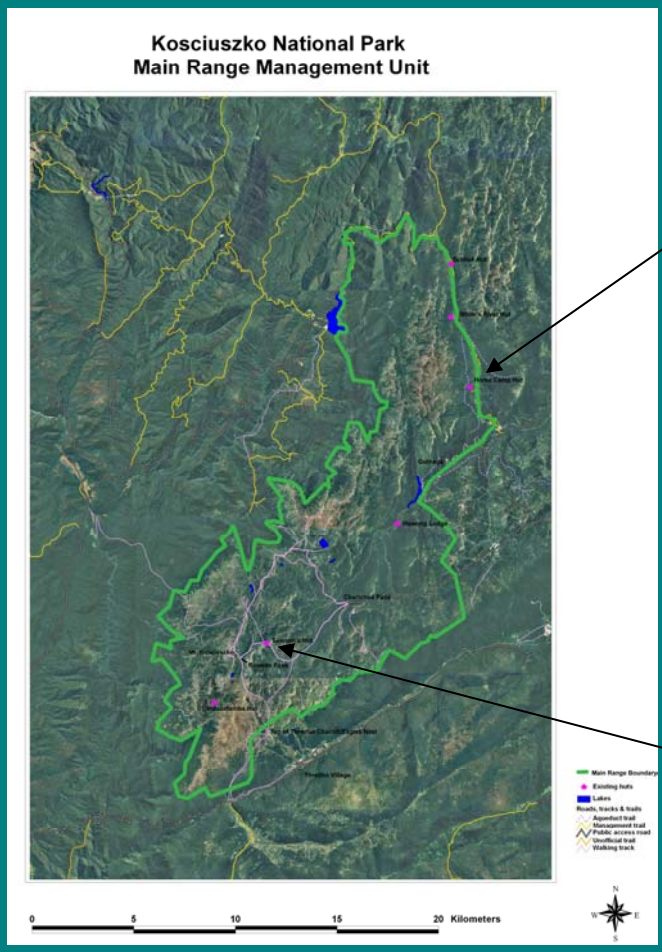
Human Waste Management Strategy

Main Range Management Unit – Kosciuszko National Park

Department of Environment and Conservation



Taking Care of Business

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Taking care of business

Human Waste Management Strategy for the Main Range Management Unit, Kosciuszko National Park

June 2005

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CONTENTS

Page

Figures

Photographs

Tables

Attachments

1. SUMMARY

About the Strategy
The Draft Plan of Management for Kosciuszko National Park provides for the development of a human waste management strategy for the Main Range Management Unit. In summary, the Plan requires the Strategy to address:

- best practice human waste management;
- the adequacy of existing toilet facilities;
- the provision of visitor information;
- appropriate waste management in the Main Range;
- a carry-out human waste disposal system for backcountry areas not serviced with toilets.

While the Strategy is an element of the new Draft Plan of Management, concerns regarding human waste management in the Main Range are longstanding. This draft Strategy aims to present a comprehensive review of existing issues and available options, and a coordinated set of solutions for the Main Range Management Unit.

The significance of the Main Range
The Main Range contains the most significant values of one of the most significant national parks in the world. The Unit is made up largely of alpine environments, and features Australia's highest mountain, Mount Kosciuszko. It contains internationally significant physical and biological values, including glacial and periglacial landforms, threatened and alpine endemic flora and fauna, rare and endangered ecosystems and structurally unusual treeline formations. The spectacular glacial features and rolling alpine landscape of the Main Range have exceptionally high social value, expressed through increasingly high levels of visitation and recreational activity.

Recreation use
Summer visitation has increased dramatically, with a three-fold increase since 1982. During summer, over 1,500 people may visit the Main Range each day, mainly along the major routes via Thredbo or Charlotte Pass. Family groups are common, and most visitors stay for less than half a day. Popular summer activities include short and long walks (78.8% of visitors), sightseeing (11.6%), mountain biking (3.2%) and camping (1.9%). Winter use tends to be more dispersed than summer as skiers are less constrained by vegetation and the location of tracks. The main access points are Thredbo chairlift top station, Guthega Village and Guthega Power Station. Mount Kosciuszko is one of the most popular backcountry skiing destinations in the park. Camping in winter is centered on the huts and protected backcountry valleys.

Recreation settings
The Draft Plan of Management identifies the following four recreation settings:

- major gateway or 'grandstand' sites (Charlotte Pass, Thredbo Chairlift);
- major walking tracks (Charlotte Pass - Thredbo Chairlift);
- secondary gateway sites (Guthega Village, Guthega Power Station); and
- backcountry areas.

The draft Strategy is organised around these settings, with a further distinction drawn between undeveloped backcountry areas and huts. Each setting carries its own cluster of constraints and opportunities, in terms of visitor expectations, attitudes and abilities, and environmental sensitivity. Under the Draft Plan of Management, toilets are acceptable in principle in each setting, with the exception of backcountry areas away from huts.

The current situation in the Main Range

At present, permanent toilets are provided at each of the primary gateway sites (top of Thredbo Chairlift and Charlotte Pass), at the Whites River corridor huts, and are proposed for Seaman's Hut, on the Summit Walk, and Rawson Pass, below the Mount Kosciuszko summit. A toilet is available to visitors at the Guthega Power Station, and during daytime in winter a public toilet is available in the Nordic Centre at Guthega village. In the backcountry, where toilets are not provided, visitors are expected to comply with a minimal impact code involving the burial of waste well away from water sources. There are issues relating to signage at the Thredbo lower terminal, Thredbo chairlift, Charlotte Pass and Guthega Power Station facilities. Visitors have also reported odour problems at the Charlotte Pass facility. The absence of toilets on the long walk to Blue Lake from Charlotte Pass has presented problems for visitors. Evidence of unburied waste at points beside the walking tracks, around Seaman's and Cootapatamba Huts and at dispersed campsites indicate non-compliance with the minimal impact code. Faecal waste may represent a health risk to backcountry campers through contamination of water sources.

Best practice human waste management

The Draft Plan of Management provides overarching principles and policies which form the basis for the best practice criteria. In addition, the draft Strategy applies the principle that all solid human wastes should be removed for disposal outside the Management Unit, because of the exceptional significance and sensitivity of the Main Range environment. The Strategy also applies the 'minimum tool rule', which aims to minimise management intervention while achieving management objectives. Selecting the most appropriate solution for a particular site is a two stage process: determining the best broad management option, then selecting between specific alternatives within that option. The draft Strategy provides a set of planning and design standards to assist with the assessment and selection of toilet systems and carry-out methods, incorporating environmental, functional and social criteria.

Alternatives for the Main Range

The wider range of broad management options to deal with human waste problems in natural areas is reviewed, including visitor use restrictions, changing the location of use areas, hardening the environment and active rehabilitation. Broad options which have potential for each recreation setting are identified. Alternative specific waste management systems within these options are reviewed and compared. The draft Strategy reviews experiences with human waste management in cold climate, sensitive environments in Australia and overseas, covering toilet systems, waste disposal options and waste carry-out programs.

Proposed new policies, facilities and actions

The draft Strategy proposes a range of management measures, including:

- new toilet facilities at Rawson Pass, Seaman's Hut and potentially at Cootapatamba Hut;
- phasing in a carry-out policy for backcountry areas of the Main Range;
- a raft of facilitation measures to support the carry-out policy including carry-out waste disposal facilities, commercial liaison, and communications and publicity;
- initial human health risk assessments of backcountry camping areas and watercourses;
- ongoing monitoring of facility performance, backcountry camping areas and watercourses; and
- improvements to signage and accessability at existing toilets, for example appropriate and effective signage at grandstand sites with clear messages such as "last toilet for x km's" at Thredbo Chairlift.

Areas for future extension and development are also identified, including potential improvements to carry-out arrangements. Most of the proposals in the Strategy would be implemented over a 10 year timeframe, with monitoring and review continuing indefinitely. New works, reviews and assessments would take place within the first three years. The carry-out policy would be implemented following the establishment of infrastructure, communications and other arrangements.

2. INTRODUCTION

The Main Range of Kosciuszko National Park is one of the most environmentally significant and fragile natural areas in Australia. It is also among the most beautiful and iconic, and attracts a growing number of bushwalkers, campers and backcountry ski-tourers, snowboarders and snowshoers. Increasingly, recreation uses in the park require careful management to ensure that environmental and cultural values are protected, and visitor experiences are not compromised.

The management of human waste is addressed in the Draft Plan of Management for the park, which acknowledges the critical importance of waste management at both high-visitation destinations and remote locations. The Draft Plan requires the preparation of a comprehensive human waste management strategy for the Main Range.

This draft Strategy provides a framework for the better management of human waste in the Main Range Management Unit, over a 20 year timeframe.

The approach adopted in the Strategy is based on the principle that solid human wastes (and where practicable, liquid wastes) should be removed for disposal outside the Main Range Management Unit. This is because of the exceptional significance and sensitivity of the alpine environment, and its limited natural capacity to absorb and assimilate waste. The Main Range also protects the headwaters of important river systems, including the Murray River and the Snowy River.

The Strategy aims to provide for sufficient facilities and practices to ensure that the environment and visitors are protected from unmanaged human waste. A fine balance must be struck; too little management intervention and the environment and visitor experiences will continue to be degraded (by unmanaged human waste), too much intervention will also cause unnecessary disturbance to the environment and visitor enjoyment (from management activities and requirements).

In summary, the Strategy comprises:

- an analysis of the current waste management issues;
- a set of best practice waste management objectives and criteria appropriate to the Main Range;
- an assessment of available waste management alternatives; and
- a recommended policy and management regime for the Main Range.

The draft Strategy also offers guidance on implementing the Strategy, covering impact assessment, environmental management, performance monitoring, public consultation, commercial liaison, communications and publicity, priorities for implementation and evaluation and review.

The Strategy recognises that a range of recreational settings exist in the Main Range area, and that each setting requires a different mix of management techniques. The selection of solutions appropriate to each setting is based on knowledge of the Main Range environment, human waste impacts, user group values, attitudes and abilities, management alternatives and past experiences both here and overseas.

The draft Strategy will be placed on public exhibition for a period of two months. Following the consideration of input from interest groups and the wider public, a final strategy will be prepared. Any construction works required by the Strategy would be subject to separate environmental impact assessment processes.

The draft Strategy has been prepared by Paul McPherson and Michael Gromer of **ngh**environmental, and recreation planning consultant Stig Virtanen for the NSW Department of Environment and Conservation.

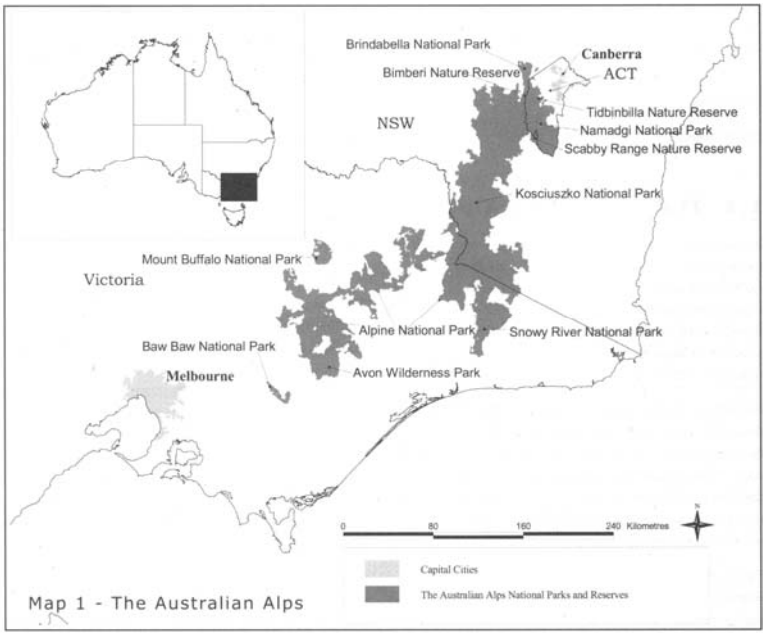


Figure 2.0.1 Location of Kosciuszko National Park**.**

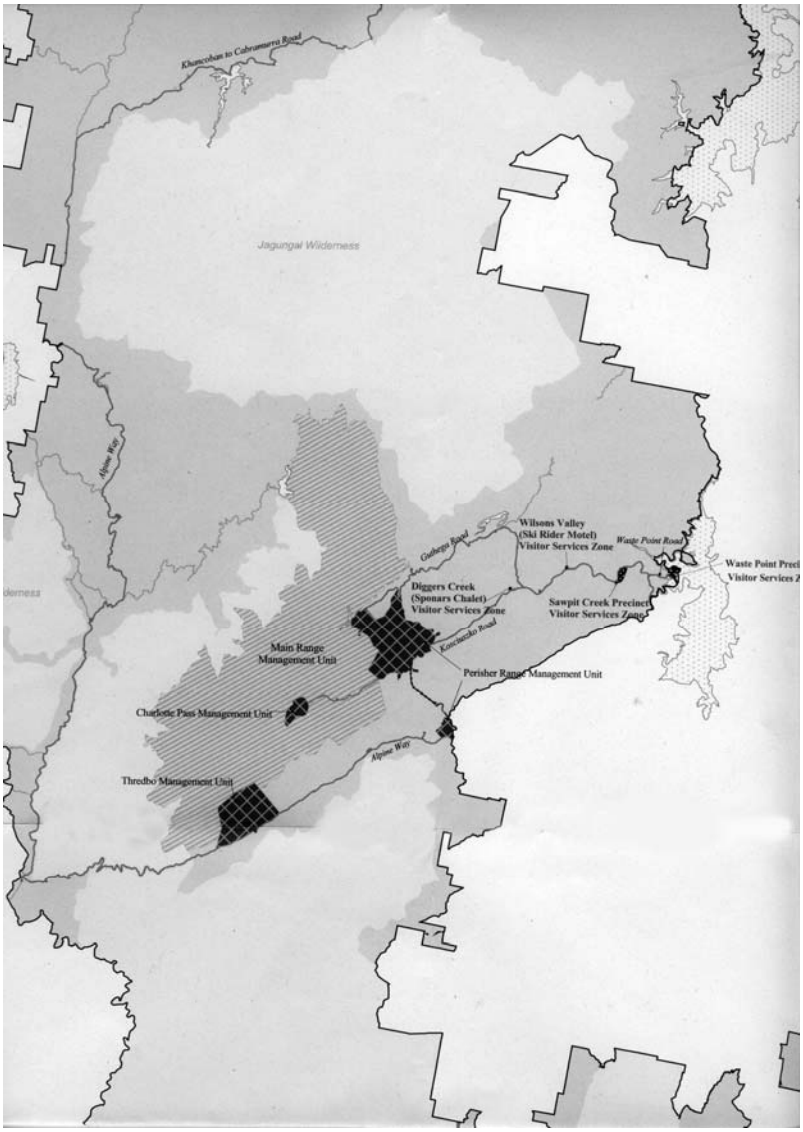


Figure 2.0.2 Location of the Main Range Management Unit within Kosciuszko National Park.

Source: Kosciuszko National Park Draft Plan of Management

3. BACKGROUND

3.1. The Environment of the Main Range

3.1.1. Kosciuszko National Park and the Main Range Unit

Kosciuszko National Park is one of the world's great national parks, and the largest in New South Wales. It covers almost 675,000 hectares and contains the highest mountain in Australia, Mount Kosciuszko at 2,228 metres above sea level, and all NSW's ski fields. The park is one of the Australian Alps national parks, which stretch from the Brindabella Range west of Canberra through the Snowy Mountains of New South Wales to the Victorian high country.

Kosciuszko National Park is listed as a biosphere reserve under the United Nation's Educational, Scientific and Cultural Organization Man and the Biosphere Program. Blue Lake and its surrounding area is listed as a wetland of international importance under the Ramsar Wetlands Convention. The Australian Alps are recognised by the World Conservation Monitoring Centre as one of the 167 world centres of biodiversity, and by the IUCN as one of six Australian sites of plant diversity. The 11% endemism in the Australian Alps is amongst the highest for mountain areas around the world.

The Kosciuszko Main Range Management Unit has an area of approximately 20,800 hectares and extends along the spine of the Great Dividing Range for a distance of 28 kilometres, from the South Ramshead Range in the south to Dicky Cooper Bogong in the north. To the west, the Unit is bounded by the wilderness area of the Western Fall. To the east of the Unit lie the Thredbo and Perisher village ski resorts, and Schlink Pass Road marks the northern and north-eastern boundary of the Unit. Management in the Unit is strongly focused on the protection of the natural and cultural values of the alpine zone and the management of increasing levels of recreational use.

3.1.2. Climate

The Main Range features an alpine climate, with no dry season and a mild summer (Stern *et al.* 2000). Very low winter temperatures of between -15°C and -22°C can occur in valleys due to cold air drainage (Ruddell *et al.* 1990 in Kinhill 1997). The mean annual precipitation is between 1,900 mm and 2,300 mm, with about half falling during winter (Mallen *et al*. 1985). The area is subject to extended periods of snow cover, generally between June and October, and frost can occur throughout the year. Westerly and north-westerly winds prevail, particularly during winter when gusts on exposed peaks can reach 200 kilometres per hour (NPWS 1985). Temperature and rainfall are shown in Figures 3.1 and 3.2 below (Courtesy DEC Kosciuszko National Park website). The area's highest recorded temperature is 33.5°C, and the lowest recorded temperature is -23°C, based on Bureau of Meteorology records from Charlotte Pass, at Kosciusko Chalet (elevation 1755m).

Figure 3.1.2.1 Average temperature ranges, Charlotte Pass (Kosciuszko Chalet)

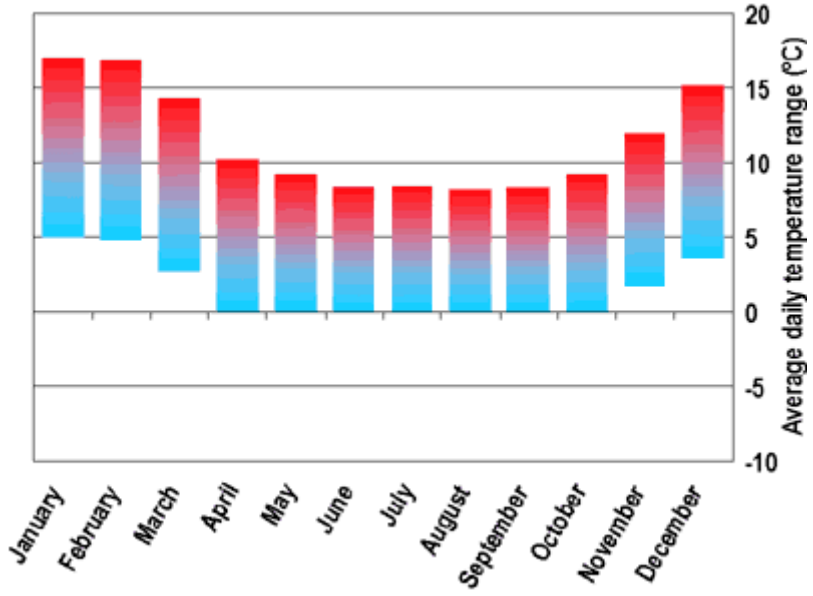
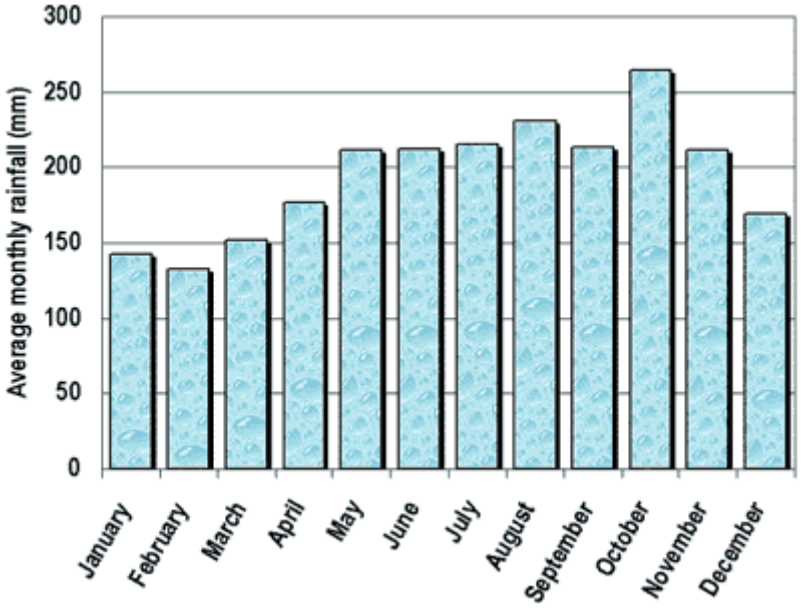


Figure 3.1.2.2 Average rainfall ranges, Charlotte Pass (Kosciuszko Chalet)



3.1.3. Geology and soils

The alpine area of the Main Range is dominated by the granitic rocks of the Kosciuszko Batholith. A narrow band of Siluro-Devonian shale, slates and phyllites derived from deep marine mud and sand, runs roughly north-south through the Rawson Pass site (Costin *et al*. 2000). The Australian Alps was the only part of the mainland to have been affected by glaciation and contains a variety of unique glacial and periglacial landforms above 1,100 metres. Small valley glaciers formed during

the Pleistocene Period (35,000-12,000 years ago), evidenced by glacial features such as moraine deposits, cirques, erratics, polished and scratched pavements and glacial lakes. The more widespread periglacial processes during this period produced features such as the boulderfields, stone-banked lobes, solifluction terraces, non-sorted steps, rock shattering and wedging and nivation hollows in alpine and sub-alpine areas. These glacial and periglacial features are relict landforms, and will not reform following disturbance under current climatic conditions.

The major current weathering processes in the Unit include chemical action (accelerated by acidic groundwater) and the mechanical effects of seasonal and day/night freezing cycles. The relatively deep soil mantle covering the high mountain areas in Australia contrasts with the thinner deposits of most mountain ranges of other continents, which tend to be of higher altitude and/or latitude. Rounded boulders of weathered rock are commonly present in granitic soil profiles and on the surface, occasionally as large tors.

Soils in the Main Range include alpine humus soils derived from granite, and organic peat soils under *Sphagnum* bog communities and fringing vegetation. Alpine humus soils are dominant on better drained and sheltered slopes in alpine and high sub-alpine areas. These soils are notable for a lack of podsolisation, showing in fact a reversal effect with an accumulation of colloids and nutrients in the upper soil layers from wind deposits and biological activity (ISC 2002). Alpine humus soils also generally display high water-holding capacity in the root zone, low nutrient status (except for the organic rich surface layer), high levels of organic matter with low nitrogen availability, severe acidity, shallow and stony profiles and high erodibility (Rowe *et al*. in CAAE/DNRE 2002). Peat soils are acidic, sensitive to nutrients, vegetation loss and exposure to the atmosphere. These soils are comparatively rare in Australia, and have been impacted by past climatic changes and more recently by burning and cattle and horse grazing.

3.1.4. Hydrology and catchment values

The Main Range contains the headwaters of a number of significant rivers including the Murray and the Snowy. The area also contains significant glacial lakes, subterranean waterbodies and alpine fen and bog systems. The alpine lakes of the Main Range have especially low nutrient levels and are the freshest waterbodies on the Australian mainland (NPWS 2004).

In the undisturbed alpine and sub-alpine environments of the Unit, runoff from precipitation and snow-melt rarely flows over the surface, tending to infiltrate the soil and flow downwards. This water reappears in valleys at lower elevations as springs, often associated with bog vegetation. Water movement in areas where the water table reaches the surface manifests as oozing rather than flowing (Costin *et al.* 1959). Bog and fen communities (particularly *Sphagnum* associations) are significant in regulating water flow, storing winter moisture and slowly releasing it over the subsequent summer and autumn.

Existing streams in the alpine region are primarily of two types, either fast flowing and turbulent with stony beds, or highland plateau streams having pools that accumulate fine sediments and organic matter. Both of these stream types are groundwater fed and are perennial. They also respond quickly to surface runoff and are supported by snow melt (Beggs and Norris 1994). High flows are extended from winter through summer due to snow melt, contrasting with the low summer flow patterns prevalent at lower altitudes. Water quality in streams flowing out of the area is characterised by low pH, low temperature, low conductivity, high dissolved oxygen and low nutrients (Begg and Norris 1996).

3.1.5. Vegetation

The alpine areas of the park support about 200 plant species (Mitchell 2002). The alpine and sub-alpine zones of the park contain 6 threatened species (1 endangered, 4 vulnerable and 1 in the process of being listed), 28 ROTAP species and 27 endemic species (21 of which are alpine species). A further 62 species have their entire NSW distribution confined to the park, of which at least 12 are considered uncommon in the park.

The alpine and high sub-alpine zones support a distinctive array of vegetation communities, including herbfields, grasslands, heaths, feldmarks and wetland formations, several of which are unique to Kosciuszko. The position of each vegetation type is governed by the distribution of snow and groundwater, which are determined by physiography (ISC 2002). The general presence of relatively deep soil in the Australian alps favours forb and grass growth over shrubs, and accounts for the prevalence of tall herbfield/grassland communities.

Rare, restricted and specialised plant communities of very high conservation significance occur where temperature, aspect, drainage and exposure impede the growth of tall herbfields (NPWS 1988). These include feldmarks which cover less than 1% of the alpine zone, found on extremely stony and exposed snow patch sites of the alpine region (Mitchell 2002). Fen and bog are restricted communities, and occupy 5.8% of the alpine zone (Costin *et al*. 2000). Alpine bog is currently being assessed for listing as a threatened ecological community under the Commonwealth EPBC Act by the Threatened Species Scientific Committee. *Sphagnum* bogs are covered by the preliminary listing of Montane Peatlands and Swamps as an Endangered Ecological Community under the *Threatened Species Conservation Act 1995*. Windswept feldmark, snowpatch feldmark, short alpine herbfield, alpine/subalpine fen, bog and wet heath wetland communities, *Podocarpus lawrencei* heathland and old growth snow gums are listed in the KNP Schedule of Significant Natural Features.

Australian upper slope and inverted treelines are unusual in the world in being dominated by open-crowned evergreen angiosperms (Kirkpatrick (1994b) in ISC 2002). The upper slope and inverted treelines of the park are the best examples in Australia, and so are of national significance. The treelines are also of international significance as the best examples of a structurally unusual type of treeline (ISC 2002).

Many weed species are established in the Park, some continuing to spread, and new introductions continue to occur (ISC 2002). Species of particular concern include Jointed Rush, Soft Rush, Sweet Vernal Grass, Browntop Bent, Yorkshire Fog, Yarrow, Russell Lupin, Blackberry, Broom and Willow species.

3.1.6. Fauna

The alpine zone and subalpine woodlands make up around 30% of the park (Thomas *et al.* 2002) and support 100 native fauna species (ISC 2002). Fauna occupying high elevation habitats in the park generally display special adaptations to extreme environmental conditions, contrasting with other Australian fauna which have adapted to conditions of aridity and high temperatures (Good 1992). The most common mammal species are the Bush Rat, Broad-toothed Rat and the Dusky Antechinus. A total of 36 bird species have been recorded, though few remain during winter. A number of reptiles and amphibians (12 species) also occur in the area, and both native fish (Mountain Galaxias), and introduced fish (Trout) occur in local streams. The alpine zone supports high numbers of springtails, mites and earthworms, but few phasmids and snails.

The distribution of fauna species is strongly tied to habitat features such as vegetation structure and floristics, and the presence of streams/pools and boulders. Vegetation such as tall heath and dense tussock grasses, and large surface rocks provide protection from the weather and predators, both directly and through the creation of sub-nivean spaces during winter. These habitats consequently support far greater numbers of species and individuals than more exposed habitats such as feldmark and open forms of tall alpine herbfield.

Threatened species in the alpine/subalpine zones include 3 frogs, 3 reptiles, 4 birds and 4 mammals (ISC 2002). While the alpine/subalpine environments support around 30% of the total species in the Park, they also support a disproportionate 55% of the threatened fauna species (ISC 2002). Endemic or alpine specialist species include 1 mammal, 4 frogs, 4 reptiles and a range of invertebrates (ISC 2002). Perhaps the most significant faunal feature of the Kosciuszko alpine zone is the endangered Mountain Pygmy Possum (*Burramys parvus*), the only marsupial alpine specialist. Glacial lakes and alpine streams support specialised aquatic fauna, including several highly restricted endemics (Good 1992). The alpine zone supports high numbers of individuals and species of reptiles, compared to alpine areas on other continents (ISC 2002). While bird fauna diversity is generally low, the proportion of seasonally migratory bird species is of zoological interest.

