AGENDA

Strategic Financial Management Committee

MEETING OF THE STRATEGIC FINANCIAL MANAGEMENT COMMITTEE

TO BE HELD ON

MEETING DATE

TUESDAY, 26 FEBRUARY 2008

commencing at 6.00 pm

in Conference Room 3

JOONDALUP CIVIC CENTRE,
BOAS AVENUE, JOONDALUP

Note:

Clause 77 of the City's Standing Orders Local Law 2005 states:

"Unless otherwise provided in this local law, the provisions of this local law shall apply to meetings of committees with the exception of:

(a) clause 29 (Members seating;) and

(b) clause 54 (Limitation on members speaking.)"

GARRY HUNT
Chief Executive Officer
22 February 2008

www.joondalup.wa.gov.au

City of Joondalup

CITY OF JOONDALUP

Notice is hereby given that a meeting of the **STRATEGIC FINANCIAL MANAGEMENT COMMITTEE** will be held in Conference Room 3, Joondalup Civic Centre, Boas Avenue, Joondalup on **TUESDAY, 26 FEBRUARY 2008** commencing at **6.00 pm.**

GARRY HUNT
Chief Executive Officer
22 February 2008

Joondalup
Western Australia

AGENDA

Committee Members

Cr Geoff Amphlett	*Presiding Person*
Cr Russ Fishwick	*Deputy Presiding Person*
Mayor Troy Pickard	
Cr Tom McLean	
Cr Trona Young	
Cr Michele John	
Cr Brian Corr	

Terms of Reference

1 Promote and advocate sound financial management within the City and provide advice to the Council on strategic financial management issues;

2 In particular advise Council on:

(a) How funding can be achieved for any major capital works project before the Council makes a commitment to a project;

(b) Levels of service delivery — determine:

(i) which services to be provided;

(ii) Standards of service. Such standard will be determined with reference to:

- *best industry practice standards where applicable;*
- *internally agreed standards which will be determined with reference to local community expectations;*

(c) Preparation of the Plan for the Future with high priority being given to ensure that the Plan is achievable in the long term;

(d) Alignment of the Plan for the Future to the Council's Strategic Plan;

(e) Consideration of public submissions to the Plan for the Future;

(f) Final acceptance of the Plan for the Future;

3 *Policy development and review of policies with financial implications for the City.*

DECLARATION OF OPENING

APOLOGIES/LEAVE OF ABSENCE

CONFIRMATION OF MINUTES

MINUTES OF THE STRATEGIC FINANCIAL MANAGEMENT COMMITTEE HELD 20 NOVEMBER 2007

RECOMMENDATION

That the minutes of the meeting of the Strategic Financial Management Committee held on 20 November 2007 be confirmed as a true and correct record.

ANNOUNCEMENTS BY THE PRESIDING PERSON WITHOUT DISCUSSION

DECLARATIONS OF INTEREST

IDENTIFICATION OF MATTERS FOR WHICH THE MEETING MAY SIT BEHIND CLOSED DOORS

PETITIONS AND DEPUTATIONS

REPORTS

ITEM 1 DRAFT STRATEGIC PLAN - RESULTS OF CONSULTATION – [01529]

WARD All

RESPONSIBLE DIRECTOR: Mr Ian Cowie
Governance and Strategy

PURPOSE/EXECUTIVE SUMMARY

To provide feedback to the Strategic Financial Management Committee on the results of the consultation with respect to the draft Strategic Plan. These are presented so that committee members get an early understanding of the nature of the feedback received.

BACKGROUND

The Draft Strategic Plan 2008-2011 (Attachment 1) was endorsed for a community consultation period of 60 days at the Council Meeting on 28 August 2007 (CJ157 – 09/07 refers) which involved advertising the draft document and making copies available on the City's website (electronically); in all the City's libraries, at the customer service centres at the Joondalup Administration Building and the Whitford City Shopping Centre and by request. Members of the public were invited to use a feedback form to give their comments on the document.

Also at the Council Meeting of 28 August 2007, it was resolved that the consultation process would include consideration of "…the outcomes of a community workshop before final adoption of the Strategic Plan 2008 – 2011." A community workshop was scheduled for Wednesday 12 December 2007 but later cancelled.

DETAILS

Survey Responses

Nine submissions were received by the close of the consultation period on 5 November 2007. The results are summarised in Attachment 2 to this report. This shows the following levels of support for the draft plan.

Support for the draft Strategic Plan overall – 89%

Support for the Key Focus Areas:

- Leadership and governance – 78%
- The natural environment – 89%
- Community wellbeing – 89%
- Economic prosperity and growth – 78%
- The built environment – 78%

Community Workshop

In accordance with the resolution, a community workshop was scheduled for Wednesday 12 December 2007. 93 people were randomly selected from the City's databases and were sent a personalised invitation to attend. Of those invited, only 3 responses were received by the due date and they could not attend the workshop. Given the above, it is recommended that the draft Strategic Plan is referred to Council for adoption without further amendment or consultation.

OPTIONS

The Committee could recommend that either:

- The draft plan, as approved by Council for consultation, be adopted without further consultation;
- The City undertakes further consultation on the draft plan.

Link to Strategic Plan:

Not Applicable.

Legislation – Statutory Provisions:

Not Applicable.

Risk Management considerations:

Not Applicable.

Financial/Budget Implications:

Not Applicable.

Policy implications:

Not Applicable.

Regional Significance:

Not Applicable.

Sustainability implications:

Not Applicable.

Consultation:

As noted in report.

COMMENT

Nil.

ATTACHMENTS

Attachment 1	Draft Strategic Plan
Attachment 2	Consultation feedback to date

VOTING REQUIREMENTS

Simple Majority.

RECOMMENDATION

That the Strategic Financial Management Committee:

1 NOTES the comments received from the nine submissions;

2 REFERS the draft Strategic Plan to Council for adoption without further amendment or consultation.

Appendix 1 refers

ITEM 2 SOUTH AUSTRALIAN STRATEGIC ACTION PLANNING GUIDE FOR SUSTAINABLE PUBLIC LIGHTING [00906]

WARD: All

RESPONSIBLE DIRECTOR: Mr Ian Cowie
Governance and Strategy

PURPOSE/ EXECUTIVE SUMMARY

To provide the Strategic Financial Management Committee with opportunity to consider and review the South Australian Strategic Action Planning Guide for Sustainable Public Lighting.

BACKGROUND

At the Council Meeting held on 28 August 2007 Cr Steve Magyar moved the following motion:

> *"That Council REQUESTS a report on the "South Australian Strategic Action Planning Guide for Sustainable Public Lighting" report.*
>
> *The "South Australian Strategic Action Planning Guide for Sustainable Public Lighting" report prepared by ICLEI-Local Governments for Sustainability-Australia/New Zealand, released in October 2006 is referred to the Sustainability Advisory Committee for consideration, following which a report will be presented to Council".*

In accordance with the Local Government Act 1995 all committees' membership ceased on the 20 October 2007 at the October 2007 local government elections. As at that time it was unknown when the next Sustainability Advisory Committee will be held the requested report on the "South Australian Strategic Action Planning Guide for Sustainable Public Lighting" report has been provided directly to Council.

At the Council Meeting held on the 19 December 2007 a report was presented to Council on "South Australian Strategic Action Planning Guide for Sustainable Public Lighting*".* Council moved the following motion:

> *"1 NOTES the South Australian Strategic Action Planning Guide for Sustainable Public Lighting forming Attachment 1 to Report CJ271-12/07;*
>
> *2 NOTES the Improved Street lighting Study for Greenhouse and Safety Benefits: Institutional and Technical Review forming Attachment 2 to Report CJ271-12/07;*

3 REFERS the guide to the Sustainability Advisory Committee and the Strategic Financial Management Committee for consideration and review."

DETAILS

The report on the South Australian Strategic Action Planning Guide for Sustainable Public Lighting is provided in Attachment One. The purpose of this report is to review the International Council for Local Environmental Initiatives Report titled the 'South Australian Strategic Action Planning Guide for Sustainable Public Lighting'. The potential for the City of Joondalup to utilise the information provided in the Report is also assessed.

Link to Strategic Plan:

Outcome: The City of Joondalup is environmentally responsible in its activities.
Objective: 2.1 To plan and manage our natural resources to ensure environmental sustainability.

Outcome: The City of Joondalup is an interactive community.
Objective: To ensure the City responds to and communicates with the community.

Legislation – Statutory Provisions:

Not Applicable.

Risk Management considerations:

Not Applicable.

Financial/Budget Implications:

Not Applicable.

Policy implications:

Not Applicable.

Regional Significance:

Not Applicable.

Sustainability implications:

Not Applicable

Consultation:

Not Applicable.

COMMENT

Nil.

ATTACHMENTS

Attachment 1	South Australian Strategic Action Planning Guide for Sustainable Public Lighting (Report to Council).
Attachment 2	South Australian Strategic Action Planning Guide for Sustainable Public Lighting.
Attachment 3	Improved Street lighting Study for Greenhouse and Safety Benefits: Institutional and Technical Review.

VOTING REQUIREMENTS

Simple Majority.

RECOMMENDATION

That the Strategic Financial Management Committee consider and review the attached South Australian Strategic Action Planning Guide for Sustainable Public Lighting Report.

Appendix 2 refers

ITEM 3 DEVELOPMENT OF THE 2008/09 BUDGET - [66610]

WARD: All

RESPONSIBLE DIRECTOR: Mr Mike Tidy
Corporate Services

PURPOSE

For the Strategic Financial Management Committee to consider the proposed development plan for the 2008/09 budget and the parameters on which the budget will be based.

EXECUTIVE SUMMARY

After due consideration of the setting and context for the 2008/09 budget it is recommended that the Strategic Financial Management Committee recommends to Council the:

1 ENDORSEMENT of the key parameters for establishing the development of the draft 2008/09 budget based on

(a) increases in fees and charges of 3.0%,

(b) employment cost increases be budgeted at business unit level in line with current EBA provisions of 4% and any additional provision for the new EBA be separately budgeted for, and

(c) non employment operating cost increases being maintained at 3.0% recognising that this increase will not be uniform and areas will vary.

2 ENDORSEMENT of the programme for the adoption of the 2008/09 budget.

BACKGROUND

Progress in relation to the compilation of the 2008/09 budget is underway with the preparation of working files and other back office processes. The Executive will have carriage of the compilation of draft budgets to the point that they are able to be presented to elected members and then workshopped. The objective is to have a final draft budget document ready for consideration for adoption by mid June 2008. A copy of the timetable is at attachment 1.

DETAILS

Issues and options considered:

The economic environment continues to be very strong with significant pressure on costs and the ability to resource operations and projects whether via directly employed staff or by contract. The inflationary risks are starting to be of greater concern after a long period of growth with sustained low inflation.

To set the scene:

General

- The Australian Bureau of Statistics (ABS) National Consumer Price Index (CPI) weighted average for the 12 months to December 2007 was 3.0% as was the CPI for Perth up from 2.6% for the previous quarter.

- The ANZ economic forecast for the December 2007 quarter predicts that nationally inflation will return to 3.0% and remain at this level through 2008.

- The WALGA local government Economic Briefing for December 2007 reports the Reserve Bank's outlook for the national CPI is an annualised rate of 3.5% for the next few quarters before slowing to around 3.0% by the end of 2008. Over the past four years annualised CPI growth in WA has been 0.7% points above the national figure translating the above national forecast into a Perth CPI forecast of close to 4% for 2008. Clearly the Perth CPI which is the environment in which the City of Joondalup has to operate continues to outstrip the national CPI and sets the benchmark for the kind of economic environment in which we operate.

- The WALGA local government Economic Briefing for December 2007 also reports that during 2007 the General Construction Cost Index fell below 10.0% pa for the first time since 2004. The prediction is that the increase for this index in 2008 will be 8.5%. If this is the case the WALGA Local Government Cost Index (a combination of the Construction Index and Perth CPI) will calculate at approximately 5.5% for the first half of the 2008 calendar year falling to around 5% by the end of 2008. A copy of the WALGA local government Economic Briefing for December 2007 is at attachment 2.

Labour Costs

Labour costs are a key factor in the City's cost structure traditionally accounting for as much as 40% of the operational expenditure budget.

The City's principal employment instruments are contracts for executives, managers and some coordinators and Enterprise Bargaining Agreements (EBA's) for the bulk of the staff. In the latter case there are three separate agreements. These three agreements are all up for renegotiation before the end of 2008.

For this reason the predictability of labour cost increases for the 2008/09 year are far less certain than the last couple of years.

- The ABS Labour Price Index (LPI) for the 12 months to September 2007 shows a national public sector movement of 4.1% with the Western Australian figure being 4.4%. The all sectors movement for Western Australia is 4.7%.

Proposed Parameters

With this economic background in mind for the 2008/09 draft budget development it is proposed that:

1 Existing fees and charges be reviewed in line with market and expected CPI on average, ie 3.0%.

2 While the outcomes of EBA negotiations are some way off and there is no certainty, the City should consider a conservative approach to the budget. It is quite possible that the agreed annual increase over the life of the EBA is not uniform and increases may be different in different years. With the economic data and EBA issues in mind and the current very tight recruitment market it is proposed that for the practical purpose of putting the budget together the base labour cost working target for the draft budget be as per the current EBA of 4.0%. Any additional requirement to meet the new EBA will be provided for separately. At this stage what that might be is unknown but it should be better understood as we get closer to budget adoption.

3 In relation to non employment related operating costs the picture is not uniform. Some costs are increasing and others are showing negligible increases or even decreases. The competitiveness of the particular market is a key factor. On this basis the City is working towards a target of containing non-employment operating costs to an average increase in line with CPI predictions of around 3.0%. This will vary however from one type of cost to the other. New construction tenders for example are expected to reflect cost increases well above this.

Link to Strategic Plan:

Organisational Development

4.1 To manage the business in a responsible and accountable manner
4.2 To provide quality services with the best use of resources

Legislation – Statutory Provisions:

The requirements for local governments to prepare a budget are set out in section 6.2 of the Local Government Act 1995. Section 5.56 further provides for local governments to prepare and adopt a plan for the future. The provisions of the Local Government (Financial Management) Regulations 1996 also contain extensive provisions in relation to the preparation and presentation of budgets while the Local Government (Administration) Regulations 1996 contain provisions in relation to the setting up of plans for the future.

Risk Management considerations:

The adoption of the annual budget contains significant risk management considerations in terms of being able to ensure that the City can supply the works, services and facilities and continue to manage the assets that it is charged with.

Financial/Budget Implications:

This report considers the content and framework for the preparation and consideration for the draft 2008/09 budget. This impacts the underlying financial premises on which the budget is based.

Policy Implications:

Not Applicable.

Regional Significance:

Not Applicable.

Sustainability Implications:

Financial sustainability is absolutely critical to the future growth and development of the City of Joondalup. The adoption of an annual budget is a critical element to this long-term financial sustainability.

Consultation:

Not Applicable.

COMMENT

It is considered that the parameters described represent a significant stretch target in terms of putting together the draft 2008/09 budget. In some areas of Council's operations this will be very difficult to achieve while other areas will fare better.

While these parameters are very broad there are significant demands on the City in relation to the provision of services, facilities and the management of its assets and infrastructure. The City has in recent times struggled to maintain its programmes in terms of being able to provide the resources whether from internal means or externally by contract and to do so at a reasonable cost to the community.

ATTACHMENTS

Attachment 1	Budget Preparation Timetable
Attachment 2	West Australian Local Government Association Economic Briefing December 2007

VOTING REQUIREMENTS

Simple Majority.

RECOMMENDATION

That the Strategic Financial Management Committee recommends that Council:

1 ENDORSES the key parameters for establishing the development of the draft 2008/09 budget based on:

(a) increases in fees and charges of 3.0%;

(b) employment cost increases be budgeted at business unit level in line with current EBA provisions of 4% and any additional provision for the new EBA be separately budgeted for; and

(c) non employment operating cost increases being maintained at 3.0% recognising that this increase will not be uniform and areas will vary.

2 ENDORSES the programme for the adoption of the 2008/09 budget.

Appendix 3 refers

ITEM 4 REVIEW OF INVESTMENTS POLICY 8-9 – [19136]

WARD: All

RESPONSIBLE DIRECTOR: Mr Mike Tidy
Corporate Services

PURPOSE

To consider a report and make a recommendation to Council on the review of the City's Investment Policy 8-9.

EXECUTIVE SUMMARY

Policy 8-9 relates to investments of funds by the City. The current policy arose out of a major review of all policies undertaken and subsequently adopted by Council in June of 1999. The policy has subsequently been reviewed on five occasions, the last in October 2007 with only relatively minor changes being made.

Due to the current investment environment and following requests from Elected Members it was considered appropriate to review the policy to ensure that it best supports and preserves the City's cash assets.

It is recommended that the Strategic Financial Management Committee recommends to Council that it:

1 REVOKES the current Policy 8-9 Investment (attachment 1); and

2 ADOPTS a new Policy 8-9 Investment (attachment 3).

BACKGROUND

The current City Policy 8-9 Investment was adopted in June 1999 following a major review of the entire Policy Manual. The policy has been reviewed on a number of occasions since then without substantial change.

There has been significant turmoil in investment markets in recent times and a number of local governments across Australia have investments that have been caught in that turmoil. Also there have been a number of enquiries from Elected Members relative to the exposure of the City to the current investment turmoil and the adequacy of the City's investment policy. It is considered appropriate therefore to undertake a review of the investment policy.

It Is important to understand firstly the broad types of investments that local government are involved in and how these are exposed to the market.

The traditional investments for local government have been interest bearing deposits and bank accepted/endorsed commercial bills. The key features are:

- are usually backed by major banks have a high credit rating due to the backing for the investment being clearly known and understood;

- are relatively short term;
- are very secure;
- the value of the investment at any time is known;
- the return on the investment and when it will be received is known, and
- if there is a need to break the investment before its maturity this may result in a penalty.

Because of this they generally offer a conservative rate of return relative to benchmarks.

In the last decade local government has been more involved in investing in managed funds. These come in many permutations but essentially they involve pooling investors funds and then reinvesting those funds across a range of investment types. The key features are:

- offered by many institutions some have major bank backing but many do not and there can be more than one institution involved;
- are generally longer term not short term investments;
- are investing in a variety of securities such as cash based investments, equities, mortgages etc;
- in some cases specialise in investing in certain types of securities;
- exposed to the market fluctuations particularly affecting the types of underlying securities that the fund has invested in and therefore do not provide a predetermined return on the investment;
- exiting a managed fund prior to maturity means selling in the market at prevailing market rates;
- while they have credit ratings (in some cases quite high ratings) these can be confusing because it doesn't mean that the underlying securities that the fund has invested in all have the same rating and the relationship between the securities and their potential impact on the whole fund can be complex and not readily understood.

The biggest issue with managed funds is having a clear understanding of what the managed fund is investing in. In many cases this can be clear and transparent and the risks of the investment can be determined. As the investment instruments become more and more complex however it can be very difficult to determine the risk and exposure. Relying on rating agencies to rate the investment also can be risky. Some of the funds that have been hardest hit were rated relatively highly.

The investment market turmoil of recent times has hit managed funds hard. In some cases such as the sub prime mortgage market problems its because the fund has direct exposure to these types of investments. In other cases it is simply because of general market conditions and the exposure to equity markets generally.

It should be noted that while a lot of focus is currently on the poor performance of managed funds the traditional interest bearing deposits and bank accepted/endorsed commercial bills are performing very well. Twelve months ago it was the reverse.

DETAILS

Issues and options considered:

The existing Policy 8-9 Investment is included as attachment 1. The policy sets out the:

- investment objectives;
- risk profile of the City;
- delegated authority to invest;
- types of authorised investments;
- limitations on direct investments in terms of quotations, terms of maturity, liquidity requirements etc;
- prudential requirements where investments are made with fund managers;
- policy guidelines in terms of diversification of risk etc.

There is also a section dealing with financial reporting and the current practice is to provide a comprehensive investment report with each financial report put to Council on a monthly basis.

There are several perspectives from which the policy needs to be viewed.

The first is does the policy adequately cover all of the issues that ought to be addressed in an appropriate investment policy and does it support prudent and effective management of the City's investments with appropriate levels of governance. The Department of Local Government and Regional Development has been developing a local government operational guideline for investment policy and in December 2007 released a draft of that guideline a copy of which is at attachment 2. A key element of that guideline is the establishment of appropriate investment policies and what should comprise those policies. The draft guideline canvasses a wide range of issues for consideration in an investment policy and is considered a valuable reference point.

The elements proposed in the draft guideline comprise;

- Objectives
- Legislative Requirements
- Delegations of Authority to CEO
- Prudent Person Standard
- Ethics and Conflicts of Interest
- Approved Investments
- Prohibited Investments
- Risk Management Guidelines
- Investment Advisor
- Measurement
- Benchmarking
- Reporting and Review

Many of these elements are encapsulated in the City's existing policy although not necessarily under the same heading. A sample investment policy is included in the draft guideline.

In examining the issues covered by the draft guideline there are a number of areas where the City's existing policy is quite adequate but others where there could be

improvements. In some cases its just improvements to the wording but in others the specific intent of the policy can be improved. The key changes proposed are:

1 The City's current policy has objectives however they also include references to legislation and benchmarking which would both be better referred to separately. The wording of the suggested objectives in the draft guideline also better articulate the objective of an investment policy.

2 The City's current policy under the heading Risk Profile has an extensive list of all of the issues that are to be considered when considering an investment decision. Many of these are covered by other parts of the policy and some are really about process and not policy. There is no equivalent of this in the draft guideline. It is proposed to delete this section.

3 The draft guideline contains a section dealing with ethics and conflicts of interest. This issue however is not exclusive to the area of investment and applies right across all activities of the City. The City's Code of Conduct and other policy provisions and statutory provisions under the Local Government Act all cover issues of ethics and conflict of interest and to include a specific section would only be duplication. It is not considered therefore that such specific reference is warranted in the investment policy.

4 The draft guideline has both an approved investments section as well as a prohibited investments section. By comparison the existing City policy has only an authorised investments section. It could be argued that if the policy spells out what is authorised then all else is unauthorised and it shouldn't be necessary to also spell these out. Unfortunately with the vast array of investment instruments that exist there are many shades of grey which could leave open to some interpretation whether a certain investment is authorised or not. While the interpretation of the City's current authorised investments means that no investment would be made in the sort of investments listed in the draft guidelines prohibited investment list it is considered that there is merit in spelling this out in the policy. It makes a clear statement about the type of investment that the City does not want to make.

5 The City's existing policy in regard to risk management guidelines is not adequate. The existing policy uses a single percentage to define the spread between financial institutions and the credit rating. These would be better set out separately. The City has been examining this for some time and has determined a separate set of limits for overall portfolio and the counterparty credit framework. This also includes separating direct investments from managed funds. The draft guideline uses the same breakdown. The percentage spreads that are recommended by administration however are more conservative than those proposed under the draft guideline. By way of example the draft guideline suggests that up to 50% of the entire investment portfolio could be invested with a single AAA rated managed fund. It is proposed in the City's case that this be limited to 25% to achieve a more conservative spread of risk. The proposed term to maturity framework is also more conservative than that suggested in the draft guideline. Maximum term proposed is 36 months for a maximum of 10% of the portfolio.

6 The draft guideline suggests the inclusion of the requirements of an investment advisor. There are no specific requirements that a local government has to have an independent investment advisor. The City of Joondalup does have such an advisor and has used one for quite some time.

It is proposed to include a new section to cover the provisions relating to an investment advisor.

The second perspective is once having a policy that covers the issues that are believed to be required can the policy be applied in practice and deliver on its objectives.

Although there are quite a number of changes that are proposed many of these are already current practice even though they may not have been clearly spelt out in the policy. For example:

- The City does not invest in any of the type of investment instruments referred to in the proposed prohibited investments;
- Although the current policy permits up to 50% of the portfolio to be invested with a single AAA rated investment the City doesn't do this in practice.

It is felt therefore that the policy as now proposed has practical application as well as ensuring prudent and effective management of the City's investments with appropriate levels of governance.

The proposed new City Policy 8-9 Investment incorporating the above points is at Attachment 3.

Link to Strategic Plan:

Organisational Development

4.1 To manage the business in a responsible and accountable manner

Legislation – Statutory Provisions:

The requirements governing local government investments are covered by:

- Local Government Act 1995 – Section 6.14;
- The Trustees Act 1962 – Part III Investments;
- Local Government (Financial Management) Regulation 1996 – Regulation 19, Regulation 28, and Regulation 49
- Australian Accounting Standards

Risk Management considerations:

There are significant risk implications in managing the City's investment portfolio. Policy 8-9 Investment sets out provisions for compliance and governance that are designed to mitigate these risks. In addition to the policy there are internal processes and procedures governing investment transactions and these are subject to both internal and external audit.

Financial/Budget Implications:

As most of the proposed changes to Policy 8-9 Investment represent current actual practice there will not be any financial impact from adopting the new policy.

Policy Implications:

This report proposes the replacement of the existing policy with a new Policy 8-9 Investment.

Regional Significance:

Not Applicable.

Sustainability Implications:

Financial sustainability is absolutely critical to the future growth and development of the City of Joondalup. The policy in relation to the City's investments is a critical element to this long-term financial sustainability.

Consultation:

Not Applicable.

COMMENT

The existing Policy 8-9 Investment has served the City well and the proposed changes in the new policy really represent a fine tuning and not radical change. The changes tighten the policy in particular more clearly defining the types of investments and the spread of risk. Please note that the proposed new policy on Attachment 3 is not provided with 'tracked changes' as it has been totally reformatted.

The proposed policy represents a relatively conservative approach to investment that is felt to be appropriate to the needs of the City and for the market conditions.

ATTACHMENTS

Attachment 1	Existing Policy 8-9 Investment
Attachment 2	Department of Local Government and Regional Development Draft Investment Policy Local Government Operational Guideline
Attachment 3	Proposed new Policy 8-9 Investment

VOTING REQUIREMENTS

Simple Majority.

RECOMMENDATION

That the Strategic Financial Management Committee recommends that Council:

1 REVOKES the current Policy 8-9 Investment forming Attachment 1 to this Report;

2 ADOPTS a new Policy 8-9 Investment forming Attachment 3 to this Report.

Appendix 4 refers

MOTIONS OF WHICH PREVIOUS NOTICE HAS BEEN GIVEN

REQUESTS FOR REPORTS FOR FUTURE CONSIDERATION

CLOSURE

APPENDICES FOR AGENDA OF STRATEGIC FINANCIAL MANAGEMENT COMMITTEE

ITEM	TITLE	APPENDIX	PAGE
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Item 2	**South Australian Strategic Action Planning Guide For Sustainable Public Lighting [00906]** • Attachment 1 - South Australian Strategic Action Planning Guide for Sustainable Public Lighting (Report to Council). • Attachment 2 - South Australian Strategic Action Planning Guide for Sustainable Public Lighting. • Attachment 3 - Improved Street lighting Study for Greenhouse and Safety Benefits: Institutional and Technical Review.	2	25
Item 3	**Development Of The 2008/09 Budget - [66610]** • Attachment 1 - Budget Preparation Timetable • Attachment 2 - West Australian Local Government Association Economic Briefing December 2007	3	203
Item 4	**Review Of Investments Policy 8-9 – [19136]** • Attachment 1 - Existing Policy 8-9 Investment • Attachment 2 - Department of Local Government and Regional Development Draft Investment Policy Local Government Operational Guideline • Attachment 3 - Proposed new Policy 8-9 Investment	4	207

ATTACHMENT 1

DRAFT

The City of Joondalup
Strategic Plan
2008 - 2011

VISION

“A sustainable City that is committed to service delivery excellence and operates under the principles of good governance.”

MISSION

“To undertake all our activities with the endeavour of meeting community expectations and achieving sustainable lifestyles”.

VALUES AND PRINCIPLES

The Values and Principles outlined below will underpin the way the City achieves its Vision and Mission. These Values and Principles are:

Customer Focus

- We will work to understand and respond to the needs of all our customers both now and into the future.
- We will provide opportunities for community engagement.
- We will focus our improvement efforts on better services for our customers.

Purpose, Direction and Planning

- We will be plan driven, we will set priorities and we will ensure the effective allocation of resources to achieve our plans.

Sustainability

- We will minimise any adverse impact from our activities on the external environment and the resources available for future generations.
- We will provide value for money to all of our stakeholders.
- We will always act to ensure our activities serve the long-term interests of Joondalup.

Data, Measurement and Understanding

- We will make decisions based on information and understanding.
- We will measure and report progress against our goals.
- We will use measurement to drive continuous improvement.

Honesty and Integrity

- We will be fair, open and transparent in our activities.

CITY OF JOONDALUP PROFILE

The City of Joondalup is home to an estimated 160,000 people; 34.5% of whom were born outside of Australian borders.

This rich diversity of ethnicity and culture forms the basis of Joondalup's reputation as a facilitator of attractive lifestyles and community wellbeing.

The City is also blessed with a wide variety of natural and built environments including wetlands; coastal foreshore reserves; residential areas; light industrial and commercial precincts; a golf course; and dry and reticulated parks. All of these areas contribute to the City's overall high environmental and social amenity.

THE STRATEGIC PLAN

The City's Strategic Plan articulates the highest level of direction for the City for the coming four years. It is an overarching framework that aims to achieve better leadership and decision making with greater community participation.

The 2005 amendment of section 5.56 of the *Local Government Act 1995* had the effect of requiring local governments to "plan for the future of the district". The Strategic Plan 2008-2011 has been prepared in accordance with the Act and forms the City's "Plan for Future".

THE PLANNING FRAMEWORK

The City has developed a Planning Framework to ensure that programs and services are being delivered in alignment with the strategic priorities of the organisation. The Strategic Plan is the key document within the planning framework as it outlines these strategic priorities or 'key focus areas'.

The City's Organisational Development Plan is responsible for driving internal operational activities, which are developed in line with the priorities set in the Strategic Plan. Internally focused documents that support the Organisational Development Plan are not included in the Strategic Plan because of their internal operational nature.

High-level Plans enable key focus areas in the Strategic Plan to be more comprehensively articulated. Actions in these Plans are measured against key performance indicators, which enable the City and the community to gauge success in the implementation of strategic objectives.

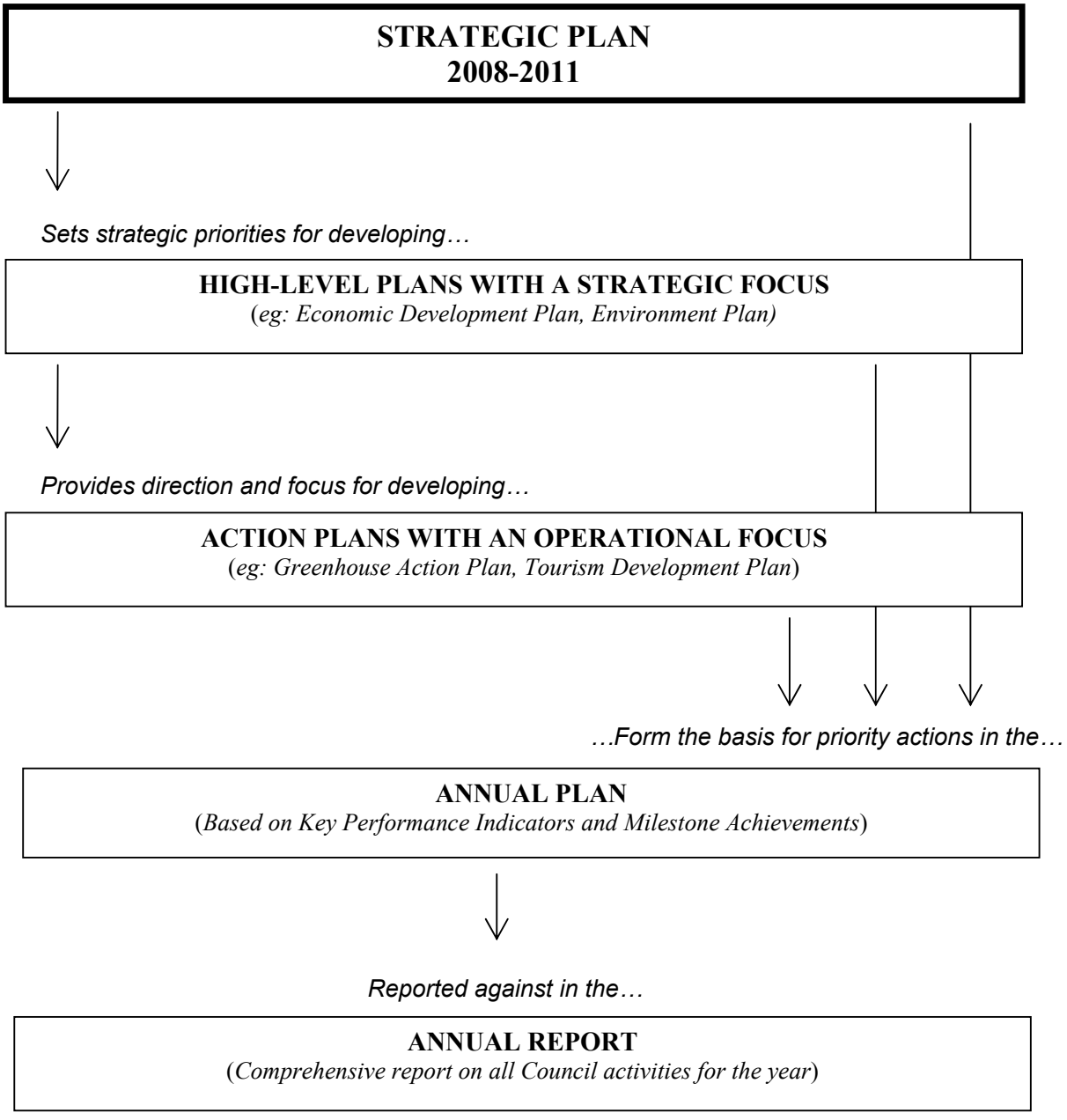
Successes in the achievement of Strategic Plan outcomes will be ascertained through:

- Annual Customer Satisfaction Survey Results
- Annual State of Environment Report
- Timely delivery of projects in line with the Annual Plan
- Annual statistical data comparisons
- Delivery of projects on budget

To ensure that transparency is achieved, the City's Annual Report will detail the yearly achievements of the City in line with the strategic priorities and outcomes

addressed in this Strategic Plan. The Annual Report is a public document that is accessible to all.

Below is the City's externally focused Planning Framework:



SUSTAINABILITY

The City of Joondalup recognises sustainability as an essential means of achieving a good quality of life for the community, both now and in the future, while maintaining and enhancing the environmental resources upon which we all depend.

It is a principle that permeates all of the City's decision-making and planning processes and has been given a degree of prominence in the Strategic Plan in accordance with its significance.

Sustainability at the City

Under the Local Government Act 1995, the City is required to play a key role in sustainable development, using its best endeavours to meet the needs of current and future generations through integration of environmental protection, social advancement and economic prosperity.

The City has taken this legislative requirement a step further through the adoption of its Sustainability Policy. The overall objective of the policy is:

> *"To establish the City's position on its responsibility towards developing, achieving and maintaining a sustainable community".*

Some of these responsibilities include:

- Incorporating elements of sustainability into all policy developments
- Ensuring that all City activities take in consideration the impacts of sustainability
- Utilising local laws to control activities that are adverse to sustainable principles
- Raising community awareness and assisting the community to achieve sustainable practices
- Providing leadership to positively influence the community

This policy will effectively guide the implementation of the objectives and strategies contained in the Strategic Plan.

KEY FOCUS AREAS:

Setting the Strategic Priorities for the City of Joondalup

KEY FOCUS AREA: LEADERSHIP AND GOVERNANCE

The *Local Government Act 1995* places significant emphasis on leadership and governance, particularly through its statement of intent. This statement focuses on:

- Better decision making;
- Greater community participation;
- Greater accountability; and
- More efficient and effective local government

This key focus area of the City's Strategic Plan translates the legislative statement of intent into objectives and strategies for the City. It acknowledges that high quality leadership and governance processes are essential for a local government to operate at its optimum capacity.

The following objectives and strategies reflect the fact that:

- There are often diverse and competing needs within the community;
- The City cannot meet the needs of the local community on its own but needs to do this in partnership with other stakeholders; and
- Effective local leadership can only be achieved by understanding the community and acting with accountability and integrity.

Since the election of a new Council in 2006, the City has taken significant steps towards regaining community confidence. Extensive training has occurred and a governance framework has been implemented. The objectives and strategies identified below and their associated outcomes are designed to enhance community confidence that the City is providing strong leadership and high quality governance processes.

1.1 OBJECTIVE

To ensure that the processes of local governance are carried out in a manner that is ethical, transparent and accountable.

STRATEGIES

1.1.1 The City maintains an appropriate code of conduct which influences the way Elected Members and staff operate.

1.1.2 The City provides regular training to Elected Members and staff to assist them in complying with their legislative responsibilities and the City's Governance Framework.

1.1.3 The City ensures that all Council documents involving decision-making processes and Council procedures are available and accessible to the community.

OUTCOME

The City's Elected Members and staff act with integrity and in the best interests of the community.

1.2 OBJECTIVE

To engage proactively with the community.

STRATEGIES

1.2.1 The City implements and, if necessary, further refines its Public Participation Policy.

1.2.2 The City implements and, if necessary, further refines its Marketing and Public Relations processes.

1.2.3 The City continues to enhance its website and embraces opportunities to communicate with the community.

1.2.4 The City maintains its commitment to public engagement, allowing deputations and public statement times, in addition to the legislative requirements for public participation.

OUTCOME

The City acts with a clear understanding of the wishes of its community.

1.3 OBJECTIVE

To lead and manage the City effectively.

STRATEGIES

1.3.1 The City develops and implements comprehensive and clear policies which are reviewed regularly.

1.3.2 The City maintains a long-term Strategic Financial Plan which is reviewed regularly.

1.3.3 The City develops and implements a wide variety of Plans which benefit the community socially, economically and environmentally.

1.3.4 Elected Members and staff represent the community on external bodies and build strategic alliances.

OUTCOME

The City provides effective local leadership.

KEY FOCUS AREA: THE NATURAL ENVIRONMENT

Preserving the City's natural environmental assets is of critical importance as population growth and activity places increasing pressure on such environments. This key focus area identifies a series of objectives and strategies to protect and preserve these assets in line with the City's Environment Plan.

The City's Environment Plan is divided into 5 priority areas which cover land management, water management, air quality, local biodiversity and waste management. The plan also identifies the development of an Environment Centre in the Yellagonga Regional Park as a key opportunity.

The environmental issue of climate change is receiving considerable public and political attention at present. The City has been proactive in reducing its own greenhouse gas emissions and has also encouraged the community to decrease its emissions. As a result, the City has achieved the fifth and highest milestone in the Cities for Climate Protection (CCP) program and will continue to undertake activities to minimise emissions through participation in the CCP Plus program.

The following objectives and strategies also recognise that effective protection and preservation of the natural environment cannot be achieved by the City alone. It requires the support of the community, other organisations and the State Government to be successful.

The City is fortunate to have many well-established Friends Groups who are very active in pursuing positive outcomes for the natural environment. In particular, assistance has been received in implementing many of the actions identified in the City's Coastal Foreshores Natural Areas Management Plan. The ongoing rehabilitation activities that Friends Groups undertake along the City's coastline and in natural bushland areas are highly valued and as such, the City will continue to work with these Groups under this Strategic Plan to achieve valuable environmental outcomes.

2.1 OBJECTIVE

To ensure that the City's natural environmental assets are preserved, rehabilitated and maintained.

STRATEGIES

2.1.1 The City finalises, implements and, if necessary, refines its Environmental Plan.

2.1.2 The City incorporates further environmental considerations into its planning processes.

2.1.3 The City develops and implements a water plan to reduce water consumption.

2.1.4 The City implements improved storm water management and water quality processes.

2.1.5 The City reduces its greenhouse gas emissions and assists the public to reduce community emissions.

2.1.6 The City implements strategies and projects that reduce the amount of waste which requires disposal.

2.1.7 The City protects local biodiversity through effective planning of biodiversity and natural areas.

OUTCOME

The City's natural environmental assets are preserved for future generations.

2.2 OBJECTIVE

To engage proactively with the community and other relevant organisations in the preservation of the City's natural environmental assets.

STRATEGIES

2.2.1 The City works closely with external organisations in establishing environmental management and monitoring processes.

2.2.2 The City conducts campaigns to raise community awareness about environmental protection and preservation.

2.2.3 The City undertakes actions to protect and rehabilitate its natural bushland and coastal environment and works closely with Friends and local environmental groups to achieve these outcomes.

2.2.4 The City will promote and support sustainable transport opportunities.

OUTCOME

The City establishes new, or maintains existing, networks and partnerships in relation to the preservation of its natural environmental assets.

KEY FOCUS AREA: COMMUNITY WELLBEING

The City of Joondalup is committed to enhancing the wellbeing of all people in the community – socially, emotionally, culturally and physically. The City has taken many steps to demonstrate this commitment. For instance, it has:

- Established a state of the art recreational centre at Craigie;
- Created a substantial library at Joondalup;
- Assisted in the development of the Joondalup Learning Precinct;
- Supported the popular Joondalup Festival as well as a range of other festivals and events;
- Provided 24 hour security patrols for the whole community; and
- Provided ongoing support for youth, seniors and families with children

The objectives and strategies associated with this key focus area support and continue these past initiatives. They also address areas of past weakness. For instance, some of the City's community facilities, particularly in the southern part of the City, are fairly old and require major upgrades. Enhancing the City's approach to asset management will help the City improve the standard of its community facilities in the future.

The City is also committing to the TravelSmart programs in an effort to promote healthy lifestyles and reduce motorised travel (and its associated greenhouse gas emissions). Enhanced safety and security, through the implementation of a Community Safety Plan, will support TravelSmart programs and encourage additional walking. Achieving the outcomes identified below through the objectives and strategies identified will provide a major boost for community wellbeing in Joondalup.

3.1 OBJECTIVE

To ensure the City's facilities and services are of a high quality and accessible to everyone.

STRATEGIES

3.1.1 The City develops and implements a Strategic Asset Management Framework to improve the standard and management of its community infrastructure, including the consolidation and rationalisation of current building facilities.

3.1.2 The City implements and, if necessary, reviews, its Community Development Plan.

OUTCOME

Agreed levels of service for community infrastructure are achieved and the City's facilities and services are accessible to everyone.

3.2 OBJECTIVE

To facilitate healthy lifestyles within the community.

STRATEGIES

3.2.1 The City provides high quality recreation facilities and programs.

3.2.2 The City develops and implements TravelSmart programs

3.2.3 The City provides efficient and effective environmental health and immunisation services.

OUTCOME

The Joondalup community is provided with opportunities to lead a healthy lifestyle.

3.3 OBJECTIVE

To facilitate culture, the arts and knowledge within the community.

STRATEGIES

3.3.1 The City continues to host festivals, concerts and events and enhances these in response to community demands.

3.3.2 The City provides high quality libraries and learning programs.

3.3.3 The City finalises and then implements a Community Education Strategy.

OUTCOME

Cultural and artistic opportunities within the City are maintained and enhanced whilst the City's libraries provide quality environments and learning opportunities.

3.4 OBJECTIVE

To work collaboratively with stakeholders to increase community safety and respond to emergencies effectively.

STRATEGIES

3.4.1 The City develops and implements a Community Safety Plan.

3.4.2 The City maintains an effective visual presence in local residential areas and business districts.

3.4.3 The City works in collaboration with other local governments and the State Government to enhance community safety.

3.4.4 The City develops and implements a comprehensive Road Safety Program.

OUTCOME

Public perceptions of City safety programs remain high or increase.

KEY FOCUS AREA: ECONOMIC PROSPERITY AND GROWTH

Almost 69% of the people who live in the City and are members of the workforce travel outside of the City to work. This has significant implications for sustainability (for instance, the extra travel which is required and the pressure that this can place on family structures). Consequently, it is particularly important that the City places emphasis on local economic growth for the benefit of the local community and the region.

To achieve prosperity and growth, the City has developed an Economic Development Plan. This presents a multifaceted approach to achieve growth and prosperity outcomes covering urban planning, business industry sector development, marketing, infrastructure provision, property development, finance, workforce capability building and strong leadership.

The objectives and strategies outlined below support the implementation of this Economic Development Plan. In particular the City plays a significant role in business development and attraction through the collection and analysis of information about the local economy. This information is used to identify opportunities for local business and industry sectors to grow and develop, resulting in increased prosperity for business and more local employment opportunities for residents. The information can also be used to target and attract new industries and to encourage investment in the region. Two of the major established industry sectors that will support the achievement of these objectives include the Joondalup Learning Precinct and the Joondalup Health Campus.

Attracting industries and encouraging investment will not be a success without sufficient and appropriate physical infrastructure to support the growth. This does not simply refer to the amount of land available but also to the suitability of the land, the availability of floor space and the adequacy of infrastructure that serves the land. Each of these needs to be addressed before economic prosperity and growth can be maximised.

Finally, the objectives and strategies in this key focus area acknowledge that the City needs to work collaboratively and cooperatively with other Government entities and the private sector to achieve the best possible outcomes.

4.1 OBJECTIVE

To encourage the development of the Joondalup CBD.

STRATEGIES

4.1.1 The City finalises, implements and, if necessary, refines those elements of its Economic Development Plan relating to the CBD.

4.1.2 The City facilitates opportunities for development in the CBD through promotion, the provision of information, the identification of suitable opportunities and the implementation of supportive planning provisions, including the development and implementation of a new Structure Plan for the CBD (see Strategy 5.1.2).

4.1.3 The City works collaboratively with the State Government in developing and implementing strategies to facilitate development in the CBD.

4.1.4 The City attracts and grows office-based professional service industries within the CBD.

4.1.4 The City implements its CBD Parking Strategy.

OUTCOME

The Joondalup CBD's position as an employment and activity hub is enhanced.

4.2 OBJECTIVE

To increase employment opportunities within the City.

STRATEGIES

4.2.1 The City supports local businesses in their activities.

4.2.2 The City finalises, implements and, if necessary, refines its Economic Development Plan to support employment opportunities.

4.2.3 The City works collaboratively and cooperatively with the City of Wanneroo and the State Government in developing and implementing regional strategies to increase employment opportunities.

4.2.4 The City promotes Joondalup as an attractive investment destination and provides information and advice to assist businesses to relocate to the City.

4.2.5 The City supports targeted skills development to enhance local workforce growth and supply.

4.2.5 The City implements its Tourism Development Plan.

OUTCOME

Employment opportunities within the City are increased.

KEY FOCUS AREA: THE BUILT ENVIRONMENT

The 'look and feel' of the built environment within the City of Joondalup is important because of its impacts on local residents and the broader community. Well planned and managed suburbs and infrastructure provide for ongoing achievements in sustainability, a safer community, visually pleasing suburbs, cost effectiveness and regional attraction.

The City has achieved considerable success in developing its built environment. For instance, it generally has high quality roads and kerbing, it is well endowed with high quality parklands and open space, the Joondalup CBD reflects high quality design and infrastructure development and the City's planning control scheme is much more recent than the schemes which exist in many other local governments.

However, there is still much to be done. The planning scheme will be reviewed and revised during the term of this Strategic Plan. The City's management framework for infrastructure assets will be significantly improved and it is proposed that the City commence some major activities which will impact on the built environment. These include commencing the process of developing the Ocean Reef Marina site and also facilitating more significant buildings within the Joondalup CBD to support additional employment. A focus on building new community facilities in the City's north and prioritising maintenance of southern located community facilities will also occur during the period of this Strategic Plan.

The following objectives and strategies detail these and other initiatives in relation to the built environment.

5.1 OBJECTIVE

To ensure high quality urban development within the City.

STRATEGIES

5.1.1 Develop and implement a new planning scheme for the City.

5.1.2 Develop and implement a new Structure Plan for the Joondalup CBD.

5.1.3 Give timely and thorough consideration to applications for statutory approval.

OUTCOME

The City's planning documents and statutory approvals are dealt with thoroughly and efficiently and set a high standard of quality for future developments within the City.

5.2 OBJECTIVE

To progress a range of innovative and high quality urban development projects within the City.

STRATEGIES

5.2.1 Develop a concept for, and commit to, the development of land at the Ocean Reef Marina site.

5.2.2 Develop a concept for a Cultural Centre at Lot 1001 Kendrew Crescent, Joondalup

5.2.3 Facilitate the development of landmark buildings within the Joondalup city centre.

5.2.4 Support initiatives for the undergrounding of power to improve the amenity of areas.

5.2.5 The City develops and implements its Asset Management Strategy.

5.2.6 The City implements, and if necessary, refines its Capital Works Program.

5.2.7 The City provides technical support for externally driven infrastructure projects that are undertaken within the City.

5.2.8 The City provides an effective service for eradicating graffiti from City-owned and privately-owned buildings.

OUTCOME

Projects are completed on time, within budget and reflect the interests of the community.

ATTACHMENT 2 – SUMMARY OF RESULTS

ITEM	RESPONSE	ADDITIONAL COMMENTS
General support for the direction and content	Yes - 89%	
Understanding of the Vision and Mission	Strongly agree – 78%	"Vision and mission statements are far too generic to have any meaning." (Ocean Reef resident) "Sustainability is not defined and is used flippantly as one word fits all making the whole document unclear. Should have a definition and be applied this way through the whole document. wishy washy." (Greenwood resident) "Statements are similar to documented aspirations contained in earlier plans that did not align with the actions taken by management. Given past performance against similar documented goals the plan lacks credibility." (Non resident)
Appropriate Values and Principles	Strongly agree – 78%	
Key Focus Area 1: Leadership and Governance	Issue should be a KFA Strongly agree – 78% Agree – 22% Support objectives and strategies Strongly agree – 78% Agree – 22%	"The direction taken is dictatorial and does not focus enough on community representation through governance and leadership. More focus on representation is required." (Greenwood resident) "The statements providing comment on the actions implemented to date are inaccurate. Leadership and Governance at the Administration level is operating below that provided by CEO Smith and Mayor Bombak leading to the Council's eventual dismissal." (Non resident) "Item 1.1.1 Code of ethics/conduct should be in place, signed by all Members and copies available to the community. Item 1.3.2 Financial plan should refect how strategies will be planned and implemented during the strategic plan over next 4 years and be available to the community. Major capital projects should be identified over the 4 years." (Sorrento resident)

ATTACHMENT 1 – SUMMARY OF RESULTS

ITEM	RESPONSE	ADDITIONAL COMMENTS
Key Focus Area 2: The Natural Environment	Issue should be a KFA: Strongly agree – 89% Agree – 11%	"Since living in the city since 1999, I would say over 50% of native vegetation has been removed, especially in Joondalup and Edgewater areas." (Heathridge resident 1) "The natural environment includes private space such as yards where is the notion of area, flora and fauna for drainage and to support these ecological habitats. Sounds like you want to pave paradise to leave a little in public ownership. Perth climate not considered." (Greenwood resident) "Item 2.1.5 The major contribution to gas emissions by individuals is travel by motor vehicle. Suggest strategic plan includes provision of more car parking facilities at rail stations and/or increased bus feeder services." (Sorrento resident)
	Support objectives and strategies: Strongly agree – 77.8%	
Key Focus Area 3: Community Wellbeing	Issue should be a KFA Strongly agree – 89% Agree 11%	"Banning smoking at beaches is unenforceable. Are you going to have someone at every entry point 24 hrs a day and charge them a fee for using the beach? Make sure it is a user pays system, not rates being wasted." (Heathridge resident 1) "Communities in Joondalup enjoy the openness, the privacy and choose amenity when they choose Joondalup - more research needed to know what the community considers there well being rather than a big stick approach." (Greenwood resident) "Item 3.4.1 A broad based safety plan should be the top priority of any strategic plan." (Sorrento resident)
	Support objectives and strategies Strongly agree – 78% Neutral – 22%	

ATTACHMENT 1 – SUMMARY OF RESULTS

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ITEM	RESPONSE	ADDITIONAL COMMENTS
Key Focus Area 4: Economic Prosperity and Growth	Issue should be a KFA: Strongly agree – 78% Agree – 11%	"Whilst I agree with economic prosperity, I do not agree with linking it with growth. Q6 shows that the person responsible for the question is stuck in a neo-classical economic framework and has not studied or understood the basics of ecological economics. - - The City of Joondalup cannot become a sustainable City until a critical number of its decision makers have improved their understanding of economics." (Heathridge resident 2)
	Support objectives and strategies Strongly agree – 89% Neutral 11%	"A reality check is needed. The City centre is little more than a shopping centre supporting the needs of the local population. The Centre itself consists of nothing more than tilt up retail and commercial spaces found in any regional centre. The City should look at what influence it can have given what it has achieved. The objectives and strategies are the same or similar to those documented in earlier plans. As such the City should be able to look forward to replicating the same ineffectual results." (Non resident)

ATTACHMENT 1 – SUMMARY OF RESULTS

ITEM	RESPONSE	ADDITIONAL COMMENTS
Key Focus Area 5: The Built Environment	Issue should be a KFA Strongly agree – 78% Agree – 11%	"There is still and has been for too long too much emphasis on the Joondalup CBD to the detriment of the established suburbs. Some years ago an effort was made by the Council to remedy this but small groups of locals objected and the Council gave up. I would like to see each suburb have a more distinct attraction. As an example, I live in Kingsley and the natural hub of Kingsley is the area bounded by Kingsley Drive and Creaney Drive. This area should be developed as a local gathering place. To a certain extent this already happens but the Council has done very little on a co-ordinated manner to make it an attractive area. There are similar areas in most suburbs. The Community will support this type of development if they are brought along in the process. I discuss this idea regularly with my friends and I have not had one person disagree. You could form interested groups in suburbs to work with Council to develop the plans. A couple of suburbs a year would be fine, starting with the most neglected suburbs." (Kingsley resident)
	Support objectives and strategies Strongly agree – 89% Neutral – 11%	"There is little in the objectives that link back to sustainability such as improving the energy efficiency of the built environment." (Heathridge resident 2) "Be honest. The preamble to the built environment should include the failure of present and past planners and their blue prints. Joondalup City Centre is at present a cluster of unconnected spaces dominated by an urban shopping centre and adjacent low to mid quality retail and commercial precincts. Many of the residential apartments recently approved and constructed in the City Centre highlight the inadequacy of the present planning controls and ineffectiveness of the planning function. Prominent residential apartments on key sites are already showing the potential to develop a ghetto like atmosphere." (Non resident)

ATTACHMENT 1 – SUMMARY OF RESULTS

ITEM	ADDITIONAL COMMENTS
Any further comments on objectives, strategies, outcomes in the Key Focus Areas	"…would like to see more done to discourage 4wd and vans and trailers at shopping centres. Have restricted areas for vision blocking vehicles and council to start policing it, which it rarely does now. Encourage sensible cars for the City, not empty trucks for shops and train stations." (Sorrento resident) "Many of the strategies are generalised and state the obvious. There is no substance to these statements about how or when the objectives will be achieved. Where are the KPI's? - Of course we want to be prosperous and safe, but what about the quality of life? - Where is the strategy to minimise the rate payments per resident. This is what every ratepayer wants! - As a resident of Ocean Reef I am particulary interested in the development of the marina. This project has taken far too long, involved far too many people who are not directly affected and money has been wasted on consultants and reports. The council is not rewarded for achieving results, otherwise there would have been some action and it would have been built by now. Not to mention that Ocean Reef doesn't even have a post office! - Words such as 'facilitate' and 'development' are non-specific. The Council should nominate less projects and actually commit the resources to completing them swiftly. - With regards to the security strategy of maintaining a visual presence in the residential areas, this is a massive waste of rate payers funds. It is ineffective and is a smoke screen strategy to give the perception that the problem is being addressed. Redirect the funds to worthwhile projects. - The City of Joondalup has as lot of potential and we desperately need someone with vision who can achieve significant progress without getting bogged down in bureaucracy." (Ocean Reef resident) "Thank you for the opportunity to comment." (Kingsley resident) "The City needs to be realistic about what it can achieve. Many of the items like Ocean Reef have been on the agenda for decades and included in dozens of documents forecasting progress that simply has not occurred. What's different about now is the Administration seems less capable." (Non resident) "A much needed strategic plan and a move in the right direction. - I believe that some comment should be made regarding the `Order of Precedence`, if any of the Key Focus Areas. - The draft document seems to infer `Leadership and Government` first `The Built Environment` last." (Sorrento resident)

APPENDIX 12
ATTACHMENT 1

MEETING DATE: **19 DECEMBER 2007**

SOUTH AUSTRALIAN STRATEGIC ACTION PLANNING GUIDE FOR SUSTAINABLE PUBLIC LIGHTING

59091

WARD: All

RESPONSIBLE DIRECTOR: Ian Cowie
Governance and Strategy

PURPOSE/ EXECUTIVE SUMMARY

The purpose of this report is to review the International Council for Local Environmental Initiatives Report titled the 'South Australian Strategic Action Planning Guide for Sustainable Public Lighting'. The potential for the City of Joondalup to utilise the information provided in the Report is also assessed.

BACKGROUND

At the Council Meeting held on 28 August 2007 Cr Steve Magyar moved the following motion:

That Council REQUESTS a report on the "South Australian Strategic Action Planning Guide for Sustainable Public Lighting" report.

The "South Australian Strategic Action Planning Guide for Sustainable Public Lighting" report prepared by ICLEI-Local Governments for Sustainability-Australia/New Zealand, released in October 2006 is referred to the Sustainability Advisory Committee for consideration, following which a report will be presented to Council".

In accordance with the Local Government Act 1995 all committees members ceased on the 20 October 2007 at the October 2007 local government elections.

As it is unknown when the next Sustainability Advisory Committee will be held the requested report on the "South Australian Strategic Action Planning Guide for Sustainable Public Lighting" report has been provided directly to Council.

DETAILS

The South Australian Strategic Action Planning Guide for Sustainable Public Lighting (Attachment 1) provides a framework for South Australian local governments to undertake a strategic approach to the delivery of public lighting in their municipality. Multiple benefits for local governments who take action to increase the energy efficiency of public lighting are identified including reducing financial losses, reducing greenhouse gas emissions and increasing the effectiveness of local government management practices.

The Report consists of four chapters:

- Chapter 1: Public Lighting Basics
- Chapter 2: How to Manage Public Lighting Sustainably
- Chapter 3: Public Lighting Market and Regulatory Structure

- Chapter 4: Useful Resources

Chapter One introduces public lighting and its impacts (energy, financial and greenhouse), typical local government practices for public lighting management and some of the technological options for public lighting. This information is provided at a national level and a South Australian specific level.

Chapter Two presents a framework for addressing public lighting strategically. It explains the foundations and underlying principles that local government can use to guide their approach to sustainable public lighting and outlines a step-by-step process for developing and implementing Sustainable Public Lighting Action Plans. The framework presented is the framework used in the Cities for Climate Protection (CCP) Plus Sustainable Public Lighting Advancing Action Project.

Chapter Three overviews the sustainable public lighting opportunities and challenges inherent under Full Retail Contestability (FRC) both nationally and in South Australia. Note: that under current State Government policy the provision of public lighting in Western Australia is not contestable.

Chapter Four details where to find further information beyond this guide such as public lighting tools, references and further reading.

Issues and options considered:

Western Australian Public Lighting Context

In Western Australia, local governments are responsible for the provision of street lighting. An exception is major roads where the responsibility for road lighting lies with Main Roads WA or is shared between Main Roads WA and Local Government.

The historical arrangement in WA has been for Local Governments to request Western Power, previously SECWA and SEC, to install streetlights on power poles. During 2006 Western Power was split. "Synergy" is the retail entity that bills Local Government for street lighting and "Western Power" claims ownership of street lighting equipment. Under the present State Government contestability policy Synergy and Western Power claim that lighting is not contestable.

A large proportion of street lighting in Western Australia is below Australian Standard requirements. Mercury vapour lamps are used for most Local Government street lighting. Mercury vapour lamps have proved reliable for street lighting but the future is likely to lie with a combination of compact fluorescent, metal halide and high pressure sodium lamps that are typically twice as energy efficient as mercury vapour.

Western Power and Local Government have been moving forward with more efficient street lighting technology. In June 2007, the Improved Street Lighting Study for Greenhouse and Safety Benefits: Institutional and Technical Review by Sage Consulting Engineers was released (Attachment 2). This Review was written for the Western Australian Local Government Association (WALGA) and the Sustainable Energy Development Office (SEDO) and in partnership with the City of Subiaco, City of Swan and the Town of Mosman Park.

The review outlines sources of information, a methodology, definitions, a short history of street lighting and current practice in WA including the State Underground Power Program (SUPP). Information is provided on the current state of lighting technology, the efficiencies that can be

obtained, the greenhouse gas emissions produced and environmental impacts. Information is also provided about street trials using more efficient lamps and luminaires in a number of metropolitan councils (including the City of Joondalup), the depreciation rates and reliability of the technology and the carbon dioxide emissions.

The executive summary concludes "it is possible for local government to halve energy consumption of street lighting with no drop in performance. An option is to improve street lighting to AS/NZS 1158 and still achieve energy savings". However, the review does not adequately address the many areas of overhead and underground power installed from the mid 1970's to the mid 1990's across the Perth metropolitan area which were installed as a condition of subdivision to the standards imposed by the then SEC, SECWA or Western Power.

The City, along with many other similarly planned and aged metropolitan councils has a huge legacy of poorly designed lighting systems using inefficient lamps which are owned and operated by Western Power. The City had no say in the choice of lighting and lamp technology at the time of subdivision and the conversion of these systems now will require a considerable capital investment either by Western Power or the City or both to adequately address the lighting standard and greenhouse gas issue.

The Review provides a sound basis for using energy efficient lighting in future projects and programs but does not give sufficient thought to the considerable problem of Western Power owned and operated lighting across the majority of the City. This issue, common to all metropolitan councils will require a high level governmental approach to resolve.

City of Joondalup Public Lighting Practices

The City of Joondalup continues to use energy efficient lighting in its own installations such as the Sorrento North Beach Redevelopment, Tom Simpson Park (which also uses power switching to reduce energy costs after 9.00pm), Kanangra Park path lighting to Greenwood Train Station as well as most park lighting which use Metal Halide and High Pressure Sodium to many carparks. The newer suburbs of Burns Beach and Harbour Rise Estate, Hillarys have Metal Halide and the City is trialling both Metal Halide and Fluorescent lamps in the City Centre as a replacement for mercury vapour lamps.

