



2012  
Final Report 1 of 5  
**OVERVIEW &  
FINDINGS**

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# OVERVIEW & FINDINGS

Crime Risk Assessment, CPTED-Lighting Audit &  
CCTV Feasibility Study



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## Crime Risk Assessment, CPTED-Lighting Audit & CCTV Feasibility Study

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***REFER TO RELATED***

***CRIME RISK ASSESSMENT, CPTED-LIGHTING AUDIT & CCTV POTENTIAL CAMERA LOCATIONS***

**PART 2 OF 5 BYFORD**

**PART 3 OF 5 MUNDIJONG**

**PART 4 OF 5 JARRAHDAL**

**PART 5 OF 5 SERPENTINE**

## 1. Executive Summary

---

Amlec House Pty. Ltd. is pleased to submit our final report following a Crime Risk Assessment, Crime Prevention Through Environmental Design (CPTED) - Lighting Audit and CCTV Feasibility Study on behalf of the Shire of Serpentine Jarrahdale.

The Shire of Serpentine Jarrahdale is constituted as a district under the *Local Government Act 1995*. The general function of a local government is to provide for the good government of people living and working within its district and includes legislative and executive powers and responsibilities.

The objective of the Audit process was to identify those areas where inadequate or inoperable lighting and poorly designed physical features restrict illumination, as well as natural access control and passive surveillance of the public space. Improved lighting and carefully implemented environmental design concepts in public areas can significantly enhance community safety, perception of safety and reduce the incidence of crime or antisocial behaviour in those areas. This benchmarking study, inclusive of a Crime Risk Assessment, can be used for comparative analysis for the Shire of Serpentine Jarrahdale for future public space planning, lighting design and consideration to the implementation of public closed circuit television (CCTV) surveillance systems.

Amlec House has outlined key findings and made 135 recommendations, presented in Annexure 1, to guide the Shire of Serpentine Jarrahdale in improving area lighting, Crime Prevention Through Environmental Design (CPTED) strategies and determining the feasibility of implementing a public CCTV system to facilitate community safety and crime prevention.

### 1.1. Key Findings

#### 1.1.1. Crime Risk Assessment

Mundijong Police have identified Byford as their major concern within the Shire of Serpentine Jarrahdale. Burglary and nuisance crimes, such as damage, vandalism and theft, were identified as prominent issues within the Shire and require constant police attention. Local police believe offences are generally conducted by bored youths who are willing to spend time circumventing security measures and show little concern to being caught. An increase in police numbers in April/May 2010 provided an increase in police presence and subsequently an increase in the number of offenders apprehended and processed through the justice system.

A program is required targeting local youths to identify youths at risk of offending and provide support to re-direct behaviour and opportunity. Hot spot areas, identified through the crime risk assessment, are generally located at poorly illuminated 'dead zones' with limited activity, reduced natural surveillance and poor reflection of community pride and ownership.

There has been a large increase in the number of clandestine illicit drug laboratories located by WA police over the previous year within the Shire of Serpentine Jarrahdale. Police believe that due to the semi-rural area, a large number of laboratories are located in residences and in bushland areas throughout the Shire. Drug related crime has remained a constant issue for local police.

Mundijong Police encourage community assistance in crime prevention and post crime intelligence throughout the Shire by promoting crime prevention and awareness via community newsletters, Neighbourhood Watch and E-watch programs. Community information has assisted police during investigations and contributed to the arrests of a number of offenders.

Evaluation of Crime Risk Assessments for each of the four (4) town centres, indicate the primary offences experienced in the Shire of Serpentine Jarrahdale are Burglary and Theft. Statistics show spiked activity, specifically during the summer months, which may be attributed to school holidays, an influx of offenders to the area or caused by select individuals. In our experience, the identification and arrest of local offenders is a primary contributor to broad reductions in local area crime.

### 1.1.2. Lighting Audit

Main street lighting throughout the Shire of Serpentine Jarrahdale appears broadly compliant with minimum Australia Standards Category P lighting; however is not sufficiently supported by secondary street illumination. Existing street lighting systems generate isolated dark areas and do not support the implementation of a CCTV strategy. Inconsistent area illumination, observed throughout the Shire, will impede image quality of CCTV installations. We refer to current Western Power practice of phasing out 80 Watt Mercury Vapour (MV) lamps and replacing them with 42 Watt Compact Fluorescent Luminaires. Western Power will exchange existing 80 Watt Mercury Vapour lamps that are found to have failed and cannot be repaired. Alternatively, the Shire of Serpentine Jarrahdale can invest and pay for a works program to upgrade existing street lights to 42 Watt Compact Fluorescent Luminaires.

An overall lighting strategy must be considered when implementing a CCTV strategy as image quality increases when white light is located adjacent or at the rear of the camera. Image quality decreases with yellow light (Sodium), poor area illumination and lighting directed towards the camera. In addition, enhanced area illumination has a strong crime prevention role to further support the surveillance strategy.

In our view, a lighting upgrade to use Compact Fluorescent or MH lamps with Town Centres, designed to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions.

### 1.1.3. CPTED Audit

The Shire of Serpentine Jarrahdale has developed a Local Planning Policy, Number 24, for Designing Out Crime. The Policy requires all major developments to consider CPTED principles facilitated by the completion of a Designing Out Crime toolbox. The 'toolbox' is conducted in the form of completing a checklist which is to be signed off by a "suitably qualified professional" on behalf of the developer. The definition of a 'qualified professional' is not adequately provided and in our view should include a professionally qualified, licensed, experienced and independent security and CPTED consultant engaged by the developer. Views were received from the Shire indicating new and proposed developments are not being adequately scrutinised from a CPTED perspective and the Shire may consider ensuring the Designing Out Crime checklists are being appropriately signed off.

CPTED principles and initiatives are outlined in Town planning documents developed by the Shire of Serpentine Jarrahdale; however initial designs for the Byford Town Centre do not holistically or adequately implement these strategies. Greater consideration should be given to CPTED principles throughout the planning stages and plans should be consistently reviewed during this process. The proposed Byford Town Centre development, as discussed in Part 1.1, Report 2, provides limited pedestrian flows from car parks through the Town Centre and contains small laneways facilitating numerous blind corners reducing natural surveillance and community safety perceptions. Revised development plans should design out these CPTED related issues and ensure CPTED strategies are given adequate priority in concept plans.

General maintenance of roads, pathways, car parks and other publicly accessible areas is required to significantly enhance town centre aesthetics and remove or reduce the opportunity for vandalism and other illegitimate activity, often facilitated by loose debris (brick paving, litter), natural ladders and poorly illuminated 'dead zones' containing limited natural surveillance. The Shire should consider maintenance schedules of street foliage and vegetation, specifically adjacent facility entrances, street corners and pedestrian pathways to increase natural surveillance (decreasing blind corners or improving lines of sight), community safety and perceptions of safety. Tree canopy heights should be raised to a minimum height of 3.0 meters and ground vegetation kept to a maximum of 0.5 metres in pedestrian areas to maintain clear sight lines throughout the Shire.

The Shire of Serpentine Jarrahdale promotes activity generators to enhance natural surveillance and community safety perceptions. The implementation of alfresco dining areas, café seating areas, transparent shop fronts and well maintained and well located public parks and facilities

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will encourage community activity in town centres. Consideration should be given to pedestrian pathways and pedestrian flows to enhance connection of adjacent areas and increase clear sight lines throughout the town centres to assist with police and ranger patrols and improve perceptions of safety.

#### 1.1.4. CCTV Feasibility Study

Key considerations for the Shire of Serpentine Jarrahdale include the purpose and likelihood of success versus the cost of a public CCTV system, including the operational functions, camera and recording equipment locations, information sharing with police and Town management roles and responsibilities. Key findings include:

1. The Shire of Serpentine Jarrahdale does not currently have sufficient technical infrastructure or adequate space in the communications room for the location of head-end equipment for a centrally controlled and monitored public CCTV system.
2. The Shire of Serpentine Jarrahdale and Mundijong Police do not currently have adequate resources for live monitoring of a CCTV system. Future Shire planning should consider the cost and benefits of employing dedicated monitoring staff and/or utilising council Rangers to monitor the system during periods of high activity, such as Friday and Saturday nights.
3. The Feasibility Study supports the implementation of a public CCTV system within the Byford and Mundijong Town Centres; however the effectiveness of the CCTV system will be reliant on first addressing deficient area illumination and improving CPTED strategies in order to provide sufficient crime prevention and enhanced perceptions of community safety.
4. The Feasibility Study concluded that there is insufficient technical infrastructure, primarily data towers or fibre optic communications to link Serpentine and Jarrahdale town centres to the Shire's Administration Building in Mundijong. Consideration may be given to mobile CCTV trailer units, standalone systems or alternatively portable cameras situated at the Byford BMX Track, Mundijong Pavilion, Jarrahdale Tavern and Serpentine Town Centre to assist with known 'hotspot' locations. Portable units will also assist with special events and spiked activity in each of these areas. The Shire should first consider improving area illumination and natural surveillance around camera locations and the likelihood cameras will be actively targeted for theft or damage.
5. CCTV system design should be integrated as part of future town centre redevelopments, with appropriate conduit paths laid in road construction works for future use of fibre optic cable. Specific camera locations, outlined in Part 5 of each respective Town Centre Report, numbered 2 - 5, should consider area entrance/egress junctions and high pedestrian/vehicular traffic points.
6. An integrated private and public system remains a viable option, pending stakeholder involvement and appropriate long term commitment. The Shire has expressed a desire to encourage appropriate security CCTV requirements for new business premises/ventures in addition to their registration with the Blue Iris program. Greater promotion of the Blue Iris program is required to assist police identify and utilise existing CCTV surveillance systems.

The Shire of Serpentine Jarrahdale has the following options in terms of CCTV System network configuration:

1. Install each Town Centre System independently and in isolation of each other, with local recording and storage;
2. Install each Town Centre System as part of an integrated, connected system with local recording and storage and live feeds, via wireless transmission back to Shire of Serpentine Jarrahdale Administration, Mundijong and Mundijong Police Station;
3. Install each Town Centre System as part of an integrated, connected system with local recording and storage and live feeds, via wireless transmission back to Shire of



Serpentine Jarrahdale Administration, Mundijong for recording and storage and live feeds to Mundijong Police Station;

4. Install selected Town Centre Systems for integration and connection with both local recording and storage and live feeds, via wireless transmission back to Shire of Serpentine Jarrahdale Administration, Mundijong and Mundijong Police Station and remaining Town Centre Systems to be isolated and recording and storing locally.

Each network configuration option has considerable and related cost implications and system expansion considerations.

In addition, for the Mundijong and Byford Town Centres, a fibre optic network of cameras, is recommended for the longer term. Cameras may be connected to head end and data storage equipment situated in the Shire of Serpentine Jarrahdale Administration Building, Mundijong with monitors and controls situated in the Community Services Office and monitors only, mounted in the Mundijong Police Station Radio Operators Room or other preferred location.

The use of CCTV must be considered in conjunction with broader Shire initiatives including, CPTED and lighting improvements, support of seniors, youth engagement programs and education of parents, businesses and the community about crime, drug and alcohol related issues.

The effectiveness of a public CCTV system should be measured against clear and concise Key Performance Indicators (KPI's) for CCTV Operation to allow effective reporting and monitoring of system efficacy and quickly highlight trends concerning the fundamental operation which may require early intervention or closer monitoring by Shire management.

We recommend a Crime Prevention Awareness plan be integrated into the Community Safety and Crime Prevention Plan, in particular in support of any introduction of public CCTV operations and to maintain a high degree of awareness of CCTV operations amongst the Shire of Serpentine Jarrahdale community.

Table 1: CCTV System Overview

Area	No. of Cameras	Camera Type	Mounting & Height	Head End Equipment Location/Options	Backbone Link Distance	Issues	Budget
Byford Existing Commercial Development (BECD)	16	PTZ/ Fixed	Poles 5 - 8m	Byford Hall	Local/8.9km	Refer BECD CPTED Recommendations 4, 10 & 14 Refer BECD Recommendations Lighting issues Cameras may be actively targeted for damage and theft	~\$240,000
Byford BMX Track	4	Portable/ PTZ/ Fixed	Existing Infrastructure/ Building 5 - 8m	Recreation Centre/Byford Hall	500m	Refer BMX Track Recommendations Lighting issues Cameras may be actively targeted for damage and theft Line of sight issues	~\$20,000
Mundijong Town Centre (MTC)	10	PTZ/ Fixed	Poles 5 - 8m	SoS-J Administration	N/A	Refer MTC CPTED Recommendations 11, 12 & 14 Refer MTC Recommendations Lighting issues Cameras may be actively targeted for damage and theft	~\$150,000
Mundijong Pavilion (MP)	4	Portable/ PTZ/ Fixed	Existing Infrastructure/ Building 5 - 8m	SoS-J Administration	500m	Refer MP CPTED Recommendations 2, 4 & 6 Refer MP Recommendations Lighting issues Cameras may be actively targeted for damage and theft Line of sight issues	~\$20,000
Jarrahdale Tavern (JT)	4	Portable/ Fixed	Poles 8m	Jarrahdale Tavern	8.2km	Refer JT Recommendations and Lighting issues Cameras may be actively targeted for damage and theft Line of sight issues	~\$20,000
Serpentine Town Centre	3	Portable/ PTZ/ Fixed	Poles/ Existing Infrastructure/ Building 6 - 8m	Clem Kentish Recreation Centre	Local/7.28km	Refer Serpentine Recommendations Lighting issues x 2 Line of sight issues	~\$15,000
<b>Total</b>	<b>41</b>						<b>~\$465,000</b>

\*Budget estimates not inclusive of head end equipment. Estimated figures based on \$15,000 per permanent camera and \$5,000 per portable camera.

Table 2: CCTV Project Costs Breakdown

Associated Costs Breakdown	Estimated Cost \$	Comments
Dedicated Fibre Infrastructure	\$150,000	Per Km
Wireless link equipment	\$150,000 – \$200,000 \$2,000 – \$15,000	Based on 41 local links from cameras and 4 backbone links to Council building Mundijong with additional link to Mundijong Police Station Per link pending distance and lines of sight
Back end servers and equipment	\$10,000 – \$40,000	Figures will differ during system expansion to multiple sites
Storage	\$8,000 – \$20,000	
UPS systems for control equipment	\$4,000 – \$15,000	
Licensing Fee for Microwave Link	\$4,000	Per annum
Rental Cost for Microwave Repeater	\$4,000	Per annum
Staff training	N/A	Should be included during commissioning
Local Control Room Infrastructure	\$20,000	
Local 24 hour monitoring Dayshift Component Nightshift Component	\$350,000 – \$400,000 \$3,000 – \$3,500 p/w \$3,500 – \$4,000 p/w	Per annum. Control Room trained employee should be paid at Level 3 security rates.
Outsourced 24 hour monitoring	\$350,000 – \$450,000	Per annum
<i>Local Thursday, Friday and Saturday night Monitoring</i> Employee Costs Activity Based Costing's including: <ul style="list-style-type: none"> <li>• Human Resources ad Payroll Service Fee</li> <li>• Information System Support</li> <li>• Building Rental</li> </ul>	\$50,000 - \$65,000 \$20,000 \$3,000 \$9,000 \$5,000	Per annum
Maintenance	Variable	3% of project cost per annum
Insurance	Variable	Subject to Broker Negotiation and Shire Profile
Contingency	Variable	10% of budget

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Table 3: Summary of Initial and Ongoing Costs for Shire of Serpentine Jarrahdale CCTV Project

<b>Cost Summary</b>	<b>Cost</b>	<b>Comment</b>
Camera Equipment	\$465,000	Based on \$15,000 per permanent camera and pole, and \$5,000 per portable camera
CCTV Infrastructure and Head-End Equipment	\$263,000	Using wireless technology linking all cameras
Monitoring	\$105,000	Local monitoring on Thurs, Fri and Saturday nights
Contingency (Estimated)	\$70,000	Does not include monitoring
<b>Total initial Cost</b>	<b>\$894,000</b>	
<b>Ongoing Costs including 3 day monitoring</b>	<b>\$106,400</b>	<b>Per annum</b>

\*Costs developed using maximum values to allow for fluctuations in pricing

\*All costs are indicative and broadly estimated from previous projects only

## 2. Scope Of Work

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### 2.1. Scope of Works

Amlec House has developed a Community Safety and CCTV Design Master Plan for the Shire of Serpentine Jarrahdale. The project was conducted in accordance with Australian Standards and industry guidelines. The design of the CCTV system was based on the related community safety study, lighting audit and crime risk assessment.

The locations identified for inclusion in the audit and CCTV Master Plan were:

1. **Byford Town Centre Area** – South West Highway from the Tavern near corner of Abernethy Road both sides of the Highway up to Pitman Road. Particular attention to area around Byford Town Hall.
2. **Byford BMX Track**, Mead Street, Byford
3. **Mundijong Main Street**, Paterson Street Tavern Area – and from the Playgroup and Landcare Buildings, corner Cockram through to the new Serpentine Jarrahdale Community Resource Centre. Mundijong Road, including the Council Chambers and surrounding buildings, Library and FESA Building.
4. **Mundijong Pavilion** off Cockram Street
5. **Old Council Depot**, Whitby Street, Mundijong
6. **Jarrahdale Area** – area outside of Jarrahdale Tavern, Jarrahdale Road
7. **Serpentine** – area outside the Old Serpentine Tavern, corner Richardson and Wellard Street and the Public Toilets, corner Wellard and Lefroy Roads.