About 20 introduced vertebrate species have become established in the park, including the rabbit, horse, deer, fox, cat and a variety of bird species (ISC 2002). Climate change also poses a significant threat to fauna in the park (ISC 2002).

3.1.7. Indigenous heritage

Prior to European occupation, a number of Aboriginal tribes occupied the lower valleys and foothills of the Snowy Mountains on a permanent basis. These tribes frequented higher elevation areas during the warmer months (Flood 1980, Good 1992). The main range area is located within the tribal territory of the Ngarigo people (Tindale 1974). Ethno-historic accounts summarised by Flood (1980) suggest that the high alpine areas were occupied by Aboriginal people for short periods during the summer months when aestivating Bogong moths *(Agrotis infusa)* could be collected from crevices in rock outcrops.

The traditional lifestyles of the local Aborigines, including the annual Bogong moth feast, were disrupted from the late 1820s when graziers brought stock into the area and are considered to have ceased by 1850 in this and nearby regions. Diseases brought in by the new settlers infected Aboriginal communities, diminishing their population in this region and across NSW (HO and DUAP 1996).

3.1.8. Non-indigenous heritage

The non-indigenous history of the Main Range encompasses exploration, agricultural grazing, recreation (skiing and hiking) and conservation. Squatters with cattle occupied the Australian Alps region and surrounds by the 1820's, moving outside the 'limits of location' set for the colony (NPWS 1991). In 1840, Paul Strzelecki ascended Mt Kosciusko and Mt Townsend from the Geehi Valley.

Between the 1860 and 1880 summer grazing became established as an annual management practice in the high country, under a system of snow leases.

Recreation and tourism and in the Kosciuszko region dates from the nineteenth century, when makeshift ski events were held at Kiandra, organised tours visited Yarrangobilly caves and skiers, cyclists and horse riders ascended Mount Kosciuszko. In 1906, the State Government created a reserve around Mount Kosciuszko for 'public recreation and the preservation of game' (Good 1992). The Kosciuszko (or Summit) Road from Charlotte Pass to Mount Kosciuszko was completed

in 1908. It was closed to public vehicles in 1974. The State Government and private clubs began constructing huts and lodges in the Perisher Range area and more remote locations from the 1930's.

Alpine zone grazing was phased out between 1944 and 1958 to protect soils, vegetation and Snowy Scheme dam catchments. Kosciuszko State Park was created in 1944. This later became Kosciuszko National Park in 1967.

The Snowy Mountains Hydro-Electric Scheme commenced construction in 1949. During the 1950's, the NSW Soil Conservation Service undertook stabilisation and revegetation work in the alpine zone, using stone, hay bales, wire netting, bitumen, straw mulch and seeding techniques.

3.1.9. Visual and scenic values

The Main Range offers outstanding scenic values, particularly from peaks, ridges and saddles. Vegetation mosaics, summer wildflower displays, the often stark treeline boundary, craggy mountains and cliff faces, extensive linear river valleys, snow-topped peaks and spectacular glacial/periglacial features such as cirques, glacial lakes, moraine deposits and blockstreams have high aesthetic value in the open alpine landscape. Visual values in the Unit are dominated by natural elements and are accentuated when short, medium and long range features are available, such as occurs in areas of low or open vegetation with extensive views to distant skyline features. In places visual values are compromised by the appearance of bare soil, dead or damaged vegetation, weed growth or unsympathetic or incongruous human developments.

3.2. Planning context

3.2.1. Planning legislation

Environmental Planning and Assessment Act 1979 **(EP&A Act)**

The EP&A Act provides for a range of planning instruments including State Environmental Planning Policies (SEPP's) and Regional Environmental Plans (REP's), and for environmental impact assessment requirements. In assessing a development activity, Clause 111 applies a duty to determining authorities to consider 'to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity'. Proposals which require development consent under a planning instrument are generally assessed under Part 4 of the Act. Developments undertaken by government agencies in the Main Range Unit are assessed under Part 5 of the Act, generally via a Review of Environmental Factors.

Environmental Planning and Assessment Regulation 2000

This Regulation sets out information that must accompany development applications, including Environmental Impact Statements (for 'designated developments'), Statements of Environmental Effects (for non-designated developments under Part 4) and Species Impact Statements (where developments are likely to significantly affect critical habitats, threatened species, populations, ecological communities, or their habitats). For Part 5 developments, Clause 228 provides a list of general factors which are to be taken into account in the assessment of impacts.

3.2.2. National Parks and Wildlife Act and the Kosciuszko National Park Plan of Management (Draft 2004)

Part 5 of the *National Parks and Wildlife Act 1974* requires the Director-General to prepare a plan of management for each national park. The Kosciuszko National

Park Plan of Management identifies discrete Management Units in the Park, and Unit-specific policies and management activities. A revised Draft Plan of Management for the park was prepared and released for public comment in 2004.

A key action rising from this draft plan is the need to develop a strategy for human waste management within the Main Range Management Unit looking at infrastructure needs and mechanisms for catering for remote overnight users in balance with the natural and aesthetic importance and climatic conditions of the area.

3.2.3. Planning in the Main Range

Kosciuszko alpine area recreation management plan

A recreation management plan for the alpine area was prepared by Stig Virtanen (1993) for the NPWS. Titled 'Toward conservation and recreation management of the Kosciuszko Alpine Area', the plan is based on the KNP Plan of Management (1982). It recognises the increasing visitor use levels of the alpine area and the development of a number of specific management problems, including:

- vegetation damage due to trampling and camping;
- track erosion due to heavy use and inadequate maintenance;
- track duplication and creation of informal tracks;
- deteriorating water quality due to faecal contamination;
- vegetation damage due to eutrophication;
- increased evidence of human waste and litter;
- increased safety problems.

The plan provides for a series of management responses, covering strategies to redirect visitor use, the introduction of a permit system for camping, monitoring environmental impacts, ensuring uses are appropriate, providing toilet facilities, information and interpretation, and a walking tracks strategy.

Of direct relevance to this Strategy, the plan states that:

> *'The need for public toilets in the summit area is paramount, with the highest priority being at Charlotte Pass, Rawson Pass and Seaman's Hut'.*

The plan states that toilets are required because:

- of a lack of any existing facilities
- the large number of visitors;
- visitor expectations that toilets will be provided;
- inadequate waste disposal methods used by visitors;
- the volume of faeces and litter evident;
- potential impacts on water quality and public health if no management action is taken.

The plan considers the relative merits of several toilet types, including pit, septic, haul-out, pump-out and composting systems, and acknowledges the technical challenges associated with remote alpine toilet facilities.

Conservation and Recreation Management Statement (NPWS 1993)

A Conservation and Recreation Management Statement has been prepared by the NPWS incorporating the findings and recommendations of the recreation management plan ('Toward conservation and recreation management of the Kosciuszko Alpine Area').

The Statement provides for the introduction of a permit system for camping in the alpine area, to better manage where camping occurs, to improve interpretation opportunities for minimum impact camping and to collect user data. The Statement does not propose to place restrictions on visitor numbers or designate camping sites during the implementation stages of the permit system.

The Statement is intended to refine the existing provisions of the Kosciuszko Management Unit in the KNP Plan of Management. It was publicly released in 1993 to communicate the proposals and provide an opportunity for public comment.

3.2.4. Other legislation

Development in the Main Range is also regulated by other legislation, including:

- the *Threatened Species Conservation Act 1995*
  - particularly where threatened species and endangered ecological communities may be affected
- *Heritage Act 1977*
  - covering non-Aboriginal materials and artefacts which are at least 50 years old. Under the Act, approval from the NSW Heritage Council and the DEC is required before any relic or artefact dating prior to 1900 can be disturbed.
- the *Protection of the Environment Operations Act 1997*
  - regulating air, water and noise pollution emissions
- the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
  - particularly where Commonwealth land, Commonwealth Government actions or decisions or identified 'matters of national environmental significance' (such as nationally listed threatened species and ecological communities, migratory species and World Heritage properties) are involved. Threatened and otherwise significant species listed in the Act which have been recorded in the Main Range area include the Alpine Tree Frog, Southern Corroboree Frog, Mountain Pygmy Possum and Latham's Snipe. New South Wales Southern Highlands Montane Peat Swamps are also under consideration for listing as a threatened community under the Act.

3.2.5. Australian Alps Liaison Committee (AALC)

In 1986 the Australian, ACT, NSW and Victorian governments agreed the national parks in the Australian Alps should be managed co-operatively to protect the area's special character. A Memorandum of Understanding (MOU) was signed to protect the landscape, water catchments, plants, animals and cultural heritage of the Australian Alps as a whole ecosystem while providing opportunities for public appreciation and sustainable enjoyment.

The MOU has streamlined the management of the Australian Alps national parks. Where before there was duplication of research, development and management projects, management is now cooperative and information is shared between agencies. The MOU is overseen by the Australian Alps Liaison Committee, made up of one senior representative from the ACT Parks and Conservation Service, the NSW Department of Environment and Conservation (National Parks and Wildlife Division), Parks Victoria, and the Department of the Environment and Heritage. The AALC developed and promoted the Australian Alps Walking Track. The Minimal Impact Code – Leave No Trace principle is shown in Attachment 1.

The AALC has adopted Minimal Impact Codes for various recreational users of the Alps Parks. These codes follow internationally acceptable principles of minimal impact techniques and practises that are promoted under various banners such as "Leave No Trace" and "Walk Softly".

3.2.6. Complementary plans and strategies

Walking Track Environmental Management Plan
The Walking Track Environmental Management Plan (EMP) has the following objectives:

1. To meet the requirements of the Draft Kosciuszko National Park Plan of Management 2004 (NPWS 2004).
2. Defines the environmental standards and best practises for walking track construction and maintenance in the Main Range.
3. Complies with the minimum content requirements for environmental assessment as defined by the *Environmental Planning and Assessment Act (1979)* and related legislation.
4. Provides an inventory of current track standards, desired standards, construction types and environmental risks/issues.
5. Defines acceptable track construction materials and methods for each track and sections within tracks as necessary.
6. Provides an environmental framework for the walking track upgrade and maintenance program for the next 10 years.

The Environmental Management Plan will need to comply with the NPWS General Guidelines for Environmental Management Plans; however it is understood that this document would be a working document and would not be seen as an exhaustive or definitive list of matters or issues relevant to the walking track program. This document is currently being prepared by **ngh**environmental.

Communications Plan
The Draft Kosciuszko National Park Plan of Management 2004 (NPWS 2004) provides for the development of a park-wide Communications Plan to engender appreciation, enjoyment and understanding of the park's values and support for their ongoing protection, to encourage community cooperation in the protection of park values and to facilitate public participation in park management.

Restoration and Rehabilitation Plan
The Draft Plan of Management 2004 (NPWS 2004) provides for the development of a Restoration Plan that integrates soil conservation and rehabilitation works with introduced plant and animal control programs across the entire park.

Kosciuszko Research and Survey Database
The Draft Plan of Management provides for the development and maintenance of the Kosciuszko Research, Survey and Planning Database - a park-wide electronic system for storing and managing information regarding research, survey and monitoring programs, and planning documents relating to the park and environs. All monitoring programs, including those adopted under this Strategy, will form part of the Kosciuszko Research and Survey Database.

Seaman's Hut Conservation and Management Plan

This plan for Seaman's Hut is currently in draft form. It establishes that Seaman's Memorial Chalet (Seaman's Hut) is a place of State environmental heritage significance and re-iterates that the management of human waste around the Seaman's Memorial Chalet site is a major issue. This plan identifies that the

development of this human waste strategy needs to take into consideration the heritage values of Seaman's Chalet and the appropriateness of installing a toilet.

Living Parks Draft Sustainable Visitation Strategy
This Strategy is being developed by DEC (2005) and provides a guide to the management of sustainable and culturally appropriate visitation to our national parks. It aims to ensure that the public can continue to experience, enjoy and benefit from NSW parks while protecting and conserving their diverse values. The goals of the Strategy are:

- park values protected and conserved
- enhanced visitor experiences
- sustainable and culturally appropriate visitor use
- sound practice in visitor management
- enhanced community health and wellbeing
- economic benefits for communities.

The Strategy is currently on exhibition for public comment.

3.3. Visitor use in the Main Range

The Main Range Management Unit is a major visitor destination receiving more visitors than anywhere else in the park with the exception of the alpine resorts (NPWS 2004). The Kosciuszko National Park 2004 Draft Plan of Management recognises the need to adopt sustainable recreational management regimes in order to protect and improve the condition of the area (NPWS 2004).

3.3.1. Visitor numbers

Summer visitation to the area has increased dramatically, with 102,500 visitors estimated in 1999/2000 – a three-fold increase since the 1982 Plan of Management was written (CRC for Sustainable Tourism 2001). During holiday periods, it is not uncommon for over 1,500 people to visit the Main Range each day, mainly along the major routes departing from Thredbo or Charlotte Pass. Up to 700 of these visitors may visit the Mt Kosciuszko summit, concentrated during the middle of the day.

Johnson and Growcock (2005) reported that in the 5 days around New Year and Easter (1999/2000) 7,668 visitors arrived at the summit of Mt Kosciuszko with visitation being most intense on Easter Saturday with 1535 visitors arriving between 10.30am and 3.00pm. An estimated 2,560 visitors reached the summit on that day. It has been estimated that just under half of the visitors to the Main Range alpine area visited for more than half a day. (Johnson and Growcock 2005)

3.3.2. Where people travel

Summer
The main access point into the Main Range is from Thredbo with about 68% of visitors using the metal walkway route from the Thredbo chairlift (CRC for Sustainable Tourism 2001). About 31% of Main Range visitors start from Charlotte Pass and walk to Mt Kosciuszko along the Kosciuszko Road or to Blue Lake and beyond along the Main Range Walk.

Visitors entering the alpine area during summer from the Thredbo chairlift most frequently took the Kosciuszko walk (74.8% of visitors- Johnson and Growcock 2005). However, many do not complete the walk from Thredbo to Mt Kosciuszko but turn back at the first lookout (34%), or stop once they can see Mt Kosciuszko (10%) (Worboys and Pickering 2002). Sightseeing at and around the viewing area of the

chairlift accounted for 22.8% of visitors arriving at the top of the Thredbo chairlift (Johnston and Growcock 2005)

Johnson and Growcock (2005) found that approximately 27% of all visitors accessing the Main Range from Charlotte Pass undertook the Summit Walk and took in the major attractions of the upper Snowy River crossing, Seamans Hut, Rawson Pass and Mount Kosciuszko summit. They further found that approximately 24% of visitors accessing the Main Range from Charlotte Pass started the longer Main Range Loop walk with additional destinations at Blue Lake, Mt Carruthers and the Sentinel. Less than 1% headed up Mt Stilwell.

The most popular walk from Charlotte Pass is the Snow Gums walk with 46% of visitors undertaking this short walk. Other less used walks in the Main Range Unit include routes/tracks from Guthega Village to Mt Tate and Mt Twynham, to Dead Horse Gap from Thredbo Chairlift top station (3.8% of visitors arriving at the top station – Johnson and Growcock 2005) and the Alpine Walking Track.

Winter

Winter use tends to be more dispersed than summer as skiers are less constrained by vegetation and the location of tracks. The main access points for overnight visits are Thredbo chairlift top station, Guthega Village and Guthega Power Station. Charlotte Pass tends not to be used as departure points for overnight visits as much in winter as in summer because of access difficulties.

Mount Kosciuszko itself is one of the most popular backcountry skiing destinations in the park. Backcountry areas, such as Watsons Crags on the steep western fall of the Main Range, have also become popular in recent years for ski mountaineering, reflecting major advances in ski technology and design (NPWS 2004). Anecdotally, overnight visitation and camping in winter is centered on the huts (Seamans, Cootapatamba, Illawong, Horse Camp, Whites River and Schlink), protected valleys such as Soil Conservation Creek, Twynam Creek, Pounds Creek and Guthega Creek, and the Ramshead Range.

3.3.3. Visitor characteristics

The dominant motivation for people to visit the Kosciuszko Alpine area in summer is the area's natural values. (Johnston and Growcock 2005). The predominant age of all visitors to the area is between 20 and 49 (63.2%), with a significant number of children below the age of 15 (18.5%) suggesting family groups are common. Party sizes are typically small with two people per group being the most frequent party size. Groups of more than four are uncommon. Preparation levels (i.e. appropriate clothing, water etc.) of day walkers in the area has been observed to be poor (Johnston and Growcock 2005). Visitor research has suggested no difference in the proportion of male and female visitors.

Johnston and Growcock (2005) noted:

- satisfaction levels among visitors to the Main Range alpine area were high, but some concerns were raised about facilities provided such as parking, toilets and signage and;
- a desire for more choice of walks.

3.3.4. Recreational activities

Popular summer activities include short and long walks (78.8%% of visitors), sightseeing (11.6%), mountain biking (3.2%), camping (1.9%), (Johnson and Growcock 2005). Other activities include running, biking, late season snowpatch skiing; photography, painting, rock climbing, abseiling, fishing and educational activities Commercial guided tours also occur.

The Main Range is recognised as one of the most popular locations in the park for remote area camping (NPWS 2004). Groups departing on summer camping trips into the alpine area are more likely to depart from Charlotte Pass than from Thredbo. In winter, campers are more likely to access the Main Range from Thredbo, Guthega or Guthega Power Station.

3.4. Recreation settings in the Main Range

3.4.1. Settings in the Main Range

The Kosciuszko National Park 2004 Draft Plan of Management identifies the following four tiers of recreational sites and opportunities:

- peripheral gateway or 'grandstand' sites on the edges of the Unit at Charlotte Pass and at the top of the Thredbo Chairlift (consisting of clusters of short-duration walks and interpretive opportunities that allow visitors to experience facets of the alpine environment);
- a select number of formal walking tracks on the Main Range of day or part-day duration commencing from these two nodes;
- secondary gateways or nodes at Guthega Village and Guthega Power Station (consisting of limited visitor facilities and primarily catering for self-reliant day or overnight visitors); and
- retention of a number of unmarked routes and the remainder of the Unit as untracked country catering for low-impact and dispersed day or overnight use by self-reliant visitors.

Under the Draft Plan, the types of visitor facilities provided in the Unit would be tied to these four tiers, or recreation settings, as indicated below:

- Charlotte Pass and Thredbo Chairlift visitor nodes
  - toilets, walking tracks (Classes 1, 2 and 3), interpretive, orientation and directional signs and displays, seating, viewing areas, lookouts;
- formal walking track network commencing at Charlotte Pass and Thredbo Chairlift
  - toilets (only at Rawson Pass and Seamans Hut, walking tracks (Classes 2, 3 and 4);
- secondary nodes at Guthega and Guthega Power Station
  - toilets, interpretive, orientation and directional signs and displays, seating;
- remainder of the Unit
  - toilets (only at Horse Camp Hut, Whites River Hut, Schlink Hut and possibly Cootapatamba Hut, walking tracks (Class 6), interpretive and educational signs and displays (only in hut interiors).

The structure of the Human Waste Management Strategy conforms to these recreation settings.

3.4.2. Recreation settings and waste management

The mix of waste management solutions which may be applied at any site must match the objectives of the recreation setting and user values, attitudes, abilities and expectations (although there is some scope for influencing user expectations, attitudes and behaviour through information and education).

Specific management objectives and priorities also vary between recreation settings, and sites within each setting. The differences in management emphases, and implications for toilet infrastructure development, are identified in Table 3.4.2.2.

Table 3.4.2.2 Differences in management emphases between recreation settings

Setting	Management emphases	Toilets compatible with setting?	Indicative locations*
Peripheral grandstand sites	Resource hardening, interpretation and orientation, visitor accessibility and comfort	Yes	Charlotte Pass, Thredbo Chairlift
Secondary peripheral nodes	Visitor orientation and interpretation	Yes	Guthega Power Station, Guthega Village and Dead Horse Gap
Major formal walking track system (Class 1-3, Charlotte Pass – Thredbo Chairlift)	Resource hardening, visitor accessibility, visitor safety and comfort	Yes	Rawson Pass and Seamans Hut
Huts	Environmental and cultural value conservation, visitor safety and secondary internal nodes	Yes	• Horse Camp, Whites River, Schlink Huts, Illawong Lodge (existing) • Seamans and Cootapatamba Hut (proposed)
Backcountry areas	Environmental protection, nature conservation	No	Dispersed

* based on Chapter 9, Draft Plan of Management

Some key implications of the variations between settings for waste management are identified below:

Grandstand sites - toilet facilities are required that provide a high level of user amenity and accessibility, and can accommodate high levels of use. As focal access nodes, information and interpretation opportunities can target users of all recreation settings.

Secondary visitor nodes - provides toilet facilities and information/interpretation for backcountry day and overnight visitors. Relatively low levels of use (such as Guthega Village in summer) may not justify a stand alone facility.

Major walking track system – catering for day or part-day duration users, this setting receives high levels of use. Visitors may have a low level of environmental awareness and self reliance so carry out options are unlikely to be taken up by this group. Toilet facilities are appropriate at grandstand sites and at Rawson Pass and Seaman's Hut consistent with the Draft Plan of Management.

Backcountry areas – caters for day and overnight walkers and ski tourers. Toilets are currently provided at some huts. No toilets are provided in dispersed camping areas; Australian Alps Minimal Impact practices (waste burial) is currently promoted for these areas. This user group is likely to be environmentally aware and self-reliant, relative to other user groups.

While the construction of toilets may, in principle, be appropriate in a given setting, decisions on whether to proceed will be based on an assessment of need (considering use type and use intensity, user characteristics) and practicality (including functional effectiveness, serviceability and visitor useability).

3.5. Current human waste management in the Main Range

3.5.1. Grandstand sites

Thredbo Valley Terminal

In terms of visitation, the Thredbo Valley Terminal is the principal entrance point to the Main Range Management Unit. While the terminal is not located within the Unit, the facilities are relevant to waste management in the Unit and are included in the inventory of currently available services. Current toilet facilities consist of a toilet block that contains a male section with 4 cubicles, 4 hand basins and 2 separate urinals, and a female section with 6 cubicles, which includes a larger cubicle for the disabled. The toilets are located between the retail area and the chairlift with a small sign located in the walkway. The toilets are connected to the Thredbo sewerage treatment plant, an activated sludge tertiary treatment plant, discharging into the Thredbo River.

Toilet capacity appears adequate although queues outside the women's toilet develop during peak periods (pers. comm. terminal managers). Signage is only evident once inside the terminal; signage could be improved to advise visitors approaching the terminal of the availability and location of the toilets.

Photo 3.5.1.1 Approaching Thredbo Valley Terminal – toilet signage?

Photo 3.5.1.2 First visible toilet sign at Thredbo Valley Terminal.

Photo 3.5.1.3 Sign on exiting Thredbo Valley Terminal.

Thredbo Chairlift – Eagle Nest Restaurant

The chairlift is a major access point used by downhill and cross country skiers in winter and by day walkers and sight-seers and backcountry overnight walkers in summer. At the entry point, the building has a utilitarian, industrial appearance. The men's facility has 3 cubicles, 2 hand basins and 2 urinals, while the women's has 4 cubicles. These toilet facilities are connected to the Thredbo sewerage system. The waste is macerated before being piped to Thredbo STP. Vehicle access and parking is for Eagles Nest Restaurant, Park officials and the lease holder only.

A queue develops at the entrance to the women's toilet peak times in winter, although this is not considered to be excessive (Malcolm Browne, Manager Eagles Nest pers. comm.). At peak times an odour develops within these facilities. These toilet facilities would be difficult for disabled access. Visitors must enter the restaurant building complex to access the toilets. The toilet sign may not be obvious to visitors who don't venture into the building, and may be interpreted as being restricted to restaurant patrons.

Photo 3.5.1.4 Signage on exiting Kosciusko Express Chairlift at Eagles Nest – no external toilet signs.

Photo 3.5.1.5 Signage at Eagles Nest inside building.

Photo 3.5.1.6 Facilities inside Eagles Nest building.

Charlotte Pass

The Charlotte Pass site is a main grandstand site, and an important entry point for skiers and walkers. The site can become inaccessible to visitors and management during snow storms and strong winds, and the facility can be totally snow-covered. The Charlotte Pass facility is a purpose built structure designed to blend with the local environment and landscape. The facilities include; disabled access, men's toilets with 1 cubicle and 2 urinals, women's toilets with 2 cubicles. While the facility was intended to be a 'state of the art' application of passive solar design and high altitude composting technology, it is experiencing continuing problems related to functioning, servicing and OH&S issues for staff and contractors. DEC is monitoring the functioning of the facility and may consider reverting it to a 100% pump out facility in the near future. There is summer vehicle access to the site.

Visitors have complained of an odour of urine at this facility (Johnston and Growcock 2005). Recent visitor surveys have highlighted problems with urine odour in the facility. Signage to the facility is not adequate. Visitors approaching these facilities see only one small sign. There is also no indication of the next closest toilet facility, on the walking track system.

Toilet facilities are also available at Charlotte Pass village. These facilities are generally not available in the summer period as the village is largely closed down. The village facilities are largely under utilised in the summer period and have the potential to link with and compliment the gateway facilities at the Pass itself.

Photo 3.5.1.7a & b Charlotte Pass toilets and signage.

3.5.2. Major visitor milling area

Rawson Pass

Rawson Pass is the major milling point at the nexus of the two main walks to Mount Kosciuszko from Thredbo and Charlotte Pass. It is the main milling and resting area

before visitors approach the summit of Mount Kosciuszko. The site carries high levels of walker traffic during summer. The current temporary facilities consist of 6 'porta loos' which are emptied on a regular basis, from December to April only (summer season). Permanent toilet infrastructure is proposed for this site, comprising 7 toilet units, including 1 disabled toilet and 1 urinal (NPWS 2002, DEC 2005a).

Signage to indicate and direct people to the facilities at Rawson Pass are inadequate. This is expected to be addressed when the detailed design and implementation work is undertaken for new toilet facility. Wheeled vehicular access to the site via Kosciuszko Road from Charlotte Pass is generally available in early summer depending on remaining snow cover/drifts.

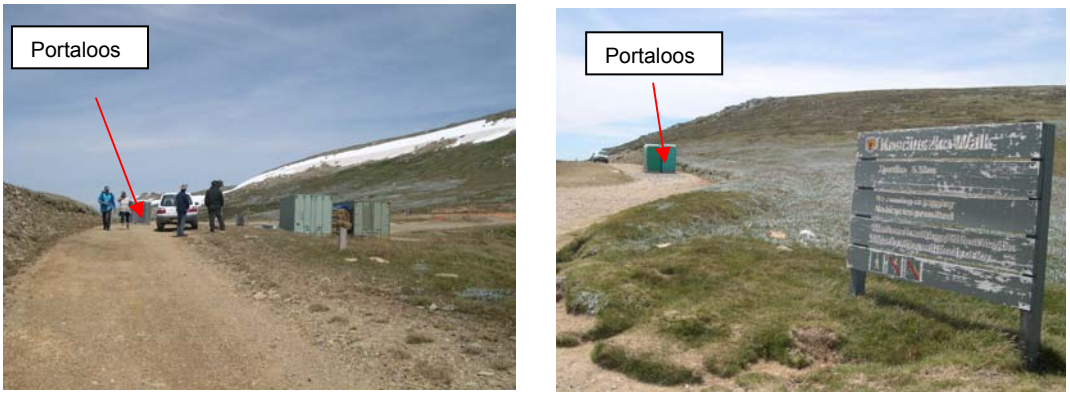


Photo 3.5.2.1a & b Rawson Pass porta loo toilets and signage.

3.5.3. Secondary gateways

Guthega Village

This is an important gateway to the Main Range in winter - both for day trips and overnight camping. The Guthega Village Nordic Alpine Centre, comprising a chairlift terminal, is open during the day in the winter snow season. The facilities available are; men's toilets consisting of 4 cubicles and 2 urinals, and women's toilets consisting of 8 cubicles. These facilities are not available (open) for summer visitors. Vehicle access to the site is excellent.

Signage at this complex is adequate for a privately owned facility catering for winter skiers. While there is no external indication of available toilet facilities or opening times, ski terminal users would be aware of, and expect the availability of toilets on entering the building. Toilet facilities are adequate in winter as the terminal building is open. The toilets are not available during the summer walking season. Given the volume of use, the absence of toilets is not considered a high priority in comparison to other grandstand or visitor node sites.

Photo 3.5.3.1 Guthega Village (Alpine Nordic Centre) signage

Guthega Power Station

The current facility is provided by Snowyhydro and comprises a single toilet with one cubicle, which is located inside the Power Station building, with direct access from the carpark. Guthega Power station has parking facilities and is a gateway to the Main Range for winter cross-country skiing and summer walking/camping. The site is an important entry point for both the Main Range and Jagungal area. In terms of capacity, these facilities would appear adequate for its low visitation rates. DEC and Snowyhydro will be looking to re-locate the carpark and toilet facilities outside of the Power Station environment within the next five years. In terms of capacity (4,000 litre pump out facility), these facilities would appear adequate for low visitation rates.

