100%</td></tr><tr><td>Luminous efficacy</td><td>118 lm/W</td><td>Total power</td><td>36 W</td></tr></table>	Lamp type	LED	CCT	3000 K	Nominal lamp power	36 W	CRI	70	Total flux	4250 lm	LOR	100%	Luminous efficacy	118 lm/W	Total power	36 W
Lamp type	LED	CCT	3000 K														
Nominal lamp power	36 W	CRI	70														
Total flux	4250 lm	LOR	100%														
Luminous efficacy	118 lm/W	Total power	36 W														
Mounting mode Pole top mounted Shape and measurements Length: 550 mm Width: 250 mm Height: 195 mm Adjustability Tilttable Design Colour of housing: Silver gray	Electric System power: 36 W Appliance Class: II Integrated sensors Integrated sensors: Daylight sensor Protection IP: 66 IK: 08																

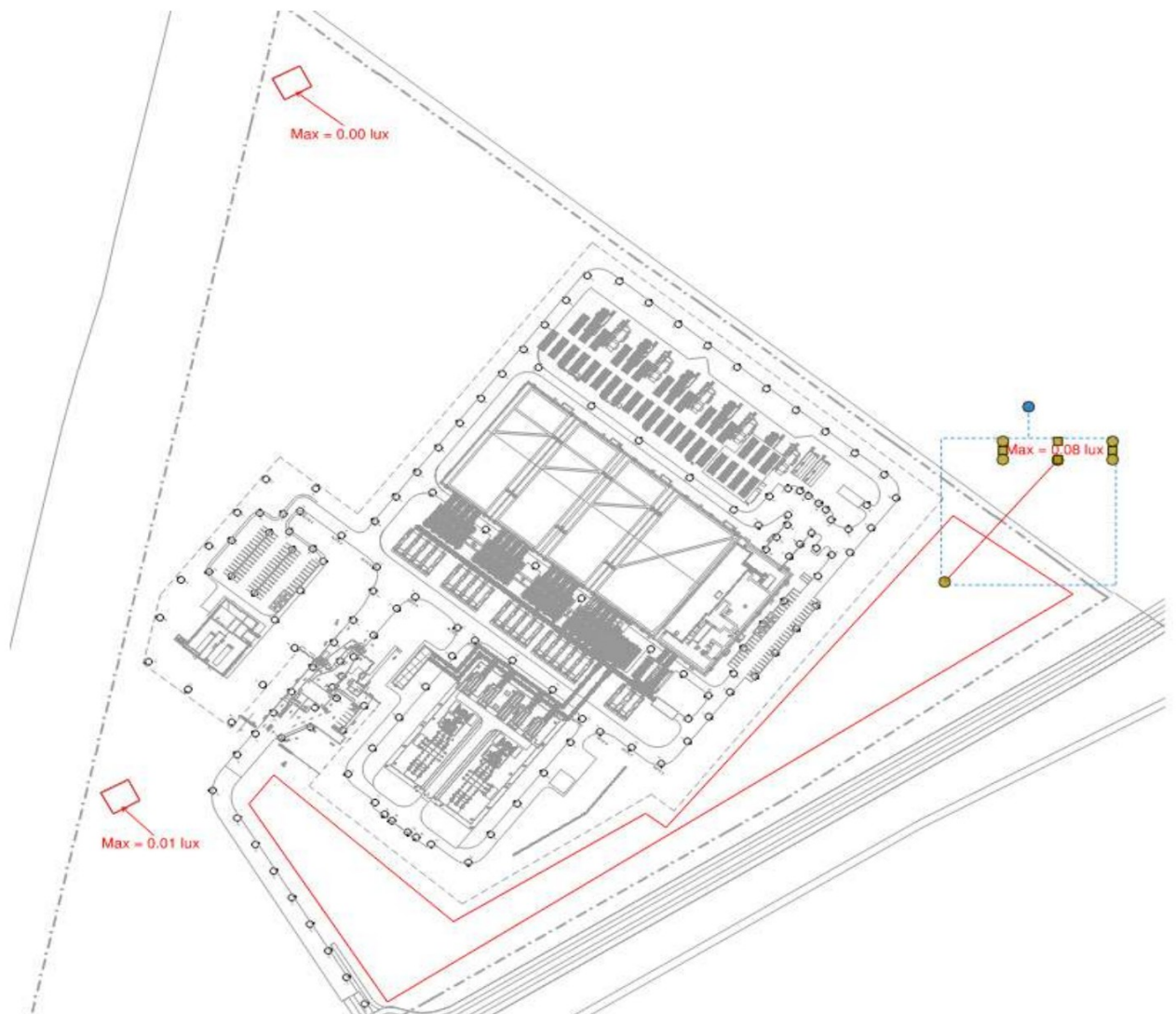
3.0 Interessegebieden voor berekening externe verlichting

De berekeningen van de externe verlichting zijn gebaseerd op de gebieden zoals weergegeven in de volgende sectie.

De onderstaande tekening markeert de algemene verlichtingslay-out die ten grondslag ligt aan de verlichtingsberekeningen.



