Legend

- E2 Environmental Conservation
- RU2 Rural Landscape

Ordinary Meeting 29 January 2013 - Item 1

Draft LP404 Planning Proposal

DSLEP 2009 - LZN

Attachment D

N

0 100 200 400

Metres

CADDATA (I:)\Planning\Graphics\Projects\City\Lep\DIep\DraftLP404_PlanningProposal\PlanningProposal\DraftLP404PlanningProposal_LZN.mxd

Legend

Minimum Lot Size (sq m)

X4	8000
Y	10000 (1ha)
AA3	70000 (7ha)
AB4	400000 (40ha)

Ordinary Meeting 29 January 2013 - Item 1

Draft LP404 Planning Proposal

Minimum Lot Sizes

Attachment D

N

0 150 300 600

Metres

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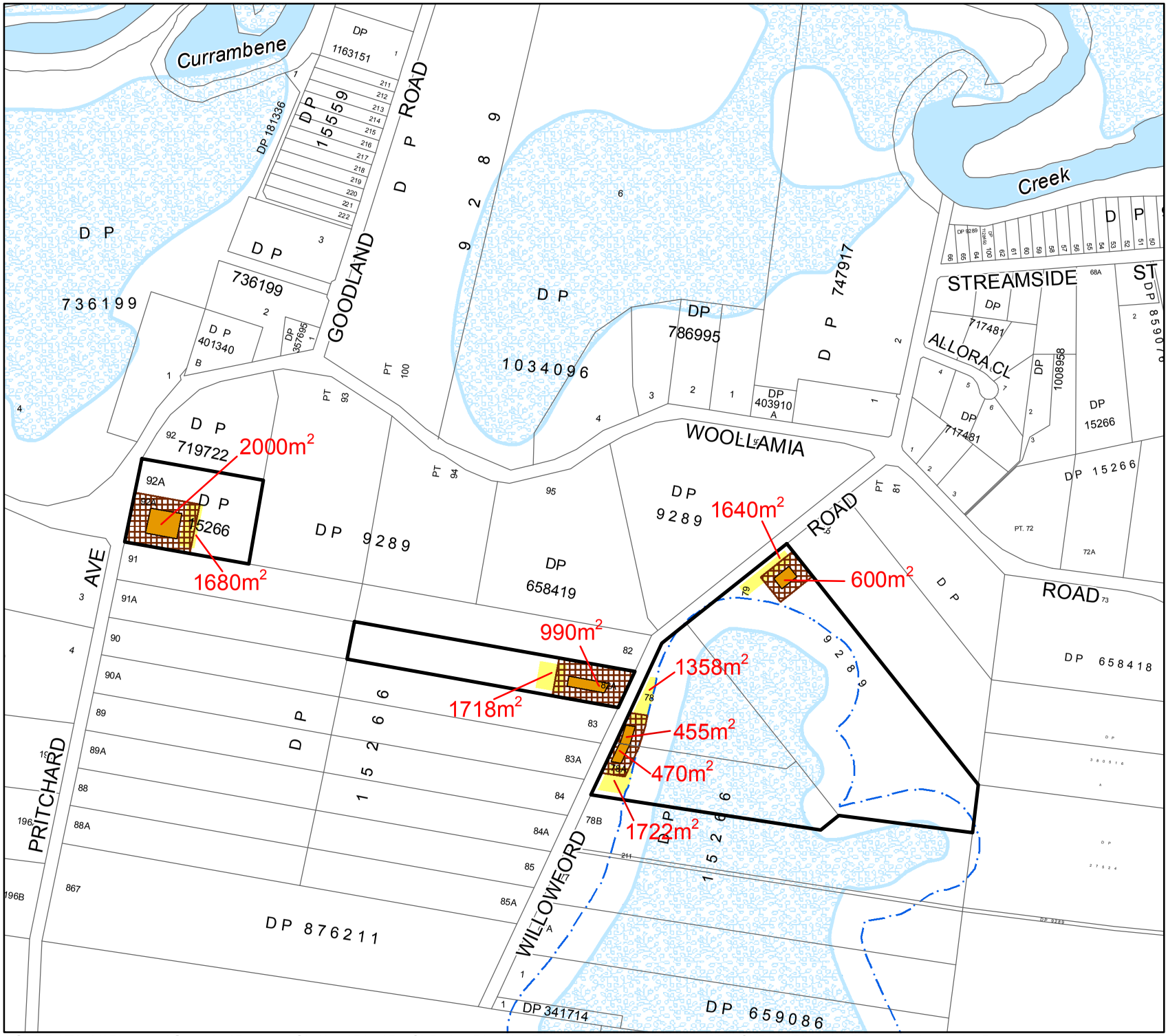

Legend

- Subject Land
- Indicative Building Envelope
- APZ
- Sepp14 Wetland
- Sepp14 50m Buffer
- Effluent Reserve

Ordinary Meeting 29 January 2013 - Item 1

Draft LP404 Planning Proposal

INDICATIVE DEVELOPMENT AREAS

Attachment E

N

0 100 200 400

Metres

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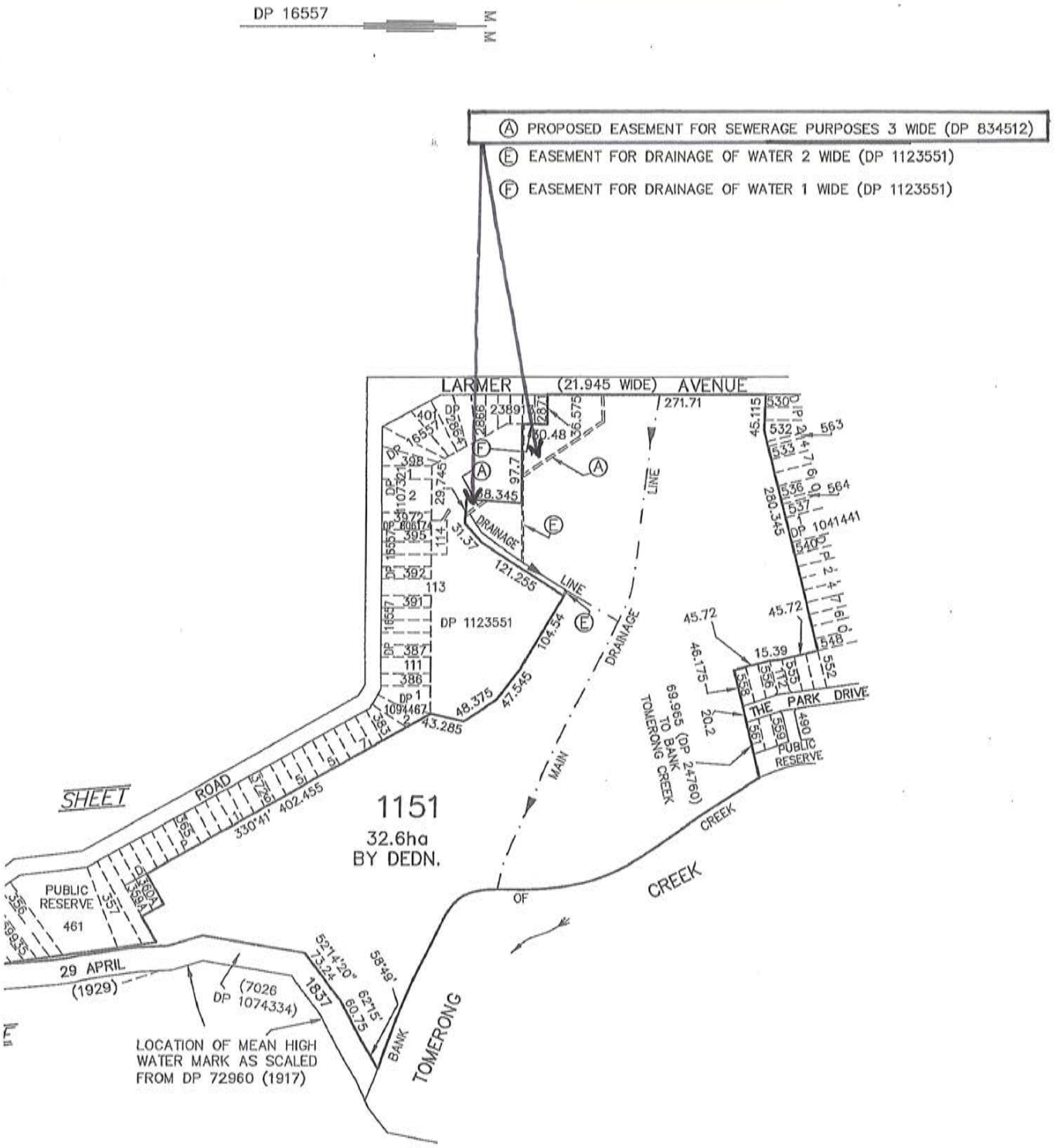
ATTACHMENT 'A'

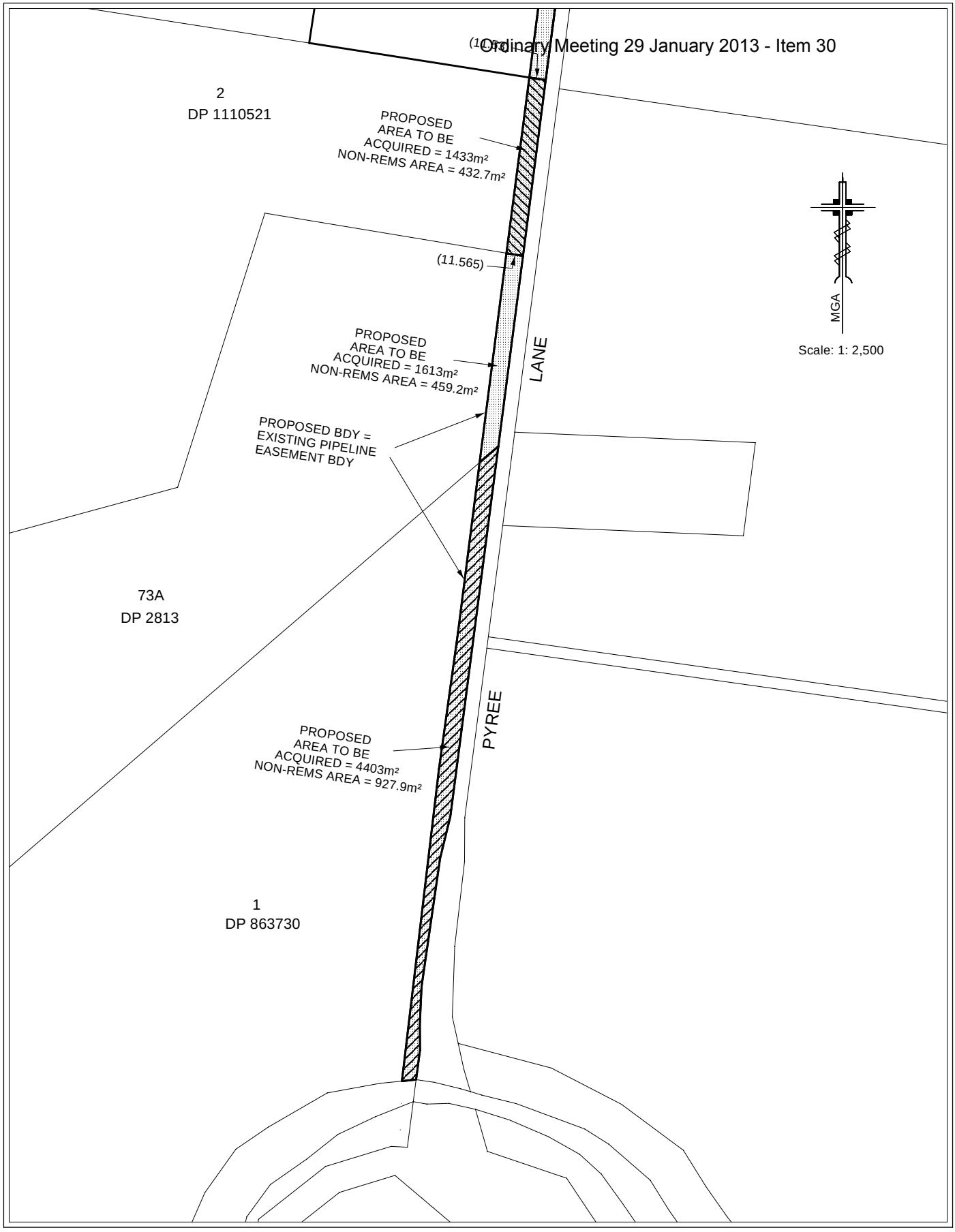


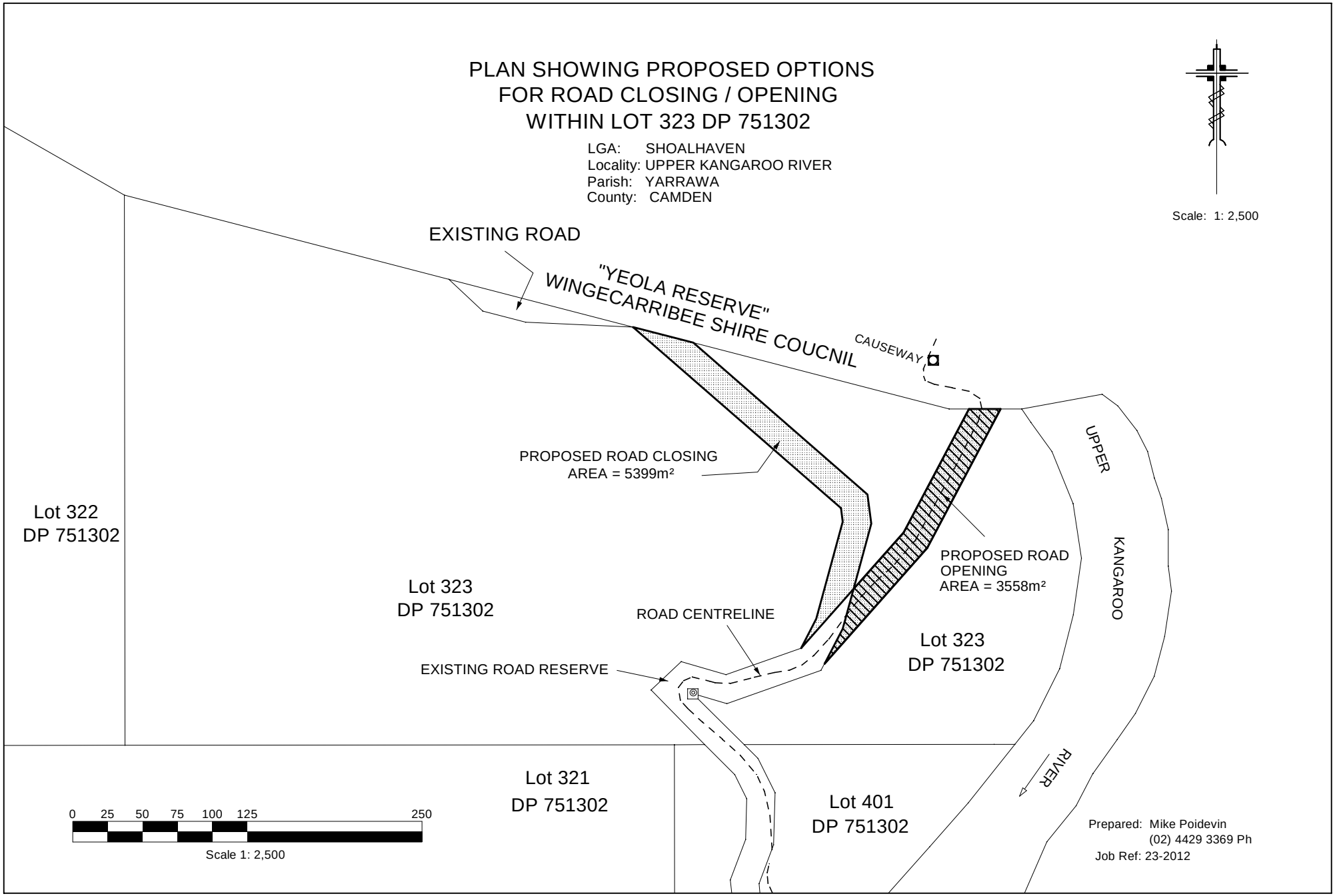
NOTE:

