Road Lighting – A New Era

Chris Corr & Kevin O'Sullivan

Thursday 27th September, 2018.

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

ARUP

TII Road Lighting Standards, Specification & Guidance

- Design Standards
- Specification for works
- Requirements for Measuring & Pricing
- Guidance on Specification for Works
- Guidance for Measuring & Pricing
- Asset Management & Maintenance

TII Strategic Objectives

Safety

Improve national road and light rail safety.

Delivery

Secure the delivery of the nation road, light rail and metro elements of the Governments Capital Investment Plans.

Sustainability

Incorporate sustainability principles into the development and operation of assets under TII's care.

Strategic Goal

Secure the provision, maintenance and operation of safe, efficient and sustainable networks of national roads, light rail and metro.

Service

Build relationships with local authorities, similar organisations and stakeholders.

People

Promote a culture of leadership, collaboration and innovation.

Investment

Maximise contributions to Ireland's development.

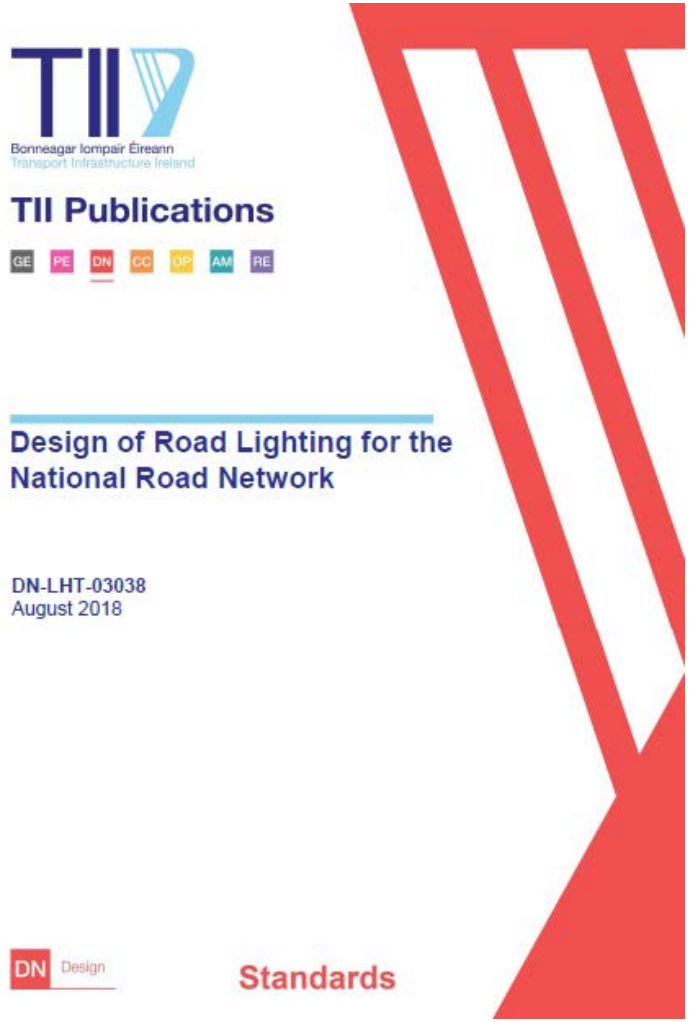
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

ARUP

The Need to Update TII Lighting Standards & Guidance

- Last update was in 2007
- Reference to superseded Standards
- Written around older technologies (SON & SOX)
- More efficient light sources – e.g. LED
- Better methods of control – e.g. dimming
- Clarity on where to Light and Extents
- Reflect National Roads in Ireland

Updating TII Road Lighting Standards & Specifications



Bonneagar Iompair Éireann
Transport Infrastructure Ireland
ARUP

Key Aim Around the Update

A Balanced Approach

- Safety
- Environment
- Economy
- Integration
- Accessibility
- Physical Activity

Lighting Evaluation Tool & Justification for Lighting the Mainline

Project Lighting Assessment Balance Scorecard

Summary Table

Grove Park Drive

Scheme Name	Description	Problems Identified		NPV (€m)	-€ 7,412,559.11
Grove Park Drive				BCR	0.13
				PVB (€m)	€ 0.01
				PVC (CAPEX) (€m)	€ 5,664,806.07
Road Type	Route No.	Scheme Length	Opening Year AADT	Speed Limit	PVC (OPEX) (€m) € 2,815,479.07
Motorway		45	75,000		PVC (Total) (€m) € 8,480,285.14

Appraisal Criteria	Appraisal Sub-Criteria	Objectives	Quantitative Statement		Sub-criteria Performance Description	Sub-criteria Score	Appraisal Criteria Score
Environment	Landscape & visual quality				Not significant or Neutral	4	Not significant or Neutral
	Biodiversity				Not significant or Neutral	4	
	Cultural, Archaeological , Architectural Heritage				Not significant or Neutral	4	
Safety	Collision reduction			Opening Year Collisions Savings:	Not significant or Neutral	4	Not significant or Neutral
				30 year Collisions Savings:	Not significant or Neutral	4	
	Security				Not significant or Neutral	4	
Economy	Economic Cost				Not significant or Neutral	4	Not significant or Neutral
Accessibility & Social Exclusion	Vulnerable groups				Not significant or Neutral	4	Not significant or Neutral
	Journey Ambience				Not significant or Neutral	4	
	Severance				Not significant or Neutral	4	
Integration	Integration with other government policies				Not significant or Neutral	4	Not significant or Neutral
Physical Activity	Physical Activity				Not significant or Neutral	4	Not significant or Neutral
				Overall Appraisal Score	Not significant or Neutral		

Sub Criteria Scale:		Economy Scoring Guidance	Safety Scoring Guidance
7	Major or highly positive	BCR > 3	Collision savings >15 over 30 year assessment period
6	Moderately positive	BCR > 2 and < 3	Collision savings >7 and < 15 over 30 year assessment period
5	Minor or slightly positive	BCR > 1.5 and < 2	Collision savings >3 and < 7 over 30 year assessment period
4	Not significant or Neutral	BCR > 1 and <1.5	Collision savings >1 and < 3 over 30 year assessment period
3	Minor or slightly negative	BCR > 0.5 and < 1	Collision savings <1 over 30 year assessment period
2	Moderately negative	BCR > 0.25 and < 0.5	
1	Major or highly negative	BCR < 0.25	

Night Time Accident Saving increased from 10% to 20%. No RPI extra Over for Energy. Lower CAP KWhr rate

PVB	Year of Cost Estimate	PVC CAPEX	PVC OPEX	Total PVC	NPV	BCR	FYRR
€ 242,852	2016	€ 464,751	€ 173,846	€ 638,598	-€ 395,746	0.38	3.3%
€ 485,704	2016	€ 929,502	€ 347,693	€ 1,277,195	-€ 791,492	0.38	3.3%
€ 485,704	2016	€ 929,502	€ 347,693	€ 1,277,195	-€ 791,492	0.38	3.3%
€ 485,704	2016	€ 929,502	€ 347,693	€ 1,277,195	-€ 791,492	0.38	3.3%
€ 485,704	2016	€ 929,502	€ 347,693	€ 1,277,195	-€ 791,492	0.38	3.3%

TII Publications — DN-LHT-03038

Design of Road Lighting for the National Road Network — July 2018

Lighting Evaluation of the Mainline

Overview

Date 01-Jan-18

Revision 0

Scheme Name: Grove Park Drive

Project Number: 1234/AB

Irish Grid Co-ordinates (Required):