### 2.2. Communication and Consultation

Amlec House consulted with the following personnel and external stakeholders;

1. Community Development Officer – Community Safety, Janice Ferguson, Shire of Serpentine Jarrahdale
2. Councillor, Christine Randall, Shire of Serpentine Jarrahdale
3. Depot Operations, Ron Bettsworth, Shire of Serpentine Jarrahdale
4. Depot Operations, Frank Strever, Shire of Serpentine Jarrahdale
5. Design Support Officer, Courtney Owston, Shire of Serpentine Jarrahdale
6. Director of Corporate Services, Alan Hart, Shire of Serpentine Jarrahdale
7. Julie Richards, Shire of Serpentine Jarrahdale
8. Emergency Services Risk Coordinator/Fire Control Officer, Jim Johnson, Shire of Serpentine Jarrahdale
9. IT Technician, Mathew Smith, Focus Networks
10. Manager Community Development, Carole McKee, Shire of Serpentine Jarrahdale
11. Blue Iris CCTV Project Officer, Senior Constable Steve Harrison, Police Operations Centre
12. Officer in Charge, Senior Sergeant Clyde Pearson, Mundijong Police

13. Senior Ranger, Brian Owston, Shire of Serpentine Jarrahdale
14. Informal and opportune interviews were conducted, as available

### 2.3. Documentation

Amlec House referred to the following documents during the audit period;

- a. Map of nominated area
- b. WA Police crime statistics for nominated area
- c. Community Safety and Crime Prevention Plan 2009-2012, Shire of Serpentine Jarrahdale
- d. Byford Townscape Project, Shire of Serpentine Jarrahdale
- e. Byford Public Art Master Plan, 2011, Shire of Serpentine Jarrahdale
- f. Local Planning Policy LPP16 Paterson Street Design Guidelines, 17 February 2003, Shire of Serpentine Jarrahdale
- g. Draft Local Planning Policy No.24, Designing Out Crime, January 2011, Shire of Serpentine Jarrahdale
- h. Designing Out Crime and Using Technology, Shire of Serpentine Jarrahdale
- i. CCTV Proposal, 27 January 2010, Community Safety and Crime Prevention Steering Committee, Shire of Serpentine Jarrahdale
- j. Linear Park Landscape Concept Plan, drawing 03:13-02 Revision C, Shire of Serpentine Jarrahdale
- k. Shire of Serpentine Jarrahdale website
- l. Shire of Serpentine Jarrahdale Community Safety and Crime Prevention Profile 2007-2008, Office of Crime Prevention
- m. Shire of Serpentine Jarrahdale Community Safety and Crime Prevention Profile 2008-2009, Office of Crime Prevention
- n. Shire of Serpentine Jarrahdale Community Safety and Crime Prevention Profile 2009-2010, Office of Crime Prevention
- o. On The Beat, December 2010 – August 2011, Mundijong Police Sub Station
- p. CCTV – Minimum requirements – A policy of the Director of Liquor Licensing, 7 June 2011, Department of Racing Gaming and Liquor
- q. Security at Licensed Premises – A Policy of the Director of Liquor Licensing, 31 May 2011, Department of Racing Gaming and Liquor
- r. Perth Biodiversity Project, 2010, Western Australia Local Government Association

## 3. Overview Of CPTED & Lighting Audit Principles

### 3.1. What is Community Safety?

The Office of Crime Prevention adopts safe communities as places where people are able to pursue and obtain a full life without fear or hindrance from crime or disorder. People in a safe community feel empowered and experience a better quality of life. They are also helped to cope with any criminal and anti-social behaviour they experience.

Community safety that can be addressed through road safety, fire prevention, environmental protection, mental and public health, social exclusion, youth issues and other risk factors which are all important ways of promoting community safety.

### 3.2. What is Crime Prevention?

The Office of Crime Prevention defines crime prevention as:

*“Any public or privately based initiative or policy aimed at reducing or eliminating criminal behaviour, violence and the fear of crime or violence in the community.”*

Community Safety and Crime Prevention Planning projects include the following:

- Positive intervention with parents in early childhood development;
- Strengthening communities and revitalising neighbourhoods;
- Early intervention with juveniles and adult offenders at initial stages of involvement in the criminal justice system;
- Environmental design, building design and suburban infrastructure development to reduce the opportunity for crime to occur; and
- Interventions to reduce re-offending.

Crime prevention focuses on preventing and reducing crime and anti-social behaviour by tackling the causes. By reducing crime and anti-social behaviour through well targeted interventions, crime prevention can provide the essential conditions for community safety to flourish.

### 3.3. Crime Prevention Through Environmental Design (CPTED)

CPTED is defined as ‘the proper design and effective use of the built environment which can lead to a reduction in the fear of crime and the incidence of crime, and to an improvement in the quality of life’ (Crowe, 2000, p. 1). CPTED comprises the concepts of natural surveillance, natural access control and territorial reinforcement in order to protect an asset.

Designing out crime concepts adopt CPTED and can be practically applied in a range of settings. For example, within alcohol retail premises design factors can either minimise or exacerbate the likelihood of violence. CPTED is well understood by security designers and as such provides a moderate security application for the protection of assets in a community (Rogers, 2007; Dewberry, 2003; Hummer and Preston, 2006). CPTED is most distinct from the concept of defence in depth where barriers are imposed to prevent access to assets (Smith, 1999).

“...CPTED is based on the psychological principle that environmental cues indicate to a normal user a site is safe, while at the same time telling an abnormal user it's not.” (Adams & Crowe, 1995, p. 36)

CPTED design should encourage use of areas which provide natural surveillance and create land use activities in unused locations, so that normal users will control this space and be more likely to challenge abnormal users (Adams & Crowe, 1995).

The design of open public space should include the use of natural barriers and improve scheduling of productive and effective activities. The perception of natural surveillance can be increased by being overlooked by building windows, regular and unscheduled activities and with general gathering areas in the line of sight to other areas needing protection. Distances and

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isolation may be overcome by improving communication to isolated areas such as security call posts and frequent security patrolling (Adams & Crowe, 1995, p. 37).

For further information on CPTED strategies we refer to the WA Planning Commission Designing Out Crime Guidelines, however there are several aspects to this strategy that maybe used separately or in conjunction, which are as follows:

**Natural Access Control** which provide secure barriers to prevent unauthorised access and to reinforce and guide the legitimate movement of people;

**Surveillance through physical design** which provides opportunities for natural surveillance by physical design, use of space and appropriate lighting;

**Territorial Identity** which clearly delineates private and public areas to deter and discourage trespass.

**Social Interaction** and fostering positive relations within the community will enhance community surveillance and reporting as well as supporting good corporate citizenship and building community capacity. Actions that can be undertaken include:

- Emphasising that violence is unacceptable and having a clear and consistent message in response to violence where it occurs.
- Adopting 'designing out crime' principles around the home, neighbourhood and workplace.
- Proactively responding to aggression before it becomes violent. Somewhat paradoxically, most violent incidents are a reaction to perceived aggression. By recognising and appropriately responding to the cues, victims can do much to reduce the risk of violence.

**Security Services** to ensure the security service employed/contracted is able to provide the appropriate response to detection of intruders.

#### 3.4. Lighting Management Strategies

We have sourced Byford Town Centre, Mundijong Town Centre, Jarrahdale Road and Serpentine Town Centre lighting records from Western Power, as attached on CD Rom. Lighting records generally conform with street lighting audit conducted on 27 September 2011; however inconsistencies were observed, specifically with Wellard Street lighting records

#### 3.5. Road and Public Space Lighting Systems – Australian Standards AS/NZS 1158.0:2005

Lighting standards in each of the audit areas should comply with Category P lighting, which is applicable to roads on which the visual requirements of pedestrians are dominant. The lighting category applicable to all sites is:

- a) Category P lighting which is applicable to roads on which the visual requirements of pedestrians are dominant, e.g. local roads and to local area traffic management devices (LATMS) installed on such roads. Also lighting which is applicable to outdoor public areas, other than roads, where the visual requirements of pedestrians are dominant, e.g. outdoor shopping precincts. Subcategories range from P1 to P12.
  - a. Performance and installation design requirements for Category P lighting are specified in AS/NZS 1158.3.1.



Table 4: Illumination Guide

APPLICATION	LUX	ILLUMINANCE	NOTES
Large, open areas	5—20	(0.5—2)	Greater surrounding brightness requires higher illuminance in the space.
Buildings	5—20	(0.5—2)	Vertical illuminance on the facade. Greater surrounding brightness requires higher illuminance on the facade.
Perimeter fence	5	(0.5)	Illuminance on the ground on either side of the fence
Entrances	100	(10)	Illuminance on the ground in the inspection area.

***Illuminance intensities recommended by I.E.S. in 1993***

### 3.6. Types of Lamps used by the Shire of Serpentine Jarrahdale - Nominated Areas

#### ***HPS: Street Lighting***

*150, 250 & 400 watts*

High Pressure Sodium (HPS) street lighting emit a monochromatic yellow light which has no colour rendering quality. They are the most efficient lamps, and where colour rendition is not important they are usually the first choice.



Figure 1: Sample street lighting used in Mundijong

#### ***Mercury vapour (MV) Lamps: Street Lighting***

*50, 70, 80, 125, 250 watts*

Mercury high-intensity discharge lamps use mercury as the primary light-producing element. Although this lamp produces a white light, its colour rendering ability can be poor.



Figure 2: Sample street lighting used in Byford and Mundijong

### ***Fluorescent Lamps***

This type of lighting source is used around the perimeters of buildings, particularly ablution blocks. They are more efficient, and last much longer than incandescent lamps. Under Western Power maintenance programs 80 Watt Mercury Vapour luminaires that are found to have failed and cannot be repaired, are being replaced by 42 Watt CFL (Compact Fluorescent) luminaires. Local Governments can pay to proactively upgrade luminaires for energy efficiency purposes.

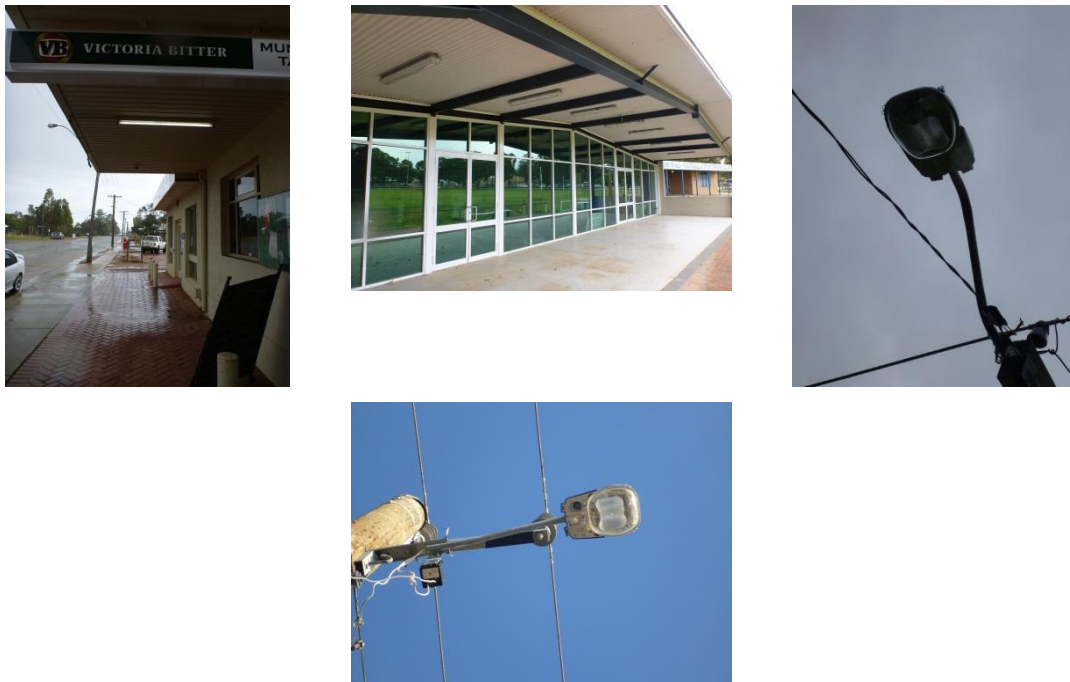


Figure 3: Sample lamps used in Byford and Mundijong

### ***Continuous lighting***

Continuous or stationary lighting are commonly used systems and consist of a number of fixed lamps arranged to flood a specified area. It is usual that the cones of illumination will intersect to provide an unbroken strip of light. Increasing lamp wattage and/or maintaining clean housing reflectors will assist in distributing illumination to a higher and wider level.

### **High brightness metal halide lamps / Floodlights:**

Floodlights use a parabolic reflector to produce a high intensity beam of light, and can create considerable glare. Floodlights can be specified in degrees of beam width, but are generally referred to as wide, medium, or narrow.

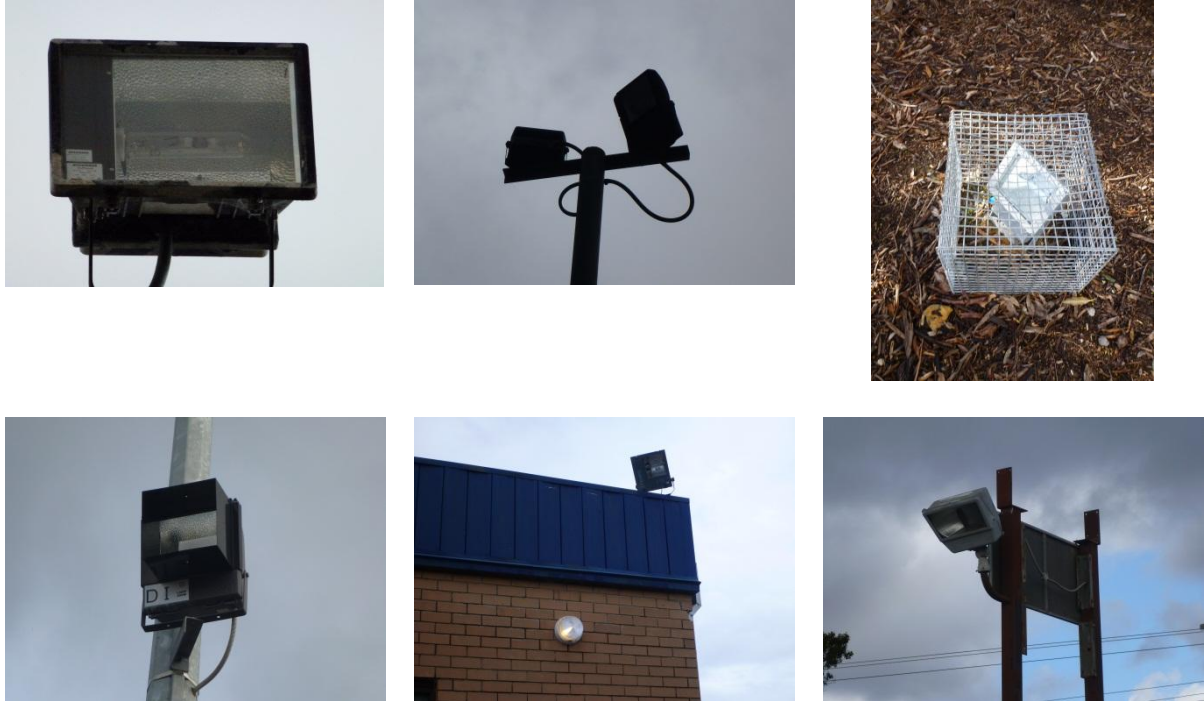


Figure 4: Sample Spotlights used in the Audit Areas

### **LED Street Lighting**

LED street lighting is an integrated light that uses LEDs as its light source. Most LED street lights have a lens on the LED panel, which is designed to cast its light in a rectangular pattern. The primary appeal of LED street lighting is energy efficiency compared to incandescent bulbs of the same luminance. Current practice has observed several low power LEDs packed together to perform the same purpose as a single high power LED.

#### **3.7. Lux Readings**

Lux readings were obtained under the following conditions:

Natural Light:	Cloudy sky with no moon
Time:	1900 – 2100 hours
Apparatus:	LX1010B Digital Lux Meter
Precision:	+/- 5 %
Range Settings:	0 – 2000 Lux
Unit:	lux (lx); 1 lx = 1 lm/m <sup>2</sup> .

Measurement: Horizontal illuminance (E<sub>h</sub>) is the value of illuminance on a designated horizontal plane at ground level. Readings taken 30 centimetres off the surface provides a consistent approach in obtaining the degree of illumination. The physical measure of illumination

is illuminance. It is the luminous flux arriving at a surface in the horizontal plane, divided by the area of the illuminated surface.

Observation Table Key:

	Sufficient illumination for purpose
	Illumination needs rectification or review
	Poor or nil illumination

### 3.8. Special References

The audit refers and may base recommendations on Australian Standards. The formulation of Australian Standards reflects current best practice, based on progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. The Standards referred to in this report apply to the lighting of roads and other outdoor public spaces and therein set out the definitions and lighting categories needed for reference in other Standards in that series.

Amlec House acknowledges Standards Australia as the copyright owner of the following documents referred to in the compilation of the Audit Report;

1. ISO 31000 Risk Management;
2. AS/NZS 1158:2005 Lighting for Roads and Public Spaces
3. AS 4806.1:2006 Closed Circuit Television (CCTV) - Management and Operation; and
4. AS 4806.2:2006 Closed Circuit Television (CCTV) - Application guidelines.
5. AS2890.2 2002 Off Street Commercial Vehicle Facilities
6. WA CCTV Guidelines
7. WA Planning Commission 'Designing Out Crime' Guidelines, 2006

## 4. Overview Of Crime Prevention Framework

### 4.1. Shire of Serpentine Jarrahdale Crime Prevention Framework

The Shire of Serpentine Jarrahdale, in partnership with the State Government, developed the Community Safety and Crime Prevention Plan 2009-2012. The Shire established a Community Safety and Crime Prevention Steering Committee to oversee the development, implementation and evaluation of the planning process.

