Whose waste is it anyway?

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Abstract

The importance of the Lord Howe Island Group was recognised with its inscription on the World Heritage List in 1982 for its outstanding natural values. With 105 endemic plants, the islands support extensive colonies of nesting seabirds and at least 168 bird species have been recorded either living at, or visiting, the islands. A number of these are rare or endangered. The waters surrounding Lord Howe provide an unusual mixture of temperate and tropical organisms. The coral reef is the southern most in the world and provides an example of the transition between coral and algal reefs.

Historically, settlers made a living by hunting, fishing and growing vegetables, fruit and meat for trade with passing ships. Today tourism dominates the local economy. The existing landfill covers approximately 2 ha immediately behind Lagoon Beach, west of the airport and south of the settlement. Historically waste was tipped and burnt in-situ. More recently combustibles were incinerated daily in a cage, with solid waste stockpiled separately and periodically burnt. The resulting ash (and metals) was buried in a nearby swale, with putrescibles buried adjacent and septic sludge in soakage pits along the dunes.

The Lord Howe Island Board (Board) cares, controls and manages much of the islands. The Board, together with the local Clean Up Australia Committee (Clean-Up Australia, 1997), proposed to develop a Waste Treatment & Recycling Facility (WTRF). It was proposed to develop the facility at the existing landfill site, in the southern part of the settlement, near the lagoon. The Board and committee were concerned with the limited remaining area at the landfill, public health issues associated with landfilling, undesirable emissions and fire risk associated with daily incineration and potential impacts of leaching on the nearby lagoon.

Commonwealth, State & Board approvals required an Environmental Impact Report, the preparation of which began in 1999.

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Introduction

The international importance of the Lord Howe Island Group was recognised with its inscription on the World Heritage List in 1982 for its outstanding natural universal values (NSW Government et al, 1981):

- as an example of superlative natural phenomena; and
- containing important and significant habitats for in situ conservation of biological diversity.

Located 700 kilometres north-east of Sydney, the Group comprises Lord Howe Island, several offshore islands, Ball's Pyramid, and associated coral reefs and marine environments. It covers an area of 146 300 hectares. Nearly seven million years ago, geologic movement of the Lord Howe Rise (an underwater plateau) gave birth to a large shield volcano on its western edge. Over time the sea eroded 90 per cent of the original volcano, leaving the islands that today comprise the Group. Lord Howe Island has a spectacular landscape with the volcanic mountains of Mount Gower (875 m) and Mount Lidgbird (777 m) towering above the sea. The central low-lying area provides a marked contrast to the adjacent mountains and northern hills. Rainforests and palm forest dominates most of the island. Grasslands occur on the more exposed areas of Lord Howe Island and on the offshore islands. Most of the main island and all of the offshore islands are included in the Lord Howe Island Park.

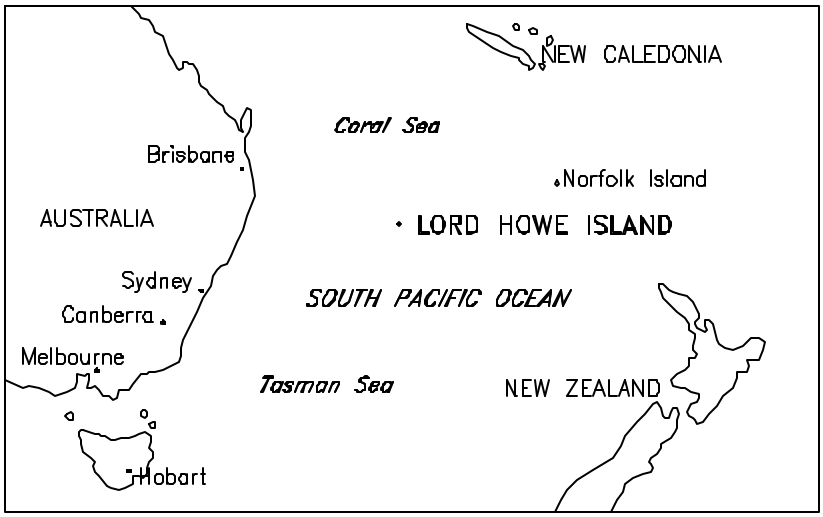

Figure 1 - Locality Diagram

There are 241 different species of native plants, of which 105 are endemic to Lord Howe Island. The islands support extensive colonies of nesting seabirds and at least 168 bird species have been recorded either living at, or visiting, the islands. A number of these are rare or endangered. The endangered woodhen is one of the world's rarest bird species.

