



**VAUGHAN CHARLES & ASSOCIATES (PTY) LTD**  
quantity surveyors, construction cost consultants & project managers



## **Phase Two LED Solar Street Lighting Lighting along Langalibalele Street**

*Contract No: MLM03KZNR010*

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**March 2015: Report on the potential expansion of contract to include the installation of Solar Street Lights along Langalibalele Street in Zone 12**

Original Submission : 09<sup>th</sup> March 2015  
Revised Submission : 16<sup>th</sup> March 2015

H346214-0000-95-128-00040 Rev. 5

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## DOCUMENT CONTROL

DOCUMENT DETAILS				
<b>Document Title:</b>	March 2015: Report on the potential expansion of contract to include the installation of Solar Street Lights along Langalibalele Street in Zone 12			
<b>Document Ref:</b>	H346214-0000-95-128-00040 Rev. 5			
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<b>Prepared By:</b>	Winston Ponsamy <i>Winston</i>			
<b>Date</b>	09-03-2015 (revised issue 16th March 2015)			
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<b>Date</b>				
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0	Client Approval	Thabani Madlala (Thabani.Madlala@msunduzi.gov.za)	2015-03-09	Winston Ponsamy
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<b>Date Of Approval:</b>				
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		2.		
		3.		
		4.		
		5.		

## Table of Contents

<b>1. Project Details</b> .....	<b>1</b>
<b>2. Project Background</b> .....	<b>1</b>
<b>3. Project Technical Details</b> .....	<b>1</b>
3.1 Design Standards .....	1
3.2 Work Organizational Structure.....	1
3.2.1 Main Contractor.....	1
3.2.2 Civil Works Contractor .....	1
3.2.3 Electrical Unit Supplier .....	1
3.3 Lighting Design Layout .....	1
3.4 Lighting Design Report .....	1
3.5 A 9.5m SM Solar Pole With Double Box And 2 X 250w Panel.....	12
3.6 Pole Design.....	13
<b>4. Project Budget</b> .....	<b>14</b>
4.1 March 2015 Project Budget .....	14
<b>5. Cashflow</b> .....	<b>15</b>
5.1 Cashflow as at the 11 <sup>th</sup> March 2015 .....	15
<b>6. Construction Programme - 3 Months</b> .....	<b>16</b>

## 1. Project Details

Current Contract Details			
1.1 Contract Name:	Solar Street Lighting <b>Phase Two</b> : Lighting along Langalibalele Streets		
1.2 Contract Number	MLM03KZNR010		
1.3 Contractor	Edison Power Electrical (Pty) Ltd		
1.4 Summary of Works	The installation of 18 Light Systems and the construction of civil works infrastructure for 21 base positions		
1.5 Total Budget	<b>A. R3,965,517.72</b>	1.5.1. Contractors Value	R 3,315,517.20
		1.5.2. Consultants Value	R650,000.00
		1.5.3. Outstanding Payments due on Current Contract	R995,492.00
Expanded Contract Details			
1.6 Summary of Works	The installation of 23 Light Systems and the construction of the civil works infrastructure for these 20 bases and a grid connectivity system		
1.7 Proposed Budget	<b>B. R6,074,392.45</b>	1.7.1. Outstanding Payments due on Current Contract	R995,492.00
		1.7.1. Contractors Value	R4,816,475.53
		1.7.2. Consultants Value	R262,424.92

## 2. Project Background

The Msunduzi Municipality is at the forefront of Solar Powered LED Streetlight operations. Their vision of a sustainable city is being realized through the implementation of the following projects.

	Status	Project Title/Description	Value	Summary of the Projects	Deliverables
<b>Phase 1</b>	Completed March 2014	Installation of solar powered street lighting along: Henrietta, Langalibalele, Archbell And Jabu Ndlovu Streets	<b>R4,152,798.47</b> <i>Payments to Contractor and Consultant. See email of the 19<sup>th</sup> February 2015</i>	<p><b>Achievements of Phase 1</b></p> <ul style="list-style-type: none"> <li>Proving that the Solar Powered System is feasible within the City Centre and</li> <li>Displaying to the public that the City Centre is making technological progress towards being a 21<sup>st</sup> Century City.</li> </ul> <p><b>Challenges, Shortcomings of Phase 1</b></p> <ul style="list-style-type: none"> <li>The throw or light coverage along Langalibalele Streets is not as expected.</li> <li>The contractor experienced challenges in adhering to the construction programme.</li> </ul>	<b>31</b> Phillips Solar Street Lights
<b>Phase 2</b>	Practical Completion March 2015 (proposal for expansion, see below)	Installation of solar powered street lighting along Langalibalele Streets	<b>R3,965,517.72</b> <i>See item 1.5 above</i>	<p><b>Achievements of Phase 2</b></p> <ul style="list-style-type: none"> <li>Expanding the Solar System to a greater area of the CBD</li> </ul> <p><b>Challenges, Shortcomings of Phase 2</b></p> <ul style="list-style-type: none"> <li>The absence of any lights around Publicity House and outside the KZN Legislature is of concern to the client</li> </ul>	<b>18</b> Phillips Solar Street Lights, Sub-surface works for 21 lights.
<b>Timeframe 3 Months</b>	Expansion of Phase Two (THIS PROPOSAL)	Installation of solar powered street lighting along Langalibalele Streets	<b>R5,078,900.45</b> <i>See item 1.7 above</i>	This proposal refers to the installation of 3 Phillips Solar Street Lights outside Publicity House and the installation of 20 Beka lighting systems within the area defined as Zone 12. See below the pertinent design details.	<b>3</b> Phillips Solar Street lights and <b>20</b> Beka Lighting Systems

This document focuses on a proposal expanding the current Phase 2 contract to offer increased lighting coverage to the 500m stretch of road from the intersection of *Chief Albert Luthuli and Langalibalele* streets to the intersection of *Pieter Kerchhoff and Langalibalele* streets.

### 3. Project Technical Details

#### 3.1 Design Standards

Proposals in the form of (design specifications, schematics, layouts and pricing) were solicited from three Solar Streetlighting Suppliers. These were Phillips, Beka and Eurolux. Phillips and Eurolux did not respond within the defined timeframe. Beka have provided the project with the required particulars. Accordingly, Beka's submission is included in this proposal.

The suppliers and contractors were tasked with adhering to the following:

- I. Report E14 of 2013, dated 20 September 2012, Published by The Msunduzi Electricity Department, For The Bid Specification Committee. This document defines the Municipalities Specification's for LED Street Lighting.
- II. E16 OF 2013, 2014, 2015 (3 years) dated 29 October 2012, Published by The Msunduzi Electricity Department, For The Bid Specification Committee. This document defines the Municipalities Specification's for steel street poles
- III. SANS10098 - Appendix A - Table - Recommended Lighting Values for Group A roads.
- IV. Galvanizing to SANS 121 (ISO 1461) – 1987-1

The above information was further augmented with site verification visits to confirm the efficacy of system to comply with conditions within the area.

