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Discussion Paper: The future of Salinity Management in Western Australia

CONSULTATION PAPER

Focus on the Future: Opportunities for Sustainability in Western Australia

Submission

Prepared for:
Sustainability Policy Unit
Ministry of the Premier and Cabinet
15th Floor, 197 St Georges Tce
PERTH WA 6000

Prepared by:

Halliburton KBR
ACN 007 660 317
256 St George's Tce, Perth
Telephone (08) 9278 4100, Facsimile (08) 9267 4200

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Authorised by: G.R. Puglisi

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1 ABSTRACT

We know how to reduce pollution by using cleaner production methods to change the way goods and services are produced and supplied. However, the community and business seem to lack the skills or will to implement this knowledge, despite countless successful demonstration projects. Perhaps it is because the overall drivers for sustainability, such as fundamental taxation reform and pricing, are missing.

We know less about how the environment as a whole interacts, and what drives some ecosystems to extinction, but we are continuing to improve our understanding of the factors and detailed mechanisms.

If sustainability is seen as worthwhile, the State (and Federal) Government needs to get serious about implementing and leading the change. There is no point doing something half-heartedly by tinkering around the edges. Sustainability does require changes to the status quo, but there is no need for there to be any losers, only winners. This will happen if an effective, sustained long-term approach is clearly articulated and implemented so that business and the community can adapt and incorporate changes to their way of operating.

The Government needs to move from blueprints and strategies to action. Some of the key actions are as follows:

- allowance for the true worth of natural and human capital needs to be included in planning decisions. In other words, in our relatively wealthy country, economics should not be the sole determinant of the worth of an action. Rather, social and environmental benefits and harm arising from the commission or omission of an act need to be included. Some activities or options should be pursued despite the fact they could (but need not, or may not if an integrated approach is taken) cost more;

- royalties on extractive industries including minerals and building raw materials should reflect the true worth of the resource and encourage resource conservation and recycling;

- land clearing for agricultural and residential purposes needs to be curtailed with much more stringent controls;

- planning for liveable communities needs to take much more account of social and environmental needs, by encouraging and providing for sustainable transport, recreation and ecosystem services;

- greater incentives need to be provided to encourage resource recycling and the use of recycled materials;

- water use needs to become sustainable, and targets need to be set and projects implemented for reducing water consumption and wastewater recycling.

2 WHERE ARE WE NOW

There is a perception amongst some in the community that sustainability is solely about ensuring that existing or proposed activities can continue to operate and generate employment and profits indefinitely.

Whilst long-term gainful employment and monetary wealth generation should be the outcome of sustainable activities, such a single-minded approach or strategy does not consider whether the activity allows the processes on which it ultimately depends to also continue. Such an approach also does not question whether the activity meets the aspirations of employees or the community as a whole.

This perception needs to change as better ways of meeting society's requirements must be found and implemented. Positive stories and examples of how this can be achieved need to be spread widely to promote understanding and uptake of the concepts.

Despite current perceptions, the pursuit and implementation of true sustainability is gaining ground. Many large companies, in Australia as well as overseas, encouraged by a ground swell of community interest and support for sustainable endeavours, are attempting to incorporate sustainability principles into their planning and operations. These companies see opportunities to increase their competitive advantage and grow by gearing their strategies and management to supply sustainable products and services while at the same time reducing and avoiding sustainability costs and risks.

Many of the initiatives in sustainability revolve around increasing the efficiency of use of virgin resources and decreasing waste.

Many of the initiatives in sustainability revolve around increasing the efficiency of use of virgin resources and decreasing waste. Pollution prevention and control are essential to sustainability. However, the emphasis is shifting from treatment to the avoidance of emissions through cleaner production methods and processes.

Construction waste collected and recycled on site at the Woodman Point Environmental Enhancement Project. In line with Western Australia's State Recycling Blueprint (1993), efforts were made by Halliburton KBR in concert with its Alliance Partners to minimise the generation, and maximise the recycling, of waste.