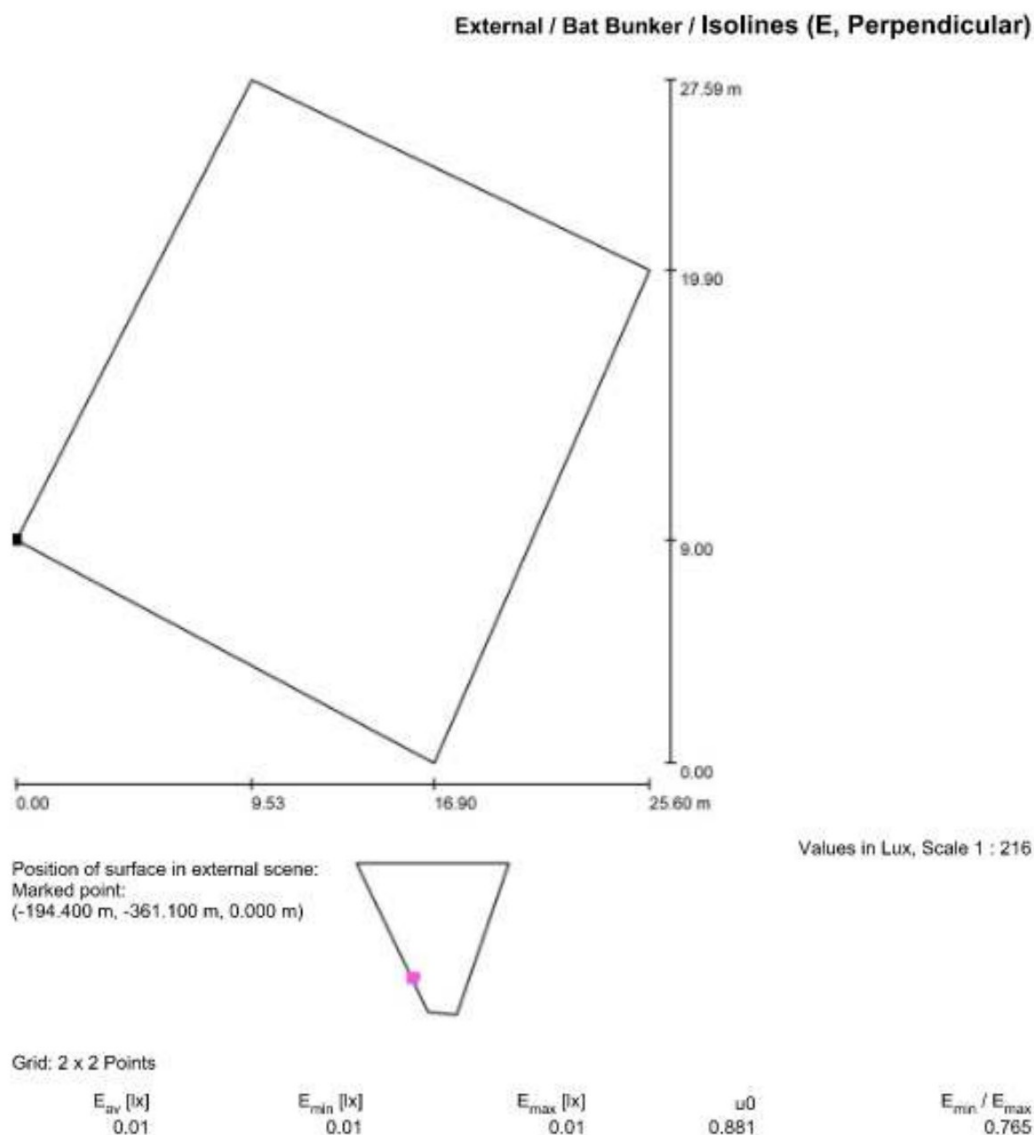
De onderstaande tekening markeert de buitenoppervlakken die ten grondslag liggen aan de berekeningen van verlichtingsverspilling.

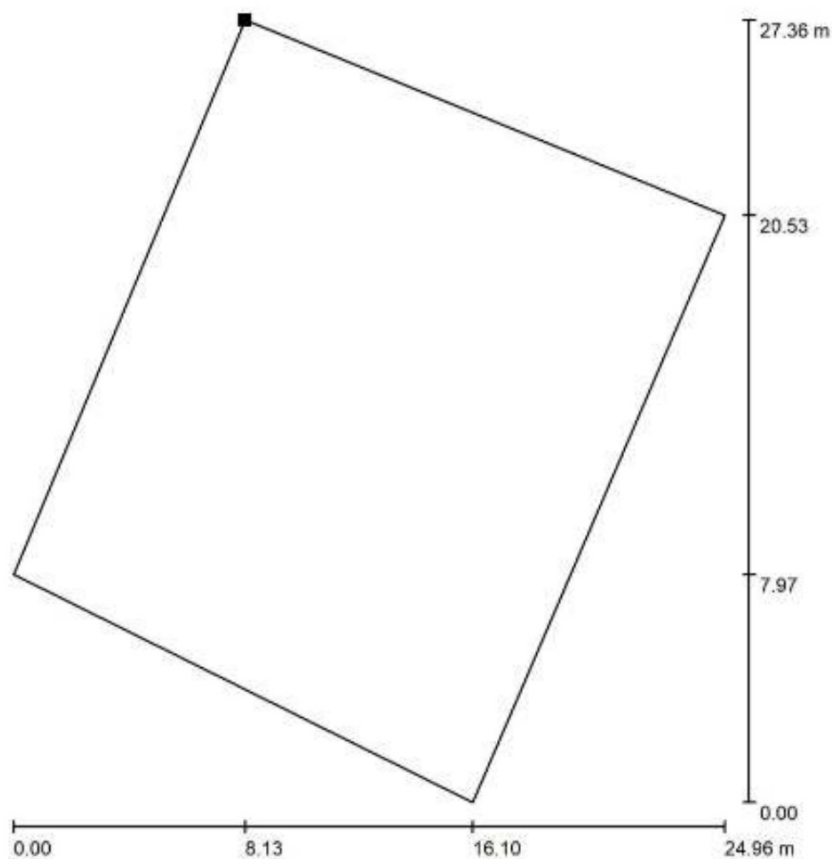


4.0 Resultaten

De resultaten van de berekeningen van de externe verlichting met DIALux staan in bijlage A.

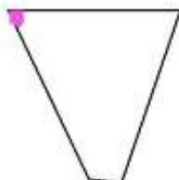
Uittreksels van de berekeningen staan op de volgende pagina's met de verlichtingsniveaus die zijn berekend op de specifieke gebieden die in de vorige sectie zijn gemarkeerd.



External / Bat Bunker / Isolines (E, Perpendicular)

Position of surface in external scene:
Marked point:
(-389.874 m, 76.763 m, 0.000 m)