1. THE LOCATION OF THE LANDWARD BOUNDARY OF THE 30.48 RESERVATION HAS BEEN DETERMINED BY SCALING FROM DP 16557 DATED 1929 AND FROM DP 72960 DATED 1917

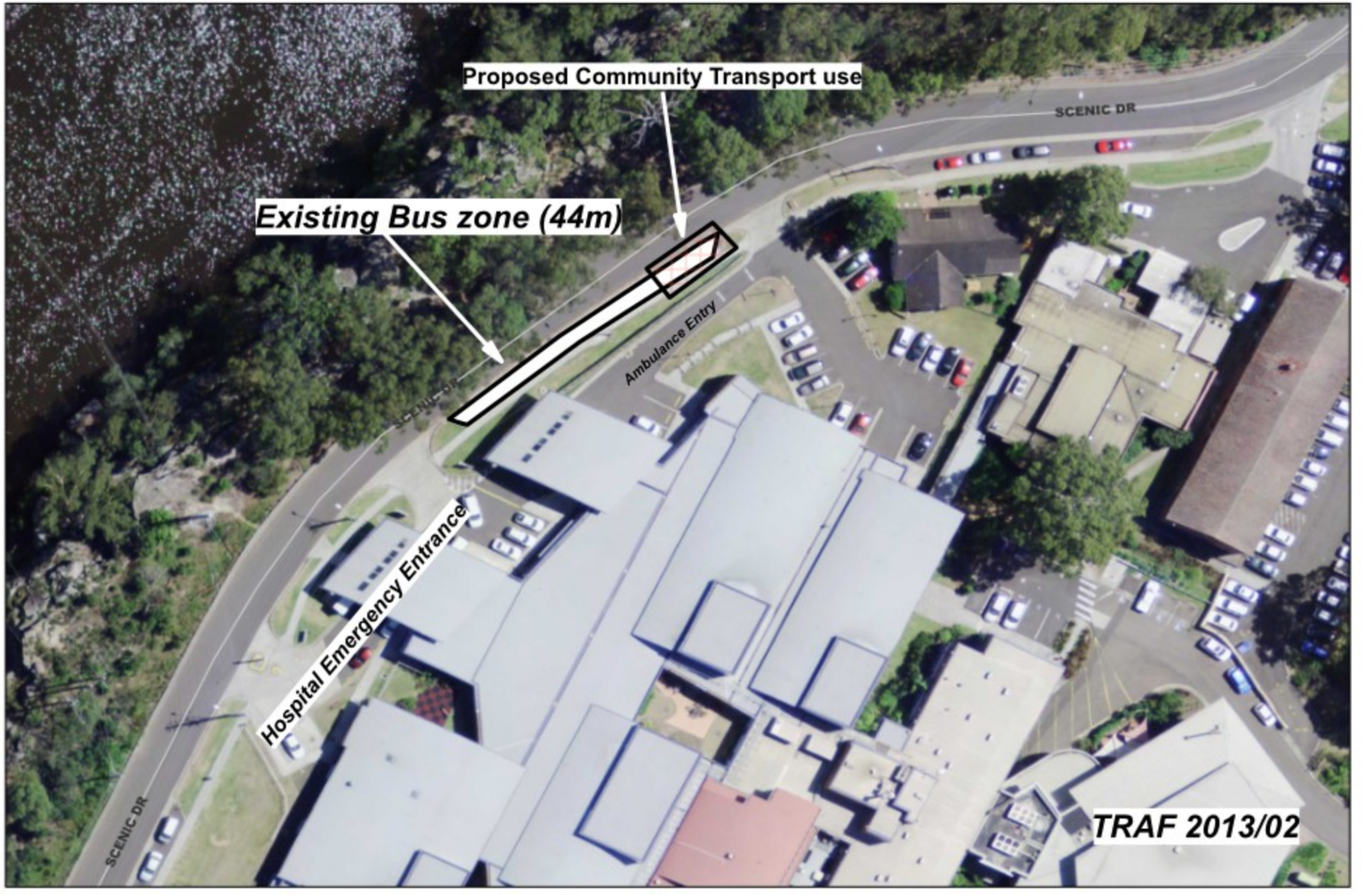
2. BOUNDARY DIMENSIONS HAVE BEEN TAKEN FROM DP 16557 AND DP 1123551

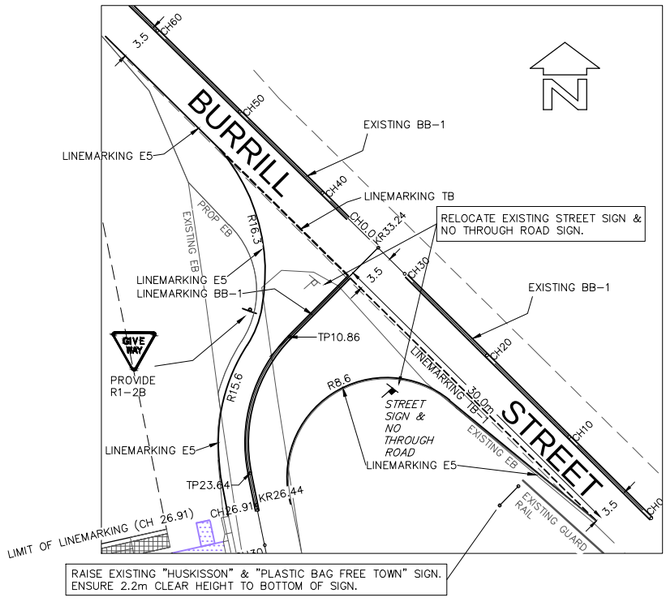
FINITION OF 15 DP 1123551	LGA: SHOALHAVEN Locality: SANCTUARY POINT Subdivision No: Lengths are in metres. Reduction Ratio 1: 5000	Registered 17.05.2011	DP1159783


2
DP 1110521
PROPOSED
AREA TO BE
ACQUIRED = 1433m²
NON-REMS AREA = 432.7m²
(11.565)
PROPOSED
AREA TO BE
ACQUIRED = 1613m²
NON-REMS AREA = 459.2m²
LANE
PROPOSED BDY =
EXISTING PIPELINE
EASEMENT BDY
73A
DP 2813
PYREE
PROPOSED
AREA TO BE
ACQUIRED = 4403m²
NON-REMS AREA = 927.9m²
1
DP 863730
MGA
Scale: 1: 2,500


PLAN SHOWING PROPOSED OPTIONS
FOR ROAD CLOSING / OPENING
WITHIN LOT 323 DP 751302
LGA: SHOALHAVEN
Locality: UPPER KANGAROO RIVER
Parish: YARRAWA
County: CAMDEN
Scale: 1: 2,500
EXISTING ROAD
"YEOLA RESERVE"
WINGECARRIBEE SHIRE COUCNIL
CAUSEWAY
PROPOSED ROAD CLOSING
AREA = 5399m²
PROPOSED ROAD
OPENING
AREA = 3558m²
UPPER
KANGAROO
RIVER
Lot 322
DP 751302
Lot 323
DP 751302
ROAD CENTRELINE
EXISTING ROAD RESERVE
Lot 323
DP 751302
Lot 321
DP 751302
Lot 401
DP 751302
0 25 50 75 100 125 250
Scale 1: 2,500
Prepared: Mike Poidevin
(02) 4429 3369 Ph
Job Ref: 23-2012

Proposed Community Transport use of Bus zone
Scenic Drive, Bomaderry





LINEMARKING & SIGNS

0 2.5 5 7.5 10 20

scale:– 1:250

LINEMARKING & SIGNAGE NOTES

1. All linemarking to be in accordance with Shoalhaven City Council requirements, Austroads Guide to road design part 4A (2010), RTA & AS1742.
2. All signage to be in accordance with Shoalhaven City Council requirements, Austroads Guide to road design part 4A (2010) & AS1742.
3. All warning signage to be "B" size and grade 1 reflective.
4. All other signage (including regulatory) to be in accordance with AS1742.2.
5. Appropriate Raised Reflective Pavement Markers (RRPMs) to be installed on all line marking at 3m spacing, including centre lines, edge lines, continuity lines, lane lines, transition lines and painted islands in accordance with AS1742.2 (Sec 5.6).
7. Guide posts are to be provided on Southern side of Burrill Street & upgraded section of Murdoch Street in accordance with AS1742.2 (Sec4.2.4).

Locality Sketch

Map drawn and published by Cartodraft Aust P/L

DIAL BEFORE YOU DIG www.1100.com.au

BEWARE!
THE CONTRACTOR IS TO VERIFY THE LOCATION OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL BE RESPONSIBLE, AT THE CONTRACTOR'S EXPENSE, FOR ANY REPAIRS TO DAMAGE CAUSED DURING CONSTRUCTION.

TRAF 2013/04

Liability limited by a scheme approved under Professional Standards Legislation.
COVER OF EXCELLENCE®

RATIO: 1 : 100 (AT A1 SIZE)

DATUM: AUSTRALIAN HEIGHT DATUM
ORIGIN: PM 40390 RL 1.709
DATE OF PLAN: NOVEMBER 2012

SURVEY	LT
DESIGN	AJM
DRAWN	AJM
CHECK'D	MAK

	REVISION	BY	DATE
0	ISSUE FOR APPROVAL	AJM	23/11/2012
1	SIGNS-LINES SEPARATE SHEET - SCC REQUEST	AJM	10/12/2012
2	SIGNS-LINES AMENDMENTS - SCC REQUEST	AJM	8/01/2012

allen, price & associates
land and development consultants
75 plunkett street, nowra, nsw. 2541
phone:(02) 4421 6544 fax:(02) 4422 1821
consultants@allenprice.com.au www.allenprice.com.au

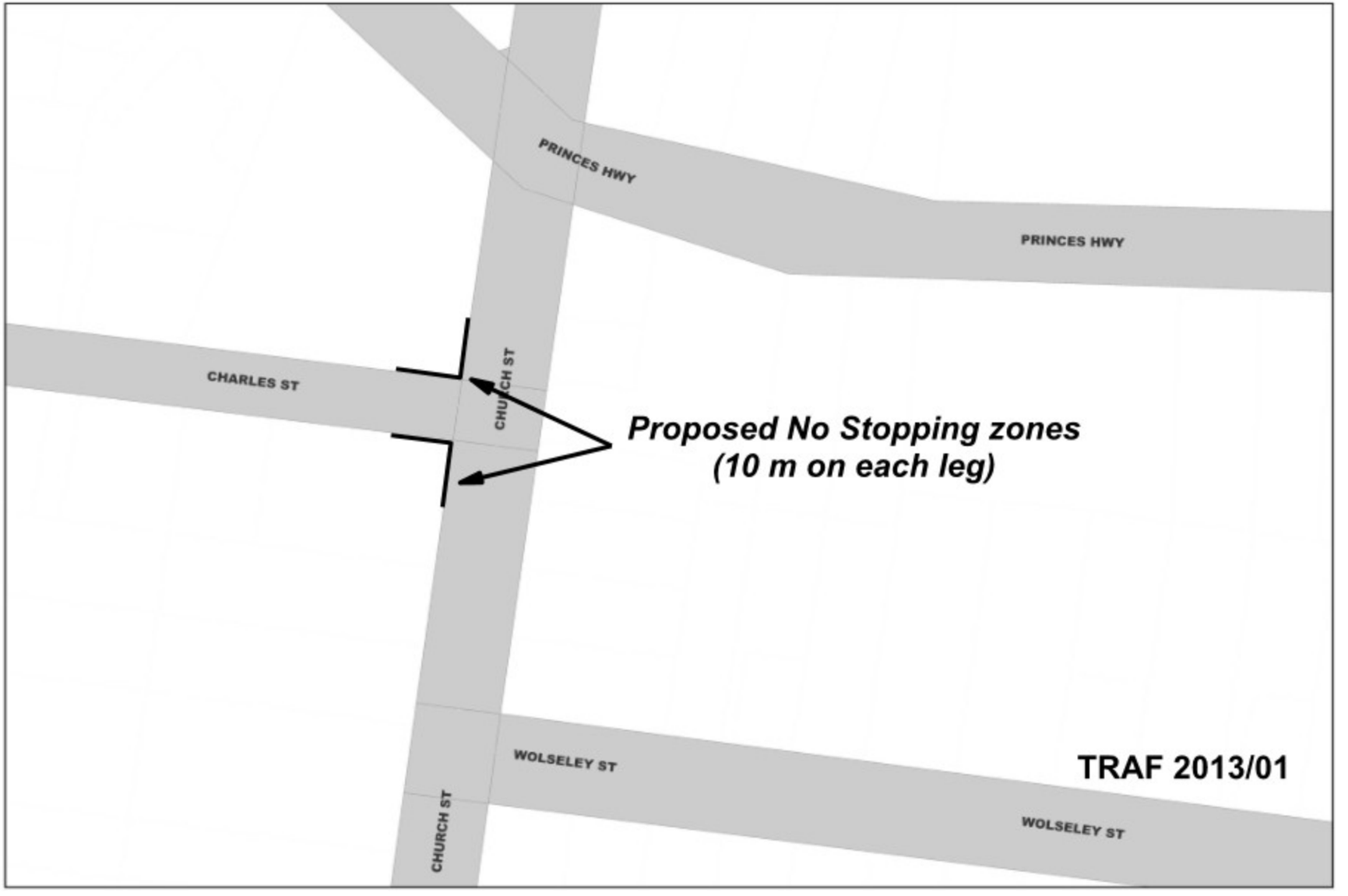
PLAN SHOWING PROPOSED ROAD UPGRADE FOR MULTI STOREY UNIT DEVELOPMENT OVER LOT 102 DP755928 AT MURDOCH STREET HUSKISSON FOR SKYTON DEVELOPMENTS P/L.