Eco-efficiency is the efficiency with which environmental resources are used to satisfy human needs. Reducing material and energy input and cutting back emissions per economic value is widely recognized as an important strategy to meet the environmental challenges ahead. It is also seen as an opportunity to reduce economic costs and thus improve corporate profitability. Consequently, an increasing number of firms are integrating eco-efficiency measures into their activities.

Fundamental changes are required to ensure sustainable existence. They require courage and vision to implement.

Other, more fundamental, changes are required to ensure sustainable existence. These changes involve reducing or reversing the impact of development on ecosystem support processes, such as wetlands, rangelands and riverine environments, and re-design of community structures and transport systems. Many of these changes would also improve the quality of life of communities.

However, many of these changes are large scale, complex and controversial, and typically require government planning, involvement and stimulation. They require courage and vision to implement. Consequently, very few of these changes have been implemented. We therefore continue to live in un-sustainable communities, and farm and mine unsustainably.

Engineering projects need to incorporate environmental impact assessment and review to ensure ecological sustainability. Lake Kunnunurra (pictured above) is an example of a healthy man-made ecosystem.

Truly fundamental changes can be brought about by re-thinking what it is that we want provided. In many cases, what we want are services or attributes rather than goods. For example we want wholesome food and comfortable shelter, and we want entertainment and recreation. We don't necessarily want to own a refrigerator or to own a car so that we can go to the movies. We would be happy if our food was stored in a pay-for-use refrigerator that was maintained by the supplier if it was cheaper and used less energy. And we would be happy to walk to the movies if they were just down the street, or watch it on-line, or rent or share a car if these alternatives were cheaper overall.

Thinking about the service that is required rather than about a particular item can lead to fundamentally more sustainable activities. However, this requires a change of perception by suppliers of goods and services, and encouragement on the part of government to correctly price the goods and services to incorporate environmental and social costs. Incentives need to be introduced to encourage the change to sustainable practices, and subsidies which encourage the reverse need to be phased out.

3 WHAT CAN BE DONE

Mechanisms which reflect the true environmental and social cost of extraction and disposal must be introduced to encourage production of less waste and use of fewer virgin and more recycled resources.

We have speculated about the limits to growth for at least a century, but we are now finding that material resources are in shorter supply than labour resources.

The path to sustainability would be facilitated if the true cost of producing goods and services and disposing of the waste was incorporated into the economic cost. At the present time, the benefits provided by the environment and communities are not valued or are substantially undervalued. The benefits provided by the environment include nutrient recycling, oxygen production, carbon fixation and water purification, while benefits from community include mental and spiritual support and nurturing, bringing up children in socially-acceptable fashion, entertainment and health care.

However, it is difficult to remain competitive by including the true cost of environmental and social benefits into a product or service if all suppliers of that particular product or service do not also make allowance for the benefit. In this context, Government has a role to ensure that there is a level playing field.

Nevertheless, innovative and entrepreneurial companies can take advantage of new technology and/or consumer preferences to deliver more sustainable products and services which take into account the environmental or social benefits. Government can assist this process through financial support, taxation changes or preferential purchasing policies.

Several areas where government policy and activity can influence the adoption of more sustainable practices are outlined in the following sections.

Canning Dam (pictured above) has been one of Perth's most important reservoirs for around 60 years. The dam impounds a maximum of 90.5 GL and discharges up to 650,000 m^3 water per day. Halliburton KBR was recently involved in a project to repair and increase the height of the dam wall on behalf of the Water Corporation.

Water

Western Australia is currently experiencing water restrictions, and with continued dry winters likely, faces the prospect of similar or more severe permanent water restrictions. In such a climate, it is important to use water wisely and to extract as much use from each litre of water as possible.

One of the obstacles to efficient water use in Western Australia is its low price. Scheme water is relatively inexpensive compared to other bulk goods, and especially compared to bottled water. Groundwater is even cheaper and in many areas and for many applications (except drinking water) can be supplied solely for the cost of pumping (once the infrastructure is in place).