Upgrade of lighting is currently considered on the basis of cost savings in energy paying for the installation and reduced energy cost. This premise forms the basis of a consultant's report for Joondalup City Centre Lighting with trials of new luminaires programmed for parts of Boas Avenue, Reid Promenade, Upney Mews and Joondalup Drive in November/December 2007. All other installations are on a replacement basis either as faults occur, ad hoc requests for improvements for old equipment or planned as part of asset management programs in conjunction with bulk lamp replacement. The latter principle will be applied to Iluka and Harbour Rise Estate, Hillarys and will become economic as the cost of metal halide lamps reduce in line with greater usage. Ad hoc and new works are considered and funded from the 5 Year Capital Works Program – Street Lighting, with park lighting funded in the Parks & Reserves Enhancement Program. All lighting installations funded from the Capital Works Program use energy efficient lighting.

The City's recently adopted Greenhouse Action Plan 2007 – 2010 includes a number of actions to address the energy efficiency of street lighting:

Action 6 Finalise a general lighting policy for streets, reserves, parks and cycle ways under the City's control that addresses energy efficiency.

Action 7 Investigate opportunities for introducing solar power lighting as pilot projects.

Action 8 Continue to request Main Roads to supply energy efficient traffic lights when replacing or installing traffic lights.

Action 9 Lobby WALGA to encourage Main Roads and appropriate State Government utilities to provide energy efficiency lighting to all new street lighting installations.

CCP Sustainable Lighting Project

The Cities for Climate Protection Plus Program includes a number of advancing action project areas. One of these project areas is sustainable public lighting referred to as the Sustainable Public Lighting Toolbox. The aim of the Toolbox is to accelerate the uptake of sustainable public lighting and is a 'one-stop-shop', which enables Local Governments to:

- Access guidelines, tools and case studies, and technological information,
- Share information with other active Local Governments and regions,
- Find state-specific information about public lighting regulations and energy markets, and
- Keep up-to-date with sustainable public lighting developments.

The Toolbox proposes that to achieve sustainable public lighting, Local Governments adopt the following step-by-step approach, which is based on the CCP's five milestone process:

1. Assess the Current Situation,
2. Set Priorities,
3. Action Planning,
4. Implement Actions, and
5. Review and Re-strategise.

Link to Strategic Plan:

Objective 2.1 To plan and manage our natural resources to ensure environmental sustainability

Strategy 2.1.2 Further develop environmentally effective and energy efficient programs

Legislation – Statutory Provisions:

Not applicable

Risk Management considerations:

Not applicable

Financial/Budget Implications:

The installation of energy efficient lighting on an ongoing basis is a part of the City's Capital Works Program as practicable. If the City wanted to upgrade the entire existing public lighting infrastructure it would have significant financial implications. The table below provides some preliminary estimates.

Upgrade of Overhead Power	
Upgrade of existing luminaires to use energy efficient lighting across most of the City.	$10 million
Installation of additional luminaires to ensure that the lighting provided meets Australian Standards (current lighting spacing in some areas are substandard)	$2 – 4 million
Upgrade to Underground Power	
If all the overhead power areas (19,000 properties) were converted to underground power as part of the State Underground Power Program, lighting to Australian Standards using energy efficient lamps is included. However, even if the City were granted a project area for each round of the program into the future it would take approximately 38 years.	$209 million
This would still leave 23,000 properties with substandard underground powered lighting which would need to be upgraded.	$20 million
Ongoing Costs	
While energy cost savings will be made through increased energy efficiency there may still be an increase in ongoing costs because of the extra lights that need to be installed to achieve Australian Standards and because the replacement costs of Metal Halide are greater and have to be replaced every three years rather than four years. As a result it is unknown whether ongoing costs would be more or less than they are now.	

Policy implications:

Not applicable

Regional Significance:

Not applicable

Sustainability implications:

The installation of energy efficient public lighting assists in the reduction of greenhouse gas emissions.

Consultation:

None

COMMENT

The City is abreast of new energy efficient lighting technologies and continues to apply them in new lighting installations. As a CCP Plus Council the City has access to the Sustainable Public Lighting Toolbox and will continue to utilise its tools and publications in improving the sustainability of the City's public lighting.

The problem of improving the efficiency of Western Power owned and operated lighting across the majority of the City is common to all metropolitan councils and will require a high level governmental approach to resolve.

ATTACHMENTS

Attachment 1 South Australian Strategic Action Planning Guide for Sustainable Public Lighting

Attachment 2 Improved Street lighting Study for Greenhouse and Safety Benefits: Institutional and Technical Review

VOTING REQUIREMENTS

Simple Majority

RECOMMENDATION

That Council:

1. **NOTE the South Australian Strategic Action Planning Guide for Sustainable Public Lighting (Attachment 1); and**
2. **NOTE the Improved Street lighting Study for Greenhouse and Safety Benefits: Institutional and Technical Review (Attachment 2).**

Signature of Originating Manager

Signature of Originating Director

APPENDIX
- - 2 - -

ICLEI
Local
Governments
for Sustainability

ATTACHMENT
- - - 2 - -

South Australian Strategic Action Planning Guide for Sustainable Public Lighting

These guidelines were prepared by
ICLEI-Local Governments for Sustainability-Australia/New Zealand
with funding from the Local Government Association of South Australia
Research & Development Scheme.

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The guide was developed in consultation with eleven urban and rural Cities for Climate Protection (CCP) councils in South Australia. ICLEI-A/NZ thanks the following councils for their input through workshops, contribution of case studies and other information, which has been invaluable in ensuring the appropriateness and applicability of the guide to local governments in South Australia:

- Adelaide City Council
- City of Charles Sturt
- City of Mitcham
- City of Port Adelaide Enfield
- City of Unley
- City of Norwood Payneham & St Peters
- City of Marion
- District Council of Mount Barker
- Campbelltown City Council
- Clare & Gilbert Valleys Council
- Salisbury City Council

ICLEI-A/NZ gratefully acknowledges the following organisations that generously contributed their time and information:

- Local Government Association of South Australia
- Public Lighting Steering Committee
- Local Government Corporate Services
- ETSA Utilities
- Department for Transport, Energy and Infrastructure, Energy Division
- Department for Transport, Energy and Infrastructure, Transport Division
- Essential Services Commission of South Australia
- Department of the Premier and Cabinet, Sustainability and Climate Change Division
- Australian Greenhouse Office, Department of Environment and Heritage
- Australian Local Government Association

The project participants and stakeholders at the ICLEI-A/NZ South Australian Recognition & Briefing Breakfast, Friday 20 October.

Back row (from left): Lord Mayor Michael Harbison, Adelaide City Council; Mayor Ivan Brooks, City of Mitcham; Mayor Steve Woodcock, Campbelltown City Council; John McArthur, City of Unley; Ken Potter, Salisbury City Council; Bob Burgstad, Essential Services Commission of South Australia; and Alex Fearnside, Department of the Environment and Heritage.

Front row (from left): Cr Raelene Telfer, Marion City Council; Mayor Fiona Barr, City of Port Adelaide Enfield; Cr John Howland, City of Charles Sturt; Martin Bellamy, ETSA Utilities; Mayor John Rich, President, Local Government Association; and Martin Brennan, ICLEI-A/NZ.

CONTENTS

LIST OF CASE STUDIES

LIST OF TOOLS

INTRODUCTION

Before a local government can develop a sustainable approach to the delivery of public lighting in their municipality, it is important to understand the benefits of, barriers to, and opportunities for such an approach. This introduction provides that context, as well as a basic explanation to the South Australian Strategic Action Planning Guide for Sustainable Public Lighting, why it was created, and how local governments can use it to manage their public lighting in a sustainable manner.

Why should my council act on public lighting?

Across Australia, local governments are taking action to address energy consumption from public lighting for several reasons:

1. *To reduce financial losses.* Local government spending on public lighting ranges from $75,000 to $1.5 million per annum per council in South Australia (source: Data gathered by CCP councils at Milestone 1). Potential efficiency gains of 60-65% (source: Genesis Automation *et. al,* 2006)[1] would mean significant financial savings for councils.
2. *To reduce greenhouse gas emissions.* Cities for Climate Protection (CCP) councils across Australia have reported that public lighting can account for 15-70% of their corporate[2] emissions inventories (source: CCP Software). Most of these councils' local greenhouse action plans identify public lighting as an important area of work, and recognise it will be difficult to achieve their greenhouse reduction goals without reducing emissions from the public lighting sector.
3. *To increase the effectiveness of council's management processes.* Like waste management and planning, public lighting is a service delivered by council to the community. Council's delivery of lighting in public areas should focus on how to provide the service most *effectively*, rather than always using past courses of action. Strategic contract management, infrastructure planning, and service delivery naturally lead to energy efficient public lighting, as they can cost-effectively ensure appropriate lighting levels and light quality. This is particularly important in the context of a deregulated electricity market, where councils have greater decision-making responsibility for meeting the regulatory standards in areas they choose to light, whilst reducing light pollution, managing crime and related fears, improving public amenity, increasing the use of public space, and reducing or controlling the risk of litigation.

[1] References used in this Guide are referred to by the author and date, and full document details are found in Chapter 4 under Publications.

[2] Councils familiar with the CCP Program will know that the 'corporate' sector refers to a council's own operations, including facilities owned or managed by council. 'Corporate' includes six sub-sectors: buildings; vehicle fleet; employee commute; water/sewage; streetlights and waste. The other sector is 'community' which covers the broader municipality.

Why isn't local government public lighting more energy efficient?

Although some councils across Australia lead the way, and despite significant technological capability to reduce emissions in the sector, council have reported that public lighting is an area in which they often find it challenging to take action. Common barriers experienced by councils are summarised in Box 1.

Box 1: Barriers to Sustainable Public Lighting

National barriers

- **Price disincentives for councils.** Contestable energy has lowered prices, potentially reducing the reasons for councils to act. Depending on the financial model, introducing energy efficiency changes can sometimes involve an upfront capital expenditure to council, higher maintenance costs due to the low economy of scale of new lights (if done individually rather than regionally or in bulk), and/or council liability to maintain the lamps.
- **Price disincentives for distribution businesses and retailers.** As distributors costs are scrutinised and capped by regulators, there is limited incentive for distributors to take risks on new technologies for which they are uncertain of long-term performance and costs. As public lighting uses off-peak rather than peak demand energy, there is less pressure to reduce energy consumption.
- **Complicated public lighting system.** Councils can be unclear about asset ownership, regulations, their role, and energy efficiency options under electricity market deregulation (Full Retail Contestability—or FRC—has been implemented in SA and is at different points in other states).
- **Limited technical knowledge.** Local governments have varying levels of access to technical expertise (internal and external) on the latest lighting technologies and their relevant applications. Within the research field, experts still have inadequate data on the response of the eye under low light conditions, the performance requirements for public lighting, and the performance of blue-white and orange light at night.
- **Limitations to maintenance.** Maintenance levels (under current tariffs) tend to be oriented towards light failures at night versus lights burning during the day.
- **Council difficulties in accurately tracking assets.** Lack of clarity regarding location, tariff type, energy spend, and so on, reduces council ability to manage energy and cost performance.
- **No national standards for energy efficiency.** Energy efficiency is not covered under the Australian Standards for Road Lighting (AS/NZS 1158).
- **Lack of coordination and funding of research and development.**

South Australian barriers

- **Supply monopoly.** As is the case in some other states, having one distributor in SA limits the tariff and financial options for energy efficiency.
- **Few council-owned assets.** As ownership of the majority of public lights was vested in ETSA Utilities as part of it's sale by the State, councils don't own the majority of the assets and therefore have fewer lighting options and less control of the technology.

(Sources: South Australian CCP councils identified the barriers at the CCP SA Regional Meeting October 2005 and SA Sustainable Public Lighting Project council workshops in December 2005 and May 2006; Genesis Automation et. al, 2006; LGA June 2003).

What's possible

A common misconception amongst the CCP councils that work with ICLEI-A/NZ is that, given these barriers, local government is not in a position to influence public lighting. This concern has recurred during the Victorian Public Lighting Forums delivered by the former Sustainable Energy Authority in February 2003, the WA Sustainable Public Lighting Advancing Action Project delivered by ICLEI-A/NZ (2005/06), and this SA Sustainable Public Lighting Project (2005/06). There are, however, many opportunities for local government to influence public lighting, as listed in Box 2.

Box 2: Opportunities for Sustainable Public Lighting

National opportunities

- **Bulk purchasing and increased bargaining power.** Collectively, local government is the largest public lighting customer in Australia. In deregulated markets, councils can use their position to negotiate renewable electricity purchasing, energy efficient lighting, improved maintenance and service levels, and access to public lighting data. Working on a regional level with other councils is a particularly effective strategy to negotiate desired outcomes.
- **Council support.** All CCP councils have politically endorsed greenhouse gas emissions reduction goals and action plans, which often include action on public lighting.
- **Available and emerging technologies and trials.** Includes T5 fluorescents, compact fluorescents, efficient photo-switches, dimming, and a range of other technologies (see Chapter 1 and Case Studies throughout the guide).
- **Reinvestment of financial savings.** Council can use the potential financial savings from lower energy and maintenance costs to finance further sustainable public lighting initiatives.
- **Increasing body of resources, projects and support.** This guide and other materials, projects, networks, and funding opportunities (see Chapter 4) are increasing the options for of councils to take action.

South Australian opportunities

- **State leadership on greenhouse action and acknowledgement of the role of local government** though renewable energy and greenhouse reduction targets, the Premier assuming the role of Minister of Climate Change, and other greenhouse commitments.
- **A building momentum by local government** in SA, demonstrated by lighting policies, trials and other initiaitves by councils; and council participation in this SA Sustainable Public Lighting Project 2005/06 and the SA CCP Plus Sustainable Public Lighting Advancing Action Project 2006/07.
- **Joint state-local government electricity retail contracts,** which include GreenPower options.
- **Proposed trial of T5 compact flourescents by ETSA Utilities** (see Case Study 7), and commitment to energy reductions through a $20million demand management program for projects.
- **A range of installation options under the existing tariff structure.**

(Sources: South Australian CCP councils identified these opportunities at the CCP SA Regional Meeting October 2005 and the SA Sustainable Public Lighting Project council workshops, December 2005 and May 2006; Genesis Automation et. al, 2006; LGA April 2003 and circulars (multiple dates); information from stakeholders).

A strategic approach is essential

Through working with councils on specific sustainable public lighting projects in South Australia, Victoria and Western Australia, ICLEI-A/NZ has found that councils can encounter challenges when they try to address individual issues. ICLEI-A/NZ recommends that rather than acting in an *ad hoc* manner, councils take a strategic step-by-step approach to their public lighting work. This allows councils to build their capacity, minimise risks, effectively tackle barriers, leverage opportunities, and maximise potential benefits. The case studies in this Guide show that councils can change their delivery of public lighting services to the community while broadening decision-making considerations to include energy efficiency in addition to community safety and cost considerations. As councils begin to take more control of the management of their public lighting stock, further opportunities to reduce energy spend and greenhouse gas emissions will open up.

How to use this guide

In line with a strategic approach, the *South Australian Strategic Action Planning Guide for Sustainable Public Lighting* has been developed to assist local governments to do this. The guide provides information, advice, templates, tools and case studies that councils can use to develop and implement Sustainable Public Lighting Action Plans (SPLAPs) – a working document developed and used by council to identify and prioritise actions that will increase the sustainability of its public lighting services.

The guide is designed for the use of council staff and elected members working to address public lighting. While different chapters and sections of this guide will vary in relevance according to the reader's role, background and interests, ICLEI-A/NZ has found that each component reinforces the other, so the guide is structured to progressively introduce further detail, and can be read either sequentially or according the reader's interest and needs.

Chapter 1 – Public Lighting Basics, is designed to orient council staff or elected members with the issue of public lighting. It introduces public lights, explains how they work, and outlines the associated energy, financial and greenhouse implications. The chapter then examines how councils typically manage their public lighting and interact with other public lighting stakeholders. Finally, it provides an overview of the technological options for energy efficient public lighting.

Chapter 2 – How to Manage Public Lighting Sustainably, presents a framework for councils to address their public lighting strategically. It explains the foundations and underlying principles that councils can use to guide their approach to sustainable public lighting. The chapter then outlines a step-by-step process for developing and implementing Sustainable Public Lighting Action Plans (SPLAPs). It contains tools, templates, advice, and case studies that councils can use to complete each step and adapt according to their unique needs.

Chapter 3 – Public Lighting Market and Regulatory Structure, overviews the sustainable public lighting opportunities and challenges inherent under Full Retail Contestability (FRC) both nationally and in South Australia. Councils can use this

information to prioritise and coordinate their work around meeting the Australian Standards, negotiating electricity contracts and service level agreements, making submissions to relevant State policies, and taking advantage of other current and upcoming issues.

Chapter 4 – Useful Resources, details where to find further information beyond this guide. It contains lists of public lighting tools, references, and further reading. It also outlines the many public lighting stakeholders, their roles, and potential ways local government can interact with them in pursuing sustainable public lighting.

Tools. At the end of the guide is a series of tools councils can use as they progress along the strategic step-by-step framework, including tools for finding information, auditing public lighting assets, conducting a self-analysis of council's capacity, workplanning the development of council's SPLAP, and deciding on actions for the SPLAP.

Chapter 1. PUBLIC LIGHTING BASICS

Before council embarks on managing its public lighting in a sustainable manner, it is important to ensure relevant staff and elected members understand the broad technical, political, greenhouse, and management issues associated with public lighting. Public lighting is a complex area, and although it is certainly not necessary to be an expert in every aspect of the technology and its management, it is essential to know the broad issues and options.

A broad overview is particularly relevant in the local government context where different members of staff and elected members hold expertise in unique aspects of public lighting. For example, in the case of an energy efficient lamp trial, an environment officer may understand the greenhouse implications, a finance manager the contract options, an elected member the community aspirations, and an infrastructure officer the lighting performance implications. In working together – an essential ingredient to the success of a trial or indeed any public lighting work – it is crucial for council to share a common language and understand how the pieces fit together.

This chapter provides a starting point for such an understanding. It begins with an explanation of how public lights work, and then outlines the energy, financial and greenhouse implications. The chapter then examines how councils typically manage their public lighting, and how they interact with the other stakeholders involved. Finally, it overviews the technological options for energy efficient public lighting.

What is a public light?

Public lighting is defined by the Australian Standards — a national standard that regulates the types and number of lights that are to be used in public spaces, described in Chapter 3 — as the lighting provided on major and minor roads (source: Genesis Automation *et.al* 2003). In South Australia street lighting is referred to in retail terms as "12 hour unmetered lighting" and traffic signals as "24 hour unmetered lighting". Other types of public lights include: car park lighting; flood lighting; lighting in parks and gardens; sign lighting; and marine lighting.

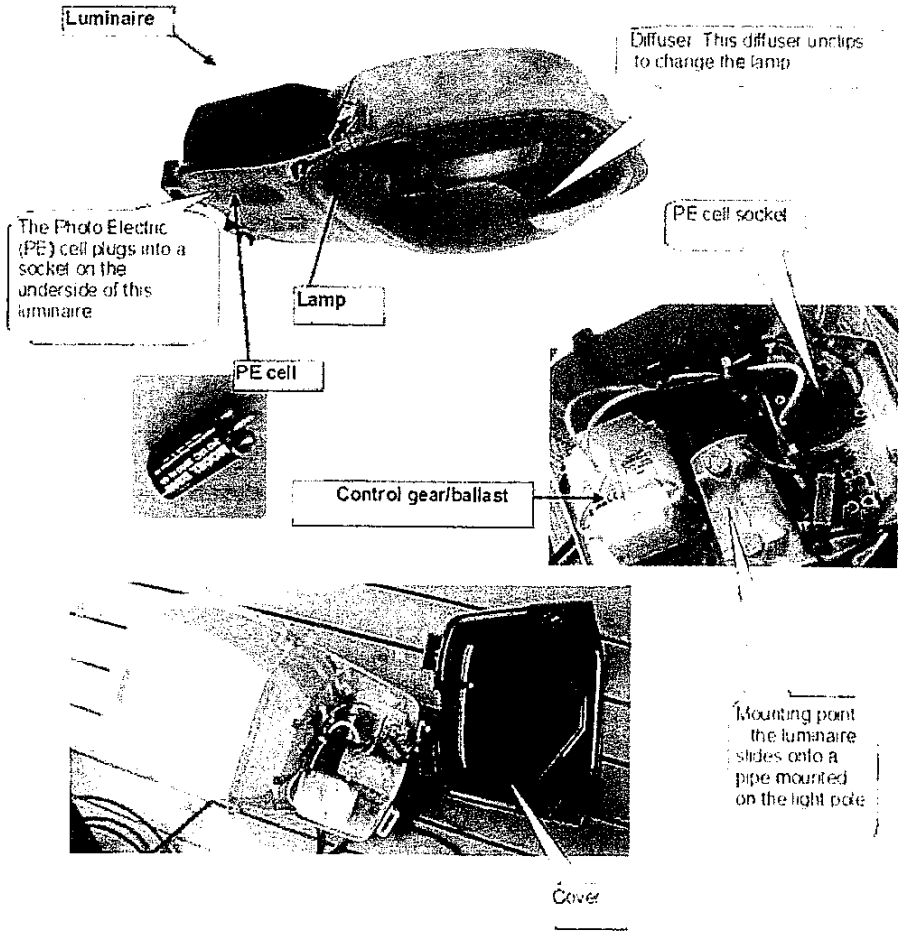
The first electric streetlights installed in South Australia were along King William Street in 1902 (photo courtesy Sir Thomas Playford ETSA Museum).

Other than the pole, public lights are comprised of four main elements:

1. The luminaire, or light fitting, attached to the pole. These generally last 20 years, and protect the rest of the light from rain, hail, dust, temperature, insects, birds and pollution. They also distribute the light using a reflector and lens (symmetric or asymmetric).
2. The lamp.
3. The ballast/control gear. Ballasts help provide the right current and voltage to the lamp. They can be magnetic or electronic, and their energy use varies.
4. The on-off switching control, usually a photoelectric (PE) cell (which responds to light levels), but there can also be: no control gear (permanently on); a manually switched lamp; a ganged PE cell; dimming (during dusk/dawn period, during low traffic period); or intelligent lights – self-monitoring for the hours of use.

These four elements are illustrated in Figure 1. For more information on the components of public lighting, see the "Sustainable public lighting technologies" section of the Sustainable Public Lighting website (http://www.energy-toolbox.vic.gov.au/publiclighting/index).

Figure 1: Components of a public light



(Source: http://www.energy-toolbox.vic.gov.au/publiclighting/index)

Greenhouse and financial implications

A lot has changed in public lighting in Australia since the first electric public light was installed in Tamworth, NSW, more than 116 years ago (source: Genesis Automation *et. al*, 2006). Table 1 compares the public lighting situation in South Australia and Australia as a whole. Australia's 1.94 million streetlights are responsible for 1.15 million tonnes CO_2e, whilst South Australia's 198,670 lights contribute 86,400 tonnes CO_2e to the Australian total. The table shows considerable historical growth and projected future growth in public lighting. It also reveals significant technological potential to reduce energy use in this area.

Table 1: Public lighting in South Australia and Australia

	South Australia	Australia
Public lighting stock	198,670 lights	1.94 million lights
Category breakdown	86% minor roads (category P)	70% minor roads
Electricity use	90 gigawatt hours (gWh)	1035 gigawatt hours (gWh) (0.57% of Australia's total)
Greenhouse gas emissions	86,400 tonnes CO_2e	1.15 million tonnes CO_2e (0.63% of Australia's total CO_2e from electricity)
Costs	(Not available)	$210 million
Growth in electricity use in past 14 years	45%	45%
Projected growth in next five years	(Not available)	35,000 new lanterns, 16-21 gWh, and 18-23kt CO_2e
Potential energy savings	(Not available)	60 to 65% reduction annually through the adoption of energy efficient lighting equipment

(Source: Genesis Automation et. al, 2006. Note statistics cover all councils – including CCP councils – and State and Territory roads authorities.)

South Australian participants in the Cities for Climate Protection (CCP) Program have generated greenhouse inventories that reveal street lighting (the major component of public lighting) is responsible for 15–70% of council's corporate greenhouse gas emissions and costs $75,000–$1.5 million per council per year. These results span rural, regional, urban and fringe councils.

Table 2 compares South Australian and Australian CCP councils. It shows public lighting accounts, on average, for 32% of South Australian CCP councils' annual greenhouse gas emissions and approximately half of their annual corporate energy and waste budget. This is higher than for Australian CCP councils, for whom public lighting accounts for an average 24-25% of their corporate emissions. Table 2 also shows the greenhouse and financial savings from sustainable public lighting actions in both SA and Australia, which CCP councils have quantified.

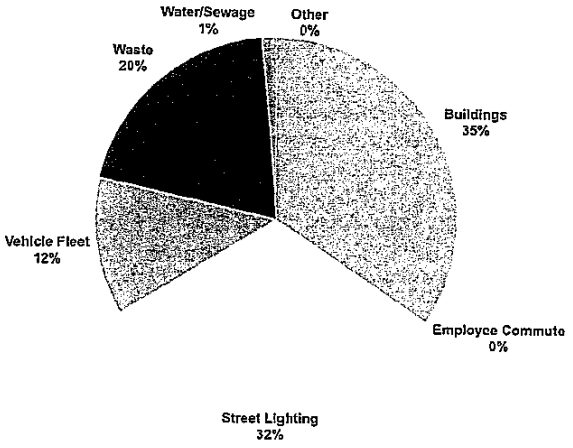
Table 2: Councils' greenhouse and financial costs and savings in public lighting

	South Australian CCP councils	Australian CCP councils
Number of councils	18 (72% of population)	215 (82% of population)
Greenhouse gas emissions per council per year	15–70% of corporate emissions (average ~32%)[1]	15–70% of corporate CO_2e[3] (average ~24–25%)[1]
Costs per council per year	$75,000–$1.5 million (average 50% of their total corporate energy and waste costs)[1]	$1,000–$2.5 million (average 35% of their total corporate energy and waste costs)[1]
Total greenhouse savings from public lighting actions per year	More than 550 tonnes CO_2e[2] (0.03% of total corporate savings)[4]	More than 40,000 tonnes CO_2e[4] (8% of total corporate savings)[4]
Total financial savings from public lighting actions	More than $76,000 per year[2]	More than $365,000 per year[2]

(Sources: [1] Unpublished greenhouse inventory data by CCP councils completed using the CCP for their Milestone 1–(base year– and Milestone 5–reinventory year;.data drawn from multiple years); [2] Unpublished 2004-05 data from ICLEI-A/NZ's CCP Measures database, used to inform the CCP Australia Measures Evaluation Report; [3] ICLEI-A/NZ 2004; [4] ICLEI-A/NZ 2005.)

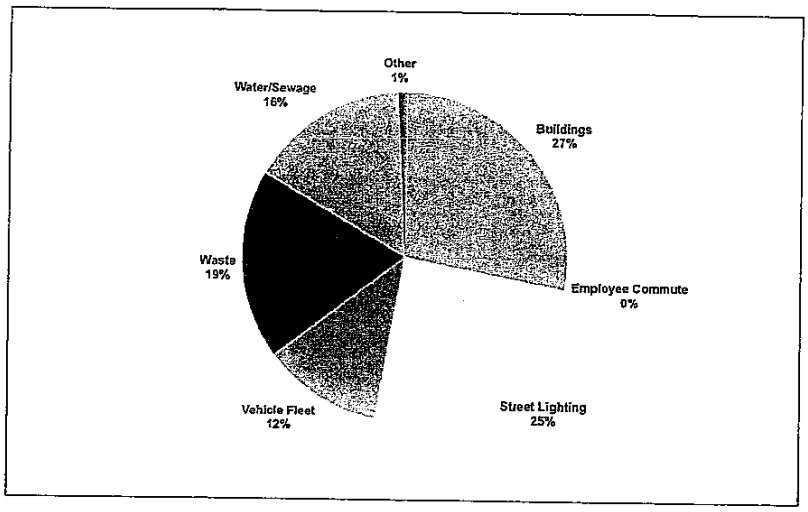
Figures 2 and 3 compare the breakdown of South Australian CCP councils' corporate greenhouse gas emissions to Australian CCP councils.

Figure 2: South Australian CCP councils' average corporate greenhouse emissions



(Source: Data gathered by CCP councils at Milestone 1).

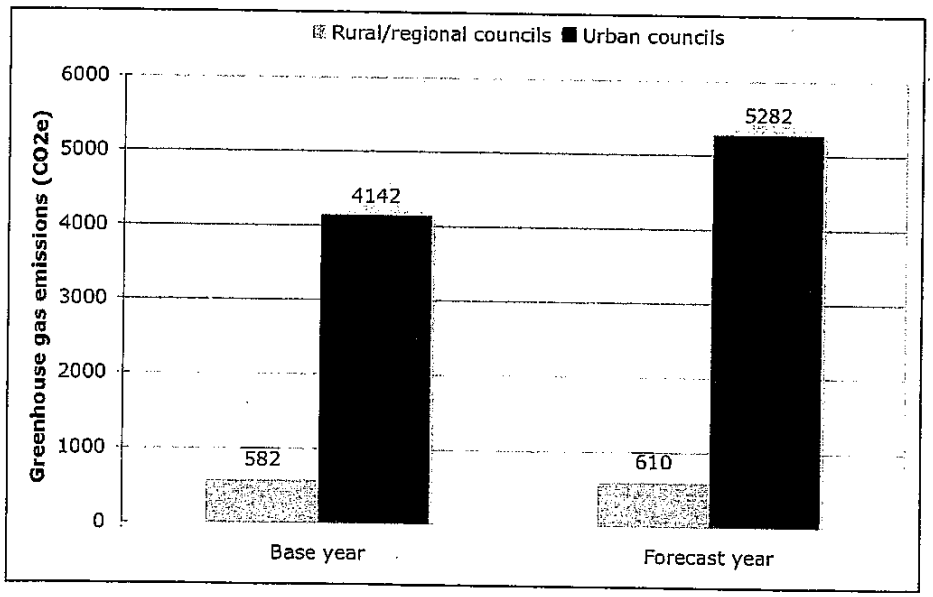
Figure 3: Australian CCP councils' average corporate greenhouse emissions



(Source: Data gathered by CCP councils at Milestone 1).

The proportion of a council's corporate greenhouse emissions attributable to street lighting is usually highest in an urban context and decreases as you move to the outer suburbs and then to a rural/regional context (source: *Data gathered by CCP councils at Milestone 1)*. Urban councils also have greater street lighting emissions in absolute terms, and greater forecasted emissions growth from this sector, as can be seen in Figure 4.

Figure 4: Average urban versus rural and regional public lighting emissions growth



(Source: Data gathered by CCP councils at Milestone 1: average base and forecast year public lighting data for all rural versus all urban Australian CCP councils).

Public lighting management within councils

Local government fulfils several roles in relation to public lighting:

- Planning authority
- Road authority (or coordinating with the responsible road authority)
- Environmental management
- Fiscal responsibility
- Provision of community needs.

(Source: Adapted from presentation by Thomas Kuen to CCP NSW State Forum session on Public Lighting 2003).

Dependant on council size and structure, public lighting is managed by a range of staff members. Management of public lighting generally sits within infrastructure services. Table 3 provides examples of the departments that may have public lighting responsibilities within your council.

Table 3: Departments in council that may have public lighting responsibilities

Business Unit	Public Lighting Responsibilities/Impact Areas
Assets & Maintenance	General public lighting stock information, maintenance of non-standard public lighting as negotiated with distributors.
Finance Department	Public lighting data management, approval and payment of public lighting bills, financial tracking of public lighting accounts, monitoring pay back periods, administration of council's revolving energy fund that could resource public lighting projects.
Elected Members/ Councillors	Conduit to community perceptions on public lighting, leadership on change in the sector, signal of support from council.
Executive	Sends signal of support from council on issue, determines resources available, has knowledge of council structures. May need to be made aware of the management issues relating to public lighting, given the proportion of council's budget that it constitutes, in order to make action a priority.
Planning	Setting standards for lighting types and pole types and approval of new lighting in the community; residential, commercial and industrial planning; contact with developers.
Community Services	Opportunities for community engagement, surveys, safety and perception issues.
Communications	Communications with the broader community, promotion of council work, promotion of strategic responses from council.
Environmental Services	Monitoring greenhouse gas emissions from public lighting. Decisions and planning on issues connected to energy efficiency.

Other stakeholders

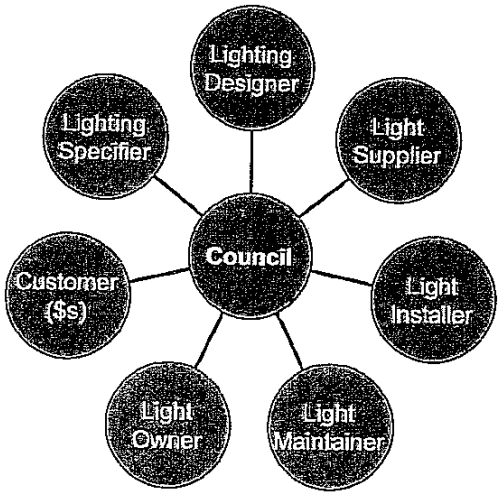
As well as councils, there are many other stakeholders involved in public lighting in Australia, including:

- Other public lighting customers, ie roads authorities
- Distribution businesses
- Public lighting users – pedestrians and drivers
- Local government associations and regional bodies
- Equipment suppliers
- Energy retailers
- Federal and state government bodies responsible for sustainability and/or energy
- Electricity regulators
- Standards Australia
- Peak industry bodies and professional associations.

(Source: Genesis Automation et al, 2006).

Councils typically have some form of relationship with many of these stakeholders, although the nature and extent of these relationships vary between councils according to their size, approach to public lighting management, the market and regulatory framework, and historical factors. A useful way of defining a council's role is as the body that brings the parties responsible for public lighting together (as shown in Figure 5) by liaising with all stakeholders involved in the design, installation, maintenance and replacement of lamps.

Figure 5: Councils' public lighting role



(Source: Thomas Kuen, Glen Eira City Council, Victoria Local government representative on the AS/NZS 1158 committee)

For more information about stakeholders in Australia and South Australia, see Tables 7 and 8, and for an explanation of their specific roles and motivations, read the Australian Greenhouse Office's publication *Public Lighting in Australia – Energy Efficiency Challenges and Opportunities* (Genesis Automation *et al*, 2006).

Sustainable public lighting options

Council can reduce the greenhouse gas emissions caused by its public lighting stock in four main ways: reduce lighting stock; reduce the energy consumption of existing stock; reduce the operating hours of existing stock; and change the energy supply powering its lighting stock. Each option involves different possible actions that can be done at different points, as outlined in Table 4. In addition to greenhouse savings, council can reduce toxic waste pollution from used lamps by reducing their number and improving the method of disposal (e.g. using sealed drums or accredited companies).

Table 4: Energy efficient options and what they involve

Broad option	Specific action involved	When this can be done
Reduce number of lights	• Remove lights from inappropriate locations. • Increase spacing of lights.	• Maintenance. • Upgrades. • Redevelopment.
Reduce energy consumption of lights	• Substitute existing lighting technology for more energy efficient technologies, such as T5 (Triphosphor Fluorescent), high pressure sodium (HPS), metal halide, or compact fluorescent lights; PE cells, electronic control gear, or active reactors. • Use more effective lanterns (e.g. reflector design, diffuser losses, better light distribution). • Improve lamp maintenance routine to ensure lighting levels are effective and lights are not coming on during the day. • Turn lights down (ie dimming), during dusk, dawn, and/or low traffic periods.	• Planned upgrades (individual or bulk) either prior to or at the end of their economic life. • New developments (eg greenfield developments, new roads, undergrounding etc). • One off upgrades (eg to take advantage of budget surpluses).
Reduce operating hours of lights	• Turn lights off after specified times (eg. after midnight), using time clocks or line switching.	• Anytime, particularly during a contract negotiation with the distribution business.
Change energy supply	• Switch to a renewable source of energy (ie Green Power). • Install solar lighting.	• Anytime, especially during budget bids or strategic or environmental planning. • Trials, upgrades or new developments.

(Source: Adapted from Victorian Sustainable Public Lighting Action Plan Guidelines; Genesis Automation et. al, 2006; and "Streetlighting Basics" presentation by the former Energy SA, 2003).

In deciding which option is best for each situation, council should take a number of factors into consideration, including:

- Capital investment
- Staff and management resources
- Ongoing costs or savings (including over what time period and their certainty)
- Expected greenhouse emission reductions
- Risk (of changing and of not changing lighting)
- Lighting performance
- Community needs
- Aesthetics.

A number of resources exist to help councils make decisions that fulfil their needs, including comparisons of the performance of different lights, cost-benefit analysis calculators, case studies of trials by other councils, sources of technical advice, and organisations with technical expertise. A range of these resources are listed in Chapter 4.

Bringing the pieces together

In this short overview of public lighting, we have seen how public lights work, and the significant energy, greenhouse and financial costs they bring to local government and the broader community. We have also seen both the current greenhouse and financial savings of actions implemented by councils in South Australia and Australia, and the potential future savings possible from a range of available and emerging sustainable public lighting options and technologies. We have examined how local governments – who hold primary responsibility for minor road lighting in Australia and South Australia – typically manage their public lighting internally and interact with other stakeholders involved.

The themes of council management and decision-making, data and technologies, and stakeholder relationships emerging from this overview are the main areas where council can work to achieve sustainable public lighting. How council can achieve positive outcomes in each area is explained in the following chapter.

Chapter 2. How to manage public lighting sustainably

The previous chapter covered information to help you navigate the sustainable public lighting landscape. Having a basic understanding of (and knowing where to find information on) statistics, technologies, stakeholders, key barriers and opportunities is essential to taking effective action on sustainable public lighting.

However, information alone is not enough. Councils encounter challenges when they use this information while attempting to enact individual public lighting changes. Rather than use this information in an *ad hoc* manner, ICLEI-A/NZ recommends councils take a strategic step-by-step approach that generates targeted solutions to the real barriers to sustainable public lighting. This type of approach also serves to build council capacity, minimise risks, effectively tackle barriers, leverage opportunities, and maximise potential benefits.

This chapter introduces ICLEI-A/NZ's approach to sustainable public lighting and provides a step-by-step approach to build council's capacity to develop a public lighting plan, manage technology and enhance key relationships.

The foundations and underlying principles of sustainable public lighting

Through working with CCP councils in Victoria, Western Australia, and South Australia on targeted public lighting capacity building and action planning projects, ICLEI-A/NZ has identified three foundations for the sustainable management of public lighting:

These are the three key areas that council needs to manage in order to achieve sustainable outcomes in public lighting. The following is a brief overview of what each foundation is, and why it is important:

Internal Strategy & Support

This foundation is about the processes, systems and strategies that underpin public lighting management within council. It is also about the strength of support for energy efficient public lighting within your council, from councillors and senior management.

Building this foundation will involve coordinating council actions in relation to public lighting. It may involve assessing the current public lighting management structure and cultivating internal support for council's public lighting aims amongst senior management, councillors and staff with public lighting responsibilities.

Data & Technology

This foundation is about council's access to public lighting data, ability to analyse and use that data, and access to people with public lighting expertise.

Building this foundation will involve collecting and understanding data on public lighting stock to enable better decision-making. By improving data and technological knowledge, council will be able to present a more robust business case on new lighting types to senior management and council, including greenhouse and energy spending benchmark figures. It may also involve making connections with people who have public lighting expertise, whether within your council or externally, to guide decisions on energy efficient lighting that take full consideration of the Australian Standards and other regulations.

External Relationships

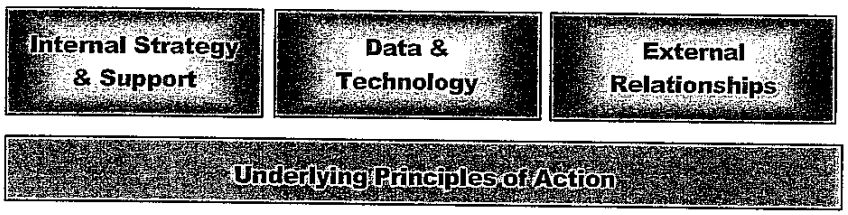
This foundation is about building external relationships with all parties who have some stake in public lighting.

> *"Coming together is a beginning.*
> *Keeping together is progress.*
> *Working together is success."*
> *~ Henry Ford*

Building this foundation will require developing better communication and understanding with your local distribution business. It will also require connections with lighting suppliers, the community and, importantly, other councils.

Underlying principles

Councils need to build capacity in each of the three foundations. Utilising the four underlying principles will assist capacity building and allow council to take advantage of current opportunities, and choose actions which are more effective and are easier to implement.



The four principles are as follows:

1. **Seek actions that build relationships** within council and with external stakeholders. This is how you can build the Internal Strategy & Support and External Relationships foundations.
2. **Seek to coordinate actions** within council and with external stakeholders. Coordinating actions will help you to conserve time and resources, and will also help you to build relationships.
3. **Seek solutions that consolidate existing council systems** rather than create more systems. No one needs more systems or policies that exist in isolation; where possible, make public lighting part of an existing management system so that it becomes part of normal operations. For

example, if your council is updating its general data management system, use that process to get better data management of public lighting.

4. **Seek to implement actions in areas with existing opportunity.** Choose actions complementary to other council processes, efforts by other councils in your region, and to previous actions and achievements. For example, if you have one group of residents already actively involved in becoming sustainable, run public lighting trials in their locality. They are more likely to react positively to the changes, which will pave the way for installation in other localities. Working in areas of opportunity will save you valuable energy.

A step-by-step approach

The complex nature of public lighting means it is important to approach public lighting strategically. The foundations and principles are mutually supportive and need to be built together. A logical step-by-step approach, described in Box 3, can help council do this.

Box 3: Summary of suggested steps for achieving sustainable public lighting

Step 1:	Assess the current public lighting context at council, by conducting a gap analysis of the three foundations – Internal Strategy & Support, Data & Technology, and External Relationships - at council;
Step 2:	Set goals and priorities for sustainable public lighting;
Step 3:	Develop a Sustainable Public Lighting Action Plan (SPLAP) with actions to build council's capacity in each of the foundations;
Step 4:	Implement actions that develop sustainable public lighting, using the principles – build relationships, coordinate actions, consolidate existing systems, and leverage existing opportunities - to guide your prioritisation; and
Step 5:	Review and re-strategise council public lighting emissions and actions.

Councils can follow these steps in one of three ways:

1. CCP Plus councils can apply to participate in a Sustainable Public Lighting Advancing Action Project (AAP), if it is offered in the relevant state. As a part of the AAP, ICLEI-A/NZ offers participating councils a structured framework involving workshops, verification of gap analyses and action plans, one-to-one support, and political recognition. If your council is a CCP participant visit our website for more information: http://www.iclei.org/ccp-au/public-lighting.

2. CCP councils still working through the milestones, and CCP Plus councils not involved in an AAP can still access from ICLEI-A/NZ the online materials and resources, telephone/email liaison, brokering of information, and invitations to events and network meetings.

3. Non-CCP councils can use publicly available online materials to manage their public lighting, including this guide.

Before starting

Time spent in preparation before undertaking the five steps listed in Box 3 can help council achieve a more effective and efficient result:

1. Make sure you are orientated to public lighting issues by reading this guide and other materials (see Chapter 4, Further Resources).
2. CCP Councils should contact their CCP State or Territory Manager to discuss their intentions and options.
3. Workplan how council will approach and progress sustainable public lighting. In particular determine:
   a. How this fits in with your CCP Milestone 3 local action plan, Corporate/Business/Strategic Plan and other plans;
   b. Council roles and responsibilities for working through the framework (including management and staff time); and
   c. Whether there is assistance available from ICLEI-A/NZ, for example through an Advancing Action Project (see above).
4. Establish or work with an existing whole-of-council group of staff members to work on sustainable public lighting with representatives from all the units that have responsibilities for public lighting. See Table 3 in Chapter 1 for potential staff members to invite.

Step 1: Assess the current situation

Assessing council's current public lighting situation is essential before undertaking any action, as it helps council to benchmark its current public lighting management strategy and energy efficiency, and identify strengths and weaknesses. The benchmark informs council's overall direction, goals, priorities and the resulting actions to be included in its Sustainable Public Lighting Action Plan (SPLAP).

ICLEI-A/NZ recommends that, at a minimum, council assess its capacity in each of the three foundations by involving relevant members of staff, preferably through an internal whole-of-council working group.

CCP Plus councils involved in the Advancing Action Project use the CCP Sustainable Public Lighting Gap Analysis Tool, which contains instructions on how to complete a public lighting gap analysis.

There are three tools to help you with this process:

- Tool 1: How to find public lighting information in your council, which council can use to gather information for the self-assessment, audit, and later on when creating SPLAPs
- Tool 3: Council Self-Analysis Checklist, which council can use to undertake a self-assessment it's capacity in each of the three foundations
- Tool 4: How to audit existing lights, which council can use to audit it's public lighting assets

In addition, council may wish to undertake a stakeholder analysis using non-public lighting specific tools. For a manual on stakeholder engagement, try *"The Stakeholder Engagement Manual"* by UNEP, AccountAbility and Stakeholder Research Associates Canada, available from http://www.uneptie.org/outreach/

Case Study 1: Street Lighting Audit, City of Marion, SA

Greenhouse gas emissions from street and public lighting contribute to almost 60% of the City of Marion's corporate emissions and costs council around $1 million per year. The city is currently undertaking a street lighting audit to provide information on the number, type, location and condition of street and public lighting in Marion, in order to create a more accurate database and allow for comparison with ETSA Utilities accounts. Once a clearer understanding of the composition of council's street and public lighting assets is obtained, a policy direction can be developed to guide the management of these assets with the view to improved performance and service delivery.

For more information contact Ann Gibbons, Environmental Planner on ann.gibbons@marion.sa.gov.au or (08) 8375-6857, or Kimberly Awalt, Unit Manager Technical Services, on kimberly.awalt@marion.sa.gov.au or (08) 8375-6847.

Other councils who have either undertaken or are in the process of undertaking street lighting audits include the Coffs Harbour City Council (see Case Study 11) and in South Australia, the cities of Adelaide, Mitcham, Salisbury, and Unley.

Step 2: Setting priorities

Identifying and agreeing upon goals and priorities for sustainable public lighting helps council set a direction for its Sustainable Public Lighting Action Plan (SPLAP).

"If you don't know where you're going, how will you know when you get there?" ~ Anon

ICLEI-A/NZ recommends the development of goals be: established internally with the whole-of-council working group; relate directly to any gaps identified at Step 1; be achievable within set time frames; and be measurable.

For CCP councils involved in the Advancing Action Project, ICLEI-A/NZ assists them to identify their priorities and goals for public lighting through a workshop.

One possible process for council to establish goals is by following these three, simple steps:

1. As a group, begin to imagine the sustainable public lighting future you want for your council – what would it look like?
2. Using this vision, identify council's sustainable public lighting goals. When setting the goal, remember to consider the key drivers and constraints of sustainable public lighting at your council as identified in your gap analysis.
3. If necessary, break your council's goals down into mini-goals to act as smaller steps along the path to achieving the larger goals.

Possible example goals and mini-goals might include:

- Reduce energy use in the public lighting sector by 20% by 2015 from 1996 levels.
- Achieve a 2% (pro rata) decrease in energy use from public lighting by 2010/11 from 1998/99 levels.
- Reduce toxic waste resulting from mercury light disposal by 10% by 2010.

- Maintain public lighting amenity as per the Australian Standards and Public Lighting Code by 2010.
- Improve the level and quality of public lighting in the City (*e.g.* meet Australian Standards).
- Improve data collection, recording and revision for public lighting.
- Have a public lighting policy in place by 2007/08 (e.g. requiring developers to install energy efficient street lights in all new developments).
- Ensure the future implementation of energy efficient street lighting in the City.
- Establish good external relationships by 2007/08 (e.g. with distribution business and lighting supply companies that specialise in energy efficient street lighting).
- Work collaboratively with all levels of government, lighting suppliers, and distribution companies to develop regional approaches to sustainable public lighting. (e.g. establish a regional Public Lighting Working Group).

The most effective goals will be those that are measurable and have a timeline for achieving a particular action. For examples of sustainable public lighting goals set by other CCP councils, see the example SPLAPs located in the "Sustainable Public Lighting Action Plans" section of the Energy Toolbox at http://www.energy-toolbox.vic.gov.au/publiclighting/.

Step 3: Action planning

A Sustainable Public Lighting Action Plan (SPLAP) is a working document developed and used by your council to identify and prioritise actions that will increase the sustainability of council's public lighting services. It is most commonly an internal rather than a public document. The SPLAP should be based upon the outcomes of steps 1 and 2, as well as other council directions, such as those identified in strategic plans, business plans, or CCP local action plans.

As well as creating individual council SPLAPs, councils can also consider creating regional SPLAPs and sustainable public lighting policies and strategies, described in the following sections.

For CCP councils involved in the Advancing Action Project, ICLEI-A/NZ works with council on its SPLAP development and verification, providing feedback and guidance throughout the process.

How to create an individual council SPLAP

The following step-by-step process outlines how councils can create an individual SPLAP, identifying the tools and resources to help throughout the process.

1. **Workplan the development of your council's SPLAP** using Tool 2.

2. **Develop and write the SPLAP,** using the SPLAP template (located at the "Sustainable Public Lighting Action Plans" section of the Energy Toolbox at http://www.energy-toolbox.vic.gov.au/publiclighting/). The SPLAP template has been developed in collaboration with local government *for* local government so it is a powerful tool to help your council affect change in this sector. It can be filled out and adapted by council and contains instructions for its use. The SPLAP template will walk you through a series of steps, including:
   - **Incorporate council goals** identified in step 2
   - **Choose or create actions that will help your council to achieve your sustainable public lighting goals.** There are several tools to help you do this: the Sustainable Public Lighting Principles (see earlier in this chapter); the case studies throughout this guide; the Action Planning Worksheet [Tool 5]; and Potential Sustainable Public Lighting Actions Checklists [Tool 6]
   - **Identify staff responsibilities for actions**
   - **Set priorities for actions**, ensuring that relevant actions are completed by important dates such as batch replacement dates
   - **Set budget figures for the actions**
   - **Set timelines for actions**. Incorporate key dates identified in the data and technology foundation (for example, batch replacement dates, budget timelines, contract renewal)
   - **Undertake work planning/scheduling for the actions**
   - **Establish a monitoring and review process and timeframe**

   It is worth looking at completed SPLAPs by CCP councils for strategies and action ideas. Copies of these can be found at the Energy Toolbox at http://www.energy-toolbox.vic.gov.au/publiclighting/
3. **Get Mayor or CEO/GM sign off** on the SPLAP and the monitoring and review process.

Case Study 2: Sustainable Public Lighting Steering Committee, City of Melbourne

Based on the success of the City of Melbourne's Greenhouse Steering Committee for ensuring whole-of-council involvement in local action planning, council is applying the same approach to the development and implementation of its SPLAP.

A SPL Steering Committee comprising of representatives from Engineering, Design, Environment, Parks, Community Services and Place Management has been created to improve whole-of council knowledge and management of public lighting. The Committee is responsible for the regular review of SPLAP strategy and actions, and will ensure council gains the appropriate support for SPLAP initiatives. The Committee will also determine the level of capacity building required within council as well as build effective working relationships to deliver to their SPLAP goals.

For more information contact the Greenhouse Projects Coordinator at the City of Melbourne, through their switchboard 03 9658 9658.

How to develop a regional SPLAP

Throughout the process of developing individual SPLAPs, councils often identify that some aspects of sustainable public lighting actions could be managed through

regional collaboration. A regional SPLAP is a useful way to structure this work, clarify goals and responsibilities, and ensure high-level support for implementation. A regional SPLAP could be developed in one of two ways:

1. A region of interested councils create individual SPLAPs, then identify commonalities and opportunities for regional collaboration, and use this as the basis of a regional SPLAP. This method is recommended by ICLEI-A/NZ as it can eliminate redundant actions (that individual councils are pursuing) and complement the actions already being undertaken by councils individually.
2. A region of interested councils form a working group to identify, from their existing knowledge, commonalities and opportunities for regional collaboration, and use this as the basis of a regional SPLAP or informal plan of action (see Case Study 3).

Whichever method a region uses, much of the foundations, underlying principles, steps, and tools presented in this chapter can be scaled up for regional application. In addition, councils wishing to develop a regional SPLAP should draw on existing regional work, such as initiatives run under regional CCP Milestone 3 local action plans or through greenhouse or public lighting council networks.

Case Study 3: Street Light Group of Councils, multiple councils, Victoria

The Street Light Group of Councils (SLG), formed in December 2002, now represents 31 Victorian rural and metropolitan municipalities on street lighting issues. The SLG has quarterly regular meetings, with a core group meeting monthly to work on specific projects. The SLG serves as a forum for increasing the knowledge and understanding of public lighting issues and opportunities, and provides a united voice for its members on various sector issues. The SLG's objectives include:

- Achieving fair and reasonable street lighting charges for OMR (Operations, Maintenance and Repair)
- Clarifying roles and responsibilities in the provision of street lighting
- Development of the street light market, e.g. competitive service provision
- A transparent and accountable public lighting regulatory framework.

To date, the SLG has saved money for members on the 2004 OMR review, and is currently working on a revision of the Public Lighting Code, establishing a regulatory framework to achieve TBL outcomes, councils' liability issues with non-standard lights, and public lighting policies that protect the best interests of councils.

For more information on the SLG please contact Craig Marschall, on 03 9418 3907 or cmarschall@tteg.com.au.

As part of the CCP Plus Sustainable Public Lighting Advancing Action Projects, ICLEI-A/NZ assists participating councils to develop regional SPLAPs. For more information please email PublicLighting-anz@iclei.org.

Sustainable public lighting policies and strategies

Some councils find that a public lighting policy or strategy can complement a SPLAP by providing higher level commitment in between the goals identified in Step 2 of this process and the operational (timeline/budget/responsibilities) aspects of the SPLAP

identified in Step 3 of this process. It is recommended that the *sustainable* public lighting strategy forms part of a larger public lighting strategy that also incorporates aesthetic, safety, economic and other considerations. Council may have an existing policy it can review.

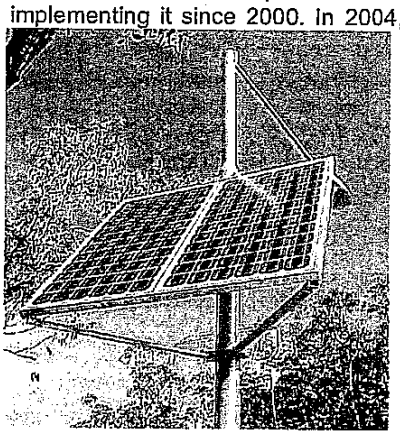
A sustainable public lighting strategy should identify the following:

- The benefits of sustainable public lighting for your council
- The opportunities available for accelerating it's uptake
- Changes needed to accelerate the uptake of sustainable public lighting
- How opportunities identified can be realised
- How and when these opportunities can be delivered, through a SPLAP.

(Source: The "Strategy for sustainable public lighting" section of the Energy Toolbox website http://www.energy-toolbox.vic.gov.au/publiclighting/index)

Case Study 4: Public Lighting Policy, City of Mitcham, South Australia

The City of Mitcham has been working towards a more efficient public lighting network since 1997. In 2000, Council endorsed a "Street Lighting – Energy Efficiency" policy requiring that efficient lamps be used for new developments and spot replacements. Council planners and technical staff are aware of the policy and have been implementing it since 2000. In 2004, nine solar powered lights were erected at traffic control devices in the rural part of the City. Council staff actively promote the issue of energy efficient public lighting to the local government association and the South Australian energy distributor.



Council is also involved in two trials. Ten 50w High Pressure Sodium (HPS) luminaires have been installed in Dudley Avenue, Daw Park. The second component of the trial, of ten 42w Compact Fluoro luminaires are yet to be installed. Performance measurements, in terms of energy efficiency and community acceptance, have not yet been recorded at either site.

For more information contact the Civil Project Engineer at the City of Mitcham on (08) 8372 8131.

Case Study 5: Public Lighting Policy, City of Greater Bendigo, Victoria.

The City of Greater Bendigo is developing a Public Lighting Policy through a Steering Committee comprising representatives from Capital Works, Strategic Planning, Economic Development, Planning and Engineering Services. Origin Energy has provided valuable technical input to the Steering Committee as part of its Climate Care Partnership with the City of Greater Bendigo.

Following consultation with the local developers and Powercor, it is anticipated the Public Lighting Policy will be included in the City's Infrastructure Guidelines and become part of the Council's Planning Scheme. This Policy document is seen as complementary to the development of a Service Level Agreement with Powercor.

For more information contact the Environmental Sustainable Development Officer at the City of Greater Bendigo.

For further examples of sustainable public lighting policies and strategies, see:

a. Adelaide City Council "Council Policy: Lighting Policy" and "Operating Guidelines: Lighting Policy" (2005). Note: Although documents are not available for public viewing, Council has available a Powerpoint presentation of the Lighting Policy. Please contact the Senior Lighting Designer for more information through the switchboard 08 8203 7777.

b. City of Melbourne *Lighting Strategy (2002)* http://www.melbourne.vic.gov.au/rsrc/PDFs/Lightingstrategy.pdf

c. City of Port Philip *Public Lighting Strategy (1999)* http://www.portphillip.vic.gov.au/public_lighting_strategy.html – L4 Note: Council has since developed a new strategy with community consultation and it is past the draft stage, but no document is available to download on web.

d. Bankstown City Council *Bankstown Public Lighting Strategy (2003)* http://www.bankstown.nsw.gov.au/docs/strategies/majorstratdocs.cfm

e. City of Yarra *Draft Public Lighting Policy* (2005) www.yarracity.vic.gov.au/council/meetings/pdf/agenda05/010205pcd/2.3ATT1.pdf Note: Although the Policy available for download indicates it is a draft, it is actually the final version of the Policy that was approved by council.

Step 4: Implement actions

As council progressively implements actions from its SPLAP, keep in mind these points.

- Ensure that responsibilities for SPLAP tasks/actions are built into staff/unit work schedules. Use Tool 5 to help you do this.
- Ensure SPLAP actions are incorporated into council budgets as relevant.
- Progressively build the business case for action within council. The business case for councils is effectively reduced energy and service bills, which can then be used for energy efficient installations and other actions. Getting accurate data to demonstrate greenhouse and financial savings is essential for this.
- CCP councils will be annually quantifying all energy efficient public lighting installations for the CCP National Measures Report, using the ICLEI-A/NZ Quantification Toolkit.
- Continue to identify and actively pursue funding options such as grants, revolving energy funds (REFs), financing facilities that fund initiatives and make loan repayments less than the savings, asset and environment budgets, and partnerships and risk-sharing models[3].

[3] With regard to this last point, remember that the business case for distribution businesses in Australia is lower operations and maintenance costs from new technologies, however there is an initial risk and uncertainty for them to invest in a new technology. To overcome this, they require firmer data on the technologies' performance (which can be developed through trials and working with manufacturers) and/or financial risk-sharing models.

- Regularly identify opportunities for new projects and actions through the SPLAP monitoring and review process.
- Work with other councils and stakeholders to implement actions.
- Ensure political support by keeping councillors up to date.

For CCP councils the effective implementation of the SPLAP and incorporation into council operations and decision-making will be facilitated through CCP program, technical and political support.

Case Study 6: Street Lighting Improvement Program (SLIP), multiple councils, NSW

The South Sydney Regional Organisation of Councils (SSROC) received over $4 million from the DEUS NSW Energy Savings Fund to improve the energy efficiency of street lights in the 29 local government areas. The Program brings together SSROC and EnergyAustralia to improve the energy efficiency of 85% of the street lights in their region. Different technologies will be used for main road and residential lighting.

For more information, visit the SSROC website (http://www.ssroc.nsw.gov.au/projectsissues/streetlighting.cfm), or contact the Program Manager, Graham Mawer, Next Energy on 02 9251 4072 or email gmawer@nextenergy.com.au

Step 5: Review and re-strategise

Through steps 1 to 4, councils will have developed many of the necessary policies, systems and processes for effective implementation of sustainable public lighting. Once council has implemented parts of the SPLAP and developed public lighting actions, it is important to monitor and periodically review its progress. Council will have determined the monitoring and review process in the SPLAP. This should involve a re-assessment of council's situation (ie a repeat of step 1), re-strategising (ie a repeat of step 3), and ensuring actions are still aligned with sustainable public lighting goals (as set out in step 2). To ensure that the SPLAP is being implemented effectively and incorporated into the culture of the council, the review should be conducted by council's workplace public lighting working group, environmental team, or other equivalent body.

Summing up

In this chapter we have overviewed ICLEI-A/NZ's approach to sustainable public lighting. By taking a step-by-step approach and keeping in mind the underlying principles for strategic action, council can produce and implement a targeted sustainable public lighting action plan that builds it's capacity in the three foundations – Internal Strategy & Support, Data & Technology, and External Relationships. Through this council can effectively minimise risks, effectively tackle barriers, leverage opportunities, and maximise potential benefits.

During the first three steps of the process – assessing the current situation, setting priorities, and action planning – council may find it's primary focus is on the first two foundations, and to a lesser extent External Relationships. However, as part of the action planning and implementation steps, it will be important to be aware of the sustainable public lighting opportunities council can leverage within the public lighting market and its regulation. These opportunities are outlined in the next chapter.

Chapter 3. PUBLIC LIGHTING MARKET & REGULATORY STRUCTURE

As discussed in the Introduction, a common misconception by local government is that it is not in a position to influence public lighting, due largely to price disincentives and the distribution of roles and responsibilities between councils and other stakeholders. On the contrary, the current and emerging market and regulatory structure contains many opportunities for local government to influence public lighting. Keeping abreast of technological and market developments will help council to identify and individually and/or regionally leverage opportunities as they arise, as part of council's strategic approach outlined in Chapter 2.

To help council start to navigate the public lighting landscape and target their action planning, this chapter sets out the main areas of opportunities for local government. Depending on council's exisiting capacity, some of the suggested actions can be included in council's SPLAP, whilst others can be added to it later. This chapter is designed to be used in conjunction with Tool 6, the Action Checklist.

The chapter initially explores opportunities at the national level under the Australian Standards. It then focusses on the South Australian context under Full Retail Contestability, and provides an introduction to the market, relevant changes, and a history of public lighting in the state. Within this context, the chapter explores opportunities for renewable energy purchases within electricity contracts; energy efficient lighting installations and other opportunities under current service tariffs and standards; potential energy efficient provisions in cost-sharing arrangements with the road authority DTEI, Transport Division; and growing support for greenhouse actions by the Government of South Australia through it's policies and plans.