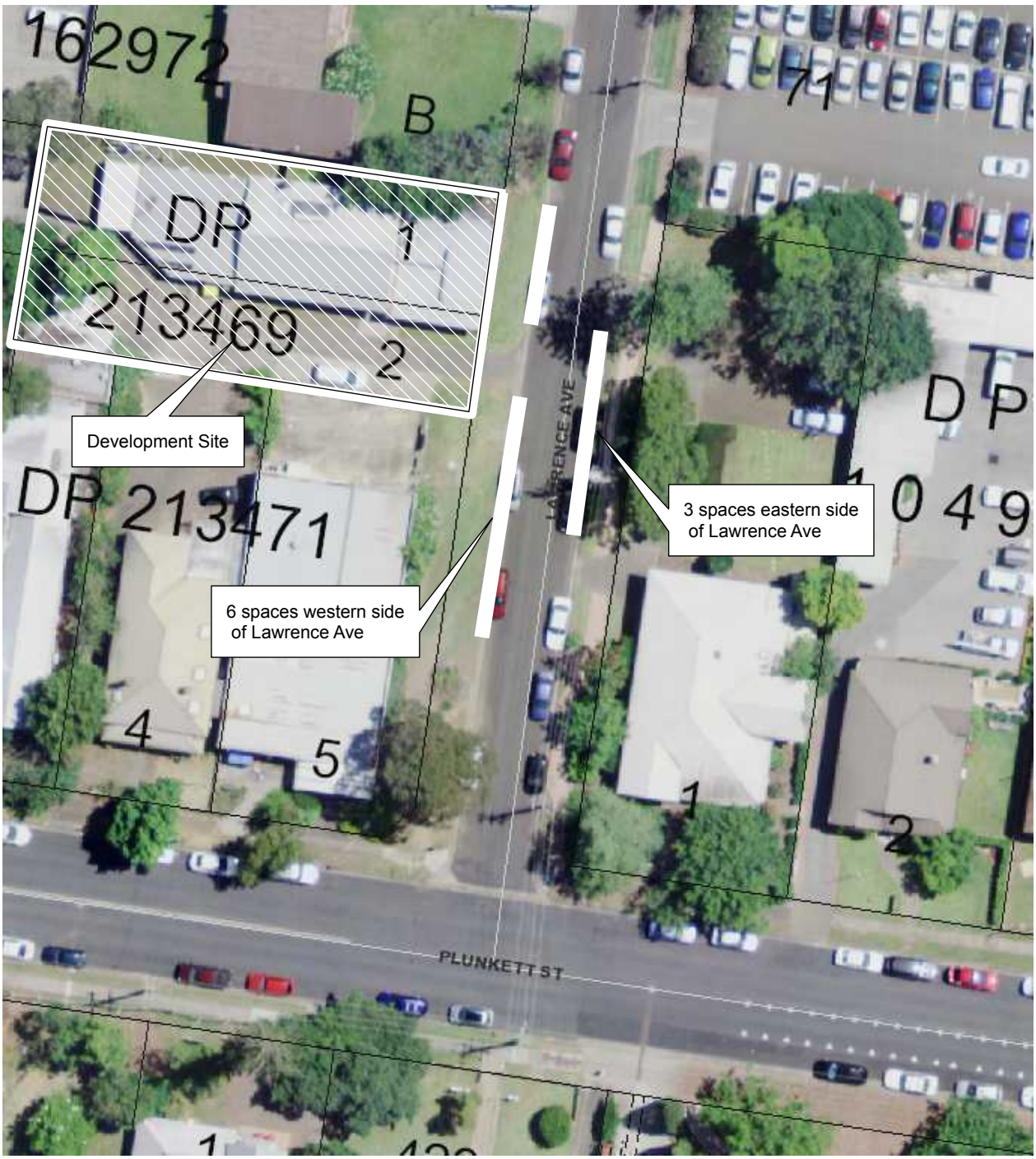
REF. No. 25907-102

SHEET 3 OF 3 SHEETS REVISION 2

M:\Projects\20000\25000s\25907\Drawings\25907_100-102_400_402-407_RD & DGE-C3D2012.dwg

Proposed No Stopping zone
Church and Charles Street, Milton





TRAF2013/05

Proposed temporary occupancy of onstreet parking - 9 spaces
Lawrence Avenue, Nowra

Ironbark Sustainability

Shoalhaven City Council Street Lighting Business Case

Shoalhaven City Council

Prepared for
Shoalhaven City Council

Version	Date	Author/Reviewer
V1	06/12/2012	Patrick Norman
V2	11/12/2012	Alexi Lynch
V3	20/12/2012	Alexi Lynch

Prepared by
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www.realaction.com.au

About Ironbark Sustainability

Ironbark is a specialist service provider for local government and business in sustainability strategy, assessment and asset management.

Ironbark has been operating since 2005 and brings together over 30 years of technical and financial analysis, maintenance and implementation experience in the areas of energy & water auditing, and public lighting technologies and management.

Ironbark provides public lighting support nationally around technology advice and approvals, business cases and projects. Ironbark delivers on a daily basis strategic and specific advice and support for the establishment of effective environmental management systems for government and business clients. We pride ourselves on supporting our clients create real action to manage their operations more sustainably.

1 Table of Contents

2 Glossary

Term	Definition
SLUOS	Street Lighting Use of System Charges
MV	Mercury Vapour
CFL	Compact Fluorescent
W	Watt
HPS	High Pressure Sodium
CPRS	The Australian Government's Carbon Pollution Reduction Scheme (pre-curser to the emissions trading scheme)
kWh	Kilowatt Hour
CO_2-e	Carbon dioxide equivalent
MWh	Megawatt Hour
Energy Savings Scheme	NSW Government scheme to improve energy efficiency
Energy Savings Certificates	Tradable certificates generated by specific energy efficiency measures (including street lighting retrofits) in NSW under the energy Savings Scheme

3 Executive Summary

Shoalhaven City Council is considering undertaking works to improve the energy efficiency of its residential street lights (Category P of the Australian Road Lighting Standard Series AS/NZS 1158). Category P covers the majority of Council's lighting infrastructure.

Shoalhaven City Council is responsible for the costs associated with the operation, maintenance, and replacement of street lighting across the Local Government Area (LGA). The costs incurred relate to both energy usage (retail) and infrastructure (distribution network). The lighting it is responsible for makes up the single largest group of energy-consuming assets within Council.

There are approximately 7,426 lights that can be readily replaced with more affordable and efficient lights in the Endeavour Energy distribution area.

This report includes recommendations on how to proceed with a bulk changeover program in the most efficient and effective way possible. The business case analysis considers the financial and environmental business case for the recommended scope of works as well as summary detail of the recommended process for delivering this project.

In addition to offering lower costs, energy consumption and greenhouse emissions, the new lights provide better lighting outcomes for the community, including:

- greater uniformity of light across and along the street,
- better colour rendering and visibility,
- less depreciation of the light output over time, and
- lower glare.

In total, the project considered in this analysis is expected to cost between $152,380 (where Endeavour Energy funds the program and the Energy Savings Scheme is used) and $3.9 million (where Council funds all of the program). Net cost savings to 2032 (after project costs have been recouped) are projected to be between $2.1m (Endeavour funded) and $8.8m (Council funded). The total greenhouse savings would be between 1,474 and 2,017 tonnes per annum depending on replacement technology and the project would pay for itself within 7-13 years after completion.

4 Introduction

Background

Street lighting is a significant consideration for local governments around Australia. It has a major impact on public amenity, costs a great deal of money, and is also one of the single biggest sources of greenhouse gas emissions for most councils.

Many local governments are now considering opportunities to replace old street lights with modern, efficient technology. New lights offer improvements in light quality and amenity, while also delivering substantial financial and environmental savings.

Shoalhaven City Council has engaged Ironbark Sustainability to undertake an analysis of the likely costs and benefits of a bulk street lighting changeover.

This document provides general information on bulk lighting changes, and background on the assumptions behind the analysis. It then presents the projected financial and environmental impacts of the project.

Which lights can be changed?

All old mercury vapour, fluorescent and incandescent lights are good candidates for replacement, whether they are on main roads or on residential streets.

Certain High Wattage Lighting including 400W Mercury Vapour and 250W Mercury Vapour can also be replaced with 250W High Pressure Sodium (HPS) and 150W HPS lights respectively.

However, Council only has exclusive financial responsibility for residential street lights. Main road lighting is either exclusively or partly paid by the Department of Transport, Roads and Maritime Services and/or adjacent local governments.

This difference in financial responsibility means that projects on main roads and residential streets need to be delivered as separate projects. This report deals with a *residential street* lighting project because it offers the simplest implementation and highest benefit to Council.

In the applicable Australian Standard (AS/NZS 1158), residential street lighting falls into Category P. This refers to lighting that predominantly serves the needs of pedestrians. Category P can also refer to some non-road lighting such as outdoor shopping precincts, parks, and car parks.

Current street lighting in Shoalhaven

Shoalhaven City Council has approximately 7,426 residential street lights in total. These lights are in the distribution area Endeavour Energy.

The following table summarises the types of lights that are currently installed.

Description	Number of lights
20W Fluorescent	23
2x20W Fluorescent	9
40W Fluorescent	5
50W Mercury Vapour	2,042
80W Mercury Vapour	4,949
125W Mercury Vapour	243
250W Mercury Vapour	134
400W Mercury Vapour	21

Standard 80W MV lights, as well as older fluorescents and incandescents, are inefficient light sources compared to other technologies that are currently available. Council is therefore in a position to benefit considerably from an energy efficient replacement of these lights.

80W MV are the current standard for category P lighting.
They consume 96 Watts of power.

Currently these street lights consume around 2,973,078 kWh of electricity and produce approximately 3,181 tonnes of greenhouse gases each year.

5 Energy Efficient Technologies

Standard luminaire replacement options are limited with only one approved fixture available for each of the fluorescent T5 and compact fluorescent lamp technologies. This is due to the combined effects of limited competition, stringent Australian Standards and meticulous approvals processes by distribution businesses. Alternative luminaires are on the horizon and will undoubtedly generate benefits in the form of price competition in the future.

The following tables provide an overview of the approved energy efficient replacement options for use in Category P roads.

32W Suburban Eco HE CFL			
Description	**Technical Data**		
Aesthetically, the 32W Suburban Eco HE is the same as the 42W version (see below), however the reflectors used in this model allow a 32W CFL lamp to be used without any significant compromises on its ability to compete with the incumbent 80W MV streetlights.	Manufacturer	Sylvania	
	Lamp	32W CFL	
	System Wattage	36.6W	
	Life Span	20 Yrs	
	Max P5 Spacing	84.9m	
	Max P4 Spacing	61.4m	

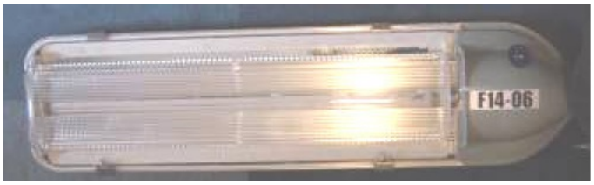
42W Suburban Eco CFL			
Description	**Technical Data**		
The Suburban Eco shares the same form factor as the current Sylvania 80-Watt MV Suburban. Modified internal electrical components allow a CFL lamp to be used. This presents the opportunity for significant energy savings. It is currently the CFL luminaire of choice in NSW despite the 32W offering higher energy savings with minimal sacrifice in performance.	Manufacturer	Sylvania	
	Lamp	42W CFL	
	System Wattage	46.4W	
	Life Span	20 Yrs	
	Max P5 Spacing	84.2m	
	Max P4 Spacing	60.7m	

Greenstreet T5			
Description	**Technical Data**		
The Greenstreet T5 provides an alternative (and more energy efficient) option to the two CFL products above. (The T5 is the current energy efficient replacement option of choice in Victoria, responsible for around 80-90% of installations over the past few years (or 30-40,000 units).)	Manufacturer	Pierlite	
	Lamp	2x14W T5	
	System Wattage	30.5W	
	Life Span	20 Yrs	
	Max P5 Spacing	83.3m	
	Max P4 Spacing	60.0m	

Under normal circumstances, all of the light types in Shoalhaven can currently be replaced with any of the abovementioned options. All these light types have obtained technical approval from Endeavour[1], and will meet or exceed Australian Standard (ASNZS 1158) at standard pole heights and spacings on Category P roads[2].

The 32W CFL manufactured by Sylvania consumes a total of 36.6Watts. The 42W CFL consumes 46.4W.

During the preparation phase of a replacement project a formal design assessment is recommended to identify the most suitable light for each location with reference to the applicable Australian Standard. Although Endeavour Energy has a preference for the 42W CFL in all locations, it is common for lower wattage lights (32W CFL or 2x14W T5) to be suitable for nearly all locations, but for higher wattage lights (42W CFL or 2x24W T5) to be more suitable in selected circumstances.



The T5 Twin 14W is manufactured by Pierlite and consumes a total of 30.2 Watts.

[1] Please note that during the project preparation it will be necessary to work with Endeavour to confirm the actual lights that can be included for each location. This will include consideration of relevant design standards.
[2] "Spacing" refers to how far apart the luminares can be placed and still meet the Australian Standards.

6 Aesthetic Considerations

The general population rarely notices the appearance of street lighting, as lights are typically mounted at a height of 7.5metres (all existing streets) or 5.5metres (new or recent subdivisions). From such a height, and in the context of poles, wires and other pole-mounted infrastructure, lights appear insignificant. The CFL luminaire is roughly the same size and shape as the old MV luminaires, whereas the T5 has a slimmer and more linear appearance, which some councils consider more consistent with the aesthetic of their poles.

An old 80W MV luminaire

A T5 luminaire

T5 luminaire after installation

CFL luminaire after installation

7 Emerging Technology

Council can only install lights that have been approved for installation by Endeavour. That means that the CFL and T5 options mentioned above are the only options available at present. However, lighting technology is improving rapidly. Some other technologies such as LED's are currently installed in test installations, and are likely to be available in years to come.

The business case analysis presented in this report therefore deals with CFLs and T5s. However, when considering its budget and approach to a changeover, Shoalhaven should bear in mind that the final technology will only be chosen, in practice, at the time a contract is signed for implementation. The purpose of this business case is not to tie Council into installing a specific technology. Rather, it is to establish a baseline business case based on the currently available options. If a new technology is approved before Council enters into a procurement contract, there will be nothing stopping Shoalhaven from adopting that technology if it compares favorably with the T5 or the CFL.

LED Streetlights

Recently, a strong interest in LED technology has arisen within the Australian street lighting community. Interest in LED street lighting is driven by the technology's touted potential to provide energy and cost savings that outstrip those delivered by current energy efficient technologies such as fluorescent tubes and compact fluorescent lamps.

Wide-scale implementation of LED street lighting in some areas of Europe and North America has also added to the level of attention given to the technology in Australia.

However, there are several obstacles for LED street lighting to negotiate before the technology can be successfully introduced into the Australian marketplace.

The three main obstacles are:

1. **Light output** -.The vast majority of LED manufacturers make lights for the European and American markets where they have much higher lighting standards than in Australia. For example in parts of England the pedestrian category lighting standard is 7 times what it is in Australia. So the majority of LED manufacturers are developing and manufacturing lights that have much higher light output than is required in Australia. They simply have not been manufacturing LEDs on a large-scale commercial level that are lower than the 28 and 32 watt options that have been approved. Consequently, the majority of LED street lights available today are not able to meet the requirements for Australian.
2. **Competitive pricing** - LED street lighting technology carries a price-tag typical of a new technology. Development and manufacturing costs are reflected in end price, which typically ranges from three to four times more than that of fluorescent and mercury vapour equivalents. Whilst much of this price can be recouped through maintenance savings, the initial capital outlay of a bulk changeover using LED street lighting would be hard to justify for an un-trialed and un-approved technology.
3. **Approval** - The approvals process for new lighting technologies can be long and involves complex negotiations. Even if an LED street lighting product was found to provide a suitable light output, the timeframe for approval could be up to 5 years.

LED technology is progressing at a rapid rate. Australian suppliers of LED street lighting are updating their products in check with advancements in the technology. Over the past three years this has seen

LED street lighting advance from a fledgling technology to a realistically viable option within the next two to three years.

In addition, the Australian Standard (ASNZS 1158) is being reviewed with a view to include LED (and induction) lighting as acceptable products. Currently they are not allowed according to the Standard. With advances in light output being matched with ever-greater reductions in costs, LED products that meet the requirements of Australian Standards and the needs of Local Government are likely to be available in the medium term.

Council will be able to consider these lights when they become available, however there is no silver bullet with lighting technologies. Lighting replacements all have specific capital costs as well as energy and costs savings during the product's life however the savings will never reduce up-front and capital costs to zero. As such we predict in the medium term (next 5 years) that LEDs will become one of a suite of good options, although many will choose other products such as Fluorescents. After that period they may become the most used street lighting technology type. For councils with funds, or the will to take action now, delaying for LEDs may not be the best option. After all there is always a better option in the future. We generally recommend councils decide base their decision on currently available information and then be willing to make a new decision in 10 years time (or after the payback period from the current project lapses).

Induction Lights

Induction lighting can be best described as a fluorescent lamp without the metal contacts used to conduct electricity through the lamp. Instead, induction lamps use electro-magnetic energy to transmit energy through the gas. Benefits of induction lamps include a long life-span (up to 100,000 hours) and energy savings on par or greater than those offered by the currently used T5 and CFL lamp technologies.

With the current emphasis firmly on fluorescent and LED technologies, the wide-scale use of induction technology for street lighting applications appears unlikely in Australia.

8 Project Outline

This section provides a summary of the key stages in a bulk changeover program if Council were to confirm its intention to proceed with such a project. If is designed to give an overview of what a bulk changeover project entails however some of these stages may require or benefit from additional third party support. Indicative costings have been provided for Council's information, however this is not a quotation. The costs are largely dependent on the amount of internal time and expertise able to be allocated to the project and the number of lights being replaced.