The Shire of Serpentine Jarrahdale sought a collaborative approach to Community Safety and Crime Prevention and conducted extensive public consultation to identify strategies and issues of concern. Local communities, businesses, youths, community groups, seniors, people with disabilities, other community organisations and community volunteers were all consulted through several community consultation meetings and public forums.

The Steering Committee reviewed crime rates, Community Safety and Crime Prevention issues that emerged from previous studies, community safety data from the Office of Crime Prevention, the Shires Community Security Audit, Community Services and Facilities Plan and documents discussing youths in regional and rural areas and drug and alcohol use/misuse.

The key community safety and crime prevention issues identified through this process were:

1. Youth related issues and crime;
2. Lack of Neighbourhood Watch/Rural Watch programs;
3. Graffiti;
4. Designing Out Crime training workshop and forum;
5. Seniors safety issues;
6. Speeding and dangerous driving issues;
7. Antisocial behaviour and violence, specifically around licensed premises;
8. Prioritise further development of diversionary activities available for youths;
9. Drug and alcohol abuse and domestic violence;
10. Limited police presence and patrols within all towns; and
11. Trail bikes and off-road vehicles being ridden illegally.

Council Officers were consulted within their specific business units to comment on the feasibility and details of strategic information. Further consultation with the Steering Committee, reference groups, community network groups, local police and various stakeholders was conducted to further identify local issues within each town or community at a broader level.

The Shire of Serpentine Jarrahdale identified four (4) key goals from the State Governments Strategic Plan and developed subsequent strategies to address community safety and crime prevention issues. Key goals and strategies identified by the Shire of Serpentine Jarrahdale include:

1. Supporting Families, Children and Young People
  - a. Constable Care project in schools
  - b. P-Plate Safe Driver education training
  - c. Develop further youth diversionary activities
  - d. Youth leadership and community mentors
2. Strengthening Communities and Revitalising Neighbourhoods
  - a. Educate parents, businesses and communities about drugs and alcohol related issues and strategies
  - b. On-line youth and community forum
  - c. Dob In A Hoon
  - d. SJ Community Watch
  - e. Keeping our seniors safe
3. Targeting Priority Offences and Reducing Repeat Offending

- a. Burglar Beware campaign
  - b. Anti-graffiti campaign
  - c. Serpentine Jarrahdale Shire Alcohol Strategy
4. Designing Out Crime and Using Technology
- a. Community safety webpage design
  - b. Urban design strategy incorporating CPTED principles
  - c. Community surveillance program
  - d. Community safety and e-watch project
  - e. Quick response graffiti removal

The effectiveness of the Community Safety and Crime Prevention Plan is measured against performance indicators identified under six (6) key performance areas.

The Shire of Serpentine Jarrahdale are heavily involved in the 'Name and Shame' campaign and the 'Dob in a Dumper' campaign and believe results are positive within the community.

A strategic alliance has been developed within the Shire of Serpentine Jarrahdale to gain the benefits of intelligence sharing when issues arise. Local police, rangers, fisheries and the water corporation meet on an ad hoc basis to run operations on the peripherals of town. Three (3) major joint operations and twenty (20) minor operations have been conducted since 2009.

The Shire of Serpentine Jarrahdale has developed the Draft Local Planning Policy Number 24 for Designing Out Crime. The policy outlines the combined responsibilities between the community, developers and the Shire to encourage crime prevention within the community. All major planning proposals and developments must consider CPTED principles by completing a designing out crime toolbox. Minor developments are not required to complete the toolbox.

The Shire of Serpentine Jarrahdale is undergoing major redevelopment; however new and proposed developments are not adequately scrutinised from a CPTED perspective. Shire officers have expressed concerns with new developments being designed with laneways located at the rear of housing to service car ports. Small laneways provide potential conflict between residents and sufficient getaway routes for off road motorbikes. Consideration should be given to area design in new developments to reduce opportunity for conflict and illegitimate activity.

#### 4.2. Crime Overview for Shire of Serpentine Jarrahdale - Nominated Areas

The Shire of Serpentine Jarrahdale Crime Prevention Profiles developed by the Office of Crime Prevention indicates the total number of recorded crime decreased between 2007 and 2010. Incidents of assault have remained constant over the four (4) year period and residential burglary has continued to present issues in the region increasing by approximately 5 per cent. Property damage, excluding graffiti, and drug related crime are identified as a prominent issue with crime rates remaining constant. Offences of theft (other) decreased by 200 incidents over the same period. Spikes in motor vehicle theft, between July and November, and illicit drug offences, between July and August, and May and June, were observed.

An increase in police numbers at Mundijong Police Station in April/May 2010 produced an increase in the number of offenders apprehended and processed through the court system for all offences, as shown in Table 5. The majority of offences are conducted by non-indigenous males with lower number of non-indigenous females. This correlates with the 2006 census showing only 1% of the population being indigenous. The age ranges of offenders were predominantly 18 to 35 years; however a decrease in offender age has been observed. The age range of victims has also been observed to decrease over the four (4) year period.

Unemployment rates increased between 2007 and 2010; however the Shire of Serpentine Jarrahdale has consistently maintained a lower level than the South East Metropolitan and Western Australian region standard.

Table 5: Arrest Rates for the Shire of Serpentine Jarrahdale 2009-10 and 2010-11

	Jul09-Jan10	Jul10-Jan11
<b>Persons processed (arrest/summon)</b>	134	330
<b>Charges</b>	239	547

#### 4.3. Shire of Serpentine Jarrahdale Crime Related Incidents

Mundijong Police identified five (5) hotspot locations requiring constant police attention, including:

1. Byford Town Centre;
2. The park adjacent the war memorial;
3. Byford Hall;
4. Mundijong Railway Park; and
5. Paterson Street near the pavilion.

Nuisance crime such as damage, vandalism and theft are constant issues throughout the Shire of Serpentine Jarrahdale. On the 24-25 September, offenders caused \$16,000 worth of damage to a recently installed reticulation box. Equipment located on the solar powered light at Abernethy Road and street signage, specifically Gobby Road and Feast Street, have been favoured targets for offenders. Entrance doors have been damaged and water stolen from the fire department. Water is suspected to be used by land owners. The Shire expressed concerns over the expense of replacing stolen water pumps located on the road sides. Offenders continued to steal water pumps, and more recently control boxes, following an increase in security and target hardening by the Shire. Asset protection has become an issue for the Shire, with offenders willing to take time to circumvent security measures.

In March 2011, local police reported a decrease of 12.7 per cent in reported crimes with a 27.9 per cent decrease in Burglary offences. A further decrease in overall crime (27 per cent) and Burglary (10.2 per cent) was reported in April 2011. Over the financial year, Mundijong Police reported a 25 per cent decrease in Burglary offences and clearance rates above corporate expectations; however Burglary remains an ongoing concern for police with spiked activity throughout the district.

The Shire of Serpentine Jarrahdale has received complaints from local residents over the use of off-road motorbike, particularly in the Byford and Nettleton Road area. Police and rangers experience difficulty identifying offenders due to generic bikes and helmets, and rely on local residents' information. Issues have been raised over the prosecution of offenders. The *Road Traffic Act* identifies offences such as, hooning, reckless driving and driving without a license, and outlines the seizing of off-road bikes for a period of 28 days following an incident. The *Off-Road Vehicles Act* outlines the seizing of bikes for a period of twelve (12) months. Offenders cannot be prosecuted under both Acts for the same offence and collaboration between local police and the Shire is required.

Building sites throughout the Shire of Serpentine Jarrahdale experience limited thefts. The sites are protected by Meridian Services and employ mobile CCTV surveillance or the threat of CCTV surveillance to deter potential offenders.

There has been a large increase in the number of clandestine laboratories located by WA police over the previous year. Police believe that due to the semi-rural area, a large number of clan labs are located in residences and in bush areas throughout the Shire.

An upgrade and possible relocation of the Mundijong Police Station has been proposed. Consideration should be given to the design of the facility to accommodate CCTV technology, such as monitors and recording equipment.

Mundijong Police encourage community assistance in crime prevention throughout the Shire by promoting community newsletters, neighbourhood watch and e-watch programs. Community assistance has aided local police on numerous occasions including a Burglary in Cockram Street Mundijong involving the charging of 24 offenders, including nine (9) adults for the

offences of aggravated burglary, receiving, trespass and drug related activity. Three (3) adults were arrested and charged with damage offences in Byford following information from a local resident. Mundijong Police have encouraged local business owners who operate a private CCTV system to register with Blue Iris to assist in police operations.

#### 4.4. Licensed Premises

The Audit examined eight (8) licensed premises and their associated CCTV systems.

A majority of licensed premises operated private CCTV systems, however few provide external coverage of their premises. External coverage of licensed premises is limited to the immediate external entrances of the premises.

The Director of Liquor Licensing has introduced a new policy for CCTV minimum standards at licensed premises and Serpentine Jarrahdale licensed premises should maintain compliance with these standards. CCTV systems at licensed premises should comply with the WA Police Preferred Minimum CCTV System Standards, as stated in the WA CCTV Guidelines, the Western Australia Closed Circuit Television (CCTV) Technical Advice, the Surveillance Devices Act 1998, and should provide '*clear images of the activities of patrons and staff at each entrance to the licensed premises*'. CCTV requirements outlined in the Security at Licensed Premises Policy include:

- *A closed circuit television video ("CCTV") surveillance system, able to identify individuals and showing times and dates, must be in place and operational within three (3) months of this condition being imposed. It is expected that this system will provide and record continuous images of the entrances and exits to the premises, from 8 pm (or the time of opening the premises if after 8 pm), until one (1) hour after trading ceases.*
- *Images recorded via the CCTV system must be retained for fourteen (14) days (or such period as the Director of Liquor Licensing specifies) and must be made available for viewing or removal by the Police or other persons authorised by the Director.*

Mundijong Police have identified a number of bush clandestine laboratories and links to Outlaw Motor Cycle Gangs (OMCG's) throughout the Shire of Serpentine Jarrahdale. Several clubs, taverns, shops and a substantial landholdings development have been identified with links to OMCG's. The Shire has experienced issues with Marron being poached and fire wood being illegally cut and sold through local taverns.

Licensed premises located in the Shire of Serpentine Jarrahdale are included in Table 6.



Table 6: Licensed Premises within the Shire of Serpentine Jarrahdale

<b>Byford</b>		
<b>Premises ID</b>	<b>Premises Name</b>	<b>License Type</b>
6190041277	Serpentine Jarrahdale Cricket Club Inc	Club Restricted
6190034520	Byford Trotting Training Complex Clubrooms	Club Restricted
6040004820	Byford & Districts Country Club Inc	Club
6020025965	Byford Tavern	Tavern
6030019273	Byford Grocery & Liquor Store	Liquor Store
<b>Mundijong</b>		
6190021659	Centrals Football & Sportsmans Club Inc	Club Restricted
6130037176	Leonda Reception and Function Centre	Special Facility – Reception Centre
6060022491	Historic Whitby Falls Centre	Restaurant
6020011205	Mundijong Tavern	Tavern
6030035535	Mundijong IGA	Liquor Store
<b>Jarrahdale</b>		
6020011247	Jarrahdale Tavern	Tavern
6180076893	Millbrook Winery	Producer's
6060111295	Serpentine, Café on the Dam	Restaurant
<b>Serpentine</b>		
6190018234	Serpentine & Districts Golf Club	Club Restricted
6030047126	Serpentine Liquor Store	Liquor Store
6020020750	The Olde Serpentine Tavern	Tavern
<b>Oakford</b>		
6030004317	Oakford Traders	Liquor Store
6160119249	Castle Lion Vineyard	Wholesaler's
<b>Karrakup</b>		
6180111410	Silver Lakes Wines	Producer's

#### 4.5. Overview of Public Events and Events Management

There are a number of events conducted in the Shire of Serpentine Jarrahdale throughout the year, in particular throughout the summer months. These events are located at a number of locations including those in the Audit area. Such events range from fairs to guided walking tours. The Jarrahdale Log Chop was held on 9 October 2011 at Jarrahdale Oval on Nettleton Road. The log chop has been operating for 18 years and contains a log chop competition, stalls of local produce, crafts, music, dancing, food and refreshments.

The Australia Day celebrations are held at the Serpentine Camping Centre, Serpentine. The 2011 event attracted over 500 people and contained several musical acts, shows and activities for all ages.

Monthly markets are held in Byford, Jarrahdale and Serpentine and generally do not attract large crowds.

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Guided walks are operated in Jarrahdale and begin at the Old Post Office. A ghost walk was held on 5 November 2011 and included a sausage sizzle.

A review on the success of each of these events should indicate if greater promotion is required for increased community participation.

#### 4.6. Community Expectations and Crime Awareness Media Management Plans

A Crime Prevention Awareness Media Management Plan was not evident. We recommend a Crime Prevention Awareness plan be integrated into the Community Safety and Crime Prevention Plan, in particular in support of any introduction of public CCTV operations and to maintain a high degree of awareness of CCTV operations amongst the Shire of Serpentine Jarrahdale community.

The awareness strategy should promote the use of CCTV systems as providing for a safe and monitored area, aimed to deter potential offenders from opportunistic and targeted criminal activity.

Table 7: Summary of Crime Related Media Coverage

Title	Date	Published	Message	Content
Man arrested over stolen Byford police van	19/01/11	Byfordwa.com	Negative	A police van in Byford was stolen by a 24 year old male after being pulled over on Beelier Drive. Police were speaking to the passengers in the vehicle when the man managed to drive away with the police van. The van was driven along bush tracks off Nettleton Road before crashing and being recovered by police. The driver was arrested by police.
Mundijong house looted in burglary free-for-all	18/01/11	Perth Now	Negative	Sixteen people, including a 12 year old child, were charged over a Burglary spree in Mundijong, in which more than \$500,000 worth of property was stolen. Items such as clothing, watches, perfumes and other collectables were stolen between 18 and 25 December 2010. Police believe most youths in town were either aware of the Burglary or involved in it.

## 5. Strategic CCTV Management & Operations

### 5.1. Relevant CCTV Standards and Guidelines

The Shire of Serpentine Jarrahdale should endeavour to implement a best practice CCTV Management and Operations Framework based on relevant Standards, Guidelines and Rulings. Standards Australia's CCTV standards cover the latest CCTV technologies, procedures and are reported to be the most up to date CCTV standards available in the world. In Western Australia, best practice CCTV Operation guidelines may refer to the following:

- AS 4806.1–2006–Closed circuit television (CCTV)–Part 1: Management and operation.
- AS 4806.2–2006–Closed circuit television (CCTV)–Part 2: Application guidelines.
- AS 4806.3–2006–Closed circuit television (CCTV)–Part 3: PAL signal timings and levels.
- AS 4806.4–2008–Closed circuit television (CCTV)–Part 4: Remote video.
- AS 4806.4–2008–Closed circuit television (CCTV)–Part 5: Digital Systems (in draft).
- AS/NZS 3000:2000 Wiring Rules
- AS 2201.2 Monitoring Centres (Construction and Performance)
- ISO 31000: 2009 Risk Management;
- AS/NZS 1158:2005 Lighting for Roads and Public Spaces;
- HB 167: 2004 Security Risk Management Handbook;
- WA State CCTV Guidelines ([Link here](#))
- WA CCTV Technical Advice ([Link here](#))
- CCTV Management and Operations Manual ([Link here](#))
- WA CCTV Analogue to Digital CCTV System Migration Guidelines ([Link here](#))
- WA Planning Commission Designing Out Crime Guidelines. ([Link here](#))
- General Disposal Authority for Local Government Records RD 2010046 – 2010 ([Link here](#))

AS 4806.1–2006–Closed circuit television (CCTV)–Part 1: Management and operation includes chapters on; principles and management of the CCTV system, procedures, personnel, CCTV control room, effective response, privacy and disclosure issues, recorded material management, documentation, licences and CCTV signage. There are appendices on staff recruitment and selection and a summary of current Australian Legislation for all states and territories.

AS 4806.2–2006–Closed circuit television (CCTV)–Part 2: Application guidelines includes chapters on, general CCTV considerations, system design criteria, objective test plan, installation, commissioning and handover, preventative maintenance, licences and signage. There are appendices on abbreviations and terminology, objective testing techniques, objective tests and measurements using a test chart, objective tests and measurements using a test pattern generator and test targets.

AS 4806.3–2006–Closed circuit television (CCTV)–Part 3: PAL signal timings and levels includes video signal timings from the Australian Broadcasting and Media Authority Technical Planning Guidelines and video signal level variables for CCTV systems which have been determined from many tests over many years.

AS 4806.4–2008–Closed circuit television (CCTV)–Part 4: Remote video sets out requirements and recommendations for the design, installation, commissioning, operation and remote monitoring of the following:

- (a) Remotely monitored detector-activated alarm verification CCTV systems.
- (b) Remotely monitored interactive video management CCTV systems.
- (c) Remotely monitored CCTV surveillance systems.

The CCTV subcommittee is currently working on a draft AS 4806.5 which will cover digital and networking in CCTV and will be of great value to both the CCTV and IT industries. The Non Broadcast Television Testing subcommittee is working on objective and subjective video test standards.

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## 5.2. Establishing the CCTV System Purpose and Measurable Results

Antisocial behaviour, vandalism and theft were identified as driving factors for the installation of a public CCTV system. The Shire of Serpentine Jarrahdale Crime Prevention Steering Committee proposed (see Item i - Part 2.3) that CCTV in conjunction with youth engagement programs and education of parents, businesses and the community about drug and alcohol related issues, will reduce incidents of antisocial behaviour and raise community participation, confidence and awareness. The Shire has expressed a desire to encourage appropriate security CCTV requirements for new business premises/ventures in addition to their registration with the Blue Iris program.

The key objectives of a public CCTV surveillance system should be to directly attribute to safety, perception of safety, control of crime or assist Shire or Police management functions. An objective and best practice approach is to first determine each camera's purpose, either to *detect, recognise or identify*.