Region	Latitude	Longitude
Dublin	313614	-234407

Brief Description of Project/Works

Include the extents / boundaries of scheme

Hypothetical Scheme to undertake an initial text of spreadsheet

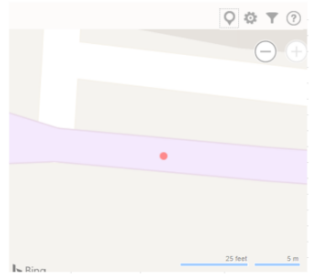
Irish Transverse Mercator (ITM) Co-ordinates:

Region	Easting	Northing
Dublin	713540.1162	734433.2270

https://gnss.osi.ie/new-converter/

Road	Road Type	Carriageway Type
National Primary	Motorway	Dual

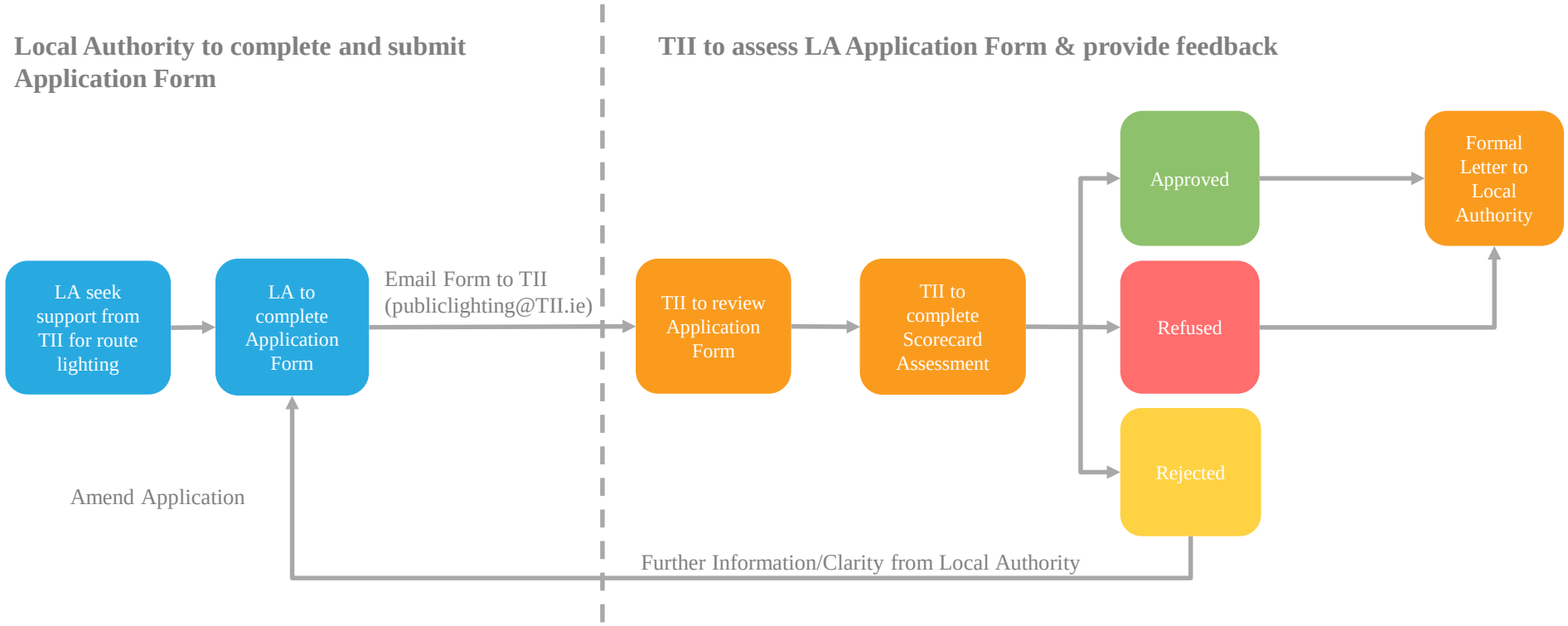
Lanes (Per Direction)	Carriageways	Junctions
3	2	5



Bonneagar Iompair Éireann
Transport Infrastructure Ireland

ARUP

Assessment for Minor Lighting Improvement Schemes



Project Life Cycle

Concept → Prelim → Detailed

- Governance for Lighting during the project life cycle
- Consideration of lighting at the concept stage
- Early development to mitigate environmental impact and inform scheme estimate
- Consistency of information at each stage
- Key Performance Metrics

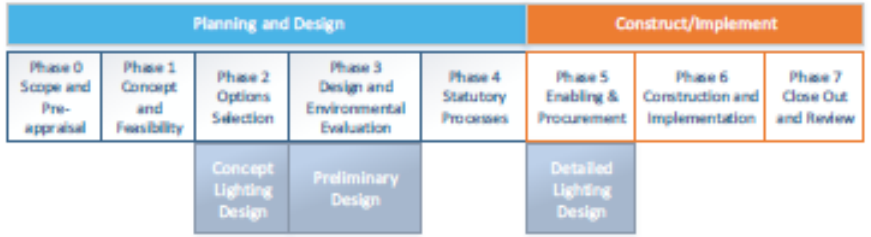
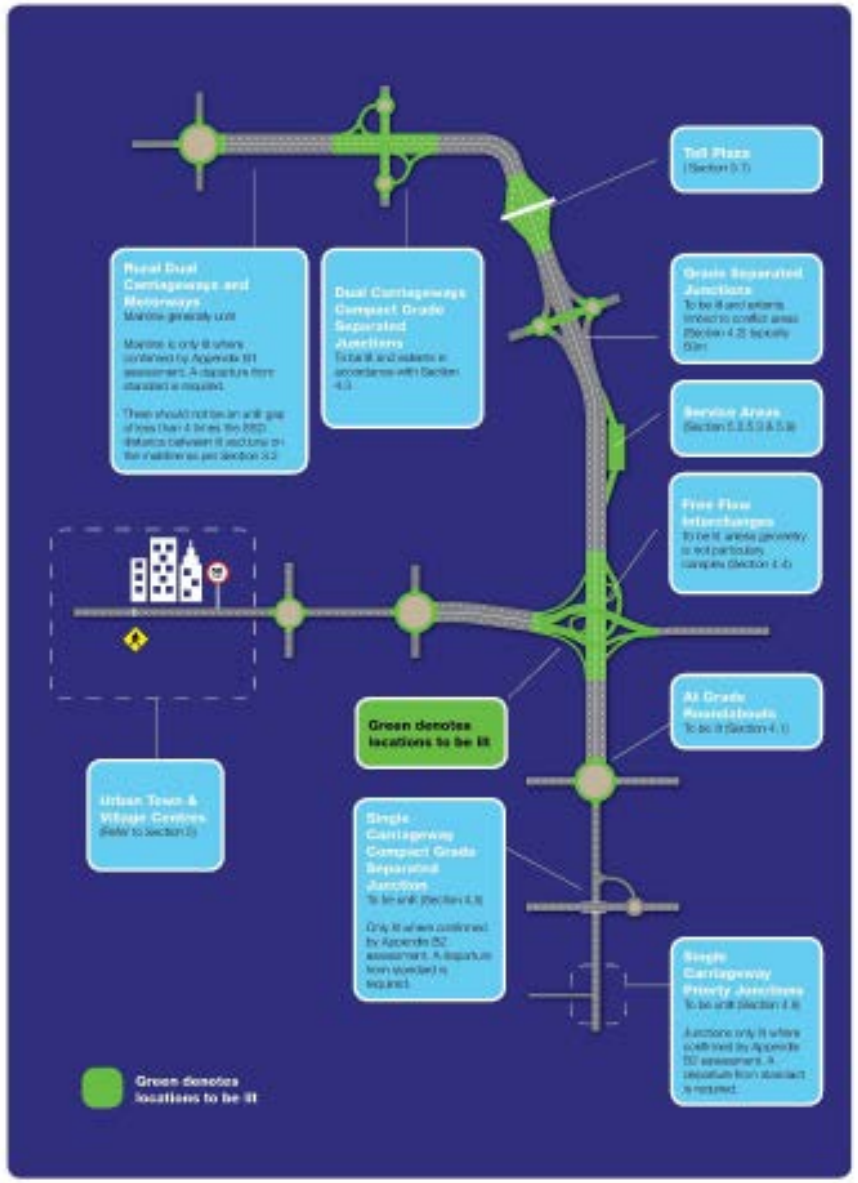


