Shaolin Tourist and Residential Development, Comberton Grange

Electrical Services Infrastructure Concept Report

Report No S.STF-0101-R02
Date 15/02/2012

engineering sustainable environments

REPORT AUTHORISATION

PROJECT: **SHAOLIN TOURIST AND RESIDENTIAL DEVELOPMENT, COMBERTON GRANGE ELECTRICAL SERVICES INFRASTRUCTURE CONCEPT REPORT**

REPORT NO: **S.STF-0101-R02**

Date	Rev	Comment	Prepared by	Checked by	Authorised by
23-07-10	A	Draft Infrastructure Concept Report	WI	BM	
22-11-11	B	Infrastructure Concept Report	RH	SB	AM
15-02-12	C	Infrastructure Concept Report	RG	PJ	AM

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EXECUTIVE SUMMARY

The proposed Shaolin Tourist and Residential Development at Comberton Grange will consist of;

- A Buddhist Temple Sanctuary comprising of a walled complex of religious buildings and integrated residential accommodation;
- A 330 seat prayer or assembly hall;
- A martial arts training facility for up to 300 students with teaching facilities, sporting field and accommodation;
- A Traditional Chinese Medicine (TMC) centre with associated health and wellness facilities;
- A four star Hotel and tourist cabins with initially 100 rooms and up to 250 rooms, with dining and conference facilities and associated staff accommodation;
- A Town Centre with food outlets, retail, commercial and community facilities;
- A convention facility for initially 300 people;
- Serviced apartments within the Town Centre;
- An external amphitheatre within the public domain for kung-fu displays and gatherings;
- A Visitor Information Centre with associated Cultural Museum, administrative facilities and golf cart hiring facilities;
- Residences of approximately 300 dwellings;
- Agricultural and herbal gardens integrated within the residential development;
- 18 hole golf course integrated within the northern development site with clubhouse;
- Chinese gardens encircling the existing lake near the quarry;

This report looks at the authority infrastructure available to service the proposed development, and the internal infrastructure required to sustain the development for electrical and telecommunications services.

There is existing overhead electrical infrastructure located with the vicinity of the proposed development.

Integral Energy have advised that a new high voltage electrical supply will be required from the Integral Energy South Nowra Zone Substation to the development site via a new underground cable service. New transformer(s) will be required on site to supply the new development. Integral Energy advises that the client shall responsible for the installation and funding of these network connection assets. Further information will require payment of monopoly fees and engagement of a level 3 accredited service provider (ASP).

The use of renewable energy systems within the services design will be able to reduce the energy demand from the supply authority. The successful implementation and the energy reduction achieved shall be dependent on site design factors which are outlined within this report. It should also be noted that energy provided by renewable systems can vary due to environmental factors.

At this stage it is deemed prudent to liaise with the Integral Energy allowing for the maximum electrical demand calculated for the site to determine that there is sufficient capacity in the network. The maximum demand can be revised at a later stage when the extent of energy reduction can be determined with greater accuracy.

There is an existing communications hub located in the vicinity of the proposed development on the eastern side of Princes Highway, near the junction with Parma Road. New underground lead in services will be required to the site.

CONTENTS

1 INTRODUCTION

The intention of this report is to investigate the following;

- Information regarding existing infrastructure available to service the Shaolin Tourist and Residential development site, through correspondence with relevant Authorities, for the following services;
    - Electrical Power Supply
    - Telecommunications Services

- Forecast demands for each service based on population and Equivalent Tenement (ET) assessments for the proposed development.
- Review of the adequacy of authority supply infrastructure required to support the proposed development.
- Outline various options for the incorporation of renewable energy or embedded generation facilities to reduce the development's energy demand.

1.1 PROPOSED DEVELOPMENT

The proposed Shaolin Tourist and Residential Development Comberton Grange South Nowra site will be located on a site, totalling 1248 hectares in area, with 79 hectares proposed for the development.