This design base will allow documented design, commissioning, performance and monitoring of each and every camera and subsequently, the whole system. Whilst the system is not being monitored, cameras should be positioned for wide fields of view for maximum detection capability. This provides the opportunity for cameras to be manipulated via PTZ controls by an operator wishing to capture recognition and identification footage. Consideration should therefore be given to Field of View (FOV) preset parameters set wide to a detection strategy with selected cameras designed to capture recognition and identification images in support.

Establishing clear and concise Key Performance Indicators (KPI's) for the CCTV Operation will allow effective reporting and monitoring of system efficacy and quickly highlight trends concerning the fundamental operation which may require early intervention or closer monitoring by management.

We recommend that CCTV Operation KPI's be centred and reported on the following:

1. Possible versus Actual Surveillance Hours conducted
2. Number of Incidents detected
3. Number of Incidents responded too
4. Number of requests/applications for recorded images
5. Time frame for responding to footage applications
6. Number of requests for maintenance or system repair
7. Time frame for maintenance repair and response

An established Community Safety and Crime Prevention Committee, for the Shire or individual town sites, should be tasked with CCTV Operations Oversight and review KPI's at each meeting. Each Committee member should be conversant with the CCTV Management and Operations Manual to ensure that system expansion is controlled and does not detract from the performance of existing cameras.

## 5.3. Installation of 'Dummy' Cameras

It may be appealing to install 'dummy' cameras or CCTV signage with the view of reducing costs. It may be possible for some members of the public to know some cameras are not operational; however it is reasonable to believe these areas would be under constant, recorded surveillance.

The following information is sourced from the New South Wales Law Reform Commission, Report 98 (2001) relating to the increased liability from the false representation of CCTV systems:

- Although there are few councils operating schemes involving 'dummy' cameras, the *Guidelines* need to acknowledge their existence and may point out some of the specific legal issues surrounding this type of scheme. In particular, duty of care issues need to be highlighted in relation to councils being held responsible where members of the public believe an area is under surveillance. (Evaluation of the NSW Government's CCTV Guidelines – Final Report, p.21)

- ‘Dummy’ cameras have been employed in some instances. Poyner reports that crime was reduced on public buses after the installation of both active and ‘dummy’ cameras on board a number of buses. Indeed, crime reduced on more buses than the ones fitted with surveillance cameras, a concept known as diffusion of benefits. It is therefore possible that ‘dummy’ cameras could achieve the same preventative aim as active systems. However, if users of the space under surveillance are led to believe, through signs for example, that they are being watched 24 hours a day and an incident occurs, the misrepresentation of a form of guardianship may have liability implications. (U.S. Department of Justice, Office of Community Oriented Policing Services Problem-Oriented Guides for Police Video Surveillance of Public Places, Problem-Oriented Guides Police Series Response Guide Series, Number 4, Center for Problem Oriented Policing) Source: <http://www.cops.usdoj.gov/files/ric/Publications/e02061006.txt>

In the United States, a rapidly growing and developing area of tort law involves plaintiffs suing property owners, alleging that the defendants’ negligence in failing to provide sufficient security has resulted in their suffering personal injuries, often at the hands of a third party. Even though the criminal act of a third party is an intervening event, the defendant may still be liable if such an act was foreseeable and the defendant did not exercise reasonable care to reduce the risk of its occurrence. Examples of these so-called “premises liability” cases have included plaintiffs being attacked in apartment car parks where lighting and locks have been inadequate. In a US case, *Nebel v Avichal Enterprises Inc*, a motel patron alleged the defendant was negligent in failing to provide “functional and operational closed circuit surveillance cameras and monitors” in a motel in a New Jersey high crime area. *Morris v Krauszer’s Food Stores Inc* was a case in which the plaintiff introduced expert testimony that, considering the foreseeability of robbery, the defendant should have increased security measures including the installation of video cameras. The Jury found for the plaintiff.

Courts in the United States of America have held that, for the plaintiff to prove negligence, it needs to show that security measures, such as a CCTV system, would be likely to deter the criminal activity which causes the plaintiff injury or loss. (Security Industry Association and International Association of Chiefs of Police, “Legal Issues Related to Silent Video Surveillance”) Source <http://www.lawlink.nsw.gov.au/lrc.nsf/pages/r98chp03>

Installing a video security system will not be sufficient to avoid liability. It seems necessary that proper policies and procedures be followed and any employees adequately trained (*Cohen v Southland Corporation* (1984) 203 Cal Report 572), and that the system be properly designed, maintained and monitored so as not to create a false sense of security which would encourage visitors, customers or staff to take risks they might otherwise not take (*Kutbi v Thunderlion Enterprises Inc* (1985) 698 P.2d 1044): Security Industry Association (26 October 1999). Source: <http://www.agd.nsw.gov.au/lrc.nsf/pages/r98chp03/>

It is the consultant’s view that the Shire of Serpentine Jarrahdale is demonstrating that there is foreseeable risk to the public which has sufficiently caused management to undertake the CCTV Feasibility Study with the purpose of deterring and reducing risk. The implementation of ‘dummy cameras’ would raise concern of responsible risk management practices. Should ‘dummy’ cameras be installed and the event of a risk occurred, such as an assault, the Shire would be unable to provide video evidence of the perpetrator(s) which may directly or indirectly result in a liability claim for damages in failing to provide sufficient security and a safe environment. In any resulting legal action against the Shire, it may be at increased risk of being found negligent and liable by not exercising reasonable care by providing a sufficient level of safety and security.

#### 5.4. Shire of Serpentine Jarrahdale CCTV Management

As the owner and operator of the CCTV Operation, the Shire of Serpentine Jarrahdale will be the principal stakeholder and should seek to garner the most value in terms of Public Asset Management and Community Safety.

The Community Safety and Crime Prevention Steering Committee should be actively involved in local safety and crime prevention initiatives. The Committee should therefore maintain a proficient knowledge and appreciation of the CCTV Operation and how it may be integrated with Committee initiatives, planning, reviewing and monitoring efforts.

The Shire of Serpentine Jarrahdale should acknowledge that the principal stakeholder to the CCTV Operation will be the WA Police. However, other Shire business units may benefit from controlled access to the CCTV Operation, including ICT who may be sought to administer the technical performance of the CCTV System.

The following personnel should be considered for administering access to the CCTV System on behalf of Council:

- Community Development Officer – Community Safety
- Director of Corporate Services
- Senior Ranger

The Community Development Officer – Community Safety may be appropriate to be the delegated Duty Surveillance Officer responsible for CCTV Management.

Additional personnel will be required to administer, operate and provide training on the CCTV system. This role may include training police on system operation, setting camera tour schedules and general system maintenance coordination.

The Shire may consider the development of a detailed and technically specified CCTV Design Master Plan to guide tender documents and submission evaluations. There needs to be a careful balance between the technical design and the system's purpose and functionality.

Commissioning and Independent Reviews should be conducted post installations and are likely to be required in accordance with funding arrangements.

### 5.5. CCTV Operation Policy, Procedures and Guidelines

The WA CCTV Management and Operations Manual should be reviewed and endorsed by the Shire of Serpentine Jarrahdale to guide future management and operations of the CCTV System.

The Shire of Serpentine Jarrahdale should purchase a copy of AS4806:2006 and maintain compliance with CCTV management and operation standards.

We refer to AS4806.1:2006 Part 3.5 which provides a need to prepare a report on an annual basis to provide information on the operation and performance of a CCTV system. We appreciate the cost involved in independent auditing however maintaining a proficient knowledge of system effectiveness will avoid longer term under or over spending on CCTV Operation. In our view, as a minimum, an independent CCTV Operation Evaluation should be conducted every two years.

### 5.6. CCTV Operations Finance and Budget

No capital budget was evident in the provided material from the Shire of the Serpentine Jarrahdale and the Feasibility Study was not able to accurately establish budget requirements for a centrally controlled CCTV System.

The Shire of Serpentine Jarrahdale may consider other regional town centre CCTV installations operating in Western Australia for budgetary comparisons, as outlined in Section 7.12 CCTV System Comparisons and Contrasts. Budget requirement estimations would likely to be in excess of \$250,000.00 for a preliminary installation of a public CCTV system installed in Mundijong and Byford town centres. We refer to Tables 8-10 for further itemised, estimated budget breakdowns.

Alternative budget requirements below \$100,000.00 would provide capacity to install limited camera standalone systems or purchase mobile CCTV trailer units.

Budgets of \$25,000.00 or less will provide capacity for one to five portable CCTV units.

## 5.7. Mundijong Police Memorandum of Understanding

The WA Police should be appropriately recognised as the lead stakeholder and principal user of the CCTV Operation. The WA Police will utilise the CCTV Operation to assist their policing functions, namely:

- Provide an effective coverage for police response to incidents and emergency situations;
- Assist in the detection and prosecution of offenders in relation to crime, antisocial behaviour, alcohol related violence and illicit drug activity;
- Assist police to create a safer environment for those who work, live and visit the respective surveillance areas; and
- To manage crime levels by deterring potential offenders.

The WA Police and the Shire of Serpentine Jarrahdale do not presently have a Memorandum of Understanding ('MOU').

The development of a MOU should appropriately document the purpose of the CCTV operator and stakeholder relationship. The MOU will outline the contribution responsibilities of each party, conflict resolution and escalation policy, agreement review and termination.

Importantly, the MOU document should endorse the Shire of Serpentine Jarrahdale's Public CCTV Surveillance objectives, namely:

1. Enhance perception of safety for residents, workers and visitors;
2. Facilitate a timely response to public safety issues;
3. Facilitate a timely response to undesired behaviour and crimes;
4. Record evidence to support investigations and prosecutions by police in relation to offences;
5. Over time, reduce the actual incidence of specific offences;
6. Assist in determining the suitability of CCTV as an effective prevention strategy throughout the Shire of Serpentine Jarrahdale; and
7. Assist with the management of public spaces.

The MOU is an important element of the CCTV Operation and maintaining a congenial relationship between the Police and Shire of Serpentine Jarrahdale.

## 5.8. WA Police Blue Iris Registration

WA Police have initiated the *Blue Iris* Project which sets out to establish a register of CCTV systems within the State of Western Australia. Registration details will be held centrally in a protected database and used to map the location of CCTV systems for use by police investigators. The NSW Police launched a similar initiative in February 2008.

The Shire of Serpentine Jarrahdale is encouraged to have all CCTV Systems registered with Blue Iris following installation and commissioning. No existing CCTV systems within the audit area are registered with Blue Iris, as confirmed by the Blue Iris CCTV Project Officer; however local police encourage participation through monthly newsletters.

## 6. CCTV System Operating Environment

### 6.1. Climate and Weather Conditions

The Mundijong/Whitby District Structure Plan (p. 36) shows the Shire of Serpentine Jarrahdale experiences a Mediterranean climate with hot, dry summers and cool, wet winters; however rainfall has become occasional erratic in recent times. The average annual rainfall varies from 800mm to 1000mm on the coastal plain area, increasing to 1200mm on the Darling Plateau. The region experiences strong north westerly winds and the majority of rainfall during the winter months.

All Cameras and mountings should be rated at a minimum of IP65 or better for resistance to moisture and dust as weather conditions will impact on surveillance capabilities.

Mounting of cameras on existing street infrastructure, such as light poles is likely to suffer from camera shake and severe stress in the event of strong winds. Appropriately designed camera poles, footings and mounts should be specified for CCTV System supply and installation.

The Shire of Serpentine Jarrahdale will require frequent camera cleaning schedules and monitor seasonal impacts on camera operations and image quality. Budget items should be inclusive of annual cleaning costs.

### 6.2. Public Space Lighting

Lighting standards in the Study Area should be, as a minimum, in accordance with Category P lighting, applicable to roads on which the visual requirements of pedestrians are dominant, e.g. local roads and to local area traffic management devices (LATMS) installed on such roads. Also lighting which is applicable to outdoor public areas, other than roads, where the visual requirements of pedestrians are dominant, e.g. public leisure and recreation precincts. Subcategories range from P1 to P12 and performance and installation design requirements for Category P lighting are specified in AS/NZS 1158.3.1.

Area illumination throughout Byford Town Centre is isolated to business operations and shop fronts, veranda lighting and street lighting and sufficiently supports the installation of CCTV cameras in these areas. Illumination of car parks and other peripheral sites requires improvement prior to CCTV installation.

Area illumination throughout Paterson Street, Mundijong adequately supports the installation of CCTV cameras; however improvements are required at Linear Park, the Pavilion and Butcher Street adjacent the Depot to provide an adequately balanced illumination level enhancing image quality of proposed camera installations.

The area surrounding Jarrahdale Tavern is poorly illuminated and requires significant improvements prior to the installation of CCTV cameras.

Wellard Street, Serpentine appears adequately illuminated to support a CCTV installation; however improvements are required in car parks and licensed premises to enhance CCTV image quality.

Lighting systems throughout the Shire of Serpentine Jarrahdale require improvement as they provide isolated dark areas and do not support the implementation of a CCTV strategy. Unbalanced lighting throughout the Shire will impede image quality of CCTV installations.

An overall lighting strategy must be considered when implementing a CCTV strategy. Image quality increases when white light is located adjacent or at the rear of the camera. Image quality decreases with yellow light (Sodium), poor area illumination and lighting directed towards the camera. Lighting systems throughout the Shire of Serpentine Jarrahdale require significant improvements prior to CCTV installation and consideration should be given to a consistent lighting strategy that supports the CCTV system.



### 6.2.1. Australian Standard 4806.2-2006 Closed Circuit television (CCTV)

#### *CCTV Evaluation of scene and illumination*

Typically, where possible, cameras produce best details when they are positioned with the source of illumination on their side (i.e., not having intense sources of light in their field of view). If additional lighting is required, the number, type, siting and power of the light sources should be determined, taking the following parameters into consideration:

- (a) Light efficiency and photometric performance of the light source.
- (b) Area to be surveyed by cameras.
- (c) Sensitivity and spectral response of colour cameras.
- (d) Reflectance of the materials making up the majority of the surveyed area.
- (e) Time delay to reach the specified light output of the lamp after application of power.
- (f) The loss of light output of the lamp due to ageing and lamp failure.
- (g) The new or additional light source selected should give acceptable pictures under all likely working conditions.
- (h) Illumination over the scene being surveyed should be as even as possible avoiding any area of very low light illumination. The ratio of maximum to minimum illumination within the covered area of any scene should ideally be 4:1 or better.
- (i) Where possible, lights should be mounted so that they do not impair the camera picture quality. The preferred position for the light is above the camera. The camera should not view the scene through intense beams of light.
- (j) There should be safe and ready access to the lamps for bulb changing.
- (k) Particular attention should be paid to the direction of illumination. The aim is to produce a maximum of contrast for detection. An object can only be detected if its brightness is different to that of its background.
- (l) For identification and recognition purposes, illumination should enable detailed features of the object as stated in the operational requirement to be observed.
- (m) Constant illumination or quickly changing lighting conditions.
- (n) Static or transient highlights in a uniform picture.
- (o) Environmental influences on visibility like rain, etc.
- (p) Infra-red illuminators should preserve the minimum safety distance to prevent eye damage.

### 6.3. CCTV Signage

CCTV signage should be considered to be a safety orientated sign and used for crime risk and safety management purposes. The primary objective of the CCTV system is to enhance the perception of safety and a signage strategy is required to support camera placement and maximise the deterrence effect on criminal and anti-social activity. Therefore the importance of effectively placing CCTV signage in the surveillance area cannot be underestimated. Location, height and existing visual distractions are major factors which contribute to the effectiveness of a sign when installed.



Figure 5: Samples of CCTV Signage and Pole Mounting

In our view, the redeveloped Town Centres should be designated as a surveillance area with defined entrance/exit points via pathways and car parks. Persons entering these areas should be advised that CCTV Surveillance is in operation. The desired impact is two-fold, firstly to provide the perception of safety to legitimate users and secondly to influence positive behaviour by deterring criminal and anti-social activity. Criminal activity to be influenced includes stealing, car park crime, breaches of by laws for alcohol, antisocial behaviour and dog restrictions.

An alternative strategy is to utilise the same signage with consistent placement at all camera locations for easier and preferred recognition as people move through each of the areas. In our view, this approach is likely to provide a higher degree of recognition amongst the public, avoid uncertainty amongst area users and reinforce the collective precincts as being under surveillance.

Signage is a critical factor in the CCTV Operation's effectiveness on influencing behaviour and enhancing perceptions of safety within the public space. It is recommended that signs be erected at all formal or high traffic access points within the monitored area, for each camera location. Signs should be checked regularly for damage and theft.

As referred to in AS4806.1:2006, Part 11, signage at all CCTV system site entries (as a minimum) shall comply with the applicable Federal, State and Territory Privacy and Surveillance Legislation and shall comply with the requirements of AS 2342. For other examples and the display of multiple hazards, also refer to AS2416-2002.

It is important that CCTV signage be installed in positions which allow the best opportunity to capture the attention of pedestrians and thus improve safety and crime risk management, hence:

- Signs should be sited to promote easy readability, including for those who may be influenced by drugs or alcohol.
- Signs should be mounted as close as practical to an adult observer's line of sight. For a standing adult this will be approximately 5 degrees up or down from a point 1500mm above the ground level in front of the observer (approximately 1700mm above the ground).
- Care should be taken to ensure that signs are not placed close to unrelated secondary signage, such as general information signs, which may limit the ability for the information to be processed and understood. Furthermore, access signage should be located to encourage the public to read and recognise the sign and therefore be placed at consistent locations (e.g. at each side of laneway and car park entrances), where possible, for recognition purposes. Consideration may be given to ground level signs in or on pathways and pavements, depending on the aesthetics of the area and degree of risk assessed.
- Each Town Centre has defined vehicle entrance/exit points. A larger entrance sign at these locations stating the existence of CCTV surveillance in the area should be easily readable and advise motorists entering Town Centres.