Neither of these situations encourages efficient water use, but rather encourages high water consuming industries and activities. The apparent ready availability and low cost of water certainly is responsible for some of our attractive lifestyle, i.e. lush public and private lawns and gardens, and enables us to attract certain industries such as titanium dioxide pigment production. However, we need to go further afield to obtain additional supplies of fresh water, and the over-application of water and fertiliser for irrigation leads to contamination of groundwater and wetlands. Further, the construction of additional dams affects the ecological health of those remaining rivers and wetlands which are not already impacted by reduced flows.

Water efficient design for gardens, such as that of the new East Perth subdivision (shown above), is both environmentally sustainable and aesthetically pleasing.

We are gradually moving in the direction of greater water efficiency by restricting the amount and the time when scheme water can be applied to lawns and gardens. Such water management needs to be extended by limiting the amount of groundwater that can be used for private, public and commercial use, perhaps by licensing and pay for use, especially in areas where such use impacts on environmental values such as wetlands and groundwater-dependent vegetation. Such restrictions will lead to desirable changes and innovations in the method of delivery of water (e.g. drippers), the purposes for which water is used, and the source of water. This will result in greater water use efficiency, reduced pollution and increased opportunity for other users of the resource.

An under-utilised source of water is domestic wastewater. There are significant opportunities for reuse of treated domestic wastewater for the following purposes:

- industrial cooling and process water;
- horticulture: irrigation of market gardens, orchards and vineyards;
- irrigation of public parks, gardens and golf courses;
- irrigation of private lawns and gardens;
- aquifer recharge.

Quality and especially health issues need to addressed in each of these applications, but there are many examples worldwide and indeed in Australia of successful wastewater reuse schemes.

Through proper treatment, wastewater can be reused for irrigation. Albany's wastewater is used to irrigate a 300-ha bluegum woodlot (pictured above) designed by Halliburton KBR.

While further research is needed to better understand all the implications, and especially issues related to long term sustainability (e.g. endocrine disrupters, heavy metals, salinity), the major impediment to wastewater reuse in Western Australia is cost and public acceptability, not scientific uncertainty or unrealistic health and environmental requirements.

Implementation of a wastewater reuse scheme, particularly in the Perth metropolitan area, requires the support of government.

In the domestic and public situation, the major cost is pumping and distribution of the treated wastewater from the central wastewater treatment plant. The unit cost can be reduced by supplying the treated wastewater to a large number of consumers along the route of the distribution network.

In most situations where wastewater is reused, the incentive to recycle has been driven by one or other of the following factors:

- the unavailability of additional water supplies of suitable quality;
- the cost of additional water supplies;
- the cost of treatment and disposal of wastewater.

Implementation of a wastewater reuse scheme, particularly in the Perth metropolitan area, therefore requires the support of government in either of the following ways:

- increasing the real cost of water to consumers to include the economic and environmental cost of developing additional supplies;
- subsidising the cost of supplying treated wastewater; or
- raising the standard of wastewater treatment for disposal to the receiving water environment, or restricting it.

The Woodman Point Wastewater Treatment Plant has been upgraded by Halliburton KBR in concert with its Alliance Partners to remove organic matter and nutrients in a Sequencing Batch Reactor (shown above) to produce a refreshed water suitable for irrigation and industrial reuse.

Aquifer storage and recovery/aquifer recharge using treated stormwater or domestic wastewater should be encouraged through research and development, with a view to utilising the recovered water for potable or non-potable purposes.

Implementation of a wastewater reuse scheme also requires the adoption of a new name for the treated wastewater (such as refreshed water) and an extensive outreach program to discuss the opportunities and issues with the community. Typically, it has required 10-20 years to implement large scale wastewater reuse, and there is no better time to start in Western Australia than the present.

Solid waste

With its wide open spaces and apparent limitless natural resources, there is little incentive in Western Australia to recycle resources, particularly of natural materials. However, disposing of waste material represents the loss of potentially valuable material, and constitutes a cost associated with the construction of, and transport of material to, waste disposal facilities, not to mention the potential environmental impacts associated with their operation.