The waters surrounding Lord Howe Island provide an unusual mixture of temperate and tropical organisms. The reef is the southern most coral reef in the world and provides a rare example of the transition between coral and algal reefs. A marine national park was declared by the State of New South Wales (NSW) in 1999 to increase protection of the marine environment.

Europeans discovered Lord Howe Island when the island was sighted in 1788 from the British colonial naval vessel HMS Supply, en route from Sydney to the penal colony on Norfolk Island. By the 1830s there was a small permanent settlement in the lowland area of the main island. Settlers made a living by hunting, fishing and growing vegetables, fruit and meat for trade with passing ships. Pigs, goats and rats have caused extensive vegetation and habitat changes, threatening populations of native species. Today tourism dominates the local economy.

The Issue

Lord Howe Island and its associated islands are under the care, control and management of the Lord Howe Island Board. The Board, together with the Lord Howe Island Clean Up Australia Committee, proposed to develop a WTRF. It was proposed to develop the facility at the existing landfill site, in the southern part of the settlement, near the lagoon. The Board and committee considered the adopted methods of waste management were unsuitable for several reasons:

- detrimental impacts on groundwater;
- current odour, air quality, noise, fire risks and vermin problems experienced by residents;
- local fauna communities may be threatened by current vermin populations;
- weed infestation in remnant vegetation;
- public health issues arising from disease vectors;
- non-compliance with waste minimisation policies;
- non-compliance with the precautionary principle and the principles of ecologically sustainable development; and
- limited remaining landfill area.

The existing landfill covers approximately 2 ha of the land immediately behind the Lagoon Beach frontal dune, west of the airport. Evidence of refuse is present in the banks of Cobby's Creek, where filling is reported to have commenced over 30 years ago. The historical practice was to regularly burn the tipped refuse in-situ. More recently, an incineration cage has been used for the daily burning of combustibles. Bulky solid waste was stockpiled separately and periodically burned. Ash, including a high proportion of steel cans, was buried in a nearby inter-dune swale. Putrescibles were buried in adjacent sections of the swale. Septic sludge was buried in soakage pits constructed in the dunes.

The majority of the cleared area and access road in the vicinity of the existing facilities was former landfill. Future landfilling space was therefore limited, particularly given the practical height constraint to ensure the landfill is not visible from the Lagoon. It was estimated that the remaining landfilling space available may be as little as 1000 m^3 or approximately two to three years of operations, unless former putrescible trench or sludge pit areas were re-worked.

Plate 1 - The existing landfill is situated behind Lagoon Beach (Site 1).

Plate 2 - Existing open burning cage

Plate 3 - Current landfill practice (disposal of ash from cage)

It was determined that severe siting constraints would apply to either the existing type of operation or a conventional sanitary landfill. Conversely, a small facility, designed to accommodate residual materials arising from an alternative waste strategy, could be part of a viable long term scheme. Any future landfill operation would need to incorporate the features implied by the NSW Environment Protection Authority (EPA) "Environmental Guidelines for Solid Waste Landfills". It was confirmed by the Board that the requirements of the *Waste Minimisation and Management Act 1996* (NSW) with respect to reductions in waste disposal to landfill, could not be met by a continuance of existing practices.

The Proposed Solution

The construction of the proposed WTRF would initiate improved management techniques for various waste streams at the existing landfill. The new infrastructure would be integrated with existing operations to facilitate significant operational changes, thereby mitigating a number of the existing impacts currently experienced at the site. The Board perceived the specific benefits arising from the development to include:

- implementation of the Waste Minimisation and Management Strategy (The Strategy, APrince Consulting, 1998);
- compliance with several statutory requirements associated with current landfilling practices.
- reduction in odours generated at the existing landfill site;

- eliminating the need for daily burning of combustibles, thereby improving air quality, and reduction in fire risks;
- likely reduction in vermin populations, thereby benefiting protected fauna species;
- protection and enhancement of remnant and rehabilitated vegetation through greater weed control;
- materials recovery will extend the useful life of the available landfill capacity;
- rehabilitation of the existing landfill site; and
- decline in leachate generation and associated groundwater impacts.

The proposal involved the construction of a WTRF based upon an enclosed Vertical Composting Unit (VCU) and the upgrading of Recycling Facilities. Once completed, these new facilities would enable waste disposal to be reduced to 27 tonnes per year from the current rate of 202 tonnes per year as per recommendations identified in the Strategy.