Values in Lux, Scale 1 : 214



Grid: 128 x 128 Points

E_{av} [lx]
0.00

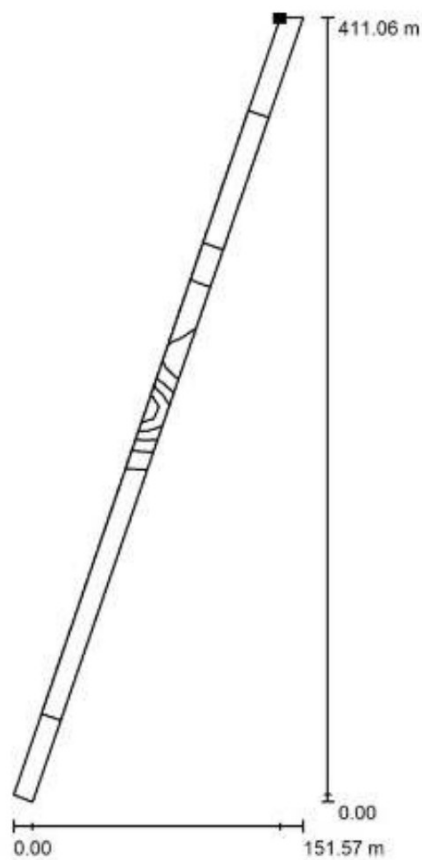
E_{min} [lx]
0.00

E_{max} [lx]
0.00

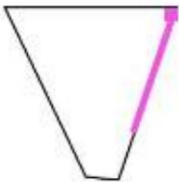
$u0$
0.990

E_{min} / E_{max}
0.981

External / Outside Fence / Isolines (E, Perpendicular)



Position of surface in external scene:
Marked point:
(170.205 m, 75.054 m, 0.000 m)

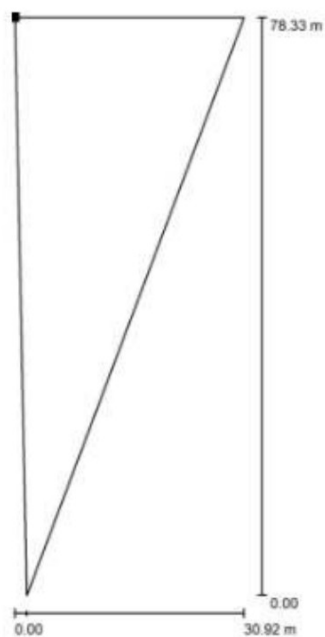


Values in Lux, Scale 1 : 3215

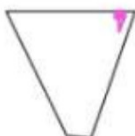
Grid: 64 x 2 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	$u0$	E_{min} / E_{max}
0.02	0.00	0.08	0.250	0.062

External / Outside Fence / Isolines (E, Perpendicular)



Position of surface in external scene:
Marked point:
(113.244 m, 85.000 m, 0.000 m)



Values in Lux, Scale 1 : 613

Grid: 16 x 8 Points

E_{av} [lx]
0.03

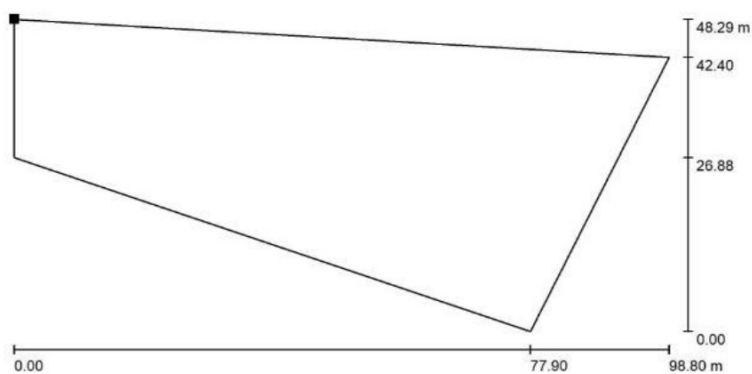
E_{min} [lx]
0.02

E_{max} [lx]
0.03

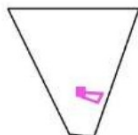
$u0$
0.661

E_{min} / E_{max}
0.561

External / Outside Fence / Isolines (E, Perpendicular)



Position of surface in external scene:
Marked point:
(-79.300 m, -296.813 m, 0.000 m)



Values in Lux, Scale 1 : 707

Grid: 16 x 8 Points

E_{av} [lx]
0.00

E_{min} [lx]
0.00

E_{max} [lx]
0.02

$u0$
0.314

E_{min} / E_{max}
0.073

5.0 Conclusie

Bij het ontwerp van de verlichting voor de buitenterreinen is gebruikgemaakt van energie-efficiënte ledarmaturen die bedoeld zijn als langdurige duurzame verlichtingsoplossing. Directe verlichting wordt geleverd door de ledarmaturen met uitgebreide optische uitrusting voor diagonaal gerichte horizontale lichtverspreiding op de rijwegen, zodat lichtvervuiling van lokale en aangrenzende percelen en gebouwen en verblinding van personen tot een minimum beperkt worden. De verlichting is hoofdzakelijk bedoeld om de aan de buitenzijde gelegen rijwegen en wandelpaden op de campus te verlichten en zo een veilige omgeving te creëren. De verlichting wordt geregeld via een systeem met fotocellen. Dit systeem biedt instelbare detectie van ochtend- en avondschemering en beschikt over een timer waarmee de verlichting op vooraf vastgelegde tijdstippen uitgeschakeld kan worden.

Er is een uitvoerige lichtstudie uitgevoerd om te waarborgen dat de lichtvervuiling van de voorgestelde buitenverlichting aan de begrenzing van de locatie niet hoger is dan 0,1 lux. Dit is in overeenstemming met de milieueffectbeoordelingsdocumentatie.

Bijlage A – Armaturen en resultaten DIALux-verlichtingsberekening

P.020212

Westpoort Data Centre Permitting
Lighting Calculations
External Site

Partner for Contact:
Order No.:
Company:
Customer No.:

Date: 21.10.2022
Operator:



Operator
Telephone
Fax
e-Mail

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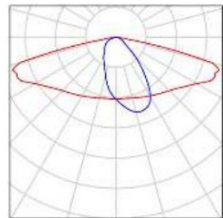
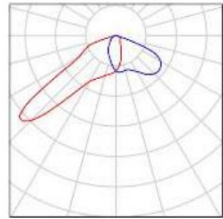
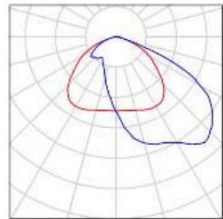
P.020212

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Bat Bunker	
Isolines (E, Perpendicular)	9
Outside Fence	
Isolines (E, Perpendicular)	10
Outside Fence	
Isolines (E, Perpendicular)	11
Outside Fence	
Isolines (E, Perpendicular)	12



