BOSCHENDAL VILLAGE

Green Report

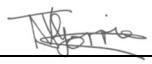
June 2016

Revision 2

Prepared for: Rob Lundie
Boschendal Estate

Prepared by: Mike Munnik

Quality Management

Issue/revision	**Issue 1- draft**	**Revision 1**	**Revision 2**	**Revision 3**
Remarks	Draft for comment	Final report	Corrections to references	
Date	17 May 2016	7 June 1016	22 June 2016	
Prepared by	M Munnik	M Munnik	M Munnik	
Signature				
Checked by	N Gorrie	N Gorrie		
Signature				
Authorised by	M Munnik	M Munnik		
Signature				
Project number	302	302		
File reference	Z:\Projects\302. Boschendal Village\report	Z:\Projects\302. Boschendal Village\report		

AGAMA Energy (Pty) Ltd

9b Bell Crescent Close

Westlake Business Park

Westlake 7945

Cape Town

Tel: +27(0) 21 701 3364

Fax: +27(0) 21 702 4920

http://www.agama.co.za

Reg. No: 2000/029294/07

Table of Contents

Acronyms and abbreviations

CIBSE	Chartered Institution of Building Services Engineers (UK)
DSM	Demand Side Management
EDGE	Excellence in Design for Greater Efficiencies
GBCA	Green Building Council of Australia
GBCSA	Green Building Council of South Africa
IFC	International Finance Corporation, Part of the World Bank
LG 6	Lighting Guide 6 (CIBSE)

1. Introduction

AGAMA Energy (AGAMA) was requested by Rory Williams of Heinrich Beer Quantity Surveyors to prepare a Green Report for the new Boschendal Village development occupying 28ha on the Boschendal Estate in the Stellenbosch Municipality area.

The Boschendal Village development project comprises new residential element (450 dwelling units and 100 bedroom hotel/self-catering apartments), general business element (9 000m2) and retail element (5 500m2). The site has been identified as the most appropriate due to the potential its location offers in terms of access and service to the greater community as well as its limited agricultural potential (Briel, le Roux, 2015).

This report will form part of the development impact assessment process.

2. Overall aim of project

It is the intention that the character of the proposed development *"will be that of a rural village, characterised by certain urban qualities, discreetly knitted into an agrarian landscape, while responding to the historical context of the area" (Briel, le Roux, 2015).*

The sustainability elements contained within this Green Report contribute to the overall aim of a resource efficient development with a focus on the reduction in consumption of municipal services. The major municipal services considered are energy, water and waste. It has been indicated that the bulk municipal electricity supply to the site is constrained (ICE Group, 2016; @planning, 2015). The Boschendal Village peak electricity demand, through the incorporation of the demand side management initiatives identified in this report in both the overall precinct as well as in the individual buildings, is anticipated to be a maximum of 1.5MVA.

3. High level opportunities

In this section we will consider the sustainability initiatives opportunities at a high level and looking firstly at the overall development level and then subsequently at the individual building level. These opportunities will need further investigation in the design development stage of the project but are presented in this report for consideration by the project team.

3.1 Overall development (precinct) level

At the overall development precinct level, the following sustainability initiatives could be considered:

3.1.1 Stormwater management

The overall stormwater management system will be designed using Sustainable Urban Drainage Systems (SUDS) principles (ICE Group, 2016). This will allow stormwater management to be integrated with the landscape using initiatives such as the provision of rainwater harvesting at building level, the application of permeable paving, vegetated buffer strips and swales within the urban design. This will ensure optimum infiltration of rainwater within the site boundary as well as improve water quality through the provision of wetlands that assist in preventing pollution from passing into the aquatic environment. A project aim is that only the stormwater from severe storms will reach the Dwars river system - rainwater is either reused within the village development or agricultural activities, or infiltrates and replenishes the ground water system.

3.1.2 Precinct wide energy efficiency

LED luminaries with lighting controls (daylight and motion sensors) will be used for common area lighting with the possibility to include solar powered street lights. Centralised hot water generation where appropriate (e.g. in high density residential area/apartments) should be considered as centralised services allow for more accurate energy load profiling and forecasting which is key for load clipping and overall precinct wide energy management. A site wide metering and monitoring system (including individual buildings) will be considered.