Figure 1 PE-PMG-02041 Process and Lighting Stage Alignment

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

ARUP

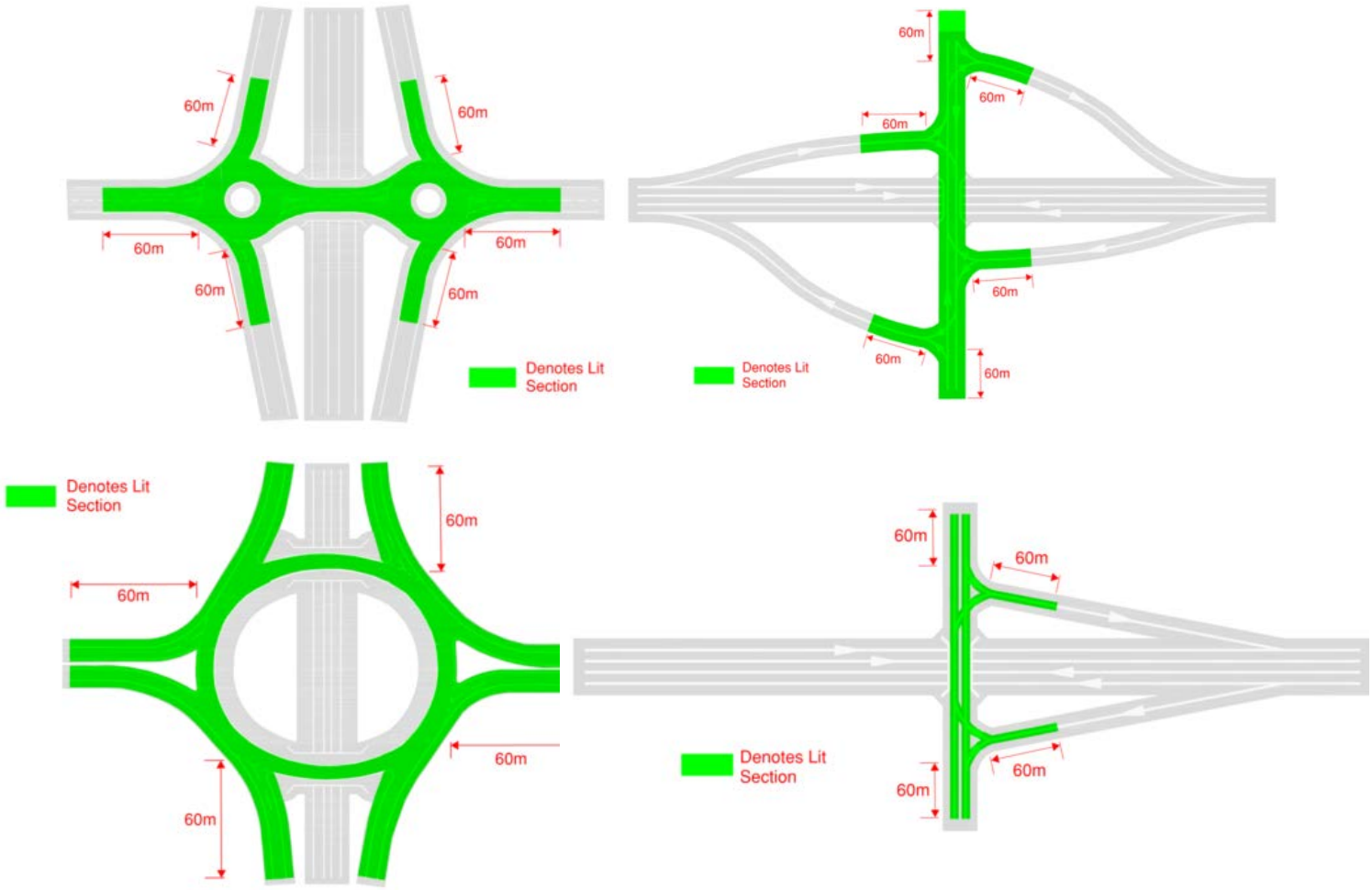
Lighting Provision

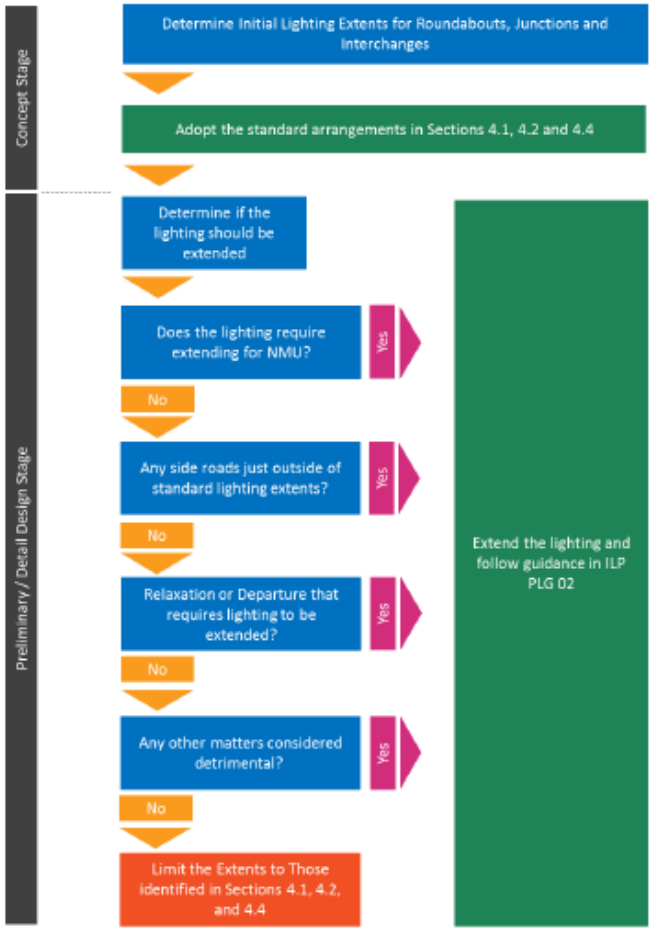


Bonneagar Iompair Éireann
Transport Infrastructure Ireland

ARUP

Lighting Extents

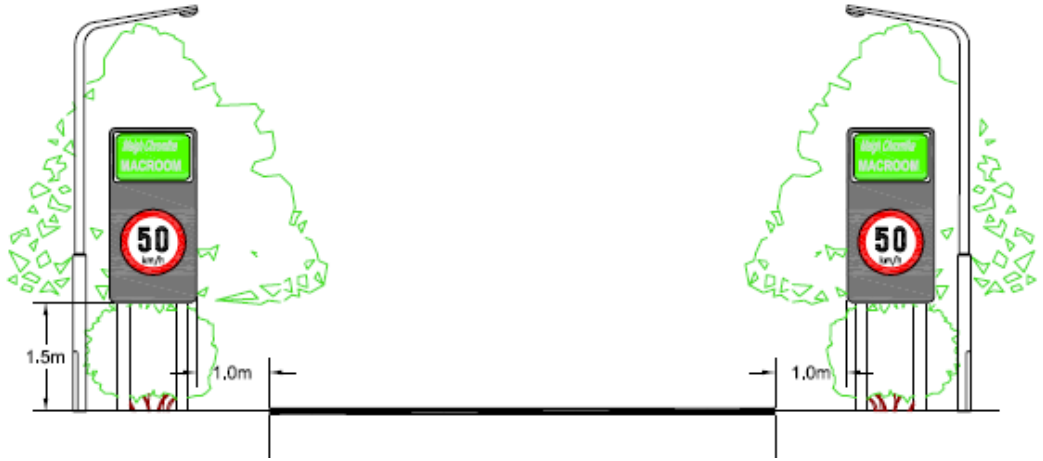




Bonneagar Iompair Éireann
Transport Infrastructure Ireland

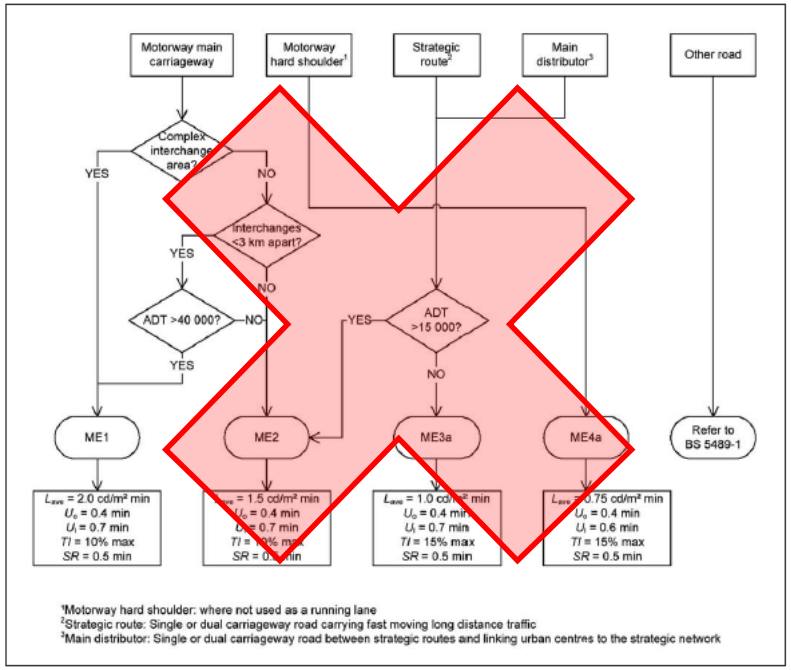
ARUP

Consideration of National Road Requirements in Ireland



ARUP

Lighting Class Selection – The right light in the right place

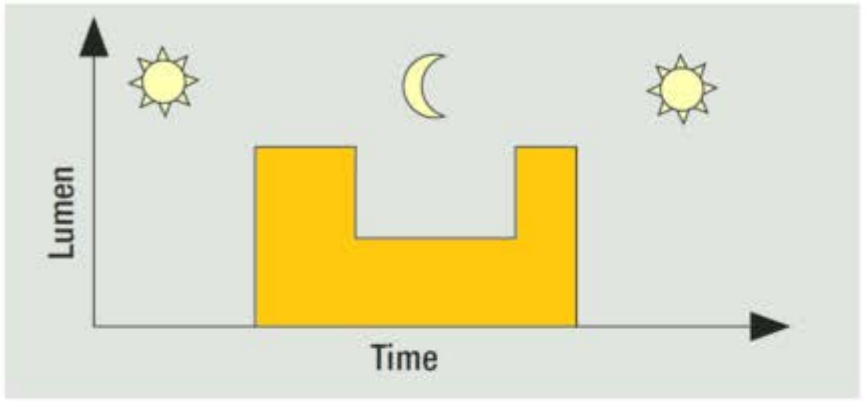


Parameters for the selection of M/ME lighting class.

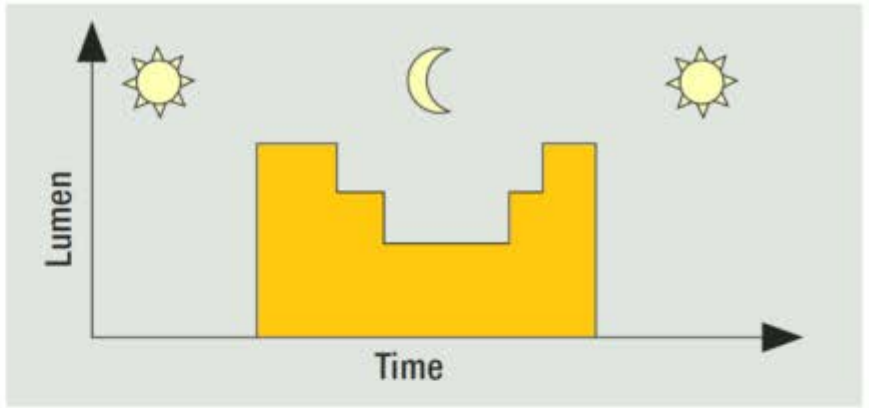
Parameter	Options	Weighting Value V_w	V_w Selected
Speed	Very High (>100 km/h)	2	
	High (70 km/h to 100 km/h)	1	
	Moderate (40 km/h to 70 km/h)	-1	
	Low (< 40 Km/h)	-2	
Traffic volume	Very High to High (ADT>40,000)	1	
	Low to Moderate (ADT between 7,000 and 40,000)	0	
	Very low (ADT <7000)	-1	
Traffic Composition (Note 1)	Mixed with high % of non-motorised	2	
	Mixed	1	
	Motorised only	0	
Separation of carriageways	No	1	
	Yes	0	
Junction Spacing (Note 2)	High (<3km)	1	
	Moderate (>3km)	0	
Parked Vehicles	Present	1	
	Not present	0	
Ambient Luminance	High	1	
	Moderate	0	
	Low	-1	
Visual guidance/ traffic control	Poor	1	
	Moderate or Good	0	
		Sum of Weighting Values	
		M - Lighting Class	**M-**