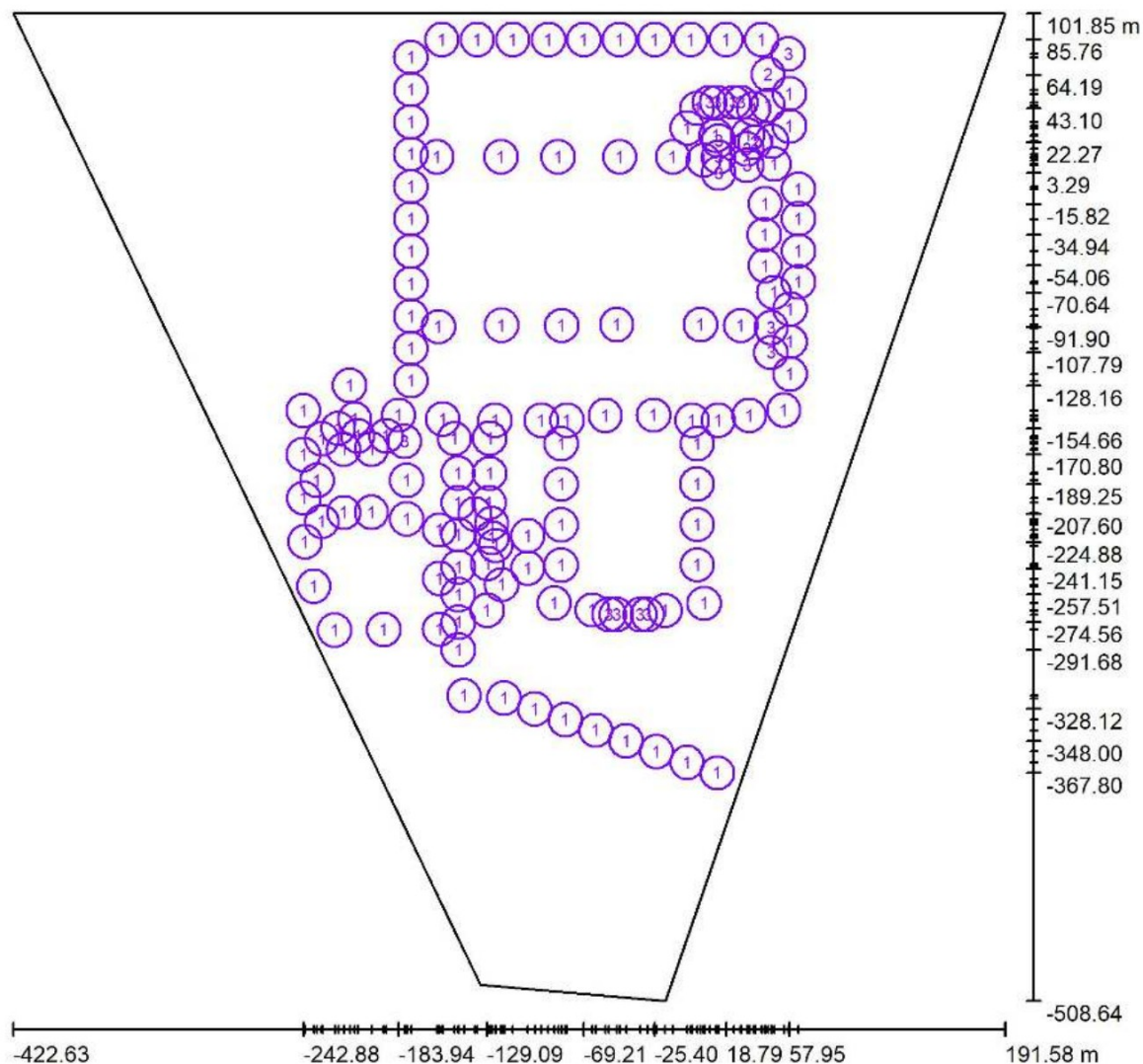
Operator
Telephone
Fax
e-Mail

P.020212 / Luminaire parts list

130 Pieces	LUG LIGHT FACTORY 130222.5L041.351 URBINO LED ED 6450lm/740 O59 szary Article No.: 130222.5L041.351 Luminous flux (Luminaire): 6450 lm Luminous flux (Lamps): 6450 lm Luminaire Wattage: 55.0 W Luminaire classification according to CIE: 100 CIE flux code: 45 76 97 100 100 Fitting: 1 x LED 4000K (Correction Factor 1.000).	See our luminaire catalog for an image of the luminaire.	
2 Pieces	LUG LIGHT FACTORY 130222.5L432.091.986 URBINO TWILIGHT LED ED 4250lm/730 O6L szary II klasanr mod.986 Article No.: 130222.5L432.091.986 Luminous flux (Luminaire): 4250 lm Luminous flux (Lamps): 4250 lm Luminaire Wattage: 36.0 W Luminaire classification according to CIE: 100 CIE flux code: 41 82 98 100 100 Fitting: 1 x LED 3000K (Correction Factor 1.000).	See our luminaire catalog for an image of the luminaire.	
17 Pieces	LUG LIGHT FACTORY 130222.5L771.181 URBINO LED ED 10200lm/740 O38 szary Article No.: 130222.5L771.181 Luminous flux (Luminaire): 10200 lm Luminous flux (Lamps): 10200 lm Luminaire Wattage: 68.0 W Luminaire classification according to CIE: 100 CIE flux code: 40 77 98 100 100 Fitting: 1 x LED 4000K (Correction Factor 1.000).	See our luminaire catalog for an image of the luminaire.	

Operator
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Fax
e-Mail

External / Luminaires (layout plan)