#### 3.2 Work Organizational Structure

Individual service providers to the project have been identified and categorized according to the following:

##### 3.2.1 *Main Contractor*

Edison Power Electrical will serve as the main contractor and will discharge all contractual duties. They will enter into individual agreements with both the civil works contractor (Cristatus Investments 13cc) and the Solar Supplier (Beka Lighting Systems)

##### 3.2.2 *Civil Works Contractor*

Cristatus Investments 13cc have been tasked with preparing all the sub-structure works including the concrete bases, ducts if any, steel reinforcement

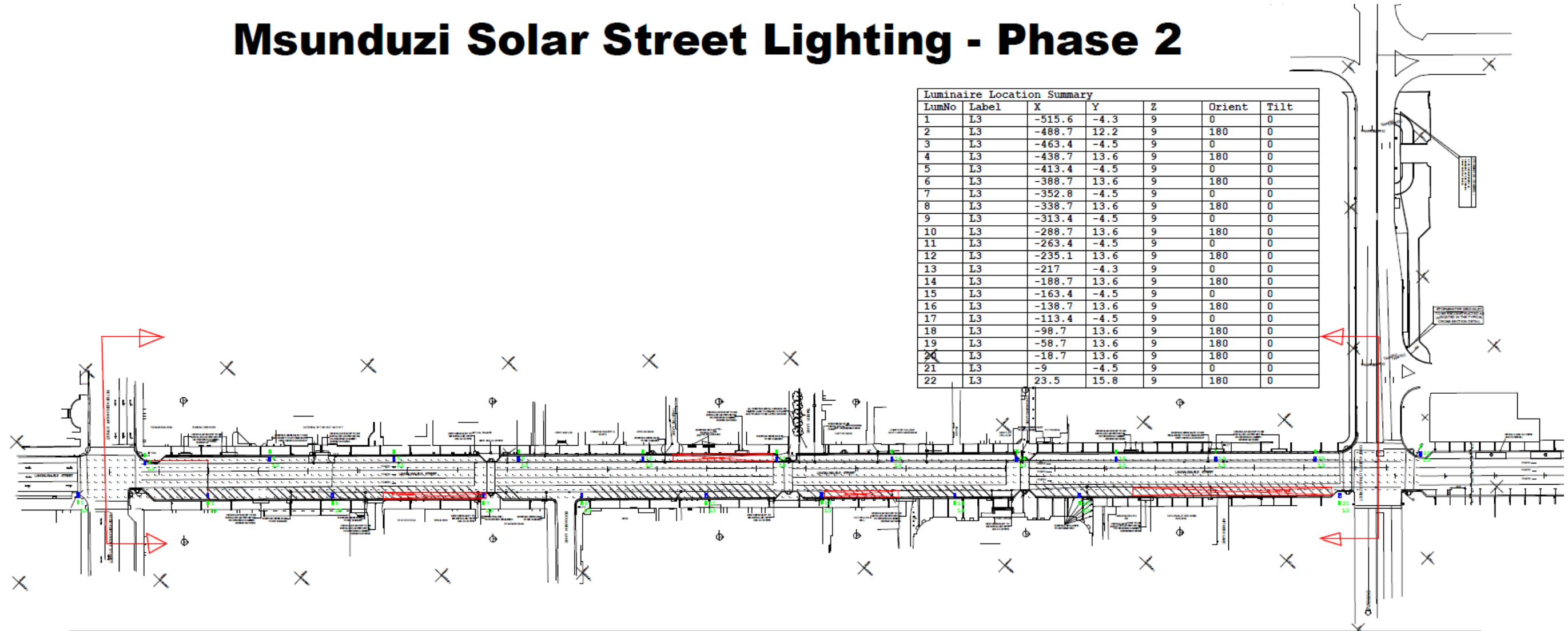
##### 3.2.3 *Electrical Unit Supplier*

Beka Lighting Systems have been identified as the preferred electrical component supplier.

### 3.3 Lighting Design Layout

The following is the proposed lighting design layout as provided by Beka. The areas identified in red are areas where not streetlights can be installed due the overhang and encroachment of colonnades and balconies

## Msunduzi Solar Street Lighting - Phase 2



Luminaire Location Summary						
LumNo	Label	X	Y	Z	Orient	Tilt
1	L3	-515.6	-4.3	9	0	0
2	L3	-488.7	12.2	9	180	0
3	L3	-463.4	-4.5	9	0	0
4	L3	-438.7	13.6	9	180	0
5	L3	-413.4	-4.5	9	0	0
6	L3	-388.7	13.6	9	180	0
7	L3	-352.8	-4.5	9	0	0
8	L3	-338.7	13.6	9	180	0
9	L3	-313.4	-4.5	9	0	0
10	L3	-288.7	13.6	9	180	0
11	L3	-263.4	-4.5	9	0	0
12	L3	-235.1	13.6	9	180	0
13	L3	-217	-4.3	9	0	0
14	L3	-188.7	13.6	9	180	0
15	L3	-163.4	-4.5	9	0	0
16	L3	-138.7	13.6	9	180	0
17	L3	-113.4	-4.5	9	0	0
18	L3	-98.7	13.6	9	180	0
19	L3	-58.7	13.6	9	180	0
20	L3	-18.7	13.6	9	180	0
21	L3	-9	-4.5	9	0	0
22	L3	23.5	15.8	9	180	0

Luminaire Schedule								
Symbol	Qty	Label	Arrangement	Total Lamp Lumens	LLF	Description	Arr. Watts	Total Watts
!	22	L3	GROUP	N.A.	0.800	BEKA LEDLUME MIDI SOLAR 75W OPTIC 5137 ON STREET SIDE & LEDLUME MINI SOLAR 18W 5137 ON PEDESTRIAN SIDE	93	2046

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Min/Avg	Min/Max
LANGALIBALELE STREET	Illuminance	Lux	10.09	24.6	1.4	0.14	0.06
ROAD LANES ONLY	Illuminance	Lux	11.26	20.9	6.1	0.54	0.29

1:1  
 A705621.AGI  
 Application Lighting Designer  
 Murray Crogg, Pr. Tech. (Eng), FIESA  
 DATE: 2015/02/25  
 TIME: 12:36:29 PM  
 AGI



### 3.4 Lighting Design Report



Ulysse 3



## Msunduzi Solar Street Lighting - Phase 2

(CIE 140)

Designer : cronjem

Project # :

Study # :

Date : 25/02/2015

USING LEDLUME MIDI SOLAR 75W AT 9m ON ROAD SIDE AND LEDLUME MINI SOLAR 18W AT 7m ALL WITH OPTIC 5137 TO  
ACHIEVE  
CLASS A3 NO MEDIAN 300 VEH/HR/LN