Australian Street Lighting Standards (AS 1158)

(Source: Adapted from http://www.energy-toolbox.vic.gov.au/publiclighting/index.php?option=displaypage&Itemid=207&op=page#analysis)

AS/NZS 1158 is the standard that defines the levels of illumination required in public areas and specifies the performance and installation requirements for different categories of road. Recent amendments to AS/NZS 1158 also prescribe limitations to the amount of upwards light that can be emitted by a luminaire. The Standard is set out in a number of sections according to the two broad categories of road lighting:

1. **Category V lighting** – applicable to roads where the visual requirements of motorists are dominant, such as arterial roads and freeways. The Standard identifies five sub-categories with different illumination requirements.
2. **Category P lighting** – deals with lighting for areas intended primarily for pedestrian use or for mixed pedestrian, vehicle and bicycle use. Its primary purpose is to facilitate the safe movement of pedestrians at night. This includes lighting for minor (collector and local) roads and outdoor public areas (eg shopping precincts). The Standard provides specifications for five lighting sub-categories, which have different illumination requirements according to the degree of pedestrian, vehicle or cyclist activity, the risk of crime and the need to enhance the prestige of the locality.

Generally, councils are only responsible for category P (pedestrian) lighting. Category V lighting generally falls under the responsibility of transport authorities. There are supplementary lighting requirements for pedestrian crossings and computer aided lighting design. Adherence to the Standards is not formally legislated through regulatory frameworks.

There are several sustainable public lighting opportunities under the Australian Standards. These include:

- **Deciding if an area will be lit.** The Australian Standards (and State public lighting regulations) only apply to areas council chooses to light; there is nothing in either document that regulates what should and should not be lit. So council can reduce energy consumption by choosing not to light particular areas. This means that council has a responsibility (both socially and environmentally) to think about whether lights are needed or beneficial in particular areas
- **Choosing the category of lighting for their public spaces and roads.** Each public place that is lit is assigned a category that determines the level of illumination that should be provided. The lighting designer will then determine pole heights and spacings for that category of road, based on the light output characteristics of the luminaire, the light output of the lamp, and the maintenance factor. This responsibility gives council the opportunity to choose a category that reduces the number, energy consumption and/or operating hours of lights while meeting the public's lighting needs (safety, etc)
- **Designating a sub category of lighting for each of these areas.** Lighting designers do not need to set the sub-category (and therefore brightness level) of lighting required – it is a council responsibility to select the appropriate category. This means that council is free to reduce lighting levels in an area, or even to change the levels needed after a specific time, as long as the sub-category is selected appropriately using the Australian Standards.
- **Ensuring the installed lights complies with the Standards.** The Standards are designed to provide technical parameters for public areas based on the primary public use of that area. An energy audit can help demonstrate compliance and identify areas that are overlit or inappropriately lit.

For more information, the AS/NZS1158 is available from Standards Australia at http://www.standards.com.au. Training courses on the AS1158 are offered by Australian Standards on an infrequent basis. Councils can contact the Training Department on 1300 727 444 for more information.

Public lighting in South Australia

Beyond the Australian Standards, the majority of opportunities for sustainable public lighting occur at the state level. In South Australia, local governments have undergone significant changes in the way they manage the delivery of public lighting services to the community. This has occurred primarily as a consequence of the deregulation of the electricity market, otherwise known as Full Retail Contestability

(FRC), which changed the role of local government in the public lighting market. Key regulatory changes, changes in ownership, projects, conferences and meetings since the late 1990s associated with FRC and sustainable public lighting efforts more broadly are presented in Box 4.

Box 4: A history of public lighting in South Australia

1998	The LGA formed a Public Lighting Steering Committee (PLSC) to review issues and progress local government options in preparing for Full Retail Contestability.
1998	Electricity Trust of South Australia (ETSA) replaced most 40W fluorescent lights with 80W Mercury Vapour (the majority) and some 50W HPS.
1999-2000	Government sells ETSA Power (retailer) and ETSA Utilities (distributer). Public lighting assets included in sale.
2000	*Public Street Lighting Tarrifs: Final Report* published by SA Independent Industry Regulator (SAIIR).
2000-01	Public Lighting Project, funded by the Local Government Research & Development Scheme (LGR&DS) and delivered by the LGA, investigated the street lighting price regime and service standards, and researched a strategy for negotiations with utilities and submissions to the SAIIRs Inquiry.
February 2002	Energy SA hosted a Streetlighting Forum.
January 2003	Full Retail Contestability (FRC) of the electricity market.
August 2003	Energy SA hosted a second Streetlighting Forum and Workshop.
December 2004	ICLEI-A/NZ "Seize the agenda: implementing greenhouse action" forum in Adelaide, with session on Sustainable Public Lighting.
May 2005	The former Office of Sustainability (OoS) organised multi-stakeholder meeting in response to a letter written by Cr Carol Bouwens from the City of Marion to the Minister for the Environment and Heritage regarding sustainable public lighting.
2005-06	SA Sustainable Public Lighting Guide project funded by the LGR&DS; series of workshops held with CCP councils and meetings with public lighting stakeholders.
2006	Announcement of proposed Climate Change and Greenhouse Emissions Reduction Bill and finalisation of Draft SA Greenhouse Strategy.
2006-2007	CCP Plus Sustainable Public Lighting Advancing Action Project rolled out in SA.

(Sources: Relevant references are found in Chapter 4, Further Resources.)

Public lighting has not figured prominently in FRC documentation and debate, and when it has, it has been couched largely in financial terms. This, together with confusion about how public lighting works and ongoing negotiations between local government and stakeholders, has slowed progress on implementing sustainable public lighting in SA. Many of these developments and negotiations, however, have

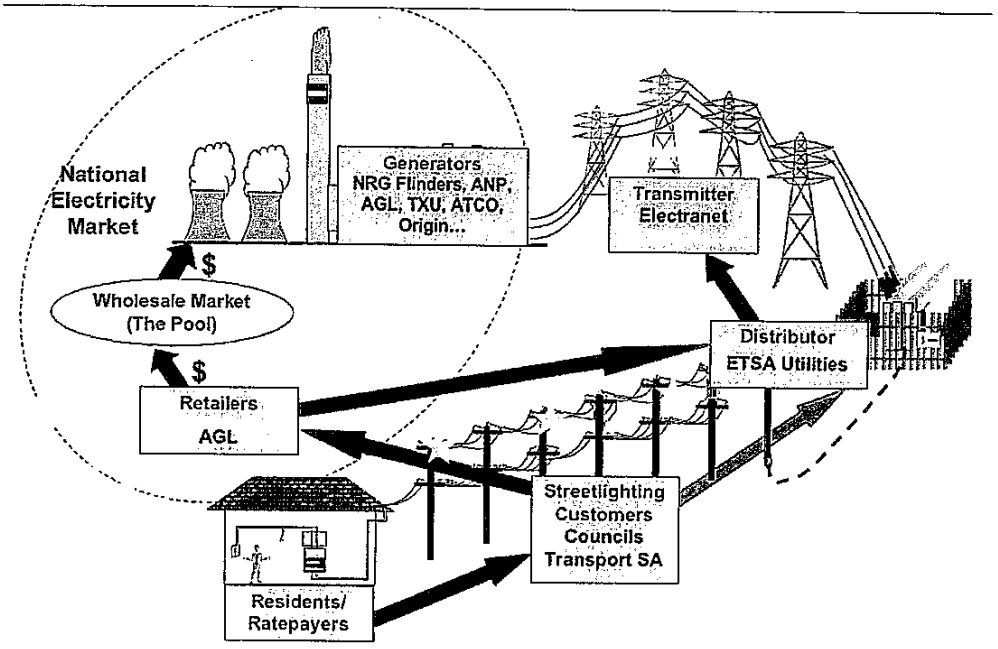
direct or indirect implications and opportunities for sustainable public lighting. Before turning to these opportunities, the market and regulatory structure under FRC is briefly explained.

Full Retail Contestability (FRC) in South Australia

FRC commenced in the South Australian electricity market on 1 January 2003. It involved the sale in December 1999/January 2000 by the South Australian government of ETSA Power (retailer) to AGL (who renamed it AGL SA Pty Ltd), and of ETSA Utilities (distributor or distribution business).

The flow of electricity and money in the public lighting market under FRC in SA is represented in Figure 6. Electricity is generated at power stations by multiple generators and then transmitted through high voltage networks by ElectraNet, whereupon the distribution business ETSA Utilities distributes the energy through the unmetered street lighting network to customers (councils). Financially, councils use funding from ratepayers to purchase electricity from the retailer (currently AGL SA Pty Ltd), and public lighting services (including installment, operation, maintenance, and replacement of assets) to ETSA Utilities. Distribution and transmission services are included in these bills. In addition, some councils pay DTEI, Transport Division for part of the costs of public lighting services and energy of certain Category V (vehicular) lighting (not included in Figure 6).

Figure 6: The South Australian public lighting market under full retail contestability



(Source: Presentation by the former Energy SA to the Metropolitan Adelaide CCP Alliance "Greenhouse friendly street lighting workshop", 2003. Note the former Transport SA is now the Department of Transport, Energy and Infrastructure, Transport Division).

FRC has had several public lighting implications for councils, such as:

- Billing arrangements. These are described in Figure 6 and relevant opportunities are explained later in this chapter
- Change in tariffs and service standards. Implications and opportunities for this are described later in this chapter
- A 'light handed' approach to price regulation. Public lighting services are an excluded distribution service, meaning councils must negotiate directly with ETSA Utilities on prices and services, and ESCOSA will only step in to arbitrate in the event of a dispute
- Ownership of the majority of local government assets was vested in ETSA Utilities as part of the sale of ETSA by the State Government in order to resolve ambiguity and disputes regarding ownership between local government, the then Transport SA, and ETSA. This has meant a capital loss for councils and lesser control of their public lighting stock
- A consequential change in roles and relationships between councils, the distributor, retailer and the Local Government Association (LGA) (to those described in Chapter 4). In the context of FRC, sustainable public lighting outcomes rely heavily on productive negotiations and partnerships with the distributor. Councils should use their interactions with the distributor to strengthen the distributor-customer relationship for purposes such as energy efficient trials and access to information.

South Australian opportunities

The following three sections outline the key sustainable public lighting opportunities under FRC, whilst the final section explores broader greenhouse opportunities that council can leverage for public lighting.

Electricity: bills, regulation and joint contracts

The first main public lighting cost and area of opportunity for councils is purchasing the electricity to power the lights. Electricity bills are determined through estimations of energy use based on the Public Lighting Load Table (which specifies the energy use of different types of lamps) and the Public Lighting Inventory Table (which lists all lights in SA by type and customer). In a small number of cases electricity use is metered (for more information see the Metered tariff type in Tables 5 and 6).

In 2002 the state government offered councils the option of joining in with their tender specification for (the then) Transport SA's unmetered public lighting. This resulted in joint state and local government retail electricity contracts with AGL SA Pty Ltd from 2003 until 31 December 2006.

The next joint contract is currently being negotiated on behalf of the State Procurement Board by Contract Services in the Department of Administrative and Information Services (DAIS). Councils have been consulted on whether to participate in the new contract and kept informed of the procurement process developments

through status reports from Local Government Corporate Services (LGCS) and via the Public Lighting Steering Committee (PLSC).

The Request for Tender involves several 'parcels', including:

- Unmetered
    - 12 hour – street lighting
    - 24 hour – traffic signals
- Metered sites
    - 750 Mw pa
    - 160–750 Mw pa
    - <160 Mw pa
    - School and TAFE (state only)

The resultant contract/s will be finalised by the end of 2006 and last up to five years, depending on the outcomes of the contract negotiations.

Sustainable public lighting implications and opportunities for local government from the new contract include:

- Green Power purchases. The new agreement aims to improve Green Power supply options. Council should consider its desired amount of Green Power and how much it wants to spend
- Improved electricity pricing. Council can then use savings for Green Power purchases or to free up budget expenditure for other sustainable public lighting work
- Simpler administration and improved data management. For example, the process may result in consolidated electronic invoicing and reporting.

For more information on the Request for Tender negotiations, please contact the Project Coordinator at Local Government Corporate Services on 08 8223 8540.

Service charges and standards

In addition to electricity charges, councils either pay for or perform parts or all of the installation, operation, maintenance and replacement of street lights. For any given area of street lighting, councils choose from four public lighting tariff options, each with differing payments, distribution of responsibilities, and asset ownership. These differences are summarised in Table 5.

Public lighting services are an excluded service under the Electricity Distribution Price Determination (EDPD), meaning ETSA Utilities set the Standard, CLER (Customers Lantern Equipment Rate), and Energy only tariffs, and advise councils of these tariffs. Local government can object to or negotiate the tariffs and service standards. These tariffs are 'lightly regulated' by ESCOSA, meaning ESCOSA will only become involved and arbitrate in the event of an unresolvable dispute over the fairness and reasonability of the tariff. As councils provide their own public lighting services under the Metered option, this process is not applicable.

Table 5: Public lighting tariff options in South Australia

	Streetlighting Use of System (SLUoS)			
	Standard	CLER (Customers Lantern Equipment Rate)	Energy only	Metered
Payment to	ETSA Utilities	ETSA Utilities	ETSA Utilities	N/A (as council manages all aspects of public lighting services)
Payment covers	Operation, maintenance, replacement and installation of public lights on standard brackets	Lamp replacements only, however some conditions apply.	Administrative costs and record keeping	
Council responsible for	Determining road category, providing design brief.	Installation, some maintenance, operation, and replacement	Installation, maintenance, operation, and replacement	Installation, maintenance, operation, and replacement
Asset ownership	ETSA Utilities	Council	Council	Council
How tariff is determined	Different tariff for each light type according to their return of asset and service costs	Different tariff for each light type according to their maintenance and administration costs	Derived from costs to maintain records and administration costs	N/A (as council manages all aspects of public lighting services)
Comments	Most lights in a council's inventory fall under this category. The material and labour cost to install luminaires is currently included in the tariff, and is recovered over the service life of the luminaire rather than as an "up front" charge.	Comprises 13.5% of lighting. Is lower in price than Standard because no capital cost included, and a reduced level of maintenance. Must be of a lamp type that appears on the Load Table and is approved for use on ETSA Utilities' Unmetered Network	ETSA Utilities has no responsibility beyond the point of connection to the ETSA Network. However, ETSA Utilities maintains the records of Energy Only lights and advises the retailer monthly.	Electricity consumption is metered.

(Sources: Based on information from ETSA Utilities' website, and from ETSA Utilities).

Installing energy efficient lighting

There are a range of financial and risk sharing models under the current tariff and service arrangements that councils can use (or in some cases potentially adapt) to install energy efficient lighting. These are outlined in Table 6.

For options using the Standard, Modified Standard, CLER and Energy Only tariffs), the light needs to be included on the Load Table for the purposes of charging electricity retail costs.

Table 6: Energy efficient lighting installation options

	Distributor pays upfront, council pays over time	Council pays upfront, and shares part or all of ongoing costs with ETSA Utilities			Council pays all upfront and ongoing costs
Relevant tariff/s	Standard tariff	Modified Standard tariff ("Full Cost recovery Tariff" or "SLUoS – ETSA Utilities Council Lights")	CLER	Energy Only	Metered tariff
Process	Council asks ETSA Utilities to install from ETSA Utilities' standard range	Council approaches ETSA Utilities to discuss if this might be appropriate and possible			Council works completely independently
Light options	Standard range of luminaires and columns held on ETSA Utilities' stock.	Currently MV 50, MV 80 and HPS 50.	Must appear on Load Table, and be approved for use on Network by ETSA Utilities.	Council choice (currently 50 HPS and 100 HPS).	Council choice (ie can include lights not on Load Table), provided meters are installed to measure its energy use
Financial model	Currently, ETSA Utilities installs and pays upfront capital of luminaire and labour to install luminaire, council pays this over time through SLUoS	ETSA Utilities installs and council pays the upfront capital costs, and pays a lower SLUoS.	Council installs and owns the asset, ETSA Utilities changes lamps only (where Standard ETSA Utilities lamps are used.	Council funded	Council finances completely (installation and all ongoing costs).
Advantages	Lowest risk to council, no up front capital required from council for installation of luminaries. Proposed trials of T5s – see Case Study 7.	Council can increase capital expenditure and reduce ongoing SLUoS and operating expenditure.	Increased choice of luminaire	Not known	Greatest freedom of choice as not reliant on Load Table. Council can maintain and replace for energy efficiency
Disadvantages	Slow process due to testing and trailing light performance and cost.	Model has not been used before. Up front cost involved.	Some councils find council-owned assets uneconomical. Can be difficult to use this tariff	Option has only been used in one council and for a limited number of light types.	Council bears all risk and cost. Metering costs (installation and ongoing).

(Sources: Based on information from ETSA Utilities' website, and from ETSA Utilities).

Case Study 7: T5 Fluorescent Trials with ETSA, multiple councils, SA

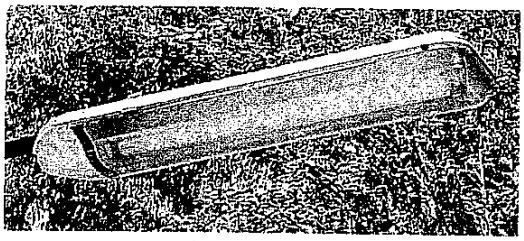
ETSA Utilities intends to trial approximately 1,000 T5 fluorescent lights in targeted Council areas across metropolitan Adelaide. These lights may replace certain 40W fluorescent lights. ETSA Utilities have developed a Street Light Use of System (SLUoS) tariff for the T5 lights and added the lamp type to the Load Table. Asset performance of the T5s will be measured, including lumen output, the ability to start in cold conditions, and monitoring failures.

ETSA Utilities will continue to monitor new technologies including the T5 and evaluate suitable luminaires as they become available. ETSA Utilities has a significant number of older fluorescent luminaires targeted for replacement. Once T5's and other trials are completed, ETSA Utilities will determine which luminaires could potentially be used to replace the 40W fluorescent luminaires. ETSA Utilities is also currently trialling 42W CFLs in the City of Mitcham and the District Council of Mount Barker (using Standard and CLER tariff respectively), and may do some further trials.

For more information, contact the Asset Manager Public Lighting, ETSA Utilities (details in Chapter 5, Further Resources).

Case Study 8: T5 trial in partnership with energy retailer, multiple councils, NSW

A number of councils within the energy retailer, Integral Energy, service area requested energy efficient street lights. Integral Energy has been using and trialling two types of T5 fluorescent light globes (2x 24W and 2x 14W T5's) since 2003 with over 4000 lights installed to date. Blacktown City Council has been involved with this move towards greener street lighting, and trialled 1000 new T5 14 watt fluorescent light globes which require 69% less energy than conventional 80 watt Mercury Vapour light globes. During the initial 12-month trial period, only 2-3 lights failed and Blacktown City Council received no complaints from the residents about the lights.



For more information contact Bill Harrigan at Integral Energy on 02 4255 4021.

Case Study 9: T5 trial with distributor, Banyule City Council, Victoria

Banyule City Council has been working closely with technical personnel from distribution business AGL Electricity to make their street lights more efficient. Collaboratively, in 2004, they have trialled four different types of efficient lights and in 2007/08 as part of a batch replacement will install T5 lights as a regular replacement for their older, less efficient technologies. T5 lights are a new generation of fluorescent with a total wattage per light fitting of 28W.

By providing several opportunities for local residents to have input into the process there is a very high level of support locally for a wider refit program. Nine other councils in the Northern Alliance for Greenhouse Action (NAGA) regional group and TXU Electricity have become involved in a Public Lighting Action Program to develop a regional SPLAP, so that it will be a small step to expand this replacement program in the future.

For further information, contact the Greenhouse Officer at Banyule City Council (03) 9457 9825 or Paul Brown at the Shire of Nillumbik (03) 9433 3219.

Case Study 10: Council helps other authorities improve public lighting, Walsall Council, United Kingdom

Walsall Council is helping local authorities across Britain upgrade their public lighting by sharing the experience gained in its innovative and award-winning partnership with Amey Highways. The partnership involves replacing Walsall's 26,000 aging public lights with new greener versions, as part of the council's public lighting Private Finance Initiative (PFI) contract.

Walsall's public lighting PFI is now a path finder and test bed for this type of public private partnership – the first to follow revised Government procedures for local authority PFI's. For further information see http://www.walsall.gov.uk/index/transport_and_streets/road_and_pathway_maintenance/street_lighting.htm

Case Study 11: Bulk replacement in partnership with distribution business, Coffs Harbour City Council, NSW

In partnership with Country Energy and NSW's former energy department, the Sustainable Energy Development Authority (SEDA), council conducted a full streetlight audit. The audit formed the basis of a major street lighting overhaul in Coffs Harbour over a few years. All of Coffs Harbour City Council's mercury vapour street lights (3,500 in the city) have been replaced with high pressure sodium (HPS) lights. All lights were replaced in the 2004/2005 financial year. Coffs Harbour is the first council in Australia to introduce energy-efficient street lighting across its entire area. This will allow council to reduce it's CO_2e emissions by 35%, or 650 tonnes per annum, and made savings of $88,500 in the first year.

The replacement followed trials of energy efficient low pressure and high pressure sodium (HPS) street lighting in two residential areas. The trials were designed to firstly, assess the suitability of energy efficient street lighting and secondly, to assess the community acceptance of energy efficient lighting. Results indicated that the main type of energy efficient street lighting under consideration, HPS lamps, were suitable for the purpose and the lighting produced was acceptable to the community.

Community surveys, though limited to the trial area, showed a high level of acceptance for HPS street lights. Country Energy funded the new capital investment (valued at about $1.25 million); council is funding the payback of the residual capital on the existing lights (to the value of about $400,000) over five years. Financial modelling shows that cost savings of $691,000 will be achieved in the first 10 years.

For more information contact the Manager of Environmental Services at Coffs Harbour City Council, through their switchboard 02 6648 4000.

Other sustainable public lighting opportunities

Other sustainable public lighting opportunities besides replacing existing stock with energy efficient lighting (described above) include:

- Engaging the community for maintenance. Councils can encourage residents to report faults such as day burners (lights on during the day) and drifting (lights switching on/off times changing gradually)
- Using financial savings for budget bids. Councils can put up budget bids to use their financial savings from the reduced energy and service costs from energy efficient lighting for further sustainable public lighting initiatives
- Improving data management. Councils can access information about their public lighting assets from the Inventory Table, purchase more detailed GIS information from ETSA Utilities, and/or undertake an audit of their street lighting assets and advise the distributor of any amendments required [see Tool 4: How to do an audit]. Accurate asset information can save council money on its electricity and public lighting service bills (which can be invested in sustainable public lighting), improve data management, and enable council to identify energy efficient lighting opportunities.

Case Study 11: Service Level Agreement, Central Victorian Greenhouse Alliance, Victoria

A model service level agreement – a variation to the public lighting code negotiated between a public lighting customer and their local distribution business(es) – has been developed by the Central Victorian Greenhouse Alliance (CVGA) under the Sustainability Victoria Sustainable Public Lighting Initiative. The service level agreement is designed to help Victorian councils to clearly define a code of practice between a distribution business and councils, outline the rights, roles and responsibilities of the parties concerned for the provision of public lighting services, and build on the standards outlined in the Victorian Public Lighting Code.

The model service level agreement is available here http://www.energy-toolbox.vic.gov.au/publiclighting/index.php?option=displaypage&Itemid=215&op=page. For further information contact Terry White, CVGA, email: terryw@vic.chariot.net.au

For more information on tariffs and service levels:

- See ESCOSA's website http://www.escosa.sa.gov.au/site/page.cfm?u=163 and http://www.escosa.sa.gov.au/site/page.cfm?u=47
- See ETSA Utilities' website http://www.etsautilities.com.au/content_page_with_downloads.jsp?xcid=138
- Contact Local Government Corporate Services (LGCS) (details in Chapter 4 under Stakeholders section)
- Read the historical and background documents referenced in Chapter 4, Further Resources.

Cost-sharing arrangements with DTEI, Transport Division

Whilst local government is responsible for category P (pedestrian) lighting, in some situations they also share costs for the category V (vehicular) lighting managed by the road authority, DTEI, Transport Division. This happens under Section 26 of the *Highways Act 2000*, where a road gazetted under section 26 will have vehicular

needs managed by DTEI, Transport Division, whilst council manages the pedestrian needs. The Commissioner may choose to improve or install lighting on any road and pass on 50% of the cost (for energy and SLUoS) to council if there are benefits to pedestrians and hence council. Due to historical anomalies and disagreement about the distribution of responsibilities and costs between the councils and the DTEI, the Section 26 Committee is currently (at the time of writing, October 2006) developing a Code to clarify the operational responsibilities between the two parties.

Sustainable public lighting opportunities are minimal due to limitations in current category V technologies that are energy efficient, affordable, economic, and meet the Australian Standards. Council cost-shared category V lighting is hence a low priority for immediate action. However, as councils improve their category P lighting they can work towards improvements on the lighting they share costs for by:

- Ensuring energy efficient lighting provisions are included in the consultative draft Code when it is circulated in ~ November 2006, through either the LGA or a council representative on the Committee
- Asking DTEI to light a section of road for which they pay some of the costs with energy efficient lighting, or light it themselves.

For more information, contact the Local Government Association (details in Chapter 4).

South Australian greenhouse policy and action

In addition to the direct public lighting policies and opportunities outlined above, the Government of South Australia has shown leadership on more general greenhouse issues that have implications for councils in regards to sustainable public lighting. The leadership role is evident through the Premier recently assuming the role of Minister for Climate Change, and through several commitments as expressed in *South Australia's Strategic Plan* and *Draft Greenhouse Strategy.* These include:

- Achieving the Kyoto target during the first commitment period (2008-12)
- Setting a target to source 20% of electricity from renewable energy by 2014, and lead Australia in wind and solar power generation within a decade
- Acknowledging the leadership role of local government in engaging local businesses and residents and supporting local government in targeted action in metropolitan and regional industry strategies
- Promoting climate-smart businesses responsive to climate-related market opportunities
- Expanding the use of metering/billing systems to improve information feedback
- An increase in energy technology research and development.

In addition, the Government is currently working on a Climate Change and Greenhouse Emissions Reduction Bill that will set a target for cutting state greenhouse gas emissions to 60 per cent below 1990 levels by 2050; and set up a voluntary carbon offset program for business and government.

State policy and plans have two main implications and opportunities for sustainable public lighting. The first is that councils can advocate for greater state commitment to and funding for sustainable public lighting by making submissions to the Draft SA Greenhouse Action Plan, and other strategies and processes as they arise. The draft bill also proposes the establishment of a Premier's Climate Change Council in which local government representation will be sought.

For more information see http://www.climatechange.sa.gov.au/ and http://www.stateplan.sa.gov.au/

Summing up

In this chapter we have overviewed sustainable public lighting opportunities for councils within the Australian and South Australian public lighting market and its regulation. Councils can use this information to prioritise and coordinate their work around meeting the Australian Standards, negotiating renewable energy options as part of electricity contracts, installing energy efficient lighting under the tariff structure, making submissions to relevant state policies, and taking advantage of other current and upcoming issues. As well as these opportunities, there will be other emerging opportunities (technical, regulatory, political and/or policy) that council should keep abreast of. The next chapter contains useful resources for staying current with these developments.

Chapter 4. FURTHER RESOURCES

As explained in the Introduction, this guide contains information, advice, templates and tools designed for council to use to build its capacity to manage its public lighting in a sustainable manner. As council progresses along each step of the process, it will be important to keep abreast of new technologies, market opportunities, and what other councils are doing. It will also be strategic to contact various public lighting stakeholders and make use of available tools and resources.

In view of this need, this chapter details where to find further information in support of this guide. It contains: lists of relevant public lighting tools and their applications; case studies and trials in Australia and internationally; and funding opportunities. The chapter also provides an outline of key public lighting stakeholders, their roles, and potential ways local government can interact with them in pursuing sustainable public lighting.

General Public Lighting Resource

Local Government Energy Toolbox – Sustainable Public Lighting

The Toolbox provides:

- Guidance in getting started with strategies and action plans
- Current information about the trials of different technologies and information sharing projects supported by the Sustainable Public Lighting Initiative (SPLI) in Victoria
- The various standards and regulations that govern public lighting in Victoria
- Tools, resources, templates and guidelines to help implement sustainable public lighting
- Information about the different technologies available
- Lists of distribution businesses, suppliers, contacts and other web based resources
- News and events.

The Toolbox was developed originally for Victorian local governments, but much of the content is useful for councils elsewhere in Australia.

http://www.energy-toolbox.vic.gov.au/publiclighting/

Stakeholders

As mentioned in Chapter 1, local government works with, and is impacted by, a wide range of stakeholders in its public lighting work. Tables 7 and 8 briefly explain the roles and responsibilities of the multiple public lighting stakeholders in Australia and South Australia respectively. They also suggest ways to engage each stakeholder and where council can find further information. For a useful explanation of the specific roles and motivations of each of the stakeholders, read *Public Lighting in Australia – Energy Efficiency Challenges and Opportunities* (Genesis Automation *et al.* 2006).

Table 7: National stakeholders (contact details are correct as of October 2006)

Stakeholder	Role in public lighting	How local government can interact with this stakeholder	For more information
Joint Technical Committee LG-002 (Australian Standards Committee)	Prepares standards for the lighting of roads and related public places ie the AS 1158 series (this is explained in Chapter 3, Market & Regulatory Structure).	Local government concerns and needs regarding the AS 1158 series can be communicated to the Committee through the Australian Local Government Association (ALGA).	https://committees.standards.org.au/COMMITTEES/LG-002/
Department of the Environment and Heritage, Australian Greenhouse Office (DEH, AGO)	Delivers the majority of programmes under the Australian Government's climate change strategy, and works with key stakeholders to improve the energy efficiency of public lighting. For major roads, the Ministerial Council on Energy in December 2005 released the 10-year *Greenlight Australia* strategy to reduce the energy consumption of lighting. As part of this strategy, national and all state and territory governments are considering developing and implementing energy performance standards for main roads lighting. For minor roads, the DEH's work is undertaken in partnership with local government, particularly ICLEI-A/NZ. The Cities for Climate Protection (CCP) Australia Program is funded by the Australian Government.	Currently working on a range of tools and case studies that will assist local government to effectively reduce their greenhouse emissions from public lighting. It is anticipated these will be released later in 2006.	Assistant Director, Community Partnerships Team on 02 6274 1022 or see http://www.greenhouse.gov.au Also see the Publications section, for summaries of DEH/AGO publications and tools. A technical report discussing a design energy limit for main roads was released in 2005. See http://www.energyrating.gov.au for a copy. In 2006 the AGO released *Public Lighting in Australia – Energy Efficiency Challenges and Opportunities (Genesis et al, 2006).*
Regional groupings of councils	Regionally pursue sustainable public lighting.	Network and share information.	See case studies throughout this guide.
ICLEI-A/NZ	Builds capacity of local governments to act on greenhouse issues through the Cities for Climate Protection (CCP) program. As public lighting is a major issue for local government, ICLEI-A/NZ has developed specific resources and	CCP Plus councils can apply to participate in a Sustainable Public Lighting AAP, when offered in the relevant state; whilst other CCP councils can access ICLEI-A/NZ's online materials and resources,	http://www.iclei.org/ccp-au/public-lighting PublicLighting-anz@iclei.org

Stakeholder	Role in public lighting	How local government can interact with this stakeholder	For more information
	programs in this area, such as this guide, the Victorian Sustainable Public Lighting Action Plan Guidelines, and CCP Plus Sustainable Public Lighting Advancing Action Projects (AAP).	telephone/email liaison, brokering of information, and invitations to events and network meetings. Non-CCP councils can use all publicly available online materials to manage their public lighting, including this guide.	
Public lighting suppliers	Develops and provides public lighting technologies. Assists councils with conducting trials of new lighting technologies.	Establish or enhance relationships to communicate customer demand and specifications for new and existing energy efficient technologies. Encourage manufacturers to produce stronger evidence of the performance of energy efficient technologies that in particular ensures distributor confidence. Approach suppliers as a regional grouping to bulk purchase energy efficient technologies.	The following suppliers have been used in energy efficient public lighting trials. This is not an exhaustive list. Pierlite – www.pierlite.com.au Sylvania – www.sla.net.au Active Reactor – www.fts.com.au Versalux – www.versalux.com.au Artcraft – www.artcraftpl.com.au Vicpole – www.vicpole.com.au
Australian Local Government Association (ALGA)	Advocates national level climate change and public lighting issues on behalf of councils. Puts interested councils in touch with each other.	Approach Assistant Director, Environmental Policy. Potential to advocate for and progress sustainable public lighting at the national level.	http://www.alga.asn.au Angela Shepard, Assistant Director, Environment Policy, and NRM Local Government Facilitator 02 6122 9433 angela.shepherd@alga.asn.au
Illuminating Engineering Society (IES): The Lighting Society	Provides information (publications, technical meetings and conferences) related to developments in road lighting; sports lighting; daylight and sun effects; environmental impact of lighting, and emergency evacuation lighting. Represents lighting designers on Committee LG-002 (see that entry for details).	Council staff with public lighting responsibilities can become members and access information and feed suggestions into the AS 1158 Series of Road Lighting Standards. Use the IES for networking. Access Lighting Engineers with experience in Public Lighting Design.	http://www.iesanz.org

Stakeholder	Role in public lighting	How local government can interact with this stakeholder	For more information
Lighting Council Australia	Represents the Australian lighting industry to policy-makers and other key stakeholders, influences relevant performance, safety and environmental standards, and advises on lighting issues.	Use their Technical Committee's analysis of technical information.	http://www.lightingcouncil.com
The Energy Networks Association Ltd	Represents distribution businesses and lobbies on government policy and regulation. Minimal public lighting role.	If needed, councils can communicate with the ENA through the Australian Local Government Association (ALGA).	http://www.ena.asn.au
The Astronomical Society of Australia	Educates society on the effect of inappropriate lighting on the ability to see the night sky. Provides information and support for people and organizations with astronomical interests affected by inappropriate lighting. Maintains a list of 'designated optical observatories' of research, educational or community value worthy of protection from obtrusive lighting.	Seek expert advice from the ASA's Lighting Consultant. Use ASA information on 'designated optical observatories'	Web site http://asa.astronomy.org.au/ ASA Council contact information http://asa.astronomy.org.au/contact.html Lighting Consultant and Representative on relevant Australian Standards committees – Reg Wilson FIES - regrw@tpg.com.au

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Table 8: South Australian stakeholders (contact details are correct as of October 2006)

	Role in public lighting	How local government can interact with this stakeholder	For more information
ETSA Utilities	Delivers electricity from the generators through the network to point of use, and bill retailers for use of the electricity distribution network. Manages ETSA owned lamps, poles, columns and wires. Maintains a Lighting Asset record and carries out asset audits on a regular basis. Trials energy efficient installations within other commercial and operational limitations. Determines the SLUoS tariffs and billing customers for services provided. Provision, installation and maintenance of security lighting. Advises retailer of number and types of lamps per council, held in ETSA's inventory. Advises ESCOSA if they add new lamp types to the Load Table. Replaces failed lamps. Maintains an asset register of council owned, Energy only lights.	On an individual council basis, such as through negotiating a Service Level Agreement, obtaining asset data, and approaching for trials of energy efficient lamps and partnership projects. Align with other councils to regionally approach for a bulk replacement and trials using energy efficient lighting. Collectively negotiate through the LGA/LGCS, PLSC, and potentially the CEO-Mayors forum. Indirectly influence through the regulatory structure and government policies (*e.g.* through the SA Greenhouse Strategy, and Ministers for Local Government, Environment and Energy). Seek or provide funding to support the cost of installation of energy efficient lighting.	http://www.etsautilities.com.au/content_page_with_downloads.jsp?xcid=138 Martin Bellamy, Asset Manager Public Lighting 08 8404 4127 bellamy.martin@etsa.com.au
Local Government Association of South Australia (LGASA)	Through the LGA Public Lighting Steering Committee, provides a forum for advocacy and representation on public lighting issues. This includes PLEC, across government contracts for supply of electricity, and where required, negotiations with ESTA Utilities (and where required ESCOSA) regarding public lighting tariffs (SLoUS and NoUS). Their R&D Scheme funds public lighting studies.	Through the Manager Finance & Infrastructure LGA. (See also the Public Lighting Steering Committee entry).	http://www.lga.sa.gov.au can be searched for public lighting related circulars, media releases, projects and reports. David Hitchcock, Manager – Finance & Infrastructure 08 8224 2052 david.hitchcock@lga.sa.gov.au

	Role in public lighting	How local government can interact with this stakeholder	For more information
Essential Services Commission of South Australia (ESCOSA)	As Metrology Coordinator, administers and approves any changes to the SA metrology procedures. These procedures cover the "metering installation" requirements for public lighting. Approves the public lighting Load Table and Inventory Tables. Provides administrative support to the Power Line Environment Committee (PLEC). Regulates the price charged by electricity retailers to SA standing contract electricity customers. Arbitrates in the event of a dispute between customers and the distribution business over SLUoS or CLER tariffs.	Obtain clarification of any regulatory aspects of public lighting.	http://www.escosa.sa.gov.au/site/page.cfm?u=47 Bob Burgstad, Director, Technical 08 8463 4353 escosa@escosa.sa.gov.au
Power Line Environment Committee (PLEC)	Assists the Minister responsible for the *Electricity Act 1996* in assessing and recommending the undergrounding of overhead power lines. A high level committee approves council applications for undergrounding public lighting power lines to enhance the aesthetics of a location. Other working groups focus on the implementation and installation of approved applications.	As with any upgrade, replacement or installation, council can choose to use the PLEC undergrounding process to install sustainable public lighting options. The opportunity here is more within council's choice of replacement lighting rather than something mandated within the PLEC process. The Committee is open to being approached by local government (through the LGA) to discuss the potential to include sustainable public lighting provisions in the PLEC Guidelines and process in the future.	http://www.escosa.sa.gov.au/site/page.cfm?u=48&print=1 Stuart McPherson, Executive Officer 08 8463 4352 plec@escosa.sa.gov.au

	Role in public lighting	How local government can interact with this stakeholder	For more information
Local Government Corporate Services (LGCS)	Commercial entity of local government that provides strategic contracting and procurement services to SA councils. Provides secretariat to and undertakes actions as directed by the Public Lighting Steering Committee (see that entry). Represents local government on the 'Across Government Electricity Supply Contracts' tender project (metered & unmetered supplies). Facilitates the review of PLEC Agreements with ETSA, LGA and Local Government Risk Services (Mutual Liability Scheme). Facilitates the development of a Public Lighting Services Agreement with ETSA Utilities in collaboration with LGA and Local Government Risk Services (Mutual Liability Scheme).	Through to the Public Lighting Steering Committee (PLSC) – See entry below for details.	http://www.lgcs.com.au Bruce Wright, Project Coordinator 08 8223 8540 bruce.wright@lgcs.com.au
Public Lighting Steering Committee (PLSC) **Note:** Their role has broadened to take into account metered as well as unmetered sites and has hence changed it's name to "The Metered & Unmetered Electricity Steering Committee" (as of October 2006).	Formed by the LGA in 1998 to review issues and progress local government options in preparing for the full deregulation (Full Retail Contestability) of the electricity market. Provides direction to the LGCS and consultants on the Model Service Level Agreement, SLUoS and other tariffs, joint local government-state electricity contracts, and other public lighting related issues. Discusses energy efficient developments on an *ad hoc* basis.	Attend meetings and raise energy efficient public lighting issues as agenda items. Join the Committee, or if unable to attend, contact a member of the Committee to raise efficient public lighting on behalf of your council. It meets on an as-needed basis and its members are self-nominated representatives from SA councils. Form a sub-committee to progress sustainable public lighting.	http://www.lgcs.com.au

	Role in public lighting	How local government can interact with this stakeholder	For more information
Section 26 Committee	Determines the operational responsibilities (including lighting) between DTEI, Transport Division and local governments with regards to roads in SA under the *Highways Act* and *Local Government Act*.	Either through the LGA or the council representatives serving on the Committee. The Committee consists of representatives from DTEI, Transport Division, councils (rural and urban), the LGA, LG Mutual Liability Scheme (Risk Services), and a local government legal representative.	"Cost-sharing arrangements" section in Chapter 3.
The Department for Transport, Energy & Infrastructure (DTEI), Energy Division	Works in partnership with consumers, industry and government to provide energy policy advice and support, energy industry development, energy resource management, and energy advice and services. In February 2002 and August 2003 held two sustainable public lighting forums and workshops, involving councils and other stakeholders in SA and interstate. Participates in the SA Sustainable Public Lighting Guide Project as observers to council workshops and as informants (2005-2006).	Information on historical sustainable public lighting events and networks in SA.	http://www.energy.sa.gov.au/home/index.htm Richard Day, Community Programs Coordinator 08 8226 5827 richard.day@saugov.sa.gov.au Tina Maiese, Energy Project Officer 08 8226 5534 tina.maiese@saugov.sa.gov.au
The Department for Transport, Energy & Infrastructure (DTEI), Transport Division	As the State Road Authority, installs, maintains and asset manages most Category V (vehicular) lighting on arterial roads in SA, as well as OBarn, some car parking, and marine (jetties) lighting. Participates with councils in joint state-local government electricity contracts and pay SLUoS to ETSA Utilities for replacements. Under the *Highways Act,* installs, operates and maintains road lighting on multi-lane roads in urban environments (and in areas where lighting is considered necessary to ensure proper traffic operation or adequate road safety), then	Share information about the different trials, practices and technologies they have used (eg solar, night checks). Collaborate on bulk purchasing opportunities. Investigate the potential for accessing or adapting their asset database 'Earls'.	http://www.transport.sa.gov.au/ Rick Burt, Unit Manager, Road Lighting and Marine 08 8226 8249 rick.burt@saugov.sa.gov.au

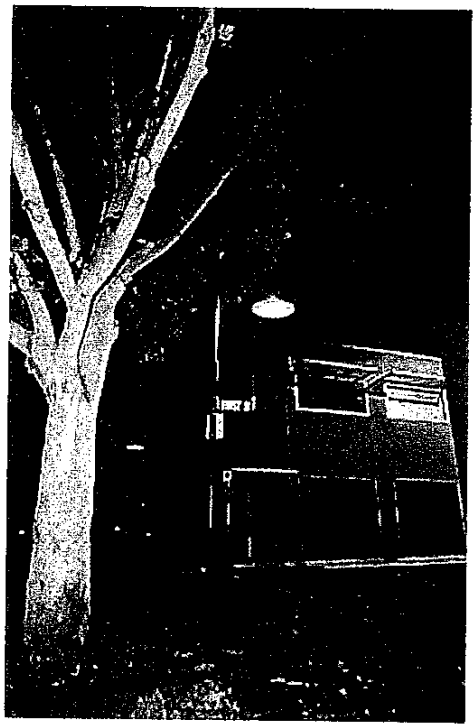
	Role in public lighting	How local government can interact with this stakeholder	For more information
	recovers half this cost from councils where there is amenity to councils.		
State Procurement Board, Department of Administrative and Information Services (DAIS)	Oversees the procurement of both goods and services by state public sector agencies. Negotiates and manages joint electricity purchase contracts between energy retailers and customers (ie DTEI, Transport Division and councils).	On joint energy contracts through the former Public Lighting Steering Committee and LGCS.	http://www.spb.sa.gov.au/
Department of the Premier and Cabinet, Sustainability and Climate Change Division	Implements climate change related actions by the South Australian Government. In May 2005, the former Office of Sustainability (OoS) convened multi-stakeholder meetings to identify barriers to using lower greenhouse technologies in street lighting and discuss ways to facilitate change. Identifies relevant policy responses as part of SA Greenhouse strategy and proposed climate change legislation.	Submissions to strategies, policies, and legislation on the importance of sustainable public lighting and related government support.	http://www.climatechange.sa.gov.au

Case studies and trials

Throughout this guide, we have looked at a number of case studies that could be helpful to councils in mapping their own sustainable public lighting activities. Here we take an in-depth look at a case study from the City of Charles Sturt in South Australia, the Sustainable Public Lighting Initiatives demonstration projects in Victoria and other case study resources.

Case Study 13: Energy Efficient (DIO) Public Path Lighting, City of Charles Sturt, SA

The City of Charles Sturt has a total operating budget of approximately $93 million per annum and serves a predominantly industrial commercial based economy with large capacity for residential infill with a population of 104,000. The City of Charles Sturt's Corporate Emissions Profile in 1997/8 showed 65% of emissions were sourced from the public lighting sector. The Corporate Greenhouse Action Plan (2000) identified the installation of more energy efficient public lighting as a priority measure.

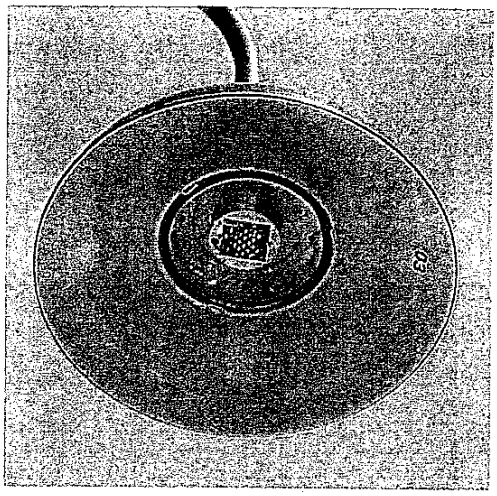


The existing 80-Watt Mercury Vapour lamps at the Station Place, Hindmarsh site required replacement due to yellowing with age or breakage due to vandalism. They were replaced in April 2003 with the more energy efficient DIO lighting (diode emitting) technology to meet the Australian Standard 1158 for park and path lighting. The DIO lights are low voltage – 18V compared to the 240 V used by conventional lights, and therefore consume less energy than conventional lights.

Financial, energy and greenhouse savings of project

Budget Allocation	$16,000 (plus $4,000 grant from the Australian Greenhouse Office)
Energy savings	86.3% power reduction per year
Greenhouse savings	10 tonnes CO_2e per year
Financial savings	$1,495 per year in energy costs
Payback Period	10.7 years
Other environmental benefits	The DIO lights contain no mercury
Community benefits	The pilot has been successful and has the potential for roll out across the city for pathways and reserves.
Other economic benefits	The lamps are expected to last between 100,000 hours and one million hours, which means they may not need to be changed for 20 years. Ongoing decreased operational electricity and maintenance costs.

Council drew on the experience of another council, the City of Port Phillip in installing the diode lighting technology. Based on advice from the City of Port Phillip, the City of Charles Sturt used Showers Pty Ltd to initiate and sustain the process and supply the product, which was then installed by a local contractor. The Station Place lights were metered to allow for pre- and post-retrofit monitoring to determine and verify electricity savings. The City of Charles Sturt utilised its community newsletter to advise the community.



Key success factors in this project included timing the initiative with the federal grant and council budget application process, utilising engineering staff expertise in relation to public lighting standards, and having management support throughout the project. The barrier experienced was the acceptable distance between the poles to meet the Australian Standard AS1185 P category lighting luminance criteria. If other councils wish to undertake a similar project in the future, it is recommended that they engage a lighting consultant to assess this requirement at the start of the project.

For further information please see http://www.charlessturt.sa.gov.au/Default.aspx?tabid=252 or contact Ms Dianne Vivian on dvivian@charlessturt.sa.gov.au or 08 8408 1204.

Action Resources

The **CCP Public Lighting Action Resources** web pages contain links to case studies and how-to guides, which are available to CCP councils at http://www.iclei.org/index.php?id=2252. Resources available on these pages include:

- Hi-tech Foreshore and Park Lighting (Port Phillip, Australia)
- Light Emitting Diodes (LEDs): Traffic Signals and Exit Signs (CCP Australia)

How to update or include your case study

ICLEI-A/NZ keeps a record of the public lighting case studies by CCP councils through our public lighting projects and through the annual Measures reporting process (see http://www.iclei.org/index.php?id=2372 for details). If your case study is featured in this guide and you would like to update any information, simply email PublicLighting-anz@iclei.org.

If you are a CCP council who has implemented a new public lighting initiative or project, or created an innovative process for its implementation, you can complete the CCP Case Study and Initiative of the Month Nomination form (see http://www.iclei.org/index.php?id=action-resources and note you need to log in to the CCP website first) and return it to your CCP State or Territory Manager. Your contributions will help ICLEI-A/NZ to compile our Best Practice Guidelines. Winners of the Initiative of the Month will also be profiled on the CCP website, in the ICLEI-A/NZ Bulletin, Councillor SnapShots, achievement papers and the annual CCP Program Report.

Sustainable Public Lighting Initiative (SPLI) demonstration projects

In November 2003 Sustainability Victoria (formally the Sustainable Energy Authority SEAV) launched the Sustainable Public Lighting Initiative (SPLI). This was done as part of the Victorian Greenhouse Strategy commitment to develop and showcase sustainable energy in public lighting. More than 20 local councils, ten residential developers, all Victorian electricity distribution businesses and other key groups are involved in providing projects and are taking a lead in sustainable energy solutions. A summary of the SPLI projects delivered by multiple councils in Victoria during 2004 and 2005 is given in Table 9.

Table 9: Summary of SPLI demonstration projects

Council and partner	Project details
City of Whitehorse & Active Reactor	Lamp controller to decrease energy use, extend lamp life and reduce maintenance costs
Banyule City Council on behalf of NAGA	High pressure sodiums (HPS) (80 lights) T5 compact fluorescent (40 lights)
City of Port Phillip	Metal halide with electronic ballast and/or sensory system to detect lamp failure (25 lights)
City of Ballarat	High pressure sodiums (HPS) (23 lights)
Casey City & Dennis Family Corporation	42W compact fluorescent amalgam lights (31 lights)
City of Melbourne	20W metal halide catenary lights (40 lights) 28W T5 compact fluorescent (25 lights)
City of Whitehorse	Retrofit of electronic ballast and electronic photoelectric cells to existing 150W metal halide lights 24W T5 compact fluorescent (18 lights) 1W light emitting diode (LED) (15 lights)
Shire of Hepburn	T5 compact fluorescent (12 lights)
Hume City & Delfin Lend Lease	42W compact fluorescent (26 lights in Flinders type luminaires) 42W compact fluorescent (93 lights in Boston style luminaires)
Hume City & Peet & Company	42W compact fluorescent with electronic ballast and electronic photoelectric cells (16 lights)
Hume City & VicUrban	42W compact fluorescent (31 lights) and retrofit of 150W HPS with electronic ballasts (27 lights)
Whittlesea & Villawood Properties	42W compact fluorescent (114 lights)
Whittlesea & VicUrban	50W high pressure sodiums (HPS) (63 lights) 42W compact fluorescent (6 lights)
Melton Shire & Stockland Development	55W metal halide (14 lights)
Whittlesea & Drapac Properties	Compact fluorescent (34 lights)
Wyndham City & Pioneer Homes	50W high pressure sodiums (HPS) (30 lights)
Wyndham City & Dennis Family Corp	42W compact fluorescent (15 and 19 lights)

(Source: The Sustainable Public Lighting website (http://www.energy-toolbox.vic.gov.au/publiclighting/index), which will be updated with trial results as these become available.)

Review of local government sustainable public lighting case studies

Environs Australia (June 2002) ***Public Lighting Case Studies***

This study, produced for the Southern Sydney Regional Organisation of Councils (SSROC) and Sustainable Energy Development Authority (SEDA), NSW, covers 19 local government public lighting case studies, includes twelve case studies from Australia (including case studies from SA, WA, VIC, QLD, ACT, and NSW), and seven case studies from overseas (Sweden, Bulgaria, New Zealand, United Kingdom and the United States). The case studies provide information on energy efficiency, photometrics, lighting output, infrastructure design, maintenance contracts, and tariff structures.

International case studies

A number of international case studies are available on the " " section of the Sustainable Public Lighting website (http://www.energy-toolbox.vic.gov.au/publiclighting/index). These case studies include detail on the following topics:

- Improving councils' ability to tender for lighting provision
- Light control system to reduce cost and liability exposure for councils
- Life cycle cost analysis
- LED traffic signal purchasing strategy
- Electric meters to measure energy cost savings of LEDs

Technical information

Councils can get information on sustainable public lighting technologies through paying for in-house expertise (eg in-house engineers), paying for external expertise (eg consulting engineers such as DPD), and conducting research in these areas:

- Stakeholders: Lighting manufacturers; public authorities from overseas; and national and South Australian organisations including The Lighting Council of Australia Technical Committee, Illuminating Engineering Society (IES) of Australia and New Zealand (the Lighting Society), ETSA Utilities, and DTEI, Transport Division (See Tables 7 and 8 for their role and contact details).
- Technologies: Different street light types, measures of luminaire performance, lamp performance data, and lamp replacement options. The Glossary of this guide explains several technical terms.

  http://www.greenhouse.gov.au/lgmodules/wep/streetlighting/
  http://www.greenhouse.gov.au/lgmodules/wep/toolkit/index.html

  http://www.energy-toolbox.vic.gov.au/publiclighting/index
- *Public Lighting in Australia – Energy Efficiency Challenges and Opportunities* (Genesis *et al*, 2006 – see Publications section for details) has a good description of technical scope and opportunities, and compares the costs and benefits of renewable electricity and energy efficient lighting options.
- The Glossary in this guide.

Publications

Publications are listed alphabetically by author, and contain website links where available.

International

1. International Energy Agency (IEA) (June 2006) "Light's Labour's Lost" – Policies for Energy-efficient Lighting

The comprehensive study is a component of the IEA's response to the G8 Gleneagles Plan of Action (July 2005), which mandated the IEA to identify strategies and scenarios for a more sustainable energy future. It is the first detailed global analysis of the energy used by lighting and includes a thorough review of the technologies and policies that can reduce it.

http://www.iea.org/Textbase/press/pressdetail.asp?PRESS_REL_ID=182

National

1. AS/NZS1158 Road Lighting series is available from Standards Australia at http://www.standards.com.au

2. ICLEI-A/NZ (2005) CCP Australia Measures Evaluation Report 2005. http://www.iclei.org/anz

3. *Bright Sparks: the Sustainable Public Lighting Bulletin.*

Bright Sparks is a forum for councils, developers, distributors and others to identify and discuss any issues on sustainable public lighting. It has a Victorian focus but also some useful national information.

http://www.energy-toolbox.vic.gov.au/publiclighting/

4. Fisher, A (2001) *Energy efficient road lighting – a contribution to greenhouse gas reduction.*

5. Fisher, A (2002) *Facing up to the reality of global warming – a concerted response from the lighting industry.*

6. Genesis Automation, Deni Green Consulting Services, and Kevin Poulton and Associates (June 2006) *Public Lighting in Australia – Energy Efficiency Challenges and Opportunities.* Department of the Environment and Heritage, Australian Greenhouse Office.

This is the first publication in Australia to look at the overall greenhouse gas emissions from public lighting. Summarises the public lighting stock, decision-making process, technologies, best-practice, challenges and opportunities in Australia. It

recommends ways the Australian Greenhouse Office can cost-effectively expedite the implementation of these opportunities.

http://www.greenhouse.gov.au/local/publications/pubs/public-lighting.pdf

7. Genesis Automation and Lablight International (1999) *Report on Energy Saving Opportunities in Street Lighting.* Commissioned by the former Energy Efficiency Victoria and SEAV NSW.

Covers an assessment of public lighting technology in Victoria and NSW, and international best practice.

8. Greenlight Australia

The Australian Government is currently developing Greenlight Australia – a 10-year strategy to improve the efficiency of lighting in Australia between 2005 and 2015. Greenlight Australia plans to provide a framework for reducing energy consumption from Australian lighting over the period 2005-2015.

A 2004 discussion paper for the National Appliance and Equipment Energy Efficiency Program (NAEEEP), *Greenlight Australia – Discussion Paper for Improving the Efficiency of Lighting in Australia 2005-2015*, is a precursor to the plan, and is designed to present background and preliminary program ideas for discussion. The Greenlight discussion paper presents a range of lighting 'technology opportunities', based primarily on currently available technologies. The barriers to the uptake of each of these technologies are assessed, and an appropriate 'intervention' is assigned to each. The resulting 'programs' have been assigned a preliminary priority rating based primarily on the perceived ease with which they are able to proceed.

The full discussion paper is available at http://www.energyrating.gov.au

South Australian

1. Department for Environment and Heritage (December 2005) *Tackling Climate Change – South Australia's draft Greenhouse Strategy*, Government of South Australia. http://www.climatechange.sa.gov.au/

2. ESCOSA (2005) *Electricity Distribution Price Determination (EDPD)* http://www.escosa.sa.gov.au/site/page.cfm?u=163 Pricing principles and statement of reasons are in Part A, Chapter 2, including the principles for SLUoS.

3. ESCOSA (November 2005) *Guideline for Excluded Services Regulation - Distribution Draft Report.* http://www.escosa.sa.gov.au/site/page.cfm?u=164

4. ETSA Utilities (n.d.) *Delivering Total Infrastructure Solutions.* CD-ROM available from Peter Dean, Network Business Manager, 08 8404 5964 or Dean.Peter@etsa.com.au

5. Government of South Australia (March 2004) *South Australia's Strategic Plan* http://www.stateplan.sa.gov.au/

6. Government of South Australia (n.d.) Draft *Climate Change and Greenhouse Emissions Reduction Bill 2006* and explanatory paper http://www.climatechange.sa.gov.au/

7. ICLEI-A/NZ (2004) *Local Greenhouse Action: South Australian Councils Participating in the Cities for Climate Protection Campaign.* This report was designed as part of Project Adelaide to highlight the achievements and challenges of CCP Councils in South Australia. http://www.iclei.org/index.php?id=previousprojects

8. Local Government Association of South Australia (14 April 2003) *"Joint Contracts for State and Local Government Electricity Needs"* media release http://www.lga.sa.gov.au/site/page.cfm?u=191&c=4677

9. Local Government Association of South Australia (20 June 2003) *Submission re: Public Lighting Issues.* Submission to ESCOSA regarding 2005 Electricity Distribution Pricing Review and service standard framework for 2005-2010.

10. Local Government Association (LGA), the LGA Public Lighting Steering Committee and ETSA Utilities (July 2003) The Draft Public Lighting Services Model Agreement. http://www.lga.sa.gov.au/site/page.cfm?u=191&c=3805

11. Local Government Association Circulars 6.3, 30.3 and 30.8 (multiple dates) Search http://www.lga.sa.gov.au/

12. PriceWaterhouseCoopers (October 2000) *LGASA Public Streetlighting Inquiry.* Consultancy report to LGASA, assessing whether ETSA Utilities charges were fair and reasonable in response to SAIIRs enquiry. The report informed LGAs and PLSCs work.

13. Public Lighting Load Table http://www.escosa.sa.gov.au/site/page.cfm?u=47

14. Public Lighting Inventory Table http://www.escosa.sa.gov.au/site/page.cfm?u=47

15. SA Independent Industry Regulator (SAIIR) (January 2001) *Public Street Lighting: Proposed changes to the Distribution Code: Public Discussion Paper* http://www.escosa.sa.gov.au/site/page.cfm?u=161&c=694

16. SA Independent Industry Regulator (SAIIR) (November 2000) *Public Street Lighting Tariffs: Final Report.* http://www.escosa.sa.gov.au/site/page.cfm?u=161&c=694

17. Sinclair Knight Merz (2000) *Street Light Benchmarking Study.* August 2000. Benchmarks ETSA Utilities' costs and service performance against other distribution businesses in Australia.

18. Trans Tasman Tariff and Fuel Consultants (June 2002) *Public Lighting Issues Paper for Local Government Association.* http://www.lga.sa.gov.au/webdata/resources/files/Public_Lighting_Issues_Paper_pdf1.pdf

Grants and funding

South Australia's Sustainable Energy Research Advisory Committee (SENRAC) provides energy Research and Development (R&D) grants for competitive proposals that have strong commercialisation prospects, environmental benefits and could potentially reduce costs for SA energy consumers. For more information, see http://www.senrac.sa.gov.au.

For a range of other funding opportunities, see the grants list on the ICLEI-A/NZ website http://www.iclei.org/index.php?id=3910.

State legislation

Public lighting is influenced and regulated by several pieces of state legislation:

- Local Government Act 1999 (SA)
- Highways Act 2000
- Development Act 1993
- Electricity (General) Regulations 1997
- The Electricity Act 1996
- Essential Services Commission Act 2002

Note: most state public lighting legislation and regulations only apply to distributor owned assets. To find the legislation go to the SA Parliament website: http://www.parliament.sa.gov.au/dbsearch/acts-list.htm

TOOL 1: HOW TO FIND PUBLIC LIGHTING INFORMATION IN YOUR COUNCIL

Use this table to find relevant information for assessing council's current position on public lighting and identifying basic areas for actions that can be included in the development of a public lighting action plan.

Information required	Who had the information?	How did you access the information?	Did you encounter any barriers?	How did you/could you overcome it?
Public lighting responsibilities at council	Design and culture – projects, strategy, standards. Engineering services. Infrastructure – bills maintenance, projects, developments. Capital works. Project managers.	In job descriptions, work plans. E.g. transportation engineer, construction works, subdivisions officer, CCP officer.	People have left and responsibilities are unclear. Inconsistent information on who owns what (streets, car parks, reserves). No one with overall responsibility for management of public lighting - $750,000 per year of unplanned spending!!	Identify roles on position descriptions.
Dates for batch/ block replacement	Distribution businesses have information on the percentage of lights in their area.	From distribution businesses. Estimated from past batch replacements (average 4 year interval).	No date for replacement, the year given but not the month. Not sure how to confirm that the block replacement has been done. Communicating with distributors has been a problem, however they will provide information. No set/confirmed dates for block replacement. No evidence of 4 yearly block replacement.	Service level agreements. Better communication with distributor.

Information required	Who had the information?	How did you access the information?	Did you encounter any barriers?	How did you/could you overcome it?
Existence of a contract variation negotiated with the distribution business	Environment Department. Infrastructure.	From relevant council departments.	There are no contracts as such. Batch replacement and contracts are out of synch.	Minimum Energy Performance Standards due from the Commonwealth in 2007. Service level agreement.
Data availability and quality	Infrastructure department. Key Staff. Distribution businesses (DB's) Distribution business system: under the amended public lighting code distributor is obliged to provide data upon request. Distributor currently logging in geographic information system GIS. Information rests between ESC, distributor and design and culture department of council.	GIS layer from the DB's. DB's spreadsheet (location, number of lamps, lamp type) OMR charges. Stark (utilities management) database. Energy bills.	No way of validating data. Cumbersome (data entry). Apart from data collected through CCP (including light numbers) there is little data available / accessible / stored. Data can be very sketchy. Data doesn't state whether non standard or standard fittings are in place.	Electronic transfer of energy data or linked with distribution business OMR data. Proposed public lighting audit. Data available from distributor in theory.
Other council public lighting projects	Project Managers (Asset Owners), Subdivision Officer, Infrastructure Staff. Urban design department.	Spoke to relevant staff.	Lack of communication with staff (not overcome at this stage). Council knows when lights are installed, distributor logging lags behind council resourcing and workload are issues.	Need to get support from internal stakeholders – formality. Policies and other SPLI projects will help with work planning.

