13.1 Roads, vehicle tracks and car parks
13.2 Walking tracks and trails
13.3 Boardwalks, steps, sand ladders and viewing platforms
13.4 Fences and other access control measures
13.5 Signage
13.6 Tools and resources

This chapter deals with design principles and site selection to minimise environmental damage when constructing roads, tracks and access control structures on coastal land near the shoreline.

Providing public access to the coast is important but controlling access is often necessary to protect coastal landforms and to maintain public safety. It is important to plan road and track development, and to control illegal tracks, particularly in sensitive locations such as actively mobile sand dunes, Aboriginal places, and penguin and shearwater colonies. Proper planning, design, construction and maintenance of structures will help to increase their life span, save money and minimise impacts on coastal values. Promoting environmentally responsible practices to the public (e.g. with signs and education programs) will encourage people to respect access control measures and stay on defined tracks.

Constructing roads, tracks, paths and fences on unstable landforms, such as sand dunes, requires good technical advice, to ensure effort and money is not wasted. Inappropriately designed or sited access management works can easily be destroyed by wind, waves or overuse, or lead to degradation.
13.1 Roads, vehicle tracks and car parks

This section only addresses the special considerations involved with constructing and maintaining roads and vehicle access in coastal areas. Other resources provide more detailed information and specifications for road works. Refer to section 13.6 Tools and resources.

Before works start, thorough investigation and planning is essential. Assessments, approvals and an Environmental Management Plan (EMP) may be required. Small projects with no EMP require a works plan, which should outline the works to be undertaken and the measures that will be used to minimise the risk of causing damage to coastal values.

Choosing the appropriate site and construction methods is important for works near the shoreline, as inappropriate locations or methods can destabilise or damage coastal areas and result in increased maintenance expenses.

Extra care is required to minimise impacts when working on sandy soils, especially dunes, which can be erodible or highly erodible. Even on hind-dunes that appear stable, exposing loose sand underlying the generally thin topsoils may significantly increase the risk of severe erosion or destabilisation.

The coast has a diverse range of values and uses, and space is in high demand. Planning may need to manage conflicting or competing uses. Tracks, roads and car parks will increase visitor use in a particular area; new accessways need to be sited carefully to ensure they will not create unmanageable impacts on natural values or conflict with other coastal uses.

Figure 13.1 A coastal road in south-east Tasmania maintained by the local council. © Leah Page
13.1.1 Legislation and approvals for roads and car parks

The Roads and Jetties Act 1935 covers the legislative requirements of road planning and construction, in addition to legislation set out in Appendices 1 and 2 covering coastal planning, environmental management, and natural and cultural values. The Land Use Planning and Approvals Act 1993 specifies that approval from the land manager is required before works can proceed.

Much of the planning for roads and car parks needs professional services and, depending on the scale, an Environmental Management Plan (EMP) may be required. An EMP will assess values such as natural and cultural heritage and the potential impacts of a proposed activity.

All roads need to meet Australian Standards. The Department of Infrastructure, Energy and Resources (DIER) is responsible for the provision and management of infrastructure associated with the state road system. All roadwork adjacent to the state road system require the approval of DIER, who may stipulate that a Traffic Management Plan (TMP) be designed and implemented.

Works cannot be undertaken on municipal, reserve or Crown land without authority. Many coastal roads come under the authority of the Crown and assessments and approvals from Crown Land Services will be required.

All tracks and roads that are planned to cross land managed by the Parks and Wildlife Service (PWS), under the National Parks and Reserves Management Act 2002, will require an assessment of values and other matters before they can be considered for approval by the PWS (Reserve Activity Assessment). This is necessary before submission of council planning applications. Environmental and heritage assessments can take some time, so forward planning is essential.

The following approval processes may apply:

- Obtain written approval from DIER for the construction of new road access or major upgrading of existing road access onto state roads.
- Consult the local council where construction of new, or substantial upgrading of, existing access onto municipal roads is required.
- Obtain approvals from the adjoining authority when a new road connects with an existing road owned by another authority.
- Any gravel or rock that is extracted as part of lawful earthworks/construction of the road alignment from within a road reserve is considered to be part of a road construction activity. It does not require a separate extractive industry approval from council, PWS or the Department of Primary Industries, Parks, Water and Environment (DPIPWE), or a mining lease from Mineral Resources Tasmania.
- Approvals from Aboriginal Heritage Tasmania, Heritage Tasmania and/or the Environment Protection Authority may be needed.

13.1.2 Site selection for roads and car parks

Guidelines for selecting sites for new roads, tracks or car parks:

- Minimise interference with natural coastal processes.
- Avoid significant natural or cultural heritage values (e.g. high conservation value vegetation, threatened species and significant fauna populations such as penguins).
- Consider sea level rise and coastal vulnerability to...
erosion, recession and flooding. Ensure that new
roads or raising roads will not create barriers to tidal
flows, or landward retreat of significant vegetation
communities. Bridges and culverts may be necessary.

Avoid unstable areas such as beaches, dunes, wetlands,
slip-prone areas, highly erodible soils, natural drainage
channels and stream banks.

Avoid works in areas infected with or vulnerable
to *Phytophthora cinnamomi* (root rot) and follow
protocols to reduce the risk of spreading the disease.

