



# How to design a sustainable heavy industrial estate



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## ABSTRACT

The Mid West of Western Australia, south of the Pilbara, is developing as the next major mineral province in Australia. The province will be served by a new port at Oakajee and will be backed by a 4000 + ha greenfield industrial area. LandCorp, the State Government's land development agency intends that the Oakajee Industrial Estate (OIE) will be a "sustainable industrial estate".

This paper describes the design process used to produce a flexible and adaptable layout of the estate to maximise use of renewable energy and minimise carbon emissions. The design and planning was complex because it had to anticipate a 50 year development program. Issues addressed included site characteristics and context, land allocation to optimise energy efficiency, embedding a multi-user co/tri-generation system in the middle of the estate, identify and estimating the production of energy from on-site and regional sources of renewable energy, options for reducing greenhouse emissions, waste reduction and reuse; and issues relating to the governance and management of the estate that will enable these site innovations to occur.

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## 1. Introduction

In 2010 the Western Australian Government's land development agency, LandCorp developed a structure plan to guide the development of the Oakajee Industrial Estate (OIE) over the next fifty years of its development. The OIE is approximately 23 km north of Geraldton in the Shire of Chapman Valley. The site is predominantly degraded farmland, however there are some areas of reasonable quality, biodiverse ecosystems in the outer hilly edge of the Estate, the coastal zone and river valleys.

Rezoning for the site was obtained in 2004. The rezoning identified a Strategic Industry Area (SIA) for heavy industry, supporting General Industry Areas (GIA's) and a Buffer Area see Fig. 1. The SIA contains the heavy industrial heart of the Estate that will use Oakajee port and 400 km rail link to the Mid West mineral province to deliver minerals to the Estate for processing and then export.

The OIE is a huge investment and had to be competitive against other international industrial Estates.<sup>2–4</sup> Trends in international

industrial development that were identified as giving the OIE an international competitiveness included [2,3,5,9,12]:

- High efficiency and minimum waste
- Innovation and technology development
- Low energy costs
- Low carbon footprint
- Water security and water use efficiency
- Easy access to flexible transport options
- Access to a sophisticated and well educated labour
- Synergistic industries located close to each other
- Sophisticated management of by-products
- Integration into surrounding communities
- Protection and enhancement of, and positive integration into, natural ecosystems

## 2. Industrial ecology framework

In the Business as Usual (BAU) model of industrial development (Fig. 2), individual industries organise their own supplies of materials, energy and water; and waste disposal is an industry-by-industry activity with the natural environment is a receptor of diluted pollutants with an associated acceptable level of damage allowed by Environmental Impact Assessment procedures. The underpinning assumption is that industry is inefficient, wasteful of raw materials and increases overall emissions and presents high levels of risk to surrounding human communities.

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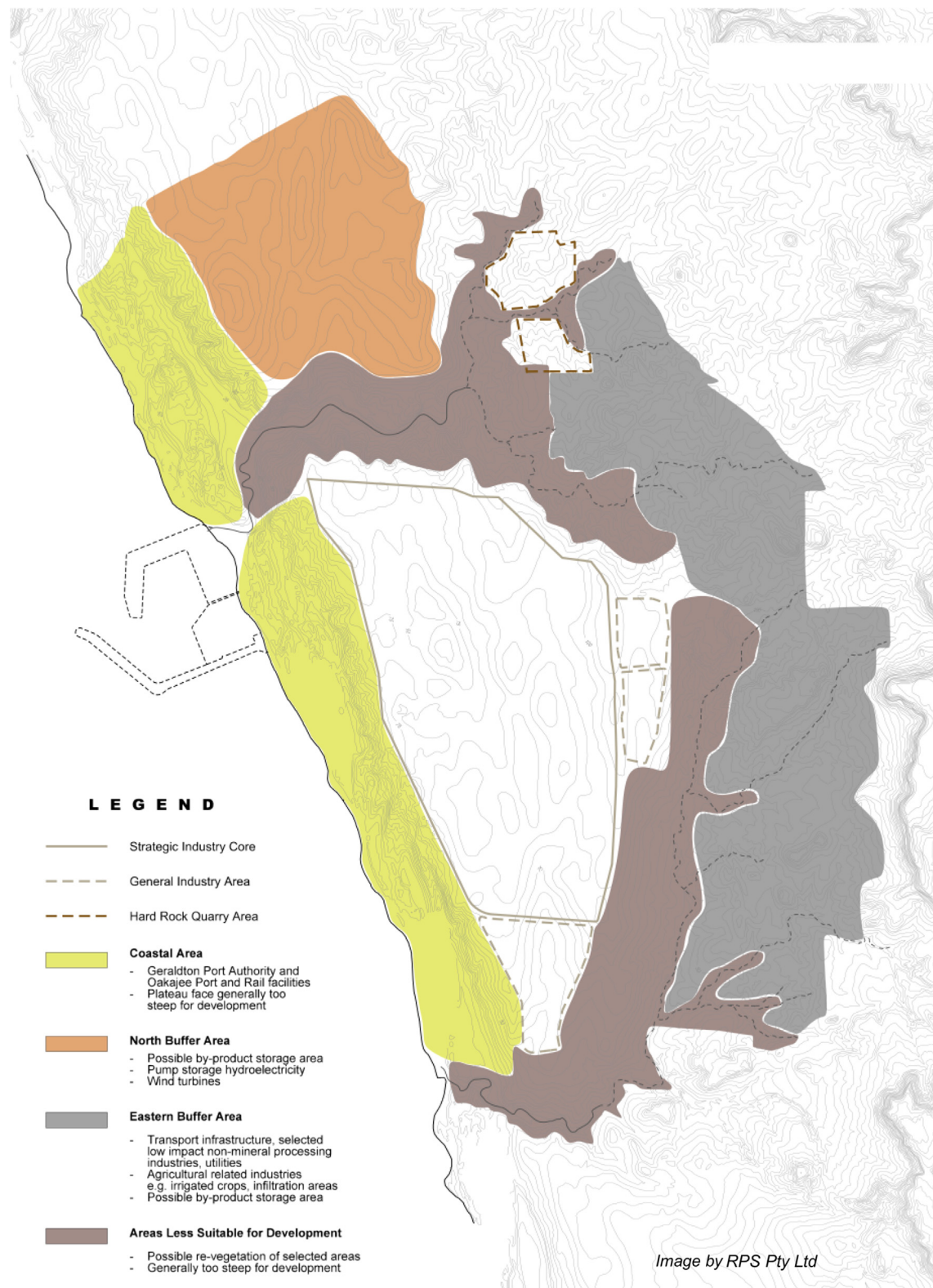
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<sup>2</sup> Australian Bureau of Statistics Australian and New Zealand Standard, Industrial Classification (ANZSIC) (Revision 1.0), (2006).

<sup>3</sup> ACIL Tasman, Oakajee Market Analysis – Market Analysis for the Oakajee Industrial Estate and Oakajee Port (2009).

<sup>4</sup> Mid West Development Commission, Major Projects Summary Mid West Region of WA, (November 2009).



**Fig. 1.** Oakajee Industrial Estate – general layout, topography and use areas.

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