(Source: Victorian Sustainable Public Lighting Action Plan Guidelines).

TOOL 2: PUTTING THE DEVELOPMENT OF COUNCIL'S SPLAP INTO STAFF WORK PLANS

Use this worksheet either as part of an internal public lighting working group meeting or go around to relevant members of staff to help workplan.

1. Identify key dates and events for the SPLAP that may impact on the work plans of staff involved in developing a SPLAP

Item	Date
SPLAP completion	
Dates for batch replacement of lamps and fittings	
Potential funding for energy efficiency projects	
Public lighting related workshops, seminars, conferences	
Council meetings	
Financial year	
Reporting periods	

2. Key SPLAP tasks that will need to be completed by a staff member in order to develop the SPLAP (see Chapter 3 for a guiding list of tasks)

Task	Time line
Information/data collation (establish current status of council public lighting)	
Internal consultation/workshops with relevant staff	
Preparing the SPLAP, background material as well as action plan	
Submitting the report to the council meeting agenda and confirming a date for submission	
Presenting to council	

3. Allocate responsibility for SPLAP development tasks into staff work plans (work loads)

Task/Chosen Response	Responsibility	Completion date	Budget	
			Staff hours	$

(Source: Victorian Sustainable Public Lighting Action Plan Guidelines).

TOOL 3: COUNCIL SELF-ANALYSIS CHECKLIST

The following checklist outlines, in ICLEI-A/NZ's experience, the attributes leading councils have in regard to sustainable public lighting. This is a tool to help council examine how it compares to leading councils. If council identifies that it is lacking any of these points, the gaps identified through this checklist will form the basis for the council's development of an action plan.

Internal Strategy & Support

☐ A senior manager, key department or public lighting team has overall responsibilities for public lighting management, coordinating the myriad of public lighting decisions.

☐ Public lighting management is included in the corporate plan or equivalent.

☐ Political (councillor/aldermen) and executive level support for actions to establish more energy efficient public lighting as a council priority.

☐ There is whole-of-council support for energy efficient public lighting.

☐ Council has a process for monitoring and reviewing its public lighting management with regard to agreed energy, financial and social outcomes.

☐ Budgets are allocated and/or other sources of financing found for public lighting energy reduction measures.

☐ Staff time is allocated to undertake sustainable public lighting work.

Data & Technology

☐ Relevant council staff have (or have access to) the understanding sufficient to design public lighting, set sub-categories according to the standards, and complete other public lighting tasks.

☐ Key council staff have (or have access to) the technological understanding necessary to make decisions on energy efficient lighting.

☐ Council has a full, accurate inventory of public lighting assets in terms of costs, energy use, lamp/luminaire type and number of lights.

☐ Council is aware of dates planned by distribution businesses for batch replacement of lamps and luminaries.

External Relationships

☐ Active engagement with council's distribution business(es).

☐ Council engages the local community in decisions on public lighting.

☐ Council has established relationships with lighting supplier(s).

☐ Council's public lighting greenhouse gas abatement actions are coordinated with the actions of other councils in its distribution area.

☐ Council is coordinating efforts to promote sustainable public lighting action on a federal/state level with other organisations.

(Source: adapted from the Victorian Sustainable Public Lighting Action Plan Guidelines).

TOOL 4: HOW TO AUDIT EXISTING LIGHTS

Having accurate information about street and public lighting infrastructure is essential for:

- Identifying potential improvements for implementation
- Reducing council budgets for street and public lighting energy costs
- Clarifying (where needed) asset ownership and responsibilities between council, the distribution business(es), and the transport authority.

An audit of the number, type, location and condition of street and public lighting in a municipality is often the starting point in this process and will underpin good data management. Councils should consider doing asset audits/reviews on a regional basis to: achieve economies of scale in engaging consultants; streamline communications with, and requests to, distribution businesses; access potential funding opportunities; develop a central resource of information; and share advice and experiences.

Here are some step-by-step instructions and a checklist for conducting an audit:

1. Access existing public lighting data available within council

In-house information to collect includes:

☐ Your council's public lighting retailer and distributor: _____

☐ Any council staff who have contact with distribution businesses for public lighting: _____

Who their contacts are (name, position, contact details): _____

☐ How/if data is recorded, reviewed, and managed for accuracy. Identifying any staff concerns with the current data (talk to asset management, distribution officers etc) will help inform the audit.

_____

_____

_____

☐ Whether there is an energy management tool in place, such as Utility Tracker: _____

If so, what information is captured with this tool? _____

☐ Whether council has access to the distribution business' geographic information system (GIS) for public lighting: _____

If so, who in council uses it: _____

Tool 1 provides guidance on where to find this information. It is important at this step to engage with all relevant staff across council to ensure that all relevant requirements will be met (e.g. asset management, environment, GIS, etc). An uncoordinated council approach to public lighting data management can make the audit process overly complicated and reduce its accuracy.

2. Audit council's public lighting stock if data is not already available

☐ Either identify in-house staff and resources or engage a consultant to carry out an on-the-ground audit: _____

(Note that in-house skills can be limited, as can be the pool of available lighting specialists from which to select an auditor, which can delay timelines for the project and turn-around times of tender documents, etc.)

Ensure the quote and actual audit covers not only streetlights but all public lighting (ie parks and gardens, car parks), and involves physical checks of:

- ☐ Number of lights
- ☐ Actual location of each light (via GIS positioning)
- ☐ Types of lamp and luminaire at each location
- ☐ Type of pole or bracket at each location
- ☐ Age and value of assets (if possible)
- ☐ Faults such as day burners or lights out

As well, determine for each light:

- ☐ How much energy the lamps use (calculate using the Load Table)
- ☐ Tariff type and what council spends on public lighting (including service charges [by distributor] and electricity use [by retailer])
- ☐ Who maintains stock (council or distribution business)

3. Compare audit data to that provided by distribution business

- ☐ If council does not already have data (as identified in step 1), request this in GIS format from the distribution business. Depending on the distribution business there may be a charge.
- ☐ Compare the information provided by the distribution business(es) with council's audit data and note any discrepancies in location, lamp type and distributors tariff. One approach to conduct this comparison is to load the information into GIS software as two separate layers.

4. Follow up action

- ☐ Advise distribution business of discrepancies for updating the Inventory Table (or equivalent), and clarify (where needed) asset ownership and responsibilities between council, distribution businesses and the transport authority. (Seek an agreed value for any refund where audit indicates overcharging by the distribution business or retailer.)
- ☐ When the lighting data is agreed and finalised, calculate council's greenhouse gas emissions from public lighting (CCP councils should update their inventory in the CCP Software; non-CCP councils can use a consultant or the AGO Factors and Methods workbook).
- ☐ Use the updated energy, asset, financial and greenhouse information to manage the assets for improved performance and service delivery, target energy efficiency improvements, reduce council's energy costs, benchmark and report on current performance, and build a business case for action on sustainable public lighting.
- ☐ Maintain data in asset management system.
- ☐ Remember to obtain an update of distribution business GIS data annually and check all new additions and deletions.

(Sources: Based on information provided by the City of Marion, Adelaide City Council and other SA CCP councils, and some information in the Victorian Sustainable Public Lighting Action Plan Guidelines).

TOOL 5: ACTION PLANNING WORKSHEET

The following worksheet can be used at your council to identify the opportunities, constraints and timelines that will affect your selection of actions for the SPLAP.

1. Identify your council's existing/future drivers and constraints of sustainable public lighting

Key drivers are those things that will encourage and aid in the implementation of sustainable public lighting and may include things like reduction goals, council strategies, opportunities and funding. Key constraints are those things that may limit your council's implementation of sustainable public lighting and may include such things as timelines, budgets and staff resources.

Drivers	Constraints
Opportunity: Greenfield developments / growth areas	No public lighting expertise at council
Batch replacement in council's CBD next year	No funding available for public lighting management in this budget cycle
Funding available from the revolving energy fund in 6 months	New development will need lighting within three months
Infrastructure manager used to work for the electricity regulator	

2. Identify council's current areas of influence / control over public lighting

It is important for you to identify the areas that your council has control over and the areas that you can influence. This will help you clarify your actions in the SPLAP and focus on the areas that your council can control and change, rather than spending all your energy on areas you can only influence.

Areas of control	Areas of influence
Aesthetic lighting	Developers
Internal strategies and policies	Funding available from the revolving energy fund in 6 months
Planning guidelines	State policy

3. Identify key dates and time lines related to public lighting

The following list, whilst not exhaustive, provides examples of things that may impact on the goals chosen by your council; items should be added to or removed from the list as appropriate:

Item	Date
Dates for batch replacement of lamps	
Dates for batch replacement of fittings	
Potential funding for energy efficient lighting projects	
Flagged legislation changes	
Related workshops, seminars, conferences	
Future energy prices increases	

4. What actions might council need to complete to achieve your goals?

Using all the information recorded on the worksheet, devise actions that will help you progress towards your council's public lighting goals.

Goals	Actions	Responsibility	Time Limitations/ Sequence
Council specific goals	Those actions councils will need to complete (including those actions that will help to overcome barriers) in order to achieve goals	Staff within council who should implement these actions	Any time limitations that apply to the goal. An estimated sequence that actions will need to be completed or an indication of parallel actions.

(Source: Victorian Sustainable Public Lighting Action Plan Guidelines).

TOOL 6: ACTION CHECKLIST

The following checklists outline, in ICLEI-A/NZ's experience, what actions leading councils have done to build their capacity in each of the three foundations – Internal Strategy & Support, Data & Technology, and External Relationships. When considering which of these actions to include in council's SPLAP, start with easier actions that produce quick wins, and progressively work towards greater achievements.

In addition to selecting actions from the below checklists, council should:

- Note the results of council's self-assessment and goals (see Chapter 2)
- Determine how to leverage existing opportunities (see Chapter 3 and Tool 5)
- Keep in mind the sustainable public lighting options (see Table 4)
- Consider potential ways to interact with stakeholders (see Tables 7 and 8)
- Be aware of other councils' achievements (see page 5 and Chapter 4)
- Identify further actions to build capacity in each of the three foundations.

Actions to build Internal Strategy & Support

Use some or all of the following methods to build strategic, political and executive support within council, consolidate the overall management of public lighting, and capitalise on any existing support and systems within council.

Consolidate management of public lighting

- ☐ Put overall public lighting management into a senior manager's role.
- ☐ Put overall public lighting management into the work plan of one council unit.
- ☐ Form a public lighting management team.
- ☐ Make sustainable public lighting a key focus for your council's energy management team (or other appropriate body, such as energy component of executive team meetings) [See Table 3, Tools 1 and Case Studies in Chapter 2].
- ☐ Strengthen requests for staff allocation to public lighting management.

Incorporate public lighting into policy and reporting system

- ☐ Develop a sustainable public lighting policy and strategy [see Chapter 2].
- ☐ Incorporate sustainable public lighting into the corporate planning policy (or equivalent).
- ☐ Include public lighting management of in council's corporate plan [see Chapter 2].
- ☐ Establish regular monitoring and review process for public lighting management focusing on monitoring and review of council's SPLAP.

Create the business case for action

- ☐ Prepare a cost benefit analysis of changing existing lighting stock to more energy efficient lamps [see Tool 7].
- ☐ Report to council on public lighting management, costs incurred and greenhouse gas emissions, and savings from any trials implemented [see SPLAP template and Tool 7].

Use existing support to implement actions

- ☐ Develop guidelines; tools or mechanisms to help council planners, urban designers and engineers encourage the installation of energy efficient public lighting.
- ☐ Strengthen budget requests for public lighting work, particularly as savings are identified over time. Ensure that the work is in the SPLAP approved by the CEO/GM or mayor

Actions to build Data & Technology

Use some or all of the following methods to improve council's access to public lighting data, ability to analyse and use that data, and access to people with public lighting expertise.

Find and develop information

- ☐ Talk to asset management about current management of public lighting.
- ☐ Complete a Public Lighting Asset Audit [see Tool 4].
- ☐ Map out what each person/department knows in relation to the technical/legislative requirements of public lighting [see Table 3].
- ☐ Attend seminars and training sessions on energy efficient technology, tariffs, standards, legislation, energy market deregulation and other public lighting topics.
- ☐ Create links with consultants/external bodies that can provide technical information on energy efficiency in public lighting.
- ☐ Train council staff on the Australian Standards for Road Lighting (AS/NZ 1158) with a view to energy efficiency options [see Chapter 3].
- ☐ Monitor and record data on public lighting stock on an ongoing basis (or negotiate for someone within the distribution business to do this).
- ☐ Use the CCP Quantification Toolkit to quantify the greenhouse, energy and financial savings from public lighting actions [see Tool 7].

Share information

- ☐ Centralise the knowledge by running information sharing workshops or sharing information with staff responsible for overall public lighting decisions.
- ☐ Work with other councils or stakeholders to regionally share information and resources, for example establish a regional panel of street lighting consultants, a national/state network of experts, and/or a technical consulting/research service for smaller councils.

Use information to implement actions

- ☐ Use council's knowledge of the Australian Standards, public lighting stock, legislation, tariffs and other public lighting knowledge to identify sustainable public lighting opportunities [see Chapter 3].

Actions to build External Relationships

Use some or all of the following methods to engage and work with distribution businesses, lighting suppliers, other councils, and the community.

Identify existing relationships and plan engagement

- ☐ Conduct a stakeholder analysis [see Step 1 in Chapter 3]
- ☐ Identify which council staff have contact with distribution businesses for public lighting and who their contacts are [see Tool 1].
- ☐ Develop a stakeholder engagement strategy, based on the stakeholder analysis and potential ways to interact with stakeholders (see Tables 7 and 8).

Establish contact

- ☐ Contact your distribution business with a view to creating a positive relationship and identifying opportunities for both organisations. Preferably do this with other councils. Check if they are a member of the Greenhouse Challenge Plus program (see http://www.greenhouse.gov.au/challenge).
- ☐ Hold community information sessions on energy, greenhouse and public lighting alternatives in areas that will have new lighting or trials.
- ☐ Conduct surveys or create working groups to determine community attitudes, perceptions, expectations and awareness of any new sustainable public lighting. Some of the expectations may be conflicting, which is why it is important to recognise them early.

However, working groups will give an opportunity to raise awareness and enable the community to make decisions about whether lighting is actually needed at all. Involve groups such as astronomical societies in this process [see Chapter 4 for details].

- ☐ Contact other local governments in your distribution business' area to assess and build their interest in working together on public lighting goals.
- ☐ Meet with lighting suppliers (preferably as a regional group) and tell them about council's goals and seek solutions – remember you are a big customer.

Build relationships

- ☐ Work as a region to develop symbiotic public lighting policies and goals.
- ☐ Share public lighting staff across the region to maximise knowledge and minimise resourcing issues.
- ☐ Build on or establish a formal regional grouping to focus on public lighting or energy reduction as the broader, long-term primary focus of the group (e.g. public lighting steering committee, CCP council network, etc).
- ☐ Establish a contract variation (known as a Service Level Agreement (SLA) in South Australia and Victoria) with your distribution business [see Case Study 3 for details]. Ensure the Agreement includes sustainable public lighting provisions such as: installation of energy efficient lights; higher maintenance levels to reduce drift and fix day burners; or even specifying minimum energy efficiency levels, or providing an Energy and Performance Review service (for financial, energy and greenhouse costs). Do this individually and/or with other councils.

Use relationships to realise outcomes

- ☐ Choose the same type of alternative lighting as neighbouring councils to increase the economy of scale for distribution businesses.
- ☐ Work with other councils, retailers and any brokering bodies to group/bulk purchase GreenPower for your public lighting.
- ☐ Create an awareness campaign at point of sale of allotments, in consultation with developer.
- ☐ Conduct trials of alternative lighting in partnership with your distribution business, lighting supplier and/or other councils in your region.
- ☐ Encourage residents to report faults, for example brief Neighbourhood night watch on the lighting trials by council and request that they report failures.

Monitor and maintain relationships

- ☐ Record comments/complaints from residents regarding new sustainable public lighting, and ensure you respond to these.
- ☐ Survey the community after the new lighting has been installed to get their input/involvement [See Case Study 11 for an example of this].

(Source: Adapted from the Victorian Sustainable Public Lighting Action Plan Guidelines and work undertaken by Coffs Harbour City Council, NSW, found at http://www.energy-toolbox.vic.gov.au/publiclighting/index.php?option=displaypage&Itemid=220&op=page).

TOOL 7: PUBLIC LIGHTING TOOLS

Several public lighting tools exist that enable councils to organise, analyse, report on and/or make decisions using the information they gather through research. This tool lists key public lighting tools currently available and explains their purpose, as well as how to access and use them. Use this information to decide which tool is suitable for your purposes.

Tool	Use it for	Who created it and where it is
CCP Greenhouse Gas Application (CCP Software)	Benchmarking: Use this to complete an inventory of council's corporate greenhouse emissions, including the energy use, financial spend and greenhouse emissions from public lighting.	ICLEI-A/NZ http://www.iclei.org/ccp-au Note: Available to CCP councils only.
Cost Benefit Analysis Tool	Decision-making: Use this to analyse the sustainable lighting options for council based on the existing mix of lighting types, electricity and maintenance costs and replacement cycles.	Northern Alliance for Greenhouse Action (NAGA), Victoria under Sustainability Victoria's Sustainable Public Lighting Initiative (SPLI), and based on work done by Coffs Harbour City Council, NSW. http://www.energy-toolbox.vic.gov.au/publiclighting/index
CCP Quantification Toolkit	Reporting on initiatives: Use the Toolkit to quantify the greenhouse and financial savings of public lighting initiatives, and report this as part of the annual CCP measures reporting process.	ICLEI-A/NZ http://www.iclei.org/ccp-au Note: Available to CCP councils only.
Car park lighting design concept checklist and design template	Designing installations: Use design concept as an example. Use the checklist to guide the design process of car parking. Use the design template to quantify energy savings for sustainable lighting designs for car parks and pathways.	City of Whitehorse, Victoria and Webb Australia Group under SPLI. http://www.energy-toolbox.vic.gov.au/publiclighting/index
The Land Developers Guide to Solar Public Lighting	Planning installations: Use for engaging or liaising with developers on installing solar public lighting.	Mornington Peninsula Shire Council, Victoria under SPLI. http://www.energy-toolbox.vic.gov.au/publiclighting/index
Sustainable Public Lighting Developers Guidelines and Checklist for new subdivisions	Planning installations: Use to incorporate sustainable public lighting outcomes in the planning process for new subdivisions. Note: adapted to the Victorian context.	Banyule City Council in collaboration with the Northern Alliance for Greenhouse Action (NAGA) under SPLI. http://www.energy-toolbox.vic.gov.au/publiclighting/index

Note: To download tools from the Energy Toolbox: Sustainable Public Lighting website, go to Sustainable Public Lighting Initiatives – Project Updates. The website also contains contact details of council staff involved in the development of the tools.

GLOSSARY

Ballast	Device used with discharge lamps for stabilising the current in the discharge. May be electronic (more efficient) or passive (iron-core). Load tables indicate wattage use by ballasts.
Candela	The candela (cd) is the standard unit of luminous intensity in the International System of Units.
Category P lighting	Lighting designed principally for local roads to provide a safe and comfortable visual environment for pedestrian movement at night, as described in AS/NZS 1158.3.1
Category V lighting	Lighting designed principally for vehicular traffic eg traffic routes, as described in AS/NZS 1158.0
CCP	Cities for Climate Protection
CCP Plus	Cities for Climate Protection Plus
CFL	Compact fluorescent lamp.
CO_2e	Carbon dioxide equivalent units (usually measured in tonnes). CO_2e is a measure of equivalent carbon dioxide relating to the global warming potential of the different greenhouse gases. If methane, for example has a global warming potential that is 21 times stronger than carbon dioxide, a tonne of methane is measured as 21 tonnes of CO_2e.
Colour rendering	A term used to describe the accuracy with which colours are represented when illuminated by particular light sources.
Colour temperature	The colour temperature of a light source refers to the apparent whiteness of the light produced. Higher colour temperatures are referred to as cooler (more blue) sources, while lower colour temperatures are referred to as warmer (more yellow) sources.
CRI	Colour rendering index
DB	Distribution business: Distributors of energy over distribution networks ("poles and wires") in their region, including the provision of public lighting unless otherwise negotiated with public lighting customers.
Direct light	Light that is incident on a point or area having taken a direct path from a source of light, such as a luminaire.
Discharge lamp	A lamp in which the light is produced, directly or indirectly, by an electric discharge through a gas, a metal vapour, or a mixture of several gases and vapours. For example, mercury vapour, high pressure sodium.
Efficiency	The efficiency of the lamp can be evaluated by measuring how many lumens of light produced for a given input of electrical power, i.e. lumens out per watt in.
Fluorescent lamp	Discharge lamp of the low pressure mercury type in which most of the light is emitted by a layer of fluorescent material excited by the ultraviolet radiation of the discharge.
GHG('s)	Greenhouse Gas(es)
GWh	Giga watt hours: 1,000 MWhs
Glare	Light causing discomfort or reductin in visibility
Halogen lamp	Gas filled lamp containing a tungsten filament and a small proportion of halogens.
HID	High intensity discharge. All HID lamps (ie mercury vapour, HPS and metal halide) operate on the principle of an electrical discharge occurring in a closed glass or silica tube containing small quantities of metals that vaporise as an electrical current is passed through the tube. The arc tube, as it is known, is enclosed in an outer glass envelope forming the lamp.

HIR	Halogen infrared
HPS	High Pressure Sodium: high pressure sodium lamps are used in areas where colour rendering ability or appearance is considered more important, but where a yellowish appearance in the emitted light is a desired or acceptable outcome.
ICR	Incandescent reflector.
Illuminance	Illuminance is the measure of the quantity of light incident on a point or a surface. It is measured in units of lux.
kWh	Kilowatt hour: 1000 watt hours.
Lamp	Is the part of a lantern, which emits light and which may require associated control equipment to operate.
Lamp	The name given to the actual light globe that is housed within a luminaire.
Lantern	A complete light fitting containing a lamp and designed to control the output of the light.
LED	Light Emitting Diode: a method of lighting that is becoming increasingly common in public lighting uses such as illuminated signage (traffic signals) and decorative lighting.
LPS	Low pressure sodium. Low pressure sodium lamps have the highest efficacy (efficiency) of all lamp types, coupled with a long life. These lamps are generally located along major arterial roads and have a distinctive yellow light. LPS lights are being phased out in favour of HPS due to HPS's better colour rendition.
Lumen (lm)	The lumen (lm) is the International Unit of luminous flux (lux).
Luminance	Luminance is the measure of what is commonly referred to as brightness. It is a measure of the quantity of light reflected or emanating from a surface. It is referred to in terms of units of candela per square metre.
Luminaire	A complete lighting unit consisting of a lamp or lamps together with the housing designed to distribute the light, position and protect the lamps and connect the lamps to the power supply. The term lantern can also refer to a luminaire.
Lux	Lux (luminous flux) is the International Standard unit of measure for illuminance and is equivalent to one lumen per square metre.
m^2	Square meters
MEPS	Minimum energy performance standards: a regulatory tool used to increase the average efficiency of a product class, in this case public lighting. MEPS regulations remove from sale the least energy efficient models on the market. MEPS programs are made mandatory in Australia by state government legislation and regulations, which give force to the relevant Australian Standards. Regulated by the NAEEEP.
Mercury Vapour	The dominant type of lamp currently used for minor road public lighting (on minor roads commonly 80W mercury vapour lamps). Mercury vapour lamps produce a bluish coloured light.
MH	Metal halide: metal halide lamps have nearly twice the efficacy of mercury vapour lamps. They give a white light with a strong blue-green component.
Mt	Megatonne
MV	Mercury vapour: see above definition
MWh	Megawatt hours: 1,000 kWhs
OMR Charge	Operation, Maintenance and Repair/Replacement Charge: A charge set by distribution businesses for services to public lighting. Approved triennially in Victoria by the ESC.
PE	Photoelectric.

PE Cell	Photoelectric Cell: cell in a street light which determines when the lamp is turned on or off according to ambient light levels. These cells use a small amount of electricity.
Public Lighting	Any infrastructure that provides lighting for public areas including streetlights, park lights and car park lighting.
Reflected/indirect light	Light that is incident on a point or area that has been reflected by at least one surface since emanating from a light source.
Starter	Device for starting a discharge lamp (in particular a fluorescent lamp).
T5	16mm diameter fluorescent lamps or tubes.
TWh	Terawatt hours: 1,000 GWhs
Upward waste light	Light from a luminarie above horizontal (1-4% excellent, 4-10% good, 30-50% poor)
Wh	Watthour: 1 watt operating for 1 hour.

ACRONYMS AND ORGANISATIONS

ABS	Australian Bureau of Statistics
AEEMA	Australian Electrical and Electronic Manufacturers' Association http://www.aeema.asn.au
AGO	Australian Greenhouse Office, Department of the Environment and Heritage
SV	Sustainability Victoria (formerly Sustainable Energy Authority Victoria or SEAV)
SPLI	Sustainable Public Lighting Initiative: An initiative undertaken by Sustainability Victoria to accelerate the uptake of sustainable public lighting in Victoria.
IPWEA	Institute of Public Works Engineering Australia
ICLEI-A/NZ	ICLEI – Local Governments for Sustainability – Australia/New Zealand
NAEEEC	National Appliance and Equipment Energy Efficiency Committee
NAEEEP	National Appliance and Equipment Energy Efficiency Program: Lighting products are regulated by the NAEEEP
NGAC	National Greenhouse Advisory Committee
UNFCCC	United Nations Framework Convention on Climate Change

APPENDIX
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SAGE CONSULTING ENGINEERS

ATTACHMENT
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THE WESTERN AUSTRALIAN LOCAL GOVERNMENT ASSOCIATION AND THE SUSTAINABLE ENERGY DEVELOPMENT OFFICE

WESTERN AUSTRALIAN LOCAL GOVERNMENT ASSOCIATION

Sustainable Energy Development Office
Government of Western Australia

IMPROVED STREET LIGHTING STUDY FOR GREENHOUSE & SAFETY BENEFITS

INSTITUTIONAL AND TECHNICAL REVIEW

JUNE 2007

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IMPROVED STREET LIGHTING STUDY
FOR
GREENHOUSE & SAFETY BENEFITS

EXECUTIVE SUMMARY

This report covers an Institutional and Technical Review of current street lighting in Western Australia with the primary aim of upgrading street lighting to Australian Standards in the most energy efficient way.

Local Government is responsible for most street lighting in Western Australia. Western Power acts as a service provider to Local Government for the majority of street lighting. Main Roads WA is responsible for street lighting of freeways and major highways. Some major routes are a shared responsibility of Main Roads WA and Local Government.

A large proportion of street lighting in Western Australia is below Australian Standard requirements. Mercury vapour lamps are used for most Local Government street lighting. Mercury vapour lamps have proved reliable for street lighting but the future is likely to lie with a combination of compact fluorescent, metal halide and high pressure sodium lamps that are typically twice as energy efficient as mercury vapour.

Australia and New Zealand Standard 1158 recommends lighting levels much lower than European, British and American standards. Australia enjoys a warmer, drier climate and night vision is not commonly impeded by snow, hail and fog.

A number of initiatives have been taken in Australia to bring street lighting up to standard and reduce energy consumption. Notable examples are Midvale, Mosman Park, Subiaco, and Joondalup in Western Australia and, in the Eastern States of Australia, in Coffs Harbour, Banyule and South Sydney. The Australian Greenhouse Office has had a study undertaken entitled *"Public Lighting in Australia – Energy Efficiency Challenges and Opportunities".*

Appendix E to this report contains details of the Western Australian trial areas of Midvale, Mosman Park and Subiaco. Measurements have been recorded regularly to monitor the performance of the street lighting over two years. A total of 265 streetlights have been monitored every three months over the two year period.

The energy efficient streetlights are performing at least as reliably as the old mercury vapour streetlights.

Appendix G contains a number of scenarios comparing compliance, energy, greenhouse gas emission, lamp cost and lamp life.

It is possible for Local Government to halve energy consumption of street lighting with no drop in performance. An option is to improve street lighting to AS/NZS 1158 and still achieve energy savings.

IMPROVED STREET LIGHTING STUDY
FOR
GREENHOUSE & SAFETY BENEFITS

TABLE OF CONTENTS

REV	DATE	DESCRIPTION	AUTHOR	REVIEW
01	28-09-04	Initial Draft	Mike Sage	Mike Sage
02	29-09-04	Prelim Draft	Mike Sage	Mike Sage
03	30-09-04	Prelim Draft	Mike Sage	Mike Sage
04	11-02-05	Final Draft incorporating WP comments (pages 5, 29, 30 & 31) & SEDO comments (pages 1 & 33) and measurements	Mike Sage	Mike Sage
05	08-03-05	Committee draft incorporating comments from meeting on 22-2-05	Mike Sage	Mike Sage
06	04-05-05	SEDO comments incorporated	Mike Sage	Mike Sage
07	31-01-06	Draft Interim Report	Mike Sage	Mike Sage
08	27-3-06	Interim report	Mike Sage	Mike Sage
09	6-9-06	Revised Interim report	Mike Sage	Mike Sage
09A	26-9-06	Revised Interim report	Mike Sage	Mike Sage
10	16-11-06	Final INTERIM report	Mike Sage	Mike Sage
11	31-12-06	FINAL REPORT	Mike Sage	Mike Sage
11 A	21-05-07	FINAL REPORT May 2007	Mike Sage	Mike Sage
11 B	6-06-07	FINAL REPORT June 2007	Mike Sage	Mike Sage

1 INTRODUCTION

The purpose of this research program is to ensure awareness and encouragement that new and upgraded street lighting, meets not only the requirements of complying with the relevant Australian Standards for illuminance level, safety and cost effectiveness, but also meets or exceeds world best practice in terms of energy efficiency.

Australian Standards for street lighting are appropriate, recommending lighting levels that are adequate without being excessive. Australian Standards require lower lighting levels than European and North American standards because of the clearer weather in Australia.

The Institutional issues relate to Local Government who are responsible for street lighting, the Underground Power Program (UPP) under which new street lighting is installed as part of the undergrounding process, the Office of Energy who is the administrator of the UPP, and Western Power who is the major street lighting service provider to Local Government.

The Technical issues relate to energy efficiency, street lighting meeting Australian Standards, technology options and comparisons of Western Australian practice with national and world practice.

2 BASIS OF REPORT

This report is based on the following sources:

- AS/NZS1158.3.1: 2005 Pedestrian area lighting
- AS/NZS1158.1: 2005 Road lighting
- Austroads: Guide to Traffic Engineering Practice, Part 12- Roadway Lighting: 2004
- IES (NA) Recommendations for Road lighting
- IESNA G-1-03 Guideline for Security Lighting for People, Property, and Public Spaces
- BS/EN 13201 – Road lighting
- State Underground Power Proposals – Guidelines for Round Four Major Residential Projects

3 METHODOLOGY

The methodology used to develop this report includes:

- Liaison with Western Power, Town of Mosman Park, City of Subiaco and City of Swan to identify trial sites.
- Assess current practice in metropolitan and regional Western Australia.
- Identify Australian and worldwide street lighting best practice.
- Review existing street lighting in Mosman Park, Subiaco and Swan against the criteria of greenhouse gas reduction, energy efficiency, safety benefits, economic performance and maintenance (economic cost/benefit).

- Consider appropriate technologies, improvements to tariffs and contracts to reduce energy and improve lighting quality, improvements to tariffs and contracts to improve maintenance, recommended actions to improve lighting services.
- Regular monitoring of the selected trial sites.

4 DEFINITIONS

Average Carriageway Luminance (L) - The average luminance of a given section of the road carriageway when viewed from the observer's position.
Average Illuminance (E) - The average lighting levels at ground level measured in the horizontal plane. For the Category P4 & P5 streets, the results measured and recorded in this column are the average over the whole street.
Average Lamp Life - Time taken until 50% of lamps has reached end of life.
Colour Temperature – An indication of the colour appearance of a lamp measured in degrees Kelvin (K). 2700K indicates a warm colour, 5000K indicates a cool colour.
Depreciation – The loss of light output over time as lamps age and optical surfaces collect dirt and deteriorate.
Disability Glare – Glare resulting in reduced visual performance, often accompanied by discomfort.
Efficacy - A measure of lamp output efficiency, with units of lumen/watt
Flat Glass Luminaires – Luminaires with no light emitting above the horizontal giving low glare & low obtrusive light.
Fluorescent Lamps – Lamps that can give "white light". Compact fluorescent lamps present the ordinary tubular lamp in a small package.
Flange Mounted Pole - a pole manufactured with a flange at the bottom to bolt down to a concrete footing.
Footing - concrete base for a flanged pole.
Glare – Condition of vision in which there is discomfort or reduction of ability to see, or both, caused by an unsuitable distribution or range of luminance, or to extreme contrasts in the field of vision.
Glare Control Mark – A measure of discomfort glare produced by a street light in a particular situation. This mark is on a scale of 1 to 9 with higher numbers being more comfortable.
High Pressure Sodium (HPS) Lamps – Lamps with a yellow colour appearance. Used on freeways.
Illuminance – The amount of lighting at a particular point, measured in lux.
Ingress Protection – or "IP rating", a two digit code that indicates resistance to ingress of solids and liquids, the first digit refers to solids, the second to liquids eg IP55 means dust-protected & water-jet proof. Higher numbers indicate better protection
Illuminance Uniformity (Ue) - This is a measure that relates average illuminance to maximum illuminance. The higher the figure, the greater the problems of excessive contrast of the highest illumination point.
Lamp – a generic term for a man made source of light sometimes colloquially referred to as a "globe" or "bulb".
Light Output – The total luminous flux emitted by a lamp or luminaire.
Luminance – the brightness of an object or surface. Measured in units of cd/m^2 (candela per square metre).
Low Pressure Sodium (LPS) Lamps – Lamps with a distinctive yellow colour. The light emitted by this lamp distorts the colours of blue, green and red, but produced a high quantity of light for the quantity of energy consumed.

4 DEFINITIONS

Longitudinal Luminance Uniformity (UI) – The ratio of minimum to maximum carriageway luminance in a longitudinal line along the road through the observer's position. The closer this figure is to 1, the more even is the luminance.

Luminaire – A light fitting or "fixture" including lamps, optical system and any electrical control gear.

Minimum Illuminance (Emin) - The minimum measured lighting level recorded in the measurement area, the measurements taken at ground level in the horizontal plane

Mercury Vapour (MV) Lamps – Lamps with a blue-white colour.

Metal Halide Lamps – Lamps which can give "white light"- more efficient than mercury vapour.

Mounting Height – The vertical distance between the centre of a luminaire and the surface of the carriageway immediately beneath the lighting.

Nominal Height – The vertical distance between the bottom of the baseplate or ground line (as applicable) and

(a) For columns with outreach arms - a horizontal line at the highest level of the outreach arm centre-line.

(b) For post-top columns – the highest point of the column excluding any fixing spigot.

Observer's Position - A reference position on the road from which theoretical calculations are based. Approximately where a driver would sit when driving down the road.

Obtrusive Light - Spill light causing annoyance distraction, discomfort, or reduction in vision.

Outreach - The distance measured horizontally from the centre of a bracket-mounted luminaire, to the centre of the column or pole, or the wall face to which the bracket is attached.

Overall Luminance Uniformity (Uo) – The ratio of minimum carriageway luminance to the average luminance. The closer this figure is to 1, the more even the luminance.

Peak Intensity - The highest value of luminous intensity from a given luminaire.

Planting Depth - The length of the column that is buried below ground level.

Reliability – in this report reliability is taken as the percentage of street lights working at a given time.

Repair time – the time taken from report of failure to restoration of the street light

Standards – Australian Standards include:

AS1158	Public Lighting
AS1428	Design for Access & Mobility
AS1680	Interior Lighting
AS2293	Emergency Lighting
AS2560	Sports Lighting
AS2890	Off Road Car Parks
AS4282	Obtrusive Light

Spill Light – Light which falls outside the boundary of the property on which the lighting installation is sited

Surround Illuminance Ratio (ES) - The ratio between the average illuminance of the road verge to the adjacent section of carriageway. The higher the ratio, the more effectively will verge details be discernible to drivers.

Threshold Increment – A measure of disability glare produced by a street lighting in a particular situation. The higher numbers correspond to greater disability glare.

Uniformity Ratio – The ratio of maximum illuminance to average illuminance.

Upcast Angle - The angle between the axis of the luminaire fixing and the horizontal.

Uplift - (For pole-mounted bracket arms) - the vertical distance between the intersection of the bracket arm centre-line with the supporting face and the highest level of the bracket arm centre-line.

5 INSTITUTIONAL REVIEW

5.1 BACKGROUND

In Western Australia, as in other states of Australia, Local Governments are responsible for the provision of street lighting. An exception is certain major roads where the responsibility for road lighting lies with Main Roads WA or is shared between Mains Roads WA and Local Government.

The arrangement in Western Australia, where Local Government is responsible for street lighting but employs the electricity supply authority to be the street lighting service provider, is also the case in other parts of Australia and in New Zealand.

In Britain, street lighting is a Local Government responsibility and Local Government; through the County Councils take care of the design, installation, maintenance and ownership of street lighting. The electricity supply authority provides an electricity supply to each light pole via a "service cut out" within the light pole. This service cut out is the dividing line between the supply authority and the County Council. If there is power at the service cut out, the County Council know maintenance is their responsibility. If there is no power at the service cut out, the County Council requests the supply authority to repair.

In Britain there is a need to replace aged public lighting and local authorities can apply for grants from central government to fund lighting improvements.

In Western Australia, there is an historical arrangement where Local Governments have requested Western Power, previously SECWA and SEC, to install streetlights on power poles. Before the formation of the SEC, street lighting was provided by Local Governments who were the local electricity undertakings. During 2006 Western Power was split. "Synergy" is the retial entity that bills local government for street lighting and "Western Power" claims ownership of street lighting equipment. Under the present State Government contestability policy Synergy and Western Power claim that lighting is not contestable.

Early Street lighting in Subiaco [1]

The Western Australian Local Government Association strongly advocates the contestability of street lighting and has published an Infopage 05-001-03-0014

5.2 CURRENT PRACTICE IN WESTERN AUSTRALIA

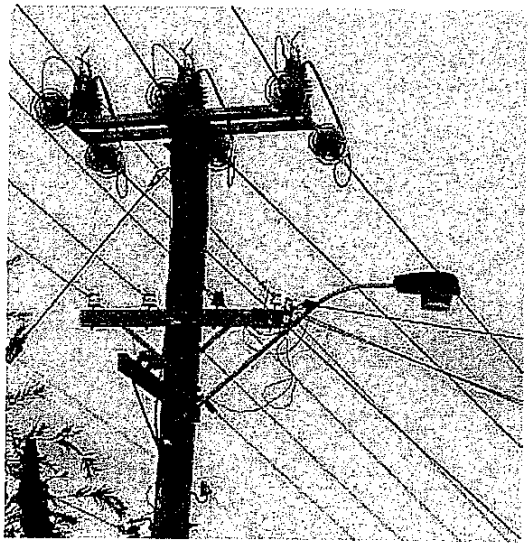
5.2.1 INTRODUCTION

Western Australia has a stock of 199 552 street lights that consumed 90.2 GWh of energy in 2002/2003. Approximately 40% of these street lights serve major roads and 60% minor roads. In Australia, major street lighting accounts for 30% of the numbers of street lights but 53% of the energy, whereas minor street lights account for 70% of the numbers but 47% of the energy[6].

In accordance with the recognized road hierarchy, minor roads are Local Access Roads and Local Distributor Roads. Major roads are the District Distributors. Principally, minor roads are lit for pedestrian security (AS/NZS 1158 Category P lighting) and major roads for vehicle safety (AS/NZS 1158 Category V lighting).

While the minor roads have a higher number of street lights, they are of lower power than major road street lights.

5.2.2 MINOR ROADS



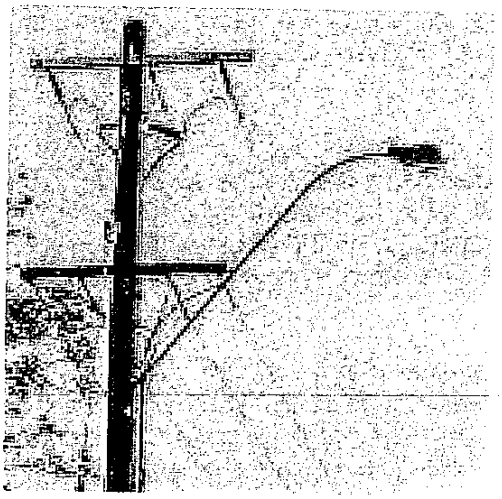
Most minor roads in Western Australia have substandard lighting. With streetlights spaced 80 m apart, the section of road halfway between the streetlights is a black spot receiving no light. Observation, measurement and calculation have confirmed this.

Typically what was called "half standard" street lighting was installed. This meant streetlights generally installed on every second power pole. The spacing was consequently four street frontages, about 80 m, generally too far apart to achieve compliance with Australian Standards.

For minor roads, 50 W, 80 W, and 125 W mercury vapour streetlights are typical with a mounting height of about 7.5 m with overhead power and 6.5 m with underground power.

Through the 1990's, Western Power upgraded many minor road streetlights to 80 W mercury vapour.

5.2.3 MAJOR ROADS



For major roads, 250 W high pressure sodium and older 250 W and 400 W mercury vapour streetlights are typical with a mounting height of about 9 m with overhead power and 10.5 m, or 12.5 m with underground power.

For the major roads, high pressure sodium lamps are energy efficient. However, a further improvement in energy efficiency can be obtained with bi-level control. Bi-level control of a high pressure sodium lamp halves the energy consumption and the light output. In effect lighting to Category V3 can be reduced to Category V5. This should be acceptable as there appears to be a reduction in traffic flow about 9pm on weeknights. Thus full lighting can be maintained during times of high traffic flow and half lighting when traffic flow reduces.

Bi-level control requires a "supplementary impedance", an extra switching wire, and a 7 day time switch, or similar device.

5.3 UNDERGROUND POWER

With the advent of the State Underground Power Policy in 1990, the Underground Power Program was launched. This programme facilitates the undergrounding of power with funding contributions from Western Power and Local Government. The aim is to have power underground in half of the metropolitan area by 2010.

By necessity, this program has to replace the streetlights mounted to power poles with new streetlights on new steel poles. With the initial trial and stages 1 and 2 of this program, streetlights were replaced on a "like for like" basis, that is, the number of existing streetlights was counted, and then replaced with the same number of new streetlights. If Local Government wanted lighting to achieve Australian Standards, Local Government had to pay for the additional streetlights needed to achieve compliance.

The Round Four Guidelines state:

"Western Power streetlights funded as part of a project will use standard Western Power galvanized poles and luminaires that will provide lighting levels to Australian Standards.

Additional streetlighting requirements such as the use of decorative poles/luminaires or increasing the lighting levels to a higher Australian Standard category may be installed at an additional cost to the local government. ....."

Consequently the Underground Power Program has now moved from "like for like" street lighting to street lighting which meets Australian Standards. The applicable Australian Standard for the lighting of minor roads AS/NZS 1158.3.1 tables five Categories of lighting, from P5 to P1. The standard prescribes four Light Technical Parameters to be met, rather than just one "minimum level". Western Power's Newsletters under "Streetlighting" typically state:

"The new streetlights are designed to conform as closely as possible to the relevant Australian Standard and are located quite differently to the old lights. The new lights will be located one metre from the edge of the roadway, more closely spaced and where possible, placed on the extensions of side boundaries and alternated to both sides of the road". [2]

It is noted that specific Categories of the relevant Australian Standard (AS/NZS 1158) are not quoted in the Office of Energy documentation.

5.4 IMPROVEMENTS

Western Power has been moving forward with more efficient street lighting technology and examples of this include:

- High pressure sodium lamps were used in Stratton in ordinary functional streetlights and in the underground power project in Claremont in decorative "Kensington" streetlights.
- In Midvale, Western Power replaced 80 W mercury vapour streetlights with 70 W metal halide streetlights. The result has seen substandard street lighting raised to Category P4 of AS/NZS 1158.3.1 with lower energy consumption.
- Western Power introduced a range of decorative streetlights in 2000. Initially this range included 80 and 125 W mercury vapour lamps and 70, 150, and 250 W high pressure sodium lamps. The current range of Western Power decorative streetlights includes 70, 150, and 250 W metal halide lamps in addition to 50, 80 and 125 W mercury vapour lamps and 70, 150 and 250 W high pressure sodium lamps.

Western Power is investigating but has not yet trialled fluorescent streetlights. Western Power's concern has been with the reliability of fluorescent technology. These have been available for some years. The 42 W compact fluorescent lamp introduced in 1994 has a similar output to the 80 W mercury vapour lamp but consumes half the energy. The T5 (16 mm diameter) linear fluorescent lamps introduced in 1996 combine high efficacy with long life. A 2 x 24 W T5 streetlight has a similar output to an 80 W mercury vapour streetlight but consumes 55% of the energy.

Modern fluorescent lamps such as the 42 W compact fluorescent lamp and the T5 linear fluorescent lamps are dependent on electronic control gear for their operation. Electronic control gear provides these modern lamps with a stable operating regime. Western Power is concerned about the ambient temperatures in Western Australia that may exceed manufacturer's ratings and shorten the life of the electronic control gear.

The Public Transport Authority is insisting on electronic control gear for all lamps (metal-halide & fluorescent) for the railway stations for the new Mandurah line.

5.5 FUNDING

Western Power and its predecessors SECWA and SEC originally funded the installation of streetlights and then recovered the cost from Local Government through tariffs based on the wattage of the lamp and the burning hours. At present many Local Governments on contract with Western Power pay for street lighting on the basis of an annual "Street Vision" charge that is fixed each year.

Through the Underground Power Program and new residential developments, half of the metropolitan area will have improved street lighting by 2010. However, some of the early underground power project areas have non-conforming street lighting.

6 TECHNICAL REVIEW

6.1 LAMP TECHNOLOGY

Two important characteristics of lamps used for street lighting are the energy efficiency and the lamp life.

The energy efficiency of lamps is measured as "efficacy". This is the ability of the lamp to produce visible light (measured in lumens) from electrical energy (measured in watts). Efficacy is measured in terms of lumens/watt. A lamp with 100% energy efficiency would have an efficacy of 683 lumens/watt. Practical lamps have efficacies in the range 10 to 200 lumens/watt.

The life of lamps may be measured as rated life or as "economic life". Rated life is the time at which 50% lamp mortality has been reached. Economic life is the time at which the light output has depreciated to 70% of the initial light output and should be replaced.

While the mercury vapour lamp has been a reliable source for minor street lighting in many parts of Australia and overseas, its status is now challenged by lamps that are more efficient.

At present, the contenders for replacing mercury vapour lamps are high pressure sodium, metal halide, and fluorescent lamps. Technologies which have not been considered are: low pressure sodium lamps which have poor colour; LED's which are not efficient and have too low power, and induction lamps that are very expensive.

6.2 MERCURY VAPOUR LAMPS

Mercury vapour lamps were developed in the 1930's and their efficacy has not improved since then.

Mercury vapour lamps have:

- A poor efficacy of 40 to 50 lumens/watt.
- A Colour Rendering Index of about 50 with a blue-white output deficient in red that renders skin tones poorly.
- A long life of 16,000 hours typically.
- Have a high mercury content.

One advantage of the mercury vapour lamp is its long and reliable life. Mercury vapour lamps may operate for over a decade, but as each year goes by, its output diminishes. After four years of operation at 4,000 hours per year, a mercury vapour lamp will produce about 65 to 70% of its initial output, but still consume the same amount of energy.

The disposal of mercury vapour lamps should be considered a serious problem. Each 80 W lamp contains 14 mg of mercury.

6.3 HIGH PRESSURE SODIUM LAMPS

High pressure sodium lamps:

- Have high efficacy, around 90-120 lumens/watt.
- Have poor colour rendition with a Colour Rendering Index of 22 and a distinctive golden colour.
- Have long life of 24,000 hours typically.
- Have low mercury content.

High pressure sodium lamps are a reliable light source for road lighting offering high efficacy and long life. The life of high wattage lamps is around 20,000 hours while the life of low wattage lamps is around 12,000 hours. A development of this lamp is the twin arc tube lamp, essentially two lamps in one envelope. This lamp offers double the life.

High pressure sodium lamps are used for lighting minor roads in New Zealand and in England. One disadvantage of these lamps is their poor colour rendition that does not accurately render skin tones, clothing colours, and vehicle paintwork. The primary purpose of minor road lighting is security and high pressure sodium lighting fails to provide colour identification for security.

Under photopic (day) vision, the eye is most sensitive to yellow light. Under scotopic (night) vision, the eye is most sensitive to blue light. Minor road lighting is in the mesopic (between photopic and scotopic) range of vision. What this means is that the predominantly yellow light from high pressure sodium lighting is not as effective as the white light from metal halide and fluorescent lamps. The latest edition of AS 1158.3.1 recognises this and recommends that a de-rating factor of 75% be applied to high pressure sodium lighting for Categories P4 and P5.

High pressure sodium lighting is valid for highway lighting and is used by Main Roads WA and Western Power for major roads.

6.4 METAL HALIDE LAMPS

Metal-halide lamps were developed in the 1960's and may be considered to have evolved from mercury vapour lamps.

Metal-halide lamps:

- Offer high energy efficiencies of around 80 lumens/watt
- Have excellent colour rendering giving "white light" with Colour Rendering Indices between 65 and 80. Their strong blue and green component makes them particularly well suited to night vision.
- Have suffered from short life of about 6,000 hours (1½ years) but developments in recent years have extended life to 12,000 hours for low wattage lamps (3 years) and up to 20,000 hours (5 years) for larger wattage lamps. Philips has a 60W metal halide lamp, branded "Cosmo-white", with a 12 000 hour rated life. Venture have metal halide lamps with long life, claiming 75% survival at 15 000 hours.
- Have low mercury content.

The Lighting Strategy for the City of Perth has designated this lamp for Perth's "White Light". One example is the Eastern Gateway to Perth where the Great Eastern Highway passes Burswood Casino. Other examples are the Thorn "Urbi" luminaires in many of the City of Perth's streets.

6.5 FLUORESCENT LAMPS

Fluorescent lamps:

- Offer high efficacy of between 80 and 100 lumens/watt.
- Offer "white light" with a Colour Rendering Index of 80 giving excellent colour rendering of red, blue and green.
- Have a life varying from 12,000 hours to 36,000 hours.
- Have low mercury content.

T5 (16mm diameter) fluorescent lamps are linear fluorescent lamps but with a smaller diameter to the conventional 26 mm lamps. These lamps run on electronic control gear and have very high efficacy (about 100 lumens/watt) and a long life of about 20,000 hours. A trial of these lamps is being established in Victoria.

One Australian manufacturer, Pierlite has produced a streetlight using two x 14 W and 2 x 24 W, T5 (16 mm diameter) lamps with electronic control gear. These lamps have a rated life of 20,000 hours. The 14 W lamps have an efficacy of 100 lumens/watt and the 24 W lamps 80 lumens/watt. A street lighting trial of T5 lamps is being established in Victoria.

T5 lamps in general are manufactured to give optimal output at 35°C whereas most fluorescent lamps are optimised at 25°C. In outdoor applications there is a possibility that the lamps may only give 80% of full output.

Streetlights with compact fluorescent lamps are available from a number of manufacturers. These lamps have an efficacy of 80 lumens/watt and a life of 12,000 hours.

Sylvania have a 42W compact fluorescent lamp with a claimed life of 28 000 hours. This is an "amalgam" type fluorescent lamp.

Old technology fluorescent lamps have been used in Australia, particularly around the Sydney metropolitan area. Twin 18 W linear fluorescent lamps with wire wound ballasts have been typical. These are T8 (26 mm diameter) lamps with a rated life of about 10,000 hours.

6.6 LOW PRESSURE SODIUM LAMPS

Low pressure sodium lamps have been used rarely in the past in Australia for street lighting but are being replaced because of their poor colour characteristics. These lamps have no Colour Rendering Index. These lamps have a monochromatic yellow colour that does not support colour vision, however they do have an extremely high efficiency of 200 lumens/watt.

Low pressure sodium lamps have been used in very few countries with limited success. These lamps have a limited future and are only of historical interest.

6.7 LIGHT EMITTING DIODES

Light emitting diodes (LED's) are a promising light source but the efficacy of white LED's is poor and the power is limited. LED's offer extremely long life.

LED's are a promising light source, but at present are not yet suitable for street lighting because of their low efficacy. LED's have been trialled in Australia but not where compliance with AS/NZS 1158 is required.

At the time of this report, high efficiency LED's are appearing to emerge.

6.8 INDUCTION LAMPS

The induction lamp is a type of fluorescent lamp that offers extremely long life. The cost is very high and makes these lamps appropriate only when maintenance access is extremely difficult.

Induction lamps are not suitable for large scale street lighting as their cost, about $1000, is prohibitive.

6.9 DIMMING

It is possible to dim some types of street lighting lamps. It can be economic, especially with high wattage major road lighting, to dim lamps to about 50% to save energy. Compliance with standards can be maintained, for instance, Category V3 lighting can be dimmed to 50% and Category V5 can still be achieved. The application for dimming would be major roads that are busy in the early evening but have little traffic after 9 or 10pm.

6.10 LAMP COMPARISON

The various lamp families are compared below in Table 1:

Table 1

Lamp Type ❶	MV	HPS	MH	FL	LPS	LED	IND
Rated Life (1000 h)	24	24	6-30	10-30	10	100	100
Economic Life (1000 h)	15	24	6-20	10-20	10	100	100
Efficacy Photopic (lumens/Watt)	40-50	90-120	80	80-100	170-200	25	100
Efficacy Scotopic (lumens/Watt)	40-50	50-70	100	80-100	NA	25	100
Power Range (W)	50-400	50-250	35-400	18-57	18-180	1	100-150
CRI ❷	OK	Poor	Good	Good	Very Poor	Good	Good

NOTES
❶ MV = mercury vapour, HPS = high pressure sodium, MH = metal halide
FL = fluorescent, LPS = low pressure sodium, LED = light emitting diode, IND = Induction.
❷ CRI = colour rendering index. An index greater than 50 is good.

The data in Table 1 is derived from lamp manufacturers represented in Australia.

Table 2 shown below compares various lamp technologies in terms of power, power per kilometre (kW/km), greenhouse gas emissions (Tonnes of CO_2 per kilometre per annum), mercury content (milligrams per lamp), life in hours, and estimated annual cost including energy and scheduled maintenance. The table assumes a standard geometry with overhead power of 80 m spacing, 7.5 m mounting height, and a 20 m road reserve.

Table 2

Lamp type ❶	80 W MV	42 W CFL	2 x 24 W T5 FL	70 W MH	50 W HPS❾	70 W HPS❾	57 W CFL
Power ❷ (W)	89.5	46	50	77	55	77	63
kW/km ❸	1.2	0.6	0.65	1.0	0.7	1.0	0.8
CO_2/km ❹ (T)	4	2	2.2	3.4	2.4	3.4	2.8
Category ❺	X	X	P5	P4	X	P4	P5
Mercury ❻ (mg)	14	4.5	6	0.01	0.02	0.02	4.6
Lamp Life ❼ (h)	16000	28000	20000	10000	20000	20000	10000
Energy Cost ❽ p.a. per lamp	$38.14	$19.60	$21.30	$32.81	$23.44	$32.81	$26.50

NOTES
❶ MV = mercury vapour, CFL = compact fluorescent, FL = fluorescent, MH = metal halide
HPS = high pressure sodium
❷ Power per lamp measured in Watts.
❸ Power required per kilometre based on a nominal spacing of 80 m.
❹ Tonnes of CO_2 produced per kilometre per annum based on 4 000 h burning and 0.9 kg of CO_2 per kWh.

❺ AS/NZS 1158.3.1 Category, **X** = non-compliant with any Category. The non-compliance refers to the geometry (80 m spacing, 7.5 m mounting height) rather than the technology. In each case compliance could be achieved with better geometry (closer spacing or higher mounting height).
❻ Mercury content in each lamp measured in milligrams.
❼ Lamp life in hours (typical burning hours for all night streetlights are 4,000 per annum)
❽ Based on Western Power tariff Z18 ($1.1676/kW per day).
❾ Twin arc tube versions of the 70 and 50 W high pressure sodium lamps are available. These lamps have twice the life of standard lamps, that is 40 000 hours instead of 20 000 hours. These lamps offer better economy through their long life, but give yellow light that is subject to a de-rating of 75%.

The data in Table 2 is derived from lamp manufacturers represented in Australia [3].

Sample calculations for CO_2 emissions are given in Appendix C.

Where non-compliance is shown against "Category", the non-compliance is due to the minimum illuminance level of AS/NZS 1158.3.1 not being achieved. With this standard geometry 80 W mercury vapour, 42 W compact fluorescent, and 50 W high pressure sodium lamps are non-compliant, but would be compliant at spacings shorter than 80 m.

While mercury vapour lamps have proved reliable for street lighting over 70 years, it is suggested that the future lies with a combination of fluorescent, metal halide, and high pressure sodium lamps that have higher energy efficiencies.

The efficacy of mercury vapour lamps is low, between 40 and 50 lumens watt. The efficacy of fluorescent and metal halide lamps is between 80 and 100 lumens/watt.

The 42 W compact fluorescent lamp will not achieve compliance with AS/NZS 1158 with the standard geometry of 80 m spacing, 7.5 m mounting height, and 20 m road reserve. However it will give performance similar to the common 80 W mercury vapour lamp while consuming half the energy.

Two 24 W T5 fluorescent lamps can achieve compliance with AS/NZS 1158 Category P5 with an energy reduction of 37.5% compared with the non-compliant 80 W mercury vapour lamp. The 70 W metal halide and 70 W high pressure sodium lamps can achieve compliance with AS/NZS 1158 Category P4 with an energy reduction of 14% compared with the non-compliant 80 W mercury vapour lamp.

The efficacy of high pressure sodium lamps is between 90 and 120 lumens/watt in the photopic (day light) range of vision and between 50 and 70 lumens/watt in the scotopic (night) range of vision. For street lighting the range of vision lies between the photopic (daylight) and scotopic (night). High pressure sodium lamps have the highest efficacy when used for street lighting at high illuminance levels, that is, towards the photopic range, and lower efficacy at low illuminance levels.

Mercury vapour lamps have about half the efficacy of the fluorescent, metal halide and high pressure sodium lamps.

Table 3 shown below compares the annual running costs of specific lamps relative to their light output.

Table 3

Lamp type ❶	80 W MV	42 W CFL	2 x 24 W T5 FL	70 W MH	50 W HPS	70 W HPS	57 W CFL
Lamp Life ❷ (years)	4	5	5	2.5	5	5	2.5
Lamp cost ❸ ($)	2.95	6.99	12.50	33.00	15.00	14.50	24.60
Labour cost ❹ ($)	32.50	32.50	32.50	32.50	32.50	32.50	32.50
Plant cost ❺ ($)	42.50	42.50	42.50	42.50	42.50	42.50	42.50
Cost per re-lamp❻ ($)	77.95	81.99	87.50	108.00	90.00	89.50	99.60
Re-lamp cost pa ❼ ($)	19.49	16.40	17.50	43.20	18.00	17.90	39.84
Power ❽ (W)	89.5	46.0	50.0	77.0	55.0	77.0	63.0
Energy Cost ❾ p.a.	38.14	19.60	21.30	32.81	23.44	32.81	26.50
Running cost ❿ p.a. ($)	57.63	36.00	38.80	76.01	41.44	50.71	66.34
Light output lumens	3600	3200	3500	4900	4400	6500	4300
Running cost per kilo-lumen ($) p.a.	**16.00**	**11.25**	**11.09**	**15.51**	**9.42**	**7.80**	**15.43**

NOTES
❶ MV = mercury vapour, CFL = compact fluorescent, FL = fluorescent, MH = metal halide HPS = high pressure sodium
❷ Lamp life in hours divided by 4,000 hours per annum.
❸ Lamp cost based on lamp manufacturers' information
❹ Labour cost based on ½ hour re-lamp time @$65/hour (electrician/linesman)
❺ Plant cost based on ½ hour re-lamp time @$85/hour (plant and operator)
❻ Sum of lamp cost, labour cost, and plant cost
❼ Cost per re-lamp divided by lamp life in years
❽ Power per lamp measured in Watts
❾ Based on Western Power tariff Z18 ($1.1676/kW per day).
❿ Sum of re-lamp cost pa and energy cost pa.

Table 3 assumes that the existing street light luminaires need to be replaced and that the cost of replacement luminaires will be the same regardless of the selected technology. This assumption is based on most existing street lights being due for replacement as they would have exceeded their expected life. Prior to 2005, Australian Standards specified a life of 15 years for street light luminaires. AS/NZS 1158 – 2005 now specifies 20 years.

The running cost per kilo-lumen p.a. for the 80 W mercury vapour lamp is calculated as follows:

Re-lamp cost p.a. =	($2.95 + $32.50 + $42.50) ÷ 4 years	= $19.49
Energy cost p.a	(89.5 W ÷1000 x $1.1676/day x 365	= $38.14
TOTAL COST p.a.		= $57.63
TOTAL COST PER kilo-lumen p.a. =	$57.63 ÷ 3.6 kilo-lumens	= $16.00

6.11 COMPARISON OF PRACTICES

6.11.1 ENGLAND

In England low pressure sodium lamps have historically been preferred for both minor and major roads. This lamp was originally selected because of its high efficacy (up to 200 lumens/watt).

The lamp produces yellow monochromatic light that does not support colour vision. These lamps are being replaced by high pressure sodium lamps on major and minor roads for their superior colour characteristics.

Where there is a perceived security risk or where security cameras are in use, white light sources, such as metal halide, or compact fluorescent lamps, are favoured.