ARUP

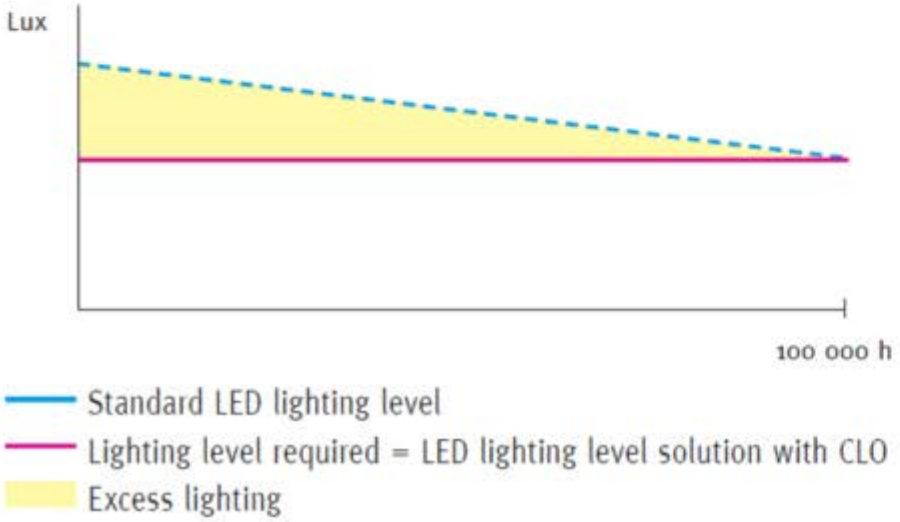
The Right Light at the Right Time

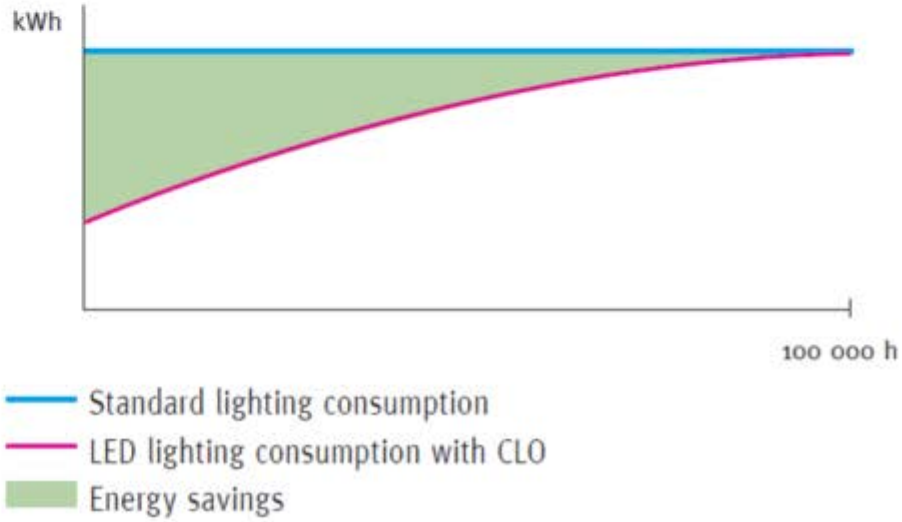


www.northcliff.org



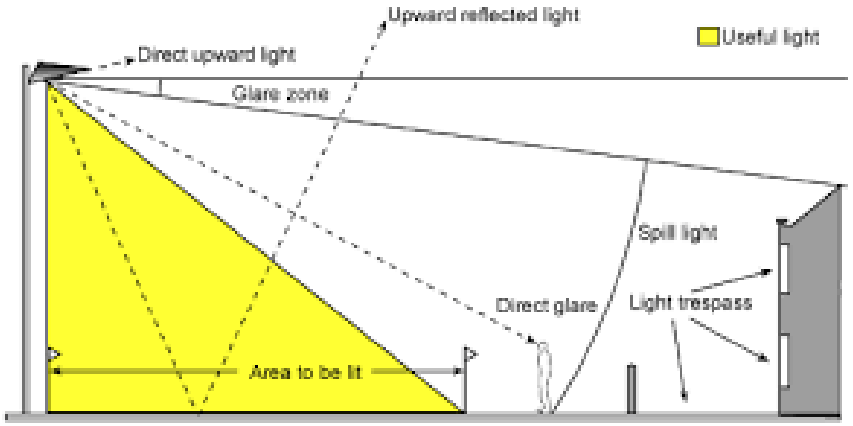
www.northcliff.org





Environmental Considerations

Zone	Surrounding	Lighting Environment	Examples	Luminous Intensity Classes
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks	G6
E1	Natural	Intrinsically Dark	National Parks, Areas of outstanding Beauty	G5 or higher
E2	Rural	Low District Brightness	Villages or relatively dark outer suburban locations	G4 or higher
E3	Suburban	Medium District Brightness	Small town centres or suburban locations	G3 or higher
E4	Urban	High District Brightness	Town/city centres with high levels of night time activity	G2 or higher



Light pollution is often caused by the way light is emitted from lighting equipment. Choosing proper equipment and carefully mounting and aiming it can make a significant difference.

Standardised Public Lighting Inventory

GEOGRAPHICAL DATA (STREET GAZETTEER)

No.	Category	
1	Street name	M
2	Road number	M
3	Location	O
4	Village, town or district	O
5	Zone	O
6	Local Authority lighting unit	M
7	TII lighting unit	M
8	Flag	O

ASSET DATA

No.	Category	
9	Equipment number	Automatically Generated
10	Unit number.	M
11	Unit Type	M
12	Unit co-ord - Easting	M
13	Unit co-ord - Northing	M
14	Column manufacturer	MF
15	Column manufacturer type reference	MF
16	Column cross section shape	M
17	Column height (m)	M
18	Column material type	M
19	Column protective coating	O
20	Column base type	O

RISK ASSESSMENT DATA

No.	Category	
64	Ground conditions	O
65	Salting of road	O
66	Road environment	O
67	Environment situation	O
68	Wind exposure	O
69	Designed for fatigue	O
70	Traffic flow	O
71	Traffic speed	O
72	On a bridge	O
73	Pedestrian density	O

OPERATIONAL DATA

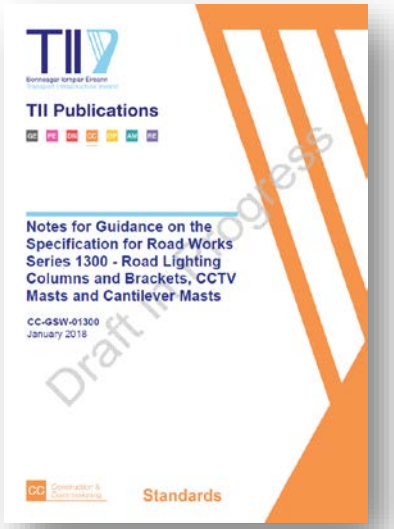
No.	Category	
77	Date of last cyclic of maintenance visit	MF
78	Date of last group lamp replacement	MF
79	Date of last cycle of cleaning	MF
80	Date of last re-application of protective coating	MF
81	Basic structural inspection and condition level	MF
82	Date of last structural inspection and condition level	MF
83	Structural test certificate reference number	MF
84	Date of Electrical Installation Test & Results	MF

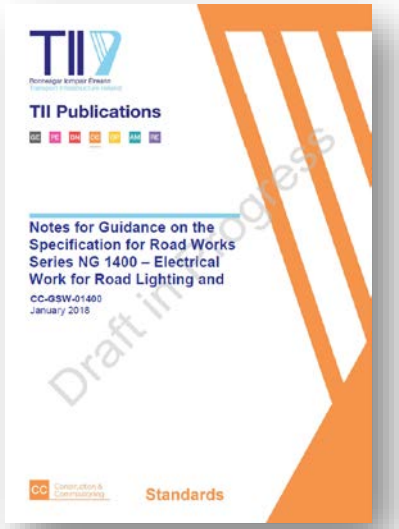
ENERGY DATA

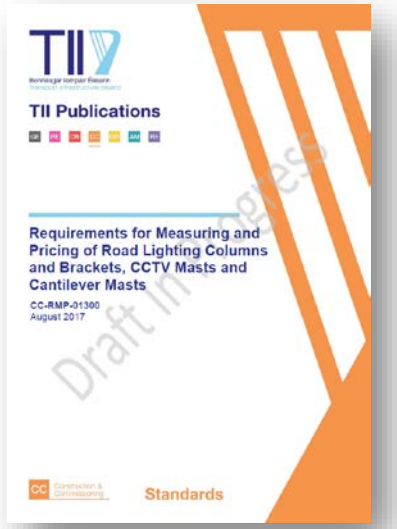
No.	Category	
96	Billable wattage (unmetered supplies only)	M
97	Maximum Import Capacity (MIC) measured in kVA	O
98	UMR billable code (unmetered supplies only)	(Reserved for possible future use)
99	Switching regime	M
100	Annual Burn Hours on UMR	M