## 7. CCTV System Technical Overview

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### 7.1. CCTV System Overview

The CCTV Feasibility Study has considered CCTV installations in and around the Town Centres of Byford, Mundijong, Jarrahdale and Serpentine, as presented in detail in Reports 2 - 5, respectively.

The design, installation, integration, management and operation of a medium, multi-site and expanding CCTV system requires consideration to key resourcing, installation and technical issues.

We herein present an overview of the CCTV system, as considered in terms of camera purpose and location and provide an outline of the entire system's technical considerations, which includes the following main components:

- Cameras and Mountings
- Network Configuration and Data Transmission
- Monitors and PTZ Controls
- Workstation Design and Capacity
- CCTV Management and Operating Systems
- Recording and Storage
- Data Access

Table 8: CCTV System Overview

Area	No. of Cameras	Camera Type	Mounting & Height	Head End Equipment Location/Options	Backbone Link Distance	Issues	Budget
Byford Existing Commercial Development (BECD)	16	PTZ/ Fixed	Poles 5 - 8m	Byford Hall	Local/8.9km	Refer BECD CPTED Recommendations 4, 10 & 14 Refer BECD Recommendations Lighting issues Cameras may be actively targeted for damage and theft	~\$240,000
Byford BMX Track	4	Portable/ PTZ/ Fixed	Existing Infrastructure/ Building 5 - 8m	Recreation Centre/Byford Hall	500m	Refer BMX Track Recommendations Lighting issues Cameras may be actively targeted for damage and theft Line of sight issues	~\$20,000
Mundijong Town Centre (MTC)	10	PTZ/ Fixed	Poles 5 - 8m	SoS-J Administration	N/A	Refer MTC CPTED Recommendations 11, 12 & 14 Refer MTC Recommendations Lighting issues Cameras may be actively targeted for damage and theft	~\$150,000
Mundijong Pavilion (MP)	4	Portable/ PTZ/ Fixed	Existing Infrastructure/ Building 5 - 8m	SoS-J Administration	500m	Refer MP CPTED Recommendations 2, 4 & 6 Refer MP Recommendations Lighting issues Cameras may be actively targeted for damage and theft Line of sight issues	~\$20,000
Jarrahdale Tavern (JT)	4	Portable/ Fixed	Poles 8m	Jarrahdale Tavern	8.2km	Refer JT Recommendations and Lighting issues Cameras may be actively targeted for damage and theft Line of sight issues	~\$20,000
Serpentine Town Centre	3	Portable/ PTZ/ Fixed	Poles/ Existing Infrastructure/ Building 6 - 8m	Clem Kentish Recreation Centre	Local/7.28km	Refer Serpentine Recommendations Lighting issues x 2 Line of sight issues	~\$15,000
<b>Total</b>	<b>41</b>						<b>~\$465,000</b>

\*Budget estimates not inclusive of head end equipment. Estimated figures based on \$15,000 per permanent camera and \$5,000 per portable camera.

Table 9: CCTV Project Costs Breakdown

Associated Costs Breakdown	Estimated Cost \$	Comments
Dedicated Fibre Infrastructure	\$150,000	Per Km
Wireless link equipment	\$150,000 – \$200,000 \$2,000 – \$15,000	Based on 41 local links from cameras and 4 backbone links to Council building Mundijong with additional link to Mundijong Police Station Per link pending distance and lines of sight
Back end servers and equipment	\$10,000 – \$40,000	Figures will differ during system expansion to multiple sites
Storage	\$8,000 – \$20,000	
UPS systems for control equipment	\$4,000 – \$15,000	
Licensing Fee for Microwave Link	\$4,000	Per annum
Rental Cost for Microwave Repeater	\$4,000	Per annum
Staff training	N/A	Should be included during commissioning
Local Control Room Infrastructure	\$20,000	
Local 24 hour monitoring Dayshift Component Nightshift Component	\$350,000 – \$400,000 \$3,000 – \$3,500 p/w \$3,500 – \$4,000 p/w	Per annum. Control Room trained employee should be paid at Level 3 security rates.
Outsourced 24 hour monitoring	\$350,000 – \$450,000	Per annum
<i>Local Thursday, Friday and Saturday night Monitoring</i> Employee Costs Activity Based Costing's including: <ul style="list-style-type: none"> <li>• Human Resources ad Payroll Service Fee</li> <li>• Information System Support</li> <li>• Building Rental</li> </ul>	\$50,000 - \$65,000 \$20,000 \$3,000 \$9,000 \$5,000	Per annum
Maintenance	Variable	3% of project cost per annum
Insurance	Variable	Subject to Broker Negotiation and Shire Profile
Contingency	Variable	10% of budget



Table 10: Summary of Initial and Ongoing Costs for Shire of Serpentine Jarrahdale CCTV Project

<b>Cost Summary</b>	<b>Cost</b>	<b>Comment</b>
Camera Equipment	\$465,000	Based on \$15,000 per permanent camera and pole, and \$5,000 per portable camera
CCTV Infrastructure and Head-End Equipment	\$263,000	Using wireless technology linking all cameras
Monitoring	\$105,000	Local monitoring on Thurs, Fri and Saturday nights
Contingency (Estimated)	\$70,000	Does not include monitoring
<b>Total initial Cost</b>	<b>\$894,000</b>	
<b>Ongoing Costs including 3 day monitoring</b>	<b>\$106,400</b>	<b>Per annum</b>

\*Costs developed using maximum values to allow for fluctuations in pricing

\*All costs are indicative and broadly estimated from previous projects only

## 7.2. Camera Locations, Mountings and Heights

### 7.2.1. Camera Selection Criteria

We refer to the five (5) essential selection criteria for the area selection of CCTV surveillance, as follows:

1. The police are willing and able to provide high priority response to the area;
2. A public survey reveals that CCTV in the area is welcomed by area users and will reduce the fear of crime or improve perceptions of safety in the area;
3. CCTV is being implemented as part of a broader crime prevention programme that includes situational crime prevention measures, in particular improved street lighting, social crime prevention measures such as activity mix and increased activity, and crime prevention through environmental design (e.g. landscaping for natural access control and few visual obstructions);
4. Funding is available either from the Council budget or from self-funding commercial operations; and
5. The surveillance must be legally permitted.

### 7.2.2. Camera Locations

Camera locations have been nominated to provide surveillance opportunities of high pedestrian or vehicle traffic areas, with supporting consideration given to area lighting, area usage, criminal activity and CPTED design principles. In addition, the selection of camera locations should be verified through consultation between major stakeholders which include police, rangers and land users.

Following installation, camera observations should be prescribed, documented or monitored as to how often a camera is or should be viewed or for scheduled panning by PTZ cameras. The PTZ operation of the camera may render the camera in a poor viewing position, subject to where it was last positioned and therefore may have a limited or ineffectual field of view until repositioned manually.

Should the camera remain unused for a predefined period, a home key function should be utilised on all PTZ cameras to automatically shift back to a pre-programmed position. This function is generically designed to avoid any activity being missed when the camera is not being monitored, however it should be noted that this may not be suitable for all cameras and will not be an option for fixed cameras.

### 7.2.3. Camera Mountings and Housings

Where alternative mounting options are not available, preference to dedicated camera pole mountings should be made. In our view, there are some alternative mounting options available for each of the Town Centres and otherwise hinged CCTV poles are preferred.

Pole mounted dome cameras should be atop the pole and designed for maximum resistance to theft, attack and vandalism.

Often, local governments mount cameras on street light poles with the view to saving costs. Unless the pole is purpose designed, this approach will most likely create image quality issues from pole shaking, even in light breezes and will increase maintenance and cleaning costs as camera access is limited.

During Town Centre redevelopments, the selection of suitable street lighting infrastructure, designed to withstand pole shaking, may be suitable for camera mounting and should be considered.

Camera mounts and housings should conform to the following criteria:

- Minimum rating of IP66 for complete protection against dust and jets of water
- Corrosion resistant

- Vandal Resistant with hardened body and reinforced glass

We have nominated CCTV pole mountings as preferred camera mounts, particularly in the absence of suitable public buildings and consideration to redevelopment plans. Importantly, CCTV poles should be in the form and design consistent with other street infrastructure to provide appropriate street aesthetics or integrated with purpose designed light poles. Cameras must be mounted low enough to obtain facial images for identification and recognition, as well as view beneath building awnings, bus shelters and have footings designed to eliminate pole movement. Cameras should be protected with heavy duty, dark domes so camera direction is not readily disclosed and must be tamper proof and tamper alarmed.

All cameras should be installed at a minimum height of 5000mm and in some areas we have nominated 8000mm to assist with vandal and theft resistance.

### 7.3. Camera Types and Image Quality

All public street surveillance PTZ Dome IP Cameras should conform with the following criteria:

- Rated IP65 or better for resistance to moisture and dust
- Day/Night operation with progressive scan preferred
- H.264 CODEC or MPEG4 minimum
- PTZ Operation unless Fixed with purpose or provided by wide angle lens
- Minimum 24 x Optical Zoom with 36 x Optical Zoom options, lighting dependent
- ONVIF compliant and interoperable with a range of Video Management Systems
- 24V AC Powered with POE option preferred.
- Power Surge and Lightning Protected
- Connected to local UPS unit with minimum 4 hours supply
- Connected via Layer 2 Switching
- UDP Streaming
- Record at a minimum resolution of 4CIF (704 x 576 TV Lines) at a rate of 10 frames per second.
- Multistream options

All public street cameras should provide image quality sufficient for use by police as evidence in court. We also refer to the WA CCTV Guidelines Technical Advice.

For critical systems, such as street surveillance, the temporary loss of picture frames should be considered unacceptable for police use. (Kruegle, H., 2007, CCTV Surveillance: Analogue and Digital video practices and technology, p. 217). When the video signal strength (S/N) is sufficiently low and synchronisation is lost, video frame 'lock-up' occurs and the last full frame transmitted may be displayed as a full frame, partial frame or none at all. Pixilation may also be caused by the temporary loss of the digital signal which will cause the loss of 'blocks' of images, or I Frames, causing the image to be absent and displaying an incomplete picture. If available bandwidth is exceeded on the network, the system can experience:

- Video artefacts (e.g. blocks)
- Frames may be dropped, making the video appear choppy
- Video resolution may drop from 4CIF to 2CIF or even CIF, making the picture appear less clear
- The video may freeze entirely and lose connection temporarily



### 7.3.1. Non-Permanent CCTV Considerations

#### CCTV Trailer Units

Due to the size of the Shire's District, the Shire of Serpentine Jarrahdale may consider a mobile CCTV Trailer Unit which may operate as a standalone unit or with wireless links to the Shire Office or Police Station.

A mobile unit would assist with special events and spiked activity in or around known hot spot locations.

A budget of between \$50,000.00 and \$90,000.00 should be allocated for a standalone trailer unit. Operating costs will be unit dependent and variable on usage. Leasing terms may also be available from some providers.

#### Portable Camera Units

The Shire of Serpentine Jarrahdale may also consider a number of portable camera units which may operate as portable video cameras or be linked to a viewing platform through an XG network via a 3G modem.

Portable units would assist with special events and spiked activity in or around known hot spot locations.

Cameras record digital still images and may be programmed in time lapse mode. Motion activated cameras and remote motion activated triggers may assist in capturing usable images. Cameras may be solar powered or powered from existing infrastructure. Colour cameras require sufficient lighting to operate, with a 500-1000 Watt security lamp recommended for each colour camera. Cameras contain standard CCTV camera housings rated at IP66 for protection against dust, salt and water.

A budget of between \$1,500.00 and \$5,000.00 should be allocated for each portable camera unit and \$39.00 and \$190.00 for a monthly network plan for XG network use. Operational costs involve time taken for temporary installation and checking footage and subject to frequency of use.

### 7.4. Network Configuration and Data Transmission

#### 7.4.1. Existing ICT Infrastructure

Fibregate Network is in use throughout Mundijong only with fibre connection to the Administration Building, Library and Operations Depot for data and communications. Current Communications and Server Room is at capacity with no further rack space available.

Wireless communication links are not used by the Shire however the Shire owns a Tower in Jarrahdale and has a link to a DEC Tower in Serpentine. The DEC tower does not have line of sight to Mundijong and the Jarrahdale Tower is at capacity.

The Shire of Serpentine Jarrahdale appears not to have the required communications and data storage infrastructure, both for wireless or fibre optic data transmission, to establish a centrally controlled and residual recording system.

It is anticipated that fibre optic cabling will be introduced to the Byford Town Centre as part of the town's redevelopment. Existing fibre runs in Byford include the Byford Hall and Recreation Centre.

With insufficient communications infrastructure, the Shire is best suited to standalone CCTV systems operating in Mundijong, Byford, Serpentine and Jarrahdale. Remote access to each system via the internet should be made available, with Mundijong and Byford most suitable for remote access. Each standalone system, as outlined, will record locally to a digital video recorder (DVR) or where possible, a networked video recorder (NVR).

#### 7.4.2. Monitoring

Consideration to space allocation and design should include a separate secure room to house a CCTV monitoring room.

On agreement with police, additional monitors should be installed in the Mundijong Police Station with options to control cameras and obtain recorded footage directly from the system, as discussed in Part 7.5.

Criteria for reviewing footage may also be developed when an incident occurs that includes a time versus cost equation. Should an incident be reported and the time not be known, this criteria may be used to identify how much time and resources should be spent reviewing footage. The implementation of more defined operations should overcome this requirement, such as the determination of select business closing times and programming cameras to adjust their fields of view accordingly.

The Shire of Serpentine Jarrahdale and Mundijong Police do not currently contain adequate resources for live monitoring of a CCTV system. Future Shire planning should consider the cost benefits of employing dedicated monitoring staff and/or utilising council Rangers to monitor the system during periods of high activity, such as Friday and Saturday nights.

#### 7.4.3. Communications

Housing localised Head End Equipment would be preferred at the Administration Building to reduce monitoring traffic over wireless, providing that monitoring will be done from this location.

The Shire of Serpentine Jarrahdale may require specifications for rack space needs, current and potential future, noting that server and storage rack space should be specified separately due to likelihood of this being integrated with existing hardware.

Initial cost estimations for Head End Equipment are outlined in Table 9 CCTV Project Costs Breakdown.

#### 7.4.4. Wireless Data Transmission

Suggested wireless link rollout options, pending technical verification, as shown in Figure 6, include;

1. Byford Hall to Mundijong Administration Centre (8.9km)
2. Jarrahdale Tavern to Mundijong Administration Centre (8.23km)
3. Clem Kentish Recreational Centre to Mundijong Administration Centre (7.3km)
4. Byford Hall (multipoint) to Byford Cameras
5. Mundijong Administration Centre (multipoint) to Mundijong Cameras
6. Jarrahdale Tavern (multipoint) to Jarrahdale Cameras
7. Clem Kentish Recreation Centre (multipoint) to Serpentine Cameras

#### 7.4.5. Multipoint Camera Systems

Microwave systems are used to connect the various remote camera stations back to a central location. Wireless equipment using the unlicensed 5.7Ghz and 5.4Ghz frequencies can be deployed in various locations to connect the remote cameras back to the local recording point.

Microwave equipment should have the capacity to connect the remote cameras to the local recording hub at speeds of up to 21Mbps duplex to enable high definition images to be captured continuously.

#### 7.4.6. Fibre Optic Networks

The Feasibility Study has not progressed to the development of schematic diagrams of the CCTV System cabling and camera locations. Conduit paths, fibre pits and final camera locations should be developed as part of the system specifications and design phase. CCTV System is dependent on the final camera location, the camera requirements and then engineered back to a head-end and if possible, a residual location. The CCTV Feasibility Study provides a thorough overview of the options available to allow focused design drawings and technical specifications to be developed in accordance with the scope of this project. However, Town Centre redevelopments should provide provisional conduit for the implementation of a fibre optics network for future CCTV installations and expansion.

The Optic Fibre backbone should consist of 12 and 24 core trunks (4 optic fibres per camera) laid throughout the surveillance area, with Roadside Termination Cabinets and power supply of 240 volt power from Main Switch Boards.

Fibre optic transmission cables for video and camera telemetry may be specified to be single mode fibre optic type with sacrificial nylon sheath compatible with connecting equipment. Fibre optic connectors must also be specified. Category 6 cabling may be specified for all UTP requirements.

Stressing of cables shall be minimised with the use of appropriate support, such as, cable trays, catenaries, enclosure cable management, and other strain relief measures. UPS and Surge Protection should be installed in any RTC Field Cabinets.

#### 7.4.7. CCTV Project Implementation

The Shire of Serpentine Jarrahdale has the following options in terms of CCTV System network configuration:

5. Install each Town Centre System independently and in isolation of each other, with local recording and storage;
6. Install each Town Centre System as part of an integrated, connected system with local recording and storage and live feeds, via wireless transmission back to Shire of Serpentine Jarrahdale Administration, Mundijong and Mundijong Police Station;
7. Install each Town Centre System as part of an integrated, connected system with local recording and storage and live feeds, via wireless transmission back to Shire of Serpentine Jarrahdale Administration, Mundijong for recording and storage and live feeds to Mundijong Police Station;
8. Install selected Town Centre Systems for integration and connection with both local recording and storage and live feeds, via wireless transmission back to Shire of Serpentine Jarrahdale Administration, Mundijong and Mundijong Police Station and remaining Town Centre Systems to be isolated and recording and storing locally.

Each network configuration option has considerable and related cost implications and system expansion considerations.

In addition, for the Mundijong and Byford Town Centres, a fibre optic network of cameras, is recommended. Cameras may be connected to head end and data storage equipment situated in the Shire of Serpentine Jarrahdale Administration Building, Mundijong with monitors and controls situated in the Community Services Office and monitors only, mounted in the Mundijong Police Station Radio Operators Room or other preferred location.