Photo 3.5.3.2a&b Guthega Power Station toilet and signage with Minimal Impact Code

Visitor use monitoring would be useful to determine use levels and the demand for additional toilet facilities at the site. Signage at the carpark is small and inconspicuous. Vehicle access and parking is adequate.

A summary of current toilet infrastructure in the Main Range is provided in Table 3.5.3.1 below.

Table 3.5.3.1. Summary of current facilities at grandstand and gateway sites

Location	Access	No. male cubicles	No. female cubicles	System	Disabled access	Management access	Issues
Thredbo Valley Terminal	year round	4	6	Flush and sewered	Yes, limited	Yes	signage
Thredbo Chairlift	year round	3	4	Flush and sewered	No	Yes (winter snow bound)	odour signage
Charlotte Pass	Often snow bound in winter	1	2	Composting/ pump out	Yes	Yes (winter snow bound)	odour signage
Rawson Pass	summer only (at present)	3	3	Pump out	No	Yes (winter snow bound)	odour signage capacity seasonal accessability
Guthega Village (Nordic Centre)	day time, winter only	4 + 2 urinal	8	Flush, and sewered	No	Yes	access signage
Guthega Power Station	year round	1	1	Flush/pump out	No	Yes	access signage

The main grandstanding sites and secondary visitor nodes are highlighted in Attachment 7.

3.5.4. Huts

Seaman's Hut

Seaman's Hut is located on the old Kosciuszko Road the major walking track between Charlotte Pass and Mount Kosciuszko. It caters for winter and summer visitors, providing a day-use picnic facility and an emergency shelter. While overnight use of the huts is intended to be restricted to emergency situations, it is clear that recreational camping occurs in and around the hut, particularly during winter. There are currently no toilet facilities and consequently there is a serious issue evident with human waste around this popular hut. There is summer vehicular access to the hut via a formed and gravelled road. The possibility of providing a toilet at the site has been canvassed in a recent discussion paper "Between a Rock and a Hard Place" (NPWS 2002).

During winter months Seamans hut is utilised as a destination for skiers. Lack of a toilet results in people toileting adjacent to the site. Depth of snow prevent these users from burying faeces into soil, and as a result there is a concentration of urine and faeces around the hut, which at times is visible to visitors. The problem is less acute during summer, as the hut is utilised on route to Rawson Pass where public toilets are available. There is currently little signage to indicate location of toilets further on at Rawson Pass.

Photo 3.5.4.1 Seaman's Hut, surrounded by rock outcrops often used as toilets.

Signage – indicating toilets at Rawson Pass

Cootapatamba Hut

There are no toilet facilities at Cootapatamba Hut. However as for all huts, there is signage in the hut which describes the Minimal Impact Code. The hut is accessed by walking in summer or skiing in winter. The hut is designed for emergency shelter purposes.

This hut receives its highest use in winter, when the hut is also used as a destination for skiers. As with Seamans hut the lack of a toilet at this site results in people toileting adjacent to it. This hut has visible evidence of faecal waste (pers. comm. Ranger NPWS), an option may be to provide a seasonal (winter) toilet at this hut.

Photo 3.5.4.2 Cootapatamba Hut

Schlink Hut

The Schlink Hut is an old linesman hut and is the largest of the Whites River corridor huts along Schlink Pass Road. It caters for cross country skiers in the winter as well as walking parties during the summer. Current toilet facilities include a separate small building with a single cubicle with a waterless toilet. There are 2 3,000 litre polypropylene (poly) tanks which are linked together to cater for excessive urine storage. The system is a pump out system which is regular maintained and pumped out by a contractor. There is signage within the hut on the Minimal Impact Code. There is good summer vehicular access to the hut via a formed and gravelled road.

Photo 3.5.4.3a&b Schlink Hut and Schlink Vault Toilet.

Whites River Hut

The Whites River Hut caters for winter and summer visitors. There is a separate toilet, a small building consisting of a single cubicle and waterless toilet. A 3,000 litre tank is maintained and regularly pumped out by a contractor. There is signage within the hut on the Minimal Impact Code. There is good summer vehicular access to the hut via a formed and gravelled road.

Horse Camp Hut

The Horse Camp Hut caters equally for winter and summer visitors. There is a separate toilet, a small building consisting of a single cubicle and waterless toilet. A

3,000 litre tank is maintained and regularly pumped out by a contractor. There is signage within the hut on the Minimal Impact Code. There is good summer vehicular access to the hut via a formed and gravelled road.

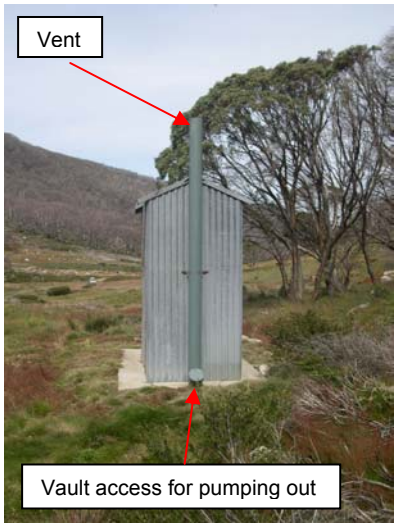


Photo 3.5.4.4a,b,c Whites River Hut toilet building, rear of toilet and Hut.

Photo 3.5.4.5a&b below Horse Camp Hut and toilet

A summary of facilities at the huts on the Main Range are provided in Table 3.5.4.1 below.

Table 3.5.4.1 Summary of current facilities at the Main Range huts

Hut	Toilet provided	Minimal Impact Code in hut	Management Access	Issues
Seaman's Hut	No	Yes	vehicle (summer) oversnow (winter)	Recreational camping, unmanaged waste Possible water contamination
Cootapatamba	No	Yes	foot oversnow (winter)	Recreational camping, unmanaged waste Possible water contamination
Schlink	yes (pump out)	Yes	vehicle (summer) oversnow (winter)	n/a
White River	yes (pump out)	Yes	vehicle (summer) oversnow (winter)	n/a
Horse Camp	yes (pump out)	Yes	vehicle (summer) oversnow (winter)	n/a

3.5.5. Backcountry areas

DEC has promoted the Australian Alps Liaison Committee Minimal Impact Code "Leave No Trace" for people visiting back country areas where no toilet facilities are provided. This code is generally displayed or referred to throughout the Main Range at the grandstand points, secondary nodes and huts. There are different codes for different recreational uses such as bushwalking, ski touring, bike riding and other activities. For human waste management the minimal impact code stipulates that solid waste should be buried at a depth of at least 15 centimetres and at least 100 metres from a water body. The current AALC codes are provided at Attachment 1.

It is likely that a proportion of winter and summer campers endeavour to adhere to these codes, although they are not always achievable in the alpine and high sub-alpine conditions of the Main Range. Some visitors, particularly members of organised bushwalking clubs, use carry-out methods although the numbers are not known. It is also apparent that some day users, hut users and campers do not apply the codes, evidenced by waste problems at several sites in the Main Range, including Seaman's Hut, Cootapatamba Hut, the Blue Lake area and some backcountry camping areas.

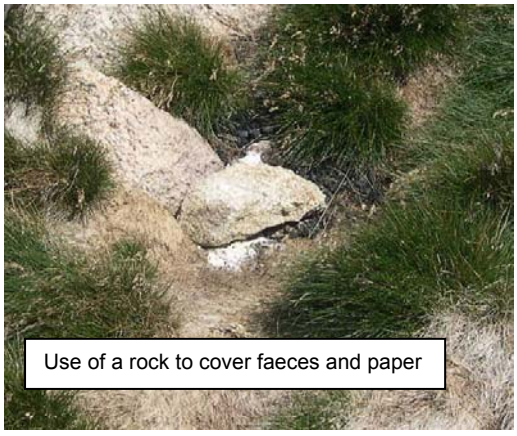
Licensed tour groups use group carry-out methods, such as "Novotel" which regularly conducts group camps south of Charlotte Pass. This group sets up a toilet with Bio-Bags for faeces only, and disposes of the biodegradable waste in the Charlotte Pass toilet facility. Urine is generally not carried out, and is not considered to be an environmental problem in dispersed areas (Liz McPhee pers. comm.). Urine accumulation surrounding huts through winter is however likely to affect vegetation in the immediate vicinity of the huts (North 1991, Kirkpatrick 1997).

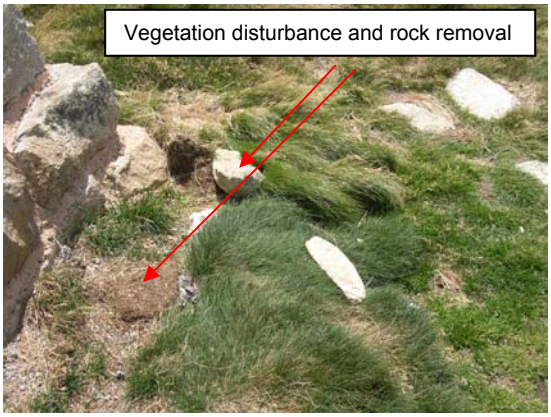
3.6. The need for improved human waste management

Management of human waste in the Unit has been a significant problem for many years (NPWS 2004). In 1982 camping was prohibited in the catchment of the glacial lakes in response to declining water quality directly resulting from unmanaged human waste. More recently, there has been evidence of human waste and urine odour on the high volume walks to Mt Kosciuszko from Charlotte Pass and Thredbo (NPWS 2004, Andrew Harrigan DEC, pers. comm.). Despite these concerns, there has been little research undertaken on the impacts of human waste in natural areas (Kirkpatrick and Bridle unpublished.)

3.6.1. Unburied waste

Unburied waste is deposited behind rock outcrops near huts and the major walking track network. Most of the waste beside the major track system is likely to have been left by day users. Particular trouble spots are located between Thredbo and Rawson Pass, Charlotte Pass and Rawson Pass and near Blue Lake. Seaman's Hut is used by daytime picnickers in summer and overnight campers, particularly skiers in winter. Cootapatamba Hut, the other hut in the Unit currently without a toilet, is used by overnight campers in summer and winter. Some unburied waste is deposited around dispersed camping areas in the Unit, but the majority of summer users at these sites probably practice a limited form of waste burial, in line with minimal impact codes. Waste is difficult to bury in ground under deep snow cover, and it appears that a significant proportion of winter campers at campsites and around huts simply bury waste in snow, to be exposed during the spring thaw.





Photos 3.6.1.1a&b: Typical unburied waste practices

3.6.2. Minimal impact codes

While it is difficult to measure the extent to which the codes are practiced, it is evident that the code provisions regarding waste burial are not followed rigorously by some campers. It is acknowledged that 15 centimetre deep burial, 100 metres from watercourses is difficult to achieve in many areas of the Main Range Unit. Waste burial under deep snow cover can also be difficult or impossible. Hygiene and safety issues arise from insect and fox contact with exposed waste, and the transmission of disease-causing micro-organisms such as *Giardia* and *Cryptosporidium* in contaminated water. Camp sites are usually located close to watercourses, exacerbating the risk of faecal contamination of water supplies.

Research in alpine areas of Tasmania has also shown that minimal impact codes are not being adhered to, with a number of deposits of poorly buried human waste found within 50 metres of a popular hut in one national park. The effect of this increase in nutrients on the soils and vegetation around the hut was limited to within a few metres of the hut. However, an increase in faecal bacteria was detected in the water supply after heavy rain. Further testing indicated that part of the contamination was likely to be from a human source (Bridle et al. 2004). This situation is likely to be analogous to huts in the Main Range, such as Seaman's and Cootapatamba Huts.

3.6.3. The impacts of human waste

Natural environment

The University of Tasmania has undertaken relevant research into the impacts of faecal waste disposal in natural areas, in response to gaps in the research literature. Prior to this work, there were very little scientific data to support or test the minimal impact guidelines currently in use in Australia, which are based on the United States' Leave No Trace campaign. There was however some evidence that these guidelines are not being adhered to (von Platen 2002, Bridle *et al.* unpublished, A. Harrigan pers. comm.). Key findings of the Tasmanian research which are of particular relevant to this Strategy are summarised below.

> ***Determining the presence and source of faecal contamination at huts and campsites in the backcountry of Tasmania*** (Bridle *et al*. 2005)
>
> ***Inadequate faeces disposal in back-county areas, Tasmania, Australia: environmental impacts and potential solutions*** (Bridle *et al.* in press)

Faeces and urine contain high concentrations of phosphorus and nitrogen and may alter environmental conditions at camping areas. Exotic plants are commonly found around hut entrances on the Central Plateau, Tasmania (North 1991 in Bridle *et al.* unpub.). It is possible that disturbance and increased nutrients are responsible for the establishment of exotic plant species (Kirkpatrick 1983 in Bridle *et al.* unpub.). The burial of human faeces introduces pathogenic bacteria into the soil which are known to persist in Tasmanian soils for over 12 months after burial (Temple *et al* 1980, Temple *et al* 1982, Ells 2000, von Platen 2003 in Bridle *et al.* unpub.). Faeces may impact upon water quality if deposited too close to a water supply, or where rainfall and surface runoff washes inadequately buried faecal material into the water supply (see review by Bohn and Buckhouse 1985, Davies *et al* 1999, Farag *et al* 2001 in Bridle *et al.* unpub.).

In the above research projects, faecal deposits were mapped around two alpine huts and campsites in Mt Field National Park, where no toilets are provided. Vegetation, soil and water quality parameters were surveyed. In the case of one hut, 86% of deposits (45 deposits) were clustered within 55 metres of the hut, and 65.4% (34 deposits) were located within 30 metres of the hut. No deposits were found at Twilight Tarn Hut, where a toilet had been installed in 2001.

Compliance with minimal impact guidelines was found to be poor. Of the 63 faecal deposits found along the Overland Track, 32% were deeply buried, 47% were shallowly buried, 16% were covered with a rock and 5% were on the surface of the ground. Soil depth strongly influenced the type of burial, with disposal under rocks being more common where soils are shallow. Water quality decreased after rainfall events. At one hut, low levels of faecal coliforms were recorded before a major rainfall event, but elevated results in tarn pools near the hut after rainfall were still high two weeks after the rainfall event.

Conclusions

Poorly buried human waste is a health risk to walkers. The authors consider that a hut without a toilet is a recipe for a potential public health problem. In such a case, the hut should be locked or removed, or toilets provided. For campsites, the authors suggest developing thresholds for human waste that could lead to management actions e.g. either the provision of a toilet, or rationing of access. Voluntary minimal impact guidelines have not worked. Enforcement of regulations would be impractical; social pressure would be more effective. Visitors need to be given good reasons for the guidelines. The authors propose a 'limits of acceptable change' approach involving management action thresholds based on the number of faecal deposits in a radius around huts. The authors acknowledge that it may not be economical or

desirable to provide toilet facilities in a remote zone, where other options such as carrying out of toilet waste or limiting visitor numbers may need to be considered.

> ***The impacts of human waste disposal in the backcountry areas of Tasmania*** (Kirkpatrick and Bridle unpub.)
>
> ***An analysis of the breakdown of paper products (toilet paper, tissues and tampons) in natural environments, Tasmania, Australia*** (Kirkpatrick and Bridle 2005)

The research measured the rates of decay of faeces and toilet paper. Buried toilet paper in western alpine environments in Tasmania showed very little decay after a two year period (Bridle and Kirkpatrick 2005). In relation to alpine and sub-alpine zones in Western Tasmania, the authors suggest that the minimal impact bushwalking codes be amended to:

- recommend no disposal of faeces or toilet paper in treeless vegetation above 800 metres;
- emphasize that placement of waste under rocks causes more environmental harm than disposal by burial, even in alpine environments;
- emphasize that strong metal trowels are necessary to excavate holes for defecation in most wild places. The overall ban on the disposal of tampons in the bush should remain.

Social environment

There is increasing awareness amongst recreational users of protected natural areas of the issues associated with waste management, and the effect of this on a satisfying backcountry experience (Pearce 2000). There is;

- concern over possible presence of water borne pathogens and water quality,
- an expectation for a higher standard of waste management,
- an increased awareness and advocacy on human waste issues in natural areas,
- concern about the impacts of human waste on the environment,
- concern about human activity in areas designated as natural and pristine and that these areas must be protected from the negative impacts of human activity.

The aesthetic values of the alpine areas are reduced by the smell and visual appearance of human waste. This will cause a major reduction in visitor satisfaction and expectations of these areas, and reduce the overall ‘wildness’ and pristine appeal of the area. The public has shown to be increasingly intolerant of sanitation problems, with exposed waste being a ‘zero tolerance norm’ which is never considered acceptable (Lachapelle 2000, in AALC 2000).

Visitors to the Main Range are likely to have a heightened sensitivity regarding odour, with strong expectations of clean, fresh air in a mountain environment far removed from industrial or urban pollution sources. The health risks associated with unmanaged human waste have been identified and documented in recent research undertaken in the alpine areas of Tasmania (refer above).

3.6.4. Problems with existing facilities

The toilet facilities currently provided in the Main Range are summarised in section 3.4, above. There are a range of management issues associated with the facilities, the most prominent are summarised in Table 3.6.4.1.

Table 3.6.4.1 Management issues at existing facilities

Facility	Management issues
Primary gateways	
Charlotte Pass	Odour (Johnston and Growcock 2005). and operational problems, signage inadequate. Under utilisation of facilities at Charlotte Pass village
Thredbo Chairlift/Eagles Nest	Signage inadequate for Main Range visitors.
Secondary gateways	
Guthega village	Not available in summer, or after hours in winter. Signage inadequate for Main Range visitors.
Guthega Power Station	Signage inadequate.
Walking track system	
Rawson Pass	Temporary toilets visually jarring (Johnston and Growcock 2005), not available in winter or spring/autumn shoulder seasons.
Track routes	Inadequate facilities signage (Johnston and Growcock 2005).
Huts	
Seaman's Hut	Toilets not currently provided; unmanaged waste problem surrounding hut. Inadequate facilities signage and information.
Cootapatamba Hut	Toilets not currently provided; unmanaged waste problem surrounding hut. Management access difficult. Signage and information may be inadequate. Assessment and monitoring required.
Illawong	Toilet not available unless Illawong open. No signage.
Horsecamp, Whites River and Schlink Huts.	Adequate pump out facilities provided. Inappropriate materials disposed of into tanks.

4. BEST PRACTICE HUMAN WASTE MANAGEMENT

4.1. Draft Plan of Management principles and objectives

The Draft Plan of Management for Kosciuszko National Park (NPWS 2004) provides overarching principles, desired outcomes, management directions and specific policies and actions. Those most directly relevant to the Strategy are summarised below, and form the foundation principles and objectives for human waste management in the Main Range.

4.1.1. Overarching principles and key outcomes

The Plan is founded on a range of principles relevant to waste management, including the need to set limits of environmental disturbance, the recognition of different levels of significance among values, the value of adaptive management, community involvement and transparency and accountability in management.

Key desired outcomes identified in the Plan include:

- the protection of the suite of internationally and nationally significant values…drives management decision-making in the Main Range.
- improvements in the environmental condition of the Main Range are achieved by the application of special environmental protection provisions

4.1.2. Main Range – management directions

Chapter 9 of the draft Plan deals with the management of the Main Range Management Unit as a place of exceptional natural and cultural significance. In particular, management of the Unit is directed at:

- protecting the outstanding natural and cultural values and enhancing their condition;
- ameliorating the environmental impacts associated with past land uses and practices; and
- maintaining and improving scenic amenity within and beyond the boundaries of the Unit through;
    - the rehabilitation of disturbed sites;
    - the removal or modification of visually obtrusive structures;
    - sensitive design and siting of new facilities.

4.1.3. Main Range – Human Waste Management Strategy

The Plan of Management requires the preparation and implementation of a human waste management strategy for the Main Range Management Unit.

The strategy will aim to effectively address the management of human waste to minimise the adverse impacts and the need for permanent toilet facilities within the Unit. The strategy will investigate and address the following:

- best practice human waste management in other areas of Australia and overseas in areas of similar climate, location, visitation and conservation status;
- the provision of adequate toilet facilities at the visitor nodes Charlotte pass, Thredbo Chairlift and Guthega village and in the vicinity of the Guthega Power Station, and where possible linked to existing sewage treatment plants;

- the provision of adequate information at the visitor nodes regarding the limited availability of toilets in the Main Range Management Unit and the preference for visitors to use toilets provided at visitor nodes;
- the need for number and location of toilets to be located within the Unit;
- the most appropriate effluent disposal system for toilet facilities within the Unit;
- the most appropriate form of access for servicing of toilets and effluent removal that minimises the impact on the environment and on the experience of visitors within the Unit;
- the location and design of toilets to ensure;
    - the design is in sympathy with the outstanding landscape values and the cultural heritage values of the management Unit
    - the provision of a minimum number of toilets
    - the use of existing disturbed areas and opportunities for landscape repair
    - that any toilets provided are readily removable and [the site rehabilitated] should toilets no longer be required in the future;
    - effluent disposal is not reliant on vehicle access to the site.
- A carry-out human waste disposal system for use by visitors to those parts of the management Unit not serviced with toilets.

4.1.4. Main Range – other relevant policies

Other relevant policies and actions in Chapter 9 of the draft Plan include that (summarised):

- the Main Range Management Unit will be managed as a road less area (some exceptions are identified in the plan);
- visitor management will be directed at…minimising associated environmental and social impacts within acceptable thresholds;
- recreation within the Unit will be managed, and facilities provided, based on the following four tiers of recreational sites and opportunities;
    1. Peripheral grandstand sites
        - toilets provided at Charlotte Pass, Thredbo Chairlift
    2. Major formal walking tracks between Charlotte Pass and Thredbo Chairlift
        - toilets provided only at Rawson Pass and Seaman's Hut
    3. Secondary visitor nodes at Guthega Power Station and Guthega Village
        - limited facilities, primarily catering for self-reliant day or overnight visitors (toilets provided)
    4. Unmarked routes and untracked country catering for low impact dispersed day or overnight use by self-reliant visitors
        - toilets provided only at Horse Camp, Whites River, Schlink and possibly Cootapatamba Huts, interpretation and directions only inside huts.
- Provide visitor facilities in accordance with the standards described in 8.2 and design, locate and manage these in ways that;
    - minimise impacts on ecological systems, are compatible with the outstanding values of the Unit, maintain the natural character of the area, are visually unobtrusive, and … minimise the use of vehicles for maintenance.

- In order to protect the natural character and values of the Unit, do not provide formal camping facilities and designated campsites;
- Promote the management Unit as primarily a day-use destination.

4.1.5. Recreation management

Chapter 8 of the Draft Plan provides for the following objective:

- visitor facilities are designed, constructed and sited so as to minimise adverse impacts upon the values of the park and enhance the experiences available to visitors.

The Draft Plan aims to create a 'signature' appearance for the park, reflected in shared design or construction elements in all infrastructure, including toilets. These principles include (summarised):

- reduction of crowding pressures and promotion of efficient visitor flows;
- placement of facilities so that they do not intrude upon the integrity of the features that visitors come to appreciate;
- minimising impact of new infrastructure;
- ensuring that facilities are not sited in or adjacent to places of ecological or cultural sensitivity or safety hazards.

Relevant actions include:

- Periodically monitor environmental conditions and social issues at popular camping areas and set impact thresholds
- Periodically monitor the environmental condition of all campsites and huts that are popular with ski tourers (eg damage associated with firewood collection, human waste problems).

4.1.6. Restoration and protection

Chapter 11 of the draft Plan provides that:

- scenic quality within the park is maintained and wherever possible enhanced.
- water quality throughout the park will be maintained or improved so as to be kept within natural ranges.

Plan actions include to:

- investigate the need for toilets at all huts, popular campsites and day-use destinations in accordance with Schedule 2; and.
- investigate a system in which visitors are required to carry out human waste from popular areas where toilets are not provided.

Chapter 15 also provides for the development of social and environmental impact monitoring programs (refer section 7.5 of this Strategy).

4.1.7. Additional principles

In addition to the wide-ranging principles identified in the Draft Plan of Management, this Strategy has applied the following principles in developing criteria and actions for managing human waste in the Main Range:

- solid human wastes (and liquid wastes in toilet systems) should be removed for disposal outside the Management Unit, because of the exceptional significance and sensitivity of the Main Range environment. This is consistent with the Draft Plan of Management which recognises the need for special environmental protection measures in the Main Range;

- in order to minimise environmental disturbance and protect visitor experiences, management intervention should be the minimum required to achieve environmental and recreation management objectives; the 'minimum tool rule' (Hendee 1990).

4.2. Best practice criteria for the Main Range

4.2.1. Finding a waste management solution: a two stage process

Determining a human waste management approach at any given site is a two stage process:

1. Identify the most appropriate broad management option

- considering the significance and sensitivity of natural and cultural values, conservation and recreation management objectives, environmental conditions, the abilities, needs, attitudes and expectations of visitor groups and the nature and intensity of visitor uses.
- this is best undertaken under a recreation setting framework which distinguishes areas offering a range of use and experience opportunities, with associated environmental management objectives.
- in Tasmania, it has been noted that there is no transparent method of determining whether toilets are needed at any camping location. Past management decisions have been ad hoc (Bridle *et al*. 2005). This is likely to have been be the case throughout Australia.

2. Assess and select specific alternatives within the broad options

- this process requires specific management objectives and a set of environmental, social and functional design standards against which to assess and compare alternatives.

4.2.2. Planning and design standards

Planning and design standards are based on broad environmental and recreation management principles and objectives, as well as functional requirements. Their application will vary between sites and between settings according to relative priorities prevailing in each circumstance. The variation in management priorities or emphases is illustrated in Table 3.4.2.2.

The standards are intended to be used to assess and compare competing choices. Selecting between toilet alternatives may involve factors such as vehicle access, treatment/disposal methods, specific site location, and an range of design characteristics. Carry-out methods vary in terms of scale, design, materials, product range, and collection and disposal options. Design standards used in the assessment of alternatives in this draft Strategy are provided in Tables 4.2.2.1 and 4.2.2.2 below.