The proposed development is for a Shaolin Village which will be a high quality tourist and residential complex. The Village will accommodate:

- A Buddhist Temple Sanctuary comprising of a walled complex of religious buildings and integrated residential accommodation;
- A 330 seat prayer or assembly hall
- A martial arts training facility for up to 300 students with teaching facilities, sporting field and accommodation;
- A Traditional Chinese Medicine (TMC) centre with associated health and wellness facilities;
- A four star Hotel and tourist cabins with initially 100 rooms and up to 250 rooms, with dining and conference facilities and associated staff accommodation;
- A Town Centre with food outlets, retail, commercial and community facilities;
- A convention facility for initially 300 people;
- Serviced apartments within the Town Centre;
- An external amphitheatre within the public domain for kung-fu displays and gatherings;
- A Visitor Information Centre with associated Cultural Museum, administrative facilities and golf cart hiring facilities;
- Residences of approximately 300 dwellings;
- Agricultural and herbal gardens integrated within the residential development;
- 18 hole golf course integrated within the northern development site with clubhouse;
- Chinese gardens encircling the existing lake near the quarry;

1.2 LIMITATIONS OF THE REPORT

Calculations and findings produced in this report were sourced from: Shaolin Tourist Residential Development, Part 3A Project Application; GHD Submission to the South Coast Independent Review Panel Sensitive Urban Lands Review July 2006; Integral Energy report entitled 'West Tomerong 132/33kV Transmission Substation Establishment'; Integral Energy 2009 Electricity System Development Review, correspondence between Umow Lai and Integral Energy and calculations by Umow Lai.

2 NEW SERVICES REQUIREMENTS

2.1 ELECTRICAL SERVICES

The electrical maximum demand for the proposed development have been estimated at approximately 3.8 MVA, with the diversified load estimated at 2.7 MVA and is outlined in the table below.

Table 1 *Electrical Load Estimate*

Project: Shaolin Tourist & Residential Development
Project No: S.STF-0101
Date: 15/02/2012
Revision: 02
Engineer: Ryan Hendricks
Title: Outline electrical load assessment - max demand

No.	Load Description	Load (Amps)	Load (kVA)	Notes
01	Buddhist temple sanctuary with religious facilities, 300 seat auditorium within the centre, with residential accommodation for up to 30 resident monks within the religious complex.	400	288	Allowance as area size and services density unknown
02	Kung-Fu Academy for up to 150 students with teaching facilities & residential accommodation.	586	421	Allow 75 rooms with 2 No. students per room and 5kVA per room with 75% diversity to allow for in room food prep. Allow 140kVA for lighting, small power & mech loads to classrooms and training facilities. Mech vent and heating to be low elec energy, gas boost type, etc.
03	100 bed, 4 star hotel with dining and conference facilities and ancillary rooms for staff accommodation	900	647	Allowance as area size unknown
04	Convention facilities for 300 people.	350	252	Allow 100A for specialist theatre lighting, 100A for specialist AV equipment. Allowance for food re-heating facilities, etc.
05	300 seat external amphitheatre for viewing of kung fu displays	200	144	Allowance as area size and services density unknown
06	Shaolin Town Centre with food outlets, retail, commerical and community facilities. Circa 5000m2	974	700	140 VA/m2 as per AS3000 max demand tables
07	Traditional Chinese Medicine Centre with associated health and wellness facilities	315	226	Allowance as area size and services density unknown
08	Visitor information centre	63	45	Allowance as area size and services density unknown
09	Agricultural and herbal farm	200	144	Allowance as area size and services density unknown
10	Residential accommodation of up to 300 dwellings	1252	900	Standard 3kVA allowance per residence as per supply authority max demand calculations.

No.	Load Description	Load (Amps)	Load (kVA)	Notes
11	Associated open parking areas	50	36	Allowance as area size and services density unknown
12	Internal roadways to access the site and its facilities	90	65	Allowance as area size and services density unknown
13	**Total**	**5380**	**3867**	
14	Allowance for load diversity	1	1	
15	**Diversified Load**	**3766**	**2707**	
16	**Add 20 % spare capacity for future expansion**	**4519**	**3248**	

General notes

01 All current values are three phase

2.2 TELECOMMUNICATIONS SERVICES

The telecommunications services requirements will be finalised when further details regarding the connectivity requirements for the development are known. It shall however comprise a mixture of copper and fibre optic telecommunications services from a suitable connection point on the telecommunications operator's network.