3.1.3 On-site centralised renewable energy generation

Given the restriction in bulk electricity municipal supply, the opportunity exists for the installation of a photovoltaic (PV) array to supplement the utility supply. The eventual size of the solar energy array will depend on the development electricity load after the detailed design of the buildings incorporating energy efficient initiatives. The aim is to provide any shortfall in municipal supply through the provision of on-site renewable energy generation. The on-site generation system could be either centralised in a grid connected array or decentralised on the roofs of buildings or a combination of both. The extent of the renewable energy generation will be determined in the design development stage.

3.1.4 Central waste recycling

Recycling of household waste, plus office building and retail waste could be organised, managed and operated at a precinct wide level. There are successful models (such as at the V&A Waterfront) where waste is recycled at source, collect from within the development and stored and finally sorted centrally. A commercial waste recycling company could be engaged to operate the overall waste system or simply the final recycling and waste removal. A precinct

wide Waste Management Plan incorporating education, recordkeeping and monitoring is key to reducing on-site waste generation.

Kitchen wet waste could be fed into an anaerobic biogas digester or alternatively managed as compost for use in the agricultural activities.

A project aim could be that no waste from the development is taken to landfill. All waste generated within the development is either reused or recycled, or composted for use in agricultural activities.

The abovementioned sustainability initiatives are considered at the overall development precinct level. The following section will consider initiatives at a high level applicable to individual buildings.

3.2 Individual building level

The opportunities for the incorporation of sustainable initiatives at the individual building level include the following:

3.2.1 Energy

The approach is the reduction in energy consumption in the building through passive design and energy efficiency. In terms of passive design, the buildings should aim to be naturally ventilated wherever possible (including business office and retail). The main focus of passive design is the reduction in internal heat gain controlled by adequate external shading, insulation, glazing ratio and properties, and optimised orientation towards the north (reduction in east and west facades). The focus on energy efficiency would centre on hot water generation using heat pumps or preferably solar water heaters (SWH) with backup heating using LPG water heater. In denser residential areas (e.g. apartments) consideration should be given to a centralised district hot water storage system. For cooking, the use of a LPG hob and possibly a LPG oven in place of the electric oven. All lighting should be LED (linked to motion sensors and HVAC in commercial buildings). If the developer has control over appliances these should be low energy (A or B in European Commission energy rating labelling system). Localised roof-mounted PV could be considered to supplement the municipal electrical supply. Monitoring and control of energy consumption is a key element in successful energy efficiency programs thus the provision of smart metering should be considered. Meters (in commercial buildings but also residential) should be connected to a monitoring system (a site wide monitoring system and strategy could be developed).

3.2.2 Water

The approach is the reduction in potable water usage in the building through the installation of low flow sanitary fittings, rainwater harvesting and greywater recycling. Rainwater storage at each building can be used for toilet flushing and showering. Recycled greywater can be used for landscape irrigation. Leak detection is a key component of successful potable water reduction thus the provision of strategically located water meters should be considered. Meters should be connected to a site wide monitoring system (similar to the energy monitoring system).

3.2.3 Waste

Household kitchen wet waste (including commercial buildings) could be composted locally at each dwelling unit or alternatively centrally (eg for the apartments and commercial buildings). If biogas digesters are installed, then the kitchen wet waste would be deposited directly into the digester with the energy produced (methane) for use in individual dwellings or alternatively compost could be used on local food gardens or general landscaping. Separation and recycling should occur at each dwelling with regular collection to a central point in the village.

4. Some initiatives in more detail

In this section we consider appropriate sustainability initiatives in more detail as they pertain to the development. Once again we will examine the initiatives at precinct and individual building level.

Each initiative will be considered in terms of implementation as "must do" (i.e. strongly recommended that the initiative is included in the design development stage of the project), "optional" (i.e. consideration should be given to the initiative), and "don't do" (i.e. the initiative is not considered appropriate for the development).