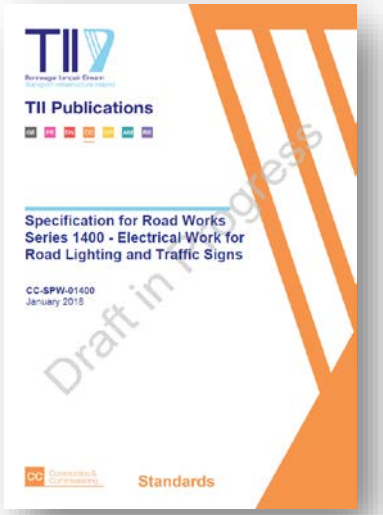
ARUP

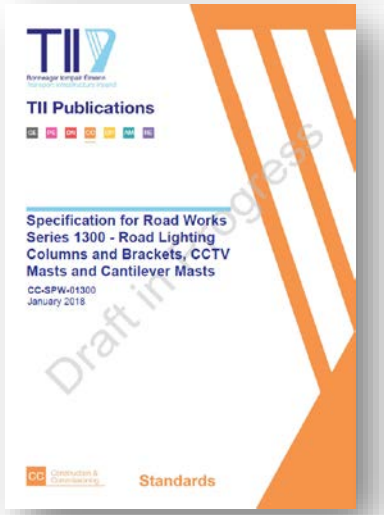
To Be Issued Soon……

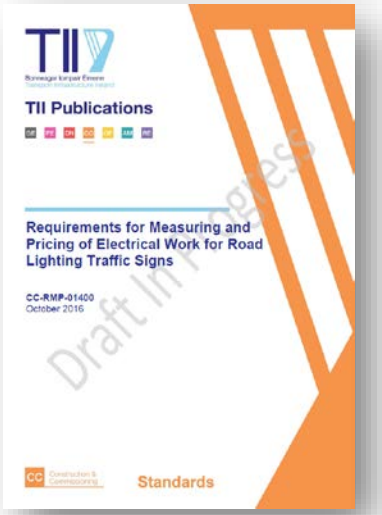












Bonneagar Iompair Éireann
Transport Infrastructure Ireland

ARUP

Lighting Standards Dashboard

WP 08A
Energy MMaRC

MMaRC Lighting Business Case - NRA

Public Lighting Energy efficiency initiatives – NRA

TII/ARUP founding members of national PL steering group and are active participants

M1 J18 Street Lighting Energy Saving Assessment- NRA, Arup

M4 J6 Street Lighting Energy Saving Assessment - NRA, Arup

M7 J22 Street Lighting Energy Saving Assessment - NRA, Arup

N7 J7 Street Lighting Energy Saving Assessment - NRA, Arup

WPA101 – Prepared Asset Inventory Collection Funding Application Tool

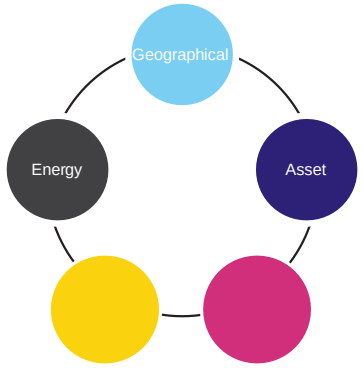
Motorway Lighting Pilot Project Energy Savings Technical Note

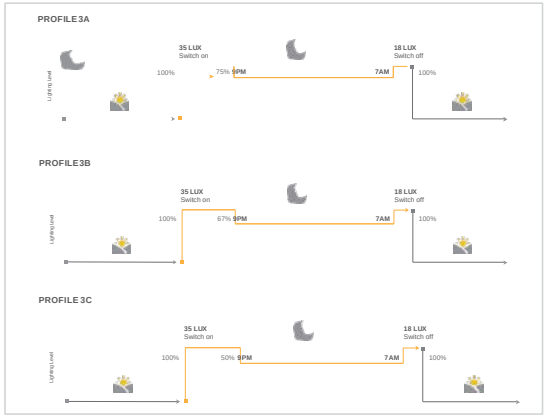
WP 08B
Energy Liaison

National Standardised Public Lighting Inventory Template - SEAI, CCMA, TII

Nationallly agreed dimming profile

Supporting SEAI with Asset Management Inventory Collection





There are **106** Fields in the Asset Management Inventory,

30 of which are Mandatory.

Broken down into the following:

8 Geographical Data

55 Asset Data

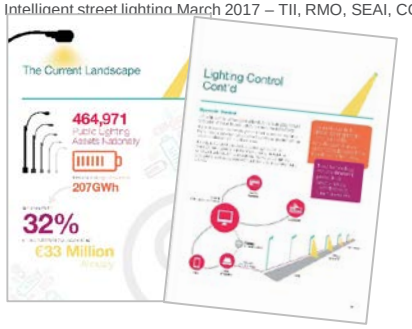
13 Risk Assessment Data

19 Operational Data

11 Energy Data

WP 08C
Energy Non-MMaRC

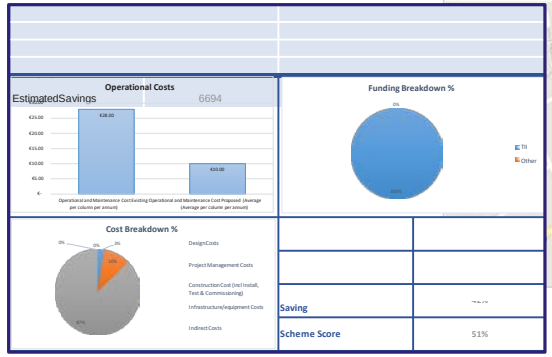
Intelligent street lighting March 2017 – TII, RMO, SEAI, CCMA



National Street Lighting Policy - Arup

EU Directive File Note - Synopsis of EU and other relevant lighting directives on the public lighting sector in Ireland - Arup

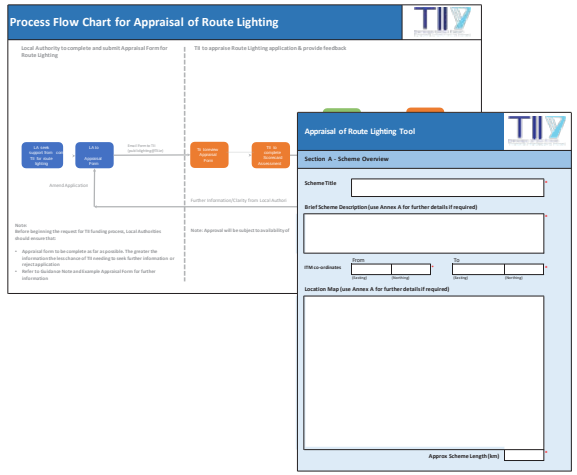
Assessment of Pilot energy efficient PL schemes

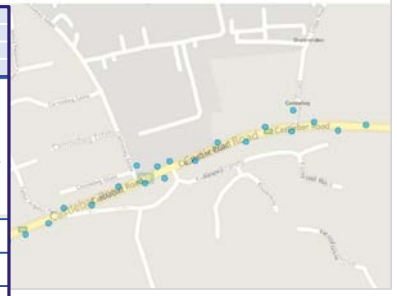


WP 08D
Lighting Standards

Route Lighting Appraisal Tool - Arup

Design of Road Lighting for the National Road Network- TII ref -DN-LHT_03038





Value Management Tool – Arup

North West Lighting Business Case – Arup, TII

ISL Technology Assessment Outline Report – Arup

Public Lighting Funding | 2018

46 LA
Schemes Funded
Plus North-Western By-passes Scheme

€3.45m
In Scheme Funding

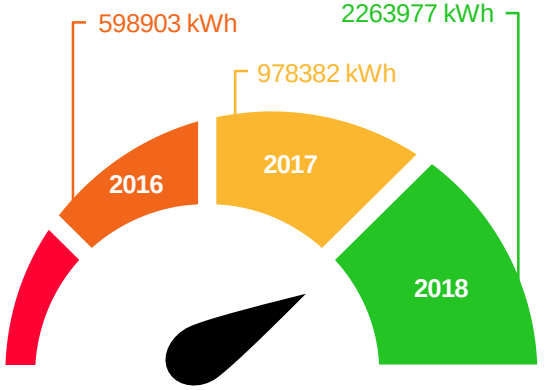
2.264m kWh
Annual Energy Savings

59%
Annual Projected Energy Savings
After implementation of all the schemes, energy savings will be **2,263,977 kWh per year**