Table 4.2.2.1 Design standards for new toilet infrastructure

Environmental criteria	Design standards
Minimum management intrusion principle	The extent of facilities and regulation should be the minimum required to meet environmental and recreation management objectives.
Minimisation of environmental impact	Minimal disturbance footprint (including service/user access ways)
	Minimal off-site impacts on water quality, soils, vegetation and fauna habitat
	Sited where possible in disturbed areas and integrates wider site rehabilitation
Environmental security	Adequate safeguards in the facility against materials failure, mechanical failure, natural hazards, vandalism
Reversibility	The facility can readily be removed and the site rehabilitated should it no longer be required.
Sustainability use of resources	No scarce or limited materials used in construction or production
	Energy efficiency in terms of production and use of materials, and operation of facility
	Efficient allocation of resources at local and regional levels
	No unacceptable levels of pollution arising from production or use of materials
	Materials used capable of being recycled following use in structure
Functional criteria	**Design standards**
Functionality and reliability	Adequate size/capacity to avoid filling during service intervals
	Functions under alpine climatic conditions (sub-zero temperatures, high winds, snow loads)
	Accessibility under all conditions by users and service staff
Flexibility	Capacity to accommodate changed treatment/disposal systems
Independent of large vehicle accessibility (internal track nodes and huts)	Toilet can be emptied by ATV or 4WD able to use walking tracks
Connection to sewerage system where practicable (peripheral gateway sites)	Toilet can be connected to existing resort sewerage schemes within acceptable levels of cost and environmental impact.
Low water requirement	Non-flushing systems
Serviceability	Servicing procedures simple, specialised tools and extensive training not required
	Facility site and equipment readily accessible during service periods
Social criteria	**Design standards**
Visual impact	Structures must be compatible with the colour, texture, scale and shape of the landscape
	Structures should be sited to integrate with landforms, avoiding impact on skylines and popular or sensitive vantage points
	Exposed walls of structures should be composed of natural or appropriate sympathetic materials (excluding glass areas)
	Signage should be low key and the minimum required to indicate toilet locations
Recreational experience	Facility and regimentation compatible with recreation setting and visitor values and expectations
Adequate number of pedestals/urinals	7 toilet units are proposed for Rawson Pass cater for 700 visitors during holiday periods with peaks of up to 1,800 visitors. Toilet unit :visitor ratio during holidays ranges from 1:100 to 1:257.
Facility spacing	No more than 3 hours travel time between toilet facilities (average walking pace)

Social criteria	Design standards
Health and safety (staff)	No physical contact with waste during waste removal, cleaning and routine maintenance
	Servicing and maintenance procedures low risk and ergonomically safe
Health and safety (visitors)	No physical contact with waste
	Risk of spillage or blockage low
	No insect access to waste
	Facility siting avoids safety hazards
Visitor comfort and privacy	Design allows for adequate privacy, user waiting areas and orderly traffic flow
	Toilet provides comfortable internal environment
	Minimal to no odour
Access and equity	Facilities accessible to all within relevant user groups (physically, financially, socially, culturally), in context of range of opportunities offered throughout the park
Cost and efficiency	The capital and operating cost of the structures or management measures must be affordable and proportionate to the environmental and community benefit

Table 4.2.2.2 Design standards for waste carry-out systems

Environmental criteria		Design standards
Minimum management intrusion principle		The extent of facilities and regulation should be the minimum required to meet environmental and recreation management objectives
Minimisation of environmental impact (dispensing and collection facilities)		Minimal disturbance footprint (including service/user access ways)
		Minimal off-site impacts on water quality, soils, vegetation and fauna habitat
		Sited where possible in disturbed areas and integrates wider site rehabilitation
Environmental security (dispensing and collection facilities)		Adequate safeguards in methods and facilities against materials failure, mechanical failure, natural hazards, vandalism
Sustainable use of materials		No scarce or limited materials used in construction or production
		Energy efficiency in terms of production and use of materials
		No unacceptable levels of pollution arising from production or use of materials
		Materials used capable of being recycled
Reversibility		Dispensing and collection facilities can readily be removed and the sites rehabilitated should they no longer be required.
Functional criteria		**Design standards**
Functionality and reliability	**Bag/liner dispensing facility**	Bag dispensing facility or system of adequate capacity and availability to cope with visitor requirements
		Bag dispensing facility or system accessible and operational during extreme winter climatic conditions (freezing temperatures, high winds, snow cover)
	Carryout containers	Waste container shelf life of at least one year without deterioration.
		Waste container of adequate capacity to take waste produced over at least one week
		Waste container and storage system functions under alpine climatic conditions (freezing temperatures, high winds, snow storms)
	Waste collection facility	Collection facilities of adequate capacity to avoid filling during service intervals
		Collection facilities accessible and operational for depositing waste during extreme winter climatic conditions (freezing temperatures, high winds, snow cover)
Carryout container		Carryout container weight suitable for backpacking (less than 1.5 kilograms, total weight when full)

portability	Carryout container bulk suitable for backpacking (maximum length 0.6 metres)
Functional criteria	**Design standards**
Ease of waste treatment and disposal	Produces waste which can be readily delivered to a Sewerage Treatment Plant (or other disposal system) safely, cheaply and with minimal pre-treatment
Flexibility	Collection facilities able to handle alternative carryout products
Serviceability	Dispensing machines and collection facilities readily accessed and serviced during all conditions
Social criteria	**Design standards**
Visual impact	Signage should be low key and minimal required to indicate acceptable waste management practices
Recreation experience	Management restrictions on behaviour consistent with setting and visitor expectations.
Health and safety (staff)	No physical contact with waste during collection facility servicing or waste transfer operations
Health and safety (visitors)	No physical contact with waste during use, waste disposal or container cleanout
Visitor comfort and privacy	Design provides for user comfort under field conditions
	Collection facilities discretely sited
	Minimal odour in vicinity of collection facility
Access and equity	Method and facilities accessible to all within relevant user groups (physically, financially, socially, culturally), in context of range of opportunities offered throughout the park
Cost and efficiency	The cost of the management measures must be proportionate to the environmental and community benefit

4.2.3. Minimal impact guidelines

Human waste management in backcountry areas of the Main Range, away from huts and the main track system, is currently based on a series of voluntary codes developed by the Australian Alps Liaison Committee (refer Attachment 1).

Best practice codes of this nature should be:

- simple, easy to understand and remember;
- accessible and equitable, physically and financially;
- socially and culturally acceptable;
- reasonable and justified in terms of return for effort;
- evidence-based or based on scientifically valid assumptions;
- based on principles of self-reliance and personal responsibility, with minimal management intrusion;
- supported by adequate information and education, in appropriate media and locations;
- appropriate to the physical ability, values, attitudes, awareness and expectations of target user .groups;
- such that achievement of objectives are measurable.

4.2.4. Environmental and social performance standards

Environmental and social performance standards, and appropriate monitoring regimes, developed for the implementation of this draft Strategy in the Main Range are included in Section 7. The selected approaches will be required to meet identified performance standards. These standards relate to the biophysical and social conditions of the Main Range. Condition indicators need to be easily measurable and directly related to the effectiveness of waste management actions.

5. THE ALTERNATIVES

5.1. Do-nothing option

Degradation of the environment and recreation experiences at several sites in the Main Range (refer section 3) oblige DEC to provide management solutions. The failure to address these issues would result in continuing damage to internationally significant values in the park, continuing visitor and staff health risks, and continuing erosion of recreational experiences. Inaction would also conflict with park legislation, the current and new Draft Plan of Management and the expectations of the wider community.

5.2. Alternative human waste management systems

There are a number of alternative human waste management systems available, and a number of them have been used in national parks and reserves around the world. Table 5.2.1.1 below includes human waste management systems that have been used in sensitive areas including alpine environments.

5.2.1. Alternative toilet systems

Sewered toilets
Typical sewerage system with flush toilets connected to a main Sewerage Treatment Plant (STP).

Composting toilets
Consisting of a chamber(s) where human waste is composted through bacterial and biological action. Fluid is evaporated with solids (and some liquid) stored for removal or allowed to return to the immediate environment. Venting is important to ensure airflow and odour removal. This type also includes dehydrator type toilets where fluid is evaporated and excess fluid stored for removal or filtered and returned to the immediate environment (refer Attachment 5). In all cases composted waste requires removal.

Site limitations such as shallow soils or high water tables, coupled with heavy use, have led to the development of batch-bin composting and moldering privies, as well as more expensive manufactured aerobic composting toilets. In a composting toilet, raw wastes are held apart from the surrounding site until sufficiently decomposed and reduced in volume to be removed from the sensitive area, usually by helicopter or vehicle but in some cases pack animals have also been used. There have been various modifications to composting toilets to cater for the extreme weather conditions of backcountry areas. There have been on-going difficulties in getting composting systems in alpine areas to work effectively with waste still needing to be removed from the site.

Pit toilets (unsealed)
The traditional repository. Because anaerobic waste breakdown in a pit is slow, pathogens may remain viable for years. The waste in poorly placed privies can leach contaminants into the surrounding area years after use has ceased, causing a significant environmental impact. However, pit toilets have worked well when properly sited and not overused. The level of use must match local soil characteristics.

Modified pit toilets (unsealed)

These attempt to avoid anaerobic decomposition in favor of aerobic decomposition. Modifications include regularly digging out pits to prolong their life or tilting to allow aeration and mixing of wastes. Wastes are then shallow-buried or composted.

Vault systems (closed septic)

These systems replaced pit toilets by enclosing the pit and containing all human waste. Waste is regularly removed and processed at a Sewerage Treatment Plant. Waste is contained in a sealed concrete or plastic tank, placed either above or below ground. These toilets require regular pump-out and therefore require access by wheeled or oversnow vehicles or helicopter. Present practice for vehicle-accessible vault toilets in the park is to dilute and break up the waste pile prior to pump-out (A. Harrigan pers. comm.). Pump-out frequency in current toilets ranges from one to several years depending on the level of use.

Septic and trenching system (open septic)

These are comparable to the typical domestic septic systems with additional measures for sensitive environments eg. Longer trenches.

Dehydration and incineration toilets

Dehydration toilets involve venting the container to facilitate fluid evaporation, excess fluid is stored for removal or filtered for release to the immediate environment. Results have been mixed. Provision of fuel (usually propane) can be expensive and disruptive, and offensive odors have been reported in some cases.

Table 5.2.1.1 Comparison of alternative human waste management systems

Criteria	Sewerage	Composting (waterless) Toilets	Vault systems	Septic and trenching system	Carry out systems	Minimal Impact Code (waste burial)
Environmental						
Water quality impact	Locally low, off-site low-moderate (tertiary treatment)	Locally low, off-site low-moderate (tertiary treatment of waste)	Locally low, off-site low-moderate (tertiary treatment)	Potentially moderate-high	Low	Potentially high
Soil impact	Locally high, off-site low	Locally high, off-site low	Locally high, off-site low	Locally high, off-site moderate	Low	Locally high
Vegetation impact	Locally high, off-site low	Locally high, off-site low	Locally high, off-site low	Locally high, off-site moderate	Low	Locally high
Cultural heritage impact	Site dependent	Site dependent	Site dependent	Site dependent	Low	Low
Experiential and social						
Visual impact	Moderate	Moderate	Moderate	Moderate (absorption area)	Low	Low (potentially high where burial not possible)
Odour impact	Low	Low-moderate (odour can be mitigated with appropriate venting)	Low-moderate (odour can be mitigated with appropriate venting)	Trench failure can produce odour	Low	Low (potentially high where burial not possible)
Access and equity	Acceptable	Acceptable	Acceptable	Acceptable	May exclude aged or mobility impaired. Backcountry visitors should be physically capable of complying.	May exclude aged or mobility impaired. Backcountry visitors should be physically capable of complying.
Health and safety risk (visitors)	Acceptable	Acceptable	Acceptable	Acceptable	Potential for spills, storage and disposal issues	Moderate–high where water supply contaminated
Method acceptability	Acceptable	Acceptable	Acceptable	Acceptable	Low-moderate (requires education and facilitation)	Moderate-high (difficult to achieve burial in winter/snow environment)
Planning and design						
Functionality	High	Moderate – composting occurs, but limited fluid	High	Moderate – absorption trench prone to failure	Moderate – some technical issues remain	Low-moderate in alpine environment

Criteria	Sewerage	Composting (waterless) Toilets	Vault systems	Septic and trenching system	Carry out systems	Minimal Impact Code (waste burial)
		reduction.		over time.		
Serviceability	High	Moderate	High	Short term high, long term low	Moderate. Uses self-service containers. Manager services collection and disposal.	n/a
Dependency on ongoing vehicle access	Low	High	High	Low	Low	Low
Reliability	Moderate-high (may be affected by contaminants)	Low-moderate	High	High (short term), in suitable soils	Variable depending on user	Moderate – waste burial may not be possible due to shallow soil or snow cover
Flexibility	Moderate	Moderate	High	Moderate	High	n/a
Health and safety risks (staff)	Low	Moderate (may require high maintenance). OH&S issues.	Low	Low	Moderate (waste collection and disposal)	Moderate (site rehabilitation)
Cost and efficiency	High cost, high efficiency	High cost, low efficiency	Moderate cost, moderate efficiency	High cost, moderate efficiency (long term)	Low user cost/moderate manager cost, moderate efficiency	Low cost, high efficiency (disregarding site clean-up)
Conclusion	Preferred option for grandstand sites and secondary nodes with main road and sewerage system access.	Currently not feasible in alpine environment. Bulk of waste is liquid which is not reduced in composting process.	Preferred option if road or track access available; requires regular waste removal and disposal.	Not suitable due to environmental impacts.	Potentially suitable for backcountry areas, some social and technical barriers. Requires facilitation and support.	Not suitable in alpine zone due to environmental impacts. Compliance may be difficult in rocky areas, in densely vegetated areas and in winter.

5.2.2. Systems appropriate to each recreation setting

Peripheral 'gateway' sites and major track heads

At the grandstand sites and major track heads there is generally excellent road access and high visitation levels. The potential alternatives are connection to an established sewerage system or large capacity vault pump-out systems.

Major walking track system

The walking track network can be separated into areas with and without vehicle access. In the Main Range, for sites with vehicle access, the best potential alternative is a vault pump-out system. Without vehicle access the alternatives are; vault with air lift out (an example is shown in Attachment 5), carry out methods or the minimal impact code. The latter two approaches are not likely to be successful on the major walking track system of the Main Range because of visitor numbers and characteristics. Major track routes which are inaccessible to vehicles and distant from toilets should be managed for their natural and remoter values through appropriate carry out and disposal methods.

Huts

Visitation rates to huts in the Main Range vary greatly. Tasmanian research has demonstrated environmental and human health issues associated with huts where toilets are not provided. Where vehicle access is available, pump-out vault toilets are likely to be most appropriate. Where vehicle access is not available (for example, Cootapatamba Hut), the alternatives are helicopter fly-out, servicing using light vehicle (skidoo or ATV), carry-out or minimal impact. Each of these alternatives has drawbacks. Helicopter access impacts on the recreation experience of visitors over a wide area. Light vehicle access suffers from low waste capacity and possibly difficult or unreliable access. Minimal impact has been shown to fail under alpine conditions, particularly in winter (refer section 3). Carry-out may be a partial solution, depending on the attitudes and abilities of the user groups.

Backcountry areas

Human waste in backcountry areas, where toilets are not provided, has traditionally involved waste burial, either on an individual basis (under minimal impact codes) or a group basis (such as trench or pit latrines). The provision of toilets in these areas would be either impractical or inappropriate to the recreation setting.

Tasmanian research, and anecdotal accounts from the Main Range, suggests that minimal impact methods are not complied with in alpine areas. In winter, deep snow cover may make waste burial difficult or impossible, shallow soils, rocks or tree roots may impede waste burial and terrain or vegetation may make the required 100 metres from watercourses unachievable. In alpine and high sub-alpine conditions waste and toilet paper is very slow to break down. Unmanaged or poorly buried waste has been shown to pose significant and persistent health risks to visitors (Bridle *et al*. 2005).

The remaining alternative is the use of carry-out methods. Enforcement and campsite signage is unlikely to be acceptable, and user education and active facilitation is required from management.

5.2.3. The carry out options

Carry out systems are used in remote areas where no toilet facilities exist and the minimal impact code is not practiced or promoted. Individuals collect their own human waste and *carry out* this waste to be disposed of outside the protected area. Disposal may involve sewage treatment works, composting facilities, incineration facilities or a suitable land fill site.

Discussions with tour group operators, private operators and DEC rangers indicated that carry-out systems should be:

- light weight;
- easy to use;
- packages easy to seal;
- carry packages in sealable container – leakproof;
- packages are deposited at regular collection receptacles;
- easy to clean and sterilise;
- sealable container purchased or hired and reusable.

In addition, the disposal system should be:

- accessible;
- affordable;
- easy to operate;
- quick and efficient;
- no mess;
- compliant with current human health and safety regulations.

Carry-out products currently come in the form of waste bags, hard containers and portable toilets. There are few carry out systems commercially available. Some of these systems are currently used by a range of operators from 'professional' tour groups to Defence forces in remote areas. Home-made methods are practiced and publicised by user groups. Some more sophisticated systems have been developed overseas but are not readily available in Australia. The currently available bag systems vary in the biodegradability and compostability of materials, ranging from petrochemical plastic to corn starch bioplastic.

Table 5.2.3.1 provides a description of each of the carry out options. Large capacity portable toilet systems have not been included in the assessment. These include bucket systems (eg. Lug-a-loo with a snap-on toilet seat) and can systems (eg the Boom Box from U.S River Systems), which are designed for large camping parties and tour organisations. Large container systems such as these are likely to be too cumbersome and excessive for backcountry visitors in the Main Range. However, small scale versions of these products such as the Clean Mountain Can (Denali National Park, Alaska) may be suitable for individual walker/skier use; this product has been included in the assessment, but does not appear to be commercially available in Australia at present.

Table 5.2.3.1 Assessment of the principal carry out options

Carry out option	Portable container toilets (eg US Clean Mountain Can)	Hard container systems (eg Poo Tube or NZ Poo Pot)	Bio-Bags	Wag Bags
Mode of operation	Collect faeces, urine (optional) and toilet paper in a sealable leak proof container. In use in Alaska, U.S and Canada in alpine remote back country areas by groups. Dump in sewerage/septic system and clean out. An automatic cleaning system is currently being developed. Not commercially available in Australia at present.	Collect faeces in bag or grease proof paper and store/carry in container. In use on Main Range. (Larger containers can be used as portable toilet; not commercially available in Australia at present). Wagbag and Biobag liners are available.	Collect faeces in biodegradable bag, place within another bag or sealable container. Dump in composting toilet, compost or bury. Seat available.	Collect urine and faeces in biodegradable bag, which contains chemicals to gel liquid, place within another bag or sealable container. Dump in composting toilet, compost or bury. Seat available.
Intended uses	Climbing, hiking, skiing and camping, short and long duration (in use for upto 24 days)	General camping, hiking, skiing short and long duration.	General camping, hiking, skiing short duration (up to 7 days)	General camping, hiking, skiing short and long duration (up to 1 month)
Approximate Cost (from manufacturer March 2005)	$100 to $180 Australian depending on exact size and any modifications	Homemade PVC poo tube c. $15 materials, NZ poo pot commercially available.	Less than $1 per bag, seat ~ $100	$3-4 per bag, seat ~$200
Availability	Yes in U.S only at present	Yes	Yes	Yes
Manufacturer	United States	Poo tube homemade, Poo Pot - NZ	Italy, maybe South Australia	United States
Ease of Use	Easy	Easy	Easy	Easy
Suitable for disposal in flushing sewered or septic systems	Yes, manufacturers design is for sewerage/septic disposal.	Yes if progressively flushed in small quantities, and paper or no wrapping is used.	No Yes if highly macerated to prevent blocking and assist breakdown	No Yes if highly macerated to prevent blocking and assist breakdown
Suitable for disposal in composting toilet	No, however can be modified, requires water for clean out.	Yes, if wrapping is biodegradable.	Yes	Yes
Compatibility with pump-out vault systems	No, however can be modified, requires water for clean out.	Yes if wrapping is rapidly biodegradable. Not if Wagbags, Biobags or plastic bags used.	Yes – needs up to 3 months to decompose.	Yes – needs up to 2 years to decompose.
Incineration	No	Yes	Yes	Yes
Currently in use	Yes in US and Canada	Yes (poo tubes) in Main Range Yes (poo pot) in Mt Cook NZ	Yes	Not in main range
Weight - bags	Container weight varies with size and modifications ~400 grams	Poo tubes ~ 700 grams Poo pot ~ 300 grams	Low	Low
Seat	n/a	n/a	Fold up and less than 2 kgs	Fold up and less than 2 kgs

Carry out option	Portable container toilets (eg US Clean Mountain Can)	Hard container systems (eg Poo Tube or NZ Poo Pot)	Bio-Bags	Wag Bags
Size	Approx. 30cm by 20cm diameter, capacity ~ 7 litres	100mm x 500mm tube (poo tube – may be sized to suit required capacity) Poo Pot – 125mm by 85 mm jar – capacity ~ 750 ml	Bags small, folded seat 100x340x550mm	Bags small, folded seat 150x450x600mm
Uses	10-14 uses	May be multiple	May be multiple	4 – 5 uses per bag
Durability	Very high – according to test results from manufacturer and in field in Alaska	High	Commode is durable, bags are biodegradable therefore some tendency to deteriorate over time	Commode is durable, bags are highly durable
Shelf life	Indefinite	Indefinite	Storage dependent- cool and dry (refrigerated) upto 1 year.	Long as wag bags come in plastic bag for storage.
Transportable	Bulky but portable	Bulky but portable attached to backpack.	seat bulky	seat bulky
Can be Hired out to visitors	Yes	Yes	Seat - yes	Seat - yes
Standards – International/ Domestic	n/a	n/a	Meets US and International Certificates for composting and biodegradability.	They are approved for disposal with normal trash, as group II non-hazardous waste.

5.2.4. Appropriate carry-out options for the Main Range

Generally there are two types of carry out options; bagged or container systems. Container systems can be divided into hard waste containers and portable toilets. The container and bag options overlap, since bags are often used to line the containers, or bagged waste is placed in a container for storage and transport.

Both small scale containers and bag systems are appropriate for use in the backcountry areas of the Main Range provided the waste wrapping is biodegradable. Non-biodegradable waste presents disposal issues, requiring specialised collection and disposal using, for example, incineration. The bags vary in the rate of biodegradability, and in longevity under use and storage conditions. A sealed container provides the best security against spillage or leakage, but is heavier and more bulky than bags alone.

Both bag products reviewed, and the Clean Mountain Can portable toilet, are available with a seat which would improve user comfort, accessibility and acceptability. A risk assessment would need to be completed for each system and associated collection, transport and disposal process to identify and minimise potential health and safety risks.

5.2.5. Field test results and comments

Currently private groups (Bruno Hofstettor pers. comm.) and tour operators (Novotel) use plastic bags and 'Biobags' respectively on the Main Range. Both methods are considered satisfactory by the users, however the operator using plastic bags would now prefer the biodegradable bags because of disposal issues. Issues relating to use of the methods arising from discussion with the above operators include:

- difficulty in high winds (plastic bag);
- privacy sometimes an issue especially for groups;
- need for a separate sealable container to contain bags in for transportation;
- disposal is 'ad hoc' – mostly in garbage bins, down composting toilet (Charlotte Pass) or buried 'back on the farm';
- removal from sealable container may cause spillage or accident;
- need for easy to clean and reuse sealable containers – potentially hire out;
- temporary loss of comfort and handling of own waste is over come by doing the right thing for the environment;
- people feel comfortable that they are not responsible for faeces left on the mountain and they are contributing to reduce human impact in sensitive environments.

5.2.6. Carry-out waste disposal Options

Disposal options for carry-out packages containing human waste include;

Composting – only suitable for compostable and bio-degradable bags, would need access to composting toilets or a composting facility. Composting most reliable at lower elevations (such as Sawpit Creek or Waste Point) due to low temperatures.

Incineration – Incineration of waste can be arranged using a company such as Stericorp to pick up the waste from a central bin in Jindabyne (refer Attachment 3). This method may be most appropriate for plastic bagged waste.

Sewerage – Waste and paper from containers could be flushed down sewered toilets in small quantities. Disposal of biodegradable waste bags requires pre-treatment by decomposition to prevent blockages at the STP. Non-biodegradable bags could not be disposed of in the sewerage system.

Landfill –. Collecting packages for landfill would involve transportation issues and consent from a landfill authority. The Snowy River Shire Council Waste and Water Manager has indicated that bags would not be acceptable mainly because of the small size of the land

fill and containment, and contact and handling issues, but did say that he would consider the matter should a workable management strategy be provided. The Council is also looking at setting up a composting section, i.e. a vertical composting unit which could accept carry-out bags. This service may still be some way off.

Garbage bins – Not an option, because of human health and safety issues. Even though human waste is not classified as hazardous waste (Tony Bles, NSW Department of Health pers. comm.) there are serious health and safety issues with handling and transportation.

5.3. Experiences in Australia and elsewhere

5.3.1. Kosciuszko National Park

Like other alpine areas, Kosciuszko National Park has progressively replaced pit toilets in remote vehicle-accessible areas with sealed tank units (vaults), which are regularly pumped out. The vault system requires a contractor with a 10,000 litre truck to regularly access the huts and pump out the vault and return the waste to a sewerage treatment plant out of the KNP. The option of using a smaller tank of 3,000 litres is available for more remote huts, lower grade roads or as an intermediary between the larger tanker and remote sites. A pump-out or haul-out system may also be serviced with a helicopter, although this has not been trialled in the park because of priority being given to grandstand and peripheral node sites. Currently the pump-out waste is transported by contractor to the Berridale Sewerage Treatment Plant. Depending on the degree of contamination in the waste (tin cans, plastics, etc.) from the remote huts the sewage may be taken to the Perisher Treatment Works if required.

Based on comments by staff the pump-out method has the following advantages:

- waste is fully contained;
- cost and time efficient;
- low maintenance;
- minimal OH&S, public health and safety issues;
- disposal is through an accepted and standard method;
- complies with public health regulations and environmental legislation.

Composting toilets have been researched and installed at a number of locations, including the Whites River corridor and Charlotte Pass. Unfortunately they have not worked as originally planned, even with the latest technological advancements for air flow, heat conservation and cubicle design. Problems that occur, and have occurred in other alpine areas around the world include; high visitation rates, cold, insufficient evaporation, low composting temperature, venting, access, equipment failure, high urine volume, high maintenance time, costs and disposal issues.

5.3.2. Parks Victoria

Past experiences in alpine areas in Victoria are similar to NSW; generally pit toilets were utilised at huts and camping sites, while in the backcountry and remote areas the Minimal Impact Code is promoted (pers. comm. Andrew Markwick A/g Chief Ranger Alpine District). Composting toilets were investigated and trialled however as a result of composting and evaporation difficulties in cold weather, composting toilets were seen as not viable in alpine districts. Parks Victoria aims to eliminate pit toilets in backcountry areas and replace them with pump-out or fly in/out facilities.

The Victorian Alpine District is currently developing a state wide ‘level of service’ program. This software based program provides recommendations on the required infrastructure needed to satisfy a range of inputs such as visitation, environmental and management issues. The program will provide a guide to the level of services required to meet a certain standard, such as toilet infrastructure and maintenance and service levels. Parks Victoria are in the process of evaluating all sites to this standard.

5.3.3. Parks and Wildlife Service, Tasmania

The Parks and Wildlife Service have investigated and researched a wide range of alternative toilet systems for their parks, with varying success. Existing problems in alpine areas with composting toilets are temperatures and urine storage and evaporation along with the associated removal of composted waste and urine bulk as hazardous waste are causing management issues.

In tracked areas, squat toilets are used which require regular removal and replacement of the vault by vehicles, other more remote areas without track access require a helicopter fly in/out procedure. This system appears to work well, however Parks and Wildlife are still investigating any new developments to reduce the volume of waste (such as dehydrator toilets, refer Attachment 5). On walking trails and in between designated camp sites Minimal Impact Codes are promoted. A Minimal Impact Bushwalking Strategy has been adopted, encouraging waste burial away from watercourses, based on the Leave No Trace campaign in the United States.

Tasmania Parks treat human waste as hazardous waste with serious environmental protection and human health requirements. They have indicated that they would consider a carry out option if it was thoroughly thought through and incorporated a risk assessment (pers. comm. Trevor Westren, Parks and Wildlife Tasmania).

5.3.4. The Australian Antarctic Division

The Australian Antarctic Division (AAD) have a Rotary Biological Container (RBC) located at each of their four permanent research stations. All four stations are occupied year-round by scientists and support staff. The aim is to bringing everything back to mainland Australia (Hobart), in accordance with their International Obligations and Agreements.

The AAD have in place an Environmental Management System which complies with ISO 14001 and an operation manual. Section 3.8.2 within this operations manual relates to Human Faeces, Urine and Grey Water management in the Field. Within this section there is a table which has been developed with the following parameters in mind:

- *to return waste from the field to the maximum extent practicable;*
- *a risk assessment undertaken of the nutrient, pathogenic, industrial contaminant and aesthetic impacts of human waste, urine and grey water disposal in the field;*
- *determination of situations where it is impractical to return waste due to logistical constraints;*
- *cumulative impacts at sites that are visited frequently; and*
- *comparison with international best practices.*

For field operations, the aim is to bring all human waste back to the main stations. Human faeces is normally double bagged (plastic bags), collected and returned to the station for incineration, the ash is then returned to Hobart Australia where it can be used as clean land fill. Human urine and grey water is collected in specific containers suited to transportation mode and returned to the station, where it is trickle fed into the treatment plant. After treatment it is released into the surrounding water body. For remote field work and depending on the situation urine and grey water may be deposited in the sea, tidal crack, glacial crevasse or ice pit in the plateau (pers. comm. Shaun Walsh, Project Manager Safety Environment, AAD).

5.3.5. Department of Conservation, New Zealand

New Zealand has a series of walking tracks and huts which are graded from serviced to standard and basic huts. The serviced and standard huts have toilet facilities. Toilet facilities that have been used are pit toilets, septic tanks, vault systems and composting toilets. For the septic tanks, trenches are used with the septic being flown out once full. The waste from vault systems is also generally flown out by helicopter.

New Zealand is in the process of converting pit toilets to either a sealed vault or septic system or in suitable areas to composting toilets. On the walking tracks and in remote areas in New

Zealand the Department of Conservation promote a New Zealand Environmental Care Code which is similar to the Minimal Impact Code used throughout Australia. This code forms a 10 point checklist. Number 3 in the checklist is:

> **Bury toilet waste**
> In areas without toilet facilities, bury your toilet waste in a shallow hole well away from waterways, tracks, campsites, and huts.

Other provisions in the code include;

- Where there is a toilet, use it.
- In areas without toilet facilities bury your toilet waste. Choose a place at least 50 metres from tracks, huts, camping sites, popular areas and water sources. Dig a shallow hole 150mm deep with the soil's organic layer and bury all toilet waste and paper. This will stop the waste contaminating water sources. Using a small trowel will make it easier to bury toilet waste.