3 EXISTING SERVICES INFRASTRUCTURE

3.1 ELECTRICAL SERVICES

The existing Integral Energy Zone Substation is located at South Nowra near the BTU Road intersection. Existing overhead transmission lines run on the eastern side of the Princes Highway and cross over to the western side near Parma Road.

Figure 1 *Approximate Locations of Integral Energy Network Infrastructure*

Integral Energy have identified Comberton Grange as an area for future development.

The maximum electrical demand for the proposed development has been assessed and determined to be approximately 3.8MVA, with the diversified load estimated at 2.7 MVA.

According to an Integral Report the South Nowra Zone Substation is equipped with 2 x 25MVA transformers. Based on the data sourced this substation has capacity to supply the proposed development, however modifications to their network are as outlined in this report.

Integral Energy have advised that is no suitable infrastructure in the immediate vicinity of the proposed site and that a new feeder shall be required from the South Nowra substation.

The new 11kV high voltage feeder shall be via a new underground cable service running from the Integral Energy Zone substation located adjacent the Princes Highway, approximately 650m north of BTU road, to the Shaolin site.

A request for a Design Information Package (DIP) will need to be made to Integral Energy with an assessment of the calculated maximum demand for the development. The DIP shall outline the proposed works required to the existing Integral Energy network to facilitate the new electrical supply to the site. Integral Energy will provide the DIP upon payment of the monopoly fees by the Client.

Integral Energy have advised that the client shall be responsible for the funding and installation of the network connection assets in accordance with their Network Connection Contestable Works General Terms and Conditions. This would include the high voltage cable and associated switchgear.

Once the DIP is received by the client's representative, a Level 3 Accredited Services Provider (ASP) is appointed to provide a detailed design of the high voltage electrical works based on Integral Energy's outline design information. This will define the installation works to be carried out by the developer and associated contractors. The client shall need to engage a Level 1 Accredited Service Provider to carry out the electrical network construction of the network assets as per the Level 3 ASP's design.

Due to the extent of the infrastructure works required, it is advised that an application be made to Integral Energy in the order of 12 months before works commence on site to allow for the required electrical infrastructure upgrades to be carried out.