Figure 6: Future CCTV Wireless Data Transmission Paths

### 7.5. Monitors and PTZ Controls

Access to the CCTV System(s) images and storage should be made available in accordance with the existing management framework, namely via the Community Development Officer – Community Safety. Secondary live viewing, PTZ control and potentially direct access to police stations should also be considered.

Viewing and retrieving images will be required. It is preferable to have a dedicated Monitoring Room with the option of having direct access to existing workstations of nominated managers. Formal usernames and passwords should be established as soon as practicable to provide a record of system access and a user identifier for auditing purposes.

The Mundijong Police Station will have an existing CCTV Monitoring Area for lockup and station CCTV. Current practices are to install additional monitors for the public street CCTV System.

Police should also be provided with formal usernames and passwords to provide a record of system access and a user identifier for auditing purposes.

For Live Monitoring and Police Station Installations, the street surveillance system should use 40 inch wall mounted monitors, or nearest too. Street surveillance monitors should be set to view multiple cameras simultaneously.

Viewing workstations should have a dedicated CCTV monitor, PTZ Control Units, keyboard, telephone, area map and camera location maps and contact telephone list.

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The Shire of Serpentine Jarrahdale and Police may need to consider the allocation of an Administration Officer to handle police officer requests for footage, as police may lack the resources to retrieve footage themselves. The timeframe following an incident is likely to vary, and other public installations have a tendency for incidents to be reported on Monday or Tuesday for incidents which occurred over the previous weekend. A common issue which arises concerning incident reports is the open time frame of when the incident is known to have occurred, namely "sometime over the weekend", resulting in 48 hours worth of footage required to be reviewed in order to identify any relevant footage. The implementation of scheduled FOVs will assist to determine the likely camera number and footage quality before footage is searched.

When retrieving footage, the VMS provides two formats, one is a proprietary source file and a converted open source file (.AVI). We recommend the WA Police retrieve both file formats for all cases where footage is being obtained for the purposes of obtaining evidence. We refer to Part 7.2 of the CCTV Management and Operations Manual pertaining to Continuity of Evidence. We recommend a formal Release Form, as per Part 9 of the CCTV Management and Operations Manual be introduced and WA Police provide copies of all completed forms to the Shire of Serpentine Jarrahdale on an agreed basis, either weekly, fortnightly or monthly.

## 7.6. Workstation Design and Capacity

The Shire of Serpentine Jarrahdale should prefer to implement a dedicated CCTV Monitoring Room conducive to a sustained period of live system monitoring. We refer to Part 7.9 of the CCTV Management and Operations Manual pertaining to designated surveillance areas. Consideration to a dedicated monitoring room or integrating live monitoring with police radio operations should be made.

A CCTV monitor installed in the Mundijong Police Radio Operations Room may assist radio operators report street activity when relevant or required urgently.

### 7.6.1. Training and Licensing

We refer to Part 7.5 the CCTV Management and Operations Manual to provide advice and requirements for training and licensing of personnel monitoring the CCTV System live.

## 7.7. Video Management System

The CCTV Operating System will require a Video Management System (VMS). VMS's may be in the form of proprietary systems or open platform systems.

Tender specifications should include a minimum of 5 days training to be provided for CCTV Operations and use of the selected VMS. A record or register of attendance should be retained.

The Shire uses EMC Virtual Servers running Windows XP operating systems (OS) on desktops. Windows 7 OS will be rolled out in 2012. System requirement and specifications should include an open platform ONVIF Compliant VMS.

## 7.8. Recording and Storage

The CCTV System will be required to stream live images and record images at 4CIF at 25ips and retained for 30 days minimum. The number of cameras, resolution and images per second (ips) to be installed will significantly impacts on storage capacity and requirements. We have provided indicative storage calculations for 41 cameras, recordings at 4CIF Resolution at 10 and 25 images per second, as shown in Tables 11 and 12.

There are now specific requirements for the storage and disposal of CCTV footage, depending on it's context. We refer to Page 128 of the *Fully Revised General Disposal Authority for Local Government Records RD 2010046 – 2010*, available at <http://www.sro.wa.gov.au/documents/GDALG-RD2010046-FINAL.pdf> or from the homepage of the SRO.

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A summary is as follows:

Description of CCTV Record	Minimum Retention Period
Footage taken from fixed cameras around public open spaces and public access areas	30 days
Footage taken by mobile cameras or car-based cameras	7 days
Footage taken from fixed cameras around local government buildings and assets with staff in attendance on a regular basis	7 days

Where footage is REQUIRED for **investigations and / or court proceedings** it is recommended to be kept for a minimum of 7 years.

### Storage calculations

Table 11: Storage Calculations for 4CIF 10ips

Camera Stream	H.264
Resolution	4CIF (704 x 480)
Image Quality	High
Average Frame Size	6KB
Number of Cameras	41
Frame Rate per Camera	10 (minimum)
Image Retention	30 days (minimum)
Bandwidth	40Mbps (520Kbps per camera)
Estimated Storage	10 TB

Table 12: Storage Calculations for 4CIF 25ips

Camera Stream	H.264
Resolution	4CIF (704 x 480)
Image Quality	High
Average Frame Size	5KB
Number of Cameras	41
Frame Rate per Camera	25 (preferred)
Image Retention	30 days (minimum)
Bandwidth	100Mbps (1.3Mbps per camera)
Estimated Storage	20 TB

### 7.9. Data Access

Following installation or use of a CCTV the Shire of Serpentine Jarrahdale will receive requests from Police to retrieve CCTV footage, however, police may be provided direct access to the system and retrieve footage directly. Protocols for the sharing of information between WA Police and the Shire of Serpentine Jarrahdale should include advising how often police are accessing the system or retrieving footage.

We advise the Shire of Serpentine Jarrahdale should implement authorised access logs to control who has access to the system. Access procedures and records should be appropriately kept through the use of Access logs and Audit reports.

## 7.10. System Growth and Capacity of Surveillance System

The CCTV Feasibility Report, detailed herein provides for continued system growth and should avoid over-reach of system capacity, in particular concerning storage insufficiencies and image quality issues. Newly installed CCTV systems should be functioning according to required specifications before the system is expanded further.

An asset register should be maintained, as provided by the CCTV Management and Operations Spreadsheet, to monitor camera information, including value and depreciation, and anticipated life cycles to allow future budgetary considerations for system maintenance and equipment replacement.

## 7.11. Supply and Installation Tender Deliverables

CCTV Tender documents should require the contractor to provide the following documentation both on CD and in two bound hardcopies, prior to practical completion:

1. System operation manuals suitable for training purposes;
2. Equipment operator manuals;
3. Manufacturer installation manuals;
4. Asset schedule containing make, model, serial number;
5. Configuration settings and installed location;
6. As constructed drawings;
7. Laminated contact listing for remedial maintenance;
8. Warranty registrations; and
9. All software licences.

## 7.12. CCTV System Comparisons and Contrasts

The Shire of Serpentine Jarrahdale may consider other regional town centre CCTV installations operating in Western Australia.

The City of Greater Geraldton CCTV System may be considered one of the leading public street surveillance systems. As of January 2011, based on the number of cameras, the Geraldton 33 Camera CCTV System is the largest regional public CCTV System, exceeding Bunbury and Albany.

In contrast to metropolitan systems, the City of Greater Geraldton CCTV system exceeds Armadale, Fremantle, Joondalup and Wanneroo. Capital Cities such as Melbourne and Adelaide consist of only 23 and 52 cameras, respectively (as at 2010).

The City of Greater Geraldton CCTV system was funded via Federal and State Government grants in the total sum of \$1.25 million. Additional funding of \$108,000 was received for an expansion of three (3) cameras and the City invested \$60,000 in ICT infrastructure to support the system. The City maintains a budget of \$6,000 per annum for camera cleaning. Cleaning costs of \$360-\$375.00 per month were increased to per fortnight to ensure cameras were maintained in a clean state for improved and consistent image quality. Should further funding be required, the City of Geraldton has considered campaigning to local businesses to assist with the CCTV system and operations; however this approach has not been required to date.

The Shire of Waroona installed a number of cameras in 2006 to target public places in the CBD. The Community Safety and Crime Prevention Plan Review 2011-2012 (pg11-12) outlines the positive effect CCTV has had on antisocial behavior and other offences in these areas. The Shire acknowledges with improvements in technology, the system will require an upgrade to adhere to current standards, including system expansion and a more user friendly interface.

The Community Safety and Crime Prevention Plan Review 2011-2012 (pg11-12) shows incidents of damage in the Waroona town site almost doubled between 2008 and 2009 with graffiti and related vandalism concentrated in areas not containing CCTV. A significant reduction of incidents (almost zero) was observed within areas containing CCTV surveillance. Despite continued maintenance, the Shire of Waroona has identified that the absence of new technology will inherently reduce the effectiveness of the CCTV system.

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Monitored public systems include Perth, Fremantle and Bunbury. The City of Bunbury operates 21 cameras within the CBD. The Bunbury CCTV system is monitored from Thursday to Sunday evenings. The City of Bunbury reported spending an estimated \$250,000 on CCTV infrastructure with an annual maintenance cost provided of \$15,000. The Bunbury “City Eye” project budget was \$25,000 for 11 months monitoring (As at August 2008).

### 7.13. Audit and Continuous Improvement

Accountability and external review can include a complaints procedure, street signage that alerts the public to the presence of surveillance, audit committees and publication of codes of conduct and policy.

The impact of the CCTV system should be monitored over time, in terms of community safety, crime rates and fear of crime. A crime impact evaluation should include:

- benchmark crime statistics for the monitored area and adjacent areas for the 12 months leading up to installation time.
- crime statistics for the monitored area and adjacent areas for at least 12 months after installation, to compare and contrast any changes.
- data on incidents where a response was initiated and no official intervention was required (to capture other incidents other than those that would generate official crime statistics).



## Refer to Related

### Crime Risk Assessment, CPTED-Lighting Audit & CCTV Potential Camera Locations

- Part 2 of 5 Byford
- Part 3 of 5 Mundijong
- Part 4 of 5 Jarrahdale
- Part 5 of 5 Serpentine

## 8. Consultant & Report Sign Off

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*BSc(Sec)*

**Approved for issue.**

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**Chris Cubbage, Director**

13 March 2012

### **CONSULTANT PROFILE**

#### **AMLEC HOUSE PTY. LTD.**

Amlec House Pty. Limited, incorporated 2004, is an independent security, risk and investigation management consultancy. Client profiles include multinationals, public companies, state and local government, industry, retail, tourism and education organisations. Consultants specialise in security auditing, security management planning, community and corporate risk assessments, investigations, intelligence collection and associated technology applications. Amlec House is a preferred supplier of Security and CCTV Consulting to the WA Local Government Association (WALGA) and has an International and Australian expert advisory board.

#### **CHRISTOPHER CUBBAGE**

Chris is an established independent security professional with over 20 years experience and a passion for the Australian Security Industry. Chris has previously held positions with WA Police, Australian Crime Commission, Edith Cowan University and is a Director of Amlec House Pty. Limited and My Security Media Pty. Limited. Chris' qualifications and accreditations include:

- Executive Editor *Australian Security Magazine*
- Author of *Security Risk Management in Corporate Governance*, LAP, 2009
- Bachelor of Science (Security) Honours
- Australian Institute of Company Directors Diploma (GAICD)
- Advanced Diploma of Business Management
- Diploma of Criminal Investigation
- Diploma of Policing
- CPPSEC2023A Install CCTV Equipment and Systems
- CPPSEC20307 CCTV Design and Construct

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## 9. Annexure 1 – Audit Recommendations Ranked

### 9.1. Crime Prevention Through Environmental Design Recommendations

Table 13: Recommendation Implementation Key

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 1 – Crime Prevention Through Environmental Design (CPTED)</b>            Consideration should be given to undertaking a Designing Out Crime Awareness Workshop to raise awareness and understating of CPTED amongst Shire officers and community stakeholders. The workshop should provide a basic introduction to the essential concepts and principles of CPTED for local government representatives and operational officers. The training should also seek to give attendees a basic understanding of the capabilities and limitations of both CPTED and CCTV technology, and cover the basic knowledge of the planning considerations essential for the implementation of CPTED, including crime elements, risk assessments, objective setting and committee structure.</p>	1	B	High	C
<p><b>Recommendation 2 – Crime Prevention Through Environmental Design (CPTED)</b>            A program is required targeting local youths to identify youths at risk of offending and provide support to re-direct behaviour and opportunity.</p>	2	C	High	C
<p><b>Recommendation 3 – Crime Prevention Through Environmental Design (CPTED)</b>            The Shire of Serpentine Jarrahdale should adequately define “suitably qualified professional” in the Designing Out Crime ‘toolbox’. The definition should include a professionally qualified, licensed, experienced and independent security and CPTED consultant engaged by the developer.</p>	1	A	Low	C
<p><b>Recommendation 4 – Crime Prevention Through Environmental Design (CPTED)</b>            Greater consideration should be given to CPTED principles throughout planning stages and plans should be consistently reviewed during this process.</p>	1	A	Moderate	C

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 5 – Crime Prevention Through Environmental Design (CPTED)</b></p> <p>The proposed Byford Town Centre development, as discussed in Part 1.1, Report 2, provides limited pedestrian flows from car parks through the Town Centre and contains small laneways facilitating numerous blind corners reducing natural surveillance and community safety perceptions. Revised development plans should design out these CPTED related issues and ensure CPTED strategies are given adequate priority in concept plans.</p> <p>Consideration should be given to pedestrian pathways and pedestrian flows to enhance connection of adjacent areas and increase clear sight lines throughout the town centres to assist with police and ranger patrols and improve perceptions of safety.</p>	2	A	Moderate	C
<p><b>Recommendation 6 – Crime Prevention Through Environmental Design (CPTED)</b></p> <p>General maintenance of roads, pathways, car parks and other publicly accessible areas is required to significantly enhance town centre aesthetics and remove or reduce the opportunity for vandalism and other illegitimate activity, often facilitated by loose debris (brick paving, litter), natural ladders and poorly illuminated ‘dead zones’ containing limited natural surveillance. The Shire should consider maintenance schedules of street foliage and vegetation, specifically adjacent facility entrances, street corners and pedestrian pathways to increase natural surveillance (decreasing blind corners or improving lines of sight), community safety and perceptions of safety. Tree canopy heights should be raised to a minimum height of 3.0 meters and ground vegetation kept to a maximum of 0.5 metres in pedestrian areas to maintain clear sight lines throughout the Shire. For specific area maintenance issues refer Reports 2-5.</p>	2	B	Moderate	C

## 9.2. Lighting Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 1 – Lighting Overview</b> Improve area illumination of car parks and other peripheral sites throughout the Byford Town Centre, specifically prior to CCTV installation. Refer Report 2 Section 3 Byford Lighting Audit.</p>	3	C	Moderate	L
<p><b>Recommendation 2 – Lighting Overview</b> Improve area illumination throughout Mundijong, specifically Linear Park, the Pavilion and Butcher Street adjacent the Depot to provide a balanced lighting level enhancing image quality of proposed camera installations. Refer Report 3 Section 3 Mundijong Lighting Audit.</p>	3	C	Moderate	L
<p><b>Recommendation 3 - Lighting Overview</b> Improve area illumination at Jarrahdale Tavern, specifically prior to CCTV installation. Refer Report 4 Section 3 Jarrahdale Lighting Audit.</p>	3	C	Moderate	L
<p><b>Recommendation 4 - Lighting Overview</b> Improve area illumination throughout Serpentine, specifically at car parks and licensed premises to enhance image quality of proposed camera installations. Refer Report 5 Section 3 Serpentine Lighting Audit.</p>	3	C	Moderate	L
<p><b>Recommendation 5 – Lighting Overview</b> Lighting systems throughout the Shire of Serpentine Jarrahdale require improvement as they provide isolated dark areas and do not support the implementation of a CCTV strategy. Unbalanced lighting throughout the Shire will impede image quality of CCTV installations. The Shire should consider an overall lighting strategy when implementing a CCTV strategy, as image quality increases when white light is located adjacent or at the rear of the camera. Image quality decreases with yellow light (Sodium), poor area illumination and lighting directed towards the camera. In addition, enhanced area illumination has a strong crime prevention role to further support the surveillance strategy. In our view, a lighting upgrade to use Compact Fluorescent or MH lamps within Town Centres, designed to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions.</p>	3	C	Moderate	L

### 9.3. Byford Existing Commercial Development Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<b>Recommendation 1 – Byford Existing Commercial Development</b> Ensure public and private construction works are appropriately controlled to reduce the opportunity for loose bricks and other debris to be used for vandalism and other illegitimate activity while improving aesthetics in the area.	1	A	High	M
<b>Recommendation 2 - Byford Existing Commercial Development</b> Resurface uneven and damaged car parks and driveways located in the Existing Commercial Development to increase vehicle and pedestrian safety. Implement parking bay lines and directional marking to car parks to guide vehicle movement through the area.	3	C	Low	C
<b>Recommendation 3 - Byford Existing Commercial Development</b> Removal of out dated signage, as referred to at Figure 30, Report 2, will improve the perception of area maintenance, public ownership and aesthetics in the area.	1	A	Low	M
<b>Recommendation 4 - Byford Existing Commercial Development</b> Redesign bus shelters throughout the Shire of Serpentine Jarrahdale to provide clear sight lines and enhance natural surveillance and community safety perceptions. Sample bus shelter designs are shown in Report 2, Part 2, Figures 67 and 68.	3	C	Low	C
<b>Recommendation 5 - Byford Existing Commercial Development</b> Rectify damaged street signage located at South Western Highway, Clifton Street and George Street. Well maintained areas can enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.	2	B	Low	M
<b>Recommendation 6 - Byford Existing Commercial Development</b> Graffiti was observed on bins and bus shelters located on South Western Highway. Ensure reporting and maintenance, and monitor trends for police attention and covert/interim surveillance, if required.	1	A	Low	M
<b>Recommendation 7 - Byford Existing Commercial Development</b> Rectify uneven brick paving on South Western Highway to increase pedestrian safety.	3	C	Low	M
<b>Recommendation 8 - Byford Existing Commercial Development</b> Relocate Sulo bins situated adjacent the bowling greens to reduce the opportunity for unlawful access over the perimeter fence.	1	A	Moderate	C