Stage 1: Prepare Financial Analysis or Business Case

This has been completed (this document).

Stage 2: Apply for funding and/or financing (internal and external)

This involves investigating all avenues of funding (eg, CEEP, ESS) and financing (e.g., Low Carbon Australia Limited). One key source of funding is the Community Energy Efficiency Program (CEEP) through the Department of Climate Change and Energy Efficiency (DCCEE).

CEEP funding for round 1 was announced on June 13 and of nearly 400 applicants there were 49 successful council applicants.

Funding for round 2 opened on Tuesday 30th and applications are due February 7th 2013.

In the first round of CEEP, 28% of all council funding from CEEP was delivered to street lighting projects. One of the reasons for this is that it very low risk for the funding body. With street lighting, there's no question of what your savings will be and no complicated variables that might come up like in some large building retrofits.

Another option available to Council is the Energy Savings Scheme (ESS), which is designed to create a financial incentive to reduce the consumption of electricity through energy savings activities. When Council undertakes a street lighting bulk change, energy savings certificates, known as ESCs, can be created which can then be sold to mandatory scheme participants (electricity retailers and suppliers). Savings can be as much as $100 per light. See Section 12, *External Funding*, for more information.

Stage 3: Define Council's Requirements for the Project

This stage involves defining and confirming a Project Plan and specification relevant to this project. At the end of this stage Council will have a clear pathway that provides:

- All the information required to tender for the project
- A Project and Communications Plan for Council reference during the project
- Clear timelines and deliverables through which the project can be tracked
- A clear Public Lighting Policy/Design Plan that defines the requirements of the project
- A final design and specification

Design Plans and Project Specifications

A *Design Plan and Specification* is required prior to procuring the project. This work forms the basis of the request for tender or quote. The design is developed in consultation with key stakeholders, including:

- Any relevant Council staff (typically environment, transport, engineering and community safety)
- Stakeholders with an interest in sustainable transport and pedestrian amenity
- Local police and other stakeholders with an interest in actual and perceived safety

The intent of the design work is to be able to:

- Ensure maximum greenhouse savings are achieved
- Understand and provide informed input into considerations such as safety, public transport and crime
- Ensure adherence to Council strategies and policies
- Provide a clear specification to the installation contractors and project contractors to ensure the project is delivered to Councils precise requirements

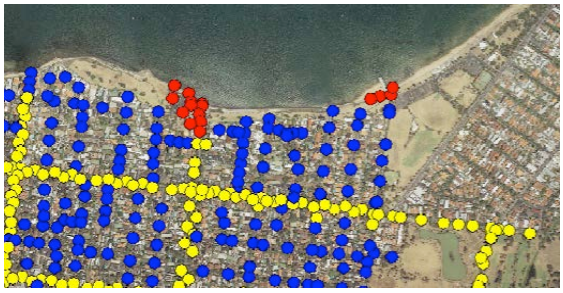
The design analysis would involve confirming Council's preferred design strategy at the outset of the project, and then creating a specification for the project.

Developing a new energy efficient lighting *Design Plan and Specification* involves the following steps:

1. Regular liaison and reality checking with key stakeholders, including preparation of internal project briefs and memos;
2. A desktop assessment of the Council's existing Category P street lighting using GIS mapping tools
3. Development of recommended changes to Council's lighting design based on
    a. Applicable Australian Standards

b. Feedback from stakeholders
c. Ironbark's corporate expertise in lighting deployment, and
d. Financial analysis

4. Field assessment of selected lights to ensure that the new lighting design is realistic and appropriate to current conditions
5. Graphical representation of the proposed lighting design using GIS mapping tools to assist during the project procurement stage. GIS mapping is also required as the basis for a request for quotation
6. Development of a summary report of the lighting design including light numbers, expected cost and greenhouse savings and a guide to the GIS layer.



At the end of the project Council will be provided with a lighting design and report for the entire municipality.

Communication Planning

At this Council would also develop a *Communication Plan*. This would include:

- Preparation of template public communications information
- Summary of communication requirements during the program (between the project partners and the wider community)
- Consideration around response requirements to resident feedback

Approximate Stage 3 Costs

Item	Cost (+ GST)	Timeframes
Defining requirements, developing *Design Plan and Specification*, *Communications Plan*	$25,000-$45,000	10-20 weeks

Stage 4: Procure the Bulk Change

In this stage, the specification is used as the basis for a request for quote or tender process, depending on whether or not the changeover is deemed contestable.

If applicable, tenders are issued, received and evaluated in this stage.

Council may or may not require support at this stage, depending on whether or not a tender is required.

Approximate Stage 4 Costs (if any)

Item	Cost (+ GST)	Timeframes
Bulk change procurement	$10,000 - $20,000	5-20 weeks

Stage 5: Manage the bulk change

During the bulk change there are many decisions to be considered and close liaison between stakeholders is needed to ensure that the contractors and distributor meet Council's requirements.

A consultant commonly assists with liaison, communications and project planning during this phase of the project to make sure the project outcomes are all met to Councils requirements.

The work includes meeting with relevant contractors prior to works completion and periodically (typically every 6-10 weeks) during the installation to ensure the project is on track.

Other key roles include:

- Managing resident feedback
- Identifying further opportunities for reducing cost, greenhouse emissions or improving community outcomes such as safety and public transport
- Clarifying how to manage data irregularities
- End of project/stage tasks (such as ensuring the billing systems reflect the new lights and Council savings can flow through as quickly as possible)
- Negotiating with the relevant distributor around program/stage finalisation
- Supporting the implementation of the communications plan, including:
    - Supporting media enquiries (as required), presenting and speaking
    - Regular reporting to Council that includes tracking of project status, timelines, complaints, variations, invoicing and incident provisions

Stage 5 Costs

Item	Cost (+ GST)	Timeframe
Management support costs	$20,000 - $45,000	TBC

Stage 6: Finalisation and reporting

Once the project is completed outcomes reporting is required for Council and any relevant funding bodies.

This stage would involve a detailed summary of the project, the outcomes that were achieved as well as the identification of any future projects that can be delivered to improve the sustainability or amenity of lighting.

Stage 6 Costs

Item	Cost (+ GST)	Timeframes
Project finalisation and outcomes reporting	$3,000-$5,000	End of Project

9 Bulk Change Business Case

Implementation Scenarios

Council requested that various implementation scenarios be considered. This included various options involving choice of technology, choice of implementation timeframes and choice of projected energy price increases. The following section provides an overview of the implementation scenarios that are explored in this report.

Technology Replacement Options

This analysis considers replacing all standard Category P lights (7,426 lights) with each of the following technologies:

- 32W CFL
- 42W CFL
- 2x14W T5

The only exceptions are the higher wattage 400W MV and 250W MV lights, which are modeled in each scenario being replaced with 250W and 150W HPS lights respectively.

Energy Price Increase Options

Energy costs are universally predicted to rise for a variety of reasons. The rising price of energy will have an impact on the savings Council accrues from the project. The greater the price rise, the greater the benefit from investment in efficiency.

When modeling the costs and benefits of a bulk changeover, Ironbark uses three price scenarios: high, average and low. Full details on the assumptions behind these scenarios are provided in Appendix 1 and 2.

In the main body of this report, Ironbark has assumed an average price increase scenario. For comparison, in Appendix 3, we have undertaken a sensitivity analysis using high and low scenarios so that Council can see what the likely impact of energy prices is on the overall economics of the project.

The table below provides a summary of the three price increase scenarios.

Period	Low	Average	High
2012-2020	34% increase	100% increase	150% increase
2020-2031	72% increase	88% increase	88% increase

Table 1: Energy price increase projections (see Appendix 2 for further details)

Financing Options

Council has two options for paying the up-front capital cost of this project:

1. Council funds the project upfront, either from its budget or from borrowings
2. Endeavour funds the project upfront and Council then pays for the project through an increase in annual SLUOS (Street Lighting Use of System) charges.

In all cases, Ironbark has assumed a 7% discount rate on the up-front capital.

In the second option, Council would still incur an up-front cost for the program, because it would need to pay the residual value, (also known as written down value) of the lights that are removed. However, it would not need to meet the up-front costs of buying and installing the new lights.

Ironbark has been advised by Endeavour Energy that SLUOS costs associated with new lights will be higher than for the current lights under both financing scenarios. However, this additional cost is more than offset by a saving in electricity costs.

Timeframe Options

This analysis compares two timeframes for implementation. In the first, all lights are changed over in in the 2012/13 financial year. In the second, the changeover is spread evenly over three years, starting in 2012/13. All scenarios share the assumptions detailed in Appendix 2.

In the case of a program funded by Endeavour Energy, only a one-year changeover is considered because this program is substantially more affordable than a Council-funded program.

When modeling the costs of a three-year changeover, some costs are expected to increase each year, while others decrease. For example, the cost of project management and installation services are both predicted to increase year-on-year over the course of the changeover; whereas increased competition among lighting manufacturers is expected to result in an annual decrease in materials costs. Although it is impossible to predict the exact impact of each of these changes, Ironbark predicts that they would be roughly equal. Therefore, in both one- and three-year programs, the capital cost is considered to be the same.

9.1 Summary Financial Analysis

Table 2 below provides a summary of the key financial indicators used below.

Indicator	Description
Project Cost	The total estimated up-front cost for undertaking the project. This includes distribution costs, materials costs, removal and disposal of old lights, supply, project management and installation of new lights
NPV	The Net Present Value of a Bulk Change to 2032
Simple Net Savings	The simple net savings of a Bulk Change to 2032 Note that the table below assumes an average price increase scenario. Ironbark has however also undertaken a sensitivity analysis to illustrate the potential effect of higher or lower increases in energy costs. This sensitivity analysis is included in Appendix 3.
Year of positive payback	The year from the beginning of the project in which the project becomes cash flow positive.

Table 2 – Key to Financial Indicators

Table 3 below summarises all financial indicators for all implementation scenarios.

Replacement	Timeframe	Finance Option	Project cost	Change to SLUOS	Cost savings	Year of positive payback
T5	1 Year	Internal	$ 3,865,380	$12,943	$ 7,987,886	10
		Endeavour	$ 523,680	$ 289,923	$ 4,373,922	7
	3 Year	Internal	$ 3,865,380	$ 12,934	$ 7,510,162	11
32W CFL	1 Year	Internal	$ 3,494,080	$ 35,274	$ 6,503,019	11
		Endeavour	$ 152,380	$ 271,149	$ 3,921,303	5
	3 Year	Internal	$ 3,494,080	$ 35,274	$ 6,219,702	13
42W CFL	1 Year	Internal	$3,494,080	$ 35,274	$ 4,519,458	13
		Endeavour	$ 152,380	$ 271,149	$ 1,927,742	10
	3 Year	Internal	$ 3,494,080	$ 35,274	$ 4,436,326	13

Table 3 - Summary of Key Financial Indicators for all Implementation Scenarios, assuming an average energy price increase.

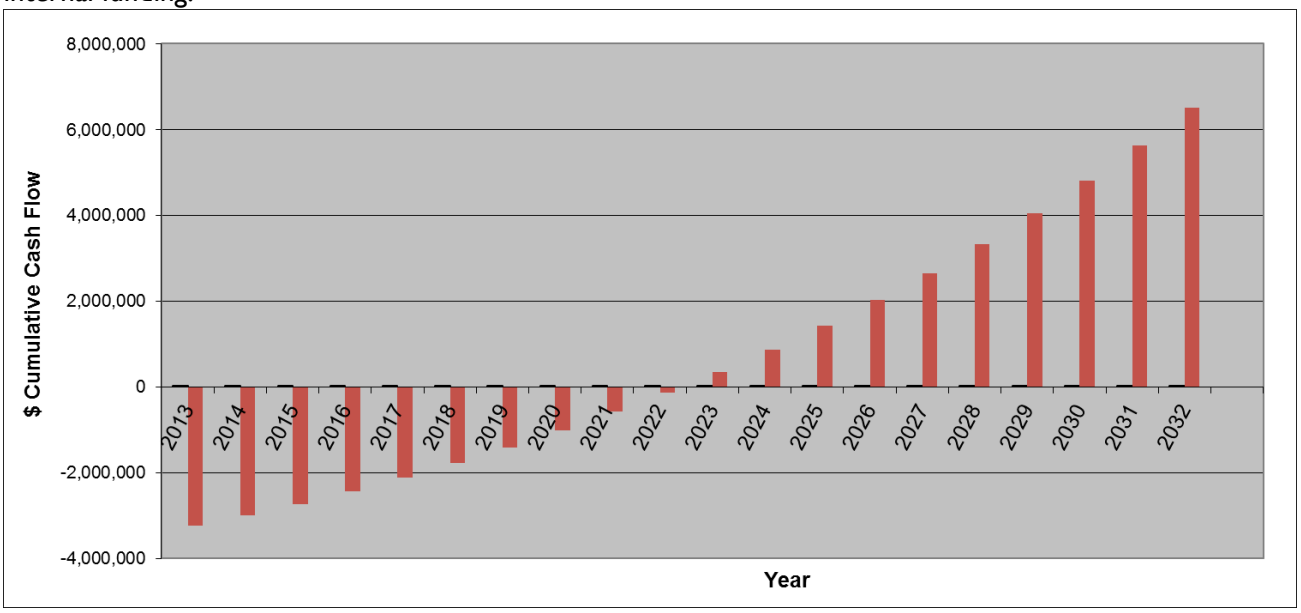
9.2 Cash Flow Analysis

The cash flow graphs in this section illustrate the rate at which a changeover project pays itself back from energy cost savings under various scenarios. Depending on how Council structures the program there are a wide range of potential outcomes.

Scenario 1: One year implementation, internal funding

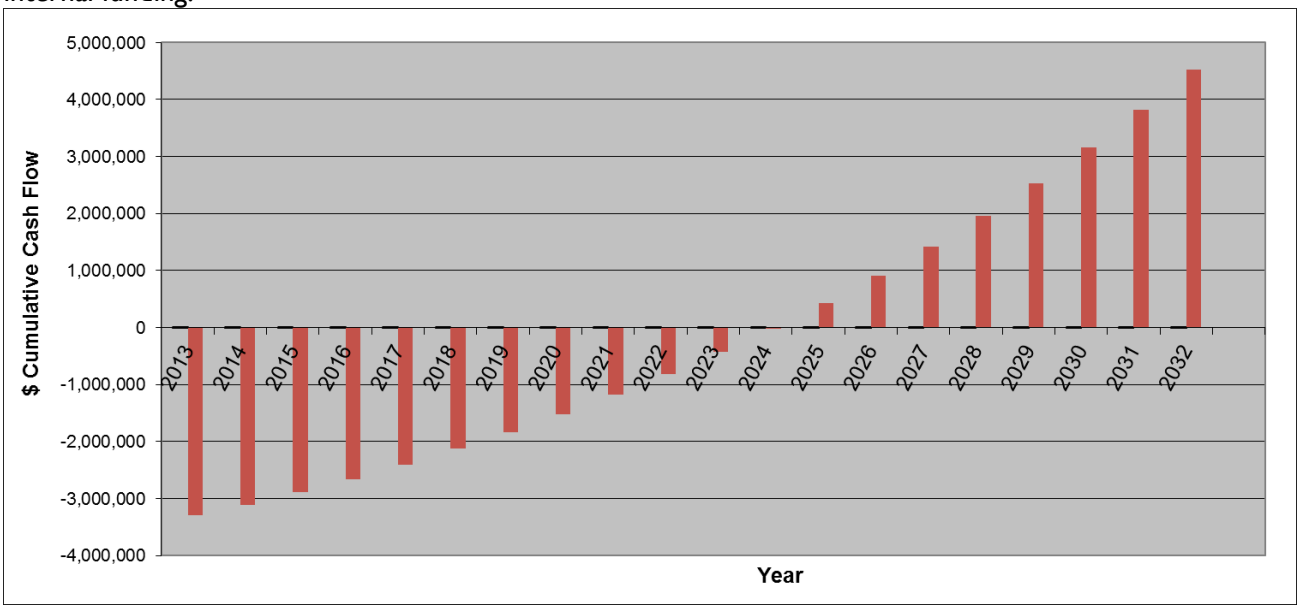
32W CFL

The following graph illustrates the cash flow assuming a one year implementation of 32W CFLs using internal funding.