5.3.6. Europe, Canada and the United States

In many alpine areas of Europe, facilities are developed to a high standard, especially at grandstand points and major tourism nodes. Hotels, lodges and chateaus are the standard form of accommodation at major tourist destinations and parks. For the more remote sites and huts there are designated camping areas. Throughout Europe there is also a code similar to our Minimal Impact Code requiring the burial of human waste. Along major tracks, roads and travel routes a similar vault type toilet facility is provided which are regularly pumped out (pers. comm. Trevor Westren).

Canada and the United States are in a similar situation. To cater for the large numbers of visitors (particularly tourists) and high peak time visitation rates sewered services are provided at key tourist nodes and park entrances and grandstand points. More remote alpine areas are serviced by pump-out facilities.

'Pack out' (or carry out) is regulated in areas where there normally is one defined entrance and exit point, such as along rivers. Even so there is inappropriate disposal of the waste collected, generally at the exit point of these parks. In several wilderness parks in both Canada and the United States visitors are required to carry a portable toilet with them. Examples of parks that require visitors to pack out human waste are Canyonlands National Park, Utah, and Grand Canyon National Park, Arizona, both in the United States and Kluane National Park, Yukon, and Tatshenshini/Alsek Wilderness Provincial Park in British Columbia.

5.3.7. Implications for the Main Range Management Unit

The negative impacts of inappropriate human waste disposal in parks throughout the world has been well documented, both social impacts (Reeves 1979, Land 1995, Cilimburg *et al* 2000, Lachapelle 2000, Rochefort and Swinney 2000) and environmental impacts (Temple *et al* 1980, Temple *et al* 1982, Cowdin 1986, Tippets *et al* 2001, Bridle and Kirkpatrick 2003; 2005, von Platen 2003). The management of waste is also causing internal legal and management issues relating to public liability, occupational health and safety and infrastructure requirements.

Potential lessons for waste management in the Main Range include:

- high visitation destinations in parks in Europe and North America have adopted high capacity, high comfort urban-style waste management infrastructure at main grandstand points (connected to reticulated sewerage and water supply systems);
- where vehicle access is available and the setting is appropriate, pump-out vault systems offer the simplest and most effective solution to the provision of toilet facilities;
- there appear to be no perfect solutions for remote areas where vehicle access is unavailable and toilets are not provided; each management option currently in use has costs and management issues attached;

- helicopter waste removal from remote areas is feasible (it is practiced in Tasmania and New Zealand) although for the Main Range the volume of waste and the financial and social costs of flying out waste need to be considered. There are also OH&S issues with flying large quantities of human waste, double handling and potential spill/contamination risks;
- carry-out systems have been applied in some North American reserves, with generally good compliance. Some of these experiences demonstrate innovative technology and also the importance of adequate and well-sited waste disposal facilities;
- incineration of carry-out waste is used in Antarctica and to dispose of carry-out waste in North America. This enables the use of non-biodegradable plastics and avoids landfill disposal.

6. SOLUTIONS FOR THE MAIN RANGE

6.1. Broad management options

6.1.1. Analysis of available options

There are a range of management options available to deal with problems of human waste in natural areas. The selection of the most suitable set of options will depend on the site and user characteristics, management objectives and environmental conditions. The wider range of management options to address recreation impacts encompasses:

- reduction of use intensity,
- changes to the location of use,
- changes to the type of use and behaviour,
- hardening the environment, and
- actively maintaining/rehabilitating the environment (Cole *et a*l. 1987).

The last three of these options have the greatest potential application for waste management in the Main Range. The control of visitor numbers (use intensity) carries costs in terms of experiences and administration, and is a last resort measure. Current use types and locations are generally appropriate to the allocated recreation settings.

The behaviour of some user groups may be altered through education and information campaigns. Carry-out methods can be promoted in this way, and actively facilitated through the provision of supporting product distribution and waste collection facilities. Visitor education/information is likely to be effective for a restricted subset of users. The provision of toilets can be considered a form of resource hardening, coupled with active maintenance. Toilet structures are not however suitable for primitive, backcountry settings for aesthetic and practical reasons.

The broad management options considered for the Main Range, and their suitability in each recreation setting, are addressed in Table 6.1.2.1.

6.1.2. Broad options for the Main Range settings

Based on the analysis presented in Table 6.1.2.1, three broad management options appear most suitable for the recreation settings on the Main Range:

- permanent toilets
  - grandstand sites, secondary gateway nodes, formal walking track system, huts
- seasonal toilets
  - huts and camping areas predominately used in winter or summer
- carryout methods
  - primary backcountry method minimal impact guidelines (personal waste burial, away from watercourses)
  - secondary backcountry method

Solutions for specific locations

Based on the design standards identified in section 5, the assessment of alternatives in section 4 and the broad options analysis presented above, Table 6.1.2.2 presents recommended waste management solutions for each of the key locations in the Main Range Unit. More detail on implementing the solutions and associated activities are provided in sections 7 and 8, and in the implementation table in section 9.

Table 6.1.2.1 Strategic analysis of broad options in relation to recreation settings

	Permanent toilet	Temporary toilet	Carry out	Minimal impact use strategy (waste burial)	No action
Grandstand sites	Appropriate to objectives of site and visitor expectations	Inappropriate to objectives of site and visitor expectations and needs	Inappropriate to objectives of site and visitor expectations	Inappropriate to objectives of site and visitor expectations	Inappropriate due to levels of use and site objectives and visitor expectations.
Secondary gateway nodes	Appropriate to objectives of site and visitor expectations	Inappropriate to objectives of site and visitor expectations	Inappropriate to objectives of site and visitor expectations	Inappropriate to objectives of site and visitor expectations	Unlikely to affect node, but detrimental to Main Range Unit accessed from node.
Formal walking track system	Appropriate at key visitor nodes on tracks - Rawson Pass and Seamans Hut	Inappropriate - temporary toilet facilities at Rawson Pass have been satisfactory only as a short term measure.	Yes. But take up by the day walker market is likely to be minimal. Use of information at Grandstand sites about location of toilets may be more effective.	Inappropriate to objectives of site and visitor expectations	Inappropriate. Likely to lead to unacceptable environmental, social and recreational impacts.
Huts	Yes, provided close to most huts.	Seasonal use/demand needs to be considered in relation to Seaman's and Cootapatamba Huts.	Yes, but not necessary or desirable at huts with toilets. Monitoring and assessment required at Cootapatamba Hut.	Not necessary or desirable at huts with toilets. May contribute to contamination of water sources. Practical difficulties in areas with shallow soils or deep snow cover. Not appropriate in sensitive alpine locations.	Inappropriate. Likely to lead to unacceptable environmental, social and recreational impacts.
Backcountry areas	Inappropriate to objectives of site.	Inappropriate to objectives of site. Permanent toilets are provided at all huts accessible to the public except at Seaman's and Cootapatamba.	Yes. Monitor outcome at popular Main Range camp sites- particularly after winter before thaw completed.	Currently practiced and promoted in setting. Practical difficulties in areas with shallow soils or deep snow cover. May contribute to contamination of water sources. Not appropriate in sensitive alpine locations. User groups likely to be aware and receptive.	Inappropriate. Likely to lead to unacceptable environmental, social and recreational impacts.

Table 6.1.2.2 Waste management solutions for specific locations

Location	Waste management solution	Justification
Grandstand sites		
Thredbo Chairlift	Improve signage regarding the location and public availability of toilet in Eagles Nest.	Public availability of existing toilet may be ambiguous. Existing toilets generally appear to be of adequate capacity, with minor queuing during peak times (Malcolm Browne, Manager Eagles Nest pers. comm.)
	Provide signage identifying the location of toilets and huts on the Main Range, especially toilets at Rawson Pass (and Seaman's Hut, when installed), noting distances and travel times. Note and explain carry-out policy, disposal options and locations of waste collection facilities. Integrate with interpretive display.	Recent visitor surveys indicate general lack of appreciation of sensitivity of alpine zone, and the damaging effects of human waste. Improved understanding will foster acceptance of policies.
	Install a biodegradable carry-out waste collection bin at Thredbo terminal (lower).	Provides disposal option for backcountry visitors exiting the Main Range via the Terminal. Existing sewered toilets are unable to accept packaged or bagged carry-out waste. The use of the lower Terminal makes for easier servicing and access for pump-out.
Charlotte Pass	Maintain existing facility, using current pump-out (liquids) arrangements.	Existing facility is adequate to meet visitor needs.
	Provide signage identifying the location of toilets and huts on the Main Range, especially toilets at Rawson Pass (and Seaman's Hut, when installed), noting distances and travel times. Note and explain carry-out policy, disposal options and locations of waste collection facilities. Note and explain absence of toilets at Blue Lake. Integrate with interpretive display.	Recent visitor surveys indicate general lack of appreciation of sensitivity of alpine zone, and the damaging effects of human waste. Improved understanding will foster acceptance of policies. Significant visitation from this gateway to Blue Lake, a long walk with no toilet facilities.
	Install a biodegradable carry-out waste collection bin in or adjacent to Charlotte Pass toilet.	Provides disposal option for backcountry visitors exiting the Main Range via Charlotte Pass.
	Address pumping and odour problem at toilet facility.	Odour issue highlighted in visitor comments recorded during recent survey (Johnston and Growcock 2005). One solution may be to convert system to a full pump out facility.
	Encourage summer use of Charlotte Pass Village facilities and services	Underutilised existing infrastrucutre
Secondary gateway nodes		
Guthega Power Station	Install signage at the site including the location of the Whites River corridor huts, and other huts and toilets on Main Range noting distances and travel times. Note and explain carry-out policy, disposal options and locations of waste collection facilities. Integrate with interpretive display.	Secondary gateway – visitors start and end (particularly overnight) walking and ski-touring activities at the site. The Horse Camp hut toilet is 3.6 kilometres away. Signage will enable visitors to understand problems of waste, plan trip around available toilets, and be aware of camping and waste disposal restrictions and the availability of carry-out services.
	Install a biodegradable carry-out waste collection bin in Power station carpark area.	Provides disposal option for backcountry visitors exiting the Main Range via the Power Station carpark. The existing sewered toilet is unable to accept packaged or bagged carry-out waste.
Guthega Resort day-use carpark	Improve external signage indicating presence and public availability of toilets in chairlift terminal during winter.	Winter day users not using chairlift need to be aware that public toilets are available. Most use occurs in winter when toilets are open. Summer use levels may not justify a stand alone toilet or waste collection facility.

Location	Waste management solution	Justification
	Install signage at the site including location of toilets and huts on Main Range noting distances and travel times. Note and explain carry-out policy, disposal options and locations of waste collection facilities, including Guthega Power Station. Integrate with interpretive display. Signage could be located en route to the dam wall.	Secondary gateway – visitors start and end walking/ski-touring activities from site, destinations include remote camping sites. Less than 1% of alpine visitors enter via Guthega (Johnston and Growcock 2005). The demand for a solid waste facility may not be high. Signage will enable visitors to understand problems of waste, plan trip around available toilets, and be aware of camping and waste disposal restrictions and the availability of carry-out services.
Walking track system		
Rawson Pass	Install a permanent all-season toilet, pump-out system, compatible with natural, cultural and visual values of the site that is capable of being serviced with light vehicle or helicopter when Kosciuszko Road is rehabilitated.	High demand site, demonstrated by use levels of portaloos. Toilets would be compatible with modified setting with high human and managerial presence.
	Incorporate toilet/hut locations and waste management messages in low key interpretive signage. Note and briefly explain carry-out policy, disposal options and locations of waste collection facilities, and a need for human waste to be disposed of in biodegradable receptacles.	Visitor surveys have indicated high demand for signage (Johnston and Growcock 2005). Signage should improve awareness of services, understanding of waste problems and visitor compliance.
Walking tracks	Low key distance markers along the major track system, incorporating a small toilet symbol to indicate the presence of toilets at relevant destinations. Markers would be very simple, and could be mounted flat on the steel mesh boardwalk or bolted to a block set into the ground on other parts of the track.	Distance markers have been proposed to improve visitor experiences in a recent visitor survey report on the alpine area (Johnston and Growcock 2005), and in past work (Stanley 1986, McMaster 2000). Knowledge of location could also allay anxiety which may be contributing to unplanned toilet stops. Low simple markers would not conflict with modified setting of class 2 tracks and expectations of user groups.
Huts		
All huts	Replace existing minimal impact code signage and leaflets with revised code. Incorporate on map display indicating toilet and hut locations, boundaries of the Main Range Unit, distances and travel times, no-camping areas, carry-out only areas, locations of biodegradable carry-out waste collection facilities, interpretive information.	Current signage and leaflets inconsistent with Strategy. Wall map would be useful to draw attention and define locations where carry-out rule applies. Locations of services and environmental features will assist trip planning. Toilet signage would encourage use of toilet for biodegradable carry-out waste disposal and publicise policy.
Huts	Assess extent of waste pollution problem around hut, particularly after rain (water quality) and after spring thaw (surface waste deposits). Monitor site for two years following introduction of carryout policy. Consider health warning signage, stronger discouragement of recreational overnighting in hut, and fly-out toilet option if problem found to be significant and persistent following introduction of carryout policy. Refer Attachment 5.	Extent and seasonality of waste problem at hut, and response of users to carry-out policy uncertain. Health risks of local water sources require assessment. Toilet installation a last resort because of remote setting, service and rehabilitation access difficulties and impacts of helicopter on recreation experience.
	Discourage overnight use of the hut, particularly in winter – emphasise in gateway information displays, hut information, leaflets etc, explaining reasons.	Visitor knowledge of unavailability of hut for overnight use, and current waste problems will assist compliance.
Seaman's Hut	Permanent all-season toilet, pump-out system, compatible with heritage values of hut. Capable of servicing with light vehicle/helicopter when Kosciuszko Road is rehabilitated.	Overnight and lunchtime uses associated with demand for toilets. Existing summer and winter problems at site.

Location	Waste management solution	Justification
Cootapatamba Hut	Undertake water sampling and monitoring program to assess need for toilet facility. Investigate fly in/fly out toilet facility.	Need to identify health and environmental risk. Site is a known winter destination.
Whites River corridor huts **- Horse Camp Hut** **- Whites River Hut** **- Schlink**	Maintain existing vault systems. Any renovation or new works should harmonise with hut architecture and materials.	Excellent vehicle access along Schlink Pass Road. Toilet structures are appropriate to modified sub-alpine setting. Toilet signage would encourage use of toilets for biodegradable carry-out waste disposal and publicise policy.
Illawong Lodge	Hut to be managed primarily for cultural heritage values, with public access. Maintain existing toilet. Publicise Main Range carry-out policy, and locations of toilets.	Hut to be managed to allow future public use. Unlikely to be large numbers using hut site as gateway to Main Range.
	Assess performance and impact of absorption trench septic system.	Absorption trench systems may fail over time. Proximity to river warrants careful monitoring.
Backcountry/ dispersed use		
	Apply carry-out policy. Promote and support biodegradable carry-out products and methods.	Minimal impact practices may be difficult or impossible. Biodegradable bags have less disposal issues and are less polluting than plastic.
	Actively facilitate the availability and value of carry-out methods and products by liaising with suppliers, shop-owners and service providers. Ensure retailers are aware of storage requirements, product durability and use advice and request they keep simple sales records for the products. Retailers would include KT at lower Thredbo terminal, Snowy River Visitor Centre, Wilderness Sports, Paddy Pallin etc.	This will maximise the availability of carry-out products for visitors. This provides essential support for the new policy.
	Provide carry-out waste collection and disposal services for biodegradable waste. Install carry-out waste collection facilities at key exit points (refer Grandstand and Gateway sites above).	Convenient waste disposal required at end of recreation activity, on leaving the Main Range, servicing visitors staying in resorts and leaving the park.
	Publicise the availability, use and value of carry-out methods and products using a range of media opportunities aimed at visitors.	This will maximise the awareness of visitors of the carry-out option.

6.2. A carry-out policy for the Main Range

6.2.1. Why do we need it?

The Minimal Impact, Leave No Trace, Tread Lightly and similar campaigns developed for a range of activities have been a positive contribution to recreation management in protected areas. In relation to human waste, these codes advise that solid waste should be buried (to allow microbial breakdown), well away from water sources. The Australian Alps Minimal Impact code advises a burial depth of at least 15 centimetres, at least 100 metres from lakes or streams (refer Attachment 1). However, research in Tasmanian has demonstrated the failure of minimal impact waste burial practices in alpine environments, because of widespread non-compliance, slow rates of decomposition in soils and ongoing health risks to water sources (refer section 3.5). The Tasmanian findings are borne out by water quality issues and anecdotal evidence of waste deposits in the Main Range.

Potential negative environmental effects of waste burial include root cutting, alteration of soil nutrient status and excavation by fauna (Kirkpatrick *et al*. 2000). Practical problems with the method in the Main Range include the difficulty in excavating through deep snow during winter, the frequent shallow depth of soils (particularly in glaciated or rocky country, or in woodland with large dense root mats), and the occasional difficulty in accessing areas more than 100 metres from streams because of thick vegetation or steep terrain. The environmental problems associated with the minimal impact code and unmanaged waste are detailed in section 3.

The Draft Plan of Management acknowledges the need for special environmental protection measures for the Main Range. The prohibition of camping in the glacial lake catchments, and prohibition of campfires in the Unit are examples. The extreme environmental significance and fragility of the alpine zone, the limited capacity of the alpine environment to assimilate waste and increasing visitor use pressures call for stronger protection for the Main Range.

6.2.2. Will visitors accept a carry-out policy?

The carry-out approach entails a shift from agency to personal responsibility for waste management. In recent years, a wide range of national park visitors have demonstrated a willingness to accept greater levels of personal responsibility by taking home rubbish from day-use and camping areas. Carry-out is an extension of the widely accepted bushwalker ethic of 'pack it in, pack it out'. It is consistent with the self-reliant nature of recreation in back-country areas.

A number of backcountry walking and skiing groups already use carry-out bag methods. Members of bushwalking clubs are also known to use and recommend the wider use of home-made PVC 'poo tubes'. Alpine backcountry users are accustomed to the need for specialised equipment, and are not likely to baulk at the need to buy or make waste management gear.

It is acknowledged that over-reliance on individual responsibility, and inadequate institutional support carries the risk of non-compliance behaviour, including carry-out waste dumping. There is groundwork needed from DEC to support the policy, and a culture shift is required from visitor groups to achieve wide acceptance and compliance. For this reason a phasing in period is proposed, with broad-ranging management support.

6.2.3. Introducing the policy

The broad sequence of actions required to introduce the policy includes a range of facilitation measures, communications materials and new infrastructure. Some of these actions will be required before the policy is formally introduced. A broad phasing-in sequence for the policy is presented below:

1 Design, manufacture and establish new infrastructure – waste collection facilities

2 Draft and produce new communications materials (signage, leaflets, publicity)

3 Introduce and publicise the carry-out policy for the Main Range Unit:

- **solid human waste should be carried out of backcountry areas.** Waste should not be buried in the alpine or sub-alpine zone. Visitors should use carryout methods or toilets provided at huts, track nodes and gateways, in these areas.

Compliance with the policy is made easier because the message is the same across the whole Main Range Management Unit. Monitoring and site assessments (refer section 7.4.1) will need to be continued to assess the compliance of this policy, also to identify the significant health risks from contaminated water sources at the informal campsites and Cootapatamba Hut.

6.2.4. What type of carry-out product?

The nature of carry-out waste packaging, i.e. whether the waste is contained in biodegradable materials (paper, corn starch membrane products) or non-biodegradable materials (plastics), has implications for waste collection facilities, disposal methods, personal and management costs and sustainability factors. This Strategy proposes that DEC promote, facilitate and provide disposal infrastructure for biodegradable carry-out waste packaging, such as 'Biobags' and 'Wagbags'. DEC should also promote the use of hard containers, either unlined or using biodegradable liners, like 'poo tubes' and equivalent commercial products.

The production of biodegradable waste is considered more sustainable in terms of pollution and climate change because the resulting sewage solids are less durable in landfill than plastics and the need for incineration is avoided. Disposing of waste in plastic carry-out bags could be handled using a waste collection service (such as Stericorp) for collection and disposal by incineration. Details relating to non-biodegradable waste collection and disposal options and costs are provided in Attachment 3.

Being wholly derived from corn starch, the 'Biobag' is the preferred choice of carry-out product. This product does however have a considerably shorter shelf (requiring refrigeration for best longevity) and field use life than the 'Wagbag', which is strengthened with polymers. Wagbags may take up to two years to breakdown in a waste pile. The biodegradability of these bags offers the potential to pre-treat the waste to enable it to be included with existing waste disposal arrangements with Sewerage Treatment Plants.

Some field testing of 'Biobags' under Main Range conditions in summer and winter is required to determine their operational limits and factors which could contribute to product failure. This knowledge will be required before DEC could consider actively endorsing, publicising or facilitating the sale of these products.

DEC should liaise with local retailers to discourage the stocking of non-biodegradable plastic carry-out products. If excessive dumping of non-biodegradable plastic carry-out products is found to occur, as litter, in rubbish bins or in toilets or biodegradable collection bins, or many complaints are received regarding the performance of the biodegradable products, possible management responses are several. DEC could do nothing and monitor any change in visitor behaviour over time as a result of the Strategy. Biodegradable options could be more aggressively promoted, by contacting clubs and organisations and press publicity. As a last resort, a non-biodegradable waste collection and disposal service could be provided (refer Attachment 3).

Carry-out is an evolving technology, and DEC should monitor developments in Australia and elsewhere in the world to continually improve practices in the Main Range. Active facilitation may be required to make new equipment and practices more widely available to park visitors. The 'Clean Mountain Can', a portable toilet developed for mountain climbers in Denali National Park, Alaska, is an example of promising technology that may help to popularise carry-out techniques in Australia (refer section 5). The need for flexibility and adaptability is a consideration in the development of communications material and infrastructure supporting the policy.

6.2.5. Mandatory regulations or voluntary guidelines?

The change to carry-out practices would entail a significant alteration to current behaviour for many backcountry visitors. Because of the difficulty in directly monitoring or enforcing compliance with the carry-out policy, DEC should aim for a gradual shift in attitudes and behaviour among user groups. The intention is to achieve a change in user culture toward increased responsibility for personal waste, and to encourage self-regulation among users. The seeds of this change are already present in some groups, notably bushwalking clubs. A number of organised tour companies also practice carry-out methods.

For these reasons, the carry-out policy should be introduced on a voluntary basis, recognising that changes in visitor attitudes and behaviour and institutional support arrangements will take time to establish. The voluntary approach is also more consistent with the low management intrusion/high self-reliance nature of the backcountry recreation experience. The role of DEC is to explain and justify the need for behavioural change, appealing to relevant value sets, and to provide practical support with information, product availability and infrastructure.

6.2.6. Carry-out waste collection and disposal

The North American experience with 'pack out' or carry out provisions demonstrates the importance of well designed and located disposal facilities. Park visitors staying at the resorts in the park, as well as those leaving the park would need to be catered for. Collection facilities would need to be placed at the exit points to the Main Range or the park. These points would include primary and secondary gateway sites, but could be rationalised to cover the maximum number of access ways. The collection points proposed in this Strategy are:

- Charlotte Pass gateway;
  - using the existing toilet facility.
- Thredbo;
  - using a new odour-proof collection tank or bin system, with amenity screening. Existing sewered toilets at the site are unable to accept bagged carry-out waste.
- Guthega Carpark;
  - using a new odour-proof collection tank or bin system, with amenity screening.
- Guthega Power station
  - using a new odour-proof collection tank or bin system, with amenity screening.

Each of the proposed collection sites offers excellent vehicular access for pump-out or collection and servicing.

Biodegradable waste requires a period of decomposition before it can be included in the vault toilet waste stream sent to the sewage treatment plant. Recently deposited waste bags have the potential to clog pumping equipment (Steve Field, Field Tech Industries pers. comm.), and therefore cannot be disposed of in existing vault toilets. Undecomposed bag material would not be acceptable to the Perisher STP (Ian Bruce pers. comm.) or the Berridale STP (Dilip Data pers. comm.). Under high sub-alpine conditions, the corn starch 'Biobags' are likely to break down within months, and the polymer strengthened 'Wagbags' may take up to two years.

At the collection point sites, a system of alternating receptacles would be required to enable bag breakdown. This could take the form of a sealed bin option at the collection points, which would be removed when full and replaced with an empty bin. Portable bins have a higher above-ground profile, and require more handling and more frequent monitoring, but have the advantage of being relocatable to a warmer, lower elevation (such as Waste Point) to speed decomposition.

The sealed bin would ideally be odour-proof, vandal-proof, theft-proof, insect-proof, with self-closing lids. These smaller collection bins would be emptied into a larger collection bin to allow for the decomposition process to be completed at the collection facility (ideally at a lower elevation with good access). Then as with vault toilets, the decomposed waste would be

broken up and diluted prior to pump-out, and included in current vault pump-out operations. During the breakdown period the bulk of the waste would reduce, possibly allowing a second period of waste input before pump-out would be required.

At the Charlotte Pass gateway, biodegradable carry-out waste (including 'Wagbags' and 'Biobags') could be disposed of in the existing toilet facility or a separate tank/bin system could be installed.

6.2.7. Agency involvement in equipment and product distribution

Agency involvement in making carry-out equipment and products available to visitors could take the following forms:

1. Simple liaison with existing retailers to facilitate the stocking and promotion of suitable products;
2. The provision of information to visitors describing how to make and use home-made hard containers like PVC pipe 'poo tubes';
3. The manufacture and sale or hire of hard containers, portable toilets (like the Alaskan 'Clean Mountain Can') and/or biodegradable bags (with or without a return-full disposal service);
4. The provision of a hard container/portable toilet cleaning service.

In view of the early stage of development of carry-out products and cleaning machines, this Strategy proposes that DEC engage in the first two of these activities. Extending DEC staff or contractor involvement into manufacture, sale, hire and cleaning services are options that could be considered as technology develops and as required to achieve management objectives. DEC could liaise with manufacturers to explore the possibility of adapting and developing container or portable toilet designs compatible with the carry-out policy.

6.3. Risk assessment

When the details of carry-out methods and products, toilet facility designs and management requirements, carry-out waste collection and disposal arrangements and communications materials have been determined, a risk assessment for the carry-out policy should be undertaken. A simple framework for risk assessment is provided in Attachment 2.

7. IMPLEMENTING THE STRATEGY

7.1. Installing new infrastructure

The development of detailed proposals for each site will be undertaken in accordance with current assessment and approval procedures under the *Environmental Planning and Assessment Act 1979* (EP&A Act). Proposals would be assessed against the planning and design standards provided in section 4, and other relevant criteria such as the 'signature' design principles contained in Chapter 8 of the Draft Plan of Management.

In accordance with the Draft Plan of Management, all proposals will be assessed for potential impact on values listed in the Schedule of Significant Natural Features (Schedule 3 in the Plan). All proposals covered by Part 5 of the EP&A Act will require an Environmental Management Plan, with provisions for monitoring, rehabilitation and auditing in accordance with section 12.8.1 of the Draft Plan of Management. Wherever possible, new works would contribute to the objectives of the Restoration Plan. Relevant environmental protection measures and rehabilitation practices would be drawn from the Alpine Rehabilitation Manual (Parr-Smith and Polley 1998). All works would be completed in accordance with the Kosciuszko National Park Environmental Safeguards Code of Practice (NPWS 2000).

At socially and culturally sensitive sites, such as Rawson Pass and Seaman's Hut, extensive opportunities would be provided for public and interest group consultation, including culturally-appropriate presentation of information and visual representations of the proposed new developments.

7.2. Lessee/licensee and other consultations

Snowy Hydro Limited will need to be consulted regarding the installation of carry out bag receptacles, the carry-out policy, providing interpretive and safety information, and monitoring visitor use and demand.

Kosciuszko Thredbo and the proprietors of the Eagles Nest Mountain Hut restaurant will need to be consulted regarding installation of carry out bag receptacles. They will also need to be consulted regarding the content and installation of interpretive/orientation signage at this site, which would indicate the location of toilets elsewhere on the Main Range, the carry-out policy, and interpretive and safety information.

Charlotte Pass Village will need to be consulted regarding the installation of carry out bag receptacles, the carry-out policy, providing interpretive and safety information, and monitoring visitor use and demand.

Perisher Blue Limited and other Guthega lessees will need to be consulted regarding the installation of carry out bag receptacles, the carry-out policy, providing interpretive and safety information, and monitoring visitor use and demand.

Shops and services at the resorts and outside the park will need to be consulted regarding and the distribution and display of revised minimal impact code and carry-out policy leaflets, posters developed to publicise the code and the policy and the stocking of suitable carry-out products. Further consultations required to facilitate the carry-out policy are identified in section 7.4.