3,978
Number of lights replaced

656
Number of Sox replaced
16% of all lights replaced were SOX

Annual Energy Savings



VM Tool

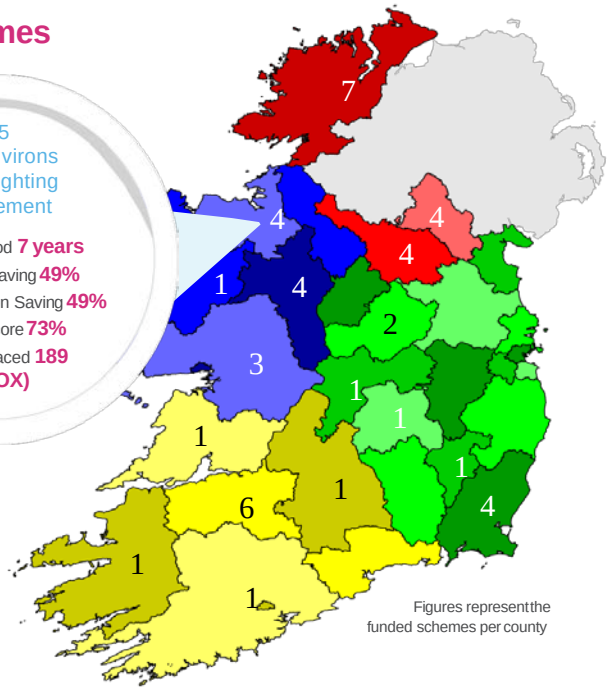
The decisions about which public lighting schemes should be funded is made with the help of a Value Management Tool. It is based on a Multi-Criteria Assessment that assigns a weighted score to each application. The final score includes parameters such as the Value for Money Assessment, the Energy Savings of the new scheme, the light type, an Environmental Assessment and other local criteria.

2018 Facts

- 3.5m in Funding for LA's (130% increase on 2017);
- North West By Passes: Works On-going - 1 single contract – replacement of 1345 lanterns;
- Management of SOX;
- More projects funded;
- More energy savings;
- Further along the road to 2020 Targets;
- Part of the Public lighting in Ireland initiative.

Top 10 Schemes

N15 Sligo Environs Route Lighting Improvement
Payback Period **7 years**
Est Energy Saving **49%**
Est. Co_2 Emmision Saving **49%**
Scheme Score **73%**
Lights Replaced **189 (47SOX)**



Figures represent the funded schemes per county

Sligo
N15 Sligo Town Environs Route Lighting Improvement
189 lights replaced **80068** kWh Energy savings

Donegal
N15 Lifford Public Lighting Refurbishment
116 lights replaced **41093** kWh Energy savings

Carlow
N80 Carlow Route Lighting Improvement
182 lights replaced **134276** kWh Energy savings

Offaly
N52 & N62 Route Lighting Improvement
105 lights replaced **57180** kWh Energy savings

Wexford
N11 & N30 Enniscorthy Public Lighting Refurbishment
137 lights replaced **90704** kWh Energy savings

Limerick
N21 Adare Public Lighting Refurbishment
91 lights replaced **39656** kWh Energy savings

Kerry
N22 Killarney Public Lighting Refurbishment
126 lights replaced **35864** kWh Energy savings

Wexford
N25 New Ross Public Lighting Refurbishment
76 lights replaced **48886** kWh Energy savings

Donegal
N13 Manorcunningham Route Lighting Improvement
119 lights replaced **94200** kWh Energy savings

Laois
N80 Mountmellick Route Lighting Improvement
71 lights replaced **34068** kWh Energy savings

Project Background / Context

The replacement of the existing lighting will achieve a number of overall objectives:

Project Background / Context

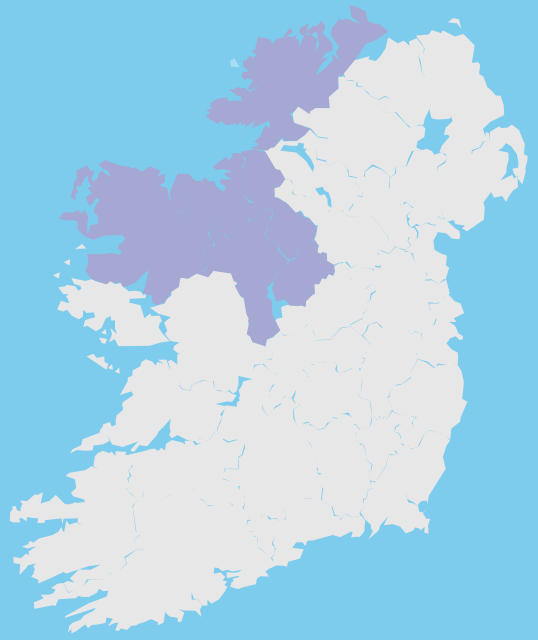
The replacement of the existing lighting will achieve a number of overall objectives:

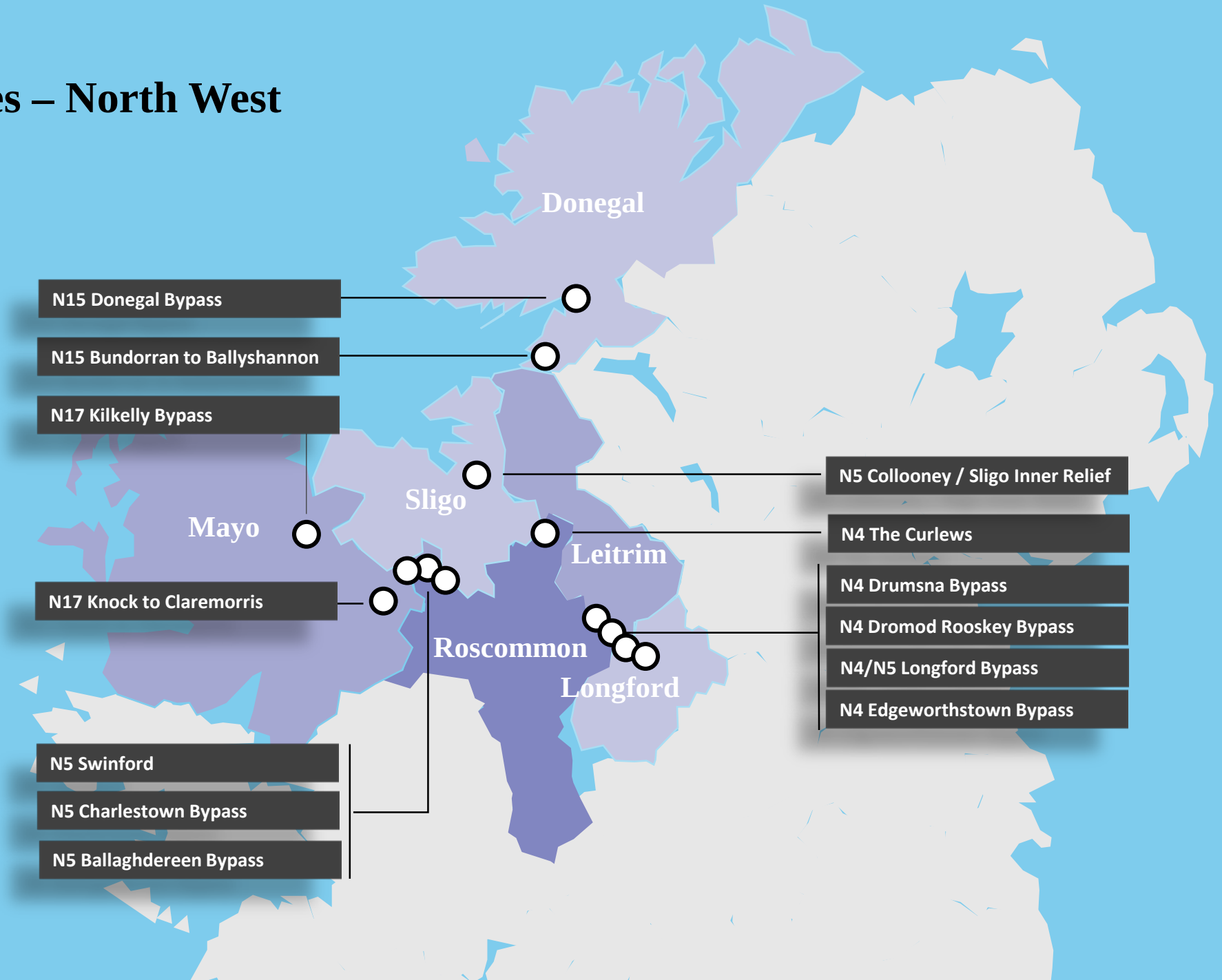
- Energy and Economic Savings
- Compliance with NEEAP
- Reduction in Environmental Effects