In discussion with lighting engineers from Surrey and Hampshire [4], a preference for 57 W compact fluorescent lamps was expressed. Trials had been undertaken with this lamp, high pressure sodium, and 35 W metal halide. The perception from this trial was that the 35 W metal halide lamp with its small envelope was very glary compared with the 57 W compact fluorescent lamp with its larger envelope and thus lower lamp brightness.

Mercury vapour lamps are not used for street lighting in England because of their poor efficiency.

6.11.2 NORTH AMERICA

In North America, mercury vapour lighting has been used for minor roads and high pressure sodium lighting for major roads. There is a tendency towards metal halide for its white light and high efficacy both for upgrading minor and major roads. The City of New York selected metal halide lighting for 40th Street to provide "white light" [5].

6.11.3 SOUTH AFRICA

In South Africa, a mixture of mercury vapour and high pressure sodium lamps is used for minor road lighting. Generally, mercury vapour lamps are being replaced with high pressure sodium lamps.

The lowest output lamp used is the 125 W mercury vapour. These are being replaced with 70 W high pressure sodium lamps.

With major roads, historically a mixture of high pressure sodium, low pressure sodium and mercury vapour has been used. Mercury vapour and low pressure sodium lamps are being replaced with high pressure sodium.

The national standard is NRS 10098 Part1: The lighting of public thoroughfares and Part 2: The lighting of certain specific areas of streets and highways. The City of Cape Town insists that the national standard is applied to all new street lighting. [6]

6.11.4 NEW ZEALAND

In New Zealand, high pressure sodium streetlights are preferred for major and minor roads.

6.11.5 AUSTRALIA

In Australia mercury vapour lamps have been preferred for minor road lighting. Some fluorescent lighting has also been used, particularly around the Sydney metropolitan area. More recently there have been a number of initiatives to change lamp technologies to achieve better energy efficiency.

In Western Australia there has been a number of energy efficiency driven street lighting initiatives in Midvale, Mosman Park, Subiaco and Joondalup.

In **Midvale**, 70 W metal halide streetlights have replaced 80 W mercury vapour streetlights. These streetlights are mounted on timber power poles at a spacing of 80 m. Not only has energy consumption been reduced by 14% but the lighting levels increased from substandard to AS/NZS1158.3.1 Category P4 thus enhancing security for the community.

In **Mosman Park** a combination of compact fluorescent, metal halide and high pressure sodium streetlights have replaced 80 W mercury vapour streetlights. These streetlights have been installed on steel poles as part of an Underground Power Program. The new lighting complies with AS/NZS 1158 whereas the previous lighting was substandard.

In **Subiaco**, 42 W compact fluorescent streetlights on 3.5 m and 4.5 m steel poles have replaced 80 W mercury vapour streetlights on overhead power poles. This has either been part of City installations or of an Underground Power Program. The new lighting complies with AS/NZS 1158.3.1 Category P4 whereas the previous lighting was substandard.

In **Joondalup** City Centre, the City of Joondalup proposes replacing the 1980's decorative road lighting with more energy efficient road lighting. The proposal can reduce the energy consumption by 60%. The new lighting will comply with AS/NZS 1158 whereas the old lighting was patchy and substandard.

The following techniques will be used in Joondalup:

- Efficient metal halide lamps
- Effective optical systems
- Low energy loss electronic ballasts
- Bi-level switching reducing lighting levels in the late evening when traffic decreases

Coffs Harbour in New South Wales has replaced all of their mercury vapour lamps with 50 W high pressure sodium lamps [7]. This program was initiated to save energy and thus greenhouse gas emission and was completed in September 2005. Coffs Harbour chose the

high pressure sodium lamp as it was established technology and the luminaires could be upgraded to metal halide or compact fluorescent when those technologies were more mature. The luminaires have proven to be reliable and community feedback has been positive.

In **Canberra**, compact fluorescent lamps have been retrofitted to existing incandescent street lights. These lamps are 28 W self ballasted with E27 screw bases. Problems of short life have been experienced. This is being addressed with better specification to obtain lamps of better manufacture. The cold weather in Canberra may be a contributing factor to the short life of these lamps.

Banyule City Council in Victoria is trialling the Pierlite "Greenstreet" luminaire with high efficiency T5 (26 mm diameter) fluorescent lamps [8]. Twin 14 W luminaires have replaced 80 W mercury vapour luminaires on existing power poles spaced 80 m apart. Over two years these luminaires have worked well with a reduction of two thirds of the energy and greenhouse gases and positive community feedback. The luminaires have proven to be robust, reliable and with no insect or water ingress.

In Victoria, **Integral Energy** has installed about 3000 Greenstreet luminaires with success.

The **South Sydney Regional Organisation of Councils** (SSROC), through their service provider Energy Australia, from 2004, stopped installing 2 x 18 W fluorescent streetlights and installed 80W mercury vapour Sylvania Suburban streetlights as an interim measure for two years[9]. On behalf of SSROC, the consultant Next Energy is evaluating two candidate luminaires: the Pierlite 2 x 14 W and 2 x 24 W T5 Greenstreet Mark III luminaire; and the Sylvania 32 W and 42 W compact fluorescent Suburban Eco luminaire. The NSW State Government is intending to contribute $4.2 million from their Energy Saving Fund to SSROC for residential and major road lighting upgrades. From October to December 2006, the major road lighting upgrade should commence as well as pilot trials of minor road lighting to test the candidate luminaires. Large scale replacement is due to start early in 2007.

The **City of Adelaide** is converting all of its street lighting to metal halide. The reasons for this conversion are energy efficiency and the community security provided by the white light of metal halide lamps.

The **Australian Greenhouse Office** engaged Genesis to undertake a study entitled "*Public Lighting in Australia – Energy Efficiency Challenges and Opportunities*". This study required:

- An overview of public lighting in Australia.
- As assessment of the total public lighting stock in Australia.
- Assessments of the state of play in Australia regarding the timing of batch re-lamping.
- A review and assessment of significant public lighting trials in Australia & overseas.
- A range of best practice scenarios for public lighting decision makers.
- A range of robust "scenario calculators".

This report was published late in 2005 and released on 9 February 2006. [10]

The Australian Greenhouse Office is producing a guide towards energy efficient street lighting. This guide will encourage local government to consider alternatives to the 80W mercury lamp.

ICLEI, the International Council for Local Environmental Initiatives, is encouraging energy efficient street lighting through the Cities for Climate Protection program.

ICLEI ran a forum in May 2005 and in March 2006 covering many sustainability issues including street lighting.

The Cities of Armadale, Bunbury, Cockburn, Gosnells, Nedlands, Perth, the Shire of Serpentine/Jarrahdale, and the City of Subiaco have been participating in these workshops.

MEPS, Minimum Energy Performance Standards, are generally Australian Standards documents that apply to components, such as lamps and lamp control gear, rather than systems. However the MEPS document, "Minimum Energy Performance Standards, Design Energy Limits for Main Road Lighting" covers lighting systems [11]. This document applies only to Category V lighting and lists power limits per metre for different road geometries and different lighting categories.

Table 4 lists two common categories and geometries, where the following power limits are specified:

Table 4

CATEGORY	GEOMETRY	POWER LIMITS (W/m)	
		Mandatory	High Efficiency
AS/NZS 1158 V3	7m, dual carriageway	7.3	5.5
AS/NZS 1158 V5	7m, dual carriageway	6.2	5.5

6.11.6 TRENDS

Internationally there appears to be a general trend away from low pressure sodium (poor colour) and mercury vapour (poor efficacy) lamps towards better colour and higher efficacy lamps.

This trend is outlined below:

ENGLAND	LPS → HPS and some MH and CFL
NORTH AMERICA	MV → MH
SOUTH AFRICA	MV & LPS → HPS
NEW ZEALAND	MV → HPS
AUSTRALIA	MV & HPS → CF/MH/HPS

6.12 LIGHTING STANDARDS

6.12.1 NATIONAL STANDARDS

AS/NZS 1158.3.1-2005 is the current national standard covering lighting of minor roads. Changes from the 1999 edition include:

- Consideration of energy consumption and efficiency.
- Recommendations on de-rating of sodium lamps for Categories P4 and P5.
- Reductions in the maximum Upward Wasted Light Ratio (to reduce light pollution and energy wastage).
- Revisions and clarifications on lighting of local area traffic management devices, curves and intersections, and car parks.

This standard contains 12 Categories of lighting of which 5 Categories, P1 to P5 cover most minor roads and pathways. The other Categories cover town squares, transport terminals, car parks, etc.

Category P5 generally should only be applied to replacement of luminaires on existing power poles. (Refer footnote e) on page 11 of AS 1158.3.1:2005).

This standard is largely performance based and recommends a number of Light Technical Parameters to be achieved. These parameters are average lighting level (lux), minimum lighting level (lux), uniformity, and for higher Categories, vertical lighting level (lux) at face height.

The standard does not specify lighting equipment or energy consumption, but the currently published draft does require an "Energy Audit". This audit is required in general rather than specific terms.

Most lighting of minor roads in Western Australia is below the lowest Category of AS/NZS 1158.3.1. Local Government may be exposed to litigation if they have facilities that do not comply with a national standard even when that standard is not mandatory.

The Inquest dated 1 April 2004 on the death of Leon Russell Coomerang on 28 February 2002 emphasised the contribution of substandard street lighting to the death.

The State Coroner stated:

"I recommend that all Local Government bodies ensure that new roads constructed are adequately illuminated and that the illumination is at least in excess of Australian/New Zealand Standards and that in the case of existing roads regular reviews are conducted to ensure that all relevant standards are met and effective maintenance programs are in place" [12]

6.12.2 INTERNATIONAL STANDARDS

Appendix A contains a summary of the Australian & New Zealand Standard, the British and European Standard, and the North American Standards.

The comparison of Standards in Appendix A shows that South African, European and North American Standards demand higher lighting levels for pedestrian areas than AS/NZS 1158.3.1.

Category P3 of AS/NZS 1158.3.1 corresponds to the lowest Category B3 of SABS 098. AS/NZS 1158.3.1 offers Categories P4 and P5 below this level. The South African standard is thus two steps higher than the Australian Standard.

Category P3 of AS/NZS 1158.3.1 corresponds approximately to the lowest Category S6 of BS/EN 13201 in terms of average illuminance, but the minimum illuminance of Category P3 is half that of BS/EN 13201 category S6. The European standard is thus two steps higher than the Australian Standard.

Category P2 of AS/NZS 1158.3.1 corresponds to the lowest Category of the North American standard for "Residential" street lighting. AS/NZS 1158.3.1 offers Categories P3, P4, and P5 below this Category. The North American Standard is thus three steps higher than the Australian Standard.

AS/NZS 1158.3.1 therefore cannot be viewed as excessive or "gold plated" when compared to the standards of other countries. Australia enjoys a warmer, drier climate than most parts of Europe and North America and night vision is not commonly impeded by snow, hail and fog. This can possibly explain the lower lighting levels of the Australian Standard.

6.12.3 ENERGY EFFICIENCY

As previously mentioned, AS/NZS 1158.3.1:2005 does mention energy auditing, but it treats energy auditing in a qualitative rather than quantitative way. The standard states that the audit is in three parts:

i) Hardware used (with a view to minimizing the use of capital equipment which itself requires high energy inputs during manufacture).
ii) Electricity use in the lamp and control gear.
iii) Energy (electricity and other) used in the maintenance of the system commensurate with ensuring reliability and the efficiency of the scheme.

Appendix E of AS/NZS 1158.3 gives the required documentation if an energy audit is requested.

6.13 OBTRUSIVE LIGHT

Western Power reports they receive as many complaints about obtrusive light as they do about poor lighting. Obtrusive light is spill light that causes annoyance, discomfort, distraction or reduction in the ability to see essential information.

Obtrusive light can affect:

- Residents, - Difficulty in sleeping may be experienced due to light entering bedroom windows or due to the direct view of bright light sources.
- Transport System Users, - Disability glare reduces the ability to see objects in the environment and reduces the visibility of transport signalling systems. Marine and air navigation are also affected by obtrusive light.
- Astronomical Observation, - Sky glow from lighting systems lightens the dark sky and reduces the ability to see the night sky. To the community this is a general loss of amenity but to astronomers this is a particular concern. In the vicinity of observatories there are guidelines that need to be followed to avoid obtrusive light.

Obtrusive light and energy efficient lighting go hand in hand. Obtrusive light is not only a nuisance but also a waste of energy. Raising the standard of street lighting does not necessarily mean "too much light", or obtrusive light. Efficient optical systems direct the light where it is needed and reduce obtrusive light.

AS/NZS 1158 addresses the control of obtrusive light from road lighting in terms of the maximum Upward Waste Light Ratio from roadlighting luminaires.

7 LONG TERM FIELD STUDY

7.1 MEASUREMENTS

Illuminance levels in lux are being recorded in Midvale, Mosman Park and Subiaco in Western Australia in an area that has been re-lit with energy efficient lighting and in a control area lit with existing mercury vapour streetlights. Readings are being taken under each streetlight and directly opposite the streetlight at the edge of the road. Readings are being taken on nights when the moonlight does not interfere with the readings. Readings will be taken regularly over two years commencing at the end of 2004, and being completed at the end of 2006.

The locations of the trial are recorded in Appendix D. The measurements of the trials are recorded in Appendix E.

7.2 ECONOMIC IMPACT

In Western Australia, the cost of street lighting to Local Government is of the order of $20 million per annum. This cost includes an energy component and a maintenance component. In a large Local Government area, the cost of street lighting is about $1 million per annum.

Present indications are that while modern lamps can halve energy consumption and cost, the maintenance cost may increase. The increase in maintenance cost would be due to the shorter life of some of the modern lamps and the higher purchase cost of some modern lamps compared with mercury vapour lamps.

7.3 ENVIRONMENTAL IMPACT

Street lighting is a major component of Local Government energy consumption. The metropolitan area has about 10 000 km of sealed roads and if these are lit with 80 W mercury vapour street lights at 80 m spacing, burning 4,000 hours per annum, the energy consumption is 44,750 kWh (89.5 W (including ballast losses) ÷ 1,000 x 10,000,000 m ÷ 80 m x 4,000 = 44,750 kWh).

Assuming 0.9 of CO_2 per kWh street lighting causes CO_2 emissions amounting to 40 million kg per annum or 40,000 tonnes per annum.

Synergy does not break down their street lighting accounts into energy, maintenance and ownership components. If the common 80W mercury vapour street light is considered, the ZE02 tariff is 23.53 cents per day. The ZE02 tariff includes the cost of energy, maintenance and ownership. However, at the Z18, energy only tariff, the energy cost is 9.34 cents per day. This hypothetical comparison indicates that the energy cost component is 40% of the total cost. If energy could be halved without an increase in maintenance and ownership costs, there is a potential to reduce the total cost of street lighting by 20%.

7.4 RESULTS & RECOMMENDATIONS

7.4.1 MEASUREMENTS

The measurement data sheets are presented in Appendix E.

Three maintenance criteria are stated in the Electricity Supply Association of Australia.

- DEPRECIATION – Light Technical Parameters shall not fall below 70%.
- REPAIR TIME – Luminaire failures should be repaired within 5 days.
- RELIABILITY – No less than 95% of luminaires shall be operational at any time.

Depreciation is defined as the loss of light output over time as lamps age and optical surfaces collect dirt and deteriorate. The field trials address depreciation and reliability.

The average depreciation over the period of the field trials is shown in Table 5 below:

Table 5

SITE	TECHNOLOGY	DEPRECIATION
SUBIACO	Compact Fluorescent	81%
	Mercury Vapour	83%
MIDVALE	Metal Halide	73%
	Mercury Vapour	63%
MOSMAN PARK	Compact Fluorescent	61%
	Metal Halide	77%
	High Pressure Sodium	87%
	Mercury Vapour	88%

The reliability for the period of field trials is shown in Table 6 below:

Table 6

SITE	TECHNOLOGY	RELIABILITY
SUBIACO	Compact Fluorescent	97%
	Mercury Vapour	94%
MIDVALE	Metal Halide	90%
	Mercury Vapour	80%
MOSMAN PARK	Compact Fluorescent	81%
	Metal Halide	96%
	High Pressure Sodium	80%
	Mercury Vapour	75%

A 97% reliability indicates that over the four field trials 3% of the streetlights were not working. The poorest reliability was that of the mercury vapour streetlights in the southern part of Mosman Park where 25% of the streetlights were not working.

The greenhouse gas emissions are indicated in Table 7 below:

Table 7

SITE	TECHNOLOGY	AS/NZS 1158 COMPLIANCE	ENERGY PER km p.a.	GREENHOUSE GAS PER km p.a.
SUBIACO	CFL	P4	1.32 kW	4.8 T *
	MV	X	1.12 kW	4 T
MIDVALE	MH	P4	1.0 kW	3.4 T
	MV	X	1.12 kW	4 T
MOSMAN PARK	CF	P5	0.57 kW	2.1 T
	MH	P4	1.13 kW	4 T
	HPS	P3	1.37 kW	4.9 T
	MV	X	1.12 kW	4 T

* Greenhouse Gas Emissions in Subiaco increased because the previous mercury vapour lighting was well below standard and the new lighting aimed to comply with Australian Standards.
X The lighting does not comply with AS/NZS1158.

7.4.2 DISCUSSIONS ON MEASUREMENTS

Depreciation

The depreciation results indicate:

- In Subiaco there are similar rates of depreciation for compact fluorescent and mercury vapour lamps.
- In Midvale there is a higher depreciation rate for mercury than metal halide lamps.
- In Mosman Park there is a higher depreciation rate for compact fluorescent and metal halide lamps when compared with high pressure sodium and mercury vapour lamps. The high pressure sodium & mercury vapour lamps in Mosman Park have similar depreciation rates.

Reliability

The reliability results have to be weighed against the following considerations:

In Subiaco, many compact fluorescent lamps have been replaced as a result of water ingress into the luminaires. The water ingress is a luminaire problem rather than a lamp technology problem.

In Midvale, the City of Swan discontinued their Bulk Globe Replacement (BGR) program with Western Power on 1 July 2005. This was due to a lack of funding rather than any dissatisfaction with the BGR program.

In Mosman Park, there were initial problems with poor quality manufacture of compact fluorescent lamps. This was rectified by sourcing lamps of better quality.

The reliability figures reflect observations at the time of the field trials. Lamps may have had to be replaced in between the times of the field trials.

The poorest reliability in the field trials is that of the mercury vapour street lights in Mosman Park. What is encouraging is that the newer technologies are exhibiting better reliability than mercury vapour. This is surprising as it has been claimed that mercury vapour, despite its poor energy efficiency, has a long reliable life.

In both Midvale and Mosman Park, the reliability of the mercury vapour street lights is so poor, 80% and 75%, as to present a safety and security hazard. With these streetlights normally spaced 80 m apart, there is a blackspot of about 20 m in between. With failed streetlights the spacing could extend to 160 m resulting in a blackspot of 100 m with no lighting.

At this stage, the field trials are indicating that the newer technologies of compact fluorescent, high pressure sodium and metal halide lamps are performing similarly to mercury vapour lamps in terms of depreciation and reliability.

Greenhouse Gas Emissions

In Subiaco the emissions have increased 20% mainly because the lighting has been improved to comply with Category P4 of AS/NZS 1158 which required a significant number of new streetlights whereas the old lighting was below standard spacings of 80 m and more.

In Midvale the emissions have dropped 15% even though the lighting has been improved to Category P4 of AS/NZS 1158. It is noted that there are no additional streetlights.

In Mosman Park, emissions have remained the same where metal halide lighting to Category P4 of AS/NZS 1158 has been installed to replace below standard lighting. Emissions on Local Distributor roads have increased 22% where high pressure sodium lighting has been installed to the higher Category P3 of AS/NZS 1158, replacing previously below standard lighting. Similar to Subiaco, there was also a significant increase in the number of streetlights.

7.4.3 RECOMMENDATIONS

This report submits the following recommendations:

- **Standards**
  WALGA encourage Local Government to adopt AS/NZS 1158 as a policy for technical design of streetlight networks. AS/NZS is appropriate, and should not be considered as excessive. There is a risk to Local Government if they do not comply with a national standard.
- **Efficient light technologies**
  WALGA encourage Western Power and Local Government to use the more efficient lamp technologies in new and replacement street lights.
- **Underground Power Program**
  The Office of Energy encourages energy efficient street lighting for Underground Power Projects, and specifies appropriate AS/NZS 1158 Categories.
- **Synergy/Western Power Invoicing**
  Synergy provides a price breakdown listing maintenance, replacement, energy, and administrative costs to individual Local Government clients.
- **Mercury**
  On overhead power systems, the 80 W mercury street light at 80 m spacing does not comply with AS/NZS 1158. Mercury vapour lamps have half the efficiency of modern lamps. Consequently the use of mercury vapour lamps should be phased out by responsible authorities.
- **Western Power**
  WALGA request Synergy and Western Power to include fluorescent lamps such as compact fluorescent and T 5 fluorescent lamps in their available stock.
- **Energy Efficient Street Lighting Technologies**
  For minor road lighting two technologies are available to Local Government:
  - 42 W compact fluorescent
  - 2 X 24 W T5 fluorescent

Both lamps are mature, not emerging technologies. The compact fluorescent lamp has been available since 1982 and the 42 W version since the early 1990's. T5 fluorescent lamps have been available since the mid 1990's. Both lamp technologies are available in Australian made street lights.
These technologies are equivalent in light output to the common 80 W mercury vapour lamp and offer a halving of energy consumption and greenhouse gas emissions.

8 REFERENCES

1 A History of Subiaco, Ken Spillman, 1985

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3 Lamp data derived from Osram, Philips and Sylvania.

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5 New Notions of Night Light, Henri Bérubé, Security Management, December 1994.Toronto

6 Email correspondence with the City of Cape Town Public Lighting Manager & staff, January 2006.

7 Telephone discussions with Rob Fletcher of Coffs Harbour (02 6648 4415) August 2004. CD available entitled "Coffs Harbour City Council Energy Efficient Street Lighting Info".

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9 An article entitled "Street lighting review", Engineers Australia, October 2002.

10 Public Lighting in Australia – Energy Efficiency Challenges and Opportunities, Australian Government Department of Environment and Heritage, Australian Greenhouse Office Final Report 2005 (prepared by Genesis Automation, Kevin Poulton & Associates, and Deni Greene Consulting Services).

11 Minimum Energy Performance Standards, design Energy Limits for Main Road Lighting, National Appliance and Equipment Energy Efficiency Program, Report No: 2005/18.

12 Inquest of the Western Australian State Coroner on the death of Leon Russell Coomerang on 28 February 2002, 1 April 2004

1 TABLE OF APPENDICES

APPENDIX A

LIGHTING STANDARDS

AS/NZS 1158.3.1: 2005- ROAD LIGHTING- Pedestrian Area Lighting
AS/NZS 1158.1:2005- ROAD LIGHTING- Vehicular Traffic Lighting
BS EN 13201 – Road Lighting
IES North America Recommendations for Road lighting
IES North America Guidelines for Security Lighting for People, Property and Public Spaces.
South African SABS 098
Comparison of Standards

AS/NZS 1158.3.1:2005 Pedestrian area lighting

Roads & Pathways

Lighting Category❷		P1❽	P2❽	P3	P4	P5	P6	P7	P8
Type Of Road Or Pathway		MIXED VEHICLE & PEDESTRIAN TRAFFIC Pedestrian or cycle orientated pathways, eg footpaths, including along arterial roads, walkway, lanes, park paths, cycle paths (P1 to P4 apply) Collector roads or non-arterial roads which collect and distribute traffic in an area, as well as serving abutting properties Local roads or streets used primarily for access to abutting properties including residential properties. Common area, forecourts of cluster housing					GENERALLY PEDESTRIAN MOVEMENT ONLY • Areas primarily for pedestrian use, e.g. city, town, suburban centres, including outdoor shopping precincts, malls, open arcades, town squares, civic centres MIXED PEDESTRIAN & VEHICLE TRAFFIC • Transport terminals and interchanges, service areas		(similar to P1)
Selection Criteria ❶❸	Activity	n/a	High	Med	Low	Low	Ped only N/A Mixed - High	Med	Low
	Risk of crime	High	Med	Low local roads -	Low	Low	High	Med	Low
	Need to enhance prestige	n/a	High	Med	n/a	n/a	High	Med	n/a
1.1.1.1.1.1 Light Technical Parameters									
Maintained Average Horizontal Illuminance (lux)		7	3.5	1.75	0.85	0.5	21	14	7
Maintained Horizontal; Illuminance (lux)		2	0.7	0.3	0.14	0.07	7	4	2
Maximum Horizontal Illuminance Uniformity E_{max}/E_{ave}		10	10	10	10	10	10	10	10
Maintained Vertical Illuminance ❹ (E_v) lux		2	0.7	0.3❺	n/a	n/a	7	4	2

Connecting Elements and Outdoor Car Parks

Lighting Category	P9	P10	P11a	P11b	P11c	P12
Type Of Road Or Pathway	Steps, ramps, footbridges, pedestrian ways.	Subways, including associated ramps or steps ❻	Parking spaces, aisles and circulation roadways ❷			Parking spaces for people with disabilities ❷
Night time vehicle or pedestrian movements	N/A	N/A	High	Medium	Low	N/A
Night time occupancy			>75%	>25%, <75%	<25%	
Risk of crime			High	Medium	Low	
1.1.1.1.1.2 Light Technical Parameters						
Maintained average horizontal Illuminance (lux) Eh	Same as for highest lighting category applying to adjacent connected areas but, where forming part of a road or pathway, to not less than Category P8	35	14	7	3.5	-
Maintained horizontal; Illuminance (lux)		17.5	3	1.5	0.7	>14 & >Eh
Maximum horizontal Illuminance Uniformity E_{max}/E_{ave} (U_n)		10	10	10	10	-
Maintained vertical Illuminance ❹ (E_v) lux		17.5	3	1.5	-	-

NOTES:

❶The highest level of selection criteria that is deemed appropriate for the road or pathway will determine the applicable lighting category.
❷P3, P4 & P5 apply across the whole road reserve. P1 & P2 apply only to the formed footpath
❸Where there are good vertical reflecting surfaces alongside the pathway, the next lower lighting category may be selected
❹Applies at 1.5m above the surface of the area.
❺The vertical illuminance requirement for Category P3 applies to pathways not local roads
❻Subway walls should have a light colour
❷Luminaires should be located to highlight obstruction and hazards. For indoor car parks refer to AS1680.2.1

AS/NZS 1158.1.1: 2005 - ROAD LIGHTING - Vehicular Traffic Lighting

Lighting Category	V1	V2	V3		V4	V5
1.1.2 APPLICATIONS Note: for all applications the upward waste light ratio should not exceed 6%	Arterial or main roads in central and regional activity centres of capital and major provincial cities, and other areas with major abutting traffic generators	Arterial roads that predominantly carry through traffic from one region to another, forming principal avenues of communication for traffic movements with major abutting traffic generators	Arterial roads that predominantly carry through traffic from one region to another, forming principal avenues of communication for traffic movements	Freeways, motorways and expressways consisting of divided highways for through traffic with no access for traffic between interchanges and with grade separation at all intersections	Sub-arterial or principal roads which connect arterial or main roads to areas of development within a region, or which carry traffic directly from one part of a region to another part.	
1.1.2.1.1.1 Light Technical Parameters						
Minimum Average Luminance $L(cd/m^2)$ (maintained)	1.5	1.0	0.75		0.5	0.35
Min Overall Uniformity U_o	0.33	0.33	0.33		0.33	0.33
Min Longitudinal Uniformity Ul	0.5	0.5	0.5		0.5	0.5
Max Threshold Increment TI(%)	20	20	20		20	20
Min Surround Illuminance ES(%)	50	50	50		50	50
At Intersections - Min Point horizontal Illuminance E_{min}, lux (maintained)	15	10	7.5		5	3.5
Max Illuminance Uniformity E_{max}/E_{min}	8	8	8		8	8
Max Upward Waste Light Ratio %	3	3	3		3	3

Notes on reflectance characteristics:
R1 = light diffuse road (eg concrete)
R2 = diffuse & specular (eg asphalt with artificial brightener in aggregate)
R3 = slightly specular, typical highways and MRWA design standard
R4 = mostly specular, very smooth texture

RECOMMENDATIONS OF BS EN 13201:2003 ROAD LIGHTING

CATEGORY	LIGHT TECHNICAL PARAMETERS	
Conflict areas, shopping streets complex intersections, roundabouts, queuing areas	**Horizontal Illuminance**	
	E (ave) lux	Uniformity min
CE0	50	0.4
CE1	30	0.4
CE2	20	0.4
CE3	15	0.4
CE4	10	0.4
CE5	7.5	0.4
Paths and residential roads:	**Horizontal Illuminance**	
	E (ave) lux	E (min) lux
S1	15	5
S2	10	3
S3	7.5	1.5
S4	5	1
S5	3	0.6
S6	2	0.6
S7	Performance not determined	
Paths and residential roads:	**Hemispherical Illuminance**	
	E hs(ave) lux	Uniformity min
A1	5	0.15
A2	3	0.15
A3	2	0.15
A4	1.5	0.15
A5	1	0.15
A6	Performance not determined	
Pedestrian areas to reduce crime:	**Semi-circular illuminance**	
	E sc, (min) lux	
ES1	10	
ES2	7.5	
ES3	5	
ES4	3	
ES5	2	
ES6	1.5	
ES7	1	
ES8	0.75	
ES9	0.5	

E (ave) = Average illuminance of vehicular and pedestrian surfaces (maintained)
E (min) = Minimum illuminance of vehicular and pedestrian surfaces (maintained)
Esc, (min) = Semi-cylindrical Illuminance (maintained)

IES NORTH AMERICA RECOMMENDATIONS FOR ROAD LIGHTING

ROAD & AREA CLASSIFICATION		Freeway		Expressway			Major			Collector			Local		
		Class A	Class B	Commercial	Intermediate	Residential	Commercial	Intermediate	Residential	Commercial	Intermediate	Residential	Commercial	Intermediate	Residential
Average Luminance L_{ave} (cd/m^2)		0.6	0.4	1.0	0.8	0.6	1.2	0.9	0.6	0.8	0.6	0.4	0.6	0.5	0.3
Luminance Uniformity L_{ave}/L_{min}		3.5		3	3	3.5	3	3	3.5	3	3.5	4	6		
Luminance Uniformity L_{max}/L_{min}		6	6	5	5	6	5	5	6	5	6	8	10		
Veiling Luminance Ratio (maximum)❶ L_v/L_{ave}		0.3		0.3			0.3			0.4			0.4		
Average Maintained Illuminance, lux															
Road Surface Classification	❷ R1	6	4	10	8	6	12	9	6	8	6	4	6	5	3
	❸ R2 & R3	9	6	14	12	9	17	13	9	12	9	6	9	7	4
	❹ R4	8	5	13	10	8	15	11	8	10	8	5	8	6	4
Illuminance Uniformity E_{ave}/E_{min}		3		3			3			4			6		

Notes:

❶ L_v = veiling Luminance

❷ R1 = light diffuse road (eg concrete)

❸ R2 = diffuse & specular (eg asphalt with artificial brightener in aggregate), R3 = slightly specular, typical highways

❹ R4 = mostly specular, very smooth texture

IES (NORTH AMERICA) GUIDELINES FOR SECURITY LIGHTING FOR PEOPLE, PROPERTY AND PUBLIC SPACES

		E_h	E_v	U (ave/min)
Unoccupied Spaces (acceptable losses): - storage yards, industrial equipment areas and container terminals		5-20	-	8
Unoccupied Spaces (unacceptable losses): - storage yards, industrial equipment areas and container terminals		10-20	-	6
Building Façade		-	5-20	8
Building Interior		10	-	6
Facial Identification		-	5-8	4
Guarded Facilities:	Entrances & gatehouse inspection	100		3
	Guardhouse interior	❷	❶	
A.T.M.'S (Exterior):	Face of ATM	-	150	3
	Within 3.5m	100	-	-
	3.5 to 15.2m Supported Parking 18.5m Side of building out to 12.2m when ATM within 3.5m of corner	20	❶	3
A.T.M.'S (Interior):	Face of ATM	-	150	3
	Preparation of ATM	150	❶	3
	Other areas of enclosure	100	❶	-
Parking Facilities Garages & Covered Parking Spaces	On pavement	60	❶	4
	Gathering points (stairs, elevator, ramps)	50		
Parking Garages for the Elderly	Entrance Exterior walkways around senior facilities	500	❶	4
Parking Lots, Areas for Public Parks	Open parking spaces	30	❶	4
	Park trails and walkway	6		
	Likely loitering areas	10		
Supermarket, Major Retail Parking	Parking lot	30	❶	4
	Low activity – close-in parking	50		
Fast Food Restaurants	General Parking	30	❶	3
	Drive up window out to 9.1m	60		
	Refuse area	30		
Convenience Stores & Gas Stations	Pump Island	60	❶	4
	Sidewalks, refuse areas & grounds	30		
	Interior of store	300		
Single Family Residences	Exterior doorways	-	8	-
Multi-family Residences	Common areas	30	❶	4
	Mail box areas	100		
Senior Housing	Hallways/Room Entrances (Active hours)	300	❶	-
	Hallways/Room Entrances (Sleeping hours)	100		
Schools & Institutions	General Parking	30	❶	4
	Sidewalks & footpaths	10		
Law enforcement, Fire, Ambulance & other Emergency Service Facilities	Within 18.2m of all vehicle and pedestrian movement areas	80	❶	3
	General parking and walkways	30		
Hotel & Motels	General Parking	30	❶	4
	Sidewalk and grounds	10		

❶ Ev 5 to 8 lux or ≥ 25% Eh

❷ Interior illuminance should be minimum recommended for specific task performance.

RECOMMENDED LIGHTING VALUES OF SABS 098 (amdt 1996)

Part 1 STREETS AND FOOTWAYS

Lighting Category	Type of Street	Min. average horizontal illuminance	Min. horizontal illuminance	Min. semi-cylindrical illuminance
B1	Residential streets in high density residential areas and medium to high traffic volume traffic	5	1	2
B2	Residential streets in medium density residential areas and medium volume traffic	3	0.6	1
B3	Residential streets in low density residential areas and low volume traffic	2	0.4	0.6
C1	Wholly pedestrian in city centre	10	3	7.5
C2	Wholly pedestrian in local shopping malls	7.5	1.5	3

Part 2: Roadway Lighting

Lighting Category	Type of Road	Without Median												With Median							
		Max traffic volume during darkness (motor vehicles per hour)																			
		>600				300				100				>900				600				200			
		L_n	U_o	U_l	TI	L_n	U_o	U_l	TI	L_n	U_o	U_l	TI	L_n	U_o	U_l	TI	L_n	U_o	U_l	TI	L_n	U_o	U_l	TI
A1		2	0.4	0.7	15	1.5	0.4	0.7	20	1	0.4	0.6	20	2	0.4	0.7	15	1.5	0.4	0.7	20	1	0.4	0.6	20
A2		1.5	0.4	0.7	20	1	0.4	0.6	20	0.8	0.4	0.5	20	1.5	0.4	0.7	20	1	0.4	0.6	20	0.8	0.4	0.5	20
A3		1	0.4	0.6	20	0.6	0.4	0.5	20	0.5	0.4	0.5	20	1	0.4	0.6	20	0.6	0.4	0.5	20	0.5	0.4	0.5	20
A4		0.75	0.4	0.5	20	0.5	0.4	0.5	20	0.3	0.3	0.5	25	0.75	0.4	0.5	20	0.5	0.4	0.5	20	0.3	0.3	0.5	25

L_n = min Luminance cd/m^2
Uo = Overall luminance uniformity
Ul = Longitudinal luminance uniformity
TI = Threshold Increment %

COMPARISON OF STANDARDS

LIGHTING LEVEL	Australia and New Zealand AS/NZS 1158.3.1			South African SABS 098 Pt 1			Britain and Europe BS/EN 13201			North America IESNA ❶		
	Cat.	Ave Lux	Min Lux	Cat.	Ave Lux	Min Lux	Cat.	Ave Lux	Min Lux	Cat.	Ave lux	Min lux
							S1	15	5			
							S2	10	3			
	P1	7	2	B1	5	1	S3	7.5	1.5	C ❷	9	❸
	P2	3.5	0.7	B2	3	0.6	S4	5	1.0	I ❷	7	❸
	P3	1.75	0.3	B3	2	0.4	S5	3	0.6	R ❷	4	❸
	P4	0.85	0.14				S6	2	0.6			
	P5	0.5	0.07				S7	Not specified				

NOTES

❶ Assumes R2 or R3 reflectance characteristic of road
❷ C = Commercial, I = Intermediate, R = Residential.
❸ Uniformity of 6:1 (average to minimum).

APPENDIX B

COMPARISON OF NATIONAL PRACTICES

COMPARISON OF NATIONAL PRACTICES

COUNTRY	EXISTING TECHNOLOGY	TREND TECHNOLOGY
ENGLAND	LPS	HPS and some MH and CFL
NORTH AMERICA	MV	MH
SOUTH AFRICA	MV & LPS	HPS
NEW ZEALAND	MV	HPS
AUSTRALIA	MV & HPS	CF/MH/HPS

Notes
CF = compact fluorescent
HPS = high pressure sodium
LPS = low pressure sodium
MH = metal halide
MV = mercury vapour

APPENDIX C

GREENHOUSE GAS SAMPLE CALCULATION

GREENHOUSE GAS – SAMPLE CALCULATIONS

Assumptions:

1. 80 W mercury vapour lamp – energy consumption with ballast losses 89.5 W.
2. 80 m street light spacing.
3. Street lights burn 4 000 hours per annum.
4. CO_2 emissions in Western Australia = 0.9 kg/kWh.

Sample calculation for one 80 W lamp (per annum)

CO_2 emission = lamp power (W) ÷ 1000 x burning hours x CO_2 coefficient (kg/kWh)

= 89.5 W ÷ 1000 x 4 000 h x 0.9 kg/kWh = **322 kg**.

Sample calculation for one kilometre of street lighting (80 W @ 80 m) per annum

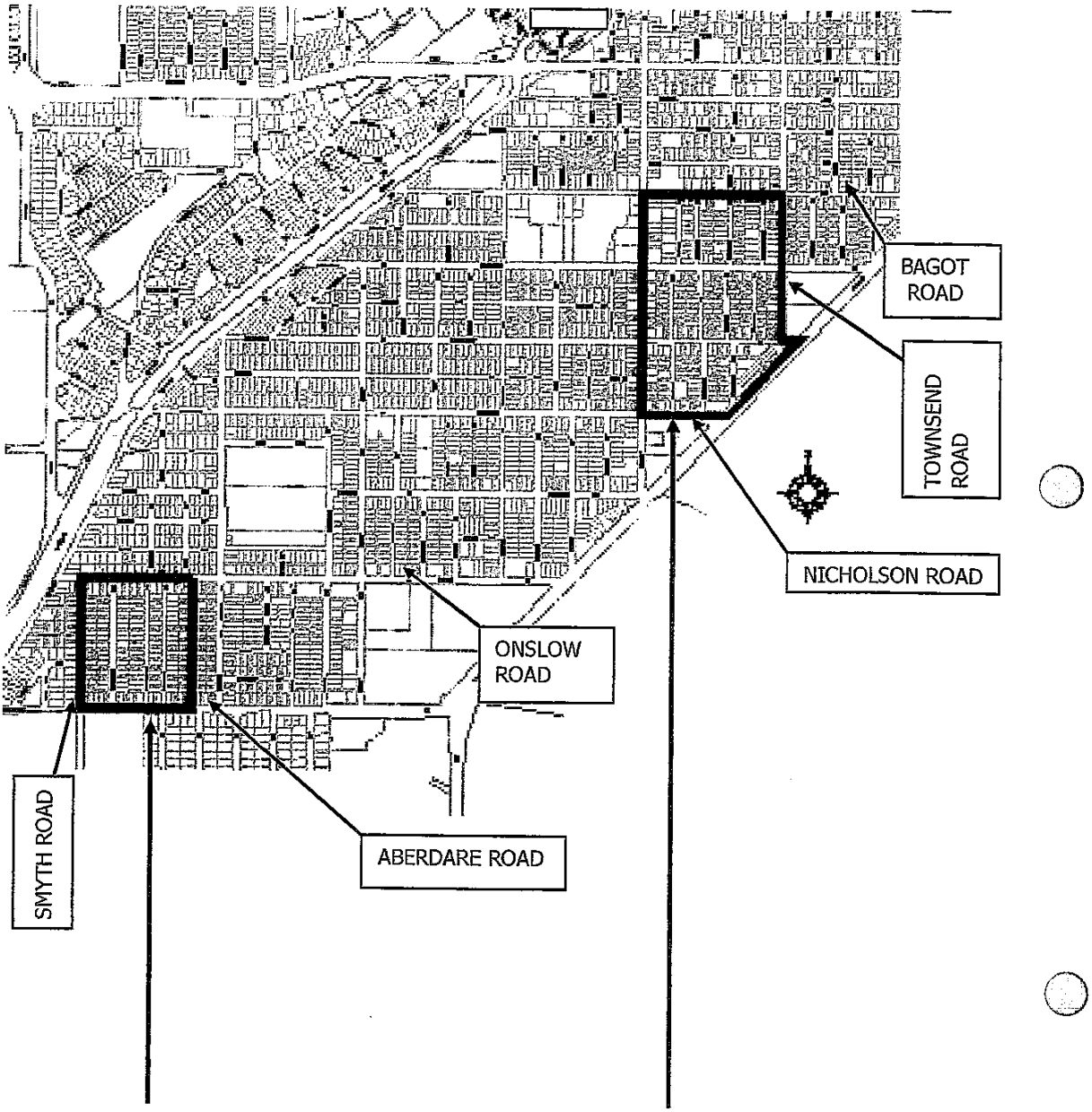
CO_2 emission = lamp power (W) ÷ 1000 ÷ spacing (m) x 1000 x burning hours x CO_2 coefficient (kg/kWh)

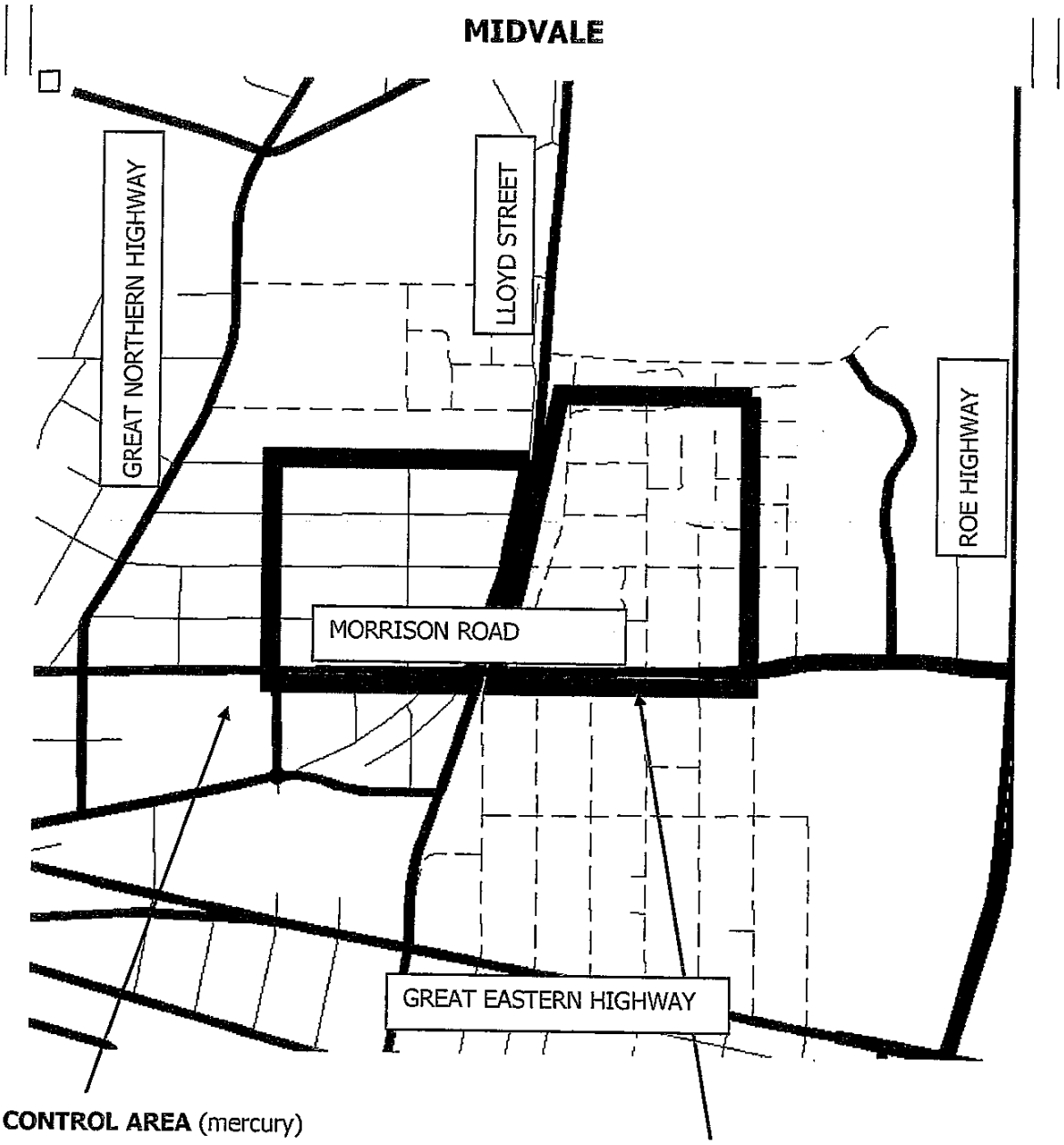
= 89.5 W ÷ 1000 ÷ 80 m x 1000 x 4 000 h x 0.9 kg/kWh = **4 027 kg = 4T**.

APPENDIX D

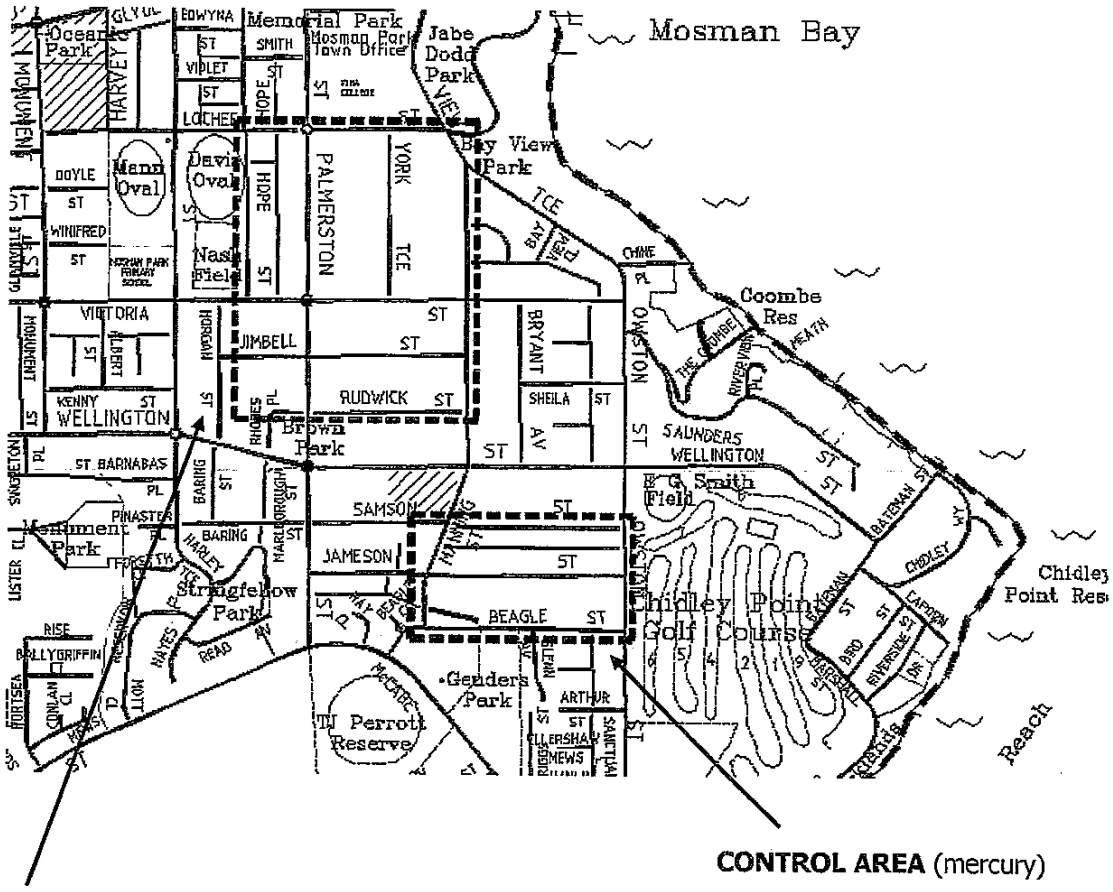
LOCATIONS OF FIELD TRIALS

SUBIACO


BAGOT ROAD
TOWNSEND ROAD
NICHOLSON ROAD
ONSLOW ROAD
ABERDARE ROAD
SMYTH ROAD
CONTROL AREA (mercury)
TRIAL AREA (compact fluorescent)


MIDVALE
GREAT NORTHERN HIGHWAY
LLOYD STREET
ROE HIGHWAY
MORRISON ROAD
GREAT EASTERN HIGHWAY
CONTROL AREA (mercury)
TRIAL AREA (metal halide)

MOSMAN PARK



CONTROL AREA (mercury)

TRIAL AREA (metal halide/high pressure sodium/compact fluorescent)

APPENDIX E

FIELD TRIAL MEASUREMENTS

SUBIACO

LUMINAIRE TYPE	STREET	POLE NUMBER	ILLUMINANCE UNDER STREETLIGHT				ILLUMINANCE ACROSS ROAD				DEPRECIATION
			Trial 1	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4	
CF	Hamersley Road	P1	12.90	13.00	12.00	11.00	0.40	1.00	1.20	1.50	14.73
CF		P2	15.40	13.00	15.00	13.80	0.70	1.00	1.00	1.00	10.39
CF		P3	8.00	8.20	17.00	14.00	0.50	0.64	1.60	3.00	17.65
CF		P4	10.00	9.90	0.00	8.00	0.15	0.34	0.00	0.50	20.00
CF		P5	13.50	15.00	14.00	13.00	0.20	0.50	1.10	0.70	3.70
CF		P6	12.30	12.00	11.00	8.50	0.30	0.49	0.50	0.40	30.89
CF		P7	12.20	12.00	11.00	11.00	0.20	0.60	0.70	1.30	9.84
CF		P8	13.00	13.00	12.00	13.00	0.30	1.00	1.10	1.10	0.00
CF		P9	11.80	10.00	10.00	9.90	0.20	0.36	0.40	0.40	16.10
CF	Heytesbury Road	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
CF		P2	12.80	14.00	13.00	13.00	0.20	4.90	0.60	0.45	0.00
CF		P3	13.70	7.00	17.00	13.00	0.60	0.71	2.60	1.40	5.11
CF		P4	15.00	18.00	14.00	14.00	0.20	0.40	0.50	0.50	6.67
CF		P5	10.20	9.50	9.30	8.60	0.20	0.45	0.80	0.50	15.69
CF		P6	6.60	7.10	14.60	12.70	0.30	0.37	1.20	0.90	13.01
CF		P7	12.10	13.00	12.00	0.00	0.15	0.45	0.50	0.00	NA
CF		P8	11.10	13.00	11.00	9.60	0.10	0.55	0.40	0.50	13.51
CF		P9	12.40	13.00	10.00	9.20	0.40	0.70	0.80	0.10	25.81
CF	Rupert Street	P1	17.30	19.00	15.90	13.00	0.40	1.80	2.30	2.10	24.86
CF		P2	10.00	12.00	8.10	7.60	0.30	1.40	1.40	1.10	24.00
CF		P3	11.20	12.00	11.00	11.00	11.20	1.70	1.90	0.90	1.79
CF		P4	10.90	11.00	10.00	11.00	10.90	1.70	2.30	2.00	9.09
CF		P5	12.50	12.00	12.00	19.20	0.30	2.00	2.00	4.00	4.00
CF		P6	13.60	15.00	13.00	12.00	0.50	1.50	0.40	1.20	11.76
CF		P7	10.30	8.90	8.00	3.20	0.40	1.10	1.10	0.80	68.93
CF		P8	7.80	8.70	7.80	6.70	0.20	1.10	1.10	1.20	14.10
CF		P9	7.80	8.70	7.30	7.00	0.30	1.10	1.00	7.00	10.26
CF		P10	5.60	5.80	5.70	5.10	0.20	0.60	0.90	0.90	8.93
CF		P11	13.50	15.00	12.20	12.00	0.75	2.40	1.80	2.20	11.11
CF		P12	12.60	12.00	7.60	11.00	0.40	2.00	2.00	2.00	12.70

CF		P13	9.00	8.40	7.30	6.40	0.40	1.10	1.20	1.20	28.89
CF		P14	8.80	7.90	11.00	11.00	0.30	1.20	2.50	2.10	10.23
CF		P15	8.70	6.50	17.30	10.00	0.20	0.70	1.40	1.01	42.20
CF		P16	11.40	10.10	10.30	9.20	1.10	8.84	1.10	0.70	19.30
CF	Salisbury Street	P1	10.90	14.00	0.00	0.00	0.45	2.40	0.00	0.00	NA
CF		P2	10.40	11.00	9.90	10.00	0.40	2.00	2.10	1.50	3.85
CF		P3	0.40	6.70	7.10	7.00	0.40	1.50	1.80	1.40	1.41
CF		P4	7.60	8.50	7.50	7.70	0.40	1.20	1.60	1.30	9.41
CF		P5	10.60	12.00	2.60	6.60	0.06	1.30	0.10	1.00	37.74
CF		P6	12.50	15.00	14.00	13.00	0.90	1.20	0.70	0.90	13.33
CF		P7	16.10	18.00	16.00	17.00	0.60	1.90	3.10	1.50	5.56
CF		P8	8.50	10.00	8.10	9.10	0.10	0.25	1.10	1.10	9.00
CF		P9	10.50	9.40	8.50	5.00	0.50	1.50	1.70	1.60	52.38
CF		P10	9.00	0.53	5.40	4.90	0.40	0.70	1.00	0.40	45.56
CF		P11	16.70	16.00	14.00	11.20	0.90	2.30	2.80	2.00	32.93
CF		P12	11.60	12.00	11.00	9.70	0.50	1.90	1.60	1.40	16.38
CF		P13	7.80	8.00	7.20	5.60	0.20	1.50	1.40	1.30	28.21
CF		P14	6.10	6.20	6.80	6.30	0.30	1.00	1.30	1.10	7.35
CF		P15	11.50	12.00	10.00	8.00	0.40	2.00	2.10	2.10	30.43
CF		P16	13.20	14.00	13.00	8.50	0.80	2.00	2.20	1.80	35.61
CF	Finlayson Street	P1	5.70	7.10	16.50	6.30	0.20	1.80	3.00	1.80	61.82
CF		P2	9.90	10.00	18.90	6.50	0.30	1.80	1.60	1.70	34.34
CF		P3	8.50	8.90	8.70	7.60	0.30	1.80	1.70	1.50	10.59
CF	Chester Street	P1	10.70	11.00	9.30	8.00	0.40	1.20	1.60	1.70	25.23
CF		P2	10.50	12.00	10.00	6.40	0.50	1.50	2.00	2.00	39.05
CF		P3	12.40	13.00	9.40	17.00	0.60	2.50	1.50	3.10	24.19
CF		P4	9.90	11.00	9.50	8.70	0.60	1.70	2.00	1.90	12.12
CF		P5	9.20	9.70	20.00	17.00	0.40	1.50	3.30	2.60	15.00
CF	Kershaw Street	P1	9.50	10.00	4.70	6.50	0.20	0.30	0.30	0.60	31.58
CF		P2	8.20	8.40	7.70	6.80	0.40	1.30	1.30	0.10	17.07
CF		P3	17.80	19.00	17.00	17.00	0.80	1.80	2.20	1.80	4.49
CF		P4	11.60	13.00	11.00	21.00	0.50	1.00	1.60	3.10	5.17
CF		P5	10.40	11.00	9.20	7.90	0.30	1.30	1.60	1.30	24.04
CF	Robinson Street	P1	13.80	13.00	12.10	11.00	0.70	1.70	2.00	1.10	20.29
CF		P2	11.00	10.00	8.20	4.10	0.60	1.75	1.50	1.50	62.73
CF		P3	8.80	9.20	8.60	7.90	0.30	1.20	2.00	1.70	10.23

CF		P4	12.60	14.00	12.00	12.00	0.50	2.00	2.30	2.40	4.76
CF		P5	8.00	7.70	7.30	6.60	0.40	1.60	1.60	1.50	17.50
CF	Proclamation Street	P1	12.40	12.00	18.80	17.00	0.40	1.50	3.00	2.70	9.57
CF		P2	8.30	11.00	8.10	7.20	0.30	1.10	1.20	1.20	13.25
CF		P3	9.30	10.00	0.00	20.00	0.40	1.20	0.00	2.90	NA
CF		P4	10.80	13.00	22.00	18.00	0.40	1.30	1.30	2.50	18.18
CF		P5	9.20	10.00	9.00	8.30	0.20	1.10	3.70	1.50	9.78
CF	Townsend Road	P1	8.00	8.80	7.80	7.40	0.15	0.25	0.60	0.50	7.50
CF		P2	11.70	13.00	11.00	12.00	0.15	0.17	0.70	0.80	7.69
CF		P3	31.60	19.00	13.00	13.00	19.30	5.60	1.40	0.80	58.86
CF		P4	11.80	12.00	11.00	11.40	0.09	0.32	0.50	0.40	3.39
CF		P5	10.40	9.60	15.00	13.10	0.14	3.80	0.70	0.70	12.67
CF		P6	0.00	0.00	7.30	5.50	0.00	0.00	0.70	0.25	NA
CF		P7	8.50	7.00	7.30	7.30	0.15	0.33	0.70	0.70	14.12
CF		P8	8.60	8.20	7.00	6.60	0.15	0.45	0.40	0.52	23.26
CF		P9	12.10	13.00	12.00	11.40	0.20	4.50	0.50	0.38	5.79
									AVERAGE DEPRECIATION		81.32
	PERCENTAGE SURVIVAL		97.60	97.60	96.30	96.30					
				AVERAGE SURVIVAL		96.95					
MV	Smyth Road	P1	0.13	0.74	2.70	0.40	0.13	0.72	1.00	3.50	85.19
MV		P2	2.80	3.80	5.90	2.70	0.35	1.10	1.80	1.60	3.57
MV		P3	4.00	4.30	11.00	12.00	0.15	0.91	2.50	2.50	NA
MV		P4	3.40	3.70	12.00	10.00	0.15	0.74	2.90	2.10	16.67
MV		P5	5.00	5.10	11.00	7.00	0.30	1.00	2.20	2.20	36.36
MV		P6	3.50	3.80	7.40	14.00	0.40	0.90	2.00	0.30	NA
MV		P7	4.90	0.00	14.00	37.00	0.40	0.00	2.30	18.00	NA
MV	Hopetoun Terrace	P1	1.70	0.11	4.90	2.90	0.20	0.59	1.50	2.10	40.82
MV		P2	0.70	0.94	6.30	7.00	0.03	0.25	1.80	2.50	NA
MV		P3	0.15	0.12	1.00	0.80	0.13	0.19	1.80	0.80	20.00
MV	Commercial Street	P1	1.50	1.50	0.00	6.10	0.20	0.49	0.00	1.20	NA
MV		P2	6.10	6.30	10.00	11.00	0.13	0.92	1.40	1.60	NA
MV		P3	5.40	5.20	6.80	7.20	0.16	1.00	1.30	1.90	3.70
MV		P4	5.80	6.10	7.60	7.80	0.40	1.10	1.70	1.70	NA
MV		P5	8.70	9.90	10.00	10.00	1.00	2.10	2.20	2.40	0.00

MV	Murchison Street	P1	1.70	4.90	1.40	1.80	1.40	1.20	1.90	0.30	63.27
MV		P2	4.50	4.50	8.70	8.50	1.40	1.30	1.90	2.60	2.30
MV		P3	4.80	5.40	8.10	7.60	1.10	1.60	2.70	2.20	6.17
MV		P4	7.00	7.00	9.00	8.10	1.80	2.00	2.70	2.40	10.00
MV		P5	4.50	4.90	7.90	7.80	1.80	1.70	3.00	2.70	1.27
MV		P6	5.80	6.10	9.20	8.60	1.80	1.40	2.40	2.60	6.52
MV		P7	6.70	8.10	8.80	8.30	2.00	1.80	1.80	1.90	5.68
MV		P8	6.60	6.60	0.00	0.00	2.30	2.30	0.00	0.00	NA
MV	Yilgarn Street	P1	7.90	7.80	0.00	13.00	1.00	2.10	0.00	3.60	NA
MV		P2	6.00	5.70	5.70	5.80	1.20	2.00	1.90	2.40	3.33
MV		P3	6.00	6.30	6.00	7.30	1.00	1.70	1.90	2.40	4.76
MV		P4	6.20	1.40	0.00	0.40	0.65	0.12	0.00	1.80	NA
MV		P5	5.90	6.10	0.00	8.80	0.80	1.80	0.00	3.20	NA
MV		P6	5.50	5.50	8.60	9.10	0.80	1.40	2.40	2.60	0.00
									AVERAGE DEPRECIATION		82.80
	PERCENTAGE SURVIVAL		100.00	96.6	82.80	96.6					
				AVERAGE SURVIVAL		94.00					