Plate 4 - Vertical Composting Unit

The selection of VCU technology followed a detailed appraisal of alternatives received in response to an Expression of Interest and tender process co-ordinated by the Co-operative Research Centre for Waste Management and Pollution Control Limited at the University of New South Wales (CRC) which commenced in 1997. The technology had been subject to research and development testing on prototypes at Long Bay Gaol and the University of New South Wales (same sized unit). The EPA (EPA, 1997) had endorsed the technology as suitable for the production of high grade compost from biosolids and other putrescible and organic waste streams generated on the Island.

The recycling facility would include the provision of a dedicated, pre-fabricated building to allow all-weather operation, with a mechanical conveyer belt to assist manual sorting operations. This would enable existing landfill operations to be modified significantly, with reduced burning frequency and quantities due to the source separation and composting (Department of Urban Affairs and Planning, 1996) of paper/cardboard as well as chipped

green waste, putrescibles, septic tank and grease trap wastes. New bin washing facilities would also allow plastic film bin liners to be phased out. A Rehabilitation Plan would be developed for the existing landfill incorporating the re-processing of selected putrescible/sand material only, excavated from previous disposal trenches and landscaping using compost and treated effluent from the WTRF. Preliminary consideration had also been given to prospective sites for other future waste management infrastructure, to ensure sustainable waste management options are addressed in conjunction with the proposal.

The design capacity of the proposed VCU anticipated up to 1.5 tonnes/day, thereby meeting anticipated existing, and future requirements for putrescible and aqueous (organic) wastes.

Golder Associates was retained by the Board to conduct a detailed assessment of the proposed WTRF and to prepare the Environmental Impact Report (EIR) (Golder Associates, 1999). Preparation of the EIR commenced in 1999 involving the preparation of a Development Application under the *Environmental Planning & Assessment Act 1979* (NSW) and an assessment under the *Environment Protection (Impact of Proposals) Act 1974* (Commonwealth).

The Environmental Impact Report

The Report included:

- An Evaluation of Alternatives;
- A Description of the Environment;
- A Description of the Proposal;
- An Assessment of Impacts;
- A Description of Mitigating Measures;
- Consultation with the Commonwealth agencies, NSW agencies and the Community; and
- Conclusions.

The Evaluation of Alternatives

The key strategic objectives were determined to be ie management of waste consistent with conservation of World Heritage values:

- maximise waste avoidance and materials recovery to achieve sustainable waste management;
- achieve immediate improvements to existing landfill operations, thereby extending the useful life of any available landfill capacity on the Island;
- satisfy appropriate safety and risk considerations;
- satisfy amenity, ecological and energy conservation criteria;
- avoid groundwater pollution from waste disposal activities; and
- identify locations which may warrant further investigation as sites for future integrated or stand alone waste management infrastructure.

The specific objectives associated with the proposed VCU were to integrate the treatment of the following organic waste streams:

- domestic and commercial putrescible waste;
- garden waste;
- septic tank and grease trap waste;
- paper and cardboard; and
- re-processing partially composted putrescible material previously disposed at the landfill.

The proposal was subject to several key constraints, requiring:

- consistency with the World Heritage status and international conventions and agreements applying to fauna populations;
- consistency with protection of the natural environmental values;

- satisfaction of both the Commonwealth and NSW statutory processes, including endangered or vulnerable species lists and recovery plans;
- achievement of stringent waste reduction targets for the disposal of waste to landfill;
- recognition of the limited financial and human resources of the community;
- recognition of the isolation complicating sustainable waste management; and
- operating licenses;

A resident survey identified the following alternative technologies for consideration:
- biodigester - (anaerobic digestion);
- composting - (aerobic composting - window, static pile, in-vessel);
- vermicomposting; and
- transfer off-island (transfer station).

In addition to the VCU, a variety of processes eg a continuous flow reactor (utilising aerobic processes), a compost bin (utilising both aerobic and anaerobic processes), compost container (utilising mechanical and aerobic processes) were considered and found less suitable.

Several (nine) sites, previously identified by government studies and others suggested by members of the local community during the initial consultation phase, were also evaluated for the location of the facility. The evaluation of these alternative sites was undertaken in accordance with Schedule 1 (clause 4) of the *Lord Howe Island Regional Environmental Plan 1986*. These included the existing landfill, the old Settlement, Gower's Paddock, Middle Beach, Moseley Park, Middle Beach Road Quarry, South Satellite Dish, Cobby's Banana Garden and behind the Board Depot. It was noted that with the exception of the existing landfill site, the proposed sites would not be available for use in the short term due to the statutory planning process involved in rezoning, for utility purposes under the Regional Environmental Plan.