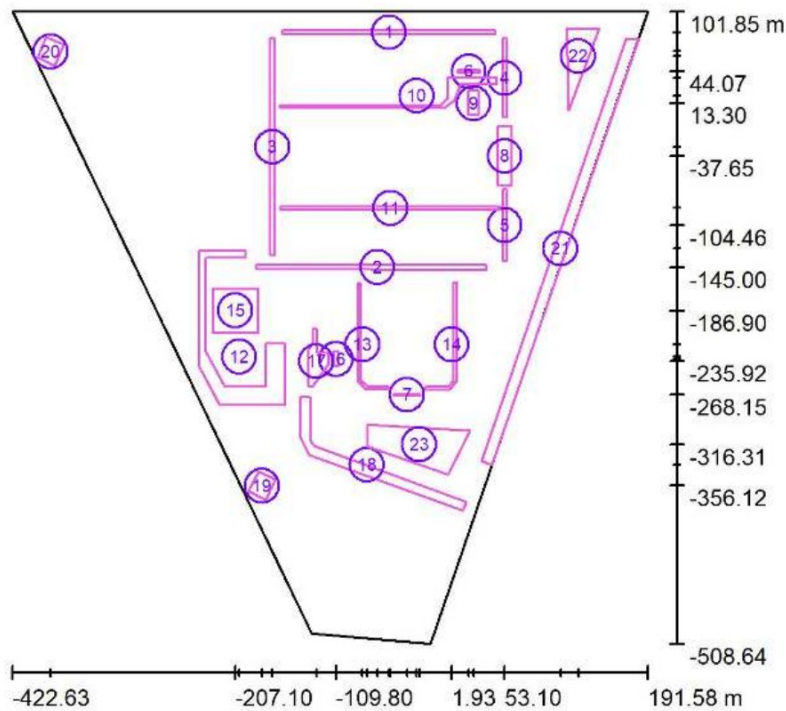
Scale 1 : 4392

Luminaire Parts List

No.	Pieces	Designation
1	130	LUG LIGHT FACTORY 130222.5L041.351 URBINO LED ED 6450lm/740 O59 szary
2	2	LUG LIGHT FACTORY 130222.5L432.091.986 URBINO TWILIGHT LED ED 4250lm/730 O6L szary II klasanr mod.986
3	17	LUG LIGHT FACTORY 130222.5L771.181 URBINO LED ED 10200lm/740 O38 szary

Operator
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External / Calculation surfaces (results overview)



Scale 1 : 6947

Calculation Surface List

No.	Designation	Type	Grid	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0	E_{min} / E_{max}
1	Main Road North	perpendicular	128 x 32	24	14	47	0.569	0.294
2	Main Road South	perpendicular	128 x 128	19	0.36	62	0.019	0.006
3	Main Road West	perpendicular	8 x 128	23	9.33	49	0.398	0.190
4	Main Road East	perpendicular	8 x 128	29	12	60	0.407	0.198
5	Main Road East	perpendicular	8 x 128	33	7.44	57	0.224	0.130
6	Fuel Loading	perpendicular	64 x 8	100	78	118	0.788	0.666
7	Fuel Loading	perpendicular	64 x 4	82	54	103	0.663	0.528
8	Car Park	perpendicular	32 x 128	14	3.89	41	0.280	0.094
9	Loading Bay	perpendicular	32 x 64	62	29	87	0.469	0.333

Operator
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External / Calculation surfaces (results overview)

Calculation Surface List

No.	Designation	Type	Grid	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
10	Fire Road North	perpendicular	128 x 128	22	3.71	56	0.168	0.066
11	Fire Road South	perpendicular	128 x 8	18	0.72	70	0.039	0.010
12	Perimeter Fence	perpendicular	128 x 128	9.62	0.20	91	0.021	0.002
13	Fire Road South	perpendicular	128 x 64	21	3.26	55	0.153	0.059
14	Fire Road South	perpendicular	128 x 64	20	1.39	53	0.071	0.026
15	Car Park	perpendicular	128 x 128	12	0.57	93	0.048	0.006
16	Car Park Outside Fence	perpendicular	16 x 32	17	7.46	43	0.438	0.175
17	Driveway Outside Fence	perpendicular	128 x 64	24	3.06	69	0.126	0.044
18	Driveway Entrance	perpendicular	128 x 64	15	1.14	48	0.077	0.024
19	Bat Bunker	perpendicular	2 x 2	0.01	0.01	0.01	0.881	0.765
20	Bat Bunker	perpendicular	128 x 128	0.00	0.00	0.00	0.990	0.981
21	Outside Fence	perpendicular	64 x 2	0.02	0.00	0.08	0.250	0.062
22	Outside Fence	perpendicular	16 x 8	0.03	0.02	0.03	0.661	0.561
23	Outside Fence	perpendicular	16 x 8	0.00	0.00	0.02	0.314	0.073