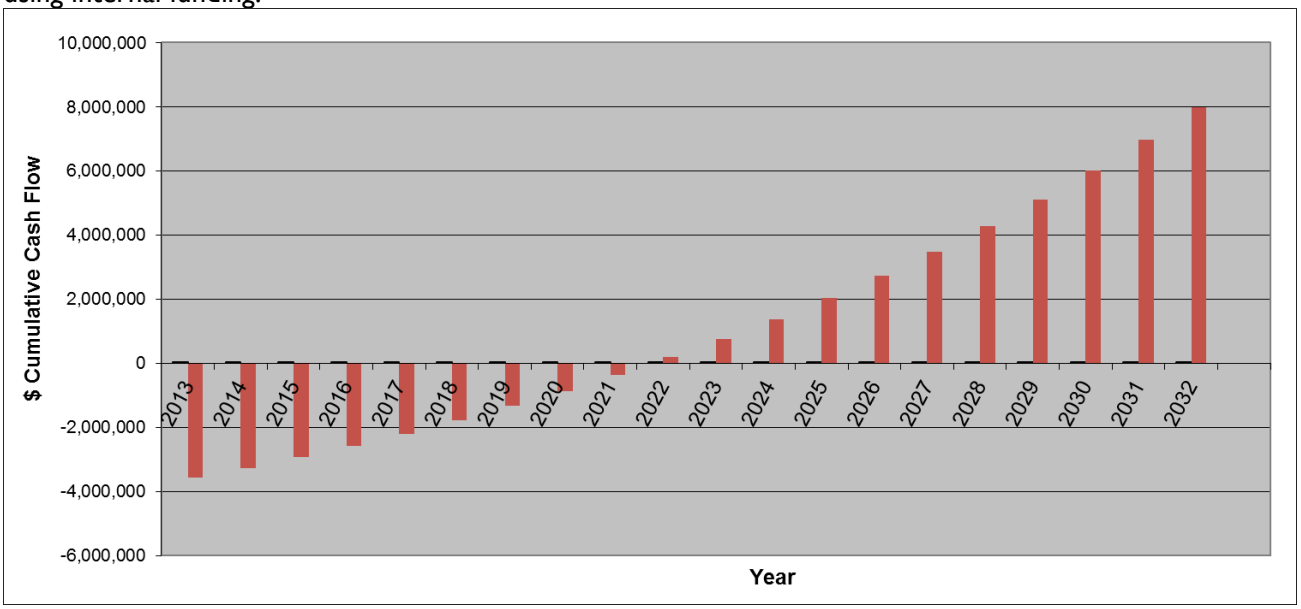
42W CFL

The following graph illustrates the cash flow assuming a one year implementation of 42W CFLs using internal funding.



2x14W T5

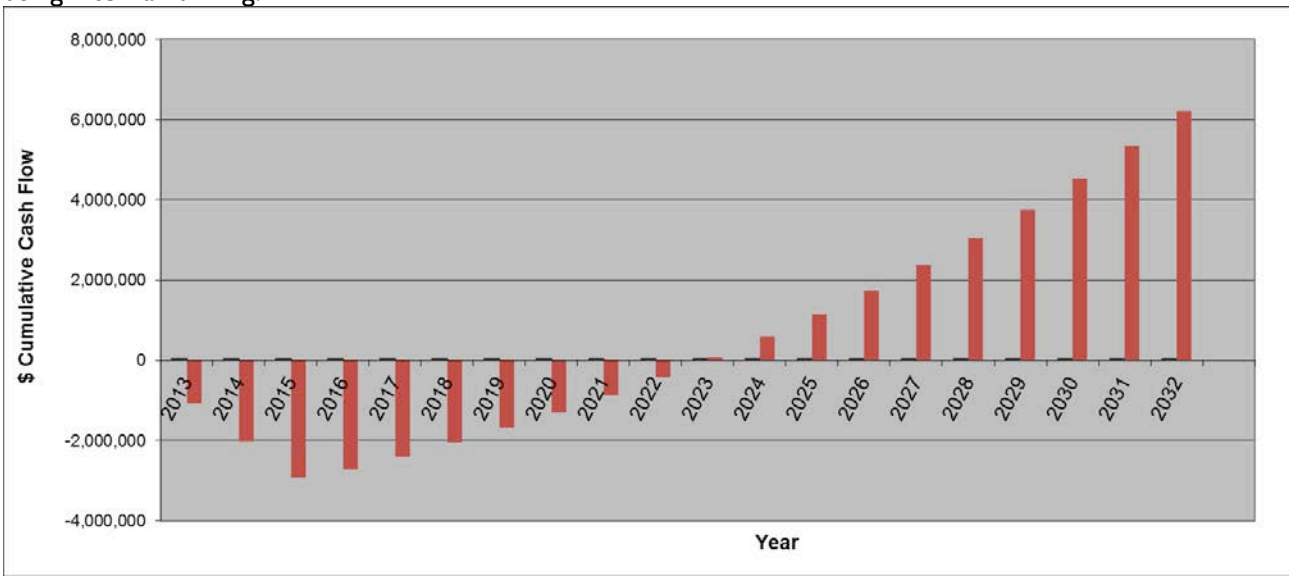
The following graph illustrates the cash flow assuming a one year implementation of 2x14W T5s using internal funding.



Scenario 2: Three year implementation, internal funding

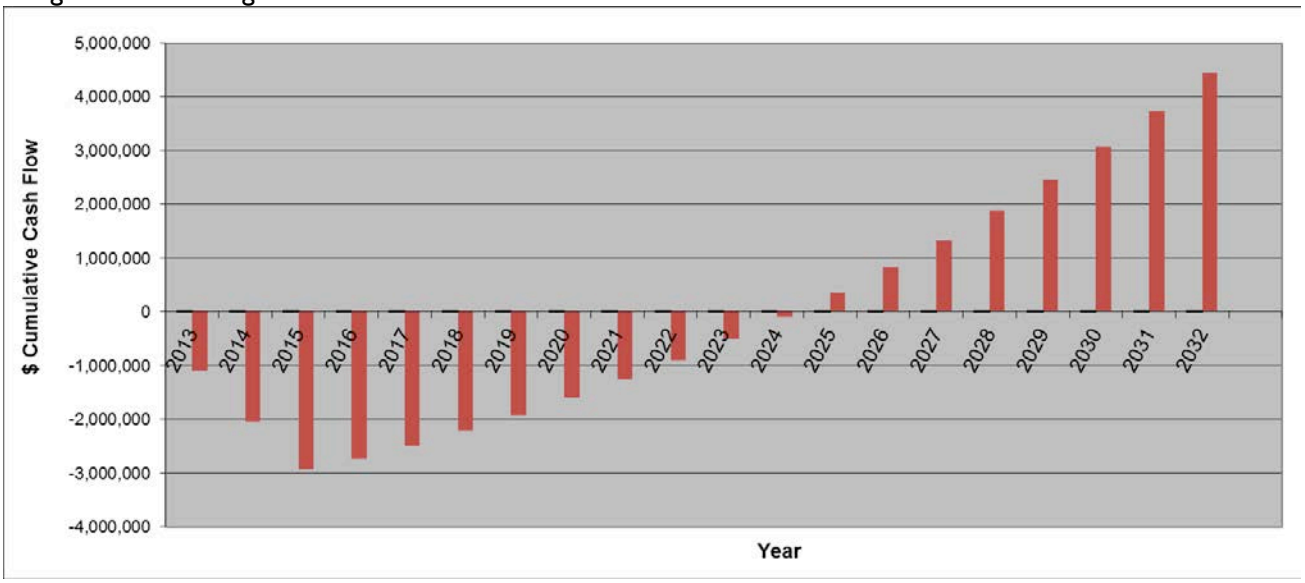
32W CFL

The following graph illustrates the cash flow assuming a three year implementation of 32W CFLs using internal funding.



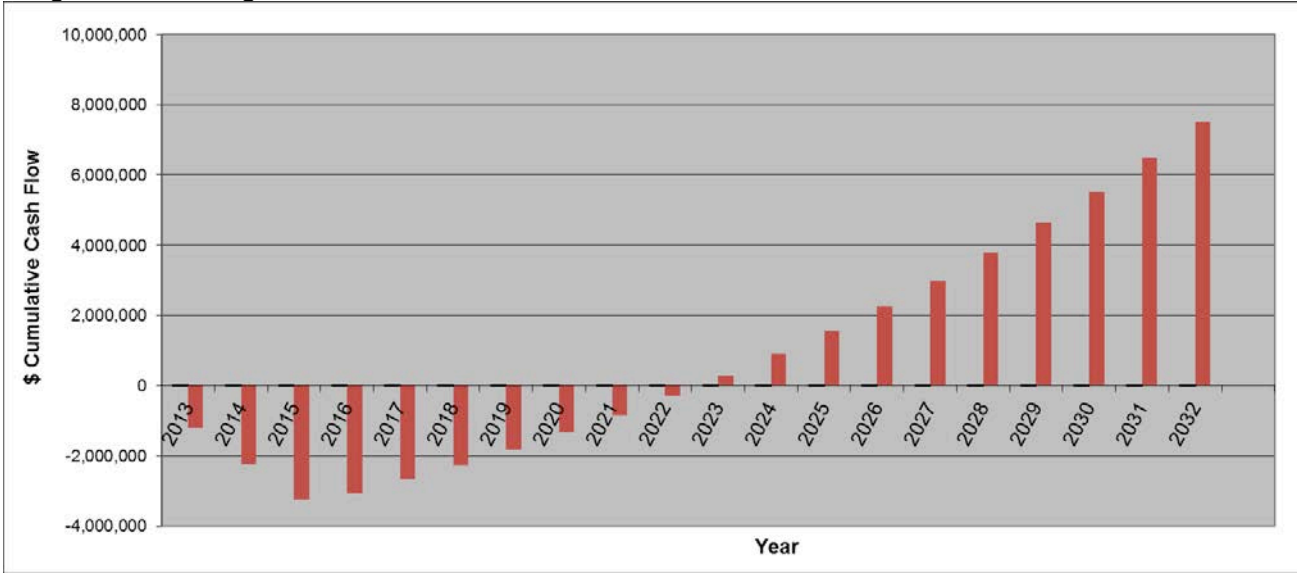
42W CFL

The following graph illustrates the cash flow assuming a three year implementation of 42W CFLs using internal funding.



2x14W T5

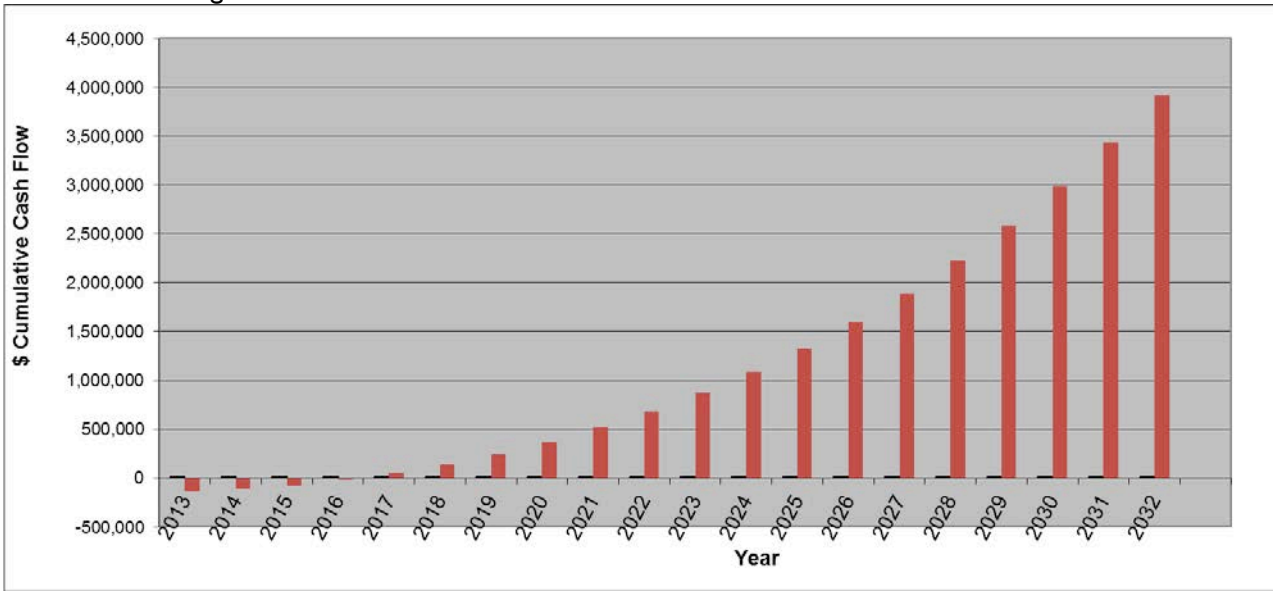
The following graph illustrates the cash flow assuming a three year implementation of 2x14W T5s using internal funding.



Scenario 3: One year implementation, Endeavour funding

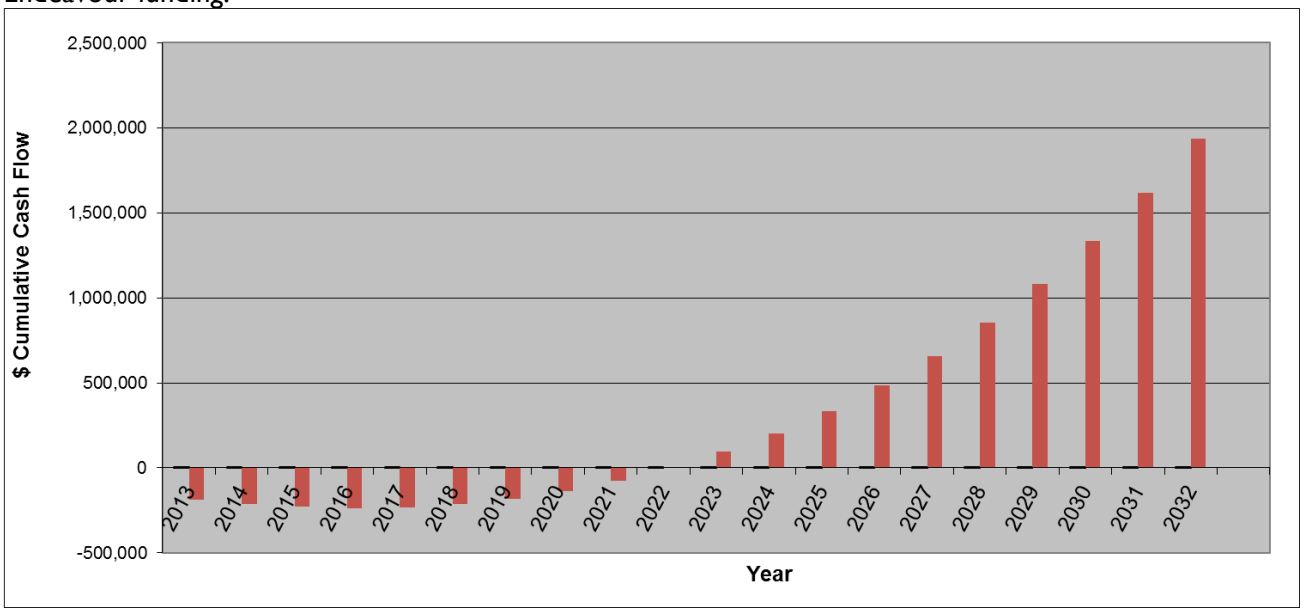
32W CFL

The following graph illustrates the cash flow assuming a one year implementation of 32W CFLs using Endeavour funding.