4.1 Overall development level

Sustainability Initiative	Implementation	Comment
Stormwater management	Must do	Design to SUDS. Include permeable paving to optimise infiltration, reedbeds to improve water quality.
On-site renewable energy generation	Must do	Installation of a grid connected PV array to supplement municipal electricity supply. Size of array will be determined during design development stage to meet any shortfall in municipal supply after incorporating all energy efficiency initiatives in the building designs.
Common area lighting	Must do	All exterior luminaires have daylight control and have a minimum luminous efficacy of 45 lm/watt. Solar powered street lighting (optional).
Waste recycling	Must do	A precinct wide waste recycling management plan to be developed. A utility refuse space has been identified in the development.

4.2 Individual building level

Category	Sustainability Initiative	Implementation	Comment
Energy	Solar water heating (SWH) plus LPG backup heating	Must do	SWH with LPG backup preferable to electric backup. Heat pumps could be considered but may be noisy in denser residential areas.
	LED lighting	Must do	Use low energy LED lighting throughout all buildings plus surrounding external areas.
	Passive design philosophy	Must do	Design to focus on building orientation, external shading and insulation as far as possible.
	LPG hob Biogas hob	Must do	Provide LPG cooking hob as part of base build or include in sales agreement. Potential for additional biogas cooker if biogas digester is installed.
	LPG oven	Optional	Provide LPG oven as part of base build or include in sales agreement.
	Energy efficient appliances	Optional	Provide energy efficient appliances (eg dishwasher, fridge, microwave, washing machine, etc) as part of base build or include requirements in sales agreement. Appliances should be certified with a minimum "B" rating of the European "Energy Rating" labelling system.
	Electric underfloor heating	Don't do	No electric underfloor heating should be used. If underfloor heating is absolutely required, investigate non-electric solutions (e.g. circulating heated water via heat pump).
	Smart meters	Optional	Smart meters (and ripple relay switches) allow measurement and monitoring of energy usage and ability to reduce peak load by turning off appliances not required.
Water	Low flow fittings	Must do	Suggest the following maximum flow rates for sanitary fittings: Dual flush toilet – 3/6 litre Urinals – 1litre per flush Showers – 7litres per minute Taps - kitchen 10litres per minute Taps – washbasin 6litres per minute.
	Rainwater harvesting	Must do	Tanks situated at each building. Rainwater used for toilet flushing and local irrigation. Tank size will be determined at design development stage.
	Greywater recycling	Must do	Greywater system installed at each building. Recycled water used for local irrigation.

	Metering	Must do	Provide easily readable meters for all major water uses to monitor usage and provide leak detection information (option to install a precinct wide monitoring system similar to energy monitoring system).
Waste	Dry waste Recycling	Must do	Each household should recycle dry waste at source. Single collection point within development.
	Wet waste recycling	Optional	Provision of biogas digester for sewage and kitchen wet waste. Energy (methane) can be used for cooking and the distillate as a fertilizer. Reedbeds can provide polishing function to effluent water. Alternatively, kitchen waste can be composted for use in local foodgardens.
Other initiatives	Construction Waste management plan	Must do	Contractor develops and implements a waste management plan during construction to divert 70% of construction waste from landfill for reuse and recycling.
	Low VOC paints, adhesives and carpets	Must do	Specification of interior finishes of buildings to contain low VOC (volatile organic compounds) materials – eg paints, adhesives, carpets.
	Water efficient appliances	Optional	Provide water efficient appliances (eg dishwasher, washing machine) as part of base build or include requirements in sales agreement. Dishwasher min water 0.93litres/placeset. Clothes washing machine min water 7.2 litres/kg.
	Landscape irrigation – technical interventions	Must do	Reduction in potable water required for irrigation through selection of water wise plants as well as site wide smart irrigation controller technology – drip irrigation, rain sensor (deactivates irrigation when raining), automated seasonal adjustment, soil moisture sensors and mulching (min 10cm thick).
	Cyclist facilities	Must do	Provision of cyclist facilities within buildings and safe and unimpeded cycling routes within the development.
	Green travel plan	Optional	Introduction of a car share scheme with dedicated car parking spaces and contractual agreement with car-share service provider.
	Masonry	Must do	Reduction in embodied energy and resource depletion through specification of clay or concrete brick masonry to have min 20% perforations for >50% of area of masonry.
	Sustainable timber	Optional	Use of reused timber or FSC (Forest Stewardship Council) certifies timber throughout development.