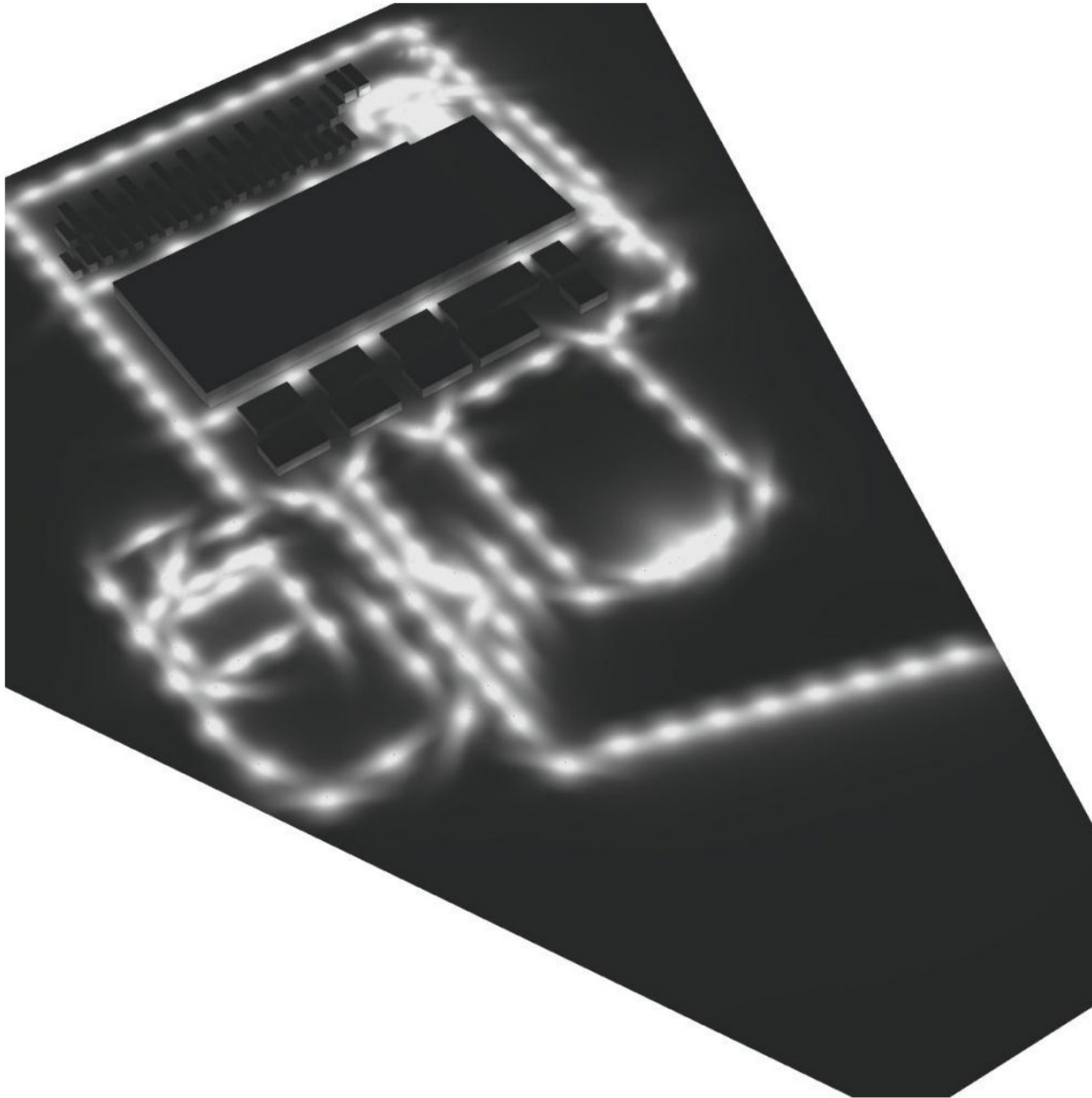
Summary of Results

Type	Quantity	Average [lx]	Min [lx]	Max [lx]	u0	E_{min} / E_{max}
perpendicular	23	10	0.00	118	0.00	0.00



Operator
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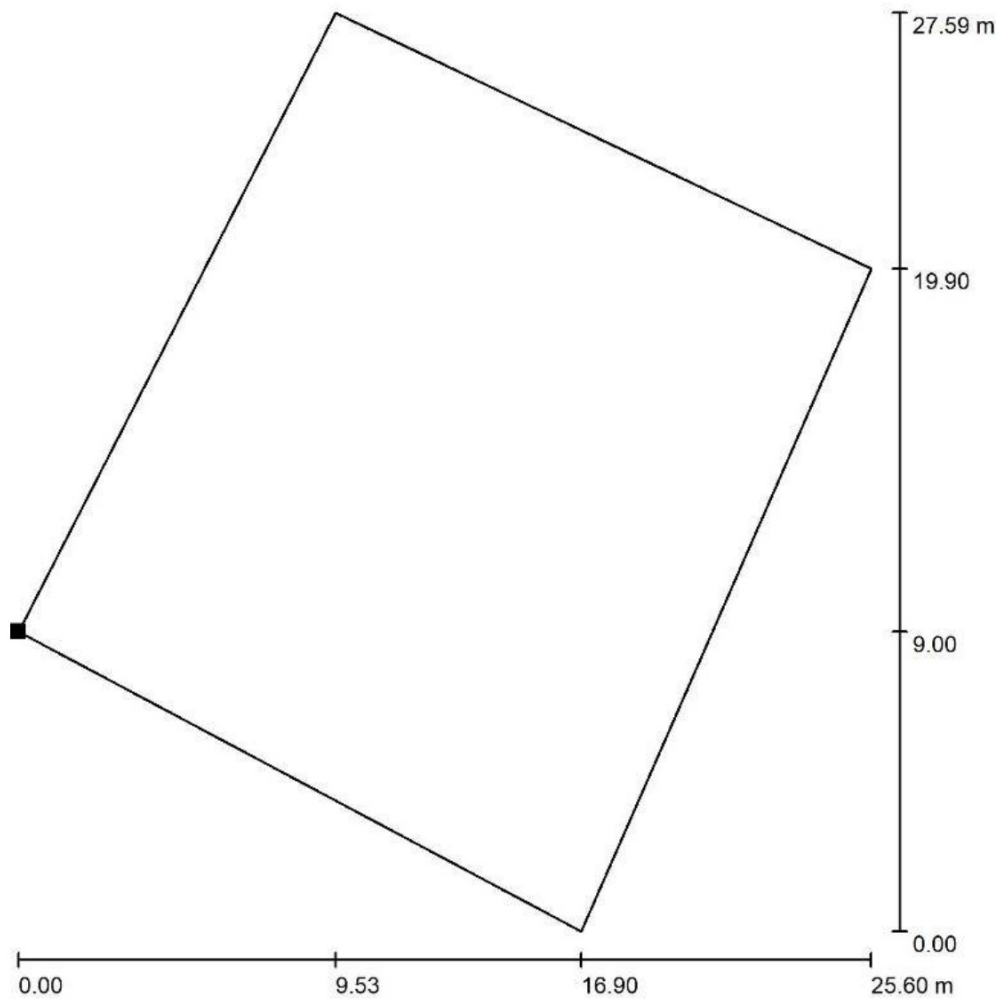
External / 3D Rendering



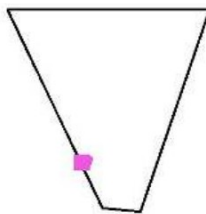


Operator
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External / Bat Bunker / Isolines (E, Perpendicular)



Position of surface in external scene:
Marked point:
(-194.400 m, -361.100 m, 0.000 m)