Description of the Environment;

Relevant legislative, regulatory, policy and planning requirements were considered, including:
- International Agreements:
  - Fauna species listed under the Agreement between the Government of Australia and the Government of People's Republic of China for the Protection Migratory Birds and their Environment (CAMBA);
  - Fauna species listed under the Agreement between the Government of Australia and the Government of Japan for the Protection Migratory Birds in Danger of Extinction (JAMBA); and
  - Values for which the group was recognised under the World Heritage Convention.
- Commonwealth statutes:
  - Values for which the group was listed on the Register of the National Estate;
  - Flora and Fauna species listed under the *Endangered Species Protection Act*; and
  - Matters requiring a Commonwealth decision where there is a potential to affect the environment to a significant extent as outlined in the *Environment Protection (Impact of Proposals) Act*.
- State statutes:
  - Sites listed in the State Heritage Inventory;
  - Flora and Fauna species listed under the *Threatened Species Conservation Act*;
  - Goals outlined in the State Coastal Policy (NSW Government 1997);
  - Land Use Planning (and Zoning) as gazetted in the Regional Environmental Plan;
  - Consents required of the Board empowered by the Lord Howe Island Act with regard to the *Environmental Planning and Assessment Act*; and
  - Various statutory instruments, such as the Island Development & Building Code.

Relevant environmental factors, such as geology, climate, coastal processes, hydrology, marine ecology, flora, fauna and air quality were considered, as were the social and economic

environment, such as demography, community infrastructure; commercial activities, cultural heritage and visual amenity were also considered.

Description of the Proposal;

The description presented the proposed waste streams and performance requirements, the proposed treatment process from the WTRF, the VCU (including the paper slurry tank, the septage holding tank, the de-watering unit to the materials blender) and the wastewater treatment process and process control. The facilities layout and ancillary infrastructure (including green waste chipper, machinery/tools, utilities and irrigation system) were outlined.

It was estimated that the proposed VCU, with a capacity to process 1.5 tonnes of organic waste each day, would typically generate approximately 0.5 tonne of Grade A compost products per day, complying with NSW EPA Guidelines (EPA, 1999). This would be suitable for site rehabilitation at the existing landfill, with future opportunities for use in parks and gardens; as erosion control measures; horticulture; nursery; golf course; and in private gardens. It was also anticipated that an expected reduction in home composting following the introduction of the VCU would also create a level of demand for the product.

A continuing demand for landfill disposal of residual wastes was also anticipated at about 60 - 100 m^3 per annum. This included hardfill (construction and demolition waste); bulky solid waste (surplus to Revolve Centre); ash (from periodic combustibles burn only); oversize inerts such as ceramic, rubble, rubber products (from VCU compost screens); and stumps, oversize logs

Assessment of Impacts;

The assessment of impacts considered the nine potential sites and focused on the following key issues:

- Environment - World Heritage, Water Quality, Air Quality, Noise (Sources, Receptors, Estimates & Impacts) and Ecosystems (Flora , Fauna & Habitat).
- Social – Employment, Cultural Heritage and Visual Amenity.
- Economic – Tourism, a Statement of Energy Requirements and Management.

A number of potentially significant benefits were also been identified for the proposal. It was noted that many of the impacts associated with the existing landfill operations would not continue under this proposal, with examples of beneficial impacts are as follows:

- daily burning of combustibles will cease, thereby improving air quality;
- vermin populations are likely to be reduced, benefiting protected fauna species;
- weed control will be enhanced by landfill rehabilitation;
- materials recovery will extend the life of scarce landfill capacity;
- odour generation from the site will be reduced;
- fire risks will be reduced by reduced frequency of burning; and
- leachate generation and its associated groundwater impacts will decline.

Wider benefits would also accrue from the integration of septage handling and the co-composting of various waste streams. The improved soil moisture retention expected in areas using the compost product, would also increase the efficiency of water use on the Island and lead to the conservation of limited water resources, consistent with the sustainability principles guiding the island's strategic management.

Description of Mitigating Measures

A proposed Environmental Management Plan (EMP) detailed how environmental impacts would be mitigated or avoided during the design, construction and operational and

maintenance phases. The EMP included management objectives, actions, monitoring requirements and implementation respons ibilities.

For the design phase, mitigation measures included siting to reduce visual impacts; appropriate colour treatment for the building and the use of non-reflective building materials to enhance integration into the landscape; and meeting wind design event standards and the requirements of the Development and Building Code. For the construction phase, mitigation measures involved: additional biological surveys; setting transportation hours; and minimisation of dust nuisance. For the operation and maintenance phase, mitigation measures included: guidelines to reduce the scale and frequency of current burning practices; staged rehabilitation; erection of acoustic enclosures around noise generating; containing all spillages during septage handling; maintenance of the integrity of the proposed hardstand and bunding; and restriction of hours of operations.