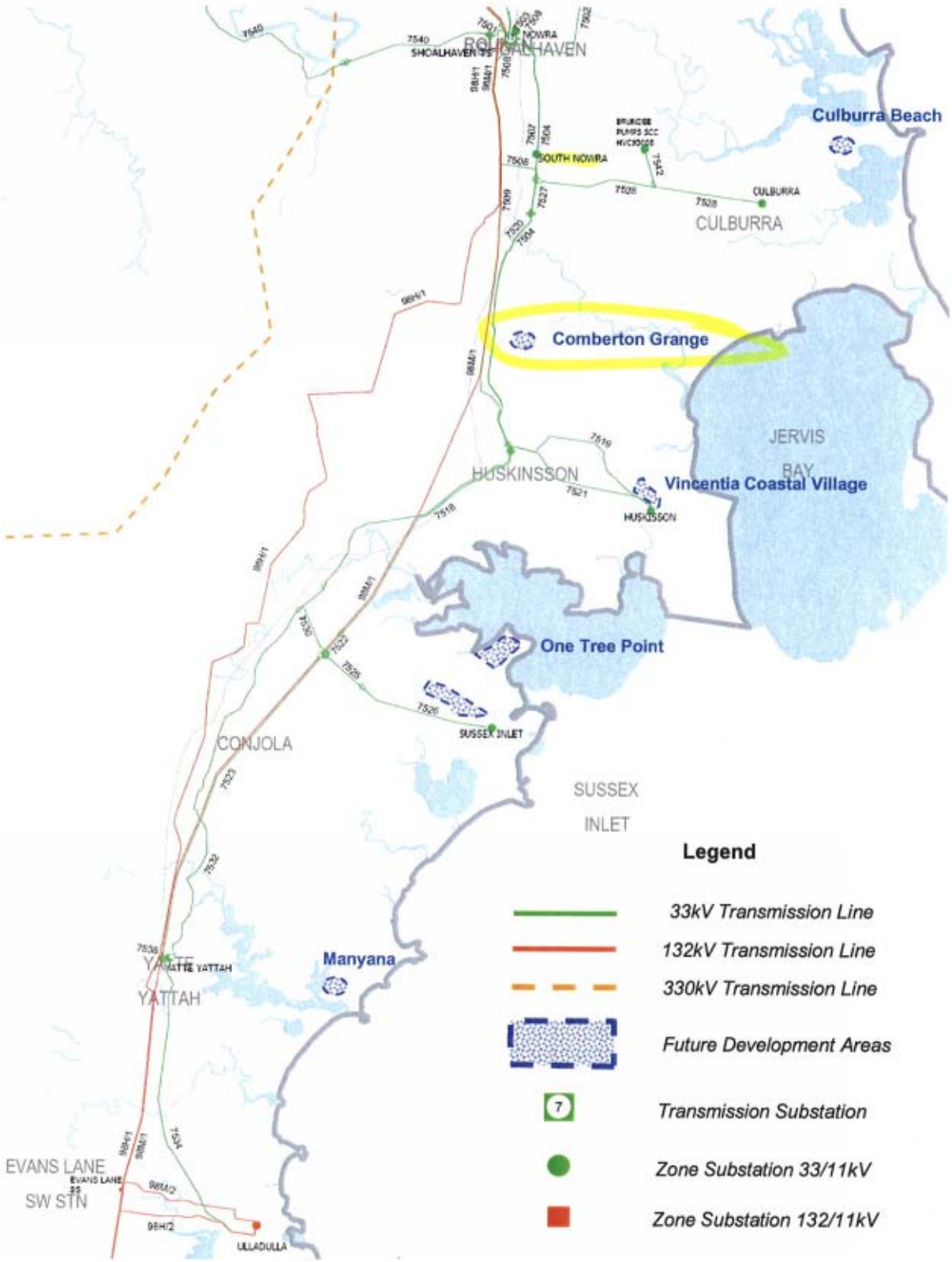

Figure 2 *Integral Energy Area Network Map Showing Supply Infrastructure in Vicinity of Comberton Grange Area*