Values in Lux, Scale 1 : 216

Grid: 2 x 2 Points

E_{av} [lx]
0.01

E_{min} [lx]
0.01

E_{max} [lx]
0.01

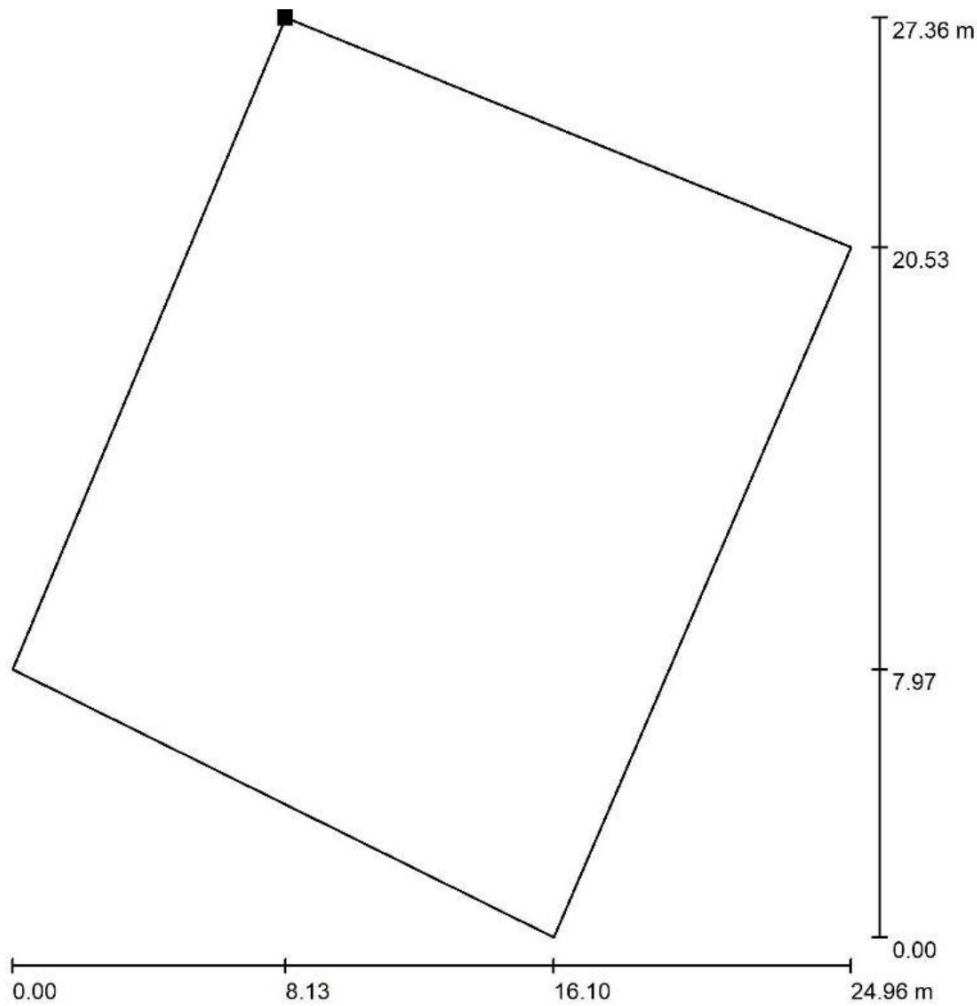
$u0$
0.881

E_{min} / E_{max}
0.765

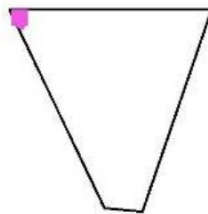


Operator
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e-Mail

External / Bat Bunker / Isolines (E, Perpendicular)



Position of surface in external scene:
Marked point:
(-389.874 m, 76.763 m, 0.000 m)



Values in Lux, Scale 1 : 214

Grid: 128 x 128 Points

E_{av} [lx]
0.00

E_{min} [lx]
0.00

E_{max} [lx]
0.00

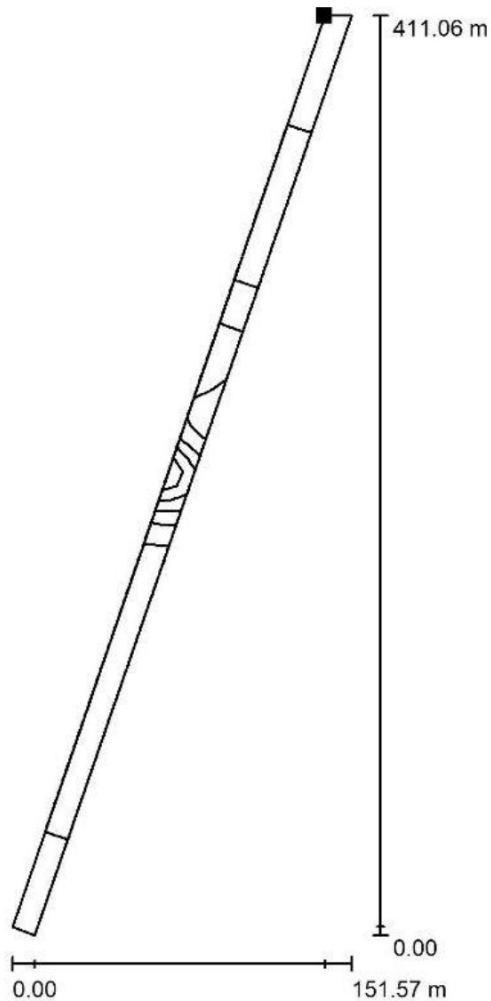
$u0$
0.990

E_{min} / E_{max}
0.981

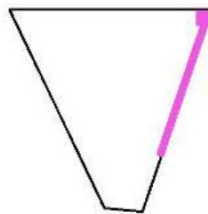


Operator
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External / Outside Fence / Isolines (E, Perpendicular)



Position of surface in external scene:
Marked point:
(170.205 m, 75.054 m, 0.000 m)



Values in Lux, Scale 1 : 3215

Grid: 64 x 2 Points

E_{av} [lx]
0.02

E_{min} [lx]
0.00

E_{max} [lx]
0.08

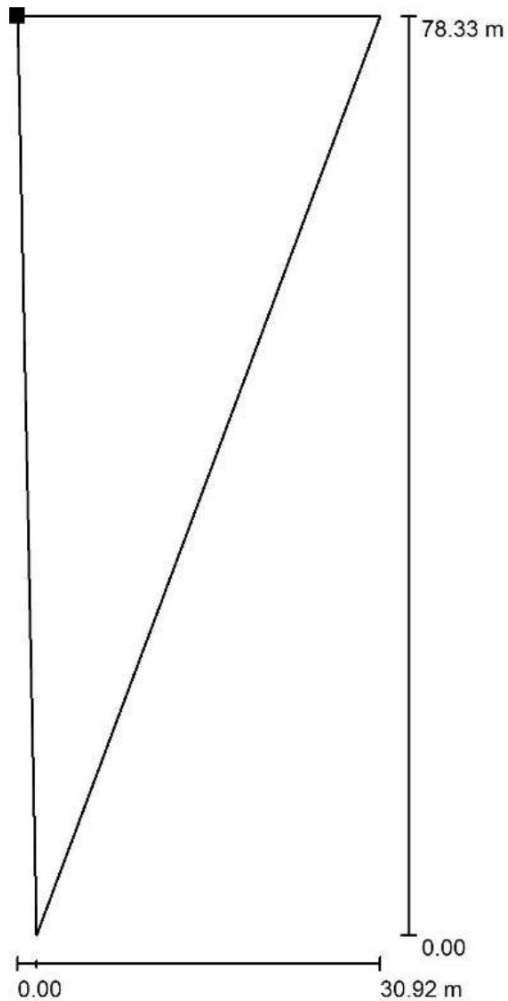
u_0
0.250

E_{min} / E_{max}
0.062

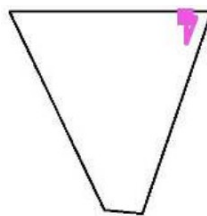


Operator
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External / Outside Fence / Isolines (E, Perpendicular)