Reduction in the generation of solid waste is the first step in managing waste. The mechanisms to bring this about include the following:

- improved production processes to reduce the production of off-specification material;
- closer alliances between producers/suppliers and consumers to deliver only the quantity and dimensions that the end user requires;

- wider adoption of the concept of extended producer responsibility whereby a manufacturer/supplier is responsible for the ultimate fate of the product, including the packaging.

The benefits of these cleaner production principles include greater material usage efficiency with consequent greater profitability, the re-design of products to allow easier recycling of the components, and the minimisation of packaging.

A system of rewards for recycling is better than a system of penalties for not recycling.

Waste will always be generated so there needs to be greater incentive to recycle the material. The concept of a landfill levy has merit, and a larger levy should lead to greater recycling. However, high landfill levies result in other problems and issues, such as illegal or indiscriminate dumping, which has the potential to destroy many areas of high conservation-value bushland. To counter this, an extensive and expensive system of licensing, surveillance and inspection is required.

High quality chairs produced from trees removed to make way for a dam on the Woodman Point Environmental Enhancement Project designed by Halliburton KBR and its Alliance partners.

A system of rewards for recycling is better than a system of penalties for not recycling. An alternative to a waste levy is payment to generators for material delivered for recycling. This is well established for scrap metals which have a value. The difference between metals and most other materials is that society has not valued other materials sufficiently highly. However, most material can now be recycled, including green waste, plastics and paper, so that the material now has value. The payment could be funded by government, in which case government purchases of

the end product, such as roadbase from recycled concrete, carpet from recycled carpet material, or stationery from recycled paper, would be at a discount because the product has already been partly paid for.

Such a strategy would provide an incentive for government to use recycled material (renamed recyclate). However, other incentives also need to be introduced for government to use recyclate. These could include a tender requirement to supply goods with a certain (stipulated) percentage of post-consumer waste content. Further, there could be a levy (or an increased levy where there are already royalties) on the use of virgin resources to reflect the reduction in natural capital and environmental impact associated with activities such as mining and forestry. This would make recyclate more economically competitive.

The funds for the payment for material accepted for recycling could be generated from the levy on virgin resources or through a surcharge on manufactured materials. The surcharge would be removed where the manufacturer implemented an extended producer responsibility program and collected and recycled the waste internally.

Steel construction waste collected and recycled on site at the Woodman Point Environmental Enhancement Project by Halliburton KBR in concert with its Alliance Partners.

4 WHAT CAN WE OFFER

Halliburton KBR employs experienced environmental and engineering managers with skills in chemical, biological and earth sciences, water and waste management and engineering design. We have successfully applied our skills to managing sustainability issues throughout the State from the Kimberley to the Great Southern. Our recommendation is that sustainability requires significant input from firms such as ours that have the ability to address problems at the appropriate scale, respond to local communities and incorporate contemporary technologies.

Halliburton KBR provides scientific and engineering solutions to complex problems.

While the overall concept of sustainability is simple, the specifics can be complex and highly technical requiring knowledge of local and regional groundwater flows. The effect of potential landuse changes on local recharge and groundwater levels and requirements for water management is often beyond the understanding of the local communities. Therefore it is essential that specialist knowledge is available to assist the community in proper planning and implementation of planned measures.

Halliburton KBR employs environmental and engineering managers with skills in chemical, biological and earth sciences, wastewater treatment, hydrology, social issues, and the application of engineering solutions to complex problems. Our recent track record with sustainable activities in Western Australia is complemented by similar activities in other states and other countries. Some examples of our work in Western Australia are described in the following sections.

Woodman Point Environmental Enhancement Project

This project, delivered in an Alliance between Halliburton KBR, Clough Engineering Limited and the Water Corporation, was committed to achieving outstanding environmental outcomes. All legislative, regulatory and social were requirements met to minimise the adverse impacts of construction on the environment. The project also improved existing environmental conditions through a revegetation program, and set new benchmarks for sustainable construction activities. To implement this approach to environmental management, a holistic environmental awareness program called Treading Lightly was developed.