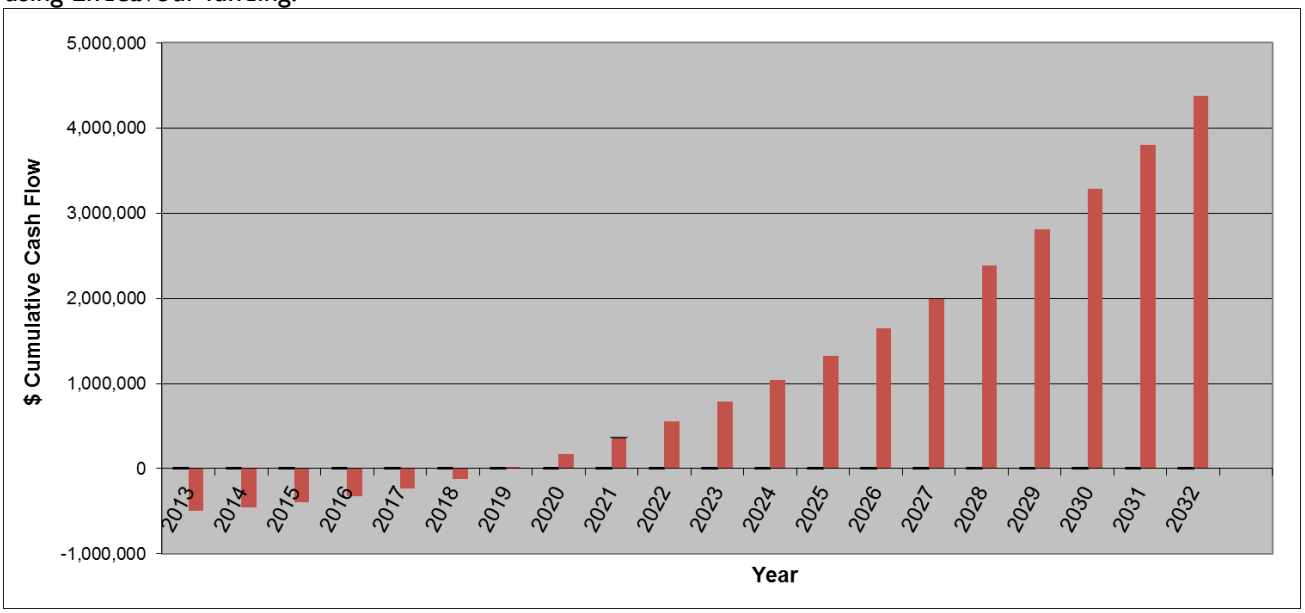
42W CFL

The following graph illustrates the cash flow assuming a one year implementation of 42W CFLs using Endeavour funding.



2x14W T5

The following graph illustrates the cash flow assuming a one year implementation of 2x14W T5s using Endeavour funding.



10 Environmental implications

The project involves reducing energy consumption through the replacement of lights, most of which use 96 watts of power, with fittings that use between 30.2 and 46.6 watts. In NSW this also reduces the emissions of greenhouse gases through the reduction in demand from fossil fuel fired power stations.

The following table illustrates greenhouse emission savings achieved from the different technology options considered in this report.

Technology	Average annual savings (tonnes CO_2-e)	Total accumulated savings to 2032 (tonnes CO_2-e) 1 year change	Total accumulated savings to 2032 (tonnes CO_2-e) 3 year change
32W CFL	1,803	36,056	34,253
42W CFL	1,474	29,484	28,010
2x14W T5	2,017	40,347	38,330

Table 4: Greenhouse Savings

11 Social implications

The 42W CFL, the 32W CFL and the 2x14W T5 perform comparably under a range of social criteria, as follows.

Improved public amenity

All three lights are a significant improvement on the existing 80W MV particularly in terms of glare and evenness of light spread, with the 42W CFL being the brightest of the three.

Generally it is undesirable to light residential streets above the minimum required standard. Doing so creates unnecessary cost and greenhouse emissions. In many areas, residents have a preference for low levels of lighting. Therefore, from an amenity point of view, the 32W CFL or the 2x24W T5 are the most appropriate choice in most circumstances.

However in selected areas, higher levels of lighting may be desirable to encourage walking, cycling and use of public transport. In areas where there are concerns about safety at night, it may improve perceptions of safety and residential amenity to exceed the Australian Standards for lighting levels. Council may also have specific policy objectives (such as pedestrian connectivity between transport nodes and shopping centres) that can be supported with higher levels of light in strategic locations.

Council is advised to reassess its Category P lighting design to address local needs in priority areas. Higher lighting levels can be achieved in selected locations by installing 42W CFLs. In certain circumstances, additional lights may also be installed on poles where there are currently no lights.

Extra lights or lights with higher than required wattage will incur extra cost to purchase and to operate. Because consultation has not yet been undertaken to determine priority areas, Ironbark cannot accurately estimate the cost implications of this approach. However it is very likely that the cost of these brighter lights would be insignificant in the context of the wider changeover.

Toxicity

Both technologies represent a significant reduction mercury content compared to 80W MV lights.

Manufacturing and Corporate Social Responsibility

Both lights are manufactured in Australia and are Australian owned technologies. The 32W CFL is manufactured by Sylvania Lighting Australasia and the 2x14W T5 is manufactured by Pierlite. Both Sylvania and Pierlite are owned by the same parent company: Gerard Lighting.

Around 98% of the components of the 80W MVs can be recycled. For example, the glass collected is recycled into products such as glass wool insulation for homes. The mercury is distilled and reused in the dental industry to manufacture amalgam. The aluminium body and other fixed components (for example, steel screws, copper wires) are collected and end up as ingots used in industry. The recycling of old lights that are is the responsibility of the installer.

12 External funding that may be available to accelerate the program

Currently there is the potential for both federal and state government funding for street lighting efficiency programs. The two programs are the Energy Saving Scheme (State), and Community Energy Efficiency Program (federal – formerly the Low Carbon Communities Program). Council could also borrow money from Low Carbon Australia Ltd.

Each of these are described in further detail below.

Energy Saving Scheme (ESS)

The Energy Savings Scheme is an energy efficiency scheme which commenced on 1 July 2009. The objectives of the ESS are:

- to assist households and businesses to reduce electricity consumption and costs;
- to complement any national scheme for carbon pollution reduction by making the reduction of greenhouse gas emissions achievable at a lower cost; and
- to reduce the cost of, and the need for, additional energy generation, transmission and distribution infrastructure.

The Scheme is designed to increase opportunities to improve energy efficiency by placing obligations on energy retailers to buy energy efficiency certificates (ESCs) from organizations who take energy efficiency measures (1 ESC being equal to 1 tonne CO_2-e saved).

Under the ESS, Council can generate certificates for its streetlighting changeover, and sell them to energy retailers. Energy retailers can refuse to buy them, but have to pay a penalty of $26.45 per MWh[3]. This effectively caps the price, because retailers will always and only buy certificates if they are cheaper than the penalty rate.

When tax considerations are taken into account, the effective penalty rate is approximately $37.78 per MWh or $40.42 per tonne. The actual price of certificates can therefore be expected to be less than $40.42.

The table below illustrates how much Council would be paid for its street lighting project at a range of certificate prices.

Certificate price	2x14W T5 (2,017 tonnes CO_2-e saved)	42W CFL (1,474 tonnes CO_2-e saved)	32W CFL (1,803 tonnes CO_2-e saved)
$20 per tonne	$ 484,080	$ 353,760	$ 432,720
$25 per tonne	$ 605,100	$ 442,200	$ 540,900
$30 per tonne	$ 726,120	$ 530,640	$ 649,080

Table 5: ESS funding opportunity

[3] The ESC penalty rate is published annually. While the 2012 penalty rate is yet to be published, this figure is based on Ironbark's discussions with the scheme administrator.

If Council was able to take advantage of the Scheme the total payback periods would be reduced by around 3 years if Council was funding the program. There is the potential of creating a project which **immediately pays itself off** for the project funded by Endeavour.

Ironbark is one of only two organisations currently accredited to create ESCs from council street lighting upgrades and can assist Council through this process

Community Energy Efficiency Program (CEEP)

Funding type: Competitive Grant
Funding Amount: $200m (for council programs) over 4 years
Amount per Council: Up to $5m
Jurisdiction: Commonwealth
Availability: Successful applicants for Round 1were announced in June 2012. Round 2 closes 7th February 2013
Information: www.climatechange.gov.au

The Community Energy Efficiency Program (formally Low Carbon Communities) is worth $330m. A total of $200m will be available for local governing bodies and community organisations to implement projects that deliver a range of energy efficiency measures to adjust to the impacts of the introduction of a carbon price.

CEEP funding for round 1 was announced in June 2012. Of the 400 applications, 63 were successful including 49 were councils (the remaining 14 made up of community and not-for-profit group). $36 million went to council applications and $11 million to council street lighting retrofits.

The viability of applications was considered from five key perspectives including the capacity of the applicant to deliver the project and their past record in delivering projects of a similar nature. Partnering in these programs can allow the demonstration of many successfully completed projects and minimise application time and management costs.

Low Carbon Australia Ltd. (LCAL)

Funding type: Financing options include loans, leases (finance and operational) and on-bill finance
Funding Amount: Interested parties are encouraged to submit individual projects no smaller than $100,000. LCAL will consider smaller projects where there is opportunity to replicate this across multiple sites within the same organisation.
Amount per Council: As per above
Jurisdiction: National
Availability: Available now
Information: www.lowcarbonaustralia.com.au/page/energy-efficiency-program

Low Carbon Australia provides finance to councils to undertake energy efficiency upgrades of existing non-residential buildings, street lights and industrial processes. The Energy Efficiency Program has funding of $87.6 million which it invests directly into projects as well as establishing co-financier partnerships to leverage private sector investment.

Financial terms including financial product type, interest rate, payback period, are tailored to suit each individual project.

Financial terms cannot be provided until Low Carbon Australia has undertaken a satisfactory assessment of the following (this list is indicative and not exhaustive):

- Project and technology type
- Risk (technical, financial, delivery and implementation, credit)
- Life of the project
- Anticipated energy and carbon savings
- Amount of finance being requested from Low Carbon Australia
- Amount of finance sourced from parties external to Low Carbon Australia

Capital poor councils are finding that financing is a practical option to pursue. LCAL have indicated a willingness to work more with local government, and the business cases prepared by Ironbark for councils have been approved by LCAL. Given that LCAL is independent of the political process, there's no fear of the financing disappearing.

Financing only works if the project makes good economic sense. From Ironbark's experience a typical council payback period for street lighting projects is between 7 and 10 years. This results in a 10-17% rate of return, which shows street lighting energy efficiency projects are far superior to a bank or term deposit, and for many councils it makes sense to borrow money now to get the project completed.

13 Recommended Next Steps for the bulk replacement program

Based on the information provided within this business case and Ironbark's experience with bulk changes, the following steps are recommended to progress the bulk change further:

1. **Complete Business Case or Financial Analysis**
    a) Done.
2. **Confirm Council commitment**
    a) Present this business case to Council to gauge interest in the program. This can also be the right time to check timeframes for the roll out (1yr vs. 3yrs for example);
3. **Define Council's requirements for the program (allow 3-6 months)**
    a) Consult around the requirements for the new lights (in particular around safety and the treatment of public transport);
    b) Assess current lighting treatment within this context and compile and final design and specification for Council's required replacement program;
4. **Procure the bulk change (allow 3-6 months)**
    a) Consider options for procurement including tendering or direct engagement with the relevant Power authority;
    b) Procure based on this consideration;
5. **Manage the bulk change**
    a) Ensure clear communication during the bulk change program occurs including consideration of media, complaints, timelines, variations, invoicing and incident provisions;
6. **Finalise and report to Council outcome**

Engaging Endeavour Energy

In order to work with Endeavour Energy, Council will need to contact Endeavour Energy's Paul Matlawski, Regional Services Manager – North, for a firm quotation and project schedule. This can be begun once Council has firm commitment to the process and has a clearly defined specification.

Please note that depending on Council's procurement requirements there may need to be a decision around contestability and a subsequent tendering process. For more details on this part of the process it is best to discuss further with Ironbark when Council is preparing for this stage and prior to discussing with Endeavour.

How Council initially approaches the process with Endeavour is critical to a good outcome.

Appendix 1: Assumptions for modelling

Assumptions

- The capital cost data provided is based on information drawn from relevant manufacturers, contractors and Endeavour Energy. Capital costs may vary considerably depending on whether or not Council issues a tender for supply and installation works. Endeavour Energy has asserted that Shoalhaven's changeover would not be contestable, however Ironbark suggests that the Australian Energy Regulator may disagree. Council should seek confirmation from relevant authorities before proceeding. This business case has used conservative capital costs which assume that the works are not contestable.
- Costs for maintenance are drawn from Council's energy distributor (Endeavour Energy).
- Electricity cost starts at 17.2 cents per kWh in year 1.
- SLUOS prices as per DB pricing schedule (2012);
- All savings and cost figures are GST exclusive
- Average hours per year that a street light is turned on: 4317.95 (NSW)
- Greenhouse emission factor is 1.07 kg CO_2-e per kWh
- A 3% annual increase is applied to SLUOS and all on-going costs
- All financial calculations use a discount rate of 7% where applicable

Appendix 2: The impact of high and low energy price rises

The analysis in the body of this report assumes an average rate of increase to energy costs. However, it is possible that the actual rate of increase to energy costs will be lower or higher than has been assumed.

As with any long-term economic projections, the modelling of energy price increases over the next two to four decades is difficult. Any number and combination of factors can render projections obsolete within a number of years, if not months.

This Business Case draws on two separate energy price increase scenarios. These are:

Federal Treasury modelling; and
Energy Users Association of Australia (EUAA) modelling.

The variance between the two projections (see table below) represents a conservative approach used by the Federal treasury and a pessimistic approach used by the Energy Users Association of Australia. Ironbark Sustainability has chosen to use the Federal Treasury's modeling as a 'low' projection, the EUAA's modeling as a 'high' projection, and the average of the two as a 'moderate' projection.

This choice was made in consultation with the authors of the Federal Treasury modeling (who are also members of the EUAA), who indicated that either of the two models was valid and possible.

The sources of information are as follows:

	Treasury Base	Treasury CPRS 5%	Treasury CPRS 15%	EUAA modeling	Average (Treasury modeling (Base Case + CPRS 15%) and EUAA)/2
Base to 2050	63%	62%	77%		
2010-2020	16%	33%	34%	150%	100%
2020-2030	16%	64%	72%	88%	88%

Sources: Report to Federal Treasury, MMA, Impacts of the CPRS on Australian Electricity Markets, December 2008. Presentation by Roman Domanski, Executive Director EUAA EUAA_CEDA_Energy_Series -_Power_ in_a_new_era

The tables below present a summary of the key financial indicators of the project in the event of a high or low rate of increase. Note this is assuming Council-funded projects. The second table is similar but assumes 2m of CEEP funding.