Snowy River Shire Council will need to be consulted regarding the establishment of any solid waste disposal facilities to accommodate "carry-out" waste.

7.3. Servicing new facilities

An Environmental Management System would be developed to manage the servicing, inspection and maintenance of toilets and other facilities in and around the Main Range. The EMS would cover issues listed in 11.6.2 of the Draft Plan of Management, and be consistent with the park-wide EMS and related EMS (such as those covering walking tracks and road maintenance). Where practicable, basic monitoring and systematic recording of any visitor

feedback or management issues relevant to waste management should form part of the service routine.

The EMS would provide for detailed emergency response procedures, equipment and resources, which anticipate a range of emergency scenarios, such as materials or mechanical failure, chemical contamination, waste spillage or leakage, extreme climatic events, wildfire and vandalism. The EMS would also incorporate the results of any risk assessment undertaken prior to the implementation of this Strategy.

7.4. Facilitating the carry-out policy

The carry-out policy for the Main Range will require active facilitation and promotion. The policy would not be introduced until backcountry camping areas have been assessed for health risks, carry-out products have been field tested, any remaining technical issues relating to disposal have been resolved, new communications materials have been prepared and supporting waste collection and disposal infrastructure is in place.

7.4.1. Initial health risk assessments

Dispersed backcountry campsites

Faecal pathogens are known to persist in alpine soils in Tasmania for over 12 months after burial, even after visible evidence of faeces has disappeared (von Platen 2003 in Bridle *et al.* unpub.). In alpine natural areas of Mount Field National Park in Tasmania where toilets are not provided, compliance with the minimal impact code was found to be poor (Bridle *et al*. 2005). The authors concluded that unburied, or shallowly buried faeces were causing ongoing health risks to park users, through contamination of water sources.

An assessment of the extent of faecal deposition and impact on water quality at the backcountry areas of the Main Range is required (refer section 7.5.2 below for locations). Local water sources should be sampled before and after heavy rain.

Huts

The Tasmanian research also has relevance for Cootapatamba Hut, effectively a campsite where no toilet is provided. The authors of the Tasmanian paper consider a hut without a toilet to be a recipe for a potential public health problem (Bridle *et al*. 2005). In the Tasmanian case, it was recommended that huts either be locked or removed, or toilets provided.

Seaman's and Cootapatamba Hut are the only huts on the Main Range not provided with toilets. Heritage significance of the huts means their removal is not an option.

The need for a toilet facility at Seaman's Hut has been recognised by DEC and should be the infrastructure priority following construction of the Rawson Pass facility. This will be in regard to the draft Conservation and Management Plan (CMP) for Seaman's Hut which recognises the heritage value of the hut and further discusses the options of a permanent or seasonal toilet at the site.

The provision of a toilet at Cootapatamba hut is problematic because only oversnow vehicle access is available for servicing. A helicopter would be necessary to install and remove infrastructure and waste. DEC should monitor impacts at Cootapatamba Hut and consider the relative and seasonal needs of any facility. Information on a fly in/out toilet option is included in Attachment 5.

7.4.2. Product and procedure field testing

Before DEC will be in a position to actively endorse, publicising and facilitating the sale of carry-out bag products, field testing will be required to validate their performance under Main Range conditions, in summer and winter. Key factors to assess will be durability and longevity under use conditions, ease of use and comfort considerations, measures to maximise performance and any factors which could contribute to the failure of the products.

The assessment would also draw upon experience of current users, such as the tour group Novotel. Novotel report acceptable performance from 'Biobags' for 2-3 day walking trips; the usefulness of the bags for walks exceeding this duration requires testing. The polymer strengthened 'Wagbags' are likely to be adequately durable and long-lived for long walks. It may be possible to enlist the assistance of groups such as ski touring and bushwalking clubs for product trials.

The testing could be extended to hard containers or portable toilets as these products come onto the Australian market. The results of this testing would be used to inform decisions about product selection, content of communications materials, and advice to visitors and retailers.

7.4.3. Collection and disposal services

Facilities at key Main Range exit points would be required to collect biodegradable carry-out waste. As detailed in section 6, collection could take the form of large in-ground tanks at the collection points, or smaller portable bins removed when full and replaced with an empty bin. Information on products from Gough Plastics which would function as an in-ground collection and pre-treatment system is provided in Attachment 5.

Collection facilities would be required at:

- the Charlotte Pass gateway;
- the Thredbo chairlift terminal;
- Guthega Village
- Guthega Power Station.

7.4.4. Manufacture and sale/hire of hard waste containers

A commercial manufacturer of hard waste containers (such as 'poo tubes') or small-scale portable toilets (such as the Alaskan 'Clean Mountain Can') in Australia has not been located. DEC could consider making simple containers from PVC pipe, and making these available to park visitors on a purchase or hire basis. Future extension of DEC involvement could include a return-full cleaning or container swap service. Ideally, cleaning and sterilising would occur in a sealed environment with no possibility of staff contact with waste. It is noted that the United States National Park Service is developing portable toilet cleaning machines in Denali National Park, Alaska.

7.4.5. Visitor feedback

DEC would need to develop mechanisms to receive, record and analyse visitor feedback on the carry-out policy and other aspects of the HWMS (refer section 7.5.3). If carryout products are sold or distributed through DEC, resort outlets or local outdoor shops, a brief survey sheet could be included requesting feedback on the performance of the product, and associated waste collection arrangements. For most value, surveys would be specifically tailored to particular products to assess the performance of product features. The visitor survey used for the New Zealand 'Poo Pot' program is provided in Attachment 4.

7.4.6. Response to improved technology

DEC will need to monitor progress in carry-out technology, particularly in relation to technical issues identified in section 7.7. A significant advancement may warrant review of communications materials and facilitation arrangements. Future advances may include improved waste collection units, improved hard containers with inbuilt seat (portable toilets), improvements in the strength, durability or biodegradability of bag materials and self-serve/staff operated container cleaning/sterilising machines.

7.4.7. Consultation and liaison

DEC will need to liaise with a range of businesses and individuals in order to facilitate the carry-out policy:

- with product manufacturers/suppliers to ensure the reliable and adequate supply of carry-out products, and in the production of publicity material describing carry-out products and their use;
- with shop owners and visitor service providers regarding the storage, sale and publicising of carry-out products, and measures to record sales and feedback, and any subsidy or rebate schemes to encourage take-up. The stocking and sale of non-biodegradable disposable carry-out products should be strongly discouraged;
- with lessees/licensees regarding the placement of waste collection bins.

7.5. Visitor use and impact monitoring

In the Draft Plan of Management for the park (NPWS 2004), monitoring programs form an integral component of park management. The plan contains relevant provisions for monitoring the condition of the environment in Chapters 9, 11 and 15. Environmental and visitor use monitoring also has direct relevance to the research objectives contained in Chapter 14.

Recreation monitoring is provided for in Chapter 8 of the Draft Plan of Management. Relevant actions include:

- periodic monitoring of environmental conditions and social issues at popular camping areas and setting impact thresholds;
- periodic monitoring of the environmental condition of all campsites and huts that are popular with ski tourers (eg damage associated with firewood collection, human waste problems).

The draft Strategy uses monitoring in two ways: to assess the adequacy of existing arrangements, and to assess the performance of the options adopted under the Strategy.

7.5.1. Monitoring the adequacy of existing facilities

The adequacy of existing toilet facilities at some sites requires further assessment during peak use periods:

- Thredbo Chairlift/Eagles Nest (7 pedestals);
- Guthega Power Station (single pedestal);
- Guthega day-use carpark (toilets available during daytime in winter only).

7.5.2. Monitoring the performance of the Strategy

The Strategy adopts a simple 'limits of acceptable change' approach, based on measurable thresholds in environmental conditions. A series of environmental and social standards and indicators has been developed to enable the systematic monitoring of conditions at representative sites in each recreation setting. The site condition standards are benchmarks against which the ongoing effectiveness of the various solutions contained in the Strategy can be assessed.

Management response to standards breaches

If the environmental or social standards are exceeded, a review is triggered to determine the best management response. Potential management responses could include new or improved signage, increased education and communications efforts, use or site restrictions or the introduction of a permit system for backcountry campers. The 1993 Alpine Area Recreation Management Statement (NPWS 1993) provides for a camping permit system for the alpine area, and the Draft Plan of Management (Chapter 8) provides for permit systems for particular recreation activities and places based on impact levels and the results of monitoring programs. A permit system could serve the Strategy by providing interpretation and communication opportunities (refer section 8.1).

Review of existing conditions

Where possible, monitoring should precede management actions to implement other aspects of the Strategy, to provide a baseline for future performance evaluation. In some cases, user

demand assessment and impact monitoring will be needed to determine the need for management actions. The extent and seasonality of human waste deposits around Seamans and Cootapatamba huts should be measured to gauge the effect of the introduction of the carry-out policy. The Guthega secondary gateways would be monitored to determine the need for new toilets. The backcountry campsites should be assessed for their suitability for minimal impact waste burial practices; in particular, depth of excavatable soil and the accessibility of private areas more than 100 metres from water sources should be assessed.

Monitoring methodology, standards and indicators

A methodology for surveying and recording faecal waste deposits around huts and campsites and the impacts of waste on water quality is presented in Kirkpatrick and Bridle (2005). Both buried and unburied waste deposits are likely to be visible in alpine environments, which can retain evidence of soil disturbance for many years (Kirkpatrick pers. obs. in Bridle and Kirkpatrick 2005). The persistence of buried waste evidence means that accuracy is required in recording deposits to avoid double counting. Survey sites could be broken into sectors and particular areas recorded using photopoints.

Tables 7.5.2.1 and 7.5.2.2 list the standards and indicators, with a proposed monitoring regime.

Table 7.5.2.1 Environmental standards and indicators

Setting	Condition indicator	Standard	Monitoring regime
Peripheral gateways	Evidence of waste or washwater spillage or leakage	No evidence of waste or washwater spillage or leakage beyond facility floorspace	Crackenback and Charlotte Pass facilities monitored biannually in winter and summer.
Major tracks and internal nodes	Evidence of waste or washwater spillage or leakage	No evidence of waste or washwater spillage or leakage beyond facility floorspace	Rawson Pass facility monitored biannually in winter and summer.
	Evidence of waste at identified trackside problem sites	No more than 2 waste deposits over both sites	Two nominated trackside sites inspected annually in summer.
Huts	Evidence of waste within 30 metres of hut	No more than 2 waste deposits within inspection zone	Two nominated huts inspected biannually in spring and summer.
Back-country	1. Evidence of waste within 30 metres of informal ski touring camping areas (winter use)	No more than 2 waste deposits within inspection zone	Two nominated informal camping areas inspected annually in spring.
	2. *E. coli* counts in streams at informal bushwalking campsite locations (summer use)	Counts no higher than natural background.	Streams at two nominated informal camping areas sampled annually in summer .
	3. Evidence of spillage or leakage from carryout collection facilities	No evidence of leakage or spillage from collection facility	Carryout collection facility inspected fortnightly, or more frequently according to collection and servicing requirements.

Table 7.5.2.2 Social standards and indicators

Setting	Condition indicator	Standard	Monitoring regime
Peripheral gateways	1. Presence of odour detectable in the vicinity of the toilet facility	No odour detectable more than 10 metres from toilet facility	Crackenback and Charlotte Pass facilities monitored biannually in winter and summer.
	2. Crowding or queuing during peak use periods	No more than 3 visitors queued inside/outside female toilet	Monitored for 30 minutes during peak use period (mornings when visitors arrive), twice each summer and winter school holiday periods.
Major tracks and internal nodes	1. Presence of odour detectable in the vicinity of the toilet facility	No odour detectable more than 10 metres from toilet facility	Rawson Pass facility monitored annually in summer.
	2. Crowding or queuing during peak use periods	No more than 3 visitors queued inside/outside female toilet	Monitored for 30 minutes during peak midday use period, twice each summer school holiday period
	3. Evidence of waste visible from major walking tracks	No waste evidence visible from main walking track	Crackenback – Rawson Pass –Charlotte Pass tracks inspected annually during summer
Huts	1. Odour detectable in the vicinity of the toilet facility	No odour detectable from outside of hut and track access to hut	Two nominated huts inspected biannually in spring and summer.
	2. Evidence of waste visible from hut and access track	No evidence of waste visible within the inspection zone	
Back-country	1. Odour detectable at informal campsites	No odour detectable at informal campsites	all huts inspected biannually in spring and summer
	2. Evidence of waste visible from hut and access track	No evidence of waste visible within the inspection zone	all huts inspected biannually in spring and summer
	3. User acceptance of carryout products	3.1 Waste deposited at appropriate collection facility	Record quantum of waste deposited during peak holiday periods in winter and summer (Perisher and Thredbo bins).
		3.2 Sales of carryout products in the park and nearby outlets	Record and collate sales figures during peak holiday periods in winter and summer

Water quality monitoring

Under the Draft Plan of Management, water quality monitoring results are to be used to inform management decision-making concerning recreational activities, infrastructure development and other uses. The plan proposes to expand water quality monitoring programs to include all watercourses and waterbodies in the park potentially at risk from pollution. The programs would use AUSRIVAS model or other appropriate models and measurements of nutrient levels and other appropriate bacteriological indicators. As part of this monitoring regime, the plan states that the water quality of the five glacial lakes and streams and rivers adjacent to popular campsites on the Main Range would be annually assessed. This program keys neatly with the water quality elements of monitoring the effectiveness of the Strategy.

Water quality monitoring for human waste contamination generally relies on the detection of *E. coli* (*Escherichia coli*), a faecal coliform bacterium which occurs in the gastro-intestinal tract and faeces of warm-blooded animals and humans. Its presence in water is considered indicative of recent faecal contamination. Potential water sampling sites could include both popular winter and summer camping areas, where waste may be deposited close to streams.

Potential monitoring sites

Specific sites will require inspection to determine their suitability for long term monitoring. Ideally, the camping sites to be monitored should:

- be relatively compact;
- be within the Main Range Unit, or used by visitors also using the Main Range Unit, accessing the site from one of the Main Range Unit gateways
- be well used for extended periods during the relevant season;
- be readily accessible when the survey is required;
- display existing waste management problems, in circumstances which could potentially result in contamination of an adjacent watercourse;
- have no other sources of disturbance aside from camping recreation use;
- be representative of user group behaviour over the wider Main Range Unit.

If feasible, the survey sites should include one site predominantly used for summer camping, and one site predominantly used for winter camping. This will help to evaluate the relative effectiveness of the HWMS in terms of the different user groups.

The practicality of complying with minimal impact guidelines at each site should be considered in the assessment of monitoring results.

Track system problem areas will include rock outcrops beside long track sections between toilet facilities, such as the Kosciuszko Walk between Thredbo and Rawson Pass, and the Main Range Track near Blue Lake.

Potential sites for the monitoring of environmental and social conditions are identified below.

Summer/winter camping
Soil Conservation Creek
Pounds Creek
Wilkinsons Creek
Guthega Creek

Track system problem areas
Main Range Track near Blue Lake (possibly near Lake lookout)
Kosciuszko Walk between Crackenback and Rawson Pass

Huts
Cootapatamba Hut (no toilet currently provided)
Seaman's Hut (no toilet currently provided)

Toilet facilities
Crackenback/Eagles Nest toilet
Charlotte Pass toilet
Rawson Pass
Guthega Power Station

Carry-out waste collection bins
Charlotte Pass
Guthega Village
Guthega Power Station
Thredbo

Tour operators have also commented on waste issues on the Dead Horse Gap walking track, to the south of the Main Range Unit. This location is within 2-3 hours of toilets at Thredbo, which is considered an acceptable interval between facilities. An education campaign and publicity associated with the carry-out policy, and track distance markers indicating toilets may adequately address this problem. The site could be visually inspected in spring and summer to

confirm the extent of the problem; if waste deposits are apparent, Bogong Creek/Thredbo River should be included in the water quality monitoring program.

7.5.3. Service records and visitor feedback

Opportunistic records

Management issues arising from the inspection, maintenance and servicing of the facilities should be recorded opportunistically on a reporting sheet and forwarded to nominated staff for collation as the need arises. Similarly, relevant visitor or staff feedback should be recorded and forwarded to nominated staff for collation. Comments and feedback could be recorded on existing reporting forms, or on a special sheet attached to existing forms. These opportunistic records would complement feedback received in response to the visitor surveys provided with carry-out products (refer section 7.4.5).

Issue prompts on the reporting sheet could include:

Servicing and maintenance

- ease, comfort and safety of service operations
- access problems
- any capacity issues (size of receptacle)
- waste accumulation rates per season
- repeated malfunctioning
- repeated misuse/abuse by visitors
- unexpected environmental impacts
- extreme weather effects
- possible improvements

Visitor to staff feedback

- aesthetic and social impacts
- any access problems
- capacity issues (number of pedestals/urinals)
- understanding of policies and information displays
- response to policies/regulation
- response to cases of pollution or facility malfunction
- suggestions for possible improvements, including positive experiences elsewhere.

The recording, analysis and reporting procedures would be undertaken for two years following the introduction of new policies, or installation of new facilities. An analysis of the reports would be undertaken as part of the finalisation of the Strategy (refer section 10).

7.6. Research and development

The Draft Plan of Management Schedule of Required Research (Schedule 7) provides for the support of research into:

- acceptable limits of disturbance [from recreation use] for different environments and activities;
- environmental and social impacts related to visitor facilities and their use, impact thresholds and associated management responses; and
- the number, profiles, distribution, attitudes and expectation of park visitors and other stakeholders.

These matters are of direct relevance to human waste management, and applied research projects could aim to incorporate key waste management issues, such as the impact of waste

and minimal impact practices on soils, vegetation and aquatic ecosystems, and the attitudes and responses of various visitor groups to carry-out methods.

Research and development is also required into the practical aspects of carry-out and alpine waste management technology. DEC could encourage tertiary institutions, research organisations and private companies to develop:

- biodegradable carry-out waste bags or hard container liners which remain stable in use for at least one week, have a shelf life of several years, and breakdown rapidly in composting bins (perhaps with the addition of a digesting enzyme or specialised micro-organisms;
- improvements in specialised two-chamber vault systems for pre-treating biodegradable carry-out waste;
- portable toilets and waste storage containers suitable for bushwalking and ski touring in backcountry areas (like the 'Clean Mountain Can' developed in Alaska);
- cleaning and sterilising facilities located at waste collection sites for 'poo tubes' and similar carry-out equipment;
- improvements in carry-out container/pedestal comfort and effectiveness and suitability for (freezing, high wind) alpine conditions.

8. PUBLIC AWARENESS AND EDUCATION

8.1. Communicating the Strategy

The success of the Strategy hinges on visitor awareness and cooperation. Visitors must be aware of the services and opportunities available, any guidelines or restrictions on behaviour which apply in the Main Range Unit and the reasons for those policies.

Developing a communications element of the Strategy will involve defining communications objectives, assessing existing material and activities against these objectives and developing new communications materials and services as required. Implementation will include media releases, the production and distribution of special leaflets on waste management in the Main Range, and signage and displays at visitor centres, gateway/track nodes and huts.

The Draft Plan of Management requires the preparation of a park-wide Communication Plan, to coordinate communication facilities and activities. The review of existing waste management communications would be linked to this process. New material produced for human waste management purposes would conform to the general objectives, style and standards developed under the Communication Plan.

8.1.1. Communication objectives

In relation to human waste management, communications will aim to:

- inform visitors of the location of toilets and other facilities in and around the Main Range Unit;
- inform visitors of the significance, sensitivity and fragility of the alpine zone;
- provide visitors with an understanding of past and current waste management problems;
- explain the approach to these problems taken by DEC and the resulting services and policies which together form the HWM Strategy.

8.1.2. Inventory and analysis of existing communications

Existing communications would be assessed against the Strategy communications objectives, and in terms of their relevance in light of new facilities, opportunities and policies. Communications assessed in this way would include:

- park information brochures;
- current minimal impact code leaflets, signage and references;
- signage in huts and toilets;
- interpretive information at trackheads, camping and day-use areas, resorts, Jindabyne Visitor Centre, Tourist Information Centres and other venues;
- roadside and trackside directional signage;
- articles and regular items appearing in ‘Kosciuszko Today’, tourist magazines and other publications;
- staff induction and training materials;
- counter and reception staff information and advice resources.

8.1.3. New information, materials and services

A recent survey of alpine campers indicates that most consider that there is little reason to be concerned about human impacts in the alpine zone (Johnston and Growcock 2005). This suggests that current interpretive signage is not effective in communicating the fragility of the alpine zone ecosystems, existing degradation in the area and the past and continuing human causes of this damage.

Content of new communications material

Taken as a whole, new visitor communications material will need to inform visitors of:

- the significance of the alpine zone, the sensitivity of alpine communities to disturbance and the impact of unmanaged waste on the Main Range environment;
- the location of toilet facilities in and around the Main Range (including huts), in the context of walking track maps, key destinations, distances and travel times. This information is best displayed on a map;
- areas where no toilets are provided and why not;
- the carry-out policy for the Main Range, including carry-out methods and related disposal requirements, the availability of carry-out products and the location of waste disposal facilities (toilets and roadside bins).

A distinction would need to be drawn between the special case provisions which apply in the Main Range Unit, and the minimal impact guidelines which apply elsewhere in the park. The combination of factors which make the Main Range worthy of this higher level of protection will need to be identified.

The key message should be:

"All solid human waste should be carried out unless toilets are provided"

Interpretive display boards at gateways to the Main Range and the Visitor Centre could be augmented to provide additional waste management information. Ideally, however, the boards would be designed to support waste management messages, providing background information on alpine values, sensitivity and human impacts. In this way, the actual text relating to waste management facilities and policies may be focused and factual, the case for environmental protection already having been made. All of the information in interpretive media should work together to leave the visitor with a picture of the alpine zone as a precious, fragile place requiring special care and protection.

Making the case

The recent CRC for Sustainable Tourism (Johnston and Growcock 2005) visitor survey suggest that there may be some scepticism among campers in the alpine area of the Main Range regarding the significance of waste impacts. Further, bushwalker websites and discussion forums reveal a range of opinions on appropriate waste management practices. A problem-solution approach is likely to be most successful in communicating the management response to waste issues. The problem needs to be clearly and simply identified, before visitors can be expected to understand and accept management decisions. As far as possible, claims of environmental damage should be supported by illustrations and evidence.

Communications will need to clearly, reasonably and convincingly make the case for better waste management. The negative impacts of current practices will need to be explained, with supporting illustrations and evidence. Recent work undertaken by the University of Tasmania will be particularly useful (refer section 3).

As well as explaining and justifying management actions and policies, public communications must explain decisions not to act in some circumstances. In particular, visitor comments have called for toilets to be provided in the Blue Lake area (Johnston and Growcock 2005). This is not surprising; a significant proportion of visitors leaving Charlotte Pass (14%) visit Blue Lake, a 10 kilometre return trip. Similarly, Cootapatamba Hut experiences overnight use but provides no toilet facilities. The sensitivity of the glacial lake catchments, the problems of accessing these areas for servicing and the undesirability of removing waste using helicopters need to be communicated to visitors.

Selling the message

Publicity material (brochures, signage) could be headed with a simple catchphrase, slogan or header. Perhaps a public or school competition could be used to identify appropriate slogans. Possible examples are included below.

What goes up, must come down	***Spending a penny? Save a mountain***
What goes in, must come out	***What comes out, must come out***
Mind your own business	***Go wild (but not too wild)***
Do your bit (and then take it home)	***It's in the bag***
Keep it clean above the trees	***When the alpine zone is a no-go zone***
When the call of the wild becomes a call of nature	***Don't waste the Main Range***
Don't waste it	***Have bag will travel***
Do the right thing – in the right place	***Feral faeces can kill!***
Do the right thing – bag it	***Backcountry is bag country***
Backcountry is special – lets keep it that way	

Information leaflets

There are opportunities to assist the introduction of the carry-out policy and the wider HWM Strategy with two types of leaflets:

- a leaflet defining the carry-out policy for the Main Range, defining the Main Range Unit boundary, and carry-out options, product availability and waste disposal arrangements, and a map with toilet locations on and around the Main Range. This leaflet will need to be produced in two forms, targeting winter snow-based recreation users and summer bushwalking users.
- a leaflet describing how to make and use a 'poo tube' using PVC pipe.

The leaflets would be distributed via normal outlets; in the first year of introduction supplies of leaflets would be left in Main Range and Whites River corridor huts, resort shop counters/leaflet racks, accommodation reception desks and Tourist Information Centres in Jindabyne, Cooma and elsewhere in the region. 'Poo tube' leaflets would need to be available to visitors before they leave home; supplies could be distributed to outdoor retailers in major towns and cities in the park visitor catchment. A media campaign publicising the HWMS would highlight the new policy as an integral part of the Strategy.

Section 8 of the Draft Plan of Management contains a policy of preparing and distributing minimal impact codes of behaviour for all recreation activities undertaken in the park. The Plan (Chapter 13) also has an objective of involving recreation groups and clubs in the development and publicising of codes of conduct that promote minimal impact recreation where appropriate. In particular, bushwalking and ski-touring organisations would be consulted in the drafting and design of new minimal impact leaflets and signage for the Main Range Unit.

General leaflets and information sheets on the park, alpine areas and the Main Range would also contribute by noting the locations of toilets, the impact of waste and the carry-out policy.

Signage inside huts

There is scope for low key signage inside the huts for orientation and policy information purposes. A map could be provided covering the Main Range, showing toilet locations, distances and travel times, and emphasising the carry-out policy for backcountry areas. Interpretive and safety information could also feature on these maps.

Major gateway / trackhead signage

There may be scope to add an information panel to existing signs at Charlotte Pass and the Thredbo chairlift terminal publicising the location of toilets (with travel times/distances) and the

carry-out policy for backcountry areas. The existing sign at Guthega Power Station carries the current minimal impact code, and will need to be augmented with the special provisions applying in the backcountry areas of the Main Range.

New signage to be installed at Thredbo Chairlift/Eagles Nest, Rawson Pass and Guthega would incorporate toilet locations and the carry-out policy for backcountry areas. At Guthega, signage could be located on the track down to the dam wall, and at the beginning of the main access road to the lodges which is used by people accessing the Main Range via Illawong.

Signage at gateway sites would need to target each of the two main user groups, making it clear that the policy is inclusive of both summer and winter uses, using visual hooks such as photographs of various recreation activities to engage and include visitors. The Draft Plan of Management has an objective of providing minimal impact ski touring and safety advice at villages and trackheads.

Low key instructional signage

Instructional signage will be required to support the carry-out policy. Park toilets in and around the Main Range should have signage noting the carry-out policy, and the suitability of the toilet for the disposal of the various forms of carry-out waste. Pump-out and composting toilets would accept biodegradable waste (biodegradable corn starch and paper-wrapped waste). A simple symbol/logo system could be developed matching biodegradable carry-out products with toilets suitable for disposal. This method could be readily implemented using stickers. The Crackenback toilet will require signage to prevent the disposal of carry-out waste in this facility, advising of locations for correct disposal (such as the Thredbo terminal).

Major walking track distance markers

In response to concerns raised by visitors in the recent CRC for Sustainable Tourism survey (Johnston and Growcock 2005), basic signage indicating distances to and from origins and destinations is proposed for the major walking tracks linking Thredbo (Thredbo Chairlift), Rawson Pass and Charlotte Pass. It is also proposed to include a small toilet symbol beside the locations. These markers could be mounted flat on the side of the track (bolted to the steel mesh boardwalk or to a stone block set into the ground), and placed every kilometre. Being aware of their relative location, and the location of toilet facilities, should help to alleviate anxiety that inexperienced walkers may feel during a walk. An example of possible marker sign content is indicated below, without the toilet symbol:

CP X km →
← RP X km

Camping permit system opportunities

If continuing breaches of environmental or social standards occur at backcountry campsites, a management option is to introduce a permit system for camping in the main range. The 1993 alpine area recreation management statement (NPWS 1993) provides for such a system, and the Draft Plan of Management (Chapter 8) also provides for the introduction of permit systems for particular recreation activities and places based on current impact levels and the results of monitoring programs. Permits issued could be accompanied by advice on camping impacts, toilet locations, carry-out methods, requirements and facilities, suitable camping areas, any restrictions on which apply (such as camping at Cootapatamba Hut), and any health risks from contaminated water sources.

8.2. Publicising the Strategy

The Strategy would be promoted using a range of media, including a feature in the tabloid magazine Kosciuszko Today, regional tourism magazines, local newspapers and local radio and television features. Messages should be clear, concise and unambiguous. Media material should reference scientific work on values and impacts (drawing on the Tasmanian work), and visitor numbers, characteristics and behaviour (drawing on the recent CRC survey). Attention should be drawn to the human health risks from unmanaged waste, using local data and

evidence where available. Tasteful photographs of waste impacts and use intensity (such as crowded walking tracks) should be used to support publicity material.