	Local sourcing	Must do	Use of materials that are extracted and processed/manufactured in close proximity to the site.
	Insulation	Must do	All insulation material should have zero ozone depletion potential (ODP) in its manufacture and composition.
	Light pollution	Must do	External lighting should not pollute night sky and have low maintained illuminance levels (in line with CIBSE LG 6).
	Minimise Urban heat island effect	Optional	To reduce local heat generation, provide site hardscaping (>50%) with light coloured materials or shading, and light coloured roofs.
	Topsoil management	Must do	Topsoil should be protected during construction to preserve its ecological integrity. A topsoil management plan should be developed prior to commencement of earthworks.

4.2.1 Energy savings at individual building level

Residential and hotel: Using the EDGE tool and considering the energy related initiatives proposed above, the potential energy savings could amount to 2 700 000kWh/yr.

Commercial offices: By incorporating best practice principles in the design of the commercial office buildings it should be possible to save 15% of the annual energy consumption. Based on SANS 10400 XA and office area of 4000m^2 this equates to 110000 kWh/yr saving.

Retail: By incorporating best practice principles in the design of the commercial retail buildings it should be possible to save 15% of the annual energy consumption. Based on SANS 10400 XA and retail area of 10 500m^2 this equates to 375 000 kWh/yr saving.

With the above 'must do' energy reduction initiatives targeted, it is anticipated that the Boschendal Village development's electrical demand will be a maximum of 1.5 MVA.

4.3 Summary

The above tables indicate the sustainability best practice initiatives that should be considered in the Boschendal Village development at an overall development (precinct wide) level as well as at an individual building level. At the current stage of the project (concept stage) it is not really possible to identify the details and costs of the initiatives – these will be determined during the design development stage.

5. Conclusion

The sustainability elements contained within this Green Report contribute to the overall aim of a resource efficient development with a focus on the reduction in consumption of municipal services. The major municipal services considered are energy, water and waste. It has been indicated that the bulk municipal electricity supply to the site is constrained (ICE Group, 2016; @planning, 2015). The Boschendal Village peak electricity demand through the incorporation of the above demand side management initiatives in both the overall precinct as well as in the individual buildings, is anticipated to be a maximum of 1.5MVA.

This report has considered appropriate energy, water and waste sustainability initiatives both at an overall development (precinct) level as well as at individual building level. The analysis has been undertaken to identify high level opportunities as well as outlining several initiatives in more detail. The sustainability initiatives have been further categorised as “must do”, “optional” and “don’t do”.

The degree of success of the incorporation of the suggested sustainability initiatives is dependent upon the level of integration of the design solutions. It is imperative that the design team addresses design issues as an integrated unit in order to optimise the environmental benefit of the chosen solution.

6. Recommendations

It is recommended that the sustainability initiatives marked “must do” and “optional” are considered seriously by the project team during the design development stage. Once the cost and engineering practicality of each initiative has been thoroughly investigated, the decision as to which initiatives to include in the development will be finalised.

Finally, it is recommended that, at the commenced of the design development stage, a workshop is convened to develop a sustainability strategy for the overall development. This will result in identifying the individual sustainability initiatives that should be incorporated within the development as well as those initiatives that require further investigation.

7. References

@Planning et al, 2015. Boschendal Village Node Presentation to Council. Prepared for Boschendal. 20 May 2015.

ICE Group, 2016. Boschendal Village Development: Bulk Engineering Services Report. Revised January 2016.

ICE Group, 2016. Boschendal Village Development: Stormwater Management Report. January 2016.

Briel P, le Roux W, 2015. Boschendal Village Development Proposal. Boschendal Village Project: Urban Design Framework, with Precinct Plans and Controls and Guidelines. Prepared for Boschendal Proprietary Limited. November 2015.