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 9 - Byford Existing Commercial Development</b></p> <p>Ensure tree pruning and vegetation maintenance, specifically adjacent facility entrances and street corners to enhance natural surveillance, community safety and perceptions of safety. Canopy heights should be raised to a minimum of 3.0 meters and vegetation kept to a maximum of 0.5 meters in pedestrian areas, to maintain clear sight lines.</p>	1	A	Moderate	M
<p><b>Recommendation 10 - Byford Existing Commercial Development</b></p> <p>Ensure all laneways in the proposed Town Centre are of sufficient width and provided with sufficient illumination to enhance pedestrian use and safety perceptions.</p>	3	C	Moderate	C
<p><b>Recommendation 11 - Byford Existing Commercial Development</b></p> <p>Rectify damaged bollards located at the Byford Village Shopping Centre. Well maintained areas can enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.</p>	2	B	Low	M
<p><b>Recommendation 12 - Byford Existing Commercial Development</b></p> <p>Rectify damaged signage, such as the Fruit and Vegetable signage and Fish and Chips shop signage, at the Byford Village Shopping Centre to enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.</p>	1	A	Low	M
<p><b>Recommendation 13 – Byford Existing Commercial Development</b></p> <p>Remove loose shopping trolleys and ensure collection times are sufficient to reduce the opportunity for vandalism and other illegitimate activity.</p>	1	A	High	M
<p><b>Recommendation 14 – Byford Existing Commercial Development</b></p> <p>Ensure blind corners and small laneways are avoided and area maintenance improved during shopping centre redevelopment works to enhance community safety perceptions. The Shire may also consider the use of portable CCTV cameras and request patrols from local police and rangers to provide a deterrent in hot spot locations.</p>	2	C	Moderate	C
<p><b>Recommendation 15 - Byford Existing Commercial Development</b></p> <p>Remove loose rocks (see Figure 49) located adjacent Byford Tavern to reduce the opportunity for vandalism and serious assault adjacent the licensed premises.</p>	1	A	High	M

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 16 - Byford Existing Commercial Development</b></p> <p>Rectify lamps not operating in the Existing Commercial Development. Refer Part 2 Section 3.2 Table 1 Lighting Systems for the Existing Commercial Development. In our view, a lighting upgrade to Category P6 lighting (21 Lux) using Compact Fluorescent or MH lamps to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions. Secondary streets should be sufficiently illuminated to enhance community safety perceptions for pedestrians returning home during the hours of darkness.</p>	3	C	Moderate	L
<p><b>Recommendation 17 - Byford Existing Commercial Development</b></p> <p>Lighting in car parks should be balanced to a minimum of 20 lux and to 60 lux preferred, to ensure all car parks are sufficiently and consistently illuminated, in particular to reduce vehicle crime and crime displacement.</p>	2	C	Moderate	L



#### 9.4. BMX Track Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 1 – BMX Track</b></p> <p>Ensure tree pruning and vegetation maintenance, specifically adjacent the entrance pathways to enhance natural surveillance. Clear lines of sight should be developed from the car park to the entrance doors to increase community safety perceptions.</p>	1	A	Low	M
<p><b>Recommendation 2 – BMX Track</b></p> <p>Graffiti was observed at the Western side of the BMX track. Ensure reporting and maintenance, and monitor trends for police attention and covert/interim surveillance, if required.</p>	1	A	Low	M
<p><b>Recommendation 3 – BMX Track</b></p> <p>Relocate the starting area of the BMX track to adjacent the Recreation Centre to increase natural surveillance of youths congregating in the area.</p>	3	C	Low	C
<p><b>Recommendation 4 – BMX Track</b></p> <p>Rectify damaged rubbish bins located at the ablution block and fencing located adjacent Briggs Park Reserve. Well maintained areas can enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.</p>	1	A	Low	M
<p><b>Recommendation 5 – BMX Track</b></p> <p>Rectify lamps not operating at the Recreation Centre. Refer Part 2 Section 3.3 Table 2 Lighting Systems for Serpentine Jarrahdale Community Recreation Centre. In our view, a lighting upgrade to Category P6 lighting (21 Lux) using Compact Fluorescent or MH lamps to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions. The implementation of motion activated lighting at the ablution block and start line of the BMX track will enhance natural surveillance and assist police and ranger patrols.</p>	3	C	Moderate	L
<p><b>Recommendation 6 - BMX Track</b></p> <p>Lighting in car parks should be balanced to a minimum of 20 lux and to 60 lux preferred, to ensure all car parks are sufficiently and consistently illuminated, in particular to reduce crime displacement.</p>	2	C	Moderate	L

## 9.5. Mundijong Town Centre Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 1 – Mundijong Town Centre</b> Rectify street signage and heritage signage located at the corner of Mundijong Road and Paterson Street. Well maintained areas can enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.</p>	2	B	Low	M
<p><b>Recommendation 2 - Mundijong Town Centre</b> Graffiti and litter were observed throughout the Town Centre. Ensure reporting and maintenance, and monitor trends for police attention and covert/interim surveillance, if required.</p>	1	A	Low	M
<p><b>Recommendation 3 – Mundijong Town Centre</b> Resurface and widen pedestrian pathways to increase safety and perceptions of safety throughout the Town Centre and enhance natural surveillance through pedestrian thoroughfares.</p>	3	C	Low	M
<p><b>Recommendation 4 – Mundijong Town Centre</b> Longer term consideration can be given to the resurfacing of driveways and car parks throughout the Town Centre to enhance a sense of ownership for the community and increase vehicle safety.</p>	3	C	Low	M
<p><b>Recommendation 5 – Mundijong Town Centre</b> Implement parking bay and directional line markings in car parks to direct vehicles through the area and increase vehicle/pedestrian safety.</p>	2	A	Low	C
<p><b>Recommendation 6 – Mundijong Town Centre</b> Support the implementation of activity generators at Linear Park with adjacent parking bays to enhance natural surveillance and community safety perceptions while encouraging a sense of ownership and pride for the community.</p>	3	C	Low	C
<p><b>Recommendation 7 – Mundijong Town Centre</b> Rectify broken curbing located adjacent the Community Resource Centre.</p>	1	A	Moderate	M

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 8 – Mundijong Town Centre</b> Review collection and maintenance procedures for ‘Good Sammy’ bins to limit times loose items are left adjacent.</p>	1	A	Low	M
<p><b>Recommendation 9 – Mundijong Town Centre</b> Consideration should be given to the installation of transparent windows at the IGA store to increase natural surveillance of the car park and petrol pumps. CCTV system should be registered with Blue Iris and ensure images are of sufficient quality to be of use to police.</p>	2	C	Low	C
<p><b>Recommendation 10 – Mundijong Town Centre</b> Ensure consistent maintenance of foliage and vegetation, specifically adjacent pedestrian pathways, car parks and entrance doors to reduce shaded dark areas and increase natural surveillance and community safety perceptions.</p>	1	A	Low	M
<p><b>Recommendation 11 – Mundijong Town Centre</b> During redevelopment works of the Paterson Street commercial precinct, the Shire of Serpentine Jarrahdale should ensure a single connected development with evident pedestrian flows encouraging movement through the precinct enhancing natural surveillance and assisting in ranger and police patrols. Pathways should connect throughout the town centre using consistent surfaces and widths.</p>	3	C	Low	C
<p><b>Recommendation 12 – Mundijong Town Centre</b> Consideration should be given to relocating the public telephone box to a higher traffic area enhancing natural surveillance and community safety perceptions.</p>	2	B	Low	C
<p><b>Recommendation 13 - Mundijong Town Centre</b> Rectify drink fountain located adjacent Paterson Street. Well maintained areas can enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.</p>	1	A	Low	M
<p><b>Recommendation 14 - Mundijong Town Centre</b> Redesign bus shelters throughout the Shire of Serpentine Jarrahdale to provide clear sightlines and enhance natural surveillance and community safety perceptions. Sample bus shelter designs are shown in Part 3 Figures 65 and 66.</p>	3	C	Low	C

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 15 – Mundijong Town Centre</b> Ensure consistent maintenance of vacant areas throughout the Town Centre to deter illegitimate activity and enhance a sense of ownership for the community and encourage community pride.</p>	1	A	Low	M
<p><b>Recommendation 16 – Mundijong Town Centre</b> Rectify lamps not operating in the Town Centre. Refer Part 3 Section 3.2 Table 1 Lighting Systems for Mundijong Town Centre. In our view, a lighting upgrade to Category P6 lighting (21 Lux) using Compact Fluorescent or MH lamps to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions. Secondary streets should be sufficiently illuminated to enhance community safety perceptions for pedestrians returning home during the hours of darkness.</p>	3	C	Moderate	L
<p><b>Recommendation 17 – Mundijong Town Centre</b> Lighting in car parks should be balanced to a minimum of 20 lux and to 60 lux preferred, to ensure all car parks are sufficiently and consistently illuminated, in particular to reduce crime displacement.</p>	2	C	Moderate	L

## 9.6. Mundijong Pavilion Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<b>Recommendation 1 – Mundijong Pavilion</b> Rectify or improve signage located at the entrance to the pavilion to provide a sense of area ownership and pride.	2	A	Low	M
<b>Recommendation 2 – Mundijong Pavilion</b> Consideration can be given to the removal of visual obstacles throughout the car park to improve sightlines in the area and resurfacing car park. Relocating parking bays to adjacent the pavilion will increase natural surveillance and community safety perceptions.	3	C	Low	C
<b>Recommendation 3 – Mundijong Pavilion</b> Ensure incomplete maintenance works are sufficiently arranged to reduce the opportunity for vandalism and other illegitimate activity.	1	A	Low	M
<b>Recommendation 4 – Mundijong Pavilion</b> Consideration should be given to relocating the playground to a higher traffic area adjacent the oval to enhance natural surveillance and community safety perceptions.	2	C	Moderate	C
<b>Recommendation 5 – Mundijong Pavilion</b> Remove wooden stake adjacent to playground (see Figure 75) and ensure consistent maintenance to enhance safety and perceptions of safety.	1	A	Moderate	M
<b>Recommendation 6 – Mundijong Pavilion</b> Longer term consideration can be given to relocating the ablution block, located immediately west of the pavilion, to enhance natural surveillance and community safety perceptions when entering the facility.	3	C	Low	C
<b>Recommendation 7 – Mundijong Pavilion</b> Better use of space at the skate park and upgrade of facilities can encourage activity in the area and increase natural surveillance and community safety perceptions.	3	C	Low	C
<b>Recommendation 8 – Mundijong Pavilion</b> Relocate and redesign skate park signage to provide a single integrated entrance statement to enhance a sense of ownership for local youths and reduce opportunity for vandalism.	2	A	Low	C

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 9 – Mundijong Pavilion</b></p> <p>Rectify lamps not operating in the Pavilion. Refer Part 3 Section 3.3 Table 2 Lighting Systems for the Pavilion. Lighting in car parks should be balanced to a minimum of 20 lux and to 60 lux preferred, to ensure all car parks are sufficiently and consistently illuminated, in particular to reduce crime displacement.</p>	2	C	Moderate	L
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## 9.7. Mundijong Depot Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 1 – Mundijong Depot</b> Remove loose street signage from public view at the depot to deter potential offenders from accessing the site.</p>	1	A	Low	C
<p><b>Recommendation 2 – Mundijong Depot</b> Consideration should be given to the installation of motion activated lighting located at the depot to deter potential offenders from accessing the facility and assist in ranger and police patrols by identifying movement in specific areas.</p>	1	C	Moderate	L
<p><b>Recommendation 3 – Mundijong Depot</b> Ensure consistent maintenance of perimeter fencing and removal of climbing debris located adjacent to deter potential offenders from accessing the site. Consideration should be given to monitoring trends of illegitimate access points for police attention and covert/interim surveillance, if required.</p>	1	A	Moderate	M
<p><b>Recommendation 4 - Mundijong Depot</b> Consideration should be given to the purpose and use of laneways located adjacent perimeter fencing. The laneways should be phased out should area development occur.</p>	1	B	Low	C
<p><b>Recommendation 5 - Mundijong Depot</b> In our view, a lighting upgrade to Category P6 lighting (21 Lux) using Compact Fluorescent or MH lamps to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions. Secondary streets should be sufficiently illuminated to enhance community safety perceptions for pedestrians returning home during the hours of darkness.</p>	3	C	Moderate	L

## 9.8. Jarrahdale Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<b>Recommendation 1 - Jarrahdale</b> Resurface and widen the pedestrian pathway located adjacent Jarrahdale Road to increase safety and perceptions of safety.	3	C	Low	M
<b>Recommendation 2 - Jarrahdale</b> Rectify broken fence located at the Anglican Church to clearly delineate between public and private property and enhance a sense of ownership for the community and encourage community pride.	1	A	Low	M
<b>Recommendation 3 - Jarrahdale</b> Rectify damaged signage located throughout the audit area.	2	B	Low	M
<b>Recommendation 4 - Jarrahdale</b> Remove loose rocks located at the starting point to the heritage walk and adjacent the Jarrahdale Tavern to reduce the opportunity for vandalism, serious assault and other illegitimate activity.	1	A	High	M
<b>Recommendation 5 - Jarrahdale</b> Ensure temporary signage is maintained and removed when necessary to reduce the opportunity for vandalism and other illegitimate activity. Remove star picket (see Figure 20) located at the front of Jarrahdale Tavern adjacent Jarrahdale Road.	1	A	Moderate	M
<b>Recommendation 6 - Jarrahdale</b> Ensure consistent maintenance of foliage and vegetation adjacent Jarrahdale Tavern to increase natural surveillance and illumination in the area. Well maintained areas can enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.	1	A	Low	M
<b>Recommendation 7 - Jarrahdale</b> Lighting in car parks should be balanced to a minimum of 20 lux and to 60 lux preferred, to ensure all car parks are sufficiently and consistently illuminated, in particular to reduce crime displacement.	2	C	Moderate	L
<b>Recommendation 8 - Jarrahdale</b> In our view, a lighting upgrade to use Compact Fluorescent or MH lamps to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions.	3	C	Moderate	L

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### 9.9. Serpentine Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 1 – Serpentine</b> Resurface uneven and damaged car parks and driveways located in the Town Centre to increase vehicle and pedestrian safety.</p>	3	C	Low	M
<p><b>Recommendation 2 – Serpentine</b> Ensure consistent maintenance of foliage and vegetation throughout the Town Centre to enhance natural surveillance, community safety and perceptions of safety. Canopy heights should be raised to a minimum of 3.0 meters and vegetation kept to a maximum of 0.5 meters, in pedestrian areas, to maintain clear sightlines.</p>	1	A	Low	M
<p><b>Recommendation 3 – Serpentine</b> Relocate Memorial Gardens sign and dedication plaque to a higher traffic area and ensure consistent maintenance of adjacent foliage to provide a clear entrance statement for the community. Rectify Memorial Gardens signage to enhance a sense of ownership for the community and encourage community pride.</p>	2	A	Low	C
<p><b>Recommendation 4 – Serpentine</b> Widen and repave pedestrian pathway located adjacent Recreation Centre car park and ensure consistent maintenance of adjacent foliage to enhance natural surveillance, community safety and perceptions of safety.</p>	3	C	Low	M
<p><b>Recommendation 5 – Serpentine</b> Remove climbing debris located adjacent fencing to deter potential offenders from scaling the fence.</p>	1	A	Low	C
<p><b>Recommendation 6 – Serpentine</b> Repave pedestrian pathways and brick paving located adjacent Wellard Street to improve aesthetics in the area and enhance a sense of ownership and pride for the community. Utilising consistent materials and straight pedestrian movement lines at pedestrian crossings will increase connection throughout the Town Centre.</p>	3	C	Low	M
<p><b>Recommendation 7 – Serpentine</b> Rectify or replace bus stop, numbered 22413, to enhance a sense of ownership for the community and encourage community pride.</p>	1	A	Low	M

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	CPTED
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Lighting

<p><b>Recommendation 8 – Serpentine</b> Ensure consistent maintenance of car park areas adjacent Wellard Street. Well maintained areas can enhance a sense of ownership for the community and increase crime prevention and community safety perceptions.</p>	1	A	Low	M
<p><b>Recommendation 9 – Serpentine</b> Rectify damaged brick wall surrounding the garden bed adjacent the bottle shop to reduce the opportunity for vandalism and other illegitimate activity.</p>	1	A	High	M
<p><b>Recommendation 10 – Serpentine</b> Relocate public phone box to a higher traffic area to increase natural surveillance and community safety perceptions.</p>	2	B	Low	C
<p><b>Recommendation 11 – Serpentine</b> Rectify damaged street signage located at the corner of Wellard Street and Richardson Street to enhance a sense of ownership for the community and encourage community pride.</p>	2	A	Low	M
<p><b>Recommendation 12 – Serpentine</b> Rectify lamps not operating in the Town Centre. Refer Part 5 Section 3.1 Table 1 Lighting Systems for Serpentine. In our view, a lighting upgrade to Category P6 lighting (21 Lux) using Compact Fluorescent or MH lamps to emit a brighter white light will significantly enhance any future CCTV surveillance capability and image quality, in addition to providing for enhanced crime prevention and community safety perceptions.</p>	3	C	Moderate	L
<p><b>Recommendation 13 – Serpentine</b> Lighting in car parks should be balanced to a minimum of 20 lux and to 60 lux preferred, to ensure all car parks are sufficiently and consistently illuminated, in particular to reduce crime displacement.</p>	2	C	Moderate	L