Increase Scenario

Replacement	Energy Price Increase	Project cost	NPV	Cost savings	Year of positive payback
T5	Low	$ 3,865,380	$ 9,709,281	$ 6,603,488	11
	Medium	$ 3,865,380	$ 7,987,886	$ 8,817,615	10
	High	$ 3,865,380	$ 5,918,608	$ 10,659,507	10
32W CFL	Low	$ 3,494,080	$ 8,041,312	$ 5,244,203	12
	Medium	$ 3,494,080	$ 6,503,019	$ 7,202,816	11
	High	$ 3,494,080	$ 4,653,848	$ 8,848,790	10
42W CFL	Low	$ 3,494,080	$ 5,777,376	$ 3,462,422	14
	Medium	$ 3,494,080	$ 4,519,458	$ 5,080,406	13
	High	$ 3,494,080	$ 3,007,323	$ 6,426,378	12

Table 6 - Summary of Key Financial Indicators assuming Internal Funding and a one year Implementation

CEEP Funded Increase Scenario

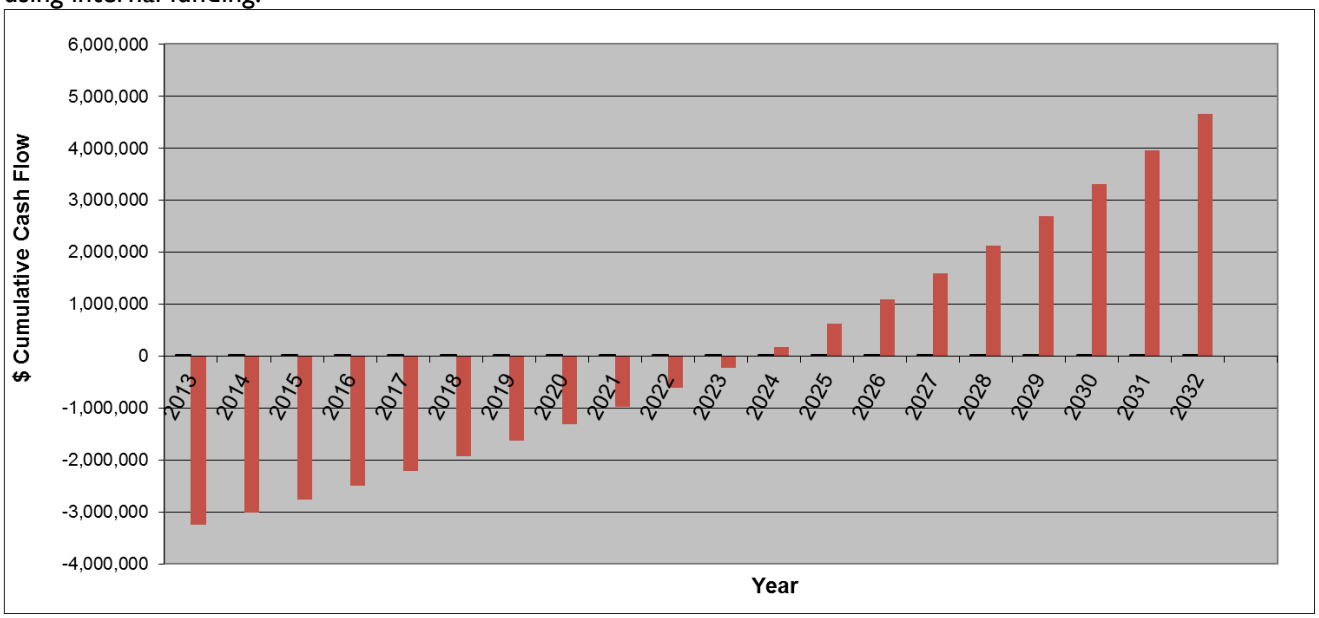
Replacement	Energy Price Increase	Project cost	NPV	Cost savings	Year of positive payback
T5	Low	$ 1,865,380	$ 7,918,609	$ 8,603,488	6
	Medium	$ 1,865,380	$ 9,987,886	$ 10,817,615	6
	High	$ 1,865,380	$ 11,709,281	$ 12,659,508	6
32W CFL	Low	$ 1,494,080	$ 6,653,848	$ 7,224,203	6
	Medium	$ 1,494,080	$ 8,503,020	$ 9,202,817	6
	High	$ 1,494,080	$ 10,041,313	$ 10,848,790	6
42W CFL	Low	$ 1,494,080	$ 5,007,324	$ 5,462,422	8
	Medium	$ 1,494,080	$ 6,519,458	$ 7,080,406	7
	High	$ 1,494,080	$ 7,777,376	$ 8,426,378	7

Table 7 - Summary of Key Financial Indicators assuming Internal Funding and a one year Implementation and $2m CEEP Funding

Scenario 4: 32W CFL Replacement

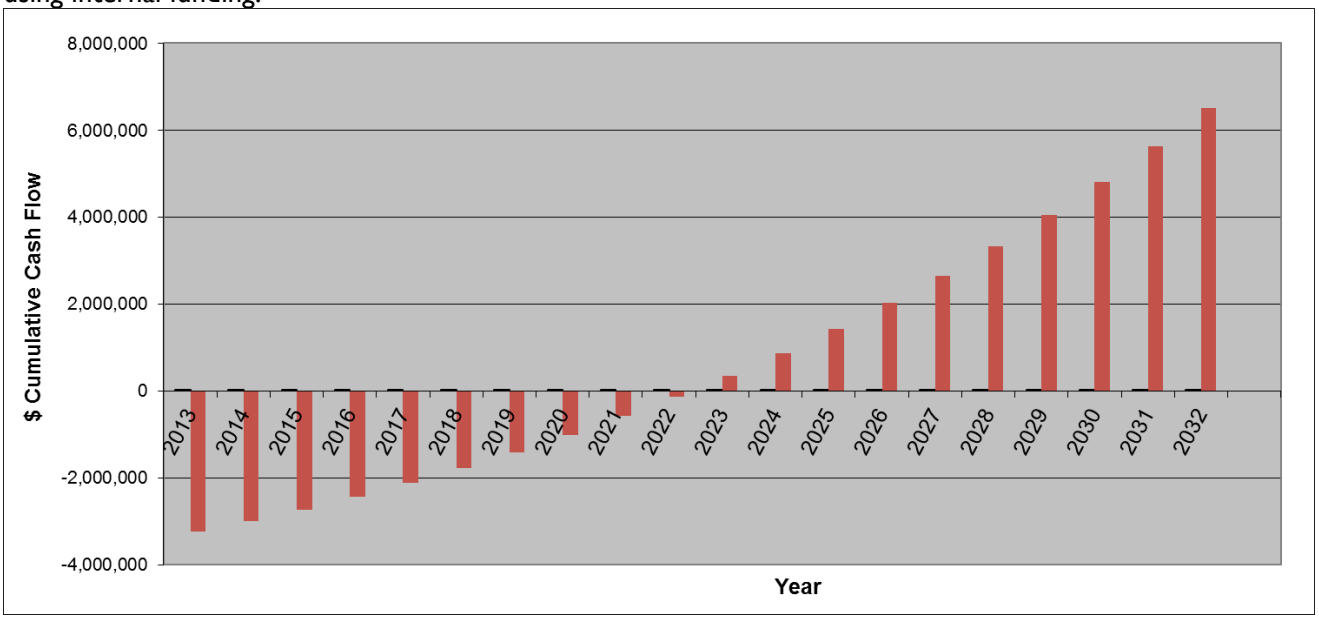
Low

The following graph illustrates the cash flow assuming a three year implementation of 32W CFLs using internal funding.



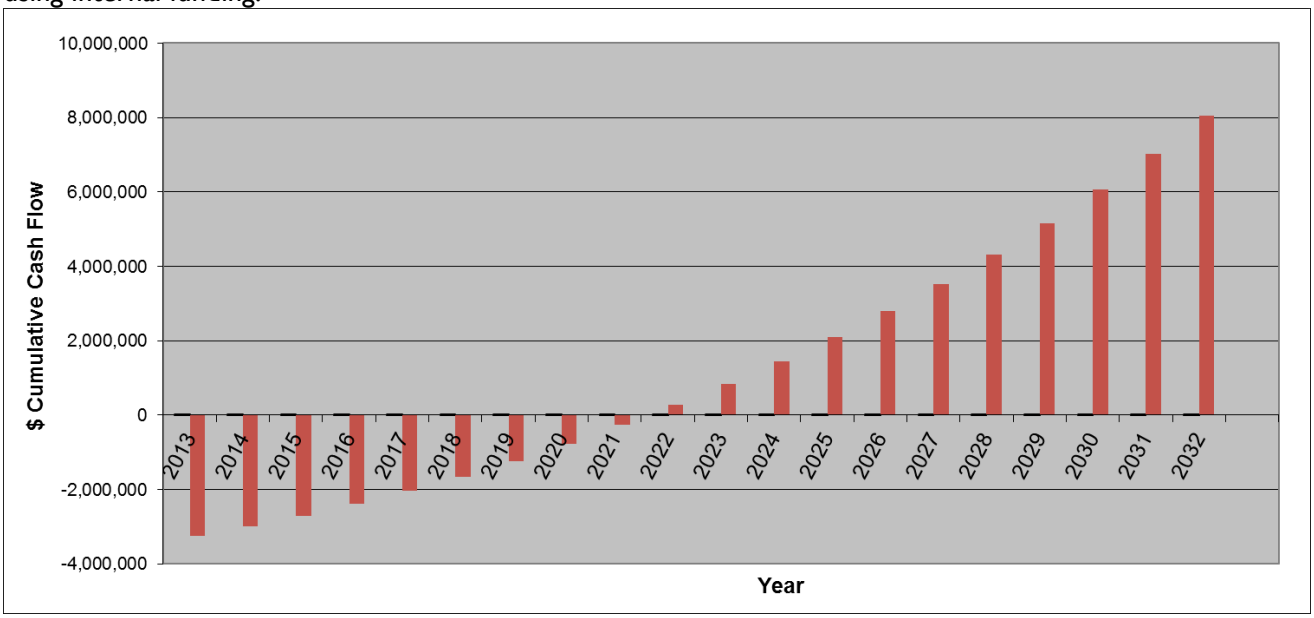
Medium

The following graph illustrates the cash flow assuming a three year implementation of 42W CFLs using internal funding.



High

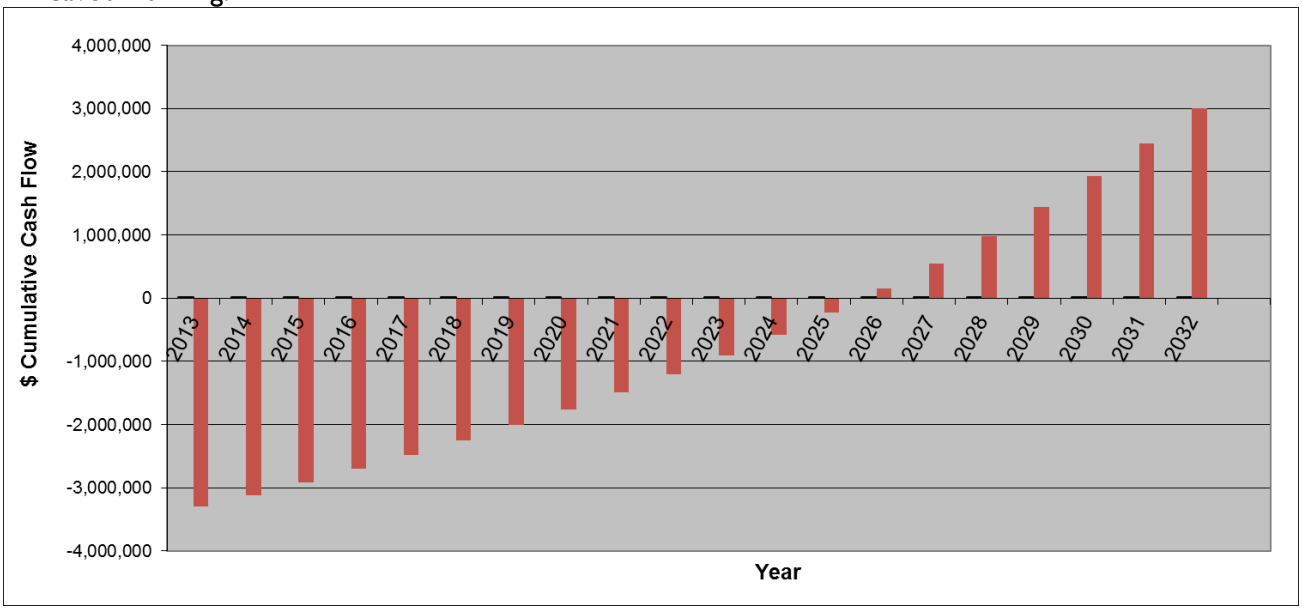
The following graph illustrates the cash flow assuming a three year implementation of 2x14W T5s using internal funding.



Scenario 5: 42W CFL Replacement

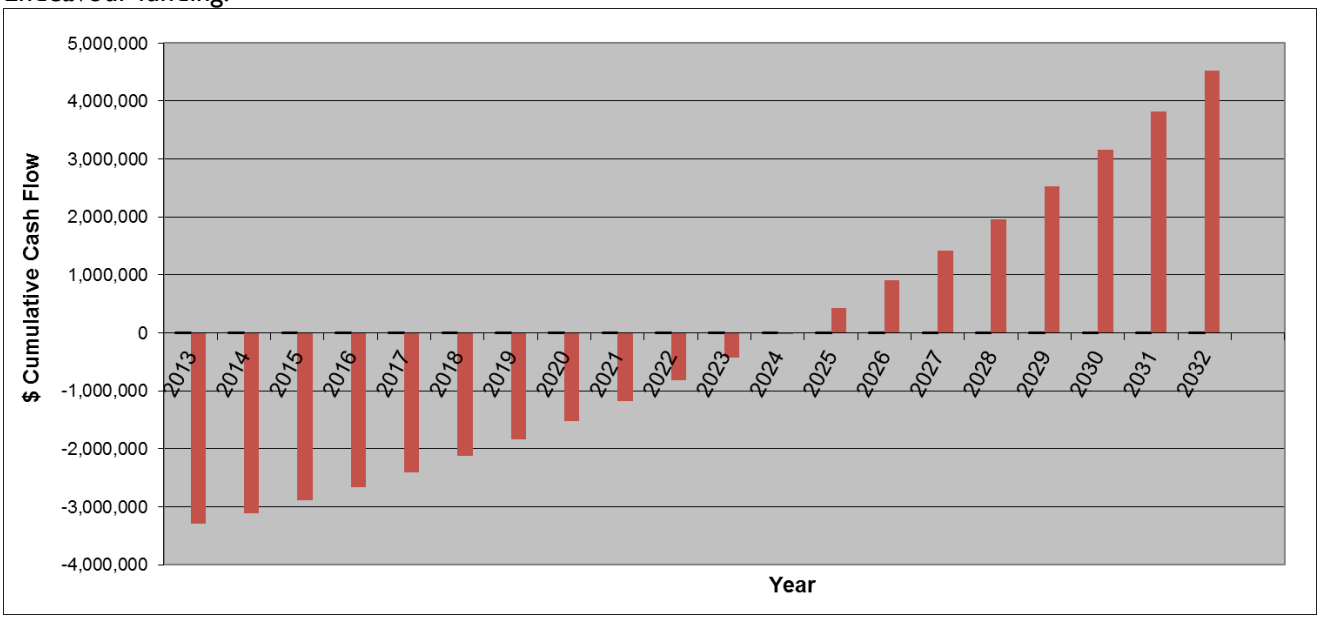
Low

The following graph illustrates the cash flow assuming a one year implementation of 32W CFLs using Endeavour funding.