BEKA Schröder  
13 WEST VIEW ROAD  
PO BOX 120  
OLIFANTSFONTEIN  
1665

## Table of contents

1. Fixtures	1
1.1. LEDLUME MIDI 5137-4000K - 8256 - 75W	1
2. Photometric documents	2
2.1. LEDLUME MIDI 5137-4000K - 8256 - 75W	2
3. Standard	3
3.1. Standard summary	3
3.2. Results	3
4. Default	4
4.1. Matrix description	4
4.2. Luminaire positions	4
4.3. Luminaire groups	4
4.4. Road (LU) - R3007 - Luminance	5
4.4.1. Road (LU) - Luminance - RTable - Observer absolute	5
4.4.2. Road (LU) - Luminance - RTable - Observer absolute	6
4.4.3. Road (LU) - Luminance - RTable - Observer absolute	7
5. Grids	8
5.1. Road (LU)	8
6. Observer	9
6.1. Road (TI)	9

Project : Msunduzi Solar Street Lighting - Phase 2

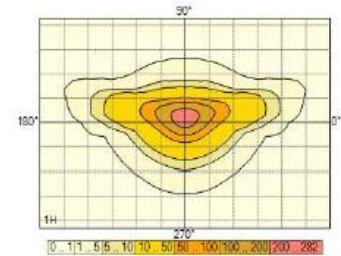
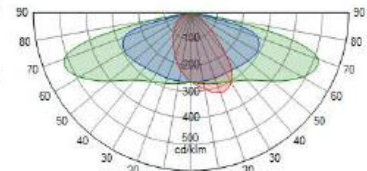


# 1. Fixtures

## 1.1. LEDLUME MIDI 5137-4000K - 8256 - 75W

Type	
Reflector	
Source	LED
Protector	
Setting	
Flux	8.3 klm
G-Class	3

Luminaire wattage	75.0 W
Source wattage	0.0 W
MF	0.80
Matrix	LEDLUME



Project : Msunduzi Solar Street Lighting - Phase 2

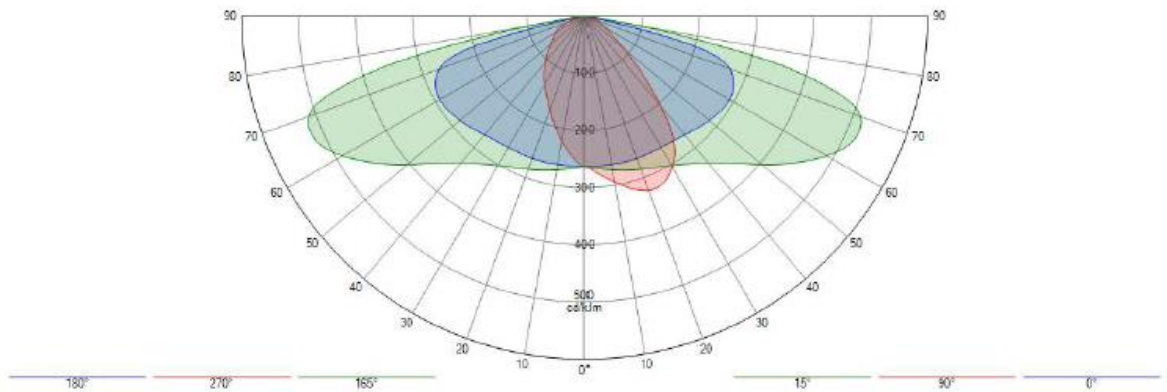


## 2. Photometric documents

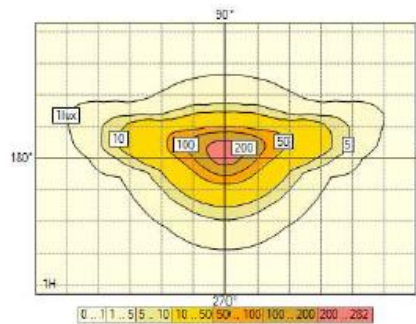
### 2.1. LEDLUME MIDI 5137-4000K - 8256 - 75W