The management response should be described as an integrated strategy, adapted to each recreation setting in the Main Range. The carry-out policy may be the most controversial element among backcountry users; the case will need to be convincing. Other concerns revealed by the CRC survey include the lack of toilets at Blue Lake – this should be acknowledged as an issue and the costs of alternative actions (helicopter use, disturbance) explained.

Recreation user groups (including bushwalking and ski touring clubs) and resort retailers and service providers could be targeted with a mailout of publicity information. DEC could produce articles in a range of commercial outdoor and NGO and club magazines that are read by backcountry users. Contacts for club magazines may be available from peak bushwalking associations. Organised tour companies could assist with publicising the policy among their clientele. The leaflet on waste management facilities and policies in the Main Range should be launched as part of the publicity campaign. A further leaflet on the construction and use of 'poo tubes' and possibly other carry-out methods could also be made available.

A key contextual message in publicity material would be that the Strategy is a way forward, rather than an end point - waste management will continue to evolve as fresh ideas emerge, knowledge accumulates and technology develops.

9. IMPLEMENTATION PRIORITIES AND TIMEFRAME

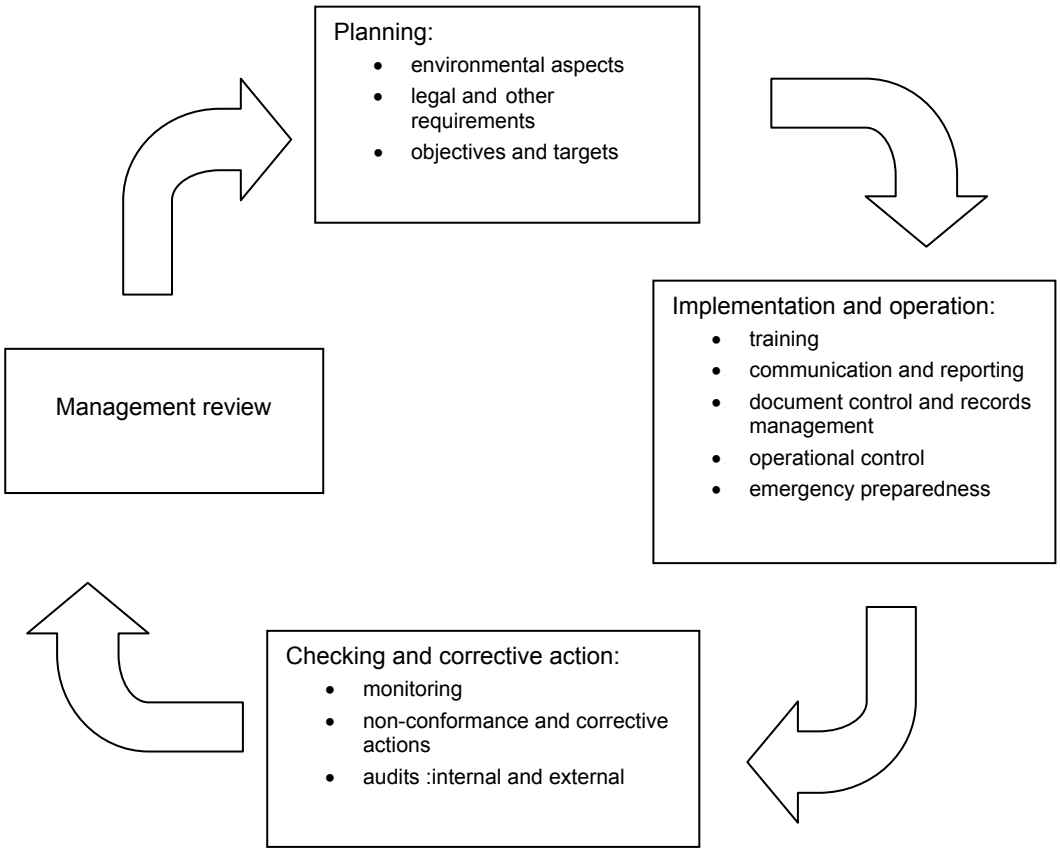
Location	Task	Strategy section	Priority	Timeframe (yrs)
Grandstand sites				
Thredbo Chairlift	Monitor performance of existing toilet facility	7.5.1	**Moderate**	**1-3**
	Liaise with KT and Eagles Nest regarding improved toilet signage and interpretive signage	7.2	**High**	**1**
	Install interpretive signage indicating toilet/waste collection locations and carry-out policy	6.2, 8.1.3	**High**	**3**
Charlotte Pass	Resolve pumping and odour issues in existing facility	7.5.1	**High**	**2**
	Review existing signage, augment/replace as required with signage indicating toilet/waste collection locations and carry-out policy	6.2, 8.1.3	**High**	**1**
	Monitor ability of toilet to cope with biodegradable carry-out waste.	7.4.3	**Moderate**	**1+**
Secondary gateway nodes				
Guthega Power Station	Monitor visitor use and demand at the site.	7.5.1	**Moderate**	**1-3**
	Install new signage showing toilet location(s)	8.1.3	**High**	**1**
Guthega Resort day-use carpark	Liaise with PBL to improve external signage indicating presence and public availability of toilets in chairlift terminal during winter, and installation of interpretive signage.	7.2	**High**	**1**
	Install interpretive signage indicating toilet/waste collection locations and carry-out policy	8.1.3	**High**	**3**
	Monitor visitor use in summer. If numbers warrant, install a stand alone 2 chamber vault toilet at the site capable of accepting biodegradable carry-out waste	7.5.1	**Low**	**3-5**
Crackenback-Charlotte Pass walking track system				
Rawson Pass	Install a permanent all-season toilet, pump-out system, compatible with natural, cultural and visual values of site	6.2	**High**	**2**
	Install interpretive signage indicating toilet/waste collection locations and carry-out policy	8.1.3	**High**	**3**
Huts				
All huts	Replace existing minimal impact code signage and leaflets with revised code.	8..1.3	**High**	**1**
	As existing toilets are replaced or upgraded, consider the option of installation of two-chamber vaults capable of accepting biodegradable carry-out waste.	7.4.3	**Low**	**10+**
Seaman's Hut	Permanent all-season toilet, pump-out system, compatible with heritage values of hut, and capable of servicing with light vehicle when Kosciuszko Road is rehabilitated.	6.2	**High**	**2**
Cootapatamba Hut	Undertake an initial human health risk assessment of local water courses	6.3.3, 7.4.1	**High**	**1**
	Monitor to determine the extent of the unmanaged waste problem and the impact of the Strategy over a two year period following introduction. If thresholds exceeded, options include the use of health warning signs, stronger discouragement of recreational overnight use, introduction of camper permit system or provide toilets.	6.2, 7.5.2	**High**	**1-5**
Whites River corridor	Maintain existing vault systems. Any renovation or new works should harmonise with hut	6.2	**Moderate**	**1+**

Location	Task	Strategy section	Priority	Timeframe (yrs)
- Horse Camp Hut - Whites River Hut - Schlink	architecture and materials.			
Illawong Lodge	Hut to be managed primarily for cultural heritage values, with increased/improved public access. On expiry of licence, maintain existing toilet. Install appropriate signage.	6.2, section 8	**Low**	**4**
	Assess performance and impact of absorption trench septic system.	6.2	**Low**	**5**
Backcountry				
Policy	Introduce the carry-out policy requiring carry-out from the Main Range Management Unit.	6.3.3	**High**	**2**
Campsite assessments	Undertake an initial human health risk assessment of local water sources at campsites which may be contaminated by faecal waste. Consider installing warning signage or closing campsites if health risks are high.	6.3.3, 7.4.1	**High**	**1**
	Assess campsites for their ability to accommodate minimal impact guidelines (soil depth, access to areas more than 100 metres from waterbodies)	6.3.3, 7.4.1	**High**	**1**
Monitoring	Select monitoring sites and commence monitoring standards. If thresholds exceeded, options include the use of health warning signs, introduction of camper permit system, providing toilets (refer Attachment 5), or closing site.	7.5.2	**High**	**1+**
General				
Liaison and consultation	Liaise with carry-out product suppliers regarding supply, publicity, use of disposal symbols and user survey sheets	7.4.6	**High**	**2**
	Liaise with carry-out product sellers regarding sources, user surveys, publicity, disposal information, survey sheets, storage requirements, discourage stocking and sale of non-biodegradable disposable carry-out products	7.4.6	**High**	**2**
Facilitation	Undertake field tests of available carry-out products, including 'Biobags' to determine longevity and performance under Main Range conditions in summer and winter.	6.3.4, 7.4.2	**High**	**1**
	Review systems to collect and carry-out waste.	7.4.3	**High**	**1**
	Develop simple symbol system to match biodegradable carry-out waste products with appropriate toilet facilities. Could implement using stickers.	8.1.3	**Moderate**	**3**
	Examine the potential of DEC manufacture and supply of PVC 'poo tubes', for either sale or hire.	7.4.2	**Low**	**5**
Environmental management	Develop an Environmental Management System for the inspection, maintenance and servicing of toilet and waste collection facilities	7.3	**High**	**1+**
Monitoring	Select environmental and social monitoring sites and commence monitoring program.	7.5.2	**High**	**1**
	Review existing conditions at monitoring sites, all backcountry campsites, the Guthega secondary gateway sites and Cootapatamba Hut.	7.5.2	**High**	**1**
	Develop simple visitor survey to accompany carry-out products	7.4.3, 7.5.3	**Moderate**	**3**

Location	Task		Strategy section	Priority	Timeframe (yrs)
	Develop service staff and visitor to staff feedback recording mechanism		7.5.3	**Low**	**2**
Research and development	Approach tertiary institutions and research organisations advising of the need for applied research and development in areas of alpine waste management		7.6	**Moderate**	**1-2**
Communications	Review existing communications materials		8.1.2	**High**	**1**
	Produce and apply new communications materials	carry-out policy leaflets	8.1.3	**High**	**1**
		'poo tube' leaflets	8.1.3	**Moderate**	**2-3**
		gateway interpretive signage	8.1.3	**High**	**1**
		hut interpretive signage	8.1.3	**High**	**1**
Publicity	Publicise the Strategy		8.1.4	**High**	**1-2**
	Liaise with shop proprietors and service providers regarding leaflets, posters and other Strategy publicity material		7.2, 8.1.4	**High**	**1-2**

10. STRATEGY REVIEW AND EVALUATION

The Kosciuszko National Park Main Range Human Waste Management Strategy requires periodic review and evaluation and can be integrated with an Environmental Management System (EMS). An EMS can be developed and designed in accordance with the international standard for environmental management ISO 14001 and the Australian/New Zealand standard AS/NZS ISO 14001:2004, which is based on the philosophy of 'continuous improvement'. There are four stages of the management cycle – planning, implementation and operation, checking and corrective action, and management review. These stages can be presented in the form below.



It is recommended that the Main Range Human Waste Management Strategy be reviewed and evaluated on a 3 year basis. The review period should commence following the establishment of new infrastructure and the introduction of the carry-out policy, scheduled for 2 years into the Strategy implementation period.

It is important that the following procedures are implemented to ensure an effective review and evaluation;

Review Cycle
The review cycle will include;

- The extent to which objective and targets have been met (Chapter 4).
- Status of corrective and preventative actions
- Follow-up actions from previous reviews
- Changing circumstances from legal requirements or other aspects

- Recommendations for improvement
- Communication from external parties and complaints (Feedback)
- Overall performance
- Results of any internal review

Reporting mechanism
A procedure shall be established for reporting of all aspects of the human waste management strategy. This procedure shall allow for information and feedback from general public, staff and management of the issues relating to human waste in the Main Range Unit. This procedure requires documented reports and meetings and the establishment of roles and responsibilities for human waste management.

Monitoring
DEC would establish, implement and maintain a procedure to monitor and measure, on a regular basis, the key characteristics of the human waste strategy (Chapter 7). The procedure and information shall be documented with all measurements and monitoring according to verified or calibrated equipment and procedures.

Monitoring needs to include;

- Visitor numbers
- Visitor destinations
- Visitor length of stay
- Visitor patterns and use of toilet infrastructure
- Current effluent quantities and locations, including seasonal
- Current visual and social impacts of non-toilet use in the Main Range Unit
- Locations of non-toilet use in the main range
- Reasons for non-toilet use in the main range

Feedback
This human waste management strategy relies on effective feedback from DEC staff, visitors and interested external parties. Therefore a procedure shall be established where feedback and responses to feedback can be documented as outlined in the reporting mechanism above and detailed in Chapter 7.

Timeframe
A definite timeframe needs to be established to allow for;

- The development of priorities and their implementation
- Monitoring and measurement of key characteristics
- Training
- Budgeting
- A continuous review of performance against objective and targets

Evaluation
The human waste management strategy should be evaluated against the best practice criteria and strategy objectives from section 4 in this report.

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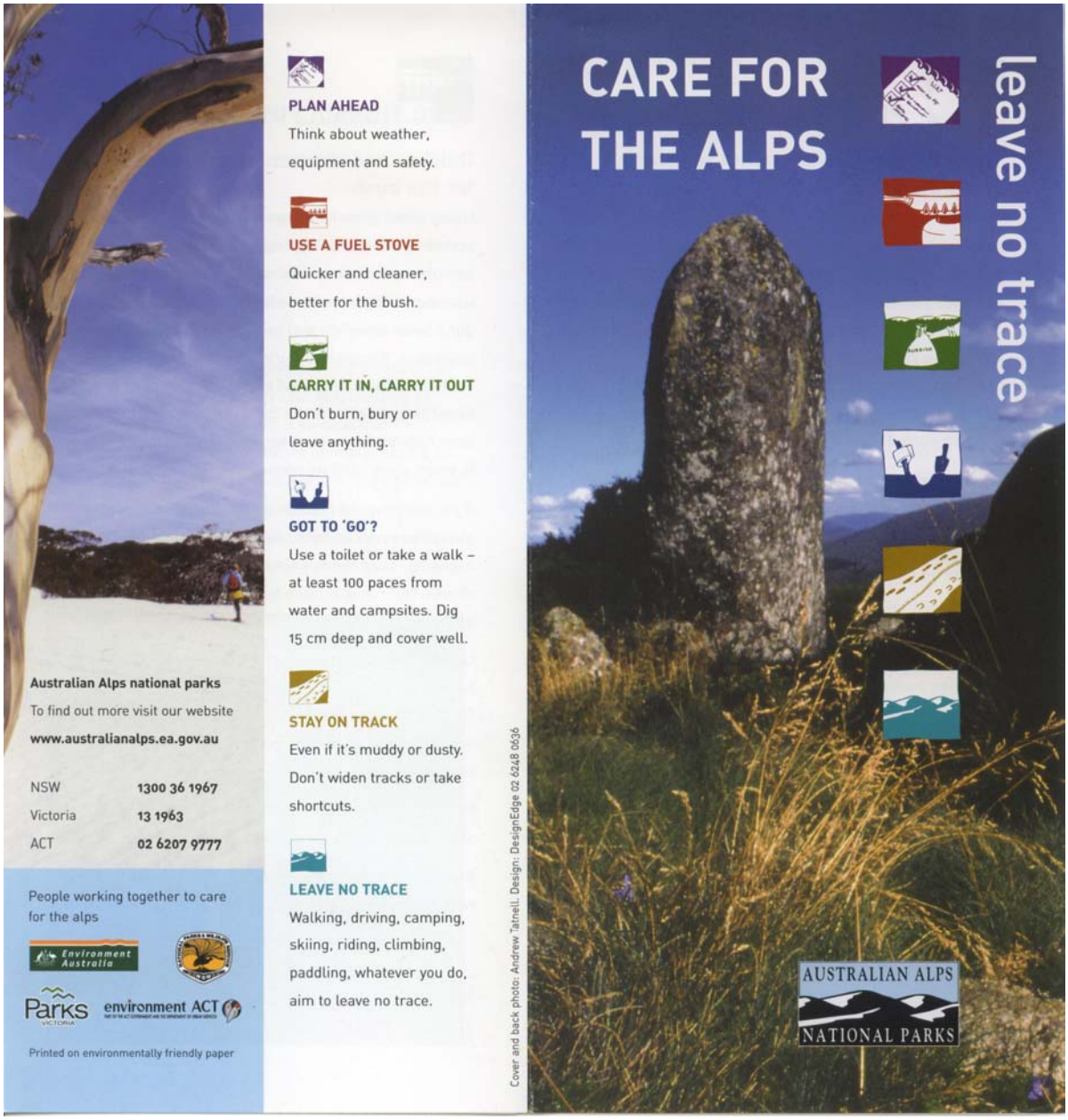
ATTACHMENT 1

Australian Alps Liaison Committee Minimal Impact Code – Leave No Trace


Australian Alps national parks
To find out more visit our website
www.australianalps.ea.gov.au
NSW 1300 36 1967
Victoria 13 1963
ACT 02 6207 9777
People working together to care for the alps
Environment Australia
Parks VICTORIA
environment ACT
Printed on environmentally friendly paper
PLAN AHEAD
Think about weather, equipment and safety.
USE A FUEL STOVE
Quicker and cleaner, better for the bush.
CARRY IT IN, CARRY IT OUT
Don't burn, bury or leave anything.
GOT TO 'GO'?
Use a toilet or take a walk – at least 100 paces from water and campsites. Dig 15 cm deep and cover well.
STAY ON TRACK
Even if it's muddy or dusty. Don't widen tracks or take shortcuts.
LEAVE NO TRACE
Walking, driving, camping, skiing, riding, climbing, paddling, whatever you do, aim to leave no trace.
Cover and back photo: Andrew Tatnell. Design: DesignEdge 02 6248 0636
CARE FOR THE ALPS
leave no trace
AUSTRALIAN ALPS
NATIONAL PARKS

PLAN AHEAD

Think before your trip about weather, equipment and safety

Planning can make all the difference. Make sure you'll be safe and comfortable throughout your trip, by knowing where you're going, what you need to take and what you need to do. At all times of year, having warm, waterproof clothing means that you're prepared for sudden changes in conditions. If staying out overnight, a good tent and sleeping bag will keep you safe and comfortable and you won't have to depend on fires for warmth.

Don't travel alone, but be aware that large groups have more impacts on the environment. If you're planning to travel in a large group, contact the park office.

If you're going into remote areas ensure you have a map and compass as well as good map reading and navigation skills. A Global Positioning System (GPS) may be a useful tool and Emergency Position Indicating Radio Beacons (EPIRBs) may be available in some areas, check with local parks offices. Always tell family or friends where you are going and when you will return.

Esther Beaton

USE A FUEL STOVE

Quicker and cleaner for you, better for the bush

Using a fuel stove is always the best option, and sometimes the only legal option. Compared to campfires, fuel stoves are much quicker and easier to use, especially in wet weather. They cook faster and don't leave unsightly and long-lasting scars on the landscape. Escaped campfires have led to disastrous bushfires. Collecting wood and fallen branches or twigs disturbs and destroys the local plants, animals and their habitat. In alpine areas where the growing season is short, such habitats recover very slowly, if at all.

If you must light a fire use an established fireplace, always be very careful to safeguard against the fire escaping. Keep the fire small and don't ring it with stones. (All rocks provide habitat and river rocks can explode!)

Use as little wood as possible – remember it provides homes for many of the Alps' tiny plants and animals. Be absolutely sure the fire is out before you leave. Use water, not soil, to put out your fire and always check that the ground beneath the coals is completely cold.

Remember to place your stove or hot pots on hard surfaces, as plants can be damaged by the heat.

Always check for local regulations and current fire restrictions.

CARRY IT IN, CARRY IT OUT

Whatever it is, don't burn, bury or leave anything

Many kinds of rubbish can be created during a trip, like food scraps, empty cans and packets, used matches, plastic bread ties, sanitary pads, tampons, condoms, cigarette butts. So please be sure that none of it ends up as litter.

Most rubbish does not decompose, even if it's buried or burnt. Instead it just stays where it's left, creating an eyesore and a mess. Worse still, it washes into watercourses and pollutes them, or animals may try to eat it and harm themselves. So always do the right thing and carry rubbish bags with you to take out everything that you bring in. And if you really care, be prepared to collect any litter that you see during your trip.

Esther Beaton

GOT TO 'GO'?

Use a toilet or take a walk – at least 100 paces from water and campsites. Dig 15 cm deep and cover well.

With so many people now visiting the Alps – and the potential for spread of infectious diseases (such as giardiasis and hepatitis A) – the management of human waste is a serious issue.

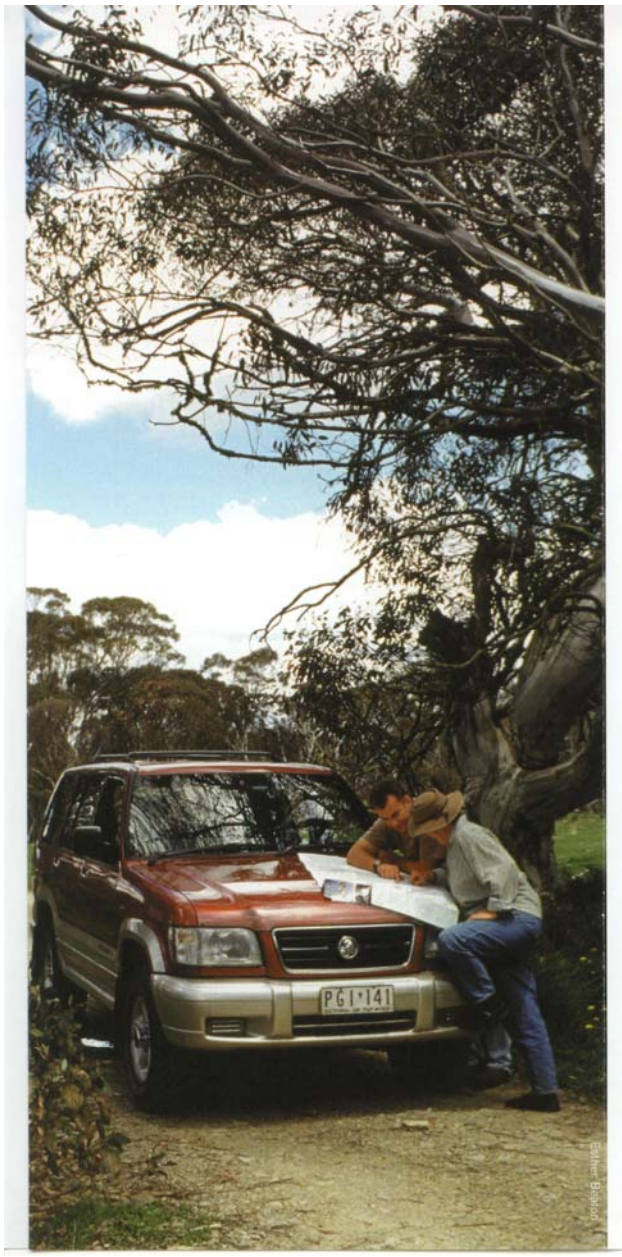
If faeces, urine or toilet paper gets into the water supply, or are uncovered by animals, the results are very unsightly and potentially very dangerous for both people and animals. Carelessness upstream could affect you downstream!

So if there is a nearby toilet please find and use it.

But where there are no toilets, please take care and carry a trowel! Walk at least 100 paces away from creeks, lakes, campsites and tracks, dig a hole as deep as your trowel/hand (about 15 cm) then bury your waste, and the toilet paper, very carefully.

Please take care when washing yourself or your belongings. Detergents, toothpaste and soap (even biodegradable ones) harm fish and water-life. Instead of washing in creeks or lakes use a container well away from the water. When finished, spread the washing water around far away from the creeks or lakes so that it can filter through the soil before returning to the stream.

When washing dishes, be especially careful that food scraps don't get into watercourses. Some people use hot water, gritty sand and a scourer instead of soap to clean billies and dishes.



STAY ON TRACK

Even if it's muddy or dusty, don't widen tracks or take shortcuts

Whether walking, riding or driving, follow formed tracks, even if they are muddy or dusty. Please don't be tempted to cut corners or travel right on the edges. This makes the tracks wider and increases the impact on the bush. Shortcuts can cause erosion, especially on steep zigzag paths, and eventually may confuse people as to which is the real path.

Where there isn't a track groups should spread out so that people don't walk in exactly the same places. Many plants can survive being stepped on just once, but are destroyed if trampled by several feet. It's even better to stay on rocks and hard ground wherever possible and avoid fragile vegetation, like sphagnum moss and cushion plants.

Cyclists and riders should always check local regulations.

LEAVE NO TRACE

Walking, driving, camping, skiing, riding, climbing, paddling, whatever you do, aim to leave no trace

No matter what kind of activities you enjoy in the Alps, you can minimise the impacts you have on the environment by following the simple guidelines described here. Challenge yourself to leave as little trace of your visit as possible.

It's all about caring for the Alps now, so that they'll be just as wonderful in the future.

ATTACHMENT 2

Risk Assessment Framework

1 RISK ASSESSMENT FRAMEWORK

1.1 General

Identifying sources of risk and areas of impact provides for a framework for risk identification and analysis.

Sources of Risk

Sources of risk include:

- Commercial and legal relationships
- Economic circumstances
- Human behaviour
- Natural events
- Political circumstances
- Technology and technical issues
- Management activities and controls
- Individual activities

Area of Impact

Risk analysis may concentrate on impacts in one area only or on several areas of impact. Areas of impact may include:

- Asset and resource base
- Revenue and entitlements
- Costs
- People
- Community
- Performance
- Timing and schedule
- Environment
- Intangibles such as reputation, quality of life
- Organisational behaviour

One way of summarising the way in which risk arises in an organisation is by using a risk identification template as shown in Table RA1 to RA2.

Level	Descriptor	Example of Detailed Description
1	Insignificant	No injuries
2	Minor	First aid treatment
3	Moderate	Medical treatment required
4	Major	Extensive injuries
5	Catastrophic	Death

Table RA1: Qualitative measures of consequence or impact.

Level	Descriptor	Description
A	Almost Certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur at some time
D	Unlikely	Could occur at some time
E	Rare	May occur only in exceptional circumstances

Table RA2: Qualitative measures of likelihood

Classifications of risk

Risk analysis requires the classification of risk according to hazard or risk exposures. They may include:

- Disease
- Economic
- Environmental
- Financial
- Human
- Natural hazards
- OH&S
- Product liability
- Professional liability
- Property damage
- Public liability

- Security
- technological

1.2 Example Environmental Risk Assessment

The system used to identify the level of risk associated with an activity is detailed in Table RA3. It is based on an assessment of the likelihood and significance of impacts with significant impacts considered to be all those impacts rated above medium.

The risk assessment is applied to each environmental issue, and is based on an assessment of risk of the activity having a high environmental impact following implementation of proposed safeguards identified as part of the environmental management. This method of approach aims to ensure that risk of the development having a high environmental impact is maintained where possible to a low level, and not exceed a medium level of risk.

Table RA3 Risk Assessment Model

Likelihood	Significance				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	Medium	High	Extreme	Extreme	Extreme
Likely	Medium	Medium	High	Extreme	Extreme
Moderate	Low	Medium	High	Extreme	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Low	Low	Medium	High	High

A ***Risk Assessment*** would fully analyse all aspects of the activity. This risk assessment would lead to regulatory instructions and an advisory pamphlet to ensure all users and operators are fully aware of the minimum requirements and safety issues.

Source: Based on the Australian standard AS/NZS 4360:1999 Risk Management.

ATTACHMENT 3

Incineration option

Incineration provider;

SteriCorp is a public listed company on the ASX that specializes in the collection and disposal of the clinical and related waste stream. They work closely with OH&S and EPA standards to improve the handling of this prescribed waste stream. SteriCorp is the major provider of collection and processing services for the Australian regulated medical waste market.

Contact details:

Tel: Christine (02) 87378538
Mail: Stericorp PO Box 6585, Silverwater, NSW DC 1811
Website: http://www.stericorp.com/irm/content/home.aspx

Incineration
Incineration is by far the most widely used technology for the disposal of medical waste, accounting for greater than 70%. Incineration burns the waste at elevated temperatures reducing the material to ash. Incineration may occur at either the Sydney or ACT Stericorp incinerators.

Contract
A 12 month contract is required. Includes pick up of bin and replacement with a clean bin and liner.

Bin sizes and approximate costs per pick up

120 litre - $55
240 litre - $70
660 litre - $140

Pick up times and frequency

Fortnightly pick up by a medium sized truck from Jindabyne, some flexibility in bin location.
Pick up time is 4 am.

Bin

The Stericorp bin is yellow with a yellow liner (slightly fragrant) and locked for OH&S and human safety reasons.