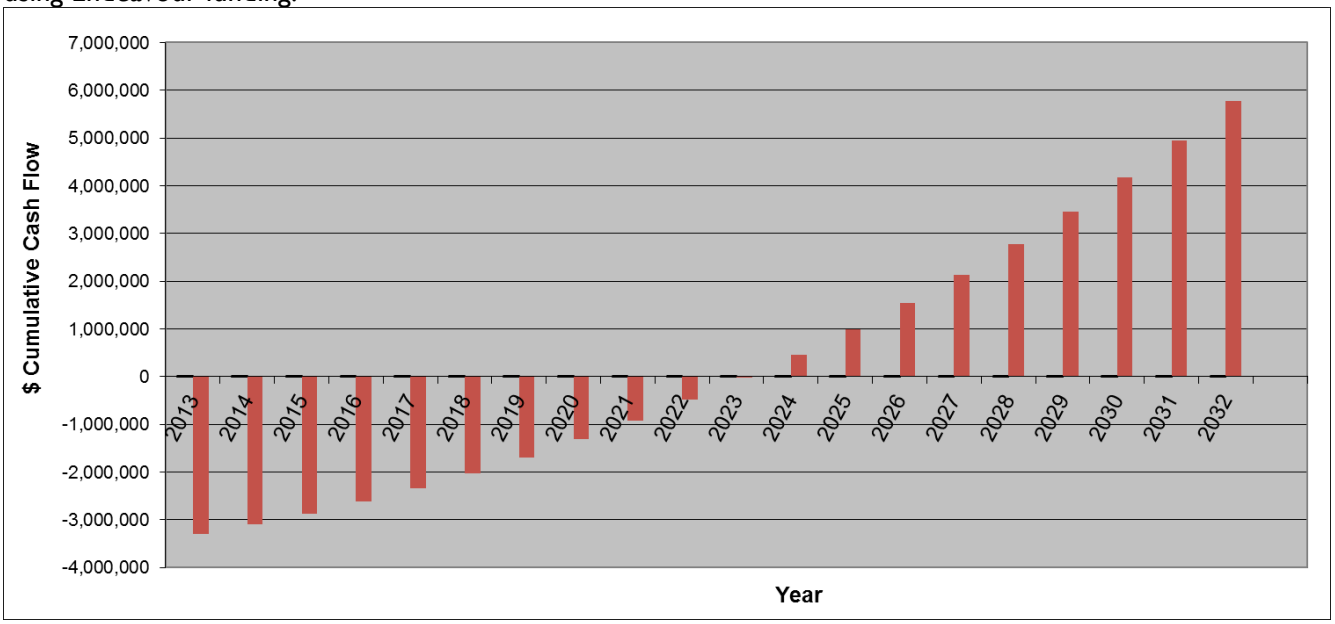
Medium

The following graph illustrates the cash flow assuming a one year implementation of 42W CFLs using Endeavour funding.



High

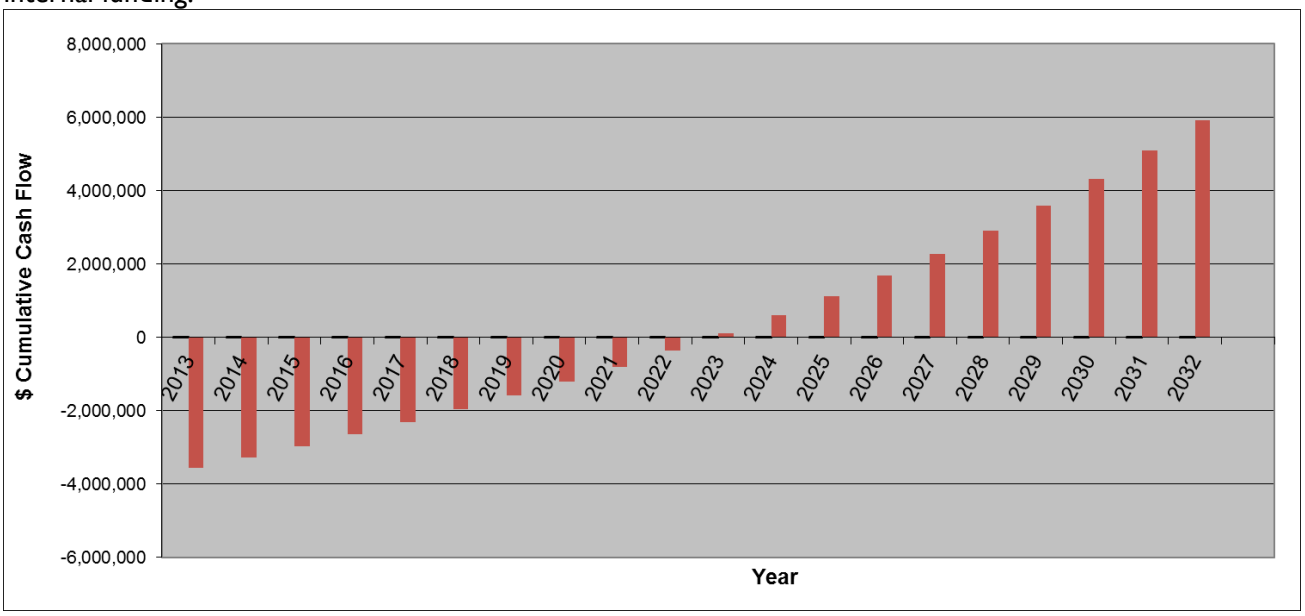
The following graph illustrates the cash flow assuming a one year implementation of 2x14W T5s using Endeavour funding.



Scenario 6: T5 Replacement

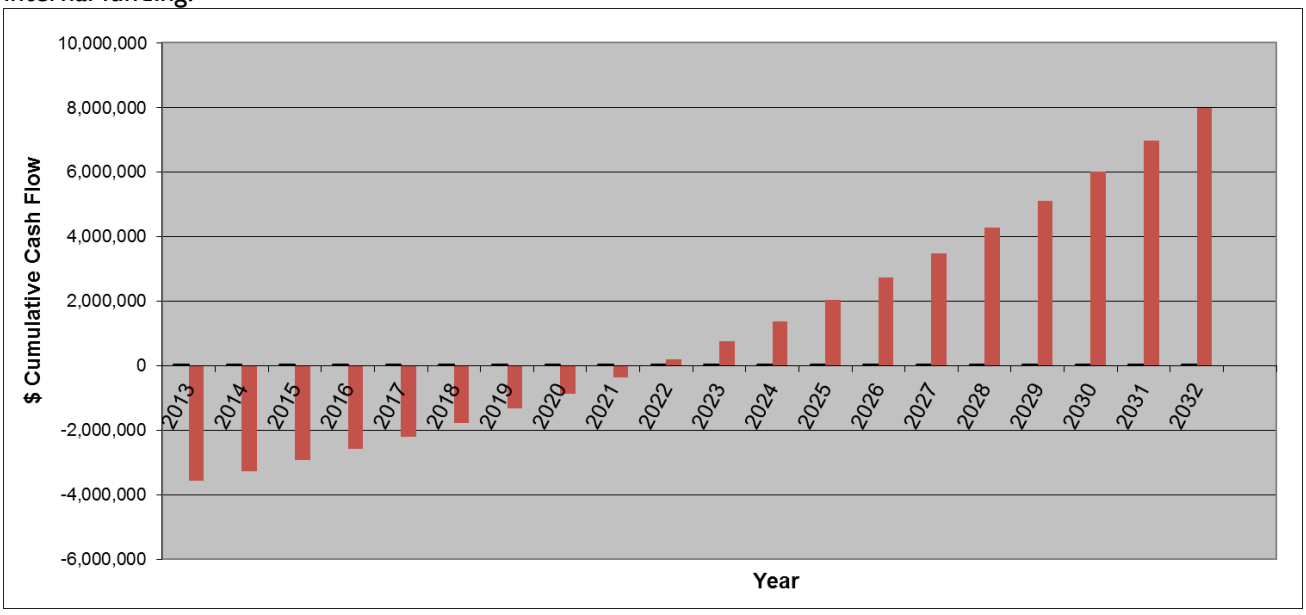
Low

The following graph illustrates the cash flow assuming a one year implementation of 32W CFLs using internal funding.



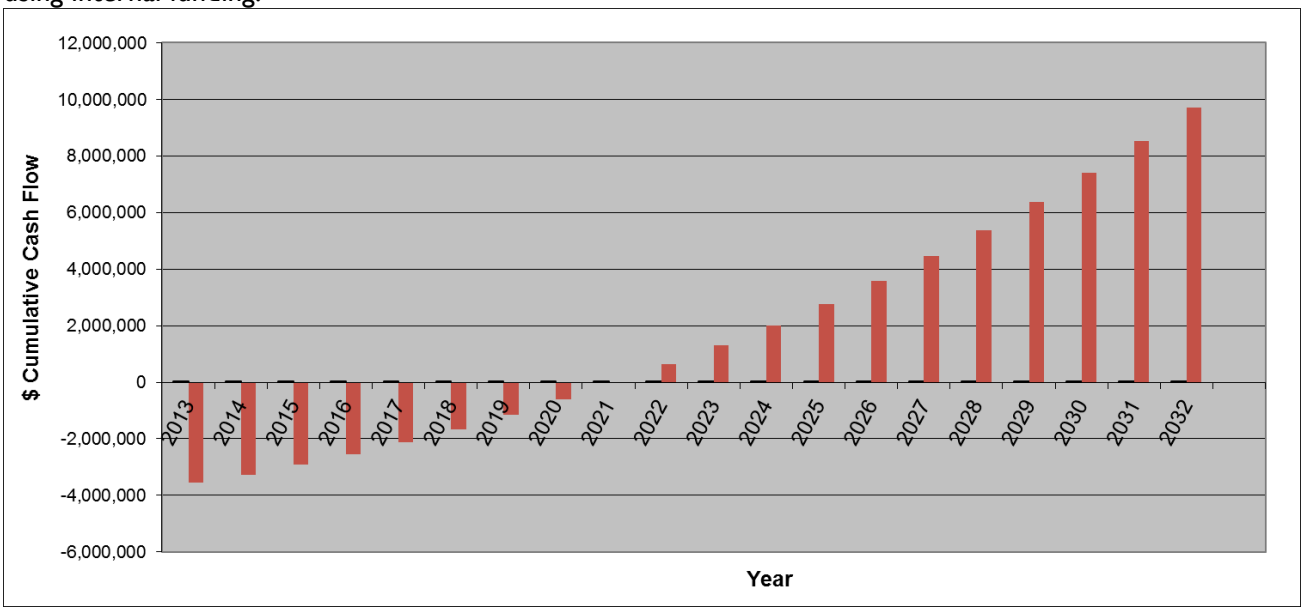
Medium

The following graph illustrates the cash flow assuming a one year implementation of 42W CFLs using internal funding.



High

The following graph illustrates the cash flow assuming a one year implementation of 2x14W T5s using internal funding.



Appendix 3: Other Opportunities to Improve the Efficiency of Outdoor Lighting

There are several areas where outdoor lighting can be improved. Many Councils that Ironbark have worked with have found considering street lighting separate from open space lighting a useful distinction.

Further street lighting actions
After the completion of the bulk change for residential streets a number of future projects can be planned. These include:

- Assessment of unmetered floodlights in laneways;
- Planning for a replacement program on main roads;

Each of these programs require some planning and preparation to get them underway. It is recommended that these issues be considered during the design phase of the bulk replacement program.

Estimated cost – $10-15,000 (some of this can be included in the preparation phase of the bulk change project)

Open Space Lighting actions
Open space lighting typically includes around 5-10% of the total lights in streets. However, many of these lights are often of higher wattage than street lighting. For example a typical sports ground light would use 2,000W compared to 80W for the typical street light.

Many Councils have found benefit in first mapping and assessing the current lighting stock. This provides the following benefits:

- Ability to plan a prepare for an energy efficiency program;
- Identification of locations and details of each existing asset;
- Option to consider asset condition (and hence future capital liability for asset replacements);

Estimated cost - $20-40,000 for initial mapping and reporting process

Guidelines for new installations
Councils often deal with requests for new lighting infrastructure. The frequency of such requests depends on the rate of new development and greenfield development in each municipality. Some councils have developed specifications to ensure that all new lighting is appropriate and efficient. These specifications can be developed in house or with the support of external contractors.Example guidelines are available for download from the Local Government Tech Hub at https://ironbark-techhub.pbworks.com/w/page/36400496/FrontPage

Ironbark can assist in preparing guidelines that are specific to Shoalhaven's circumstances.
Estimated cost - $9,500

Streetlighting Business Case Analysis

Current yearly usage	2,973,078	kWh
Average hours per year	4,317.95	
Current Average charge	17.70	c/kWh
Discount Rate	7%	

Assumptions in Ironbark report that have been changed in this analysis
Current average charge changed from 17.2 cents per kWh to 17.7 to reflect actual current charges
Annual increase applied to SLUOS and on-going costs changed from 3% to 5% to reflect pattern in current charges
Price increase % for the low scenario changed to figures for NSW in Federal Treasury report - figures used by Ironbark are for VIC not NSW

Usage Savings

Unit	Usage	Savings		Ave Annual Savings (tonnes CO_2-e)	ESC pa @ $20 (min) over 12 yrs
32 W units	1,258,547	1,684,847	kWh	1803	$36,060
42 W units	1,566,226	1,377,760	kWh	1474	$29,480
T5 2 x 14 W units	1,057,032	1,885,393	kWh	2017	$40,340

Net Present Value of Project

	Pricing Increase	Capital Cost	ESC	Energy Savings over 20 years	NPV of Energy Savings	Project NPV	Project Breakeven Year
32 W units	Low	$3,494,080	$432,720	$8,934,476	$4,405,517	$1,344,157	13
	Medium	$3,494,080	$432,720	$15,699,406	$7,185,239	$4,123,879	9
	High	$3,494,080	$432,720	$20,976,974	$9,434,668	$6,373,308	8
42 W units	Low	$3,494,080	$353,760	$7,306,043	$3,602,550	$462,230	17
	Medium	$3,494,080	$353,760	$12,837,969	$5,875,628	$2,735,308	11
	High	$3,494,080	$353,760	$17,153,626	$7,715,067	$4,574,747	10
T5 2 x 14 W units	Low	$4,202,426	$484,080	$9,997,940	$4,929,902	$1,211,556	14
	Medium	$4,202,426	$484,080	$17,568,094	$8,040,492	$4,322,146	10
	High	$4,202,426	$484,080	$23,473,847	$10,557,669	$6,839,323	9

With $2,000,000 CEEP funding

	Pricing Increase	Capital Cost	ESC	Energy Savings over 20 years	NPV of Energy Savings	Project NPV	Project Breakeven Year
32 W units	Low	$1,494,080	$432,720	$8,934,476	$4,405,517	$3,344,157	4
	Medium	$1,494,080	$432,720	$15,699,406	$7,185,239	$6,123,879	4
	High	$1,494,080	$432,720	$20,976,974	$9,434,668	$8,373,308	4
42 W units	Low	$1,494,080	$353,760	$7,306,043	$3,602,550	$2,462,230	6
	Medium	$1,494,080	$353,760	$12,837,969	$5,875,628	$4,735,308	5
	High	$1,494,080	$353,760	$17,153,626	$7,715,067	$6,574,747	4
T5 2 x 14 W units	Low	$2,202,426	$484,080	$9,997,940	$4,929,902	$3,211,556	6
	Medium	$2,202,426	$484,080	$17,568,094	$8,040,492	$6,322,146	5
	High	$2,202,426	$484,080	$23,473,847	$10,557,669	$8,839,323	5

Note: the Ironbark business case (p17) mentions that they have been advised by Endeavour Energy that SLUOS (infrastructure) costs associated with the new lights will be hgher than for the current lights. The figures above do not include any increase in the SLUOS charges.

Assumes increase in SLUOS of **$292,566** per year
Estimated increase in SLUOS (SLUOS will no longer be the legacy charge)

No CEEP funding	Pricing Increase	Project NPV	Extra SLUOS	Project NPV less SLUOS
42 W units	Low	$462,230	$4,627,528	-$4,165,298
	Medium	$2,735,308	$4,627,528	-$1,892,220
	High	$4,574,747	$4,627,528	-$52,781

With CEEP funding	Pricing Increase	Project NPV	Extra SLUOS	Project NPV less SLUOS
42 W units	Low	$2,462,230	$4,627,528	-$2,165,298
	Medium	$4,735,308	$4,627,528	$107,780
	High	$6,574,747	$4,627,528	$1,947,219

Assumes decrease in SLUOS of **$87,830** per year

No CEEP funding	Pricing Increase	Project NPV	reduced NPV SLUOS	Project NPV less SLUOS	Project Breakeven Year
42 W units	Low	$462,230	$1,389,212	$1,851,442	12
	Medium	$2,735,308	$1,389,212	$4,124,520	
	High	$4,574,747	$1,389,212	$5,963,959	

With CEEP funding	Pricing Increase	Project NPV	reduced NPV SLUOS	Project NPV less SLUOS	Project Breakeven Year
42 W units	Low	$2,462,230	$1,389,212	$3,851,442	4
	Medium	$4,735,308	$1,389,212	$6,124,520	
	High	$6,574,747	$1,389,212	$7,963,959	