#### LEDLUME MIDI

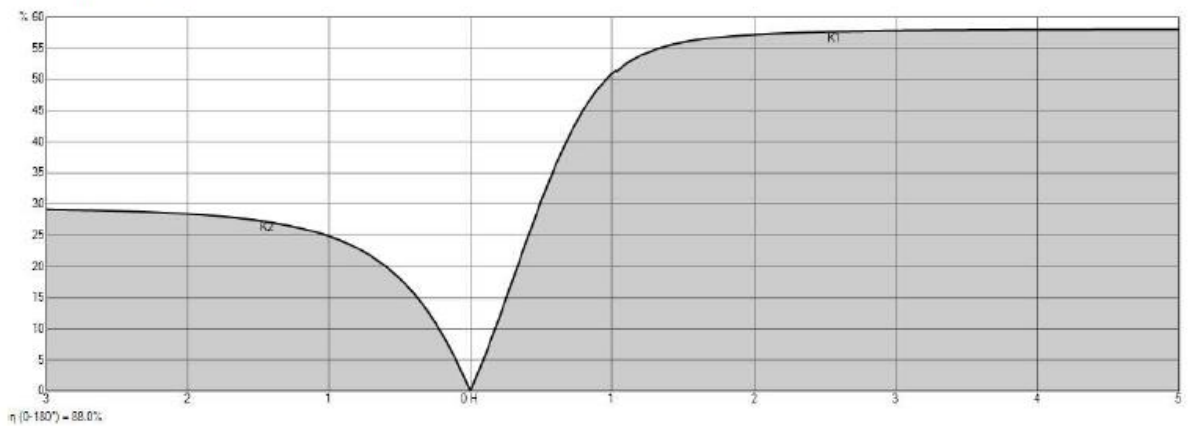
Polar/Cartesian diagram



Isolux



Utilization curve



Project : Msunduzi Solar Street Lighting - Phase 2



### 3. Standard

#### 3.1. Standard summary

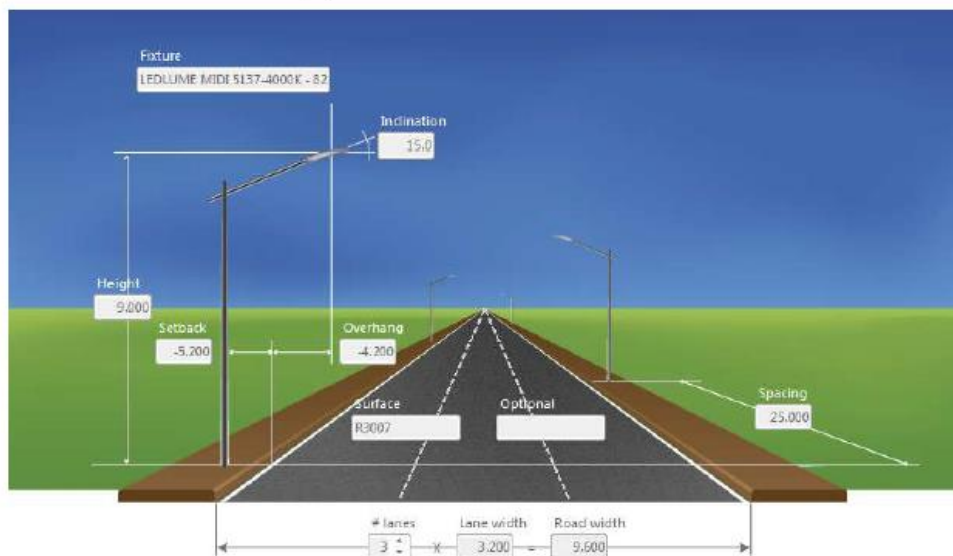
Calculations according to : CIE 140

Selected lighting class : A3 NO MED 300VEH

Constraints : LU : Ave = 0.60 cd/m<sup>2</sup> U<sub>o</sub> = 40 % UI = 50 % TI : 20

Selected lighting class (HS) : -

Constraints (HS) : -



#### 3.2. Results

Power per km : 3.000 kW

- Road (LU) - A3 NO MED 300VEH

Luminance

Ave	0.60 cd/m <sup>2</sup>	✓	0.60 cd/m <sup>2</sup>
Min	0.46 cd/m <sup>2</sup>	H <sub>1/2</sub>	
U <sub>o</sub>	76 %	✓	40.00 %
UI 1	71 %	✓	50.00 %
UI 2	87 %	✓	50.00 %
UI 3	72 %	✓	50.00 %

- Values - A3 NO MED 300VEH

TI	10.2	✓	20.0
----	------	---	------

Project : Msunduzi Solar Street Lighting - Phase 2



## 4. Default

### 4.1. Matrix description

Matrix	Description	Flux [klm]	MF	Fixture
-	LEDLUME MIDI 5137-4000K - 8256 - 75W	8.256	0.800	

### 4.2. Luminaire positions

	N°	Position			Luminaire						
		X [m]	Y [m]	Z [m]	Matrix	Description	Az [°]	Incl [°]	Rot [°]	Flux [klm]	MF
<input checked="" type="checkbox"/>	1	-25.00	-4.20	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	0.0	15.0	0.0	8.256	0.800
<input checked="" type="checkbox"/>	2	0.00	13.80	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	180.0	15.0	0.0	8.256	0.800
<input checked="" type="checkbox"/>	3	25.00	-4.20	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	0.0	15.0	0.0	8.256	0.800
<input checked="" type="checkbox"/>	4	50.00	13.80	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	180.0	15.0	0.0	8.256	0.800
<input checked="" type="checkbox"/>	5	75.00	-4.20	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	0.0	15.0	0.0	8.256	0.800
<input checked="" type="checkbox"/>	6	100.00	13.80	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	180.0	15.0	0.0	8.256	0.800
<input checked="" type="checkbox"/>	7	125.00	-4.20	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	0.0	15.0	0.0	8.256	0.800
<input checked="" type="checkbox"/>	8	150.00	13.80	9.00	-	LEDLUME MIDI 5137-4000K - 8256 - 75W	180.0	15.0	0.0	8.256	0.800

### 4.3. Luminaire groups

Linear															
	N°	Position			Luminaire					Dimension			Rotation		
		X [m]	Y [m]	Z [m]	Matrix	Az [°]	Incl [°]	Rot [°]	Dim [%]	Count	Spacing [m]	Size [m]	X [°]	Y [°]	Z [°]
<input checked="" type="checkbox"/>	1	-25.00	-4.20	9.00	-	0.0	15.0	0.0	100	4	50.00	150.00	0.0	0.0	0.0
<input checked="" type="checkbox"/>	2	0.00	13.80	9.00	-	180.0	15.0	0.0	100	4	50.00	150.00	0.0	0.0	0.0

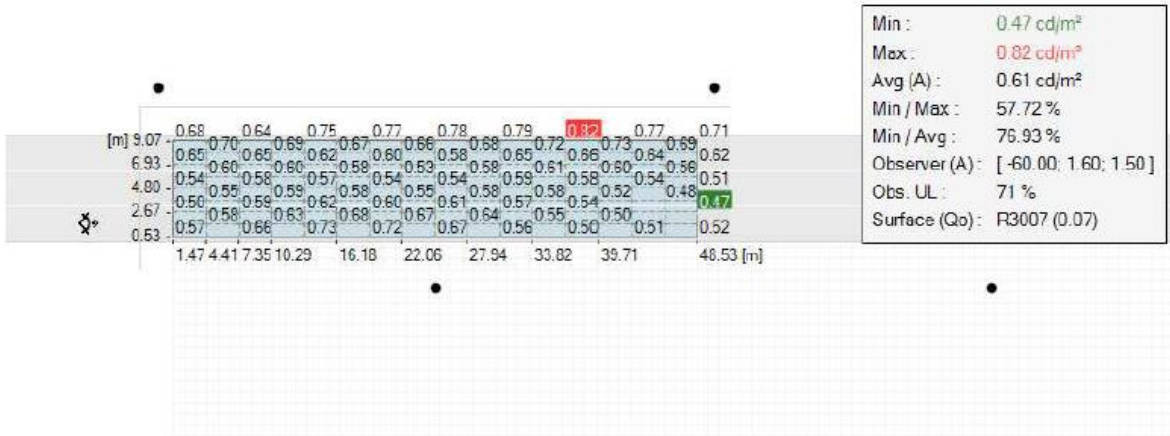
Project : Msunduzi Solar Street Lighting - Phase 2