Consultation

Consultation was undertaken with the relevant Commonwealth agencies, NSW government agencies and the Board and the community with public meetings, interviews with key members of the community.

EIR Conclusions

The 'no change' option was not considered acceptable, with the WTRF having a net benefit to the island environment and community. It was concluded that potential impacts associated with the construction and operation of the plant warranted environmental management measures to mitigate impacts. Golder Associates (1999) considered the VCU as highly suited to Lord Howe Island for the following reasons:

- Low power consumption;
- Small footprint and land use;
- Low airflow rates required due to high operating temperature;
- Modular design allows other waste streams to be added to blender without affecting VCU;
- Capacity to accommodate seasonal fluctuations in feedstock mix ratios without adverse effects on process;
- Automated process requiring low operator involvement in process performance;
- No leachate produced; and
- Availability of market for compost on Lord Howe Island.

Investigations of alternative sites conclude the existing landfill site as the preferred location.

But, whose waste is it anyway?

A mere 280 people are lucky enough to call the island home. Tourism, as stated above, is the dominant industry. Visitor numbers are restricted by law, to just 400 at any one time. A simple analysis suggests that at least 60% (and potentially 100%) of the waste is generated by tourism, tourism support industries and by the community involved tourism.

During the preparation of the Strategy (APrince Consulting, 1998) and again during the EIR, transfer off-island (including a transfer station) was a considered alternative. It was however dismissed, in the main, on economic, environmental and social grounds. Similar iconic parks across Australia encourage visitors to responsibly dispose of their wastes, suggesting that it should be taken home and disposed of in a manner similar to household waste ie reduced, reused, recycled and reclaimed. Success varies. Supplies to the island are currently shipped (predominantly food, fuel and building materials) from Brisbane or Yamba (NSW) or flown (predominantly perishables and food as personal baggage) from Brisbane or Sydney on the Australian mainland. It is possible that waste could be returned to the mainland and reused,

recycled and reclaimed but at an additional cost. Small quantities of waste are bailed and glass repatriated on the return trip to Yamba.

The WTRF was constructed. Over the first two to three years of operation of the WTRF there were teething issues, such as the mix of wastes (eg fish waste) and the moisture content of the septic sludges. The Board subsequently engaged Golder Associates (2003) to review the most appropriate long-term location for a new waste disposal site on the island, as required by the original consent conditions. The review determined that the waste treatment and processing facilities should remain at the existing site, with enhanced management at the existing site and a new waste disposal site being established as an inert landfill.

Rewriting of Commonwealth legislative requirements will require a further Environmental Impact Report.

The WTRF employed an innovative reduce, reuse, recycle and reclaim approach, which saw a diversion from landfilling and incineration. However a landfill was still required and, as seen by the more recent engagement of Golder Associates (2003), a further landfill will be required. Modern landfills require best practice design, construction and management that have social and environmental benefits and increased costs.

Conclusion

There is little doubt that the WTRF, in line with the strategy (APrince Consulting, 1998) has socially, environmentally and economically benefited the island (as evidenced by the endorsement by governments, the Board and the community). Not withstanding that the island (and indirectly tourism) will have to fund this new landfill.

References

APrince Consulting 1998, *Lord Howe Island Waste Minimisation and Management Strategy.*

Clean-Up Australia, 1997. *Lord Howe Island Waste Characterisation Study.*

Department of Urban Affairs and Planning 1996. *EIS Guideline: Composting and Related Facilities*, Sydney.

Environmental Protection Authority, 1996, Environmental Guidelines for Solid Waste Landfills

Environmental Protection Authority, 1997, *Environmental Guidelines: Use and Disposal of Biosolids Products*, Chatswood.

Environmental Protection Authority, 1999, *Draft Guidelines: Composting and Related Waste Facilities*, Chatswood.

Golder Associates Pty Ltd, 2003, *Options Report - Long-Term Location of Waste Management Facilities Report*, Lord Howe Island Board.

Golder Associates Pty Ltd, 1999, Environmental Impact Report - Waste Treatment & Recycling Facility, Lord Howe Island Board.

NSW Government 1997, *NSW Coastal Policy 1997: A Sustainable Future for the New South Wales Coast*, Sydney.

NSW Government, Australian National Parks and Wildlife Service, Australian Heritage Commission, 1981. *Nomination of Lord Howe Island Group by the Commonwealth of Australia for inclusion in the World Heritage List.*