MIDVALE

LUMINAIRE TYPE	STREET	POLE NUMBER	ILLUMINANCE UNDER STREETLIGHT				ILLUMINANCE ACROSS ROAD				DEPRECIATION
			Trial 1	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4	
MV	Hamersley street	P1	13.00	11.60	8.50	0.00	2.36	2.31	1.80	0.00	NA
MV		P2	5.72	4.96	3.90	3.50	1.25	1.28	0.80	0.80	38.81
MV		P3	9.85	9.58	7.40	7.00	2.10	2.20	1.70	1.60	28.93
MV		P4	11.45	10.24	16.80	15.30	2.87	3.02	3.50	3.40	10.57
MV		P5	8.64	0.00	0.00	0.00	3.25	0.00	0.00	0.00	NA
MV		P6	4.15	3.24	1.70	1.40	1.14	0.92	0.50	0.40	66.27
MV	North Street	P1	5.34	0.00	0.00	0.00	0.97	0.00	0.00	0.00	NA
MV		P2	6.63	6.23	5.00	4.80	2.40	2.01	1.60	1.20	27.60
MV		P3	8.40	8.05	1.00	6.10	2.62	2.55	1.70	1.60	27.38
MV		P4	5.18	4.72	4.00	3.30	1.50	1.52	1.00	0.80	36.29
MV		P5	8.68	7.41	6.80	6.80	2.00	1.75	1.50	1.40	21.66
MV		P6	7.50	7.52	6.10	6.40	1.53	1.63	1.30	1.30	14.67
MV		P7	0.11	2.21	4.20	5.50	1.19	0.20	1.40	1.60	NA
MV		P8	0.00	0.00	7.50	7.40	0.00	0.00	1.60	1.20	NA
MV		P9	4.05	0.00	12.60	11.50	0.91	0.00	3.60	2.00	NA
MV	Charles Street (west)	P1	5.62	4.63	3.50	3.60	1.57	1.36	1.00	1.10	35.94
MV		P2	4.59	3.91	2.70	2.70	1.25	1.24	0.80	0.80	41.18
MV		P3	8.30	0.00	0.00	0.00	2.13	0.00	0.00	0.00	NA
MV		P4	8.84	8.04	6.50	5.80	2.58	2.31	1.90	1.20	34.39
MV		P5	4.71	4.22	2.70	2.50	1.45	1.19	0.80	0.80	46.92
MV		P6	3.40	2.88	1.00	0.90	3.40	0.90	0.30	0.90	73.53
MV		P7	6.12	0.00	8.40	8.80	1.62	0.00	1.70	1.90	NA
MV		P8	5.23	0.00	8.30	8.90	1.55	0.00	2.40	2.40	NA
MV		P9	0.70	2.40	1.00	0.50	0.86	0.86	0.50	0.50	28.57
MV	Gartell Street	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
MV		P2	5.18	5.25	2.90	3.30	0.90	1.16	0.60	0.50	36.29
MV		P3	5.85	5.37	0.00	0.00	0.79	0.84	0.00	0.00	NA
MV	George Street	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
MV		P2	9.35	0.00	7.30	6.10	2.02	0.00	1.60	1.40	34.76
MV		P3	3.93	3.29	1.90	1.30	0.96	0.95	0.60	0.40	66.92

MV		P4	0.00	3.93	7.00	6.00	0.00	1.92	1.70	1.40	NA
MV		P5	8.39	7.56	6.60	6.40	1.84	1.70	1.70	1.40	23.72
MV		P6	5.34	5.25	3.80	3.00	1.49	1.55	1.00	0.80	43.82
									AVERAGE DEPRECIATION		63.09
	PERCENTAGE SURVIVAL		87.9	69.7	81.8	81.8					
				AVERAGE SURVIVAL		80.3					
MH	Charles Street (east)	P1	3.11	2.10	1.70	1.00	0.86	0.60	0.50	0.30	67.85
MH		P2	10.11	9.90	12.00	10.40	1.43	1.50	1.60	1.40	2.08
MH		P3	3.05	2.80	2.30	1.90	0.92	0.88	0.80	0.60	37.70
MH		P4	5.95	12.00	10.50	9.60	1.25	2.50	1.90	1.90	20.00
MH		P5	0.62	3.50	2.80	2.60	1.20	1.10	0.70	0.80	25.71
MH		P6	4.60	3.90	3.00	2.60	1.05	1.10	1.00	0.80	43.48
MH		P7	2.92	2.30	3.60	3.50	0.44	0.47	0.60	0.70	21.23
MH	Wroxton Street	P1	16.92	15.00	13.00	15.00	1.62	1.50	0.93	2.70	11.35
MH		P2	5.12	12.00	10.10	10.40	1.87	2.90	2.10	2.10	13.33
MH		P3	6.05	4.70	3.70	3.40	1.48	1.20	0.91	0.70	43.80
MH		P4	5.17	4.50	3.70	0.00	1.60	1.20	1.10	0.00	NA
MH		P5	7.85	7.75	12.00	10.50	0.98	1.40	1.10	1.20	1.27
MH		P6	1.29	0.00	7.00	7.80	1.22	0.00	1.80	2.40	NA
MH		P7	5.38	4.80	4.00	2.40	1.69	1.50	1.00	0.60	55.39
MH		P8	6.68	5.50	4.12	0.00	3.17	2.50	2.30	0.00	NA
MH		P9	5.98	0.00	11.60	11.50	1.43	0.00	2.40	2.40	NA
MH		P10	9.07	8.90	7.80	2.50	2.58	2.80	2.20	0.60	72.44
MH	Henry Street	P1	4.56	3.80	0.00	0.00	1.10	1.00	0.00	0.00	NA
MH		P2	8.85	7.80	7.30	6.60	1.74	1.60	1.20	1.10	25.42
MH		P3	6.24	5.70	4.50	0.00	1.45	1.30	1.00	0.00	NA
MH		P4	3.45	2.80	2.30	2.00	0.92	0.86	0.80	0.60	42.03
MH	Ferguson Street	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
MH		P2	4.68	9.30	6.40	6.80	1.20	2.60	1.30	1.90	26.88
MH		P3	3.89	3.50	0.00	0.00	1.26	1.20	0.00	0.00	NA
MH		P4	10.05	10.00	9.90	8.80	2.03	2.00	2.00	1.50	12.44
MH		P5	5.28	11.00	6.50	6.70	1.48	3.10	2.00	1.70	39.09
MH		P6	5.91	14.00	11.00	9.30	1.88	3.80	2.60	2.50	33.57
MH		P7	0.00	12.00	5.70	9.50	0.00	2.40	2.30	1.40	NA
MH		P8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA

MH		P9	4.68	10.00	8.90	9.50	1.11	2.40	2.00	2.00	5.00
MH	Wellaton Street	P1	4.94	0.00	8.80	7.90	1.70	0.00	2.50	1.70	NA
MH		P2	3.26	3.90	7.90	2.30	1.59	1.20	1.10	0.60	29.45
MH		P3	10.03	9.60	3.00	7.80	2.45	2.20	2.20	1.80	22.23
MH		P4	5.38	4.70	3.50	3.00	1.29	1.07	0.10	0.80	44.24
MH	Warde Street	P1	6.89	5.60	5.70	4.90	2.52	1.50	4.40	3.50	28.88
MH		P2	5.37	4.70	10.00	9.50	1.26	1.30	1.70	2.00	12.48
MH		P3	8.72	8.10	7.50	0.00	1.73	1.90	1.20	0.00	NA
MH		P4	9.15	9.40	7.20	8.90	1.82	1.90	1.10	1.70	2.73
MH	Eric Street	P1	8.48	8.40	7.50	7.40	2.21	2.40	1.90	1.30	12.74
MH		P2	6.31	5.30	4.30	2.60	1.48	1.30	1.00	0.60	58.80
MH	Roger Street	P1	4.93	4.10	18.00	18.70	1.03	1.10	2.90	2.90	16.84
MH		P2	8.14	11.00	9.80	19.40	1.54	2.10	1.90	2.40	10.91
MH		P3	5.70	0.00	0.00	15.40	1.48	0.00	0.00	3.40	NA
MH		P4	0.00	9.60	7.30	19.10	0.00	1.90	1.30	3.50	NA
MH		P5	5.42	10.00	8.10	8.30	1.25	2.50	1.80	1.80	17.00
MH		P6	7.96	7.70	6.10	6.60	1.51	1.70	1.30	1.50	17.09
MH	Kingston Place	P1	5.98	13.00	9.90	8.50	1.72	4.20	2.80	2.40	34.62
MH		P2	5.66	4.70	4.40	0.00	0.57	0.70	0.60	0.00	NA
MH		P3	5.08	4.40	12.90	10.30	1.75	1.70	9.40	3.20	20.16
MH		P4	6.61	5.80	4.80	5.10	0.25	0.50	0.70	1.00	22.84
MH	Egan Place	P1	6.04	11.10	8.70	2.70	2.10	3.40	2.90	2.60	55.30
MH		P3	10.92	10.15	8.10	8.30	1.43	0.92	1.10	1.10	23.99
MH		P3	0.00	15.00	12.20	11.80	0.00	4.24	2.50	2.20	21.33
MH		P4	9.05	9.40	7.70	7.40	3.74	3.60	3.00	2.70	18.23
MH		P5	8.78	8.10	6.90	7.00	3.04	2.60	2.50	2.30	20.27
MH		P6	6.51	0.00	13.30	11.80	0.43	0.00	0.70	1.60	NA
MH	Ewart Grove	P1	10.38	11.00	9.40	8.90	3.26	2.80	2.90	3.00	14.26
MH		P2	4.22	7.40	5.60	5.20	1.50	2.10	1.80	1.30	29.73
MH		P3	9.53	7.40	12.00	10.30	0.78	1.40	2.00	1.80	22.35
	PERCENTAGE SURVIVAL		93.20	88.10	91.50	86.40			AVERAGE DEPRECIATION		72.87
				AVERAGE SURVIVAL		89.80					

MOSMAN PARK

LUMINAIRE TYPE	STREET	POLE NUMBER	ILLUMINANCE UNDER STREETLIGHT				ILLUMINANCE ACROSS ROAD				DEPRECIATION
			Trial 1	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4	
HPS	Glyde Street	P1	20.00	19.10	19.70	22.00	1.00	4.72	5.60	5.90	1.50
HPS		P2	19.00	17.18	20.10	21.00	0.70	4.98	5.40	5.30	9.58
HPS		P3	15.00	13.75	11.70	14.00	0.50	2.50	2.70	2.60	6.67
HPS		P4	19.00	19.50	0.00	0.00	1.40	6.20	0.00	0.00	NA
HPS		P5	22.00	0.00	0.00	0.00	1.20	0.00	0.00	0.00	NA
HPS	Palmerston Street	P7	22.50	20.30	18.50	21.00	1.50	5.68	4.70	6.20	6.67
HPS		P8	24.20	21.60	20.00	0.00	1.50	5.36	2.60	0.00	NA
HPS		P9	22.00	23.30	0.00	0.00	1.00	5.08	0.00	0.00	NA
HPS		P10	20.50	14.70	14.70	14.00	1.30	2.22	4.10	4.30	31.71
HPS		P11	21.20	22.70	18.30	15.00	1.20	5.20	4.50	4.30	29.25
HPS		P12	0.00	20.60	20.40	19.00	1.60	5.67	6.40	5.90	7.77
									AVERAGE DEPRECIATION		86.70
	PERCENTAGE SURVIVAL		90.90	90.90	72.70	63.60					
				AVERAGE SURVIVAL		79.53					
MH	Edwyna Street	P1	20.00	10.40	18.30	19.00	3.80	2.06	10.10	11.00	5.00
MH	Hope Street	P1	22.60	21.60	19.70	19.00	10.00	14.40	13.00	12.00	15.93
MH		P2	18.00	16.80	12.90	13.00	3.50	10.40	7.20	7.60	27.78
MH		P3	19.00	16.55	14.20	12.00	4.00	5.65	5.50	4.60	36.84
MH		P4	19.00	23.30	12.40	20.00	4.00	13.50	2.20	11.00	14.16
MH		P5	23.00	21.20	18.60	20.00	11.30	12.50	9.80	12.00	13.04
MH	Solomon Street	P1	21.50	19.40	18.50	18.00	0.09	5.07	5.40	4.70	16.28
MH		P2	21.00	17.40	16.70	16.00	1.20	3.58	4.00	3.70	23.81
MH		P3	24.00	19.50	18.70	19.00	1.20	5.00	5.70	5.10	20.83
MH		P4	20.00	19.50	17.40	17.00	0.04	2.90	3.00	3.20	15.00
MH		P5	25.10	21.80	20.50	19.00	1.60	5.86	5.60	5.40	24.30
MH	Violet Street	P1	22.20	21.30	8.80	25.00	3.10	10.47	2.20	12.00	60.36
MH	Smith Street	P1	20.50	18.70	16.90	16.00	1.20	5.21	4.50	4.90	21.95
MH	Lochee Street	P4	0.00	0.00	19.40	0.00	0.00	0.00	7.00	0.00	NA

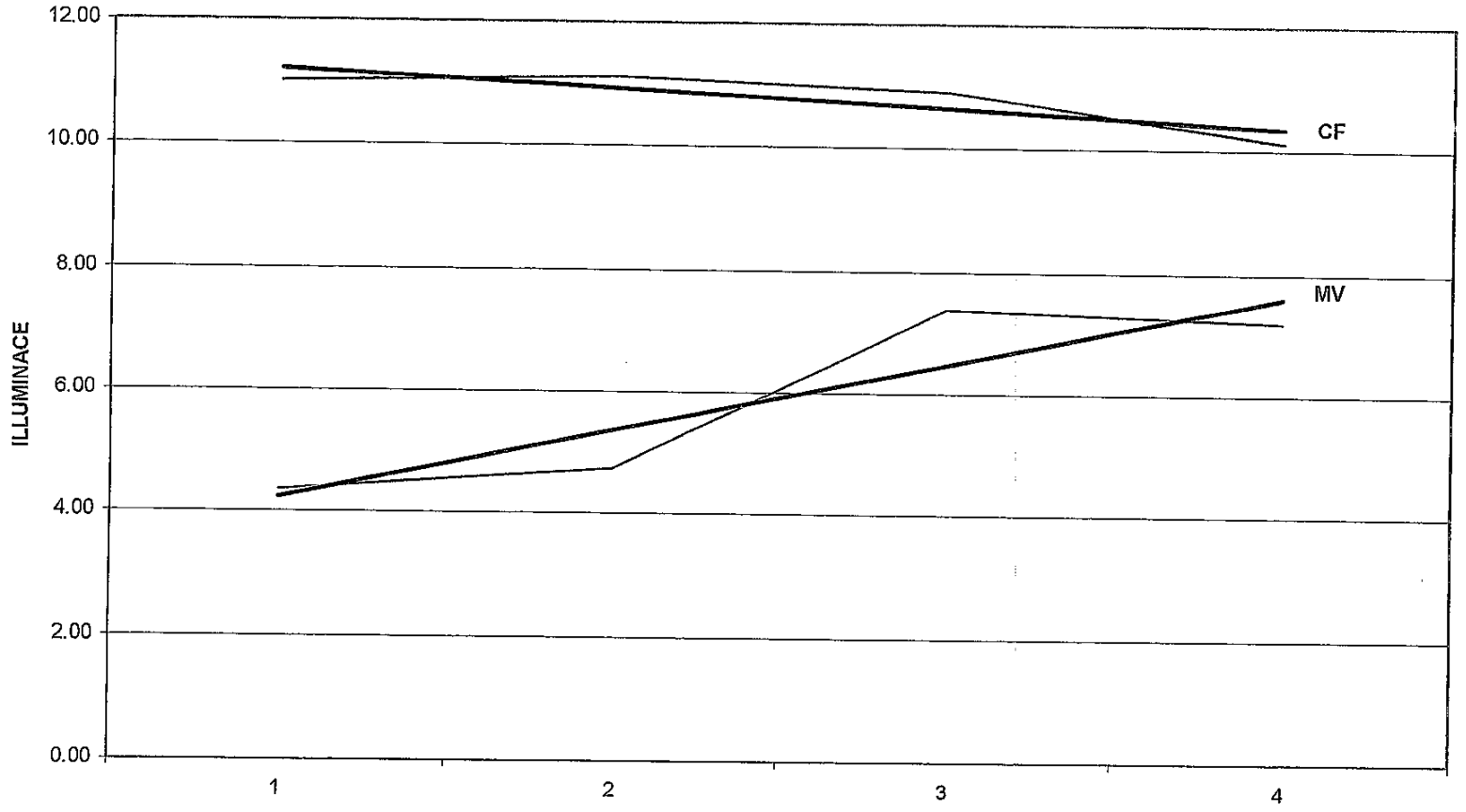
MH		P5	21.00	19.20	18.10	17.40	1.20	5.84	5.70	5.10	17.14
MH		P6	21.20	19.20	18.90	18.10	1.00	3.75	3.90	4.00	14.62
MH		P7	21.00	20.30	18.80	19.00	1.00	5.26	5.10	4.80	9.52
MH		P8	0.10	16.00	14.10	7.00	0.10	5.82	4.40	3.50	56.25
									AVERAGE DEPRECIATION		76.89
	PERCENTAGE SURVIVAL		94.40	94.40	100.00	94.40					
				AVERAGE SURVIVAL		95.80					
CF	Black Lane	P1	6.00	2.66	0.00	5.60	4.40	1.96	0.00	3.80	NA
CF		P2	0.00	4.88	2.60	0.00	0.00	3.32	1.60	0.00	NA
CF	Birchley Lane	P1	6.80	3.25	2.70	3.10	4.70	2.61	1.90	2.10	54.41
CF		P2	5.60	5.00	2.80	3.00	1.90	4.30	2.20	1.10	46.43
CF	Sibbald Lane (South)	P1	4.60	3.60	6.80	6.60	2.40	2.21	3.70	4.10	2.94
CF		P2	6.00	3.35	6.50	6.50	3.20	1.96	3.90	3.80	44.17
CF	Sibbald Lane (north)	P1	4.60	2.49	0.00	0.00	3.40	2.20	0.00	0.00	NA
CF		P2	0.00	0.00	5.30	4.00	0.00	0.00	4.00	2.60	NA
CF		P3	4.30	2.40	3.30	2.20	3.00	1.26	1.20	1.10	48.84
									AVERAGE DEPRECIATION		60.64
	PERCENTAGE SURVIVAL		77.80	88.90	77.80	77.80					
				AVERAGE SURVIVAL		80.58					
MV	Lochee Street	P1	0.00	0.00	7.90	0.00	0.00	0.00	1.30	0.00	NA
MV		P2	0.00	0.00	22.30	0.00	0.00	0.00	7.10	0.00	NA
MV		P3	0.00	0.00	18.90	0.00	0.00	0.00	7.50	0.00	NA
MV	York Terrace	P1	3.60	0.00	4.30	4.30	0.50	0.00	1.30	1.50	0.00
MV		P2	3.60	3.70	3.90	3.70	0.44	1.04	1.40	1.30	5.13
MV		P3	1.70	1.70	2.10	1.70	0.24	0.43	0.90	0.50	0.00
MV		P4	3.50	3.11	3.00	3.40	0.01	1.02	1.10	0.80	2.86
MV	Manning Street	P1	3.70	3.77	2.50	3.70	0.60	0.90	1.00	1.00	0.00
MV		P2	0.80	0.82	1.10	1.00	0.02	0.15	0.20	0.30	9.09
MV		P3	0.60	0.00	1.90	2.50	0.02	0.00	0.20	1.00	NA
MV		P4	3.50	0.00	1.70	1.60	0.01	0.98	0.90	0.90	54.29
MV	Victoria Street	P1	2.40	2.80	2.60	2.60	0.20	0.67	0.80	0.80	7.14
MV		P2	0.02	0.00	0.00	0.00	0.10	0.00	0.00	0.00	NA

MV		P3	3.20	3.72	2.90	3.00	0.15	0.73	1.00	0.90	6.25
MV		P4	5.60	4.71	5.60	5.40	1.10	1.78	2.10	2.00	3.57
MV		P5	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	NA
MV	Palmerston Street	P1	2.00	1.96	2.00	2.00	0.25	0.90	1.10	1.00	0.00
MV		P2	2.60	2.35	3.00	2.20	0.25	0.90	1.10	1.10	15.38
MV		P3	1.80	1.28	1.50	1.50	0.20	0.63	0.70	0.80	16.67
MV		P4	0.60	0.00	0.00	0.00	0.10	0.00	0.00	0.00	NA
MV		P5	6.00	4.87	4.70	3.40	1.90	4.00	3.50	1.00	43.33
MV		P6	0.00	0.00	18.20	0.00	0.00	0.00	4.10	0.00	NA
	PERCENTAGE SURVIVAL		81.80	63.60	86.40	68.20			AVERAGE DEPRECIATION		88.31
				AVERAGE SURVIVAL		75.00					

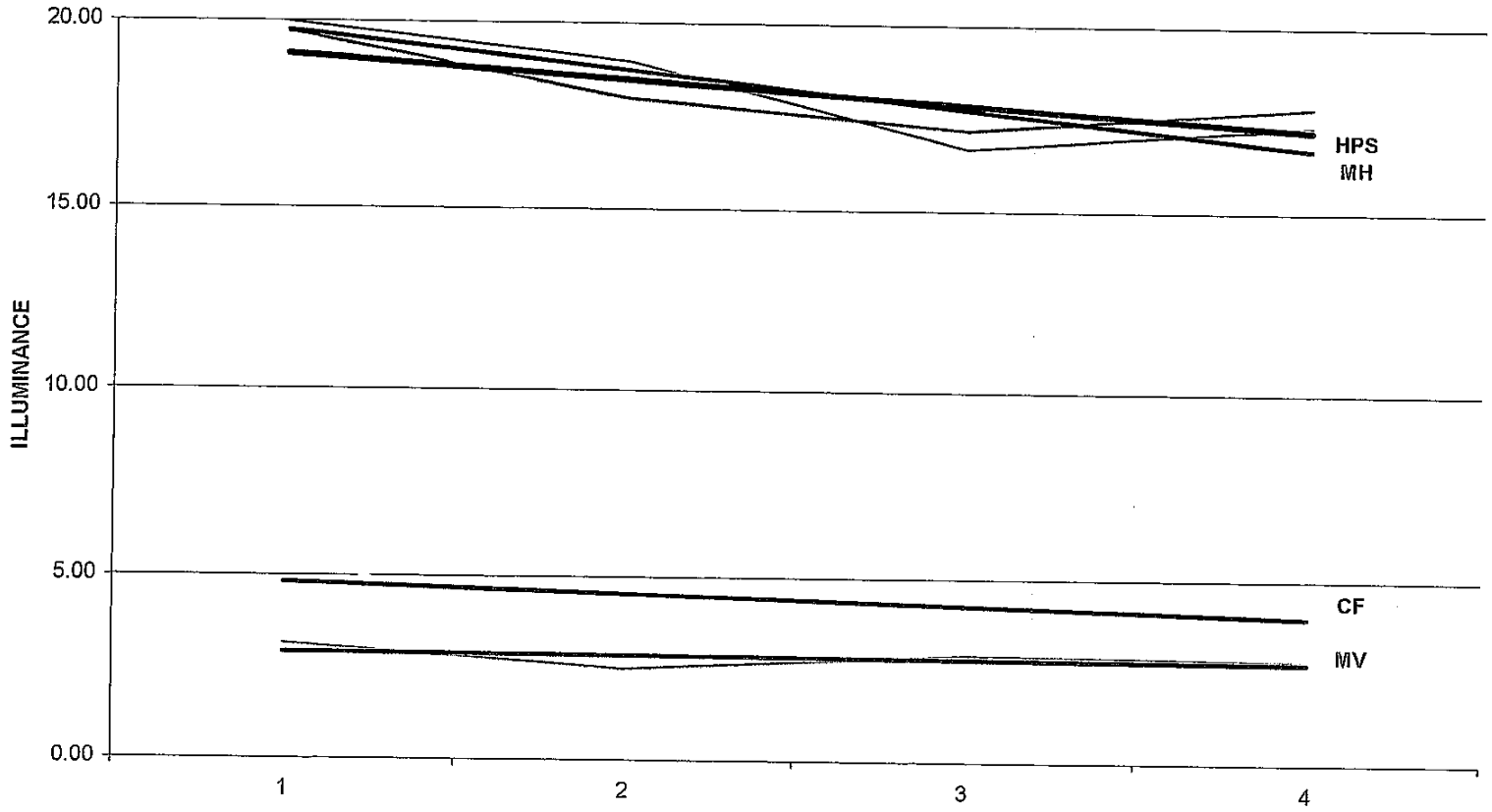
APPENDIX F

ILLUMINANCE DEPRECIATION GRAPHS

SUBIACO ILLUMINANCE TREND



MOSMAN PK ILLUMINANCE TREND



MIDVALE

LUMINAIRE TYPE	STREET	POLE NUMBER	ILLUMINANCE UNDER STREETLIGHT				ILLUMINANCE ACROSS ROAD				DEPRECIATION
			Trial 1	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4	
MV	Hamersley street	P1	13.00	11.60	8.50	0.00	2.36	2.31	1.80	0.00	NA
MV		P2	5.72	4.96	3.90	3.50	1.25	1.28	0.80	0.80	38.81
MV		P3	9.85	9.58	7.40	7.00	2.10	2.20	1.70	1.60	28.93
MV		P4	11.45	10.24	16.80	15.30	2.87	3.02	3.50	3.40	10.57
MV		P5	8.64	0.00	0.00	0.00	3.25	0.00	0.00	0.00	NA
MV		P6	4.15	3.24	1.70	1.40	1.14	0.92	0.50	0.40	66.27
MV	North Street	P1	5.34	0.00	0.00	0.00	0.97	0.00	0.00	0.00	NA
MV		P2	6.63	6.23	5.00	4.80	2.40	2.01	1.60	1.20	27.60
MV		P3	8.40	8.05	1.00	6.10	2.62	2.55	1.70	1.60	27.38
MV		P4	5.18	4.72	4.00	3.30	1.50	1.52	1.00	0.80	36.29
MV		P5	8.68	7.41	6.80	6.80	2.00	1.75	1.50	1.40	21.66
MV		P6	7.50	7.52	6.10	6.40	1.53	1.63	1.30	1.30	14.67
MV		P7	0.11	2.21	4.20	5.50	1.19	0.20	1.40	1.60	NA
MV		P8	0.00	0.00	7.50	7.40	0.00	0.00	1.60	1.20	NA
MV		P9	4.05	0.00	12.60	11.50	0.91	0.00	3.60	2.00	NA
MV	Charles Street (west)	P1	5.62	4.63	3.50	3.60	1.57	1.36	1.00	1.10	35.94
MV		P2	4.59	3.91	2.70	2.70	1.25	1.24	0.80	0.80	41.18
MV		P3	8.30	0.00	0.00	0.00	2.13	0.00	0.00	0.00	NA
MV		P4	8.84	8.04	6.50	5.80	2.58	2.31	1.90	1.20	34.39
MV		P5	4.71	4.22	2.70	2.50	1.45	1.19	0.80	0.80	46.92
MV		P6	3.40	2.88	1.00	0.90	3.40	0.90	0.30	0.90	73.53
MV		P7	6.12	0.00	8.40	8.80	1.62	0.00	1.70	1.90	NA
MV		P8	5.23	0.00	8.30	8.90	1.55	0.00	2.40	2.40	NA
MV		P9	0.70	2.40	1.00	0.50	0.86	0.86	0.50	0.50	28.57
MV	Gartell Street	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
MV		P2	5.18	5.25	2.90	3.30	0.90	1.16	0.60	0.50	36.29
MV		P3	5.85	5.37	0.00	0.00	0.79	0.84	0.00	0.00	NA
MV	George Street	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
MV		P2	9.35	0.00	7.30	6.10	2.02	0.00	1.60	1.40	34.76
MV		P3	3.93	3.29	1.90	1.30	0.96	0.95	0.60	0.40	66.92

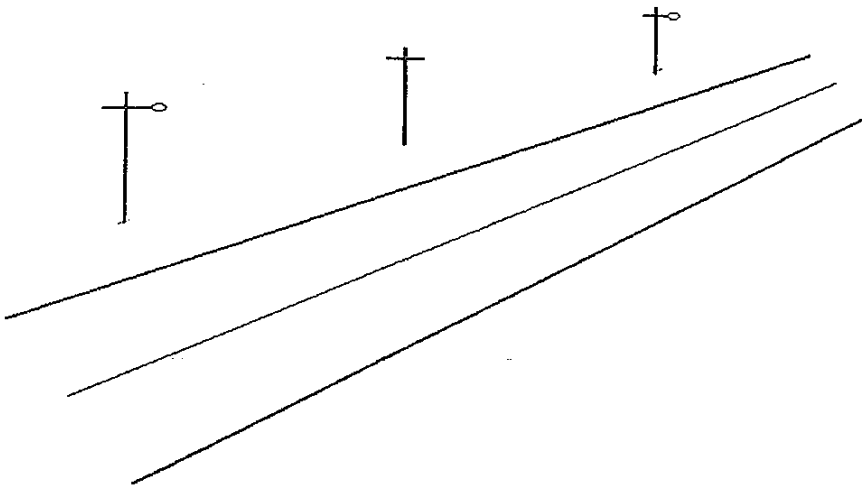
MV		P4	0.00	3.93	7.00	6.00	0.00	1.92	1.70	1.40	NA
MV		P5	8.39	7.56	6.60	6.40	1.84	1.70	1.70	1.40	23.72
MV		P6	5.34	5.25	3.80	3.00	1.49	1.55	1.00	0.80	43.82
									AVERAGE DEPRECIATION		63.09
	PERCENTAGE SURVIVAL		87.9	69.7	81.8	81.8					
				AVERAGE SURVIVAL		80.3					
MH	Charles Street (east)	P1	3.11	2.10	1.70	1.00	0.86	0.60	0.50	0.30	67.85
MH		P2	10.11	9.90	12.00	10.40	1.43	1.50	1.60	1.40	2.08
MH		P3	3.05	2.80	2.30	1.90	0.92	0.88	0.80	0.60	37.70
MH		P4	5.95	12.00	10.50	9.60	1.25	2.50	1.90	1.90	20.00
MH		P5	0.62	3.50	2.80	2.60	1.20	1.10	0.70	0.80	25.71
MH		P6	4.60	3.90	3.00	2.60	1.05	1.10	1.00	0.80	43.48
MH		P7	2.92	2.30	3.60	3.50	0.44	0.47	0.60	0.70	21.23
MH	Wroxton Street	P1	16.92	15.00	13.00	15.00	1.62	1.50	0.93	2.70	11.35
MH		P2	5.12	12.00	10.10	10.40	1.87	2.90	2.10	2.10	13.33
MH		P3	6.05	4.70	3.70	3.40	1.48	1.20	0.91	0.70	43.80
MH		P4	5.17	4.50	3.70	0.00	1.60	1.20	1.10	0.00	NA
MH		P5	7.85	7.75	12.00	10.50	0.98	1.40	1.10	1.20	1.27
MH		P6	1.29	0.00	7.00	7.80	1.22	0.00	1.80	2.40	NA
MH		P7	5.38	4.80	4.00	2.40	1.69	1.50	1.00	0.60	55.39
MH		P8	6.68	5.50	4.12	0.00	3.17	2.50	2.30	0.00	NA
MH		P9	5.98	0.00	11.60	11.50	1.43	0.00	2.40	2.40	NA
MH		P10	9.07	8.90	7.80	2.50	2.58	2.80	2.20	0.60	72.44
MH	Henry Street	P1	4.56	3.80	0.00	0.00	1.10	1.00	0.00	0.00	NA
MH		P2	8.85	7.80	7.30	6.60	1.74	1.60	1.20	1.10	25.42
MH		P3	6.24	5.70	4.50	0.00	1.45	1.30	1.00	0.00	NA
MH		P4	3.45	2.80	2.30	2.00	0.92	0.86	0.80	0.60	42.03
MH	Ferguson Street	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
MH		P2	4.68	9.30	6.40	6.80	1.20	2.60	1.30	1.90	26.88
MH		P3	3.89	3.50	0.00	0.00	1.26	1.20	0.00	0.00	NA
MH		P4	10.05	10.00	9.90	8.80	2.03	2.00	2.00	1.50	12.44
MH		P5	5.28	11.00	6.50	6.70	1.48	3.10	2.00	1.70	39.09
MH		P6	5.91	14.00	11.00	9.30	1.88	3.80	2.60	2.50	33.57
MH		P7	0.00	12.00	5.70	9.50	0.00	2.40	2.30	1.40	NA
MH		P8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA

MH		P9	4.68	10.00	8.90	9.50	1.11	2.40	2.00	2.00	5.00
MH	Wellaton Street	P1	4.94	0.00	8.80	7.90	1.70	0.00	2.50	1.70	NA
MH		P2	3.26	3.90	7.90	2.30	1.59	1.20	1.10	0.60	29.45
MH		P3	10.03	9.60	3.00	7.80	2.45	2.20	2.20	1.80	22.23
MH		P4	5.38	4.70	3.50	3.00	1.29	1.07	0.10	0.80	44.24
MH	Warde Street	P1	6.89	5.60	5.70	4.90	2.52	1.50	4.40	3.50	28.88
MH		P2	5.37	4.70	10.00	9.50	1.26	1.30	1.70	2.00	12.48
MH		P3	8.72	8.10	7.50	0.00	1.73	1.90	1.20	0.00	NA
MH		P4	9.15	9.40	7.20	8.90	1.82	1.90	1.10	1.70	2.73
MH	Eric Street	P1	8.48	8.40	7.50	7.40	2.21	2.40	1.90	1.30	12.74
MH		P2	6.31	5.30	4.30	2.60	1.48	1.30	1.00	0.60	58.80
MH	Roger Street	P1	4.93	4.10	18.00	18.70	1.03	1.10	2.90	2.90	16.84
MH		P2	8.14	11.00	9.80	19.40	1.54	2.10	1.90	2.40	10.91
MH		P3	5.70	0.00	0.00	15.40	1.48	0.00	0.00	3.40	NA
MH		P4	0.00	9.60	7.30	19.10	0.00	1.90	1.30	3.50	NA
MH		P5	5.42	10.00	8.10	8.30	1.25	2.50	1.80	1.80	17.00
MH		P6	7.96	7.70	6.10	6.60	1.51	1.70	1.30	1.50	17.09
MH	Kingston Place	P1	5.98	13.00	9.90	8.50	1.72	4.20	2.80	2.40	34.62
MH		P2	5.66	4.70	4.40	0.00	0.57	0.70	0.60	0.00	NA
MH		P3	5.08	4.40	12.90	10.30	1.75	1.70	9.40	3.20	20.16
MH		P4	6.61	5.80	4.80	5.10	0.25	0.50	0.70	1.00	22.84
MH	Egan Place	P1	6.04	11.10	8.70	2.70	2.10	3.40	2.90	2.60	55.30
MH		P3	10.92	10.15	8.10	8.30	1.43	0.92	1.10	1.10	23.99
MH		P3	0.00	15.00	12.20	11.80	0.00	4.24	2.50	2.20	21.33
MH		P4	9.05	9.40	7.70	7.40	3.74	3.60	3.00	2.70	18.23
MH		P5	8.78	8.10	6.90	7.00	3.04	2.60	2.50	2.30	20.27
MH		P6	6.51	0.00	13.30	11.80	0.43	0.00	0.70	1.60	NA
MH	Ewart Grove	P1	10.38	11.00	9.40	8.90	3.26	2.80	2.90	3.00	14.26
MH		P2	4.22	7.40	5.60	5.20	1.50	2.10	1.80	1.30	29.73
MH		P3	9.53	7.40	12.00	10.30	0.78	1.40	2.00	1.80	22.35
	PERCENTAGE SURVIVAL		93.20	88.10	91.50	86.40			AVERAGE DEPRECIATION		72.87
				AVERAGE SURVIVAL		89.80					

APPENDIX G

SCENARIOS

OVERHEAD POWER - 80 W MERCURY AT 80 M

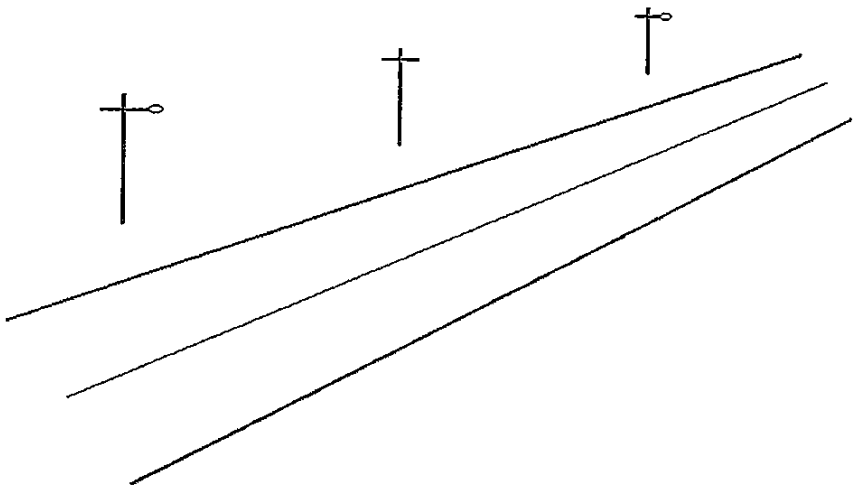


KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE	✖	
ENERGY [1]	1.12	kW/km
GREENHOUSE GAS [2]	4.0	T/km
LAMP COST [3]	$ 4.50	
LAMP LIFE [4]	4	years
SYNERGY TARIFF p.a.	$86	
Running cost per kilolumen	$16.00	

NOTES:

[1] Based on circuit power of 89.5 W
[2] Based on 0.9 kg of CO_2 per kWh
[3] Based on manufacturer information
[4] Based on 4 000 hours of operation per a year

OVERHEAD POWER - 42 W COMPACT FLUORESCENT AT 80 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE	✖	
ENERGY ❶	0.6	kW/km
GREENHOUSE GAS ❷	2.0	T/km
LAMP COST ❸	$ 13	
LAMP LIFE ❹	4	years
SYNERGY TARIFF p.a.	N/A	
Running cost per kilolumen	$11.25	

NOTES:

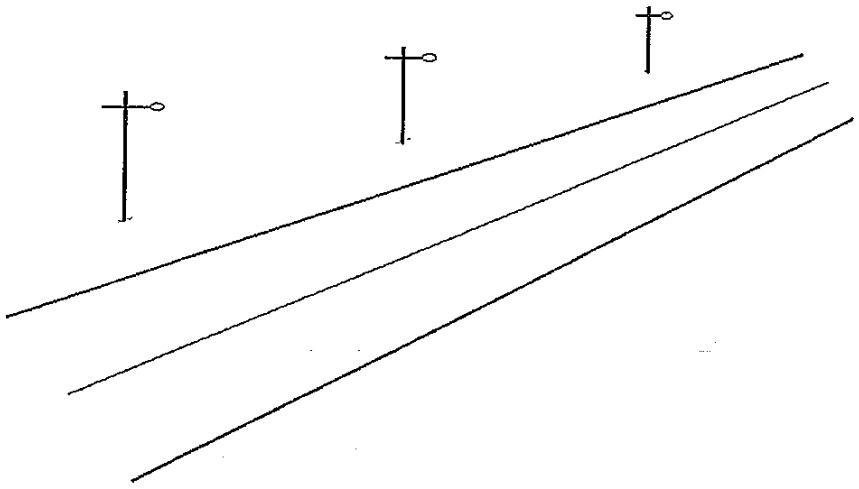
❶ Based on circuit power of 46 W

❷ Based on 0.9 kg of CO_2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

OVERHEAD POWER - 42 W COMPACT FLUORESCENT AT 40 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	1.2	kW/km
GREENHOUSE GAS ❷	4.1	T/km
LAMP COST ❸	$ 13	
LAMP LIFE ❹	4	years
SYNERGY TARIFF p.a.	N/A	
Running cost per kilolumen	$11.25	

NOTES:

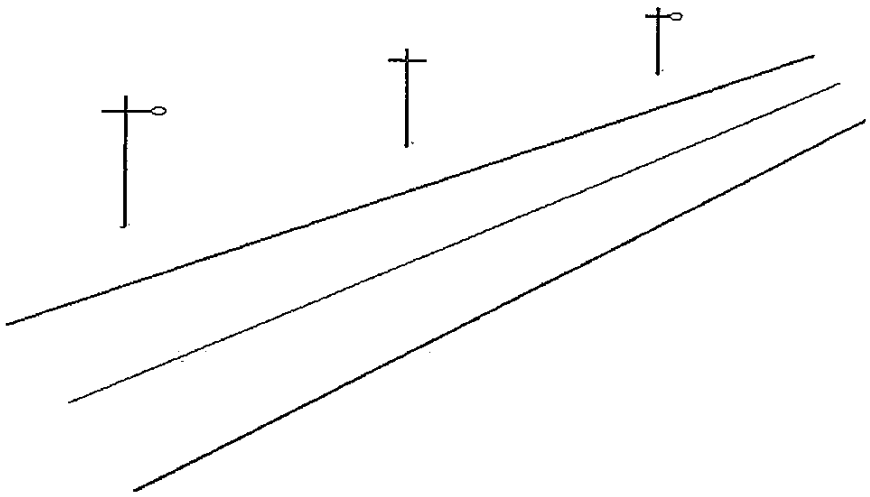
❶ Based on circuit power of 46 W

❷ Based on 0.9 kg of CO_2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

OVERHEAD POWER - 70 W METAL HALIDE AT 80 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	1.0	kW/km
GREENHOUSE GAS ❷	3.4	T/km
LAMP COST ❸	$ 40	
LAMP LIFE ❹	3	years
SYNERGY TARIFF p.a.	$129	
Running cost per kilolumen	$15.51	

NOTES:

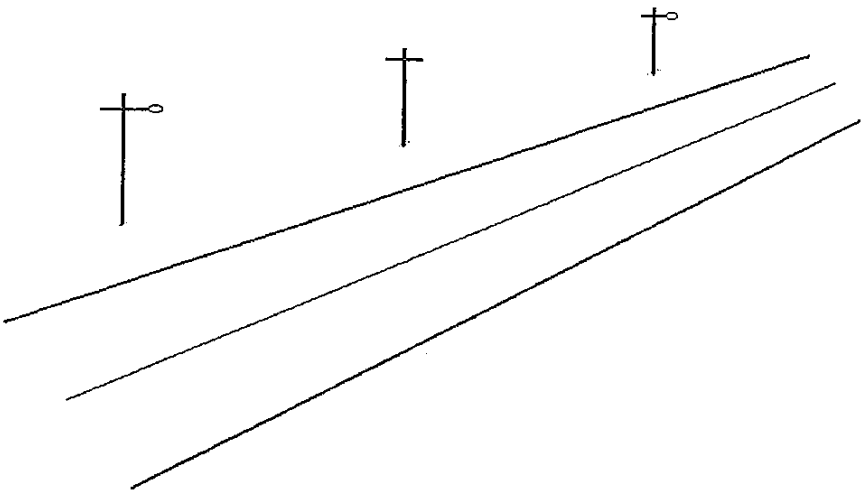
❶ Based on circuit power of 77 W

❷ Based on 0.9 kg of CO_2 2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

OVERHEAD POWER - 70 W HIGH PRESSURE SODIUM AT 80 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	1.0	kW/km
GREENHOUSE GAS ❷	3.4	T/km
LAMP COST ❸	$ 21	
LAMP LIFE ❹	5	years
SYNERGY TARIFF p.a.	$82	
Running cost per kilolumen	$7.80	

NOTES:

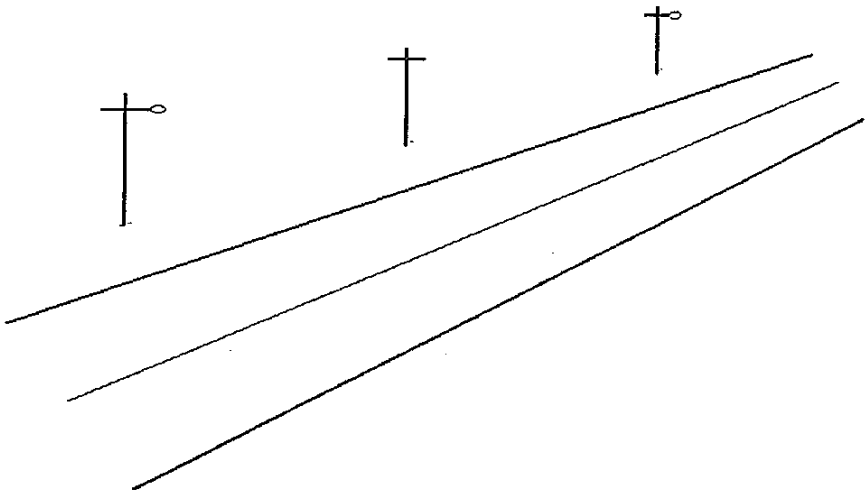
❶ Based on circuit power of 77 W

❷ Based on 0.9 kg of CO_2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

OVERHEAD POWER - 50 W HIGH PRESSURE SODIUM AT 80 M

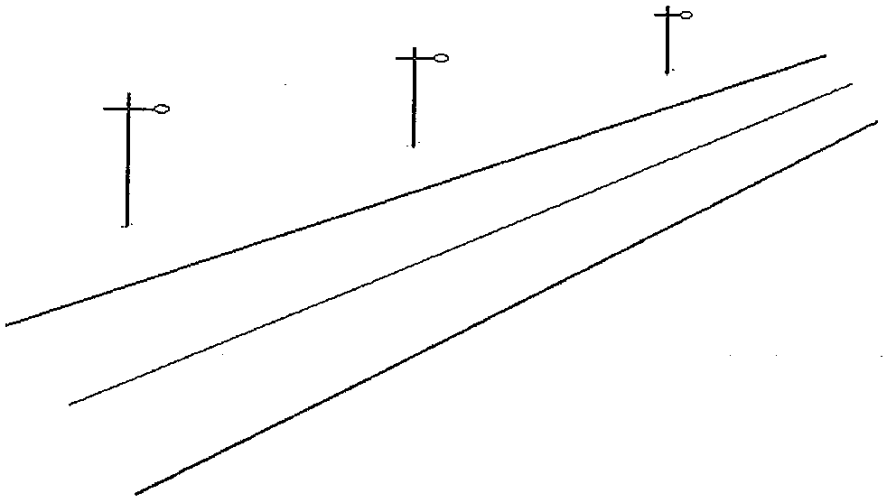


KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE	✖	
ENERGY ❶	0.69	kW/km
GREENHOUSE GAS ❷	2.5	T/km
LAMP COST ❸	$ 21	
LAMP LIFE ❹	5	years
SYNERGY TARIFF p.a.	N/A	
Running cost per kilolumen	$9.42	

NOTES:

❶ Based on circuit power of 55 W
❷ Based on 0.9 kg of CO_2 per kWh
❸ Based on manufacturer information
❹ Based on 4 000 hours of operation per a year

OVERHEAD POWER - 50 W HIGH PRESSURE SODIUM AT 40 M

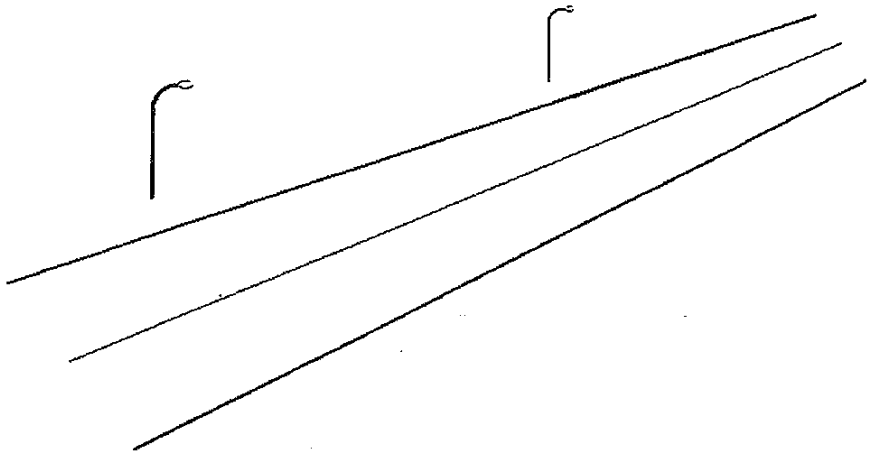


KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	1.38	kW/km
GREENHOUSE GAS ❷	4.95	T/km
LAMP COST ❸	$ 21	
LAMP LIFE ❹	5	years
SYNERGY TARIFF p.a.	N/A	
Running cost per kilolumen	$9.42	

NOTES:

❶ Based on circuit power of 55 W
❷ Based on 0.9 kg of CO_2 per kWh
❸ Based on manufacturer information
❹ Based on 4 000 hours of operation per a year

UNDERGROUND POWER - 80 W MERCURY AT 60 M

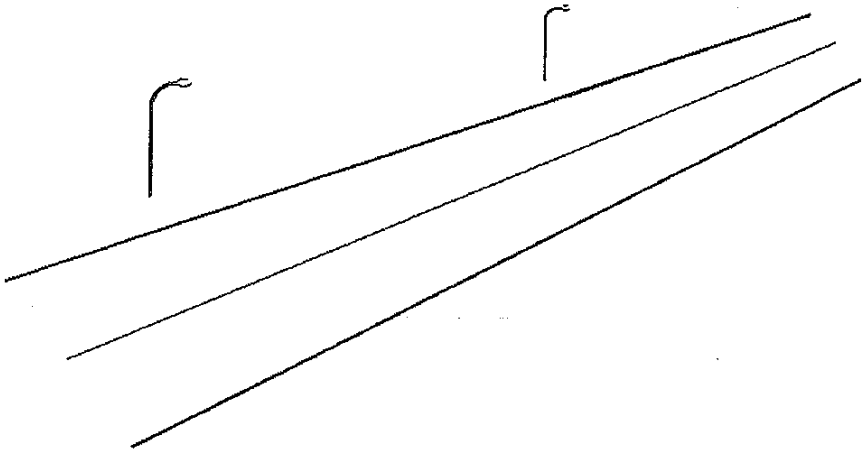


KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	1.49	kW/km
GREENHOUSE GAS ❷	5.4	T/km
LAMP COST ❸	$ 4.50	
LAMP LIFE ❹	4	years
SYNERGY TARIFF p.a.	$86	
Running cost per kilolumen	$16.00	

NOTES:

❶ Based on circuit power of 89.5 W
❷ Based on 0.9 kg of CO_2 per kWh
❸ Based on manufacturer information
❹ Based on 4 000 hours of operation per a year

UNDERGROUND POWER – 42 W COMPACT FLUORESCENT AT 60 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	0.77	kW/km
GREENHOUSE GAS ❷	2.7	T/km
LAMP COST ❸	$ 13	
LAMP LIFE ❹	4	years
SYNERGY TARIFF p.a.	N/A	
Running cost per kilolumen	$11.25	

NOTES:

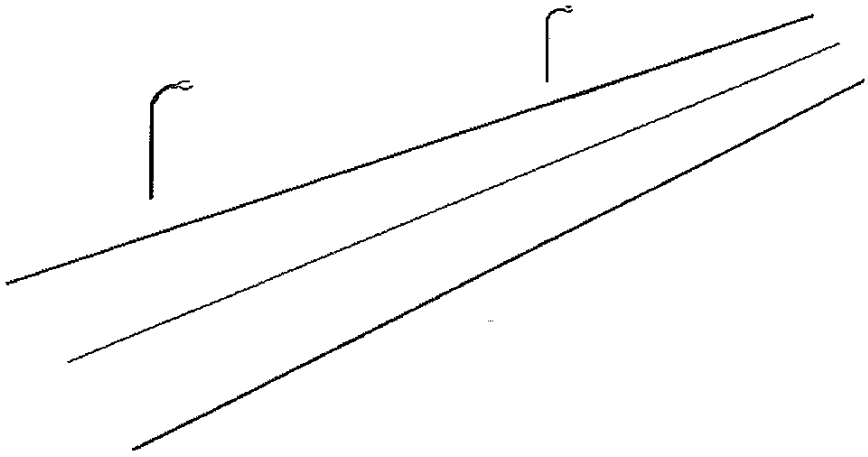
❶ Based on circuit power of 46 W

❷ Based on 0.9 kg of CO_2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

UNDERGROUND POWER - 70 W METAL HALIDE AT 70 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	1.1	kW/km
GREENHOUSE GAS ❷	4.0	T/km
LAMP COST ❸	$ 40	
LAMP LIFE ❹	3	years
SYNERGY TARIFF p.a.	$129	
Running cost per kilolumen	$15.51	

NOTES:

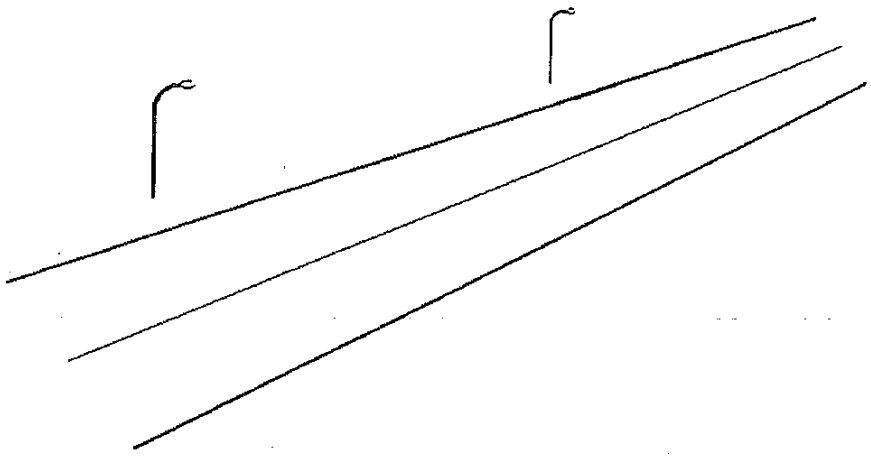
❶ Based on circuit power of 77 W

❷ Based on 0.9 kg of CO_2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

UNDERGROUND POWER - 70 W HIGH PRESSURE SODIUM AT 60 M

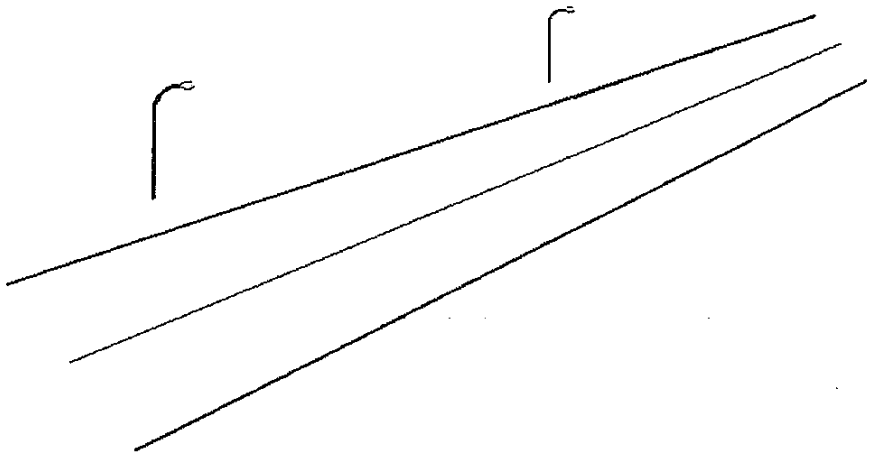


KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		**Category P4**
ENERGY ❶	1.28	kW/km
GREENHOUSE GAS ❷	4.7	T/km
LAMP COST ❸	$ 21	
LAMP LIFE ❹	5	years
SYNERGY TARIFF p.a.	$82	
Running cost per kilolumen	$7.80	

NOTES:

❶ Based on circuit power of 77 W
❷ Based on 0.9 kg of CO_2 per kWh
❸ Based on manufacturer information
❹ Based on 4 000 hours of operation per a year

UNDERGROUND POWER - 50 W HIGH PRESSURE SODIUM AT 60 M

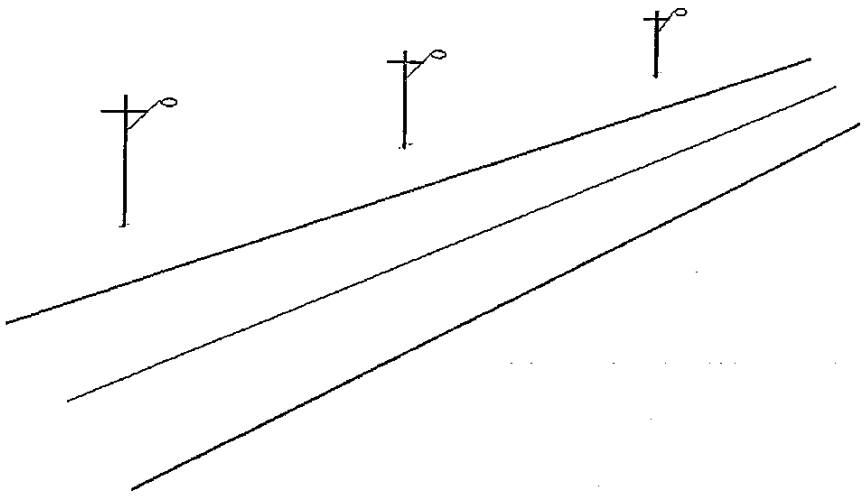


KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE	✖	
ENERGY ❶	0.92	kW/km
GREENHOUSE GAS ❷	3.3	T/km
LAMP COST ❸	$ 21	
LAMP LIFE ❹	5	years
SYNERGY TARIFF p.a.	N/A	
Running cost per kilolumen	$9.42	

NOTES:

❶ Based on circuit power of 55 W
❷ Based on 0.9 kg of CO_2 per kWh
❸ Based on manufacturer information
❹ Based on 4 000 hours of operation per a year

OVERHEAD POWER - 250 W HIGH PRESSURE SODIUM AT 40 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		Category V3
ENERGY [1]	6.9	kW/km
GREENHOUSE GAS [2]	25	T/km
LAMP COST [3]	$ 20	
LAMP LIFE [4]	4	years
SYNERGY TARIFF p.a.	$161	
Running cost per kilolumen	$5.05[5]	

NOTES:

[1] Based on circuit power of 276 W

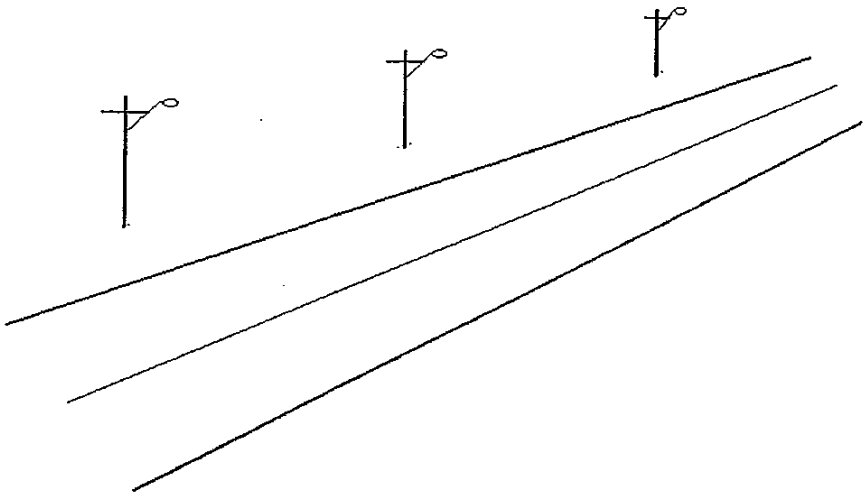
[2] Based on 0.9 kg of CO_2 per kWh

[3] Based on manufacturer information

[4] Based on 4 000 hours of operation per a year

[5] Based on 4 year lamp life, lamp cost of $20.00, the labour and plant costs listed in Table 3, circuit power of 276 W, energy cost at ZE18 tariff, and lamp output of 28 000 lumens.