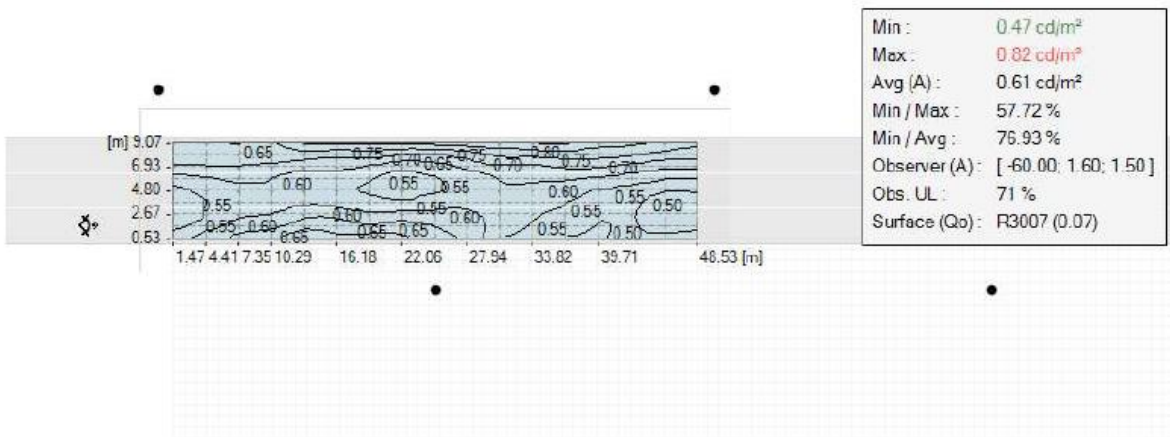
#### 4.4. Road (LU) - R3007 - Luminance

##### 4.4.1. Road (LU) - Luminance - RTable - Observer absolute

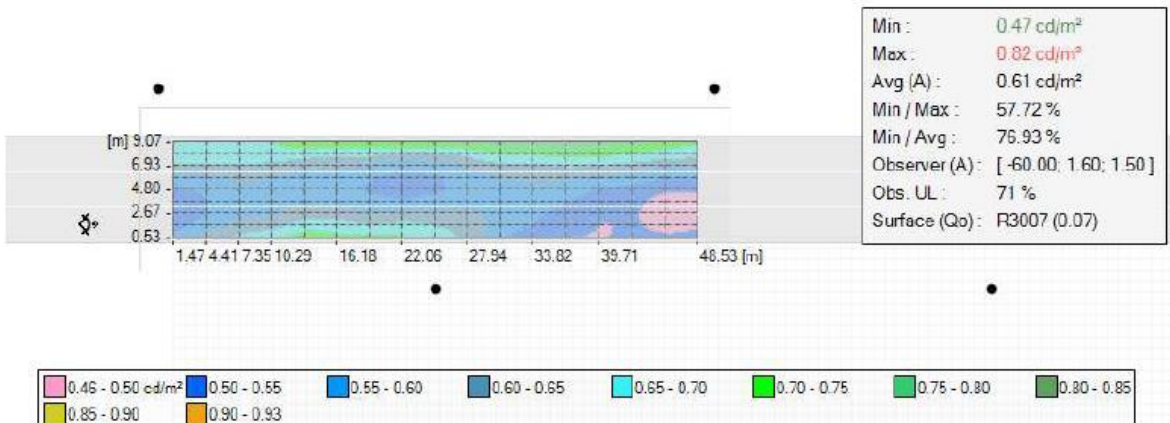
Values



Isolevel



Shading

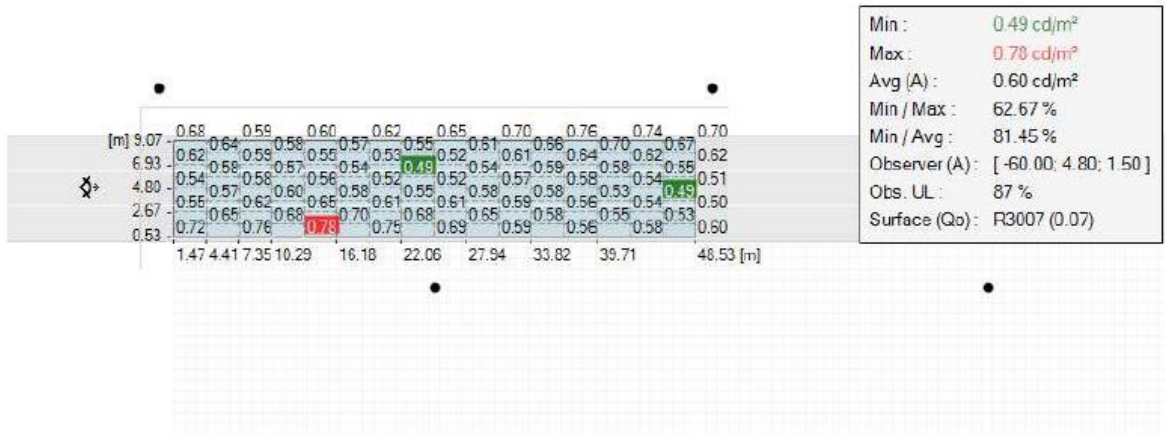


Project : Msunduzi Solar Street Lighting - Phase 2

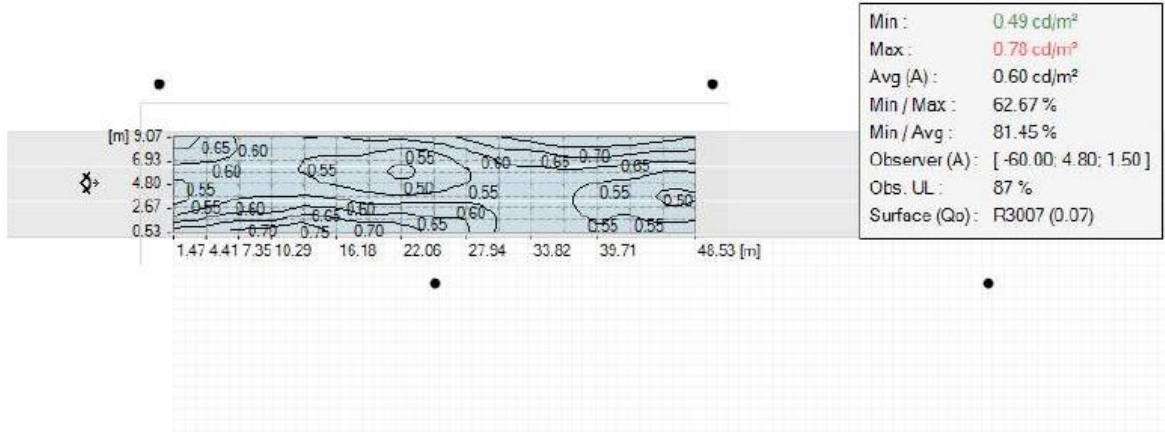


4.4.2. Road (LU) - Luminance - RTable - Observer absolute

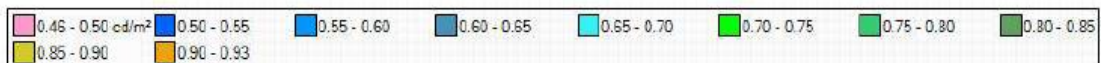
Values



Isolevel



Shading



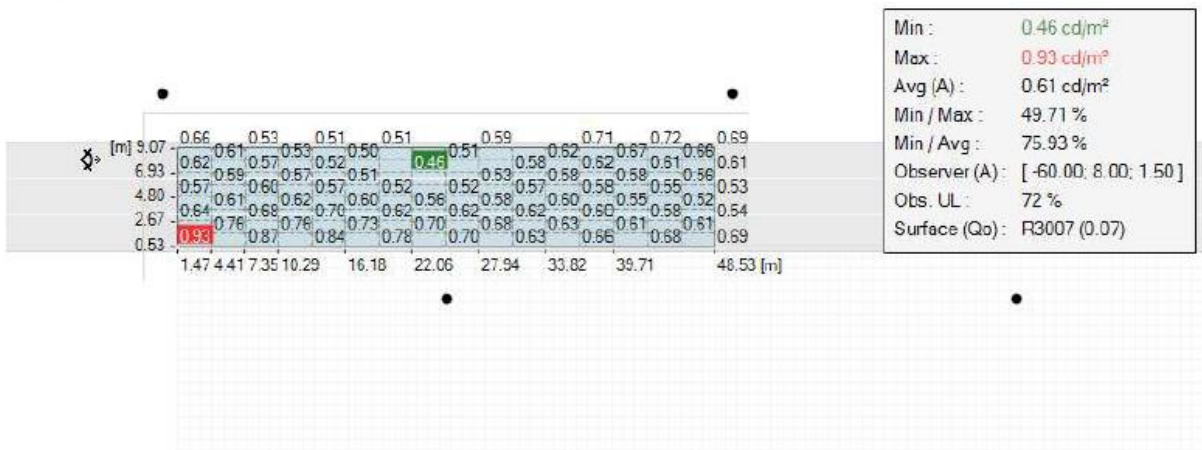


Project : Msunduzi Solar Street Lighting - Phase 2

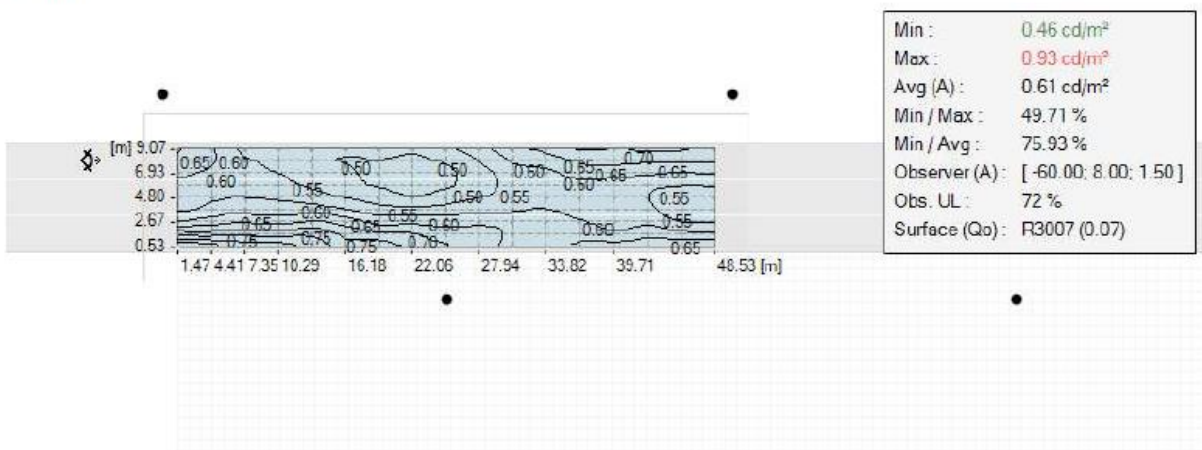


4.4.3. Road (LU) - Luminance - RTable - Observer absolute

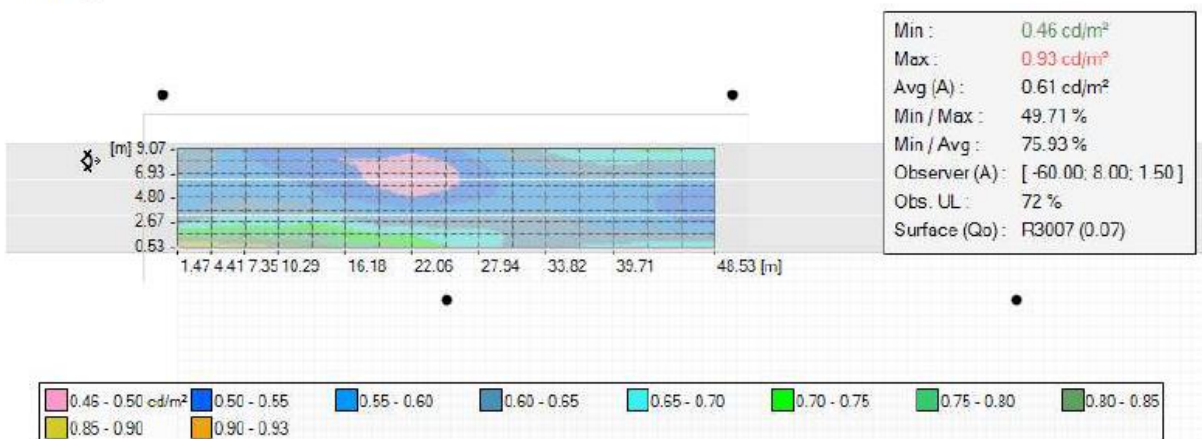
Values



Isolevel



Shading



Project : Msunduzi Solar Street Lighting - Phase 2



## 5. Grids

### 5.1. Road (LU)

#### General

Type : Grid rectangular XY

Use Exclusion : -

En :

Colour : ■

#### Geometry

##### Origin

X:  Y:  Z:  m

##### Rotation

X:  Y:  Z:  °

##### Dimension

Count X:	<input type="text" value="17"/>	Count Y:	<input type="text" value="9"/>	
Spacing X:	<input type="text" value="2.94"/>	Spacing Y:	<input type="text" value="1.07"/>	m
Size X:	<input type="text" value="47.06"/>	Size Y:	<input type="text" value="8.53"/>	m

Project : Msunduzi Solar Street Lighting - Phase 2



## 6. Observer

### 6.1. Road (TI)

#### General

Type : Observer linear

En :

Color : ■

#### Calculation

Calculation :

Directions :

Grid :

#### Geometry

##### Origin

X :

Y :

Z :  m

##### Rotation

X :

Y :