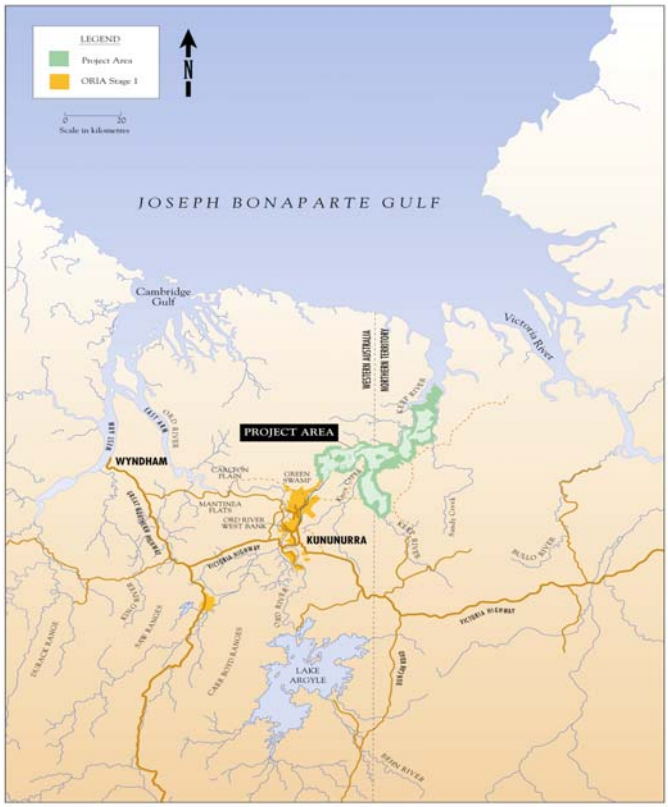
The concept of extended producer responsibility was introduced to potential tenderers. Every effort was made to reduce the generation of solid waste such as concrete, timber and metal, and all metal, timber, paper and cardboard was either reused on site or sent off-site for recycling. Records were maintained of all waste generated and recycled. Trees removed as part of construction were logged for use as furniture timber, while all other vegetation was chipped for use in revegetation.

The extension of the main sewer to the wastewater treatment plant, which crossed wetlands north of Lake Coogee, was transformed into a shared use path from which walkers get a bird's eye view of Lake Coogee and the wetlands to the north. The design of the sewer was modified to reduce its visual impact and to enable it to better blend with the vegetation. Large areas of weedy degraded land are being revegetated as part of the project, and a wetland is being created to compensate for areas of wetland removed to make way for the main sewer. About 450 grasstrees and zamias were removed for later transplantation back to the site.

The Woodman Point Environmental Enhancement Project, delivered in an Alliance between Halliburton KBR, Clough Engineering Limited and the Water Corporation, was committed to achieving outstanding environmental outcomes.

500-year old grass tree replanted on site at the Woodman Point Environmental Enhancement Project by Halliburton KBR in concert with its Alliance Partners.

Ord River irrigation study



Groundwater management was one of the key issues that needed to be addressed to ensure the Ord Sugar Project would be environmentally sustainable. Without management, groundwater would rise due to the proposed irrigated agriculture, eventually leading to waterlogging and possible salinity problems at the surface. Development of the groundwater management strategy required the use of sophisticated numerical computer simulations to analyse both the root zone of the sugarcane crop and the regional groundwater. Numerical models were used over the range of meteorological conditions and irrigation scenarios to identify an appropriate irrigation schedule and the timing and extent of artificial control of the groundwater table. A borefield system was designed to complement the capacity of the natural groundwater drainage system and to keep the entire system in balance.

The system as designed provides a balance between managing root zone salinity and sodicity and control of the rise of saline groundwater. The modeling was carried out for a 50-year period and confirmed that irrigation can be sustainable provided suitable groundwater control measures are undertaken. In addition, extensive survey work was undertaken to identify areas of significant flora and vegetation. Large areas were proposed to be reserved to enhance the conservation estate.

The tools developed for the Ord River can be used to address salinity and groundwater management issues throughout the State.