ATTACHMENT 4

Examples of carry-out container systems operating overseas

Alaska's Clean Mountain Can

New Zealands Poo Pot

Alaska's Clean Mountain Can

Source: www.nps.gov/dena/home/mountaineering/cmc.htm

A Park Service climbing ranger gives climbers an overview of the clean mountain cans. NPS Photo

CMC HISTORY AND SPECIFICATIONS

Leave No Trace mountaineering on Mt. McKinley has evolved over the past thirty years. Since the late 1970's, a pack in - pack out policy has been successfully enforced, with climbers removing all their garbage from the Alaska Range. Today our main focus takes this program one step further with the removal of human waste. The Clean Mountain Can (CMC) was conceived by Ranger Roger Robinson and the other Denali mountaineering staff for use in the rugged environment on Denali. In 2000, a 24-day ranger patrol led by Ranger Robinson proved it was possible to remove their human waste completely from the mountain using commercially designed river toilet boxes. The ranger staff then worked with the manufacturer of this toilet to create a smaller, lighter version. Through a grant from the American Alpine Club (AAC), 50 of these toilets were made and used voluntarily by climbers in 2001. This wider trial ensured it was feasible for the average climber to remove their human waste from the mountain. (See Denali National Parks 2000 and 2001 Annual Mountaineering Summaries for more information on these trials). The rangers continued to work with the same manufacturer to enhance the can, then through grants from the Access Fund and the AAC, 220 of these newly designed Clean Mountain Cans were purchased for a large scale trial. Over 500 climbers used the CMCs, successfully removing their human waste from the polluted 17,200-foot high camp. Due to this success, beginning in 2003, Denali National Park & Preserve will require that all human waste be removed from the high camp on Mt. McKinley. Use of the CMC will remain voluntary at other glacier fly-in basecamp operations at this point in time.
Since its inception, the staff has worked closely with Paul Becker, owner of Geo Toilet Systems, on design developments to create the CMC. As far as we know, no other container designed for human waste exists in this size, weight, or strength. The Clean Mountain Can (CMC) is designed to hold 1.86 gallons of human waste and has a U.S. Department of Transportation approved two-way vent to release gases through the screw down lid. The #2 polyethylene container is cylindrical in shape, measuring 11.75 inches tall and 8.2 inches in diameter. The can is sturdy enough to be sat on when in use, and the unit comes with a disposable foam ring that works as a seat. In five testing

trials, a CMC was filled three-quarters full with solid ice and dropped four feet onto concrete at an outdoor temperature of zero degrees Fahrenheit. The CMC is designed to have its contents dumped directly out and then rinsed for final cleaning. The durable CMC comes with a harness system that can lock the lid down and is sturdy enough to strap on a pack or sled. The CMC capacity is 10 to 14 uses (approximately one-half pound per use) depending on whether toilet paper is placed in the can.
If you have specific questions on Denali National Parks Clean Mountain Can program, please contact Ranger Roger Robinson at (907) 733-9108.
For more information on the Clean Mountain Can product contact the manufacturer Paul Becker.
Paul Becker
GTS, Inc
4037 E. English
Wichita, KS. 67218
(316) 682 4037
PABECKER@AOL.COM

Currently the CMCs are cleaned by a septic pumping company which is very labor intensive. Our future plans are to install a Scat Machine in Talkeetna, which would specifically be designed to clean CMCs. The Scat Machine could be coined operated, allowing climbers to clean their own cans. For more information on the Scat Machine contact Cindy Witzel.
Cindy Witzel
Frenchglen Blacksmiths
39269 Hwy 205
Frenchglen, OR 97736
541-495-2315

The following is an extract from the Denali National Park & Preserve Annual Mountaineering Summary-2004

CLEAN MOUNTAIN CAN PROGRAM UPDATE

The demand for Clean Mountain Cans was astonishingly high this season, with our entire stock of 500 cans in use all over the range at a single time. This season cans were distributed at Kahiltna Basecamp for the West Buttress and at the Talkeetna Ranger Station for cans used in other parts of the Range. Our main push was to have everyone using the CMC at high camp. Unfortunately, we found that some groups did not pack their CMCs all the way up, but instead cached them along the route. To remedy this, we will go back to providing them at the 14,200 foot camp for their use up high.

Overall, the program has evolved to a new level --- the newness has worn off and the removal of waste has become the standard. Here is a statement from RMI mountain guide Dave Hahn who traditionally guides on Denali in July, after our ranger camps are removed.

"My teams of these past two years have had the slightly unique experience of taking all of their solid waste off the mountain in Clean Mountain Cans. I know that many others use them, but they have access to the "throne" at 14,000 feet whereas my teams don't. I've been interested to find that it is quite easy to accomplish taking it ALL off the hill. Last year, my team of thirteen climbers (nine clients and four guides) took 24 days on the mountain and filled 13 cans. This year, the same sized team used about 13 for twenty days. There is a little variation, but I'll go by the rule of taking one per person on the team, plus a couple of extra just in case. We set one can up at each camp as the group latrine, rather than having each individual use their own can on each day. I have found the CMC's to be quite easy to work with and have not experienced any troubles with leakage."

Our ranger presence at high camp does keep most folks honest with using their CMC's and removing all their trash. One particularly rough storm in June found some climbers leaving a mess in the area, but our diligence and the cooperation of most climbers have kept the upper mountain from backsliding to its former condition.

As we look to the future we are currently working with the CMC manufacturer on a slightly different design that will streamline cleaning and eliminate the foam rings. We are also looking at installing a SCAT Machine in Talkeetna, enabling local cleaning and a more rapid turnaround time.

New Zealands Poo Pot

The Department of Conservation, New Zealand have voluntarily introduced 'poo pots' for Mt Cook National Park (where there is snow over 2000m) for backcountry walkers/skiers. The system was introduced in September 2004. A copy of their current manual is provided below.

The system is as follows;

People sign in for hiking/skiing/climbing trips at the Mt Cook National Park office; at signing in they are introduced to the problem of human waste and to the poo pot system. There are also signs throughout the hut, camp and track system (generally they use fly in/out drums based at huts and main camp sites).

Each person is given a jar (Screw top lid, about 125mm high and 85 mm round – holds about 750 ml) with multiple starch bags (corn starch) free of charge. On the mountain they collect their faeces in the bag and place it in the liner of the jar. When they come down from the mountain and sign out at the base camp office they deposit the jar in a wheelie bin. The rangers on a weekly basis take the wheelie bin to their sewerage treatment plant (STP) and open each jar and empty contents straight into the oxidation tank of the STP (following OH&S and Human safety procedures – ie. Gloves, glasses, overhauls) and clean the jar.

Numbers: 30-40 jars out at any one time in winter and 50-150 at any one time in summer.

The poo pot system is being reviewed and there are plans to make improvements to the system over winter, there is also research being done into waste in the park.

Contact;

Erik van der Spek
Tel: 0011 64 3435 1178
Email: evanderspek@doc.govt.nz
New Zealand
Department of Conservation
Mt Cook National Park

Fact Sheet
August 2004

Human Waste Removal from Aoraki/Mt Cook National Park

Aoraki/Mount Cook National Park and the Topuni area

Aoraki/Mount Cook National Park is set in the heart of the Southern Alps and is part of the Te Waipounamu World Heritage Area. Aoraki the mountain has spiritual significance for Ngai Tahu who consider it sacred, and in 1998 a Topuni region was created surrounding Aoraki/Mount Cook. Depositing human waste within the Topuni area is therefore considered insensitive. .

Are there not toilets in the Park?

There are toilet systems at each major hut in the Park, and in public shelters and campgrounds. However because of the nature of the Park and the different recreational activities within it, faecal waste management is needed at some locations such as the Linda Glacier and on some of the longer climbing routes. Also in winter some of the toilets located at huts may be unusable as they get buried by snow. Some high use areas such as Sefton Bivvy, Ball Pass and Twin Stream do not have any toilets at all. Unmanaged faecal waste is unattractive, carries health risks, and in our cold environment often does not break down, but freezes to remain for a long time in certain areas. There is often very little soil to bury matter in, and if buried in the snow, will be exposed when the snow melts.

Pack in your food – pack out your faeces!

This summer, Park staff are trialling a "Poo Pots in the Park" scheme. The trial scheme is using bio-degradable corn starch bags inside a solid, robust pot with a screw lid. Climbers who sign into the intentions system will be asked to take part in the trial, test the pots and the system and fill out an evaluation form once they sign out.

Where do I empty my pot?

Faecal waste wrapped in the cornstarch bags, can be emptied at a hut toilet or in the effluent drum located outside the Visitor Centre in the Aoraki/Mount Cook Village. The pots are to be left at the effluent station, and will be recycled.

Is this new for New Zealand?

This system has not been trialled in National Parks before, but the caving fraternity in New Zealand have been practising carrying out all human waste for many years. The system is used overseas in parks like Denalli in America, and is used extensively by everyone venturing out into the field in Antarctica.

How do I use the pot?

Turn over the page for step-by-step instructions on how to use the "Poo Pot".

Department of Conservation
Te Papa Atawhai

Easy guide to Poo Pot usage!

Step One.

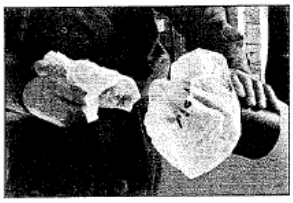
- Select a suitable size of pot. A range is available to trial.
- You will be given a number of starch bags depending on how long the trip is for.
- A zip-lok bag is provided to store these in.

Step Two.

- Put a starch bag into the pot as a liner.

Step Three.

- Lay a starch bag flat on the ground.
- Deposit faeces into middle of flat corn starch bag.
- Put any toilet paper used with this.

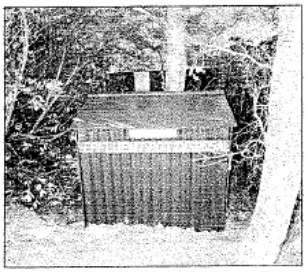


Step Four.

- Wrap up contents into a bundle
- Put wrapped bundle into pot, inside liner.

Step Five

- Seal pot with screw-on lid.



Step Six.

- At the end of your trip, empty starch bags into either a hut toilet, or into the yellow effluent drum housed outside the Aoraki/Mount Cook National Park Visitor Centre.
- Put the poo pot into the green drum.
- Fill out your evaluation form.

Thank you for your efforts and participation.

Evaluation Forms

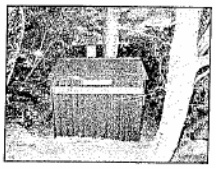
These will be issued to all participants in the trial. Filling these out will provide Park Staff with a valuable insight on the viability of the system, and any potential problems.

Evaluation Form
August 2004

Human Waste Removal from Aoraki/Mt Cook National Park Evaluation Form

Thank you for taking the time to fill out this questionnaire.

Your comments are appreciated.



Feel free to use the back of this form if you need more room

Now a few facts about yourself

1. Where did you venture to in Aoraki/Mount Cook National Park?

2. How many days and nights were you away? Days: ☐ Nights: ☐

3. What size poo pot did you use?

☐ 1ltr ☐ 1.25ltr ☐ 2ltr ☐ 3ltr ☐ 5ltr

4. Was the volume enough? Yes: ☐ No: ☐
   If no, what size would have been better?

5. What did you like about the system you used?

6. What did you dislike about the system?

7. Where did you deposit your faecal waste once out of the mountains?

8. What did you think of the Effluent Disposal Unit at the Visitor Centre?

9. How easy was it to extract the waste from the poo pot?

Very Easy: ☐ Not that easy: ☐ Difficult: ☐

10. How do you feel about DOC's pack-it-in pack-it-out policy on faecal matter?

11. What other problems did you encounter?

12. Any final comments?

Age: 0-20: ☐ 20-30: ☐ 30-40: ☐ 40+: ☐

Gender: Male: ☐ Female: ☐

Nationality:

Department of Conservation
Te Papa Atawhai

ATTACHMENT 5

Some Alternative Products Available;

-Gough Plastics: carry-out waste collection facilities and 'dehydrator' toilet
-Enviro-options Australia: Enviro Loo(evaporation/dehydration system)

Gough Plastics

Gough Plastics are a supplier of polyethylene plastic tanks for storage and transport, they also make tanks to suit industrial, commercial and private needs including toilet systems and tanks suitable for composting and other uses.

Contact details:

Office Address:
833 Ingham Road, Bohle, Townsville,
Queensland 4817 AUSTRALIA
Postal Address:
PO Box 7570, Garbutt BC
Queensland 4814 AUSTRALIA
Phone: +61 7 4774 7606
Freecall: 1800 069 805 (within Australia only)
Facsimile: +61 7 4774 7608
E-mail: sales@gough.com.au
Web: www.**gough**.com.au

Suggested Options

Option 1. This is for a site that requires combined disposal for a site to receive human waste directly into the vault and then also receive the Wag Bag product as well. Basic thought was to open one side for a period with the other locked. Once a level is reached shut down the full side and then operate on the other. Digestion and breakdown to occur over at least a year (yet to be determined) and then removed by waste contractor. Repeat the cycle and so on. Addition of Bacteria products that we use in Hybrids on a regular basis will assist digestion. Please see drawings below.

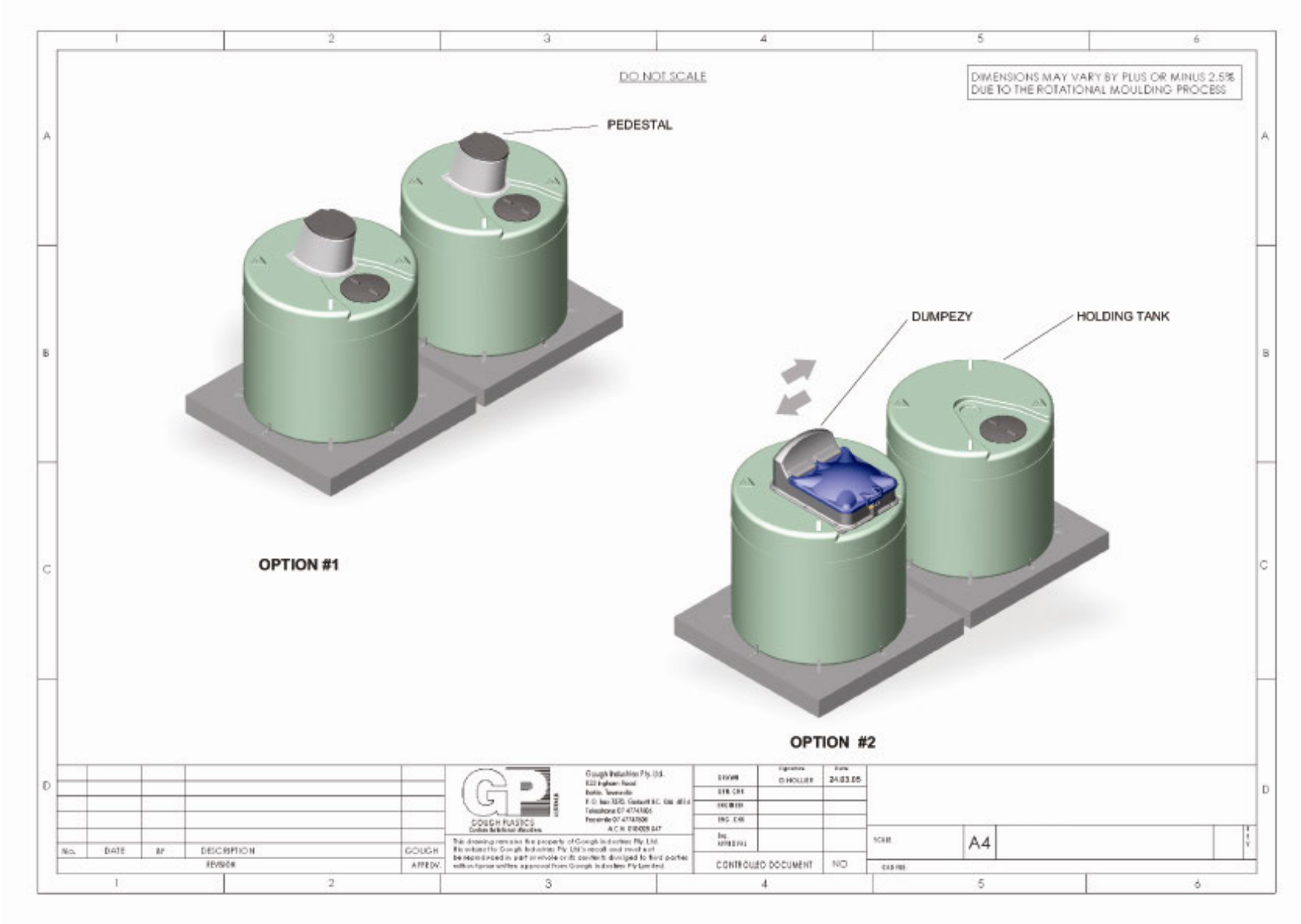
Option 2. This site is to receive Wag bag waste only. We suggest using the dump-Ezy product here to allow a robust entry point for the waste. It can be installed externally or it can be internal. On the same concept fill one tank, swap over to the other. The Dump-Ezy unit could be uncoupled from the first tank and installed on the second. As above adding bacteria will speed breakdown process. Please see drawings below.

Possible issues.

The chance that non bio-degradable rubbish waste enters bins, causing the vacuum pump hose to block.

For Option 1. you cannot control waste entry through the drop toilet.

For Option 2. the dump-Ezy unit is lockable so it is possible to limit persons placing rubbish in the tanks. It could be done on a key arrangement if required. See the attached link to the dump_ezy site for more details on this product. http://www.gough.com.au/dumpezy/features.htm


DO NOT SCALE
DIMENSIONS MAY VARY BY PLUS OR MINUS 2.5%
DUE TO THE ROTATIONAL MOULDING PROCESS
PEDESTAL
OPTION #1
DUMPEZY
HOLDING TANK
OPTION #2
GOUGH PLASTICS
A4

Option 3. See below some photos of the Dehydrator flyout unit. basic idea is to receive waste, dry it out, excess liquid passes through a Modified Hybrid unit for extra long process time, any resultant liquid if at all will have huge process time before discharge to subsurface. We use a series of Purpose built dehydrator tanks (usually 4) in rotation. Some are flyout and some and removed by vehicle taken back to base, left to compost, waste removed, cleaned out and rotated back into service.

We are most interested in working with you and the client on developing a series of potential solutions for this type of scenario. We operate across Australia and the world dealing with waste in remote areas and we have a lot of ideas to offer. We fully support the idea of carry in, carry out in some circumstances and to that end have been working directly with a manufacturer in America on the best way to deliver this Wag bag product in our country to the National Parks and in particular the military. We have imported this product and been undergoing various trials in use so we have history here and would love to be involved because we are passionate about caring for people and the planet.

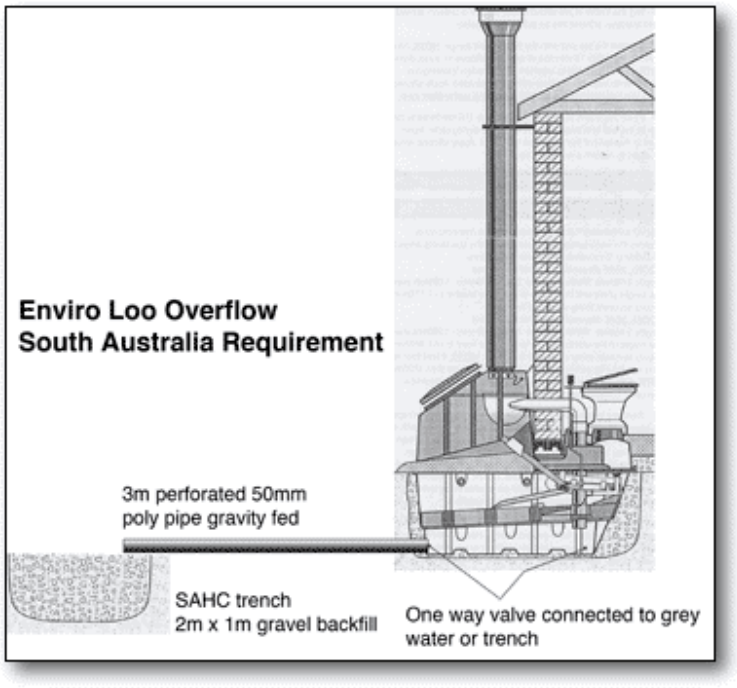
Enviro Options Australia

Contact Details:

PO Box 219
Berowra Heights, NSW
2082 Australia
Unit 11, 29 Leighton Place
Hornsby, NSW

Tel: 02 9456 0172
Fax: 02 9456 0173
Mobile: 0415 605 5762

www.enviro-options.com.au



It is important to realise that the operating principles of the Enviro Loo differ substantially from standard composting systems. In fact it can best be described as an evaporation /dehydration system.

The unique feature of the Enviro Loo System is that it separates the solids and liquids upon entering the holding tank. The liquids make their way to the bottom of the container, and the solids are captured on a specially designed drying tray that is suspended at an angle approximately half way down the holding tank. This enables the unit to efficiently evaporate the liquids, and dehydrate or dry out the solids, via an accelerated ventilation process. The solids are between 95% and 97% liquid, and in time the dehydration activity reduces the waste to between 3% and 5% of its original mass. In higher usages and colder and humid climates, an overflow needs to be installed.

POWERED BY WIND AND/OR SUN

The unique ventilation system aided by the increased internal temperature causes a negative pressure within the container which ensures no backdraft into the toilet pan. The airflow is assisted by the patented ventilation extraction unit, positioned on top of the outlet vent pipe. Air is drawn into the container via the inlet vent pipes ensuring adequate ventilation for fast odourless decomposition of human waiste. However this does not preclude the use of an extraction fan in domestic installations and low wind conditions.

Importantly, oxygen itself is also a very powerful deodoriser. Foul odours considered normal in many composting, pit and septic systems due to the chemical reaction from faeces and urine, do not occur in the Enviro Loo System due to the early separation of liquids and solids.

This is a dehydration toilet and odour will emanate at the top of the stack, which is then carried away by the prevailing winds. If there is a prevailing downwind this will affect the odour.

MAINTENANCE

In many countries it is seen as culturally improper to be constantly involved in the analysing and recycling of human waste. This is why many composting efforts in developing countries have failed to achieve the desired result. Many composting and Pit Latrines need pumping out, or emptying on a regular basis. The Enviro Loo does not. Whereas standard composting toilets actually increase the bulk of the waste by adding wood shavings, and other bulking agents, the Enviro Loo does not. The Enviro Loo actually works hard to reduce the eventual amount of waste. The Enviro Loo Toilets require periodic raking of material after installation. The dry material is removed to the drying bag for 6 months for stabilisation. After this period it is then removed. The number of users of the toilet will determine the rate of this process.

Importantly when the waste is ready to be removed it will only be a small amount of inoffensive dry material. At this point the waste is either pathogen free or has a very low count, suitable for further composting.

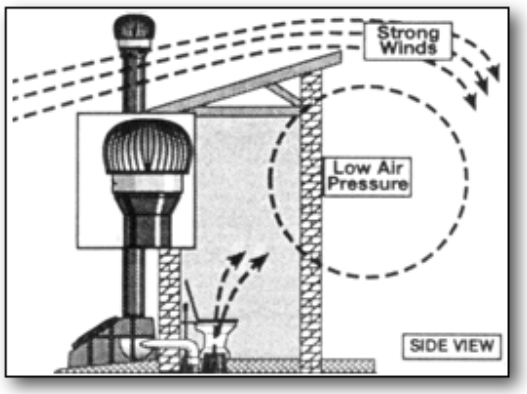
ENVIRONMENTAL CONSIDERATIONS

To our knowledge the Enviro Loo is the only dehydration / evaporation toilet on the market today.

This means that there is absolutely no chance of any pollutants entering the surrounding living environment, provided the overflow is dealt with according to Health Department requirements. Groundwater resources remain intact and contaminant free, which is particularly important in communities reliant on ground water supplies. Due to the nature of the Enviro Loo, fly borne disease is also decreased significantly - this does not cover any localised pests. In many developing countries fatalities caused by sanitation related disease such as diarrhoea and hepatitis are at epidemic proportions.

INSTALLATION / TRANSPORT

Each unit comes equipped with a simple installation manual. The bulk of the unit is manufactured from UV protected virgin polyethylene, a very durable long lasting material, that is guaranteed for 1 years by the manufacturer but in fact is expected to last in the vicinity of 20 years or longer. The system is designed with ease of transportation in mind with an efficient multiple unit stacking feature. The units are modular in design and can only fit together one way. Multiple units are popular in Schools and other high traffic situations. These units are installed with interconnecting pipes that facilitate the dispersal of the liquids evenly, resulting in a more efficient evaporation process.



Before purchasing or installing an Enviro Loo, check that the prevailing wind is not causing a negative pressure on the leeward side of the structure, which if strong enough. might reverse the airflow through the toilet. This will cause an odour problem and this type of installation is not recommended.

WARRANTY & CONDITIONS OF SALE

Upon receipt of the unit there is a 14-day money back guarantee if delivered to Enviro Options Australia or your agent **provided it has not been used**. There is a 1-year warranty on all moving parts. This is an onsite sanitation system and you will have to deal with the consequences of installing the system. Please make sure you ask your agent what can be expected, and review the conditions of sale.

ATTACHMENT 6

Biodegradable Bags

1. THE WAG BAG

Contact: Greg Wyld

Mob: 0403 383045

Email: gwyld@ferno.com.au

Ferno Australia Pty Ltd ABN 88 009 927 137

Telephone: + 61 7 3205 5055 Toll Free: 1800 804 647 Fax: + 61 7 3881 1125

Website: **www.ferno.com.au** or www.thepett.com

Each WAG BAG® kit Contains

One waste bag with Pooh-Powder™
Zip-Close Disposal Bag
Toilet Paper and Hand Sanitizer

Easy to use double-bag system made of a puncture resistant material, with a locking zip closure. Each waste bag is pre-loaded with non-toxic Pooh-Powder™, which gels waste, catalyzes decay, and removes odors (no perfumes). WAG BAG® kits are degradable and are approved for disposal in landfills.

Source: http://www.thepett.com/


- CAUTION -
WASTE DISPOSAL BAG
DISPOSE IN LANDFILL OR
REFUSE CONTAINER ONLY

2. THE BIO BAG

BioFilm Biodegradable & Compostable Products
Ausasia Link Pty Ltd.,
Level 2, 37 Bligh St.,
Sydney 2000

Contact: Neil Thomson

Email: neilthomson@mac.com

M: 0415 939 521
D: 02 9388 8366
T: 02 8257 3338
F: 02 9475 0933

BioToi Nature Bio-Toilet & Bio-Bag

BioToi is a sturdy, yet low weight portable toilet that was originally developed in cooperation with the Norwegian Armed Forces. The BioToi system is now approved and used by NATO forces in many countries. BioToi meets the highest standards for hygiene, quality, function and environmental friendliness.

Each BioToi system comes complete with a roll of Nature Bio-Bag toilet waste bags. The Bio-Bags are 100% biodegradable and 100% compostable. Nature Bio-Bag waste bags are also sold separately and can be used with most existing toilet systems.

The BioToi toilet and the Nature Bio-Bag waste bags are perfect for camping, boating, hiking, hunting, RV's and other related outdoor activities. Each waste bag is properly certified to decompose to a humus state within 40 days when placed in a controlled compost environment.

Technical information on the BioToi

- Dimensions when folded: 340 x 550 x 100 mm (13 3/8 x 21 5/8 x 4 in.)
- Dimensions when set up: 340 x 435 x 425 mm (13 3/8 x 17 1/8 x 16 3/4 in.)
- Weight: 1.9 kg (4 lb 3 oz.)
    - Material: PE HD (recyclable)

Product Information Biobag Toilet

The bags are made of Mater-Bi, which means that they are 100% biodegradable and compostable. BioBag bags will decompose quickly in connection with composting or in waste

treatment plants. Heat treatment over 248°F will cause the bag to melt and decompose instantly.

The bags are pigmented black with instructions for use printed on them. The bags are threaded around the entire rim of the toilet seat, making the system very hygienic and user-friendly. The bags high quality makes the BioToi safe to use.

Technical information on the BioBag Toilet bags for the BioToi
Dimensions: 650x480mm (25 9/16 x 18 7/8 in)
Weight: approx. 21 grams (3/4 oz.) per bag
Packaging: rolls of 8 bags packed in an outer bag
Dyeing: black, with instructions for use printed in white

Source: www.biogroupusa.com/biotoi.htm

ATTACHMENT 7

Kosciuszko National Park Main Range Management Unit; Milling points and huts

Kosciuszko National Park
Main Range Management Unit