Z :  °

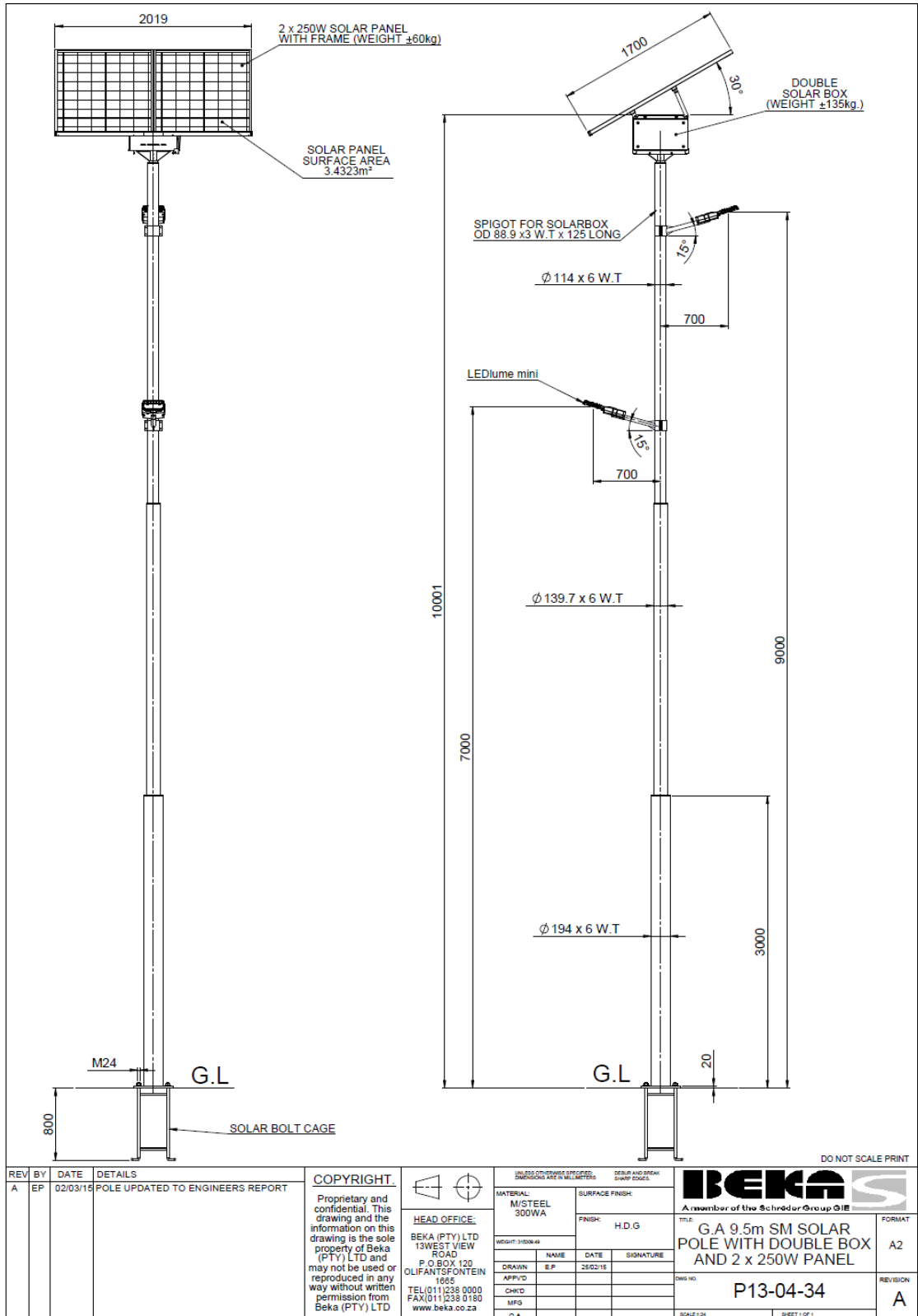
##### Dimension

Count :

Spacing :  m

Size :  m

### 3.5 A 9.5m SM Solar Pole With Double Box And 2 X 250w Panel



REV	BY	DATE	DETAILS
A	EP	02/03/15	POLE UPDATED TO ENGINEERS REPORT

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**HEAD OFFICE:**  
 BEKA (PTY) LTD  
 13 WEST VIEW ROAD  
 P.O. BOX 120  
 OLIFANTSDORP  
 1665  
 TEL: (011) 238 0000  
 FAX: (011) 238 0190  
 www.beka.co.za

UN-REG. OVERSEAS SUPPLIER	DESIGN AND DRAWING
MATERIAL: M/STEEL 300WA	SURFACE FINISH: H.D.G
WEIGHT: 31500kg	FINISH: H.D.G
APPR'D	NAME DATE SIGNATURE
DRAWN	E.P. 25/02/15
CHK'D	
MFG	
Q.A	