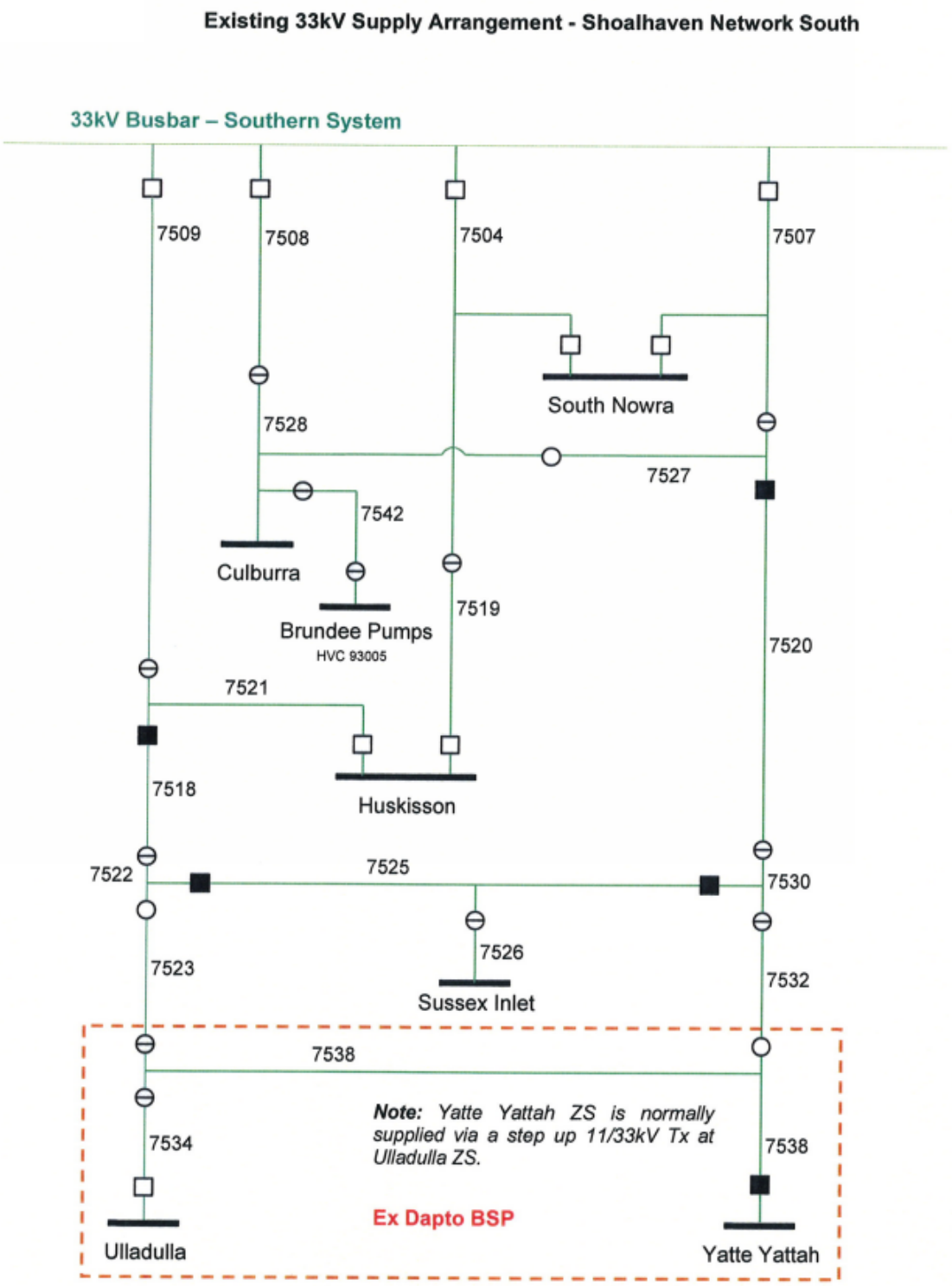

Figure 3 *Integral Energy Network Schematic Showing Supply Configuration to South Nowra Substation*

Shoalhaven Transmission Substation rating details

Zone Substation	Transformer Description (MVA)	Installed Capacity (MVA)	Emergency/Cyclic Rating (MVA)
Shoalhaven TS	3 x 60	180	130
Berry	2 x 15	30	15
Bolong	1 x 12.5	12.5	12.5
Bomaderry	3 x 10	30	20
Culburra	2 x 10	20	11
Huskisson	2 x 20	40	22
Kangaroo Valley	1 x 5 + 1 x 2.5	7.5	3.0
Nowra	3 x 15	45	30
South Nowra	2 x 25	50	25
Sussex Inlet	2 x 5	24	12

Table 2 *Shoalhaven Transmission Substation Supply Capacities*

Shoalhaven Transmission Substation summer demand forecast

Location		Actual						Forecast									
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Berry	MVA	5.3	6.2	5.6	6.1	8.0	6.9	8.7	9.4	10.0	10.5	10.8	11.0	11.1	11.2	11.2	11.2
	Rating	6.0	6.0	6.0	6.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
	MVA LAR		**0.2**		**0.1**												
Bolong	MVA	3.9	4.7	4.3	3.1	3.7	2.7	4.0	4.1	4.1	4.1	4.2	4.2	4.2	4.3	4.3	4.3
	Rating	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
	MVA LAR																
Bomaderry	MVA	15.8	15.1	17.1	19.1	19.5	20.1	21.5	22.6	27.2	28.1	25.3	26.1	27.0	27.9	28.8	29.6
	Rating	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
	MVA LAR						**0.1**	**1.5**	**2.6**	**7.2**	**8.1**	**5.3**	**6.1**	**7.0**	**7.9**	**8.8**	**9.6**
Culburra	MVA	8.0	8.7	9.7	8.9	8.9	9.0	8.8	9.2	9.7	9.8	9.8	9.8	9.8	9.9	9.9	9.9
	Rating	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