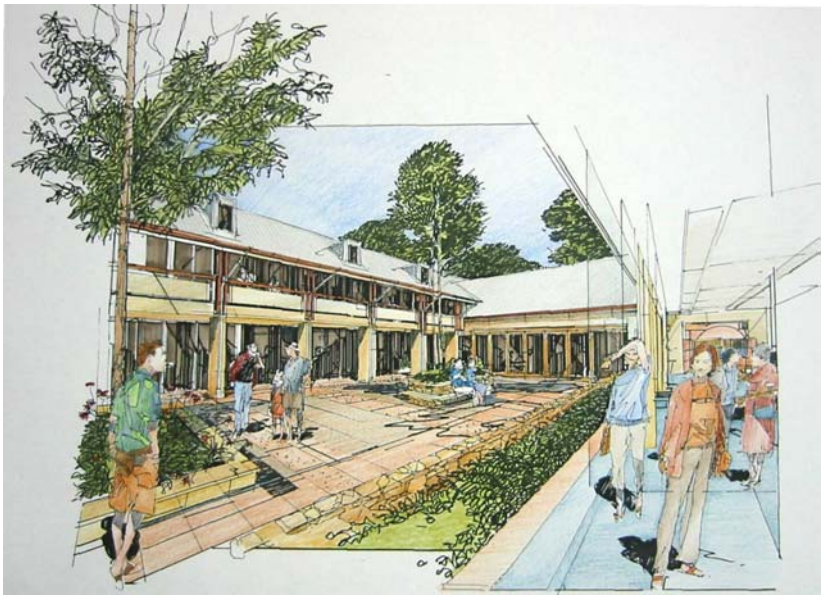
Subiaco wastewater reuse study

Halliburton KBR undertook a study to examine the feasibility of irrigating areas with refreshed water from the Subiaco wastewater treatment plant. Eighty-five groups as far as 13 km north and 11 km south of the plant were identified as potential users of refreshed water to irrigate parks, gardens and golf courses. The total potential demand (if the price of refreshed water was no greater than the cost of using groundwater) was determined to be 35 ML/d. There was a need to upgrade the Subiaco WWTP to remove nutrients to comply with environmental guidelines in order to protect nearby surface waters and with Health Department regulations to protect the health of users of the facilities.

The major proportion of the $28M capital cost for the scheme was the installation of distribution mains to deliver the refreshed water to the users. The additional unit cost of supplying refreshed water to all identified potential users in order to recover both capital and operating costs was determined to be 44 c/m^3. If only the extra operating and maintenance costs of the reclaimed water scheme were to be recovered, the additional unit cost of supplying reclaimed water to all identified potential users was determined to be 12 c/m^3. Unfortunately, the scheme has not proceeded because of the perceived expense.

The new Gosnells Civic Centre was designed on ecological sustainability principles.

Gosnells Civic Centre



Artist's impression of the Gosnells Civic Centre, designed on ecologically sustainable principles by Halliburton KBR and its associates.

Halliburton KBR were the lead consultant in the design of a new Civic Centre for the City of Gosnells which was based on ecological sustainability principles. During the concept design, a number of Environmental and Energy workshops were held to identify and rank the initiatives that were considered relevant to the project. The outcome of

these workshops was the generation of two schedules of initiatives, one of which were initiatives that would definitely be incorporated into the building. The second list were optional initiatives to be funded from a special ecological initiative budget and these were evaluated under a number of criteria including the payback period, any maintenance issues, the social value, sustainability issues and the overall value of each initiative to the project.

Some of the initiatives included in the building are as follows:

- high performance, solar controlled/double glazing to certain areas;
- external shading structures and large tree for shade;
- additional roof and wall insulation to further reduces gains and losses;
- use of Variable Refrigerant Volume air conditioning to best match the occupancy patterns;
- use of economy cycles, automatic outside air control, motion detecters and night purge to reduce fridge plant operation times and air conditioning loads;
- solar chimney (using the building's clocktower structure) to promote natural ventilation to the building entrance and lobby area;
- dimming and presence detection lighting control;
- omission of hot water outlets to WC area hand basins;
- use of waterless urinals;
- harvesting of rainwater, greywater (hand basin and sink wastes), and A/C condensate drainage for landscape reticulation purposes;
- salvaging of timber flooring form existing buildings to be demolished and reuse on this project.