**BEKA**  
 A member of the Schröder Group © IE

**TITLE:** G.A 9.5m SM SOLAR POLE WITH DOUBLE BOX AND 2 x 250W PANEL

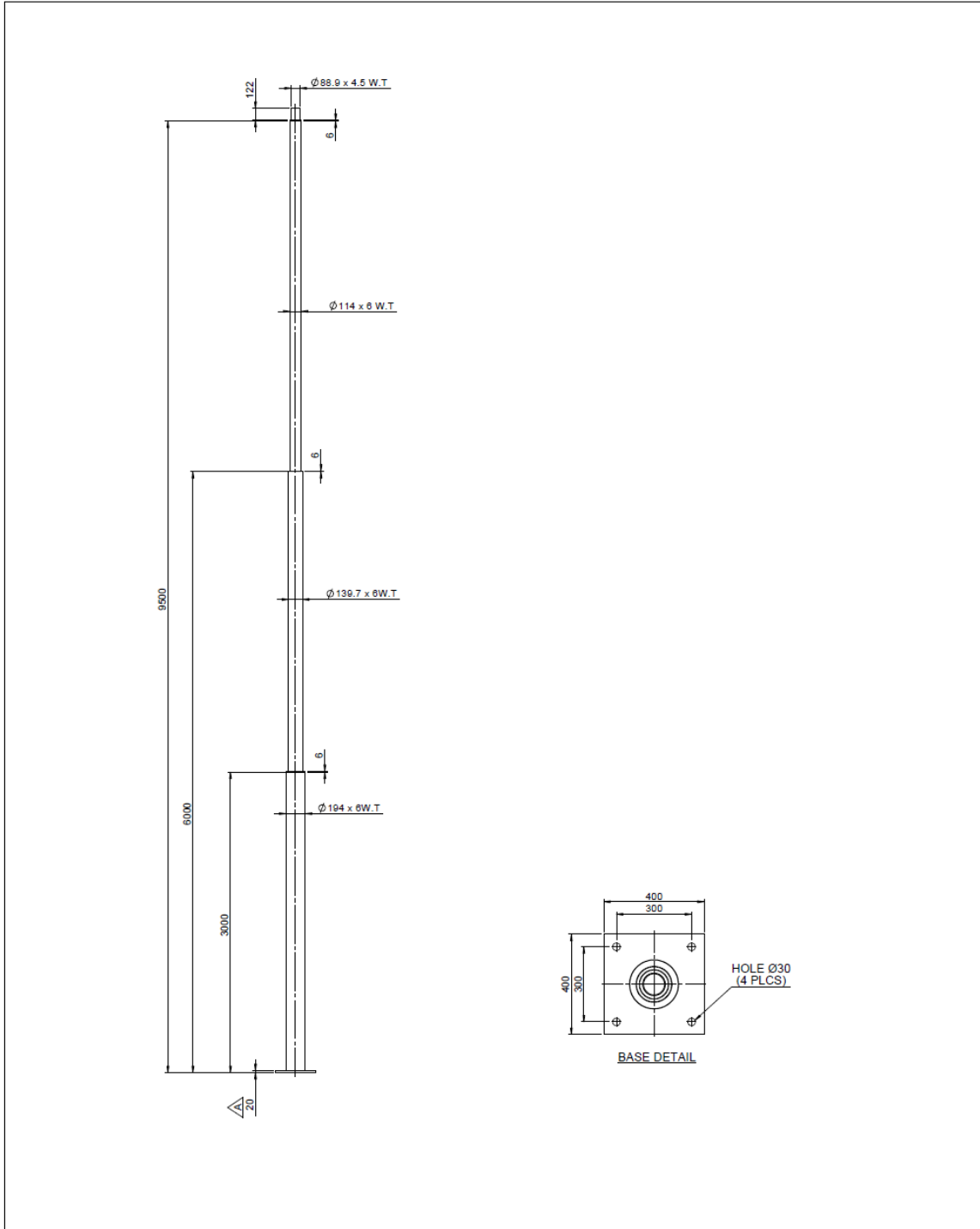
**FORMAT:** A2

**DWG NO:** P13-04-34



**REVISION:** A

SCALE: 1:34 SHEET 1 OF 1

### 3.6 Pole Design



DO NOT SCALE PRINT

REV	BY	DATE	DETAILS	<b>COPYRIGHT</b> Proprietary and confidential. This drawing and the information on this drawing is the sole property of Beka-Schröder(Pty)Ltd and may not be used or reproduced in any way without written permission from Beka-Schröder(Pty)Ltd	 <b>HEAD OFFICE:</b> Beka-Schröder (Pty)Ltd 13 WEST VIEW ROAD P.O. BOX 120 OLIFANTSFONTEIN 1665 TEL: 011 238 0000 FAX: 011 238 0180 www.beka-schroeder.co.za	<small>UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS</small> MATERIAL: M/STEEL 300WA FINISH: H.D.G. SURFACE FINISH:	 TITLE: 9.5m SM SOLAR POLE DWG NO: P13-04-34-A	FORMAT	REVISION
A	EP	05/03/15	BASE PLATE NOW 20mm THK.					A2	A

## 4. Project Budget

### 4.1 March 2015 Project Budget

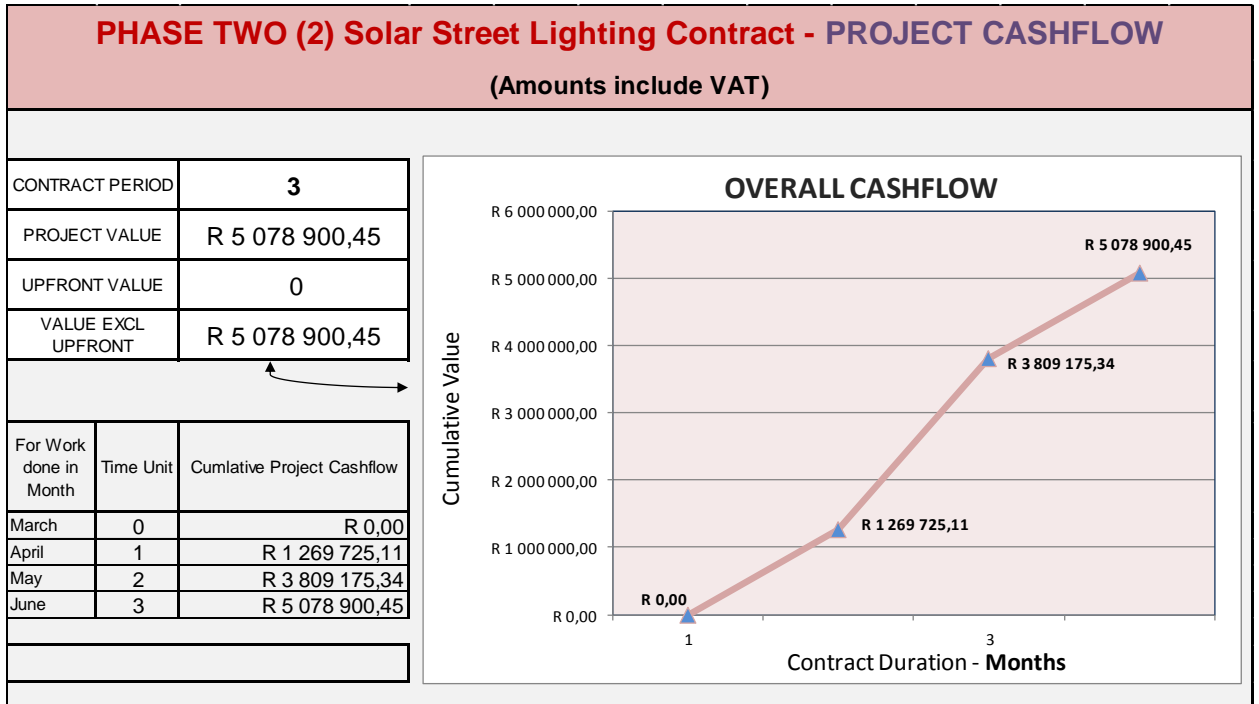
The values contained in the below mentioned financial report are current as of the 11<sup>th</sup> March 2015.

<b>Project Budget (Outstanding Amounts in Solar Phase 2 and the Beka V</b>			<b>6 074 392,45</b>
Less: Contractor's Payment No. 5 (See Cert No. 5)			816 742,00
Less: Consultant's Payment No. 2 (See Prof. Fee Claim No. 2)			178 750,00
<b>Outstanding payments due on current contract</b>			<b>995 492,00</b>
<b>Value of Work for Beka Lighting</b>			<b>5 078 900,45</b>
Section No.	SECTIONAL DETAILS	%	Total BOQ Value
1.	Preliminaries and General		206 000,00
2.	Street Lighting & Electrical Installation		1 848 960,00
<b>SUBTOTAL</b>			<b>2 054 960,00</b>
3	Civil Infrastructure Works		2 066 684,32
4	Profit & attendance on Civil Works	5,00%	103 334,22
<b>SUBTOTAL (Construction)</b>			<b>4 224 978,54</b>
5	<b>SUBTOTAL (Professional Fees)</b>		<b>230 197,30</b>
6	VAT (14%)		623 724,62
<b>Total</b>			<b>5 078 900,45</b>

## 5. Cashflow

### 5.1 Cashflow as at the 11<sup>th</sup> March 2015

Please see above the related Project Budget



## 6. Construction Programme - 3 Months