Position of surface in external scene:
Marked point:
(113.244 m, 85.000 m, 0.000 m)



Values in Lux, Scale 1 : 613

Grid: 16 x 8 Points

E_{av} [lx]
0.03

E_{min} [lx]
0.02

E_{max} [lx]
0.03

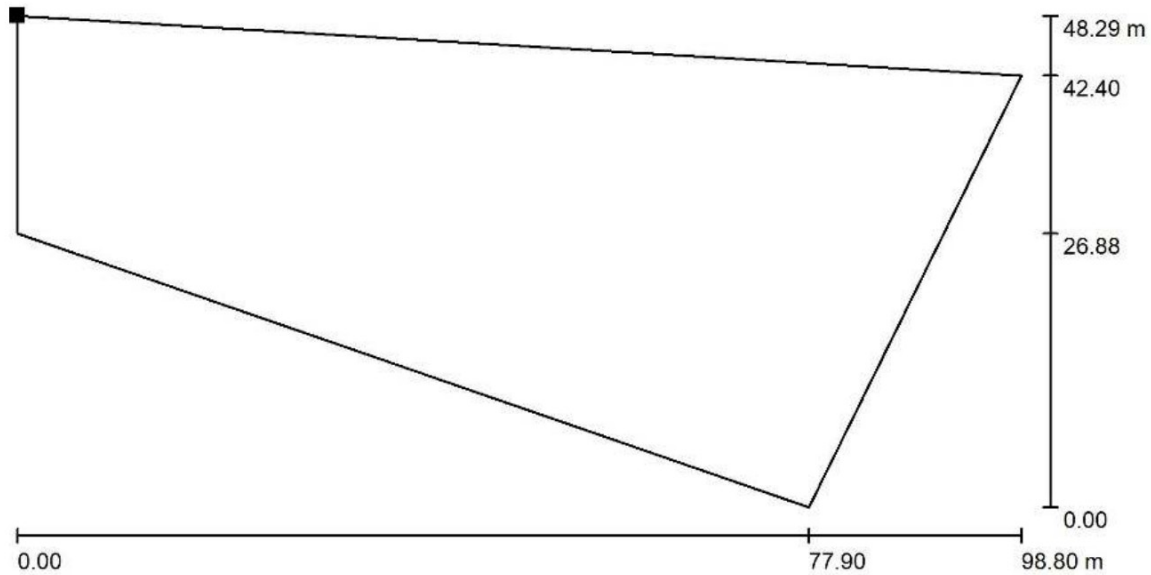
u_0
0.661

E_{min} / E_{max}
0.561



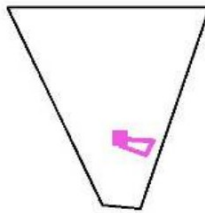
Operator
Telephone
Fax
e-Mail

External / Outside Fence / Isolines (E, Perpendicular)



Values in Lux, Scale 1 : 707

Position of surface in external scene:
Marked point:
(-79.300 m, -296.813 m, 0.000 m)



Grid: 16 x 8 Points

E_{av} [lx]
0.00

E_{min} [lx]
0.00

E_{max} [lx]
0.02

u_0
0.314

E_{min} / E_{max}
0.073

Summary of Lighting Calculations (EXTERNAL)



PROJE	Westpoort Data Centre Permitting
PROJECT NUMBER	P.020212
DOCUMENT REFERENCE	
CALCULATION SHEET VERSION	1

Lighting Condition	Room/Space	Lux Requirement (lx)	Calculation Surface Eave (lx)	Calculation Surface Emin (lx)	Calculation Surface Emax (lx)	Uniformity Ratio, U0	Remarks
NORMAL	Main Road North	20	24	8.28	44	0.41	-
NORMAL	Main Road South	20	19	0.42	61	0.024	Calculated level marginally meet requirement
NORMAL	Main Road West	20	23	8.47	42	0.406	-
NORMAL	Main Road East	20	29	13	50	0.432	-
NORMAL	Main Road East	20	33	7.05	57	0.216	Calculated value is 1.5x greater than required
NORMAL	Fuel Loading	100	100	82	117	0.804	-
NORMAL	Fuel Loading	100	82	52	103	0.637	80% less that required
NORMAL	Car Park	10	14	3.98	44	0.289	-
NORMAL	Loading Bay	50	62	22	99	0.515	

NORMAL	Loading Bay	50	62	32	88	0.515	-
NORMAL	Fire Road North	10	22	3.41	64	0.153	Calculated value is 2x greater than required
NORMAL	Fire Road South	10	18	0.94	56	0.059	Calculated value is 80% greater than required
NORMAL	Perimeter Fence	5	9.62	1.1	58	0.062	Calculated levels very high, about 2x than required
NORMAL	Fire Road South	10	21	3.13	53	0.155	Calculated value is 2x greater than required
NORMAL	Fire Road South	10	20	1.25	54	0.063	Calculated value is 2x greater than required
NORMAL	Car Park	10	12	0.52	93	0.045	-
NORMAL	Car Park Outside Fence	10	17	9.19	42	0.449	-
NORMAL	Driveway Outside Fence	10	24	4.11	89	0.155	Calculated value is 2x greater than required
NORMAL	Driveway Entrance	5	15	0.92	36	0.127	Calculated levels very high, about 3x than required
NORMAL	Bat Bunker	0	0.01	0.01	0.02	0.603	-
NORMAL	Bat Bunker	0	0	0	14	0.004	-

NORMAL	Outside Fence	0	0.02	0	0.13	0.167	-
NORMAL	Outside Fence	0	0.03	0.02	0.04	0.519	-
NORMAL	Outside Fence	0	0	0	0.03	0.253	-