Project Information

- LED **Retrofit of approx. 1000** existing public lighting lanterns
- **Performance Style** Contract
- High Mast **Lighting Columns Maintenance**
- **Measurement and Validation** of LED Lanterns (1 Year after Install)
- **29 Roundabouts and Bypasses** across **6 Counties**
- Estimated Contract Value **€520k**

National Road Bypasses – North West





Key Stakeholders

Primary Client	Project Sponsor	Clients Representative	PSDP	Contractor
Comhairle Contae Mhaigh Eo Mayo County Council	Bonneagar Iompair Éireann Transport Infrastructure Ireland	ARUP	ARUP	electricSkyline

Secondary Client(s)

AN LONGFORT CONNECTED Longford County Council Comhairle Chontae An Longfoirt

Comhairle Chontae Liatroma Leitrim County Council

ROSCOMMON Comhairle Contae Ros Comáin Roscommon County Council

SLIGO COUNTY COUNCIL COMHAIRLE CHONTAE SHLIGIGH

COMHAIRLE CHONTAE Dhún na nGall DONEGAL COUNTY COUNCIL

Tenderer Type / Contract Type

- **Contract analysis undertaken, GCCC Dispensation**
- **Open Tender**
- **NEC3 Contract, Option B**
- **Suitability Assessment Questionnaire (SAQ)**

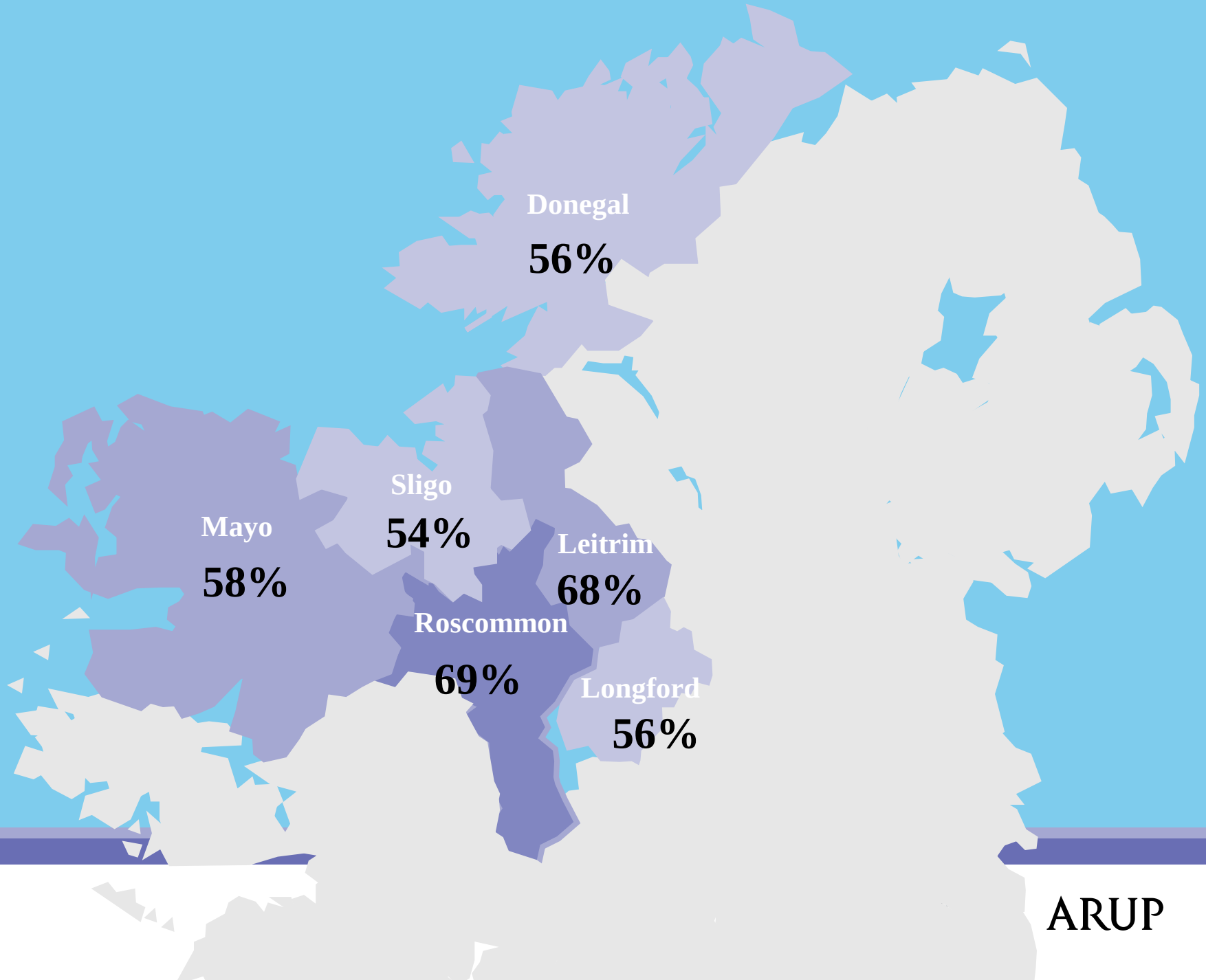
  ~ as per Standard Government Contracts

Project Time Lines

Overall Projected % savings

Overall

56%



Castlecarragh Before Upgrade

Castlecarragh After Upgrade

Claremorris Before Upgrade

Claremorris After Upgrade

Conclusions

NEC proved successful, managed Risk

New Technologies

therefore important that a ‘partnership’ approach is adopted

New Standard facilitating the energy saving approach

The Industry is changing Fast!

TII Roads Conference | 27 September 2018

Comhairle Contae Mhaigh Eo
Mayo County Council

ARUP