OVERHEAD POWER - 400 W MERCURY AT 40 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		Category V3
ENERGY [1]	10.7	kW/km
GREENHOUSE GAS [2]	39	T/km
LAMP COST [3]	$ 10	
LAMP LIFE [4]	4	years
SYNERGY TARIFF p.a.	$232	
Running cost per kilolumen	$8.50[5]	

NOTES:

[1] Based on circuit power of 429 W

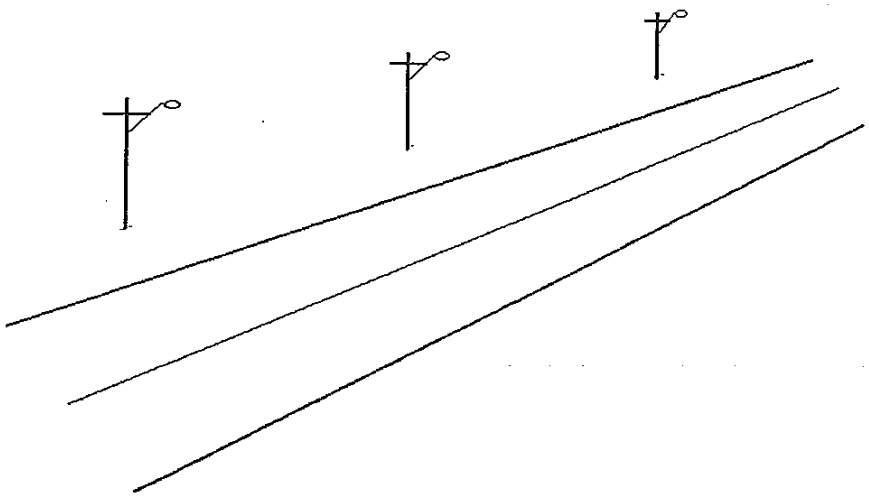
[2] Based on 0.9 kg of CO_2 per kWh

[3] Based on manufacturer information

[4] Based on 4 000 hours of operation per a year

[5] Based on 4 year lamp life, lamp cost of $10.00, the labour and plant costs as listed in Table 3, circuit power of 429 W, energy cost at ZE18 tariff, and lamp output of 24 000 lumens

OVERHEAD POWER - 150 W HIGH PRESSURE SODIUM AT 40 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		Category V5
ENERGY [1]	4.2	kW/km
GREENHOUSE GAS [2]	15	T/km
LAMP COST [3]	$ 22	
LAMP LIFE [4]	4	years
SYNERGY TARIFF p.a.	$125	
Running cost per kilolumen	$6.61[5]	

NOTES:

[1] Based on circuit power of 168 W

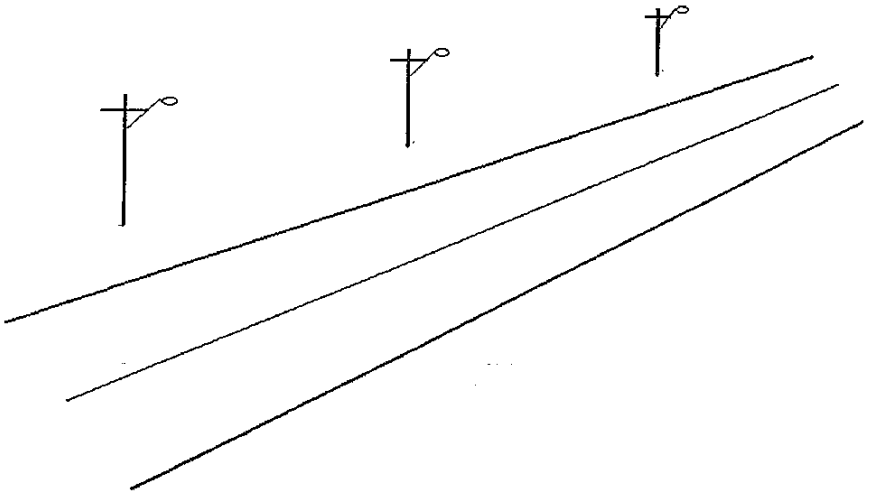
[2] Based on 0.9 kg of CO_2 per kWh

[3] Based on manufacturer information

[4] Based on 4 000 hours of operation per a year

[5] Based on 4 year lamp life, lamp cost of $22.00, the labour and plant costs as listed in Table 3, circuit power of 168 W, energy cost at ZE18 tariff, and lamp output of 14 500 lumens

OVERHEAD POWER - 250 W MERCURY AT 40 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		Category V5
ENERGY ❶	6.9	kW/km
GREENHOUSE GAS ❷	25	T/km
LAMP COST ❸	$ 10	
LAMP LIFE ❹	4	years
SYNERGY TARIFF p.a.	$173	
Running cost per kilolumen	$9.77❺	

NOTES:

❶ Based on circuit power of 276 W

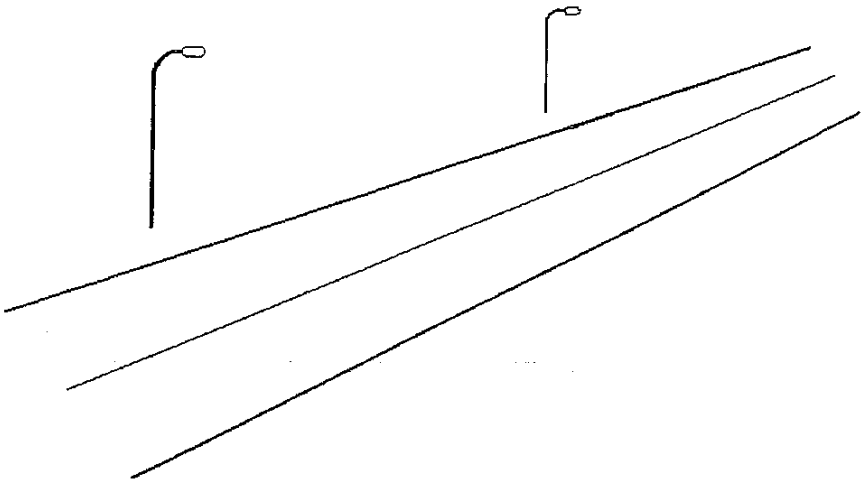
❷ Based on 0.9 kg of CO_2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

❺ Based on 4 year lamp life, lamp cost of $10.00, the labour and plant costs as listed in Table 3, circuit power of 271 W, energy cost at ZE18 tariff, and lamp output of 14 000 lumens

UNDERGROUND POWER - 250 W HIGH PRESSURE SODIUM AT 60 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		Category V3
ENERGY ❶	4.6	kW/km
GREENHOUSE GAS ❷	16.6	T/km
LAMP COST ❸	$ 20	
LAMP LIFE ❹	4	years
SYNERGY TARIFF p.a.	$161	
Running cost per kilolumen	$5.05❺	

NOTES:

❶ Based on circuit power of 276 W

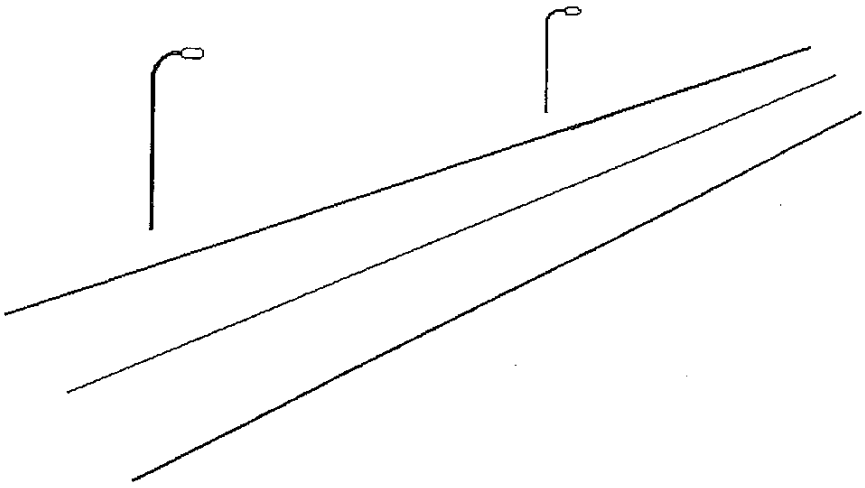
❷ Based on 0.9 kg of CO_2 per kWh

❸ Based on manufacturer information

❹ Based on 4 000 hours of operation per a year

❺ Based on 4 year lamp life, lamp cost of $20.00, the labour and plant costs as listed in Table 3, circuit power of 276 W, energy cost at ZE18 tariff, and lamp output of 28 000 lumens

UNDERGROUND POWER - 150 W HIGH PRESSURE SODIUM AT 60 M



KEY PERFORMANCE INDICATORS		
AS/NZS 1158 COMPLIANCE		Category V3
ENERGY [1]	2.8	kW/km
GREENHOUSE GAS [2]	10	T/km
LAMP COST [3]	$ 22	
LAMP LIFE [4]	4	years
SYNERGY TARIFF p.a.	$125	
Running cost per kilolumen	$6.61[5]	

NOTES:

[1] Based on circuit power of 168 W

[2] Based on 0.9 kg of CO_2 per kWh

[3] Based on manufacturer information

[4] Based on 4 000 hours of operation per a year

[5] Based on 4 year lamp life, lamp cost of $22.00, the labour and plant costs as listed in Table 3, circuit power of 168 W, energy cost at ZE18 tariff, and lamp output of 14 500 lumens

APPENDIX H

BRIEF

BRIEF September 2004

Improved Street Lighting Study for Greenhouse and Safety Benefit – Project Brief

Institutional and Technical Review

a. Conduct an Institutional and Technical review of the current situation in Western Australia. The institutional issues would relate to Western Power, the Office of Energy, the State Underground Power Programme and a comparison between Council owned street lights and Streetvision. The Technical issues would include luminaire choices and adherence to the Australian Standards and comparisons of efficiencies with other Australian States as well as World's best practice.

b. Prepare a report on outcomes of the Institutional and Technical Review. The Report will include recommendation on how the efficiency of street lighting could be improved in Western Australia.

c. Prepare a seminar designed and conducted on the outcomes of the Institutional and Technical Review.

2. Monitoring Programme

2.1 The monitoring will cover about 200 new streetlights in each of Mosman Park North, Subiaco Underground Power Area, and Midvale and about 50 control old mercury vapour streetlights in each of Mosman Park South, Subiaco overhead power area, and Midland adjacent Midvale.

2.2 Prepare an initial report (2004) outlining the area of the study with maps showing location of streetlights and then submit report to WALGA. Each local government will provide GIS information to the consultant in AutoCAD format.

2.3 Develop monitoring methodology with the Streetlighting Steering Group. Monitor by means of twelve bimonthly by night visits to each streetlight. Each Local Government will report to the consultant any streetlights burning during the day ie. (faulty PE switches). Submit data to WALGA.

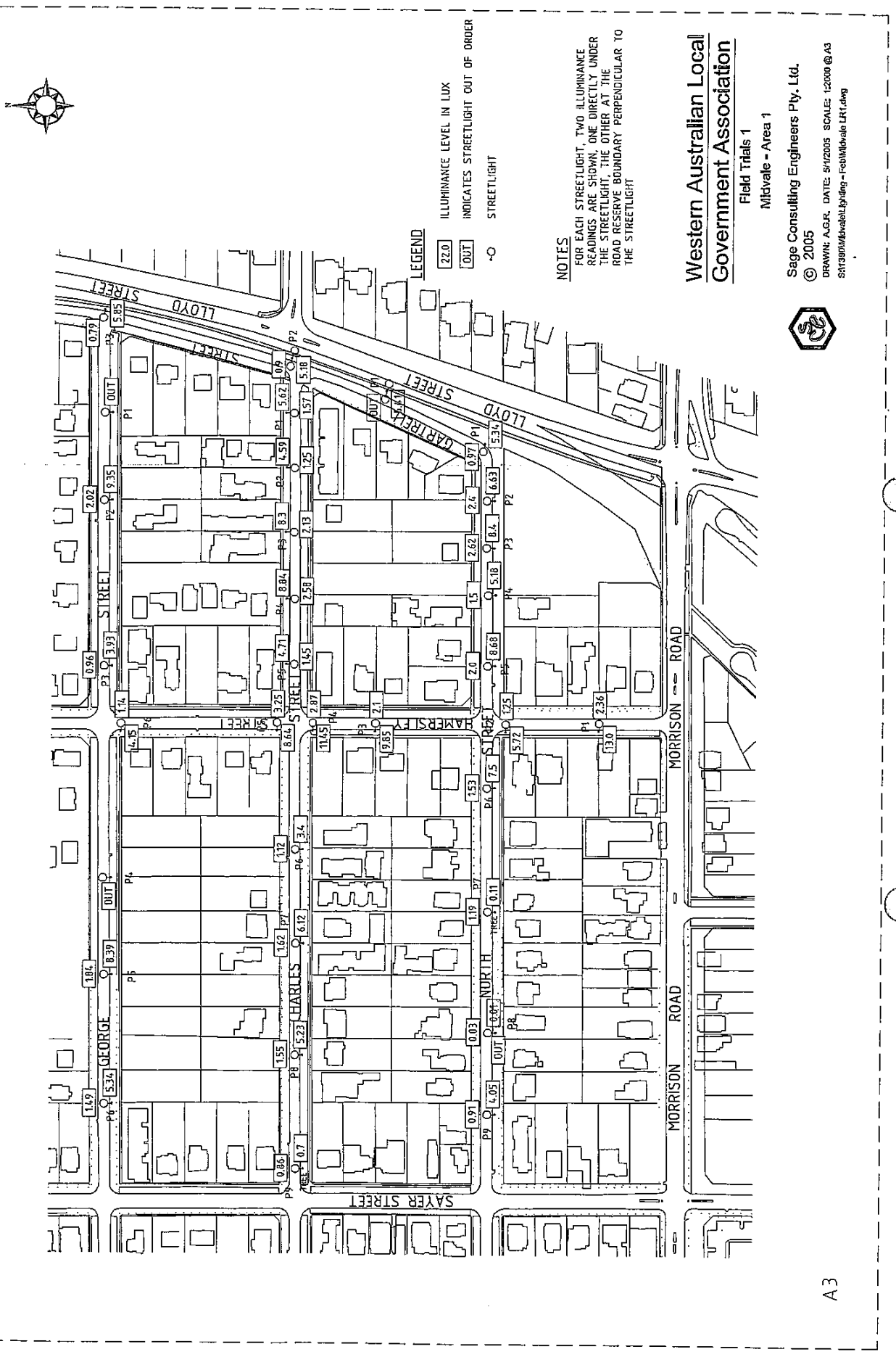
2.4 Prepare interim Report (2005) on the outcomes of Monitoring and Reporting for Three Study Sites at 12 Months. The Interim Report should draw on and include outcomes and finding of 1.2 and 1.3 in establishing interim recommendations.

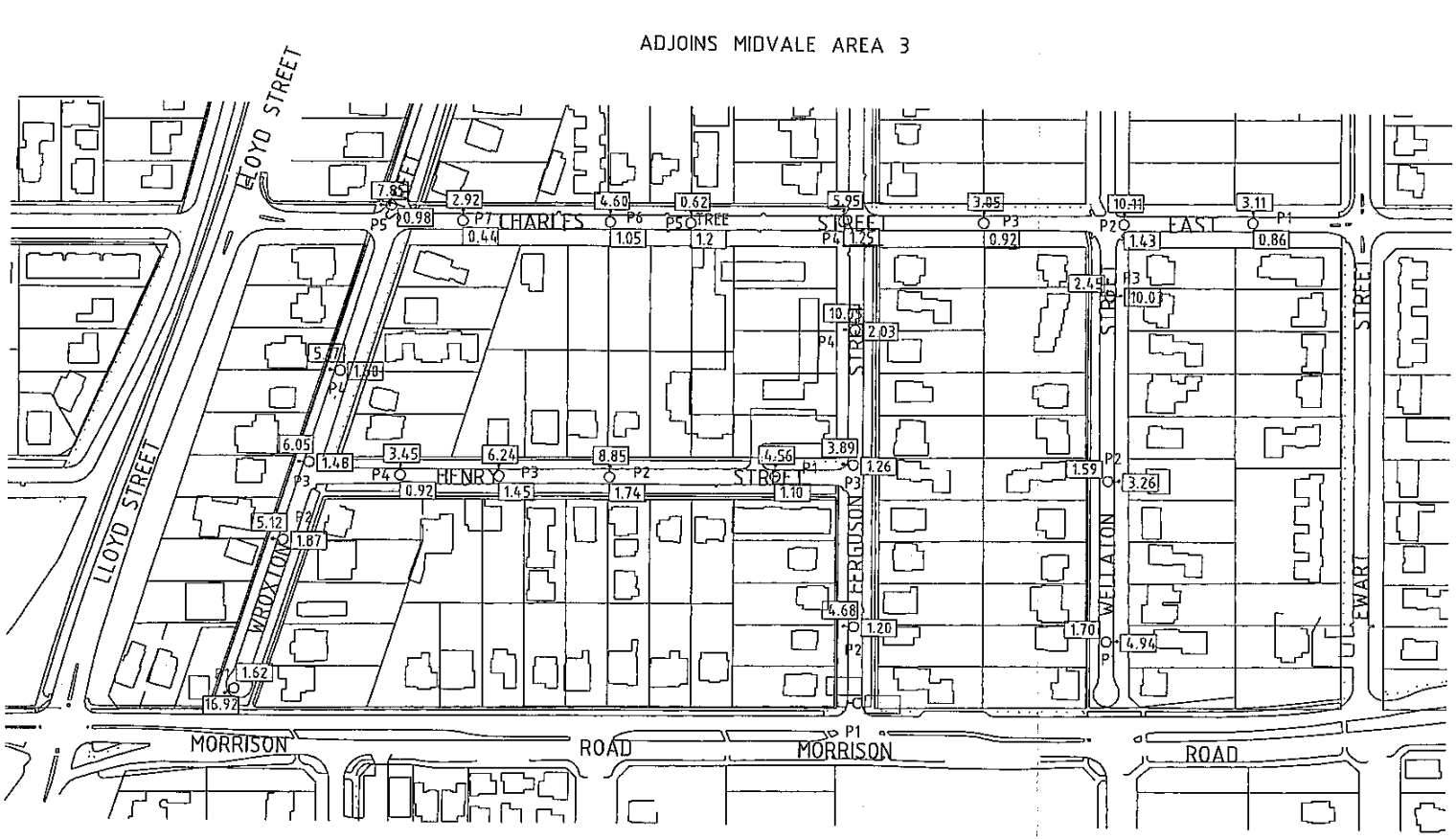
2.5 Prepare final report on the 24 month monitoring trial including link to recommendations from Institutional and Technical Review. Submit to WALGA.

2.6 Prepare a seminar designed and conducted to report project outcomes to stakeholders. Subject to level of interest, this may be conducted in parallel with the Institution and Technology seminar.

APPENDIX I

LIGHTING MEASUREMENT MAPS


LEGEND
22.0 ILLUMINANCE LEVEL IN LUX
OUT INDICATES STREETLIGHT OUT OF ORDER
STREETLIGHT
NOTES
FOR EACH STREETLIGHT, TWO ILLUMINANCE READINGS ARE SHOWN, ONE DIRECTLY UNDER THE STREETLIGHT, THE OTHER AT THE ROAD RESERVE BOUNDARY PERPENDICULAR TO THE STREETLIGHT
Western Australian Local Government Association
Field Trials 1
Midvale - Area 1
Sage Consulting Engineers Pty. Ltd.
© 2005
DRAWN: A.G.R. DATE: 5/12/2005 SCALE: 1:2000 @ A3
S:\1390\Midvale\Lighting - Feb\Midvale LR1.dwg
LLOYD STREET
CARTREFA
HAMERSLEY
MORRISON ROAD
SAYER STREET
GEORGE
CHARLES
NORTH
A3



LEGEND

22.0	ILLUMINANCE LEVEL IN LUX
OUT	INDICATES STREETLIGHT OUT OF ORDER
	STREETLIGHT

NOTES

FOR EACH STREETLIGHT, TWO ILLUMINANCE READINGS ARE SHOWN, ONE DIRECTLY UNDER THE STREETLIGHT, THE OTHER AT THE ROAD RESERVE BOUNDARY PERPENDICULAR TO THE STREETLIGHT.

Western Australian Local Government Association

Field Trials 1

Midvale - Area 2

Sage Consulting Engineers Pty. Ltd.

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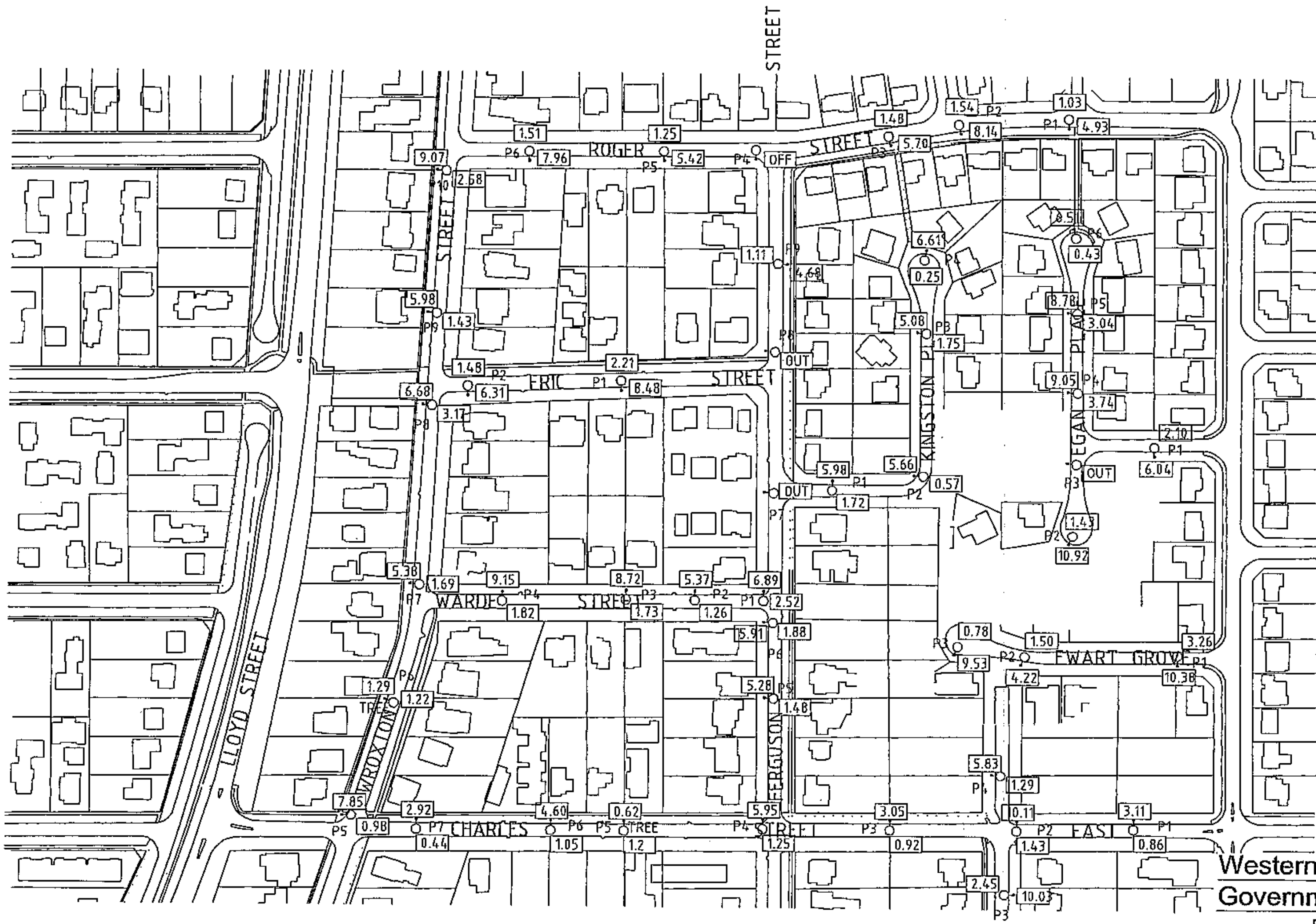
A3



ADJOINS MIDVALE AREA 2

LEGEND

22.0	ILLUMINANCE LEVEL IN LUX
OUT	INDICATES STREETLIGHT OUT OF ORDER
-○	STREETLIGHT

NOTES

FOR EACH STREETLIGHT, TWO ILLUMINANCE READINGS ARE SHOWN, ONE DIRECTLY UNDER THE STREETLIGHT, THE OTHER AT THE ROAD RESERVE BOUNDARY PERPENDICULAR TO THE STREETLIGHT.

A3

Western Australian Local Government Association

Field Trials 1

Midvale - Area 3

Sage Consulting Engineers Pty. Ltd.

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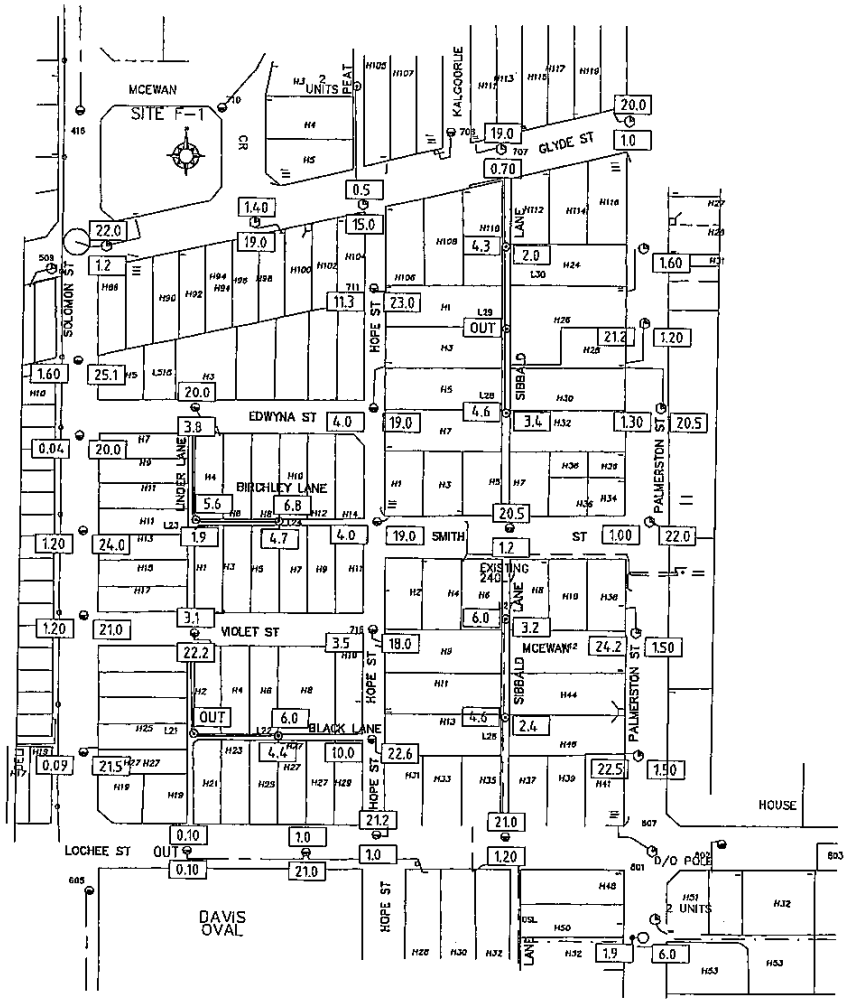

Area 1

REFER DRAWING Mosman Park LR2
FOR CONTINUATION OF AREA 2

LEGEND

22.0	ILLUMINANCE LEVEL IN LUX
OUT	INDICATES STREETLIGHT OUT OF ORDER
⊙	LANEWAY STREETLIGHT
⊖	STREETLIGHT

NOTES

FOR EACH STREETLIGHT, TWO ILLUMINANCE READINGS ARE SHOWN, ONE DIRECTLY UNDER THE STREETLIGHT, THE OTHER AT THE ROAD RESERVE BOUNDARY PERPENDICULAR TO THE STREETLIGHT.

Western Australian Local Government Association

Field Trials 1

Mosman Park - Area 1

Sage Consulting Engineers Pty. Ltd.

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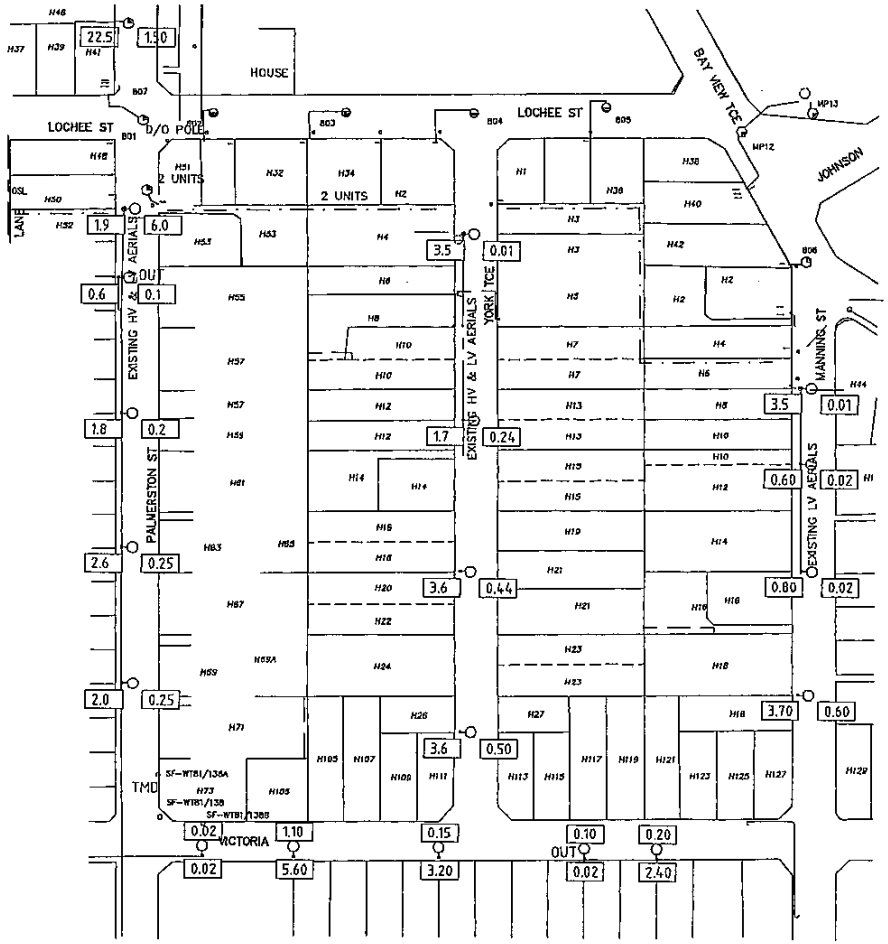
A3

REFER DRAWING Mosman Park LR1
FOR CONTINUATION OF AREA 1



Area 2

LEGEND

22.0	ILLUMINANCE LEVEL IN LUX
OUT	INDICATES STREETLIGHT OUT OF ORDER
	STREETLIGHT

NOTES

FOR EACH STREETLIGHT, TWO ILLUMINANCE READINGS ARE SHOWN, ONE DIRECTLY UNDER THE STREETLIGHT, THE OTHER AT THE ROAD RESERVE BOUNDARY PERPENDICULAR TO THE STREETLIGHT.

Western Australian Local Government Association

Field Trials 1

Mosman Park - Area 2

Sage Consulting Engineers Pty. Ltd.

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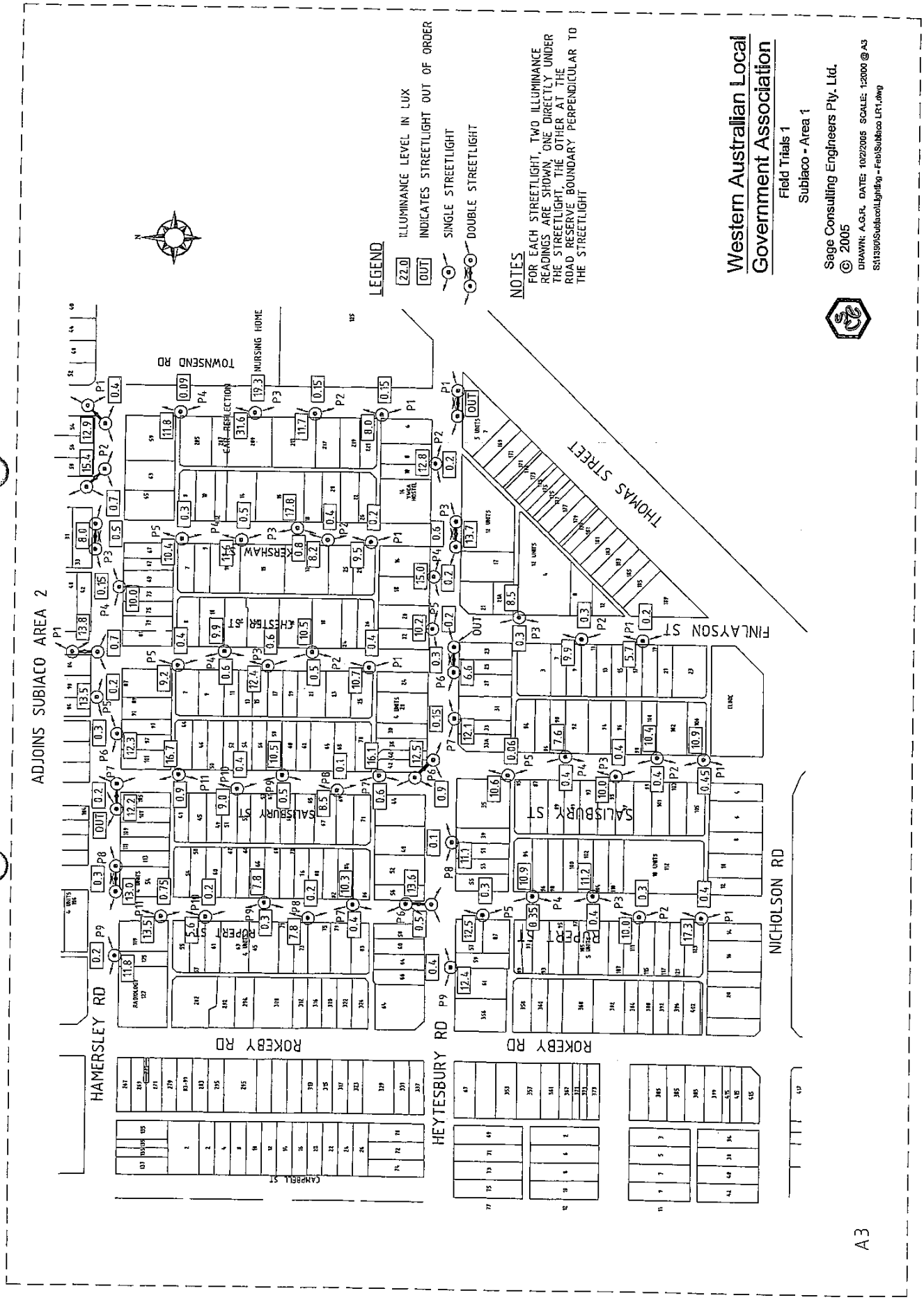
A3


ADJOINS SUBIACO AREA 2
HAMERSLEY RD
HEYTESBURY RD
ROKEBY RD
NICHOLSON RD
SALISBURY ST
FINLAYSON ST
THOMAS STREET
TOWNSEND RD
NURSING HOME
CAMPBELL ST
LEGEND
22.0 ILLUMINANCE LEVEL IN LUX
OUT INDICATES STREETLIGHT OUT OF ORDER
SINGLE STREETLIGHT
DOUBLE STREETLIGHT
NOTES
FOR EACH STREETLIGHT, TWO ILLUMINANCE READINGS ARE SHOWN, ONE DIRECTLY UNDER THE STREETLIGHT, THE OTHER AT THE ROAD RESERVE BOUNDARY PERPENDICULAR TO THE STREETLIGHT
Western Australian Local Government Association
Field Trials 1
Subiaco - Area 1
Sage Consulting Engineers Pty. Ltd.
© 2005
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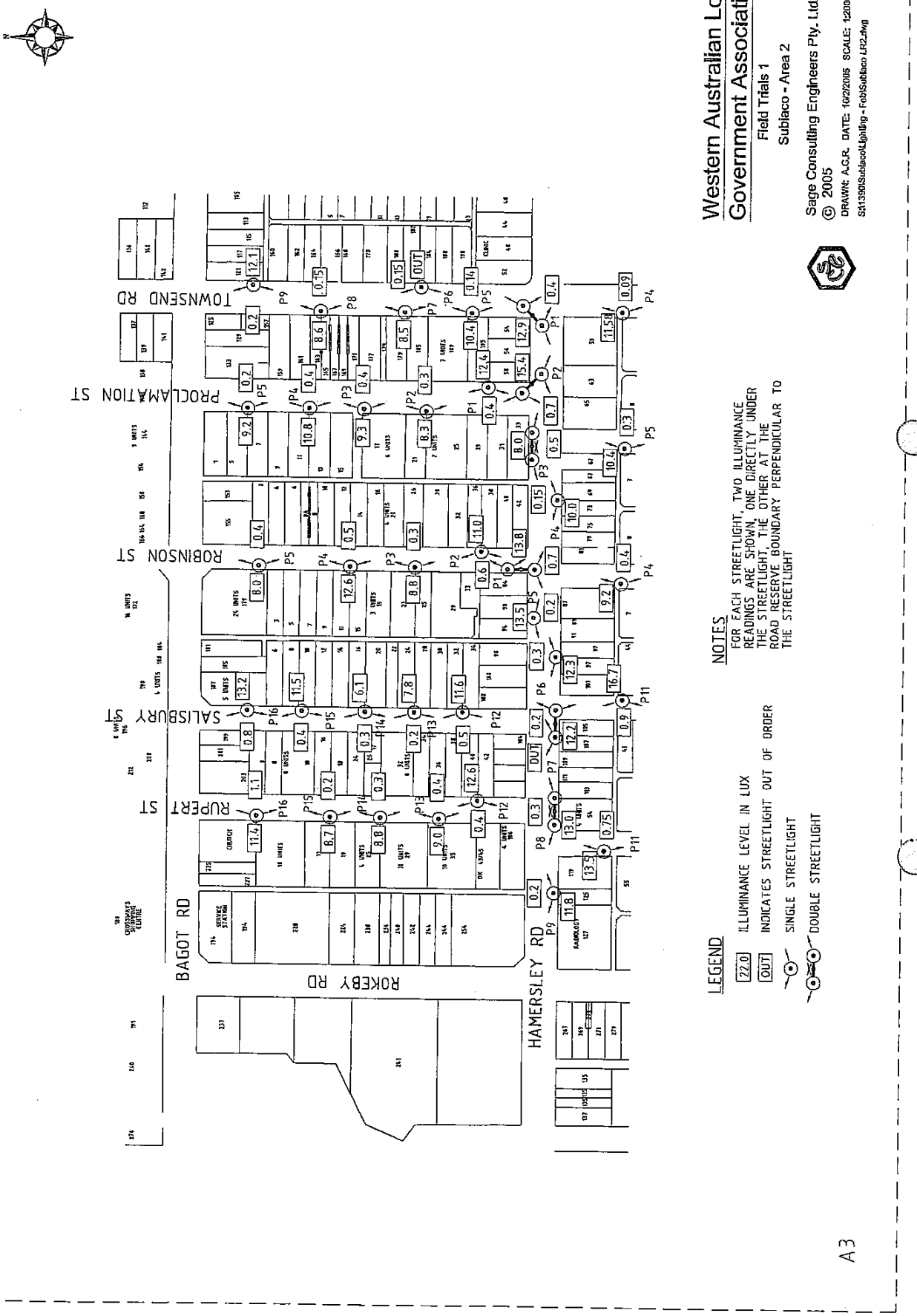
A3


Western Australian Local Government Association
Field Trials 1
Subiaco - Area 2
Sage Consulting Engineers Pty. Ltd.
© 2005
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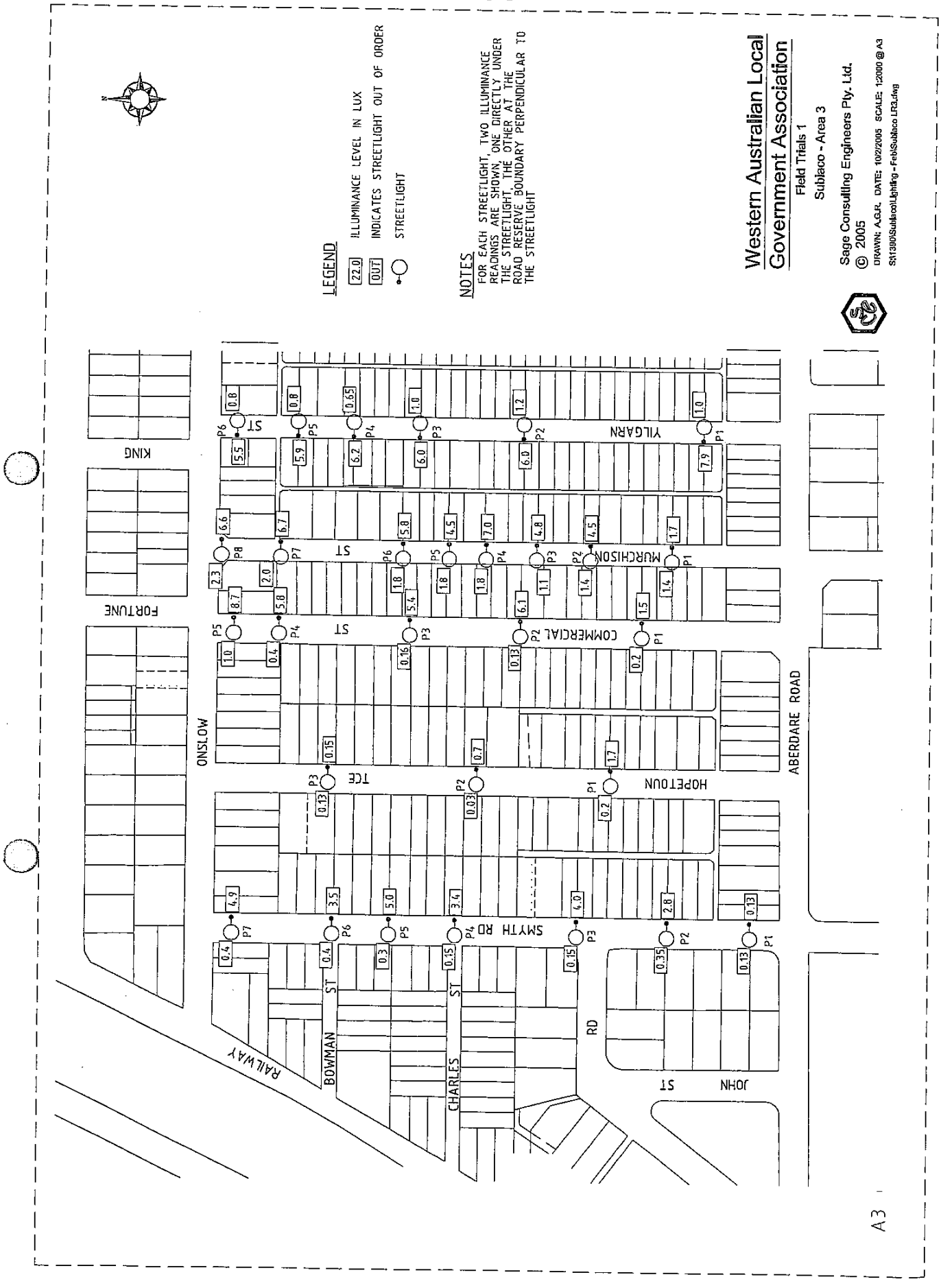
NOTES
FOR EACH STREETLIGHT, TWO ILLUMINANCE READINGS ARE SHOWN, ONE DIRECTLY UNDER THE STREETLIGHT, THE OTHER AT THE ROAD RESERVE BOUNDARY PERPENDICULAR TO THE STREETLIGHT
LEGEND
22.0 ILLUMINANCE LEVEL IN LUX
OUT INDICATES STREETLIGHT OUT OF ORDER
SINGLE STREETLIGHT
DOUBLE STREETLIGHT
TOWNSEND RD
PROCLAMATION ST
ROBINSON ST
SALISBURY ST
RUPERT ST
BAGOT RD
ROKEBY RD
HAMERSLEY RD
A3


LEGEND
22.0 ILLUMINANCE LEVEL IN LUX
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Western Australian Local Government Association
Field Trials 1
Subiaco - Area 3
Sage Consulting Engineers Pty. Ltd.
© 2005
DRAWN: A.G.R. DATE: 10/2/2005 SCALE: 1:2000 @ A3
S31390\Subiaco\Lighting - Feb\Subiaco LR3.dwg
A3
ABERDARE ROAD
ONSLOW
FORTUNE
KING
RAILWAY
BOWMAN ST
CHARLES ST
SMYTH RD
HOPETOUN TCE
COMMERCIAL RD
MURCHISON ST
YILGARN ST
JOHN ST

APPENDIX J

SUMMARY OF RECOMMENDATIONS

SUMMARY OF RECOMMENDATIONS

ITEM RECOMMENDATION

1. **Standards**
   WALGA encourage local government to adopt AS/NZS 1158 as a policy for technical design of streetlight networks. AS/NZS is appropriate, and should not be considered as excessive. There is a risk to local government if they do not comply with a national standard.

2. **Efficient lamp technologies**
   WALGA encourage Western Power and Local Government to use the more efficient lamp technologies in new and replacement street lights.

3. **Underground Power Program**
   The Office of Energy encourages energy efficient street lighting for UPP projects, and specifies appropriate AS/NZS 1158 Categories.

4. **Synergy/Western Power Invoicing**
   Synergy provide a price breakdown listing maintenance, replacement, energy, and administrative costs to individual Local Government clients.

5. **Mercury**
   On overhead power systems, the 80 W mercury vapour street light at 80 m spacing does not comply with AS/NZS 1158. Mercury vapour lamps have half the efficiency of modern lamps. Consequently the use of mercury vapour lamps should be phased out by responsible authorities.

6. **Western Power**
   WALGA request Synergy and Western Power to include fluorescent lamps such as compact fluorescent and T5 fluorescent lamps in their available stock.

7. **Energy Efficient Street Lighting Technologies**
   For minor road lighting two technologies are available to Local Government:
   - 42 W compact fluorescent
   - 2 X 24 W T5 fluorescent

   Both lamps are mature, not emerging technologies. The compact fluorescent lamp has been available since 1982 and the 42 W version since the early 1990's. T5 fluorescent lamps have been available since the mid 1990's. Both lamp technologies are available in Australian made street lights.
   These technologies are equivalent in light output to the common 80 W mercury vapour lamp and offer a halving of energy consumption and greenhouse gas emissions.

ATTACHMENT 1

2008/2009 Budget Preparation Time-Table		
From	To	Action
11-Feb-08	22-Feb-08	Create budget template files and folders
25-Feb-08	25-Feb-08	Files available to Business Units
26-Feb-08	29-Feb-08	Training Sessions for budget officers
03-Mar-08	21-Mar-08	Budget data input, including PPS update and preparation of managers' presentations to EMT
24-Mar-08	28-Mar-08	Upload budget files and consolidation
31-Mar-08	11-Apr-08	Managers presentation to EMT
14-Apr-08	30-Apr-08	Budget amendments, Adjustments, upload and Statements
14-Apr-08	30-Apr-08	Implication of Differential Rates Proposal and possible Advertising and Minister Approval
01-May-08	30-May-08	Presentations to Council Committee
02-Jun-08	13-Jun-08	Preparation of final documents and report
16-Jun-08		Ready for Adoption by Council

EMPLOYEE COSTS

DECEMBER 2007

Budgets prepared by Local Governments show Employee Costs will account for 36% of Operating Expenditure (including depreciation), or 46% of Operating Expenditure excluding depreciation in 2007/08. This is the largest single category of expenditure for most Local Governments. It is often thought that wage costs in the public sector follow movements in the Consumer Price Index (CPI) and therefore CPI provides a reasonable proxy for employment costs. While CPI is often referred to in wage discussions, there is little evidence that wage cost movements and CPI are strongly related, at least in the short term.

The Labour Price Index [1] (LPI) reported quarterly by the Australian Bureau of Statistics (ABS) estimates changes in hourly rates of pay (excluding bonuses) including the costs of leave, superannuation, payroll tax and workers' compensation for a defined group of jobs. It is designed to be unaffected by changes in the quantity or quality of work performed and is the Bureau's preferred method of assessing wage movements.

The relationship between annual changes in CPI (Perth All Groups) and LPI for employees in the Western Australian public sector (all categories) is shown in Figure 1.

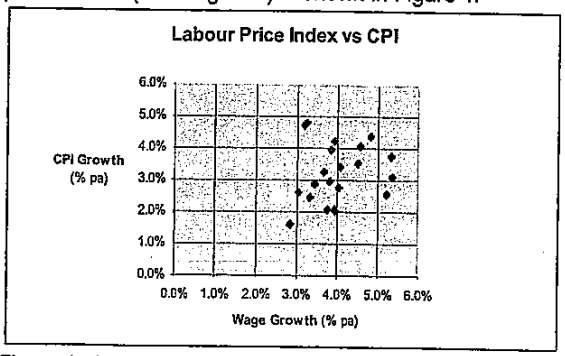


Figure 1: Annual CPI (Perth All Groups) growth plotted against Labour Price Index growth (WA Public Sector) for each quarter of the 5 year period ending September 2007.

There is no clear relationship between the two indices over the past five years. There are periods when prices have grown more quickly than wages, and other periods where wages have grown more quickly. During the past five years, public sector wage costs have grown 0.8% points per year more than the CPI on average. Over the long term, this difference is about 1% point.

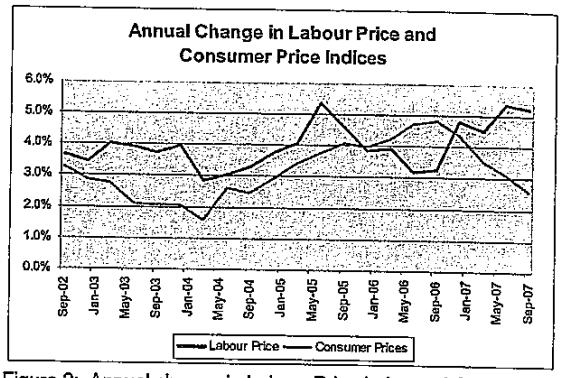


Figure 2: Annual change in Labour Price Index and Consumer Price Index.

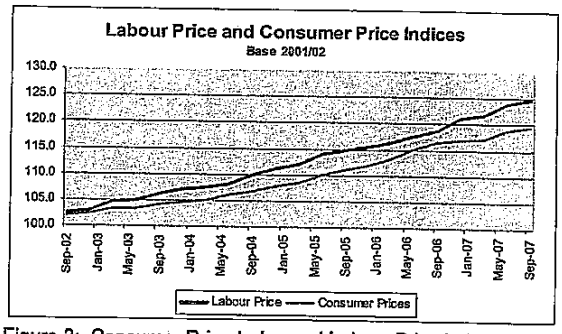


Figure 3: Consumer Price Index and Labour Price index.

WA Local Governments in aggregate have budgeted Employee Costs to increase by 13% in 2007/08. This reflects some increase in numbers of positions, the intent to fill positions that were unfilled for all or part of 2006/07 and increases in wage and salary rates. Growth in expenditure in this category is more than four times the expected growth in the CPI, a reminder of the limited relevance of CPI in contract escalation or setting fees and charges and the importance of focus on this area come budget time.

OPERATING INCOME

Every Local Government is different. However, it is at times useful to benchmark performance or outlook against others and ensure that there are sound explanations for big deviations from the average of similar councils. From a sample of 87 WA Local Governments, the budgets for 2007/08 indicate that Operating Income across the sector will increase by 1.3%. This in itself should raise alarm bells, as costs (using the Local Government Cost Index) increased by around 4% in 2006/07. This aggregate data includes local governments in the major growth areas

who have considerable increases in income (and expenditure). Rates are expected to account for 52% of income and income from rates is budgeted to increase by 7.5%. However, a major gap is in Fees and Charges which accounts for about a quarter of operating income, and is forecast to increase by just 0.9%. Operating Grants and Subsidies which contribute 13% of income are forecast to increase by just 2.0%, also well below the cost increases faced by Local Governments.

Interest contributes an estimated 4.2% of total income and is forecast to decrease by 8.3% compared to 2006/07, due in part to conservative estimates of interest earned. Contributions and reimbursements are forecast to fall markedly, although these are typically variable from year to year and will contribute only around 3% to total income in 2007/08.

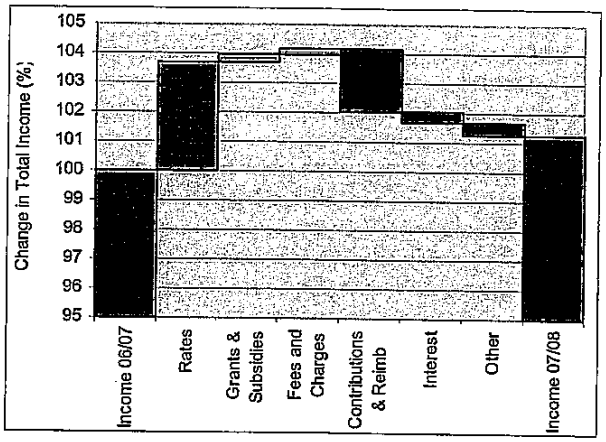


Figure 4: Components of change in local government income between 2006/07 actual and 2007/08 budget for a sample of 87 local governments.

As a sector we need to renew efforts to ensure Grants and Subsidies are indexed to relevant cost increases, and autonomy to set Fees and Charges relative to cost and value is achieved.

There will be more on benchmarks from local government budgets in the next edition of Economic Briefing.

For further information, or to comment please contact Economist Ian Duncan on 9213 2040 or email iduncan@walga.asn.au.

Notes:

1. Australian Bureau of Statistics Catalog No 6345.0 Table 4a Series Id A2159249T
2. http://www.oceania.rlb.com/documents/home/cost-comm-july-2007.pdf

OUTLOOK FOR 2008

"Trying to predict the future is a mug's game. But.. we need to have some sort of idea of what the future's actually going to be like because we are going to have to live there, probably next week."
Douglas Adams. The Salmon of Doubt. McMillan 2002.

The new calendar year is a good opportunity to review how 2007/08 is shaping up against earlier plans and update forecasts for the future.

Consumer Price Index

The Reserve Bank of Australia outlook is for the Consumer Price Index to increase at an annualised rate of 3.5% for the next few quarters, before slowing to around 3% pa by the end of 2008. The strengthening Australian dollar against the currencies of most of our trading partners is expected to be reflected in lower cost of imported goods.
However, higher prices for services, food and energy are expected to keep upward pressure on inflation. Over the past four years the annualised CPI growth in WA has been 0.7% points higher than the national average. Assuming this continues, **CPI (Perth) will increase by more than 4% pa** in the first half of 2008, before falling to a little below 4% later in the year.

Construction Costs

During 2007 growth in the General Construction Cost Index fell below 10% pa for the first time since 2004. Non-residential building construction costs continued to increase at close to 12% per annum. However, the Residential Building Costs and Road and Bridge Construction Cost indices increased by only around 4% during the year to the end of September 2007.

Demand for Non-residential building construction in WA is expected to remain strong and so most industry observers anticipate that the rate of cost increases in this sector observed during 2007 will continue into 2008. For example, the Rider Levett Bucknall Tender Price Index [2] is forecast to ease slightly from a 10.5% pa increase in 2007 to an 8.5% pa increase in 2008. From December 2007, new weightings will apply to the General Construction Cost Index published by the ABS and it is unclear what effect this will have on the reported index.

Local Government Cost Index

Assuming that the General Construction Cost Index increases by 8.5% during 2008, the **Local Government Cost Index (LGCI) will calculate at approximately 5.5% pa for the first part of 2008**, falling to around 5% by year end.

City of Joondalup

ATTACHMENT 1

POLICY 8-9 - INVESTMENT

STATUS: **City Policy** - *A policy that is developed for administrative and operational imperatives and has an internal focus.*

Developed by the Policy Committee and/or the administration and adopted by Council.

RESPONSIBLE DIRECTORATE: Corporate Services and Resource Management

OBJECTIVE: To provide policy guidelines for investment of the City's Funds which are surplus to immediate requirements.

STATEMENT:

1 Investment Objectives

The investment objective is to manage the Council's investment portfolio in order to maximise return within agreed risk parameters.

In achieving this the following must be maintained:

(a) high level of security by using recognised assessment criteria;

(b) adequate level of diversification to spread risk;

(c) ready access to funds for day-to-day requirements;

(d) adherence to the requirements of Section 6.14 of the Local Government Act 1995 and Section 18 (1) of the Trustees Act 1962 (as amended) (the "Prudent Person" rule);

(e) Ability for investment funds to achieve a return consistent with the UBSWA 90 day bank bill index and/or the Reserve Bank of Australia 11am cash rate.

2 Risk Profile

When exercising the power of investment the following are to be given consideration:

(a) the purpose of the investment and the needs and circumstances;
(b) the desirability of diversifying investments;
(c) the nature of and risk associated with existing investments;
(d) the need to maintain the real value of the capital and income;
(e) the risk of capital or income loss or depreciation;
(f) the potential for capital appreciation;
(g) the likely income return and the timing of income return;
(h) the length of the term of the proposed investment;
(i) the probable duration of the fund;

City of Joondalup

(j) the liquidity and the marketability of the proposed investment during, and on the determination of, the term of the proposed investment;
(k) the aggregate value of the investment;
(l) the effect of the proposed investment in relation to the tax liability (if any);
(m) the likelihood of inflation affecting the value of the proposed investment;
(n) the costs (including commissions, fees, charges and duties payable) of making the proposed investment; and
(o) the results of a review of existing investments.

3 Delegated Authority to Invest

The authority is to be delegated to the Chief Executive Officer to make investment decisions and sign investment lodgements and withdrawals. Pursuant to the provisions of Section 5.45 of the Local Government Act 1995. This authority may be delegated to the Statutory Accountant.

4 Authorised Investments

Authorised investments would include but not necessarily be limited to:

(a) Bank accepted/endorsed bank bills;
(b) Bank negotiable Certificates of Deposit;
(c) Bank interest bearing deposits;
(d) Bank backed floating rate notes;
(e) State/Commonwealth Government Bonds;
(f) Cash, Cash Plus (or equivalent) Managed funds; and
(g) City of Joondalup major land transactions.

5 Council's Direct Investments

(a) Quotations on Investments

Not less than three (3) quotations shall be obtained from authorised institutions whenever an investment is proposed. The best quote on the day will be successful after allowing for administrative and banking costs, as well as having regard to the limits set above and Council's bank management fee structure based around a level of credit funds being maintained.

(b) Term to Maturity

The term to maturity for an investment may range from "at call" to six months without Council approval.

(c) Liquidity

(i) At least 20% of the total investment portfolio must be liquifiable within 10 days.

(ii) Cash flow must be monitored daily to ensure cash funds are available to meet commitments.

City of Joondalup

6 Investments with Fund Managers - Prudential Requirements

Investments in managed funds will only include cash funds for funds invested for 0-3 months and cash-plus/cash enhanced funds (maximum permitted duration 2½ years with a bank bill performance benchmark) for funds available for 3 months and more.

The managed funds must have a minimum credit rating of "A" from Standard & Poors or "A2" from Moodys.

Council's investments must be available "at call" or readily accessible with no penalty over a maximum of 7-day period.

7 General Policy Guidelines

(a) Diversification Credit Risk

The amount invested with any one financial institution or managed fund should not exceed the following percentages of average annual funds invested. When placing investments, consideration should be given to the relationship between credit rating and interest rate.

Long Term Rating (Standard and Poors)	Short Term Rating (Standard and Poors)	Maximum Percentage of Total Investments with any one Financial Institution
AAA to AA- A+ to A- BBB+ to BBB-	A1+ A1 A2	50% 40% Nil

(b) Credit Ratings

If any of the funds/securities held are downgraded such that they no longer fall within Council's investment policy guidelines, they will be divested within 30 days or as soon as is practicable.

The short term rating order 0-365 days (as defined by S & P Australian Ratings) is:

A1+	Extremely strong degree of safety regarding timely payment
A1	A strong degree of safety for timely payment
A2	A satisfactory capacity for timely payment

City of Joondalup

Long term rating order is:

AAA to AAA-	An extremely strong capacity to repay
AA+ to AA-	A very strong capacity to repay
A+ to A-	A strong capacity to repay
BBB+ to BBB-	An adequate capacity to repay

8 **Financial Reporting**

Each month an investment report must be produced for Council.

The report is to summarise:

- Total funds invested by account type.
- Total funds invested by institution.
- Investment spread by institution.
- Institution exposure versus limits.
- Any breaches of authority.

(Each quarter the investment report must include returns versus benchmarks).

Amendments: CJ213-06/99, CJ121-06/02, CJ232-09/02, CJ213-09/03, CJ206-10/05, CJ207-10/07

Related Documentation: Local Government Act 1995 Delegated Authority Manual

Issued: October 2007

ATTACHMENT 2

INVESTMENT POLICY

LOCAL GOVERNMENT

OPERATIONAL GUIDELINE

NUMBER ***(* to be determined prior to final publishing)***

December 2007

DRAFT

Department of Local Government
and Regional Development
Government of Western Australia

STATUS OF THE GUIDELINE SERIES

This document and others in the series are intended as a guide to good practice and should not be taken as a compliance requirement. The content is based on Departmental officers' knowledge, understanding, observation of, and appropriate consultation on contemporary good practice in local government. Guidelines may also involve the Department's views on the intent and interpretation of relevant legislation.

All guidelines are subject to review, amendment and re-publishing as required. Therefore, comments on any aspect of the guideline are welcome. Advice of methods of improvement in the area of the guideline topic that can be reported to other local governments will be especially beneficial.

The Department would like to thank the Western Australian Treasury Corporation (WATC) for their assistance and contribution in the development of this guideline.

1 Executive Summary

This "Investment Policy Guideline" has been developed by the Department of Local Government and Regional Development in conjunction with the Western Australian Treasury Corporation.

This Guideline is intended as a "best practice guide" for local governments involved in investment activities. It examines the process of constructing a robust investment policy and identified the key issues that should be addressed by a local government when engaging in the investing of surplus funds, these consist of:

- the purposes or specific objective for investing surplus funds
- the duties and obligations of local council and officers
- requirement for internal control and procedures
- compliance with legislation including the Local Government Act, Regulations to the Act, the Trustees Act (Prudent Person Principal) and Accounting Standards
- recognising and being aware of maturity risk, liquidity risk, leverage risk, credit risk and political risk
- discussion about "deadweight costs" or a leakage of value every time a investment pass through the various financial intermediaries
- consideration of : risk and return objectives; defined investment parameters; established benchmarks; proper reporting and monitoring procedures
- Function of External Auditor, Audit Committee and Independent Review

This Guideline also included a Sample Investment Policy, Sample Monthly Investment Summary and an Investment Checklist to assist local governments in constructing their own reporting style.