### 9.10. Pre-Installation CCTV Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 1 – Pre-Installation CCTV</b> The Shire of Serpentine Jarrahdale should consider improving area illumination and natural surveillance around camera locations and the likelihood cameras will be actively targeted for theft or damage.</p>	3	C	Moderate	C
<p><b>Recommendation 2 – Pre-Installation CCTV</b> Conduit paths, fibre pits and final camera locations should be developed as part of the system specifications and design phase. CCTV system design should be integrated as part of future town centre redevelopments, with appropriate conduit paths laid in road construction works for future use of fibre optic cable.</p>	3	C	High	S
<p><b>Recommendation 3 – Pre-Installation CCTV</b> A Crime Prevention Awareness plan should be integrated into the Community Safety and Crime Prevention Plan, in particular in support of any introduction of public CCTV operations and to maintain a high degree of awareness of CCTV operations amongst the Shire of Serpentine Jarrahdale community.</p>	3	A	Moderate	S
<p><b>Recommendation 4 – Pre-Installation CCTV</b> The Shire should first determine each camera's purpose, either to <i>detect</i>, <i>recognise</i> or <i>identify</i>. This design base will allow documented design, commissioning, performance and monitoring of each and every camera and subsequently, the whole system.</p>	3	A	High	S
<p><b>Recommendation 5 – Pre-Installation CCTV</b> With insufficient communications infrastructure, the Shire is best suited to standalone CCTV systems operating in Mundijong, Byford, Serpentine and Jarrahdale. Remote access to each system via the internet should be made available, with Mundijong and Byford most suitable for remote access. Each standalone system, as outlined, will record locally to a digital video recorder (DVR) or where possible, a networked video recorder (NVR).</p>	3	C	High	S
<p><b>Recommendation 6 – Pre-Installation CCTV</b> The selection of camera locations should be verified through consultation between major stakeholders which include police, rangers and land users.</p>	3	A	High	S

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 7 – Pre-Installation CCTV</b></p> <p>The Shire should ensure CCTV Tender documents require the contractor to provide the following documentation both on CD and in two bound hardcopies, prior to practical completion:</p> <ol style="list-style-type: none"> <li>1. System operation manuals suitable for training purposes;</li> <li>2. Equipment operator manuals;</li> <li>3. Manufacturer installation manuals;</li> <li>4. Asset schedule containing make, model, serial number;</li> <li>5. Configuration settings and installed location;</li> <li>6. As constructed drawings;</li> <li>7. Laminated contact listing for remedial maintenance;</li> <li>8. Warranty registrations; and</li> <li>9. All software licences.</li> </ol> <p>Tender specifications should include a minimum of 5 days training to be provided for CCTV Operations and use of the selected VMS. A record or register of attendance should be retained.</p>	3	A	Moderate	S
<p><b>Recommendation 8 – Pre-Installation CCTV</b></p> <p>On agreement with police, additional monitors should be installed in the Mundijong Police Station with options to control cameras and obtain recorded footage directly from the system, as discussed in Part 7.5.</p> <p>A CCTV monitor may also assist radio operators report street activity when relevant or required urgently.</p>	3	B	Moderate	C
<p><b>Recommendation 9 – Pre-Installation CCTV</b></p> <p>For Live Monitoring and Police Station Installations, the street surveillance system should use 40 inch wall mounted monitors, or nearest too. Street surveillance monitors should be set to view multiple cameras simultaneously.</p>	3	C	Moderate	C
<p><b>Recommendation 10 – Pre-Installation CCTV</b></p> <p>Ensure viewing workstations have a dedicated CCTV monitor, PTZ Control Units, keyboard, telephone, area map and camera location maps and contact telephone list.</p>	3	B	Moderate	C
<p><b>Recommendation 11 – Pre-Installation CCTV</b></p> <p>Consideration should be given by the Shire of Serpentine Jarrahdale and Police to the allocation of an Administration Officer to handle police officer requests for footage, as police may lack the resources to retrieve footage themselves.</p>	3	C	Moderate	S
<p><b>Recommendation 12 – Pre-Installation CCTV</b></p> <p>It would be preferred to house localised Head End Equipment at the Administration Building to reduce monitoring traffic over wireless, providing that monitoring will be done from this location.</p>	3	A	Low	S

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Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 13 – Pre-Installation CCTV</b> The Shire of Serpentine Jarrahdale may require specifications for rack space needs, current and potential future, noting that server and storage rack space should be specified separately due to likelihood of this being integrated with existing hardware.</p>	3	A	Moderate	C
<p><b>Recommendation 14 – Pre-Installation CCTV</b> Deploy wireless equipment using the unlicensed 5.7Ghz and 5.4Ghz frequencies in various locations to connect the remote cameras back to the local recording point. Microwave equipment should have the capacity to connect the remote cameras to the local recording hub at speeds of up to 21Mbps duplex to enable high definition images to be captured continuously.</p>	3	C	High	C
<p><b>Recommendation 15– Pre-Installation CCTV</b> Ensure the Optic Fibre backbone consists of 12 and 24 core trunks (4 optic fibres per camera) laid throughout the surveillance area, with Roadside Termination Cabinets and power supply of 240 volt power from Main Switch Boards.</p>	3	C	High	C
<p><b>Recommendation 16– Pre-Installation CCTV</b> Fibre optic transmission cables for video and camera telemetry may be specified to be single mode fibre optic type with sacrificial nylon sheath compatible with connecting equipment. Fibre optic connectors must also be specified. Category 6 cabling may be specified for all UTP requirements.</p>	3	C	High	C
<p><b>Recommendation 17 – Pre-Installation CCTV</b> Appropriate support, such as, cable trays, catenaries, enclosure cable management, and other strain relief measures should be used to minimise the stressing of cables.</p>	3	B	Moderate	C
<p><b>Recommendation 18 – Pre-Installation CCTV</b> UPS and Surge Protection should be installed in any RTC Field Cabinets.</p>	3	B	High	C

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 19 – Pre-Installation CCTV</b></p> <p>CCTV signage should be considered to be a safety orientated sign and used for crime risk and safety management purposes. The primary objective of the CCTV system is to enhance the perception of safety and a signage strategy is required to support camera placement and maximise the deterrence effect on criminal and anti-social activity.</p> <p>In our view, the redeveloped Town Centres should be designated as a surveillance area with defined entrance/exit points via pathways and car parks. Persons entering these areas should be advised that CCTV Surveillance is in operation.</p> <p>An alternative strategy is to utilise the same signage with consistent placement at all camera locations for easier and preferred recognition as people move through each of the areas. This approach is likely to provide a higher degree of recognition amongst the public, avoid uncertainty amongst area users and reinforce the collective precincts as being under surveillance.</p> <p>Signs should be checked regularly for damage and theft.</p>	3	C	High	C
<p><b>Recommendation 20 – Pre-Installation CCTV</b></p> <p>Appropriately designed camera poles, footings and mounts should be specified for CCTV System supply and installation to avoid camera shake and severe stress in the event of strong winds.</p> <p>In our view, there are some alternative mounting options available for each of the Town Centres and otherwise hinged CCTV poles are preferred.</p> <p>Pole mounted dome cameras should be atop the pole and designed for maximum resistance to theft, attack and vandalism.</p> <p>Importantly, CCTV poles should be in the form and design consistent with other street infrastructure to provide appropriate street aesthetics or integrated with purpose designed light poles.</p>	3	C	High	C
<p><b>Recommendation 21 – Pre-Installation CCTV</b></p> <p>Camera mounts and housings should conform to the following criteria:</p> <ul style="list-style-type: none"> <li>• Minimum rating of IP66 for complete protection against dust and jets of water</li> <li>• Corrosion resistant</li> <li>• Vandal Resistant with hardened body and reinforced glass</li> </ul>	3	C	High	C

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 22 – Pre-Installation CCTV</b> All public street surveillance PTZ Dome IP Cameras should conform with the following criteria:</p> <ul style="list-style-type: none"> <li>• Rated IP65 or better for resistance to moisture and dust</li> <li>• Day/Night operation with progressive scan preferred</li> <li>• H.264 CODEC or MPEG4 minimum</li> <li>• PTZ Operation unless Fixed with purpose or provided by wide angle lens</li> <li>• Minimum 24 x Optical Zoom with 36 x Optical Zoom options, lighting dependent</li> <li>• ONVIF compliant and interoperable with a range of Video Management Systems</li> <li>• 24V AC Powered with POE option preferred.</li> <li>• Power Surge and Lightning Protected</li> <li>• Connected to local UPS unit with minimum 4 hours supply</li> <li>• Connected via Layer 2 Switching</li> <li>• UDP Streaming</li> <li>• Record at a minimum resolution of 4CIF (704 x 576 TV Lines) at a rate of 10 frames per second.</li> <li>• Multistream options</li> </ul>	3	C	High	C
<p><b>Recommendation 23 – Pre-Installation CCTV</b> Cameras must be mounted low enough to obtain facial images for identification and recognition, as well as view beneath building awnings, bus shelters and have footings designed to eliminate pole movement. All cameras should be installed at a minimum height of 5000mm and in some areas we have nominated 8000mm to assist with vandal and theft resistance.</p>	3	C	High	S
<p><b>Recommendation 24 – Pre-Installation CCTV</b> Cameras should be protected with heavy duty, dark domes so camera direction is not readily disclosed and must be tamper proof and tamper alarmed.</p>	3	C	High	C
<p><b>Recommendation 25 – Pre-Installation CCTV</b> Consideration may be given to the development of a detailed and technically specified CCTV Design Master Plan to guide tender documents and submission evaluations. There needs to be a careful balance between the technical design and the system's purpose and functionality.</p>	3	C	High	S

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 26 – Pre-Installation CCTV</b> The Shire should develop an MOU to appropriately document the purpose of the CCTV operator and stakeholder relationship. The MOU should outline the contribution responsibilities of each party, conflict resolution and escalation policy, agreement review and termination. Protocols for the sharing of information between WA Police and the Shire of Serpentine Jarrahdale should include advising how often police are accessing the system or retrieving footage.</p>	3	A	High	S
<p><b>Recommendation 27 – Pre-Installation CCTV</b> The WA CCTV Management and Operations Manual should be reviewed and endorsed by the Shire of Serpentine Jarrahdale to guide future management and operations of the CCTV System.</p>	3	A	Moderate	S
<p><b>Recommendation 28 – Pre-Installation CCTV</b> The Shire of Serpentine Jarrahdale should purchase a copy of AS4806:2006 and maintain compliance with CCTV management and operation standards.</p>	3	A	Moderate	C



### 9.11. Post Installation CCTV Recommendations

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 1 – Post Installation CCTV</b> The effectiveness of a public CCTV system should be measured against clear and concise Key Performance Indicators (KPI's) for CCTV Operation to allow effective reporting and monitoring of system efficacy and quickly highlight trends concerning the fundamental operation which may require early intervention or closer monitoring by Shire management.</p>	3	A	High	S
<p><b>Recommendation 2 – Post Installation CCTV</b> Whilst the system is not being monitored, cameras should be positioned for wide fields of view for maximum detection capability. This provides the opportunity for cameras to be manipulated via PTZ controls by an operator wishing to capture recognition and identification footage. Consideration should therefore be given to Field of View (FOV) preset parameters set wide to a detection strategy with selected cameras designed to capture recognition and identification images in support.</p>	3	A	Moderate	S
<p><b>Recommendation 3 – Post Installation CCTV</b> The Shire of Serpentine Jarrahdale should maintain an asset register, as provided by the CCTV Management and Operations Spreadsheet, to monitor camera information, including value and depreciation, and anticipated life cycles to allow future budgetary considerations for system maintenance and equipment replacement.</p>	3	A	Moderate	M
<p><b>Recommendation 4 – Post Installation CCTV</b> An established Community Safety and Crime Prevention Committee, for the Shire or individual town sites, should be tasked with CCTV Operations Oversight and review KPI's at each meeting. Each Committee member should be conversant with the CCTV Management and Operations Manual to ensure that system expansion is controlled and does not detract from the performance of existing cameras.</p>	3	A	Moderate	S
<p><b>Recommendation 5 – Post Installation CCTV</b> Commissioning and Independent Reviews should be conducted post installations and are likely to be required in accordance with funding arrangements.</p>	3	C	Moderate	M
<p><b>Recommendation 6 – Post Installation CCTV</b> In our view, as a minimum, an independent CCTV Operation Evaluation should be conducted every two years.</p>	3	C	Moderate	M

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 7 – Post Installation CCTV</b> Accountability and external review should include a complaints procedure, street signage that alerts the public to the presence of surveillance, audit committees and publication of codes of conduct and policy.</p>	3	B	Moderate	S
<p><b>Recommendation 8 – Post Installation CCTV</b> The impact of the CCTV system should be monitored over time, in terms of community safety, crime rates and fear of crime. A crime impact evaluation should include:</p> <ul style="list-style-type: none"> <li>benchmark crime statistics for the monitored area and adjacent areas for the 12 months leading up to installation time.</li> <li>crime statistics for the monitored area and adjacent areas for at least 12 months after installation, to compare and contrast any changes.</li> <li>data on incidents where a response was initiated and no official intervention was required (to capture other incidents other than those that would generate official crime statistics).</li> </ul>	3	A	Moderate	M
<p><b>Recommendation 9 – Post Installation CCTV</b> Amlec House endorses the Shire of Serpentine Jarrahdale initiative to encourage appropriate security and CCTV requirements for new business premises/ventures in addition to their registration with the Blue Iris program. The Shire and Mundijong Police should actively continue to encourage local business owners who operate a private CCTV system to register with Blue Iris to assist in police operations. The Shire of Serpentine Jarrahdale is encouraged to have all CCTV Systems registered with Blue Iris following installation and commissioning.</p>	1	A	Low	M
<p><b>Recommendation 10 – Post Installation CCTV</b> Following installation, camera observations should be prescribed, documented or monitored as to how often a camera is or should be viewed or for scheduled panning by PTZ cameras.</p>	3	A	Moderate	S
<p><b>Recommendation 11 – Post Installation CCTV</b> Should a camera remain unused for a predefined period, a home key function should be utilised on all PTZ cameras to automatically shift back to a pre-programmed position. This function is generically designed to avoid any activity being missed when the camera is not being monitored, however it should be noted that this may not be suitable for all cameras and will not be an option for fixed cameras.</p>	3	A	High	S

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<p><b>Recommendation 12 – Post Installation CCTV</b> Ensure all public street cameras provide image quality sufficient for use by police as evidence in court. We also refer to the WA CCTV Guidelines Technical Advice.</p>	3	A	High	M
<p><b>Recommendation 13 – Post Installation CCTV</b> Ensure frequent camera cleaning schedules and monitor seasonal impacts on camera operations and image quality. Budget items should be inclusive of annual cleaning costs.</p>	3	B	High	M
<p><b>Recommendation 14 – Post Installation CCTV</b> Consideration may be given to developing criteria for reviewing footage when an incident occurs that includes a time versus cost equation. Should an incident be reported and the time not be known, this criteria may be used to identify how much time and resources should be spent reviewing footage. The implementation of more defined operations should overcome this requirement, such as the determination of select business closing times and programming cameras to adjust their fields of view accordingly.</p>	3	A	Moderate	S
<p><b>Recommendation 15 – Post Installation CCTV</b> Future Shire planning should consider the cost benefits of employing dedicated monitoring staff and/or utilising council Rangers to monitor the system during periods of high activity, such as Friday and Saturday nights.</p>	3	C	Moderate	S
<p><b>Recommendation 16 – Post Installation CCTV</b> Formal usernames and passwords should be established as soon as practicable to provide a record of system access and a user identifier for auditing purposes.  Police should also be provided with formal usernames and passwords to provide a record of system access and a user identifier for auditing purposes.  Access procedures and records should be appropriately kept through the use of Access logs and Audit reports.</p>	3	A	High	S
<p><b>Recommendation 17 – Post Installation CCTV</b> When retrieving footage, the VMS provides two formats, one is a proprietary source file and a converted open source file (.AVI). We recommend the WA Police retrieve both file formats for all cases where footage is being obtained for the purposes of obtaining evidence. We refer to Part 7.2 of the CCTV Management and Operations Manual pertaining to Continuity of Evidence.</p>	3	A	High	S

Timeframe	Cost Estimation	Risk Priority	Management Criteria
1 = 0 - 3 months	A = < \$2,000	Low	System Management
2 = 3 - 12 months	B = \$2,000 - \$5,000	Moderate	Maintenance
3 = 12 - 36 months	C = > \$5,000	High	Capital Expenditure

<p><b>Recommendation 18 – Post Installation CCTV</b> A formal Release Form, as per Part 9 of the CCTV Management and Operations Manual should be introduced and WA Police provide copies of all completed forms to the Shire of Serpentine Jarrahdale on an agreed basis, either weekly, fortnightly or monthly.</p>	3	A	Moderate	S
<p><b>Recommendation 19 – Post Installation CCTV</b> The Shire of Serpentine Jarrahdale should prefer to implement a dedicated CCTV Monitoring Room conducive to a sustained period of live system monitoring. We refer to Part 7.9 of the CCTV Management and Operations Manual pertaining to designated surveillance areas. Consideration to a dedicated monitoring room or integrating live monitoring with police radio operations should be made.</p>	3	C	Moderate	C
<p><b>Recommendation 20 – Post Installation CCTV</b> We refer to Part 7.5 the CCTV Management and Operations Manual to provide advice and requirements for training and licensing of personnel monitoring the CCTV System live.</p>	3	B	High	S
<p><b>Recommendation 21 – Post Installation CCTV</b> Where footage is required for investigations and / or court proceedings it is recommended to be kept for a minimum of 7 years.</p>	3	A	High	S