Avoid works in acid sulfate soils (ASS). Many ASS are
prone to subsidence and roads built on these soils
may settle slowly or subside unevenly. Vibration from
passing traffic tends to make settling problems worse.

Avoid landslip areas. Potential landslip zones include
slopes that are steep, have soaks or springs, or
show evidence of ground movement (e.g. slumping,
subsidence, landslips, natural terracing caused by soil
creep, or bent tree trunks). Consult an appropriate
specialist (e.g. a coastal geomorphologist) if there is
any doubt about slope stability.

Limit access to the shoreline by focusing it into single
points that serve groups of structures or are multi-
purpose.

Locate roads and access tracks on existing informal
access lines, if appropriate, to minimise their impact.

### 13.1.3 Constructing roads and vehicle
tracks on the coast

Ensure all planning has been undertaken and approvals
acquired. Consultation with specialists is essential to
identify and protect all natural and cultural values.
Surveys are often necessary and formal assessment
procedures, such as Environmental Impact Assessments,
may be required for some activities in some locations.

Many coastal areas contain important natural and
cultural values. The Tasmanian coastline is rich in
Aboriginal heritage values. Some dunes and other
sandy landforms have geoheritage values. Other
natural values such as threatened species or
important vegetation communities may also be
present.

Community groups are often interested in access
management and it is important to consult with
them when planning vehicle access work. Their local
knowledge about visitor use and particular problems
is often valuable.

Consultation with the broader community is an
important way to increase awareness of coastal issues
and encourage compliance with road alterations and
access control. Roads are a community facility and
community consultation will be necessary if planning
new vehicle tracks or closing old ones.

All staff and contractors should be briefed about
environmental considerations for the site and any
restrictions or specific work practices that are
required. Provide appropriate supervision to ensure
environmental standards are being met.

Ensure all machinery and vehicles are free from
weeds and diseases prior to bringing them on site. If
weeds and disease are present at the site then ensure
that tools, boots, vehicles and machinery are cleaned
at a suitable location before leaving the site. Only
import material from sites that are free from disease
and weeds. Refer to Chapter 8 Weed and disease
management.

Minimise the potential for causing sedimentation
of watercourses in road design, construction and
maintenance. The *Transport Tasmania: Roadworks
specification*—Environmental protection covers erosion
control measures such as sediment traps, silt traps
and protection fencing. Investigate and, if necessary,
take precautions to minimise disturbance to acid sulfate soils. Predictive maps of potential acid sulfate soils are available on the LIST. Refer to Chapter 11 Soil management and earthworks.

Provide regular cross-culverts to reduce longitudinal drainage flows in side drains. Roads should be fully drained with culverts, table drains, or other drainage structures as required. Minimise the number of watercourse crossings. To help the passage of fish and other aquatic animals, ensure that culverts are designed and installed appropriately. Refer to Chapter 12 Stormwater and crossings.

Ensure that new roads and road upgrades take into account the latest sea level rise predictions from the Intergovernmental Panel on Climate Change (IPCC) into account. It is important that roads do not interrupt tidal flows. Raising roads to protect them against sea level rise impacts can create tidal barriers, which will change the flushing regime and lead to degradation or destruction of waterways.

Avoid creating tidal barriers by installing appropriate culverts or bridges. Consider moving roads landward to allow for the retreat of natural coastal areas. This is particularly important for coastal wetlands and saltmarsh as sea level rise leads to increased inundation of low-lying areas into the future.

Use local materials where available to minimise construction traffic. Minimise the area cleared for construction to reduce the extent of soil disturbance. Fit the road to the topography to minimise cuttings and embankments. Take extra care on very erodible (sandy) soils.

Retain topsoil for rehabilitation at the site. If there is surplus soil, use it at nearby sites requiring rehabilitation or dump it in a planned, suitably located soil dump. This is particularly important in catchments that provide drinking water.

Protect aesthetic values as far as possible. Minimise visual impacts by taking account of existing vegetation and the effects of vegetation removal. Safety considerations will require the removal of sufficient trees to allow the road to dry after heavy rain, and to provide adequate lines of sight on frequently used roads.

Where practicable, remove all vegetation debris from the roadside and dispose of appropriately (e.g., avoid dropping weed seeds on disturbed soil or in native vegetation). Otherwise, stockpile vegetation debris for mulching at revegetation sites or burning at a suitable location and time.

The construction process can result in road edges being excavated and material being deposited on the roadside. Minimise deposits and excavations in areas where penguins and other wildlife cross the road as

Figure 13.2 Cleaning soil and plant material off vehicles before entering and leaving sites will minimise spread of weeds and diseases. © Forestry Tasmania
blocking their access can lead to roadside deaths.

For sealed roads, minimise excavation and the use of imported material in the foundation (pavement preparation) where practicable, by stabilising the natural material that is sub-grade. Depending on the soil type, methods can include the use of crushed rock or polymers, geotextile and chemical stabilisation by use of lime in clays and cement for sands.

13.1.4 Special considerations for minor roads and vehicle access tracks on erodible soils

It is sometimes necessary to provide vehicle access on erodible soils (e.g. within sand dune systems), for purposes such as access to the coast or fire breaks. Highly erodible soils in coastal