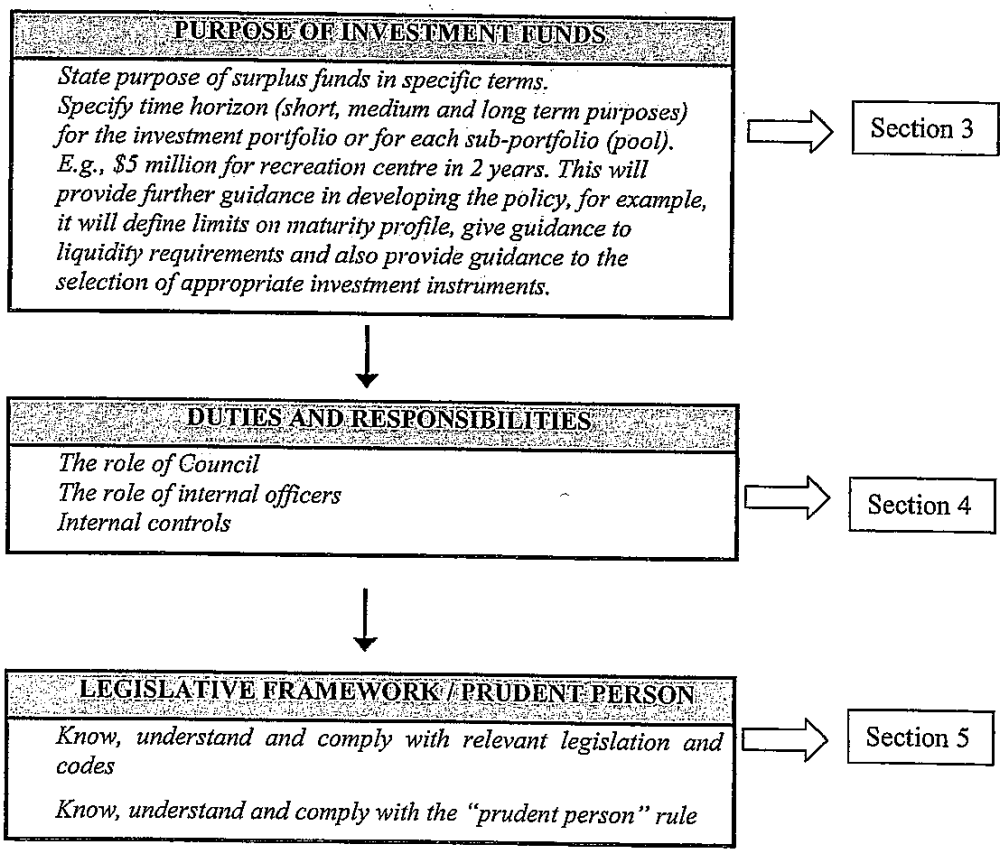
2 Introduction

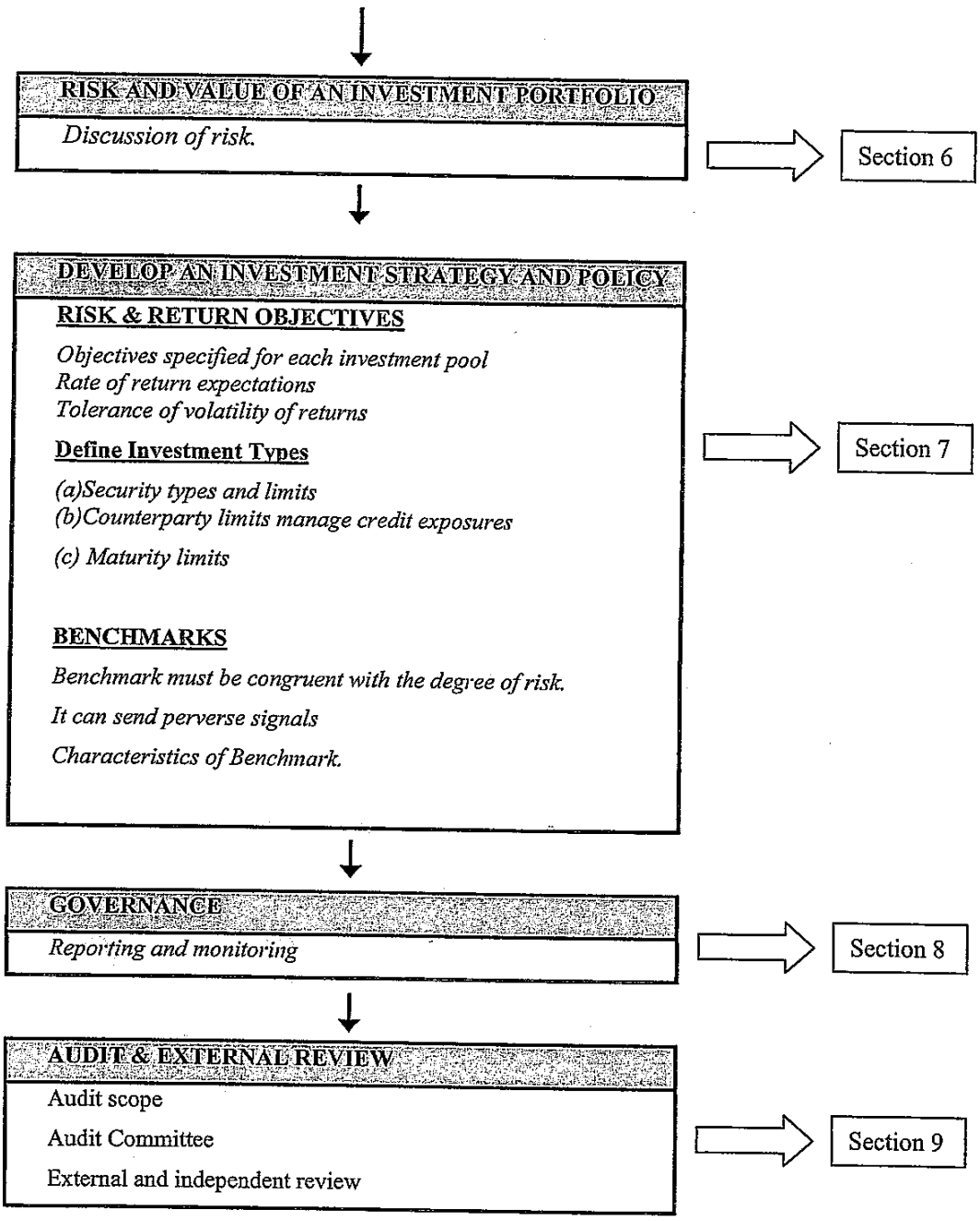
This guideline is designed to identify key issues in constructing an investment policy for local government. An investment policy provides guidance for those undertaking the investment process. Without an approved investment policy, the investment officers may make investment decisions that are not in accordance with the objectives, practices or acceptable risk intended by the local government.

An investment policy is a governing document that communicates an organisation's:

- investment philosophy and strategy;
- overall risk philosophy;
- investment objectives and expectations;
- identified roles for those involved in the investment process; and
- requirement for compliance with the policy's goals and procedures.

The investment policy is one component of the investment process outlined below. This process has been cross referenced to sections of the guideline.




RISK AND VALUE OF AN INVESTMENT PORTFOLIO
Discussion of risk.
Section 6
DEVELOP AN INVESTMENT STRATEGY AND POLICY
RISK & RETURN OBJECTIVES
Objectives specified for each investment pool
Rate of return expectations
Tolerance of volatility of returns
Define Investment Types
(a)Security types and limits
(b)Counterparty limits manage credit exposures
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BENCHMARKS
Benchmark must be congruent with the degree of risk.
It can send perverse signals
Characteristics of Benchmark.
Section 7
GOVERNANCE
Reporting and monitoring
Section 8
AUDIT & EXTERNAL REVIEW
Audit scope
Audit Committee
External and independent review
Section 9

3 Purpose of Investments

Prior to the development of an investment policy, local government should consider each of its purposes, or specific uses for investing surplus funds. For example, a pool of funds may be continually preserved to provide immediate liquidity for ongoing operational expenses, while other pools of funds are retained to carry out specific future infrastructure projects.

A clear and explicit statement of each investment purpose assists to identify the risk profile of the local government and align risk and return expectations with the specific purposes for the investment funds. It thus forms a framework for the development of the investment policy and guides the manner in which funds should be invested. The purposes for which the investments are held will define limits on the maturity profile[1], give guidance to the liquidity requirements and also provide direction to the selection of appropriate investment instruments for each investment pool.

A statement of investment purposes also provides accessible information to constituents about the nature and expectation of the investment portfolio and its components or sub-portfolios if these serve different purposes. It serves a useful function in assisting in the governance of the investment policy and helps to ensure that the audit and external review process form a judgement as to whether or not the policy is aligned with the overarching purposes for surplus funds.

4 Duties and Controls

4.1 Duties and Responsibilities of Local Government Officers

An investment policy will articulate the duties and obligations of responsible officers of local government. This is necessary to obligate officers, with respect to their investment duties, to do so with care, skill, prudence and diligence that a prudent person would exercise. The principle of acting prudently is referred to under section 4.3.1 of this guide.

The responsible officers should provide regular reports to Council on the performance and value of the investment portfolio supported by independent advice when required on new financial products and the valuation of the portfolio.

[1] For example, if funds are invested for the purpose of carrying out an infrastructure project and are required within the next twelve months this provides a limit to the term of the investment.

When selecting investments and weighing up relevant factors in relation to products, a council officer should consider the diversification, appropriateness, risk and anticipated return, and assess the performance of the financial product.

4.2 Duties and Responsibilities of Council

An investment policy sets out the objectives of Council for the allocation of the resources of a local government.

Responsibility for control and operation of local government's affairs, the allocation of resources and determination of policies rests with Council.

The role of Council is determined by legislation and includes:

- directing and controlling the local government's affairs;
- being responsible for the performance of the local government's functions;
- overseeing the allocation of the local government's finances and resources; and
- determining the local government's policies.

Council should be satisfied that responsible officers have complied with the investment policy and based its decisions on informed reports.

4.3 Internal Control

Internal control encompasses the policies, processes, tasks, behaviour and other aspects of a local government that taken together:

- facilitates the effective and efficient operation by enabling it to respond to significant operational, financial and other risks to achieve a local government's objectives. This includes the safeguard of assets, inappropriate use or loss of the asset;
- provides quality of internal and external reporting;
- ensures compliance with legislation and internal policies.

Under Regulation 19 of the Local Government (Financial Management) Regulation 1996, a local government is to establish and document internal control procedures to be followed by employees to ensure control over investments.

Separation of duties forms a critical component in the management and security of the investment portfolio. Well defined controls for the management of investments should include the separates of functions for approved authority, execution of transactions and reporting.

The purpose for the separation of duties is to reduce the risk of potential loss and misappropriation of an organisation's funds.

There should be proper procedures and controls in place for the placement and redemption of investments, the receipt of income and regular valuations of the investment portfolio.

5 Legislative Framework

The framework used for the establishment of an investment policy and the measurement and disclosure of investments is prescribed by legislation and includes the:

- Local Government Act 1995;
- Local Government (Financial Management) Regulations 1996;
- Trustees Act 1962; and
- Australian Accounting Standards.

An investment policy should be amended so as to remain current whenever relevant legislation is enacted.

5.1 Local Government Act 1995

Section 6.14 of the Local Government Act 1995 ("the Act") provides that "subject to regulations, money held in the municipal fund or the trust fund of a local government that is not, for the time being, required by a local government for any other purpose may be invested in accordance with *"Part III of the Trustees Act 1962"* (Trustees Act)".

5.2 Local Government (Financial Management) Regulation 1996

Regulation 19 of the Local Government (Financial Management) Regulation 1996 ("the Regulation") states a local government is to "establish and document internal control procedures to be followed by employees to ensure control over investments".

Regulation 28 and Regulation 49 prescribe the disclosure requirements for investment in Annual Budget and Annual Financial Report respectively. Additional disclosure requirements are provided under the Australian Accounting Standards.

As part of the reporting requirement under Regulation 34 *Financial Activity Statement Report*, each local government is to include in its monthly statement of financial activity: any supporting information considered relevant by the local government. This should

include a monthly investment summary[2] to ensure the performance of the investment portfolio is in accordance with anticipated returns and complies with the investment policy.

5.3 Trustees Act 1962

Section 17 of the Trustees Act states *"a trustee may, unless expressly prohibited by the instrument creating the trust –*
(a) invest trust funds in any form of investment; and
(b) at any time, vary an investment or realise an investment of trust funds and reinvest money resulting from the realisation in any form of investment ".

Section 18(b) of the Trustees Act includes a requirement to "exercise the care, diligence and skill that a prudent person would exercise in managing the affairs of another person".

Section 20 (1)(a) – (o) of the Trustees Act include a list of factors to be taken into account by the investor "so far as they are appropriate to the circumstances of the trust" including (i) the risk of capital or income loss (Trustees Act s20 (1)(e)); and (ii) the liquidity of the proposed investment during and on the determination of the term of the proposed investment (Trustees Act s20 (1)(j)).

5.3.1 Prudent Person Rule

The "Prudent Person Rule" is derived by legislation and under case law to obligate the trustee to exercise the care, diligence and skill that a prudent person would exercise in managing the affairs of other persons.

The concept of "prudent person" or "prudent investor" is similar in nature in tort law to a reasonable person by attempting to create an objective standard of behaviour.

A council officer must act with the care, prudence, skill and diligence that a prudent person acting in like capacity under similar circumstances would act.

Acting prudently applies to selecting investments, and requires an individual to consider diversification, appropriateness of the product, risk and anticipated return, liquidity, independent financial advice and to have a clear understanding of the product. The objective is to observe how a person of prudence, discretion and intelligence manage their own affairs, not in regard to speculation, but in regard to the permanent disposition of their funds.

The Trustees Act also allows a trustee to obtain "independent and impartial advice" if it is reasonable "reasonable required for the investment of ....the funds" (Trustees Act s 20(2)(a)). The cost of doing so may be recovered from the trust funds (Trustees Act s20

[2] See section 7.1 Reporting and also Appendix D – Sample Monthly Investment Summary

(2) (b)). The purpose is to allow a trustee to obtain appropriate 'expert' advice where required for the 'proper discharge of the Trustees Act Pt III obligations.

5.3.2 Investment by trustee, matters to be considered

Section 20 of the Trustees Act states "without limiting the matters that a trustee may take into account when exercising a power of investment, a trustee shall, so far as they are appropriate to the circumstances of the trust, have regard to:

(a) the purposes of the trust and the needs and circumstances of the beneficiaries;
(b) the desirability of diversifying trust investments;
(c) the nature of and risk associated with existing trust investments and other trust property;
(d) the need to maintain the real value of the capital or income of the trust;
(e) the risk of capital or income loss or depreciation;
(f) the potential for capital appreciation;
(g) the likely income return and the timing of income return;
(h) the length of the term of the proposed investment;
(i) the probable duration of the trust;
(j) the liquidity and marketability of the proposed investment during, and on the determination of, the term of the proposed investment;
(k) the aggregate value of the trust estate;
(l) the effect of the proposed investment in relation to the tax liability of the trust;
(m) the likelihood of inflation affecting the value of the proposed investment or other trust property;
(n) the costs (including commissions, fees, charges and duties payable) of making the proposed investment; and
(o) the results of a review of existing trust investments."

5.4 Australian Accounting Standards

AASB 132 – Financial Instruments: Disclosure and Presentation
Australian Accounting Standard AASB132 prescribes the financial reporting requirements for financial instruments and the requirements for disclosure in financial reports of information concerning financial instruments, however, certain sections of the Standard has been superseded by AASB 7.

AASB 7 - Financial Instruments: Disclosures *(supersede AASB 132 paragraph 51-95)*
This Standard has come into operation from 1 January 2007. It has replaced the disclosure requirements in AASB 132 paragraphs 51 – 95 (as at December 2007). AASB 7 has broadens the scope of financial instruments and requires more extensive balance sheet and income statement disclosures.

AASB 139 – Financial Instruments: Recognition and Measurement

AASB139 prescribes the recognition and measurement requirements for financial instruments in financial reports.

For current version of the above Standards, go to website http://www.aasb.com.au.

6 Risk and the Value of an Investment Portfolio

All investments entail some risk. Generally, the higher the expected rate of return of an investment, the higher the risk and the greater the variability of returns. It is important that a local government recognise all risks[3] in its investments and effectively communicate its understanding of, and tolerance to, its risk exposures in an investment policy. The following discussion provides a sound background to understanding the nature of the risk exposures that need to be recognised in the development of sound investment guidelines.

6.1 Risk Arises in Many and Diverse Ways

It is important to recognise that risk arises in many ways, not simply market risk, and to be cognizant with at least the following risks.[4]

- **Market Risk**

One of the most prominent exposures recognised by local governments is the exposure to market risk. More specifically, the exposure resulting from the changes in market prices, which includes changes in interest rates, currency and other prices (for example, commodity prices).

- **Maturity Risk**

Term to maturity impacts the investment's exposure in two ways: through maturity risk and liquidity risk.

Maturity risk identifies the impact of maturity on the valuation of the investment. The longer term to maturity the greater the length of exposure.

The other aspect of maturity risk is the impact of term to maturity on the valuation of an investment. That is, an increase in term to maturity leads to an increase in the impact of changes in market prices on the present value of the investment.

[3] While common risks are defined in Appendix B this list is not exhaustive.
[4] This section does not purport to be a fully comprehensive inventory of all risks, rather it is intended to convey that risk can arise in many guises and is not necessarily transparent.

Both of the above effects are important and both need to be considered when assessing the impact of the term to maturity on the risk exposure to of an investment.

- **Liquidity Risk**

Liquidity risk usually arises if there is a lack of market depth for the investment; for example, the investment has unique or structured elements, is traded in low-volume or non-standardised markets or is not regularly priced by independent market dealers[5]. Standardised instruments in well-traded markets will reduce the exposure to liquidity risk.

However, investing solely in liquid assets is not enough as liquidity risk may also be caused by a market disturbance that leads to a "flight for quality" - an environment where a rapid decline in demand for low credit quality instruments exists[6]. As a result an investor may be affected by **credit spread risk** where a decline in the perception of the credit worthiness of a particular sector or class of instruments leads to a fall in the value of the corresponding class of investments.

- **Leverage Risk**

Another exposure that is not often readily apparent but still needs consideration is the effect of leverage on an investment. Leverage increases the potential return of an investment, but also increases the potential loss as an increase in leverage has a multiplicative effect on the exposure. Leverage risk usually arises through investment in structured products or derivatives, which can potentially be used to create leveraged positions where the exposures obtained are greater than the value of assets required to support them.

6.2 Complex and Structured Instruments Increase Risk

Straightforward financial instruments are referred to as "vanilla instruments". These are the most basic or standard version of a financial instrument and can be contrasted with "exotic instruments", which alter the components of a traditional financial instrument, resulting in more complex securities.

There are significant benefits in transacting in vanilla instruments. As these instruments are more transparent, generally well-established, more readily understood and financially less complicated the risks are more easily assessed. Vanilla instruments are generally traded in liquid markets, with standardised contracts and conventions. Independent and

[5] This will be discussed further in section 6.6.
[6] Credit risk is discussed in section 6.3.2

fair market values are readily available and instruments are more readily traded in times of market stress[7].

Structured products combine elements of vanilla products. Bundling a number of characteristics into an investment product usually heightens risk and reduces transparency. This obscurity can mask elements of risk and make it difficult to assess the true risk in the product. It is also often difficult to ascertain independent and fair market values due to the uniqueness of products and thin market trading.

Consequently, it can be difficult to assess whether such investments meet risk and return objectives. If the risk and price of an asset cannot be reliably measured it should not be considered an acceptable security type for inclusion in an investment portfolio.

Some examples of structured products include investment products with embedded formulae[8], payoffs contingent on other underlying instruments or events, or exposure to multiple counterparties. Embedded formulae, contingent payoffs and multiple exposures will often act to leverage the exposure to risk. While these products can offer enhanced returns, local government should recognise that the risk may be leveraged and assess the potential downside against its risk tolerance.

Local governments should also consider option features that may be packaged within a complex product and the distinction between purchasing and selling an option[9]. The purchase of an option entails the payment of a premium to cover a specified exposure. Once the premium is paid there is no further obligation on behalf of the buyer. In contrast, the seller of an option receives a premium in return for covering a specified exposure. The potential obligation can be unlimited. Thus the sale of options does not have a place in an investment portfolio.

While a single risk measure is easier to understand than a multi-dimensional measure, the reality is that risk cannot be adequately captured in a single measure such as a credit rating. Ratings need to be supplemented by other risk measures that portray a true picture of the prospect of loss, in all its manifestations, including extreme or tail events.[10] In complex products the risk of tail events can be several times greater than for a similarly rated bond or loan.

Complex financial instruments do not fit within the context of risk aversion and therefore are not congruent with a conservative appetite for risk.

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[7] Liquid instruments will generally trade in markets having greater depth or "liquidity". The benefits of more observable prices and sufficient trading volume also translate into a lower buy/sell spread (the difference between buying and selling prices).

[8] While perhaps not readily apparent, embedded formulae will significantly alter the risk.

[9] These comments also apply generally to option products not only when they are packaged within another instrument. However, when packaged within other features of a product the option can be overlooked.

[10] Tail events are the low-probability or rare events that occur at the extremes of a distribution, that is, away from the mean or median events.

6.3 Deadweight Costs

The major consideration in the evaluation of any candidate security is that the return is a sufficient and commensurate with the risk of the security. Each time that fees are deducted as investment products pass through the various financial intermediaries there is a leakage of value or "deadweight costs". These deadweight costs subtract from the return you receive so that you may well end up not being adequately compensated for the level of risk that is being passed through to you.

Complex instruments and structured products can incur very large leakage in value because of issues such as:

- Products passing through a chain of intermediaries and several levels of structuring with fees being incurred at each step;
- The complexity involved and associated overheads such as the additional time and effort required to package and distribute the deal;
- These products are often traded as over the counter ("OTC") products with limited secondary markets;
- Non-standardised products that lack well-established market convention; and
- Large buy/sell spreads due to limited liquidity.

Significant leakage of value through fees may mean the final investor's return is not sufficient and commensurate with the risk of the security. It is essential to check the levels of fees that will be incurred on each investment.

6.4 Pricing Advantages

The fair price of a security can be considered to be the price that will earn just enough to cover the additional risk of the security[11]. If priced correctly the expected return of an investment will fully reflect the amount of risk in the investment. For standardised instruments trading in highly-liquid markets the fair price will be uncontentious and readily observable.

As the instruments become more complex and less liquid, determining the fair price becomes increasingly difficult. Furthermore, to the extent that uncertainty exists in determining this price it can be expected that the financial institution structuring the product will incorporate this uncertainty into the price.

Large financial institutions will also be better placed to assess the riskiness of complex financial instruments and thus have significant pricing advantages in these products.

[11] The additional earning as compared to investing in a "risk free" asset will fully compensate for the risk in the security.

Put simply, there is no basis for an assumption that the price paid for a product will more than compensate for the risk in the product. If anything, especially in regard to structured, opaque or complex instruments it is quite likely that the converse will be true.

6.5 Market Value

An essential requirement for establishing the validity and credibility of an asset in an investment portfolio is the ability to measure its value.

The Australian Accounting Standards prescribes the reporting and valuation requirement for financial instruments. The value of a financial instrument is initially recognised at its fair value plus any related transaction costs. Fair value can be established from quoted prices in an active market.

For standardised instruments trading in highly liquid markets there is usually little difficulty in determining a good indication of fair value. For these instruments the market price will be transparent and readily determinable. The costs involved in regular valuations will also be relatively small.

Caution must be exercised in valuing those instruments that are thinly traded, and where reliable market estimates are not readily available. The problem of obtaining good estimates of fair value becomes increasingly complicated for non-standardised instruments and particularly difficult (and costly) in the case of complex financial instruments. Similarly if the instruments are not traded in regular markets the illiquidity will make fair valuation difficult. For example, for instruments sold in Over the Counter Markets[12] ("OTC") the only price available may be from the counterparty that sold the instrument in the first place.

7 Components of an Investment Policy

7.1 Introduction

An investment policy is a document designed to provide guidance on various matters to be considered when investing surplus monies required for the future.

The decision to use a particular approach on how a local government structures its policy will depend on the particular circumstances of each local government. This includes an assessment of the scale of funds under management, safeguards in place to manage the

[12] Over the Counter Markets ("OTC") can generally be described as markets where financial instruments are exchanged directly between two parties rather than through the mechanism of an organised market or centralised exchange.

investment portfolio, the level of risk aversion[13], the capability of management, systems capacity, internal procedures and controls to protect the investment and operational risk.

At a minimum, local government investment policy should:

- include the investment objectives of the local government;
- define the risk aversion of the local government;
- preserve capital, provide liquidity and return the anticipated returns for the investment portfolio;
- comply with legislative requirements;
- prohibit the purchase of speculative financial instruments;
- prohibit the use of leveraging of an investment portfolio;
- prohibit the use of the investment portfolio for speculation;
- specify an acceptable instrument list (see below);
- require investments of local government to be regularly re-valued to reflect prevailing market prices;
- include independent financial assessments of the value of the investment portfolio for Council;
- require investments that are downgraded to below an acceptable rating benchmark to be liquidated;
- require the status and performance of a local government's investment portfolio to be reported monthly to Council;
- where applicable, document the process to choose an external investment manager.

7.2 Risk and Return Objectives

Starting with a clear concept as to the purpose for investing the funds and then formulating clear and explicit investment objectives will ensure consistency in the development of a policy. This will guide informed decisions in regard to setting return objectives within acceptable risk parameters.

7.2.1 Rate of Return Expectations

The investment policy will need to specify what the expectations are in regard to the return to be achieved by the investments. These expectations will need to be tempered by the amount of risk that the local government is willing to face.

A solid foundation for sound investment strategies is to *prima facie* disregard any perception that any financial instrument or asset class can provide an enhanced return without a substantive increase in risk. The adage that greater returns are only achievable at the cost of greater risk invariably applies in highly-traded and well-understood

[13] Risk aversion is the willingness to forgo possible higher returns in exchange for a lower risk.

financial markets. In the absence of market distortion, such as an incorrect price, it is not possible to earn a higher return without incurring a commensurately higher level of risk.

7.2.2 Tolerance to Volatility of Returns

The riskiness of an investment is often equated to the notion of how likely or probable there will be a loss of capital. It is incorrect to simply gauge the riskiness of an investment by the likelihood of capital loss as this ignores the contribution of earnings to the return of the investment portfolio. As the time period over which the investment is held grows the contribution of earnings becomes proportionately greater and can be of more significance than preservation of capital. It is the preservation and growth in value of the investment portfolio that matters.

The investment policy will need to be very clear in regard to both:

- The tolerance to capital loss; and
- The tolerance or degree to which a loss in the value[14] of the investment portfolio can be accepted.

This information will then guide decisions about which instruments and which counterparties can be included within the investment portfolio.

7.3 Defining Investment Types

Having specified the purpose, objectives and expectations in regard to investment returns and tolerance for risk, the local government is then in a good position to consider the range and allocation for the investment assets.

The range and allocation, or limits, of investments should also aim to produce a well diversified portfolio. Diversification is a risk management technique that involves spreading investments both between different asset classes and within an asset class. The risk of the resulting investment portfolio will be reduced without necessarily reducing return. Portfolio risk is smoothed as the strong performance of some investments offsets the poor performance of others.

7.3.1 Security Types and Limits

The types of asset in an investment portfolio can have very different risk characteristics that will need careful evaluation as to suitability. The investment policy should specify an acceptable range of instruments based on the risk appetite of the local government, the

[14] Refer to section 6.4 for a discussion on risk and volatility in value of a portfolio.

various different ways that risk can arise and recognition that the full risk implications inherent in some products are not always transparent.

The investment policy should also specify maximum and minimum investment limits for acceptable security types to ensure diversification between investment classes. The degree of diversification benefit between two investment classes is dependent on the strength and direction of the relationship between them, as measured by correlation.

While diversification between investment classes is important, it should be performed within the constraints of acceptable security types. That is, the risk of all assets included in the investment portfolio should be known, measurable and acceptable to the local government.

7.3.2 Counterparty Limits Manage Credit Exposures

The purpose of diversification of counterparties[15] is to ensure that no single counterparty would undermine the capital preservation objective of the portfolio. An investment policy should outline diversification requirements and avoid high concentrations to any one issue, issuer, industry or geographic area.

Grouping or categorizing counterparties based on broad external characteristics or credit ratings, ignoring risk, may result in the inappropriate allocation of limits. For example, despite being monitored by the Australian Prudential Regulatory Authority (APRA), Authorised Deposit Taking Institutions (ADIs[16]) are comprised of a large number of entities that may not all share the same credit risk.

Not only is there diversity in the credit quality of the institutions within this group there is also differences in the nature and characteristics of the instruments issued by the institutions. For example, the senior debt instrument of a major bank will be very different to a sub-ordinated debt instrument of a regional bank. Again ratings may help but will not give a full reflection of risk on their own[17]. It is necessary to examine all the risk characteristics of the instruments such as liquidity, maturity, the degree of options and other structuring embedded in the instrument and so on.

In order to set minimum standards for the credit quality of counterparties and ensure diversification of credit exposures, the investment policy should provide a list of acceptable counterparties and appropriate investment limits. Limits may be set for individual counterparties or counterparty categories.

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[15] Other parties in the agreement or contract.

[16] Authorised Deposit-Taking Institutions (ADI) – corporations that are authorised under the Banking Act of 1959 to take deposits from customers.

[17] As an example, care should be taken to look at the rating of the debt instrument not the issuer. While a particular entity may have a rating it can issue a debt instrument that is not rated.

Investment counterparties should be defined by prescribing the types of institutions acceptable to the local government and, for each, minimum credit rating requirements. Entities without a credit rating should not be considered an acceptable counterparty.

While explicit reliance will be placed on credit ratings, on their own they may not adequately describe credit risk for the purpose of setting limits. The local government should also consider:

- The type of institution within a credit rating band. For example, the four major Australian banks, ANZ Bank, Commonwealth Bank of Australia, National Australia Bank and Westpac Bank, may be allocated higher limits than similarly rated institutions because of the significant share they have of the Australian market and financial market activity;
- The types of credit rating applicable in the investment policy. That is, are rating types such as long-term senior unsecured debt ratings and structured issue ratings considered the same for the purpose of setting limits in the investment policy;
- Limits for related counterparties. Exposures for related counterparties (i.e., those with parent/subsidiary relationship, common parent or guarantee from the parent) should be aggregated for counterparty investment limits; and
- Capitalisation restrictions limiting investments to the lesser of an approved proportion of a counterparty's capital funds or the limit prescribed by the policy for its rating and type.

7.3.3 Maturity Limits

The investment policy should also specify maturity limits to ensure credit exposure and liquidity risk are maintained within the risk tolerance of the local government.

The risk of default of an investment increases with its term to maturity. Separate maturity limits may be required for different types of investment securities and different counterparty categories according to their inherent risk. For example, the investment policy may prescribe a maturity limit of ten years for Australian Commonwealth Government securities, while setting a maturity limit of three years for an A/A2 rated bank.

In setting maturity limits, the full exposure of the local government is the length of time until it is entitled to regain full control of the invested funds. If option features are included in the investment product, the counterparty may have the ability to lengthen the investment contract with the local government. The investment policy should be clearly worded so maturity limits are applied to the actual maturity of investment products and are not applied to option call or put dates or interest rate reset dates.

Liquidity requirements should also be reflected in the investment policy maturity limits. Sufficient funds should be invested in short-term investment securities to meet the cash flow requirements of the local government.

7.4 Benchmarks

An appropriate benchmark is the starting point for evaluating investment outcomes against investment objectives. The benchmark communicates important information on how well investments are matched to risk and return expectations of local government and helps to ensure that expectations are reasonable.

7.4.1 Benchmark Must be Congruent with the Degree of Risk

The benchmark must encompass both risk and return. A good benchmark does not consider performance in isolation but is concerned with maximising return for a level of risk acceptable to local government. The benchmark must therefore be constructed to reflect the "neutral" position of the local government, incorporating its risk tolerance and any critical requirements of the investment policy such as maturity structure, appropriate allocations to investment classes and liquidity requirements. In the absence of comparison to the neutral position, it will be impossible to assess how much extra return is earned for the level of risk undertaken.

7.4.2 Benchmarks Can Send Perverse Signals

Great care should be taken in setting benchmarks as arbitrary performance hurdle rates can have a perverse impact. Setting inappropriate benchmarks and performance hurdles will send incorrect signals about the types of investments that should be included in an investment portfolio and can encourage risk taking behaviour that is not in line with the investment objectives stipulated.

Setting benchmarks that do not reflect the risk in the class of instruments to be held within an investment portfolio can lead to potentially distorting behaviour. Take, for example, a performance target of 0.50% above a bank bill index. Now consider what is required to achieve this target. Quite clearly it will require the injection of quite a degree of risk into the portfolio. It is not possible to achieve the additional return with the instruments that form the benchmark and thus the benchmark will force investments in instruments that fall outside the benchmark. Setting performance hurdles above an accurate benchmark will force additional risk taking if the benchmark is to be met.
Training

7.4.3 Characteristics of a Benchmark

The characteristics of a good investment benchmark follow[18]:

- Representative of investment asset class or mandate;
- Investable;
- Constructed in an objective manner;
- Formulated from publicly available information;
- Acceptable to local government as the neutral position; and
- Consistent with underlying investor status (for example, time horizon).

The benchmark will generally be constructed from one, or a combination, of[19]:

- A well-recognised published index;
- A tailored composite of assets or indices; or
- A peer group ("universe") of similar funds or portfolios.

While published indices are preferred, the constructed benchmark must be consistent with the investment asset. For example, it is not adequate to benchmark investment returns against the returns on a short-term bank bill index when the risk characteristics of the investment portfolio differ dramatically. For investment assets with unique or structured elements, a widely recognised comparable index is unlikely to exist. It will be necessary to set the benchmark as a universe benchmark or a target return level relative to an index (or composite) with an acceptable level of variation around that target as a proxy risk measure. Difficulties arise as there is no established oversight process for determining whether the universe or variation measure accurately represents the risk of the investment asset.

Benchmarks can be misused. Poorly constructed benchmarks can undermine the effectiveness of investment objectives. If an appropriate benchmark cannot be constructed for a particular investment asset, it is unlikely to be suitable for local government investment objectives.

8 Governance

Corporate governance for the Council involves ensuring that the actions of the local government entity are directed at securing the best outcomes for its constituents. Good governance strengthens credibility and confidence. In order for a Council to fulfil its statutory duties[20] it needs to ensure there are proper policies and procedures in place to safeguard a local government's resources.

[18] AIMR Benchmark and Performance Attribution Subcommittee Report, 1998
[19] AIMR Benchmark and Performance Attribution Subcommittee Report, 1998
[20] See also Section 4 Duties and Controls.

A central tenant of good corporate governance is the role of the governing board in the protection of the interest of the shareholders (residents and ratepayers). It is essential that the governing board monitors the pursuit of self interest by corporate insiders and ensures that management and other corporate insiders do not pursue pet projects to the detriment of the organisation. This stewardship also encompasses guarding against the incentives of other "non-equity" shareholders such as banks, advisors and others.

Good governance is about ensuring that the appropriate checks and balances are in place. Councils must have in place robust and transparent financial governance policies and procedures directed to the oversight of the financial management responsibilities identified in the investment policy.

Paramount to good governance is the independence of the directors. The Council must remain vigilant to ensure that it does not become a "corporate insider".

8.1 Reporting

Council has a responsibility to measure the performance of its investments and to report its position to its constituents. All reporting must be transparent to both the Council and the constituents and must comply with the legislative requirements outlined[21].

Monthly reporting of investment activity should include, but not be limited to, the following:

- a list of securities by maturity date;
- percentage of the portfolio held by investment type and by counterparty;
- reporting of the value of investment portfolio;
- reporting on investment category and disclosure of market value, par value and maturity dates;
- where applicable, comparing performance against anticipated return and reference against benchmarks; and,
- a note on compliance with investment policy or explanation of breaches.

8.2 Monitoring

Constant review and monitoring of investment portfolios help to ensure the Council's intended outcome can be achieved. The following are the principal goals of monitoring an investment's performance and should extend to the content of the reporting.

[21] See Section 5 Legislative Framework

- assess the extent to which each individual or pooled investment objectives are being achieved;
- monitor exposures against acceptable benchmarks by investment type, counterparty, credit rating and by investment maturity;
- monitor the movements in market values for valuation purposes;
- certify that investments are in accordance with Council policy and legislative requirements;
- compare the performance of the appointed managers against the performance of other relevant professional managers and market related indices;
- continually assess the ability of each manager and their investment portfolio to successfully meet each investment objective.

Monitoring is not limited to the above and may extend to the undertaking of a review of its own performance in respect of its governance of its investment portfolio.

Council and/or responsible officers should review its investment strategy with an independent investment adviser at least once a year. An annual review allows Council to reassess its position and revise its strategy.

9 Audit and External Review

9.1.1 Audit Scope

The scope of the external audit is prescribed by legislation and is principally a review of the annual financial statements. It does not include reviews of accounting systems and procedures, internal control and Council policies.

Legislation requires the auditor to form an opinion on whether:

- The accounts are properly kept; and
- The annual financial report :

- is prepared in accordance with the financial records; and
- represents fairly the results of the operations of the local government and its financial position at 30 June, and
- compliance with the requirements of the Local Government Act 1995 (the Act), the Local Government (Financial Management) Regulations 1996; and applicable Australian Accounting Standards.

The auditor is to prepare a report on the audit and give an opinion on:

- the financial position of the local government; and

- the results of the operations of the local government.

Where it is considered appropriate to do so, the auditor is to prepare a management report to accompany the auditors report.

The minimum audit requirement prescribed by legislation may be extended to include other matters recommended by the audit committee and adopted by Council.

9.1.2 Audit Committee

Local governments are required by the Act to have an audit committee. The committee is a formally appointed committee of Council with the primary responsibility for reviewing the scope of the audit, undertaking the selection process of the external auditor and to liaise with the auditor on the performance and management of a local government's financial affairs.

The committee does not have any executive powers or authority to implement actions in areas over which the CEO has legislative authority and does not have any delegated financial responsibility. The committee does not have any management functions and cannot involve itself in management processes or procedures.

Reports from the audit committee are designed to assist Council in discharging its legislative responsibility for determining policy and overseeing the allocation of a local government's finances and resources.

The audit committee may review the scope of the audit and extend this scope to include, for example:

- a review of accounting procedures and controls;
- an assessment of risk;
- review of Council policies;
- an assessment of compliance with legislation and audit of the annual compliance return.

9.1.3 External Independent Review

A well constructed policy with clear objectives will facilitate an external review. The review should act as an intermediary to confirm that the investments explicitly align with the investment policy.

Council officers should ensure that before new investments are made they establish whether a product complies with the investment policy and where necessary obtain independent financial advice in writing on the nature and risk of the financial product.

New investments and regular valuations of the investment portfolio should be undertaken by independent financial experts that do not deal with or have a conflict of interest when they provide financial advice. This may be stipulated in the engagement letter appointing the financial advisor.

Regular reviews should be undertaken by an independent financial advisor on the performance and value of the investment portfolio and conformity with the investment policy. Reports should be prepared and sent to the audit committee and Council.

10 Appendix A – Ratings Agencies' Credit Ratings

The table below details three ratings agencies' credit rating for short and long term investments. It includes a grade explanation for each credit rating

Short Term Debt/Commercial Paper Ratings

Grade	*Moody's*	*S&P*	*Fitch*
Superior	P-1	A1+	F1+
		A1	F1
Strong	P-2	A2	F2
Acceptance	P-3	A3	F3

Long Term Debt and Individual Security Ratings

Grade	*Moody's*	*S&P*	*Fitch*
Highest Quality	Aaa	AAA	AAA
High Quality	Aa1	AA+	AA+
	Aa2	AA	AA
	Aa3	AA-	AA-
Above Average Quality	A1	A+	A+
	A2	A	A
	A3	A-	A-
Average Quality	Baa1	BBB+	BBB+
	Baa2	BBB	BBB
	Baa3	BBB-	BBB-
		Investment Grade	
Speculative	B1	BB+	BB+
	B2	BB	BB
	B3	BB-	BB-
Poor	Caa	CCC+	CCC
	Ca	CCC	
	C	CCC-	
		CC	CC
Default	-	D	DDD
			DD
			D

11 Appendix B – Definitions

ADI
Authorised Deposit-Taking Institutions (ADI) are corporations that are authorised under the Banking Act of 1959 to take deposits from customers.

Currency risk

Currency risk is the risk that the fair value or future cash flows of an investment will fluctuate because of changes in foreign exchange rates.

Credit Risk

Credit risk is the risk of loss to an investor due to a counterparty's failure to pay the interest and/or repay principal of an investment.

Counterparty
Counter party is both a legal and financial term that refers to the other individual or institution to an agreement or contract.

Financial Instrument

A financial instrument is any contract that gives rise to a financial asset of one entity, and a financial liability or equity instrument of another entity.

Interest Rate Risk

Interest rate risk is the risk that the fair value or future cash flows of an investment will fluctuate because of changes in market interest rates.

Investment Portfolio
A collection of investments

Liquidity Risk

Liquidity risk is the risk an investor is unable to close out its investments at a fair price within a timely period.

Leverage Risk

Leverage risk is the magnification of an investor's risk and return that occurs when the investor takes on financial leverage through an investment product.

Market Risk

Market risk is the risk that the fair value or future cash flows of an investment will fluctuate due to changes in market prices.

OTC – Over the Counter

Over the Counter Markets ("OTC") can generally be described as markets where financial instruments are exchanged directly between two parties rather than through the mechanism of an organised market or centralised exchange.

Par Value

The maturity value or face value of a security that an issuer agrees to pay on maturity.

Preservation of Capital

Preservation of capital refers to an investment strategy with the primary goal of preventing losses in an investment portfolio's total value.

Risk Aversion

Risk aversion is the reluctance of an individual to invest in product with a higher risk compare to a product with lower risk, but possibly lower returns.

Rating Agencies

Credit Rating Agencies such as Standard and Poor's (S&P), Moody's and Fitch are professional organisations that provide opinion on the general credit worthiness of an obligor with respect to particular debt security or other financial obligations. Credit ratings are based, in varying degrees, on the following considerations:

- Likelihood of payment
- Nature and provisions of the obligation
- Protection afforded by, and relative position of, the obligation in the event of bankruptcy, reorganisation or tother laws affecting creditor' rights.

Vanilla Instrument/Transaction

A vanilla instrument is a straightforward one. These are the most basic or standard version of a financial instrument and can be contrasted with its opposite, an exotic instrument, which alters the components of a traditional financial instrument, resulting in a more complex security. Structured products are therefore clearly not vanilla instruments. Vanilla instruments are generally also traded in more liquid markets according to more or less standardised contracts and market conventions.

Yield

The annual rate of return on an investment

12 Appendix C – Sample Investment Policy

Objectives

To invest Council's surplus funds, with consideration of risk and at the most favourable rate of interest available to it at the time, for that investment type, while ensuring that its liquidity requirement are being met.

While exercising the power to invest, consideration needs to be given in preservation of capital, liquidity, and the return of investment.

- Preservation of capital is the principal objective of the investment portfolio. Investments are to be performed in a manner that seeks to ensure security and safeguarding the investment portfolio. This includes managing credit and interest rate risk within identified threshold and parameters.

- The investment portfolio will ensure there is sufficient liquidity to meet all reasonably anticipated cash flow requirement, as and when they fall due, without incurring significant costs due to the unanticipated sale of an investment.

- The investment is expected to achieve a predetermined market average rate of return that takes into account the Council's risk tolerance. Any additional return target set by Council will also consider the risk limitation and prudent investment principles.

Legislative Requirements

All investments are to comply with the following:

- Local Government Act 1995 – Section 6.14;
- The Trustees Act 1962 – Part III Investments;
- Local Government (Financial Management) Regulation 1996 – Regulation 19, Regulation 28, and Regulation 49
- Australian Accounting Standards

Delegation of Authority to CEO

Authority for implementation of the Investment Policy is delegated by Council to the CEO in accordance with the Local Government Act 1995. The CEO may in turn delegate the day-to-day management of Council's Investment to senior staff or Chief Financial Officer subject to regular reviews.

Prudent Person Standard

Investment will be managed with the care, diligence and skill that a prudent person will exercise. Officers are to manage the investment portfolios to safeguard the portfolios in accordance with the spirit of this Investment Policy, and not for speculative purposes.

Ethics and Conflicts of Interest
Officers shall refrain from personal activities that would conflict with the proper execution and management of Council's investment portfolio. This policy requires officers to disclose to CEO any conflict of interest.

Approved Investments
Without approvals from Council, investments are limited to:

- State/Commonwealth Government Bonds;
- Interest bearing deposits;
- Bank accepted/endorsed bank bills;
- Commercial paper;
- Bank negotiable Certificate of Deposits; and
- Managed Funds with a minimum long term Standard & Poor (S&P) rating of "A" and short term rating of "A2".

Prohibited Investments
This investment policy prohibits any investment carried out for speculative purposes including:

- Derivative based instruments;
- Principal only investments or securities that provide potentially nil or negative cash flow; and
- Stand alone securities issued that have underlying futures, options, forwards contracts and swaps of any kind.

This policy also prohibits the use of leveraging (borrowing to invest) of an investment.

Risk Management Guidelines

Investments obtained are to comply with three key criteria relating to:

a) Portfolio Credit Framework: limit overall credit exposure of the portfolio
b) Counterparty Credit Framework: limit exposure to individual counterparties/institutions
c) Term to Maturity Framework: limits based upon maturity of securities.

a) **Overall Portfolio Limits**
To control the credit quality on the entire portfolio, the following credit framework limits the percentage of the portfolio exposed to any particular credit rating category.

S&P Long Term Rating	S&P Short Term Rating	Direct Investment Maximum %	Managed Funds Maximum%
AAA	A-1+	100%	100%
AA	A-1	100%	100%
A	A-2	60%	80%

b) Counterparty Credit Framework

Exposure to an individual counterparty/institution will be restricted by their credit rating so that single entity exposure is limited, as detailed in the table below:

S&P Long Term Rating	S&P Short Term Rating	Direct Investment Maximum %	Managed Funds Maximum%
AAA	A-1+	45%	50%
AA	A-1	35%	45%
A	A-2	20%	40%

If any of the Council's investments are downgraded such that they no longer fall within the investment policy, they will be divested as soon as practicable.

Investments fixed for greater than 12 months are to be approved by Council reviewed on a regular term and invested for no longer than 3 years.

c) Term to Maturity Framework

The investment portfolio is to be invested within the following maturity constraints:

Overall Portfolio Term to Maturity Limits	
Portfolio % <1 year	100 Max; 40% Min
Portfolio % >1 year	60%
Portfolio % > 3 year	35%
Portfolio % > 5 year	25%
Individual Investment Maturity Limits	
ADI	10 years
Non ADI	5 years

Investment Advisor

Council's investment advisor must be approved by Council and licensed by the Australian Securities and Investment Commission. The advisor must be an independent person who has no actual or potential conflict of interest in relation to investment products being recommended; and is free to choose the most appropriate product within the terms and conditions of the investment policy.

Measurement

The investment return for the portfolio is to be regularly reviewed by an independent financial advisor by assessing the market value of the portfolio. The market value is to be assessed at least monthly to coincide with monthly reporting.

Benchmarking

Investment	Performance Benchmark
Cash Cash Enhanced/Direct Investments Diversified Funds	Cash Rate UBSWA Bank Bill CPI + appropriate margin over rolling 3 year periods (depending upon composition of fund)

Reporting and Review

A monthly report will be provided to Council in support of the monthly statement of activity. The report will detail the investment portfolio in terms of performance, percentage exposure of total portfolio, maturity date and changes in market value.

An Investment Strategy will run in conjunction with the investment policy. The investment strategy will be reviewed with an independent investment adviser every six months with a more formal review once a year. The Strategy will outline:

- Council's cash flow expectations;
- Optimal target allocation of investment types, credit rating exposure, and term to maturity exposure and;
- Appropriateness of overall investment types for Council's portfolio.

This Investment Policy will be reviewed at least once a year or as required in the event of legislative changes.

Documentary evidence must be held for each investment and details thereof maintained in an investment Register.

Certificates must be obtained from the financial institutions confirming the amounts of investments held on the Council's behalf as at 30 June each year and reconciled to the Investment Register.

13 Appendix D -Sample Monthly Investment Summary

13.1Part (A)

Summary
Through the use of a variety of investment products, Council has been able to obtain investment returns comparable to the benchmark established by Council. This was achieved with a high quality, low risk investment portfolio.

Background
The investment policy requires Council to review the performance of its investment on a monthly basis. In accordance with the policy, a report of investments is presented to Council, which provides a summary of investments.

This report provides a summary of investment movement (See Report Part B) of the past month, to determine if the investment strategy met the objective of Council, in terms of maximising investment returns and maintaining an acceptable level of risk.

Report
During the year, Council funds were invested in six products, which have been rated by Standard and Poor's as follows.

Investments	
ADI issued	**S&P Ratings**
Security 1	AA-
Security 2	AAA+
Security 3	AA+
Security 4	AAA
Non – ADI Issued	
SecA	A
SecB	AAA

ADI* Authorised Deposit-Taking Institution

At all times during the year the designated investment exposure limits were adhered to.

Performance
Attached Summary of Portfolio Movement identifies Council's investment type, term to maturity, volume held, percentage to total portfolio, monthly price and monthly variation.

The portfolio comprised of four ADI issued interest bearing securities and two Non-ADI issued securities. The total portfolio returns in September were positive overall. There were 2,100,000 units held at a market value of $2,221,958. Total monthly gain was $35,479.5, representing a 1.6% increase in market value compare to the previous month. This is higher than the 0.53% UBSWA bank bill benchmark performance in September.

Detail investment performance summary for non ADI issued securities are provided with weekly valuations.

Monthly Economic Update
Australian and US government bond yields rose in September as investors viewed the Fed's bigger than expected 50 basis point cut to 4.75% as likely to prevent the US economy from sliding into recession. US economic reading during September were predominately soft, notably the August reading of housing starts, new home sales and existing home sales. August non-farm payrolls also surprised on the weak side of market expectations showing a small fall and calling into question whether consumption spending would hold up given weak housing activity and soft employment.

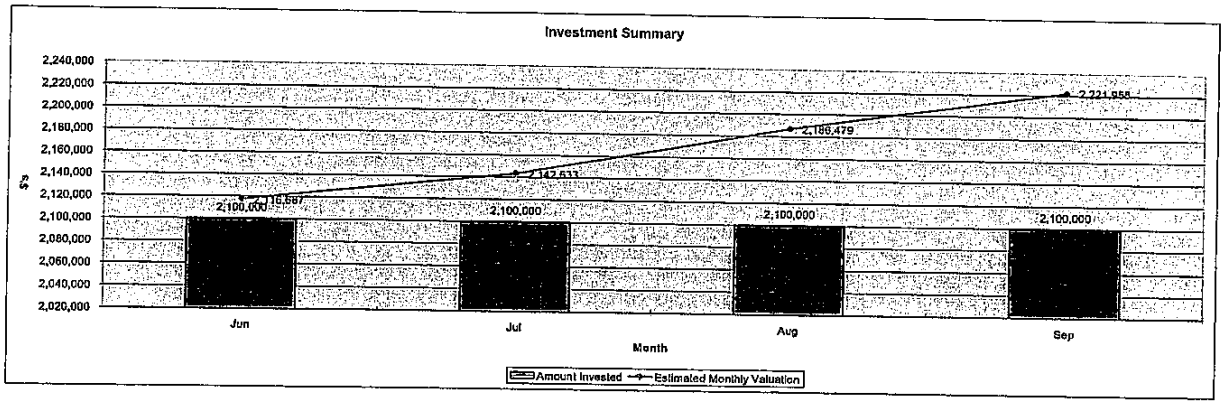
In contrast, Australian economic readings were predominantly strong through September with very strong August employment and July retail sales and international trade. The Reserve Bank held its cash rate at 6.5% but further liquidity hoarding saw the 90 day bank bill yield push up to 7.1% early in the month. While short-term money market rates came below 7.0% later in the month.

Recommendations
That the report be received.

LOCAL GOVERNMENT XYZ
Portfolio Valuation - Market Value
Summary of Portfolio Movement 30 June 20XX to 31 August 20XX

Security Description	Credit Rating S&P	Maturity / Conversion	Volume Held	% of total portfolio	Unit Price Jun	Unit Price Jul	Unit Price Aug	Unit Price Sep	Monthly Var'n	Market Value Jun	Market Value Jul	Market Value Aug	Market Value Sep	Monthly Var'n
ADI's Issued Interest Bearing Securities														
Security 1	AA-	20/10/20XX	50,000	2%	100.0%	101.2%	105.4%	104.3%	(1.1%)	$ 50,000	$ 50,617	$ 52,683	$ 52,128	-$ 555
Security 2	AAA+	2/04/20XX	750,000	36%	100.9%	101.4%	106.7%	109.3%	2.6%	$ 757,065	$ 760,613	$ 800,145	$ 819,750	$ 19,605
Security 3	AA+	17/07/20XX	250,000	12%	102.3%	100.6%	101.1%	103.3%	2.1%	$ 255,768	$ 251,473	$ 252,815	$ 258,140	$ 5,325
Security 4	AAA	27/06/20XX	500,000	24%	100.1%	103.4%	102.5%	104.0%	1.4%	$ 500,260	$ 516,770	$ 512,730	$ 519,940	$ 7,210
ADI's Issued Interest Bearing Securities Total			1,550,000	74%	100.8%	101.9%	104.4%	105.4%		$ 1,563,093	$ 1,579,472	$ 1,618,373	$ 1,649,958	$ 31,586
Non - ADI's Issued Interest Bearing Securities														
SecA	A	20/03/20XX	50,000	2%	100.2%	101.3%	103.2%	102.0%	-1.2%	$ 50,094	$ 50,661	$ 51,606	$ 51,000	-$ 606
SecB	AAA	27/02/20XX	500,000	24%	100.7%	102.5%	103.3%	104.2%	0.9%	$ 503,500	$ 512,500	$ 516,500	$ 521,000	$ 4,500
Non ADI's Issued Interest Bearing Securities Total			550,000	26%	100.7%	102.4%	103.3%	104.0%		$ 553,594	$ 563,161	$ 568,106	$ 572,000	$ 3,894
Total Securities Held			2,100,000	100%	2,100,000	2,100,000	2,100,000	2,100,000		2,116,687	2,142,633	2,186,479	2,221,958	121,958.00
Cash and Accruals														
Disposals										0.00	0.00	0.00	0.00	0.00
Income Receivable - cash amounts										9,291.10	0.00	0.00	0.00	9,292.38
Expenses Payable (Management Fees)										(500.00)	(500.00)	(500.00)	(500.00)	(500.00)
Expenses Payable										0.00	0.00	0.00	0.00	0.00
Cash and Accruals Total										8,791.10	(500.00)	(500.00)	8,792.38	8,792.38
Portfolio Total										2,125,477.60	2,142,132.50	2,185,978.50	2,230,750.38	44,771.88
										Withdrawals (Current Month)	0.00			0.00
													Monthly Movement Gain / (Loss)	44,771.88

NOTE: Market Value is a *mid* range estimate and might no represent actual value



14 Appendix E –Investment Policy Check List

This check list provides a series of questions to be considered by local government officer responsible for the investment activity of a Council. It is intended to provide a list of matters to be considered and is not an all-inclusive document.

This check list consists of three components for different financial products:

Part A - General Products

General questions to consider when investing in simply or 'vanilla' products that are straight forward such as bank deposit, commercial paper, bill of exchange, bond, promissory note etc.

Part B - Structured Products

Additional questions to consider when investing in pre-packaged products that bundle different investment instruments together. These products are more complex in nature compared to the 'vanilla' products. A structured product could contain credit derivatives, options, and swaps, together with more simply instruments.

Part C - Investment Policy

Include general items that should be incorporated into your councils' policy.

Part A - General Products

1) Have you established and documented how the funds will be invested, how it will generate returns and how these will be paid to the Council? (Could you describe to others how this product works)

Yes ☐ No ☐

Comments :

2) Are you clear on the conditions associated with this type of investment and their level of risk?

Yes ☐ No ☐

Comments :

3) Does the investment meet the council's financial objective and complies with its investment policy?

Yes ☐ No ☐

Comments :

4) Is your product issuer licensed by the Australian Security and Investment Commission?

Yes ☐ No ☐

Comments :

5) Could this investment be affected by a major shift in the economy and market sentiment?

Yes ☐ No ☐

Comments :

6) Could this product be liquidated in a timely manner without loss or penalty?
i.e. can council get their money back out of this product if it needs to? Are there any fees in getting out early?

Yes ☐ No ☐

Comments :

Part B - Structured Products

In addition to the general items, there are additional questions to be considered when dealing in structured

1) Do you thoroughly understand this product? Yes ☐ No ☐
Structured products may have embedded risks that are not readily evident. Does the product have any embedded derivates, options, formulas or other contingent payoffs?
Comments :

2) If you are exposed to derivatives, do you understand (can you explain) how derivatives are used? Yes ☐ No ☐
Comments :

3) For a product that contains more than one instrument, do you fully understand the nature of the risk in all the instruments? Yes ☐ No ☐
Comments :

4) Have you assessed and documented these risks? Yes ☐ No ☐
In addition to market risk (the potential movement in price), there are many other risks that are often not readily apparent including pricing risk, liquidity risk, credit risk and maturity risk.
Comments :

5) Do you understand the degree of leverage in the product and the impact of this on your risk exposure? Yes ☐ No ☐
Many derivatives and structured products have significant leverage to risk. You should know your tolerance and your exposure before engaged in any structured products.
Comments :

6) Have you assessed and documented the pricing of the investment product? Yes ☐ No ☐
Do you understand how products are priced? Can you get a similar price from a number of different sources? Can you obtain a firm price at which you can actually transact? How often can you get a firm or live price?
Comments :

7) Have you assessed and documented the liquidity of the product? Yes ☐ No ☐
How quickly can you sell the product at a market price? Is there a ready market to sell this product to another party?
Comments :

8) Have you attended and documented independent advice? Yes ☐ No ☐
Ensure you seek independent advice. Advice from the bank or firm that sells you a product is not independent.
Get as much advice as necessary until you are satisfied that you fully understand the risks.
Be wary of any equivocal advice and evaluate on the basis of what an advisor is prepared to commit to in writing.
Comments :

9) Have you assessed and documented ratings from rating agencies? Yes ☐ No ☐
Ratings are not a sufficient guide for a full and thorough risk assessment. Ratings issued by rating agencies for different types of assets have different meanings. They do not tell you anything about the possibility and impact of a change in rating.
Comments :

Part C - Investment Policy

Have you included the following as part of your investment policy?

1) Clearly stipulated the investment objective.	Yes	☐	No	☐
2) Defined the risk aversion of the council	Yes	☐	No	☐
3) Prohibit the i) purchase of speculative financial instruments & ii) use of leveraging of an investment porfolio.	Yes	☐	No	☐
4) Comply with legislative requirements	Yes	☐	No	☐
5) Investment to be independently valued to reflect the currenet market prices	Yes	☐	No	☐
6) Require investments that are downgraded to below an acceptable rating benchmark to be liquidated	Yes	☐	No	☐
7) Require the status and performance of a council's investment portfolio to be reported monthly.	Yes	☐	No	☐
8) Include independent financail assessments of the value of the investment porfolio for council.	Yes	☐	No	☐

City of Joondalup

POLICY 8-9 - INVESTMENT

STATUS: **City Policy** - *A policy that is developed for administrative and operational imperatives and has an internal focus.*

Developed by the Policy Committee and/or the administration and adopted by Council.

RESPONSIBLE DIRECTORATE: Corporate Services

OBJECTIVE: To invest the City's surplus funds, with consideration of risk and at the most favourable rate of interest available to it at the time, for that investment type, while ensuring that its liquidity requirements are met.

STATEMENT:

1 Objectives

While exercising the power to invest, consideration needs to be given to preservation of capital, liquidity, and the return of investment.

(a) Preservation of capital is the principal objective of the investment portfolio. Investments are to be performed in a manner that seeks to ensure security and safeguarding the investment portfolio. This includes managing credit and interest rate risk within identified threshold and parameters.

(b) The investment portfolio will ensure there is sufficient liquidity to meet all reasonably anticipated cash flow requirements, as and when they fall due, without incurring significant costs due to the unanticipated sale of an investment.

(c) The investment is expected to achieve a predetermined market average rate of return that takes into account the Council's risk tolerance. Any additional return target set by Council will also consider the risk limitation and prudent investment principles.

2 Legislative Requirements

All investments are to comply with the following:

- Local Government Act 1995 – Section 6.14;
- The Trustees Act 1962 – Part III Investments;
- Local Government (Financial Management) Regulation 1996 – Regulation 19, Regulation 28, and Regulation 49
- Australian Accounting Standards

3 Delegation of Authority to Invest

City of Joondalup

The authority is to be delegated to the Chief Executive Officer to make investment decisions and sign investment lodgements and withdrawals. Pursuant to the provisions of Section 5.45 of the Local Government Act 1995. The CEO may in turn delegate the day-to-day management of the City's investments.

4 Prudent Person Standard

Investment will be managed with the care, diligence and skill that a prudent person will exercise. Officers are to manage the investment portfolios to safeguard the portfolios in accordance with the spirit of this Investment Policy, and not for speculative purposes.

5 Approved Investments

Without approvals from Council, investments are limited to:

- State/Commonwealth Government Bonds;
- Interest bearing deposits;
- Bank accepted/endorsed commercial bills;
- Commercial paper;
- Bank negotiable Certificate of Deposits; and
- Managed Funds with a minimum long term Standard & Poor (S&P) rating of "A" and short term rating of "A2"; and
- City of Joondalup major land transactions.

6 Prohibited Investments

This investment policy prohibits any investment carried out for speculative purposes including:

- Derivative based instruments;
- Principal only investments or securities that provide potentially nil or negative cash flow; and
- Stand alone securities issued that have underlying futures, options, forwards contracts and swaps of any kind.

This policy also prohibits the use of leveraging (borrowing to invest) of an investment.

7 Risk Management Guidelines

Investments obtained are to comply with three key criteria relating to:

(a) Portfolio Credit Framework: limit overall credit exposure of the portfolio
(b) Counterparty Credit Framework: limit exposure to individual counterparties/institutions
(c) Term to Maturity Framework: limits based upon maturity of securities.

(a) Overall Portfolio Limits

To control the credit quality on the entire portfolio, the following credit framework limits the percentage of the portfolio exposed to any particular credit rating category.

City of Joondalup

S&P Long Term Rating	S&P Short Term Rating	Direct Investment Maximum %	Managed Funds Maximum%
AAA	A-1+	100%	100%
AA	A-1	60%	80%
A	A-2	40%	80%

(b) Counterparty Credit Framework

Exposure to an individual counterparty/institution will be restricted by their credit rating so that single entity exposure is limited, as detailed in the table below:

S&P Long Term Rating	S&P Short Term Rating	Direct Investment Maximum %	Managed Funds Maximum%
AAA	A-1+	20%	25%
AA	A-1	15%	20%
A	A-2	10%	20%

If any of the Council's investments are downgraded such that they no longer fall within the investment policy, they will be divested as soon as practicable.

Investments fixed for greater than 12 months are to be approved by Council reviewed on a regular term and invested for no longer than 3 years.

(c) Term to Maturity Framework

The investment portfolio is to be invested within the following maturity constraints:

Overall Portfolio Return to Maturity	Minimum	Maximum
Up to 12 months	60%	100%
13 to 24 months	0%	40%
25 to 36 months	0%	20%
Over 36 months	0%	10%

8 Investment Advisor

The City's investment advisor must be licensed by the Australian Securities and Investment Commission. The advisor must be an independent person who has no actual or potential conflict of interest in relation to investment products being recommended and is free to recommend the most appropriate product within the terms and conditions of the investment policy.

The investment return for the portfolio is to be regularly reviewed by the investment advisor by assessing the market value of the portfolio. The market value is to be assessed at least monthly to coincide with monthly reporting.

The investment advisor should meet with the responsible staff and review the City's investment portfolio no less than every six months.

9 Benchmarking

City of Joondalup

The performance of the investment portfolio shall be measured against the UBS Warburg Bank Bill Index and also against the average Reserve Bank Cash Rate for the current financial year

10 Reporting and Review

A monthly report will be provided to Council in support of the monthly statement of activity. The report will detail the investment portfolio in terms of performance, percentage exposure of total portfolio, maturity date and changes in market value.

This Investment Policy will be reviewed at least once a year or as required in the event of legislative changes.

Documentary evidence must be held for each investment and details thereof maintained in an investment Register.

Certificates must be obtained from the financial institutions confirming the amounts of investments held on the Council's behalf as at 30 June each year and reconciled to the Investment Register.

Amendments:	CJ213-06/99, CJ121-06/02, CJ232-09/02, CJ213-09/03, CJ206-10/05, CJ207-10/07
Related Documentation:	Local Government Act 1995 Delegated Authority Manual
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