	MVA LAR																
Huskisson	MVA	14.8	15.5	15.8	15.6	20.8	16.1	18.0	19.3	21.0	23.3	26.2	29.3	31.8	33.9	35.6	37.5
	Rating	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	MVA LAR										**1.3**	**4.2**	**7.3**	**9.8**	**11.9**	**13.6**	**15.5**
Kangaroo Valley	MVA	2.3	2.2	1.8	2.2	2.8	2.6	2.9	2.9	2.9	3.0	3.0	3.1	3.1	3.1	3.2	3.2
	Rating	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	MVA LAR												**0.1**	**0.1**	**0.1**	**0.2**	**0.2**
Nowra	MVA	18.2	20.8	19.4	19.7	21.5	21.0	23.4	24.6	25.9	25.9	28.7	29.5	30.4	31.2	32.1	32.9
	Rating	17.0	17.0	17.0	17.0	17.0	17.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0
	MVA LAR	**1.2**	**3.8**	**2.4**	**2.7**	**4.5**	**4.0**										
South Nowra	MVA	8.7	10.9	10.3	12.7	11.8	12.0	14.5	15.6	17.4	18.1	18.8	19.4	20.1	20.7	21.4	22.1
	Rating	11.0	11.0	11.0	11.0	11.0	11.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
	MVA LAR				**1.7**	**0.8**	**1.0**										
Sussex Inlet	MVA	5.6	6.8	7.5	6.7	6.4	6.5	6.9	7.3	7.7	8.4	9.1	10.0	11.1	12.3	13.6	15.1
	Rating	5.5	5.5	5.5	5.5	5.5	5.5	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
	MVA LAR	**0.1**	**1.3**	**2.0**	**1.2**	**0.9**	**1.0**								**0.3**	**1.6**	**3.1**
Shoalhaven TS	MVA	88.8	103.9	98.0	109.4	116.0	103.0	118.5	124.6	133.8	138.9	144.4	149.9	155.1	159.8	164.5	169.3
	Rating	99.0	99.0	99.0	99.0	99.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
	MVA LAR		**4.9**		**10.4**	**17.0**				**3.8**	**8.9**	**14.4**	**19.9**	**25.1**	**29.8**	**34.5**	**39.3**