A methodology was developed for the comparison of the embodied energy for a limited number of building element options. The results of this comparative study will used to establish which materials and forms of construction will be employed. Energy and water consumption targets have been set for the building. The energy consumption within the building will be modeled and refined to generate a building energy budget. This design budget will be compared with the actual building energy and water consumption during occupation and operation.

Telfer waste management plan

Halliburton KBR prepared a waste management plan for a remote mining site in the Pilbara. The plan acknowledges that if waste management requirements and costs are to be minimised the waste management measures must reflect the hierarchal principles of integrated waste management, namely reduce, reuse, recycle, dispose. Consequently, a number of proposed measures, such as extended producer responsibility, including supplier take back of packaging and discussions with the supply chain, address the issue of waste avoidance. The plan also incorporated proposals to preferentially use materials with a high recycled content.

Consolidation of waste recycling programs for metals, oils, batteries and vegetation and extension to include materials such as plastic containers and pipe, paper, timber and Kitchen fats/oils, were other features of the waste management plan. Incineration was recommended as preferred method of disposal of rags and other workshop wastes contaminated with hydrocarbons as well as putrescible wastes. While a waste to energy plant associated with the incinerator was also evaluated, implementation of such a scheme did not appear viable because of the relatively small amount of waste and the distance of any proposed incinerator from the major users of the electricity generated.

Engineering solutions and services

Achieving sustainability is not solely about technology. However, a company such as ours can provide engineering and management solutions which integrate with social, financial and legislative programs to drive sustainability.

Practical engineering solutions require consideration of a number of options and careful selection of the appropriate techniques based on site-specific characteristics. Some of the issues that increasingly we and others need to consider in achieving sustainability include the following:

Projects must have multiple benefits for the community as well as for the environment.

- co-ordination with suppliers to ensure all products used on a project meet acceptable criteria with respect to the impact from their manufacture, use and disposal;
- incorporation of energy efficient designs and renewable energy sources such as biogas, and wind turbines and solar thin film composite roof tiles into building design;
- greater installation of co-generation power facilities;
- implementation of wastewater treatment and recycling systems including irrigation of woodlots and gardens, stormwater recovery, and use of polishing wetlands;
- manipulation of ground water levels through shallow and deep drainage, and ground water pumping, to manage salinity;
- integration of techniques for surface water management to control salinity and erosion with those required to develop reliable water supply systems;
- development of alternative industries, such as agro-forestry, groundwater desalination and solar energy production, which have multiple benefits for the community as well as for the environment;
- greater protection and restoration of biodiversity reflecting the true value of species diversity and ecosystem services.

5 WHERE TO FROM HERE

Halliburton KBR looks forward to working much more closely with a range of government agencies and private companies to deliver a long-term sustainable future for Western Australia.

The State Government needs to get serious about implementing sustainability. The Government should have a vision of being an Australian or World leader in sustainability, and be prepared to accept the short term inconvenience or criticism associated with such a role.

Sustainability is all about working together to achieve compatible goals for the entire community and environment. Halliburton KBR has demonstrated the success of working with clients and the community in an alliance or partnership arrangement which results in excellent sustainability outcomes, restoring the environment, not simply eliminating adverse impacts.

Halliburton KBR has developed extensive experience in wastewater treatment and reuse, particularly in agriculture. This experience could be utilised to supply refreshed water to growers of horticultural crops close to Perth. Further we have designed ecologically sustainable buildings and prepared waste management strategies based on the principles of cleaner production and extended producer responsibility.

We look forward to working much more closely with a range of government agencies and private companies in the areas of water, transport, power, minerals, oil and gas to deliver a long-term sustainable future for Western Australia.

With the support of businesses such as Halliburton KBR, and our staff, the Government can move forward confidently for the long term benefit of the State.