Note: LAR denotes Load at Risk

Table 3 *Shoalhaven Transmission Substation Capacities and Demand Forecasts*

3.2 COMMUNICATIONS SERVICES

There is an existing Telstra / Optus communications hub located on the eastern side of Princes Highway near the junction with Parma Road, as shown on the sketch below.

Cable markers indicate that the hub is supplied with underground optical fibre cabling.

The proposed development will require new underground incoming copper and fibre lead in services. It is assumed that these services can be sourced from the existing communication hub but this is yet to be confirmed by the authority.

An Intent To Develop (ITD) lodgement needs to be made through Telstra Smart Community which includes a description of the development and a preliminary assessment of what services will be required. This application can be made through the Telstra Smart Community website.

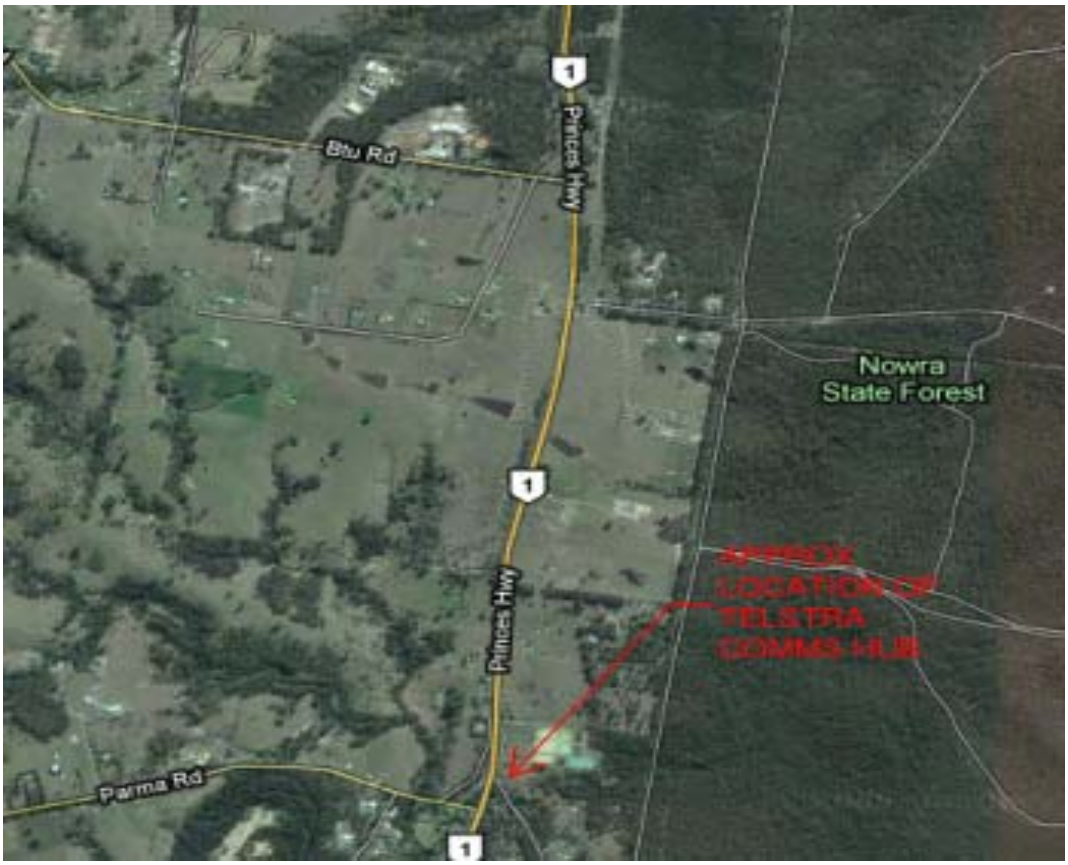

Figure 4 *Approximate Location of Telstra Communications Hub*

Figure 5 *Telecommunications Hub*

Figure 6 *Telecommunications Hub*

4 RENEWABLE ENERGY AND ENERGY DEMAND REDUCTION OPTIONS

4.1 PHOTOVOLTAIC CELL ENERGY SYSTEM (SOLAR PANELS)

Photovoltaic energy installations could be implemented to reduce the electrical energy demand. The amount of energy which can be derived from these systems will depend on the extent of suitable roof area available (i.e. in the correct orientation, no foliage obstructions and in keeping with the aesthetics of the development).

At concept stage these elements have not been sufficiently developed, but it is recommended that the development progresses in a manner which maximises the possibilities and the extent to which these systems to be incorporated.

The electrical energy produced by these systems are typically exported from the site upon generation and sold to the supply authority, offsetting the energy which the site uses.

Alternatively, energy can be stored and used when the energy is required, but requires additional capital expenditure associated with storage facilities. As it is unlikely that the site will generate more power than it consumes, on site storage would not provide much benefit.

The photovoltaic cell installations could make a considerable impact on the energy demands of the residences and smaller structures which have relatively light energy demands. Combined with energy efficient solutions for building heating and water heating and storage, such as solar thermal systems with gas boost, the amount of energy generated during the day can significantly offset the energy requirements after dark.

Commercial premises are likely to have denser electrical energy requirements for cooking, cleaning, laundry, specialist lighting, etc. Photovoltaic systems would be able to offset some of the loads associated with artificial lighting in internal areas.

The extent of the systems outlined can be further developed along with the architectural proposals.

4.2 WIND TURBINES

The provision of wind turbines will be need to consider wind measurement data for the proposed areas as well as the potential impacts of surrounding structures.

The size of the turbines will influence the amount of energy it produces, so the aesthetic and acoustic elements will also need to be considered.

Where the use of larger wind turbines may be deemed unsuitable, the use of smaller turbines combined with a photovoltaic element should be considered for power to devices remote from other structures. This would provide not only electrical power, but also serve as a visual reminder of the strategies being employed.

4.3 BUILDING AUTOMATION AND LIGHTING CONTROL SYSTEMS

Systems should be designed such that energy demands should be avoided where possible, such as increasing daylight, natural ventilation, etc. There will however be systems which shall require electrical energy and the use of high efficiency system and building controls are recommended.

These would reduce the amount of system management required from site staff and would allow systems to be more flexible to suit the environments which they serve. Examples of this would be reducing lighting, heating or hot water levels in selected parts of systems in times when these systems are not being utilised.

4.4 GAS POWERED SERVICES PLANT

Certain systems such commercial laundry services, cooking facilities, etc. will present an intensive energy demand. These systems could be powered by natural gas supplies instead of electrical power, which would reduce the amount of carbon required for the amount of energy consumed.

4.5 GAS POWERED CO-GENERATION PLANT

These systems are effective when a constant 'base' load is present, as the generation plant operates continuously. The use of gas powered co-generation systems shall be investigated in the project development. The load profiles of areas of the site can be reviewed to determine whether sufficient base load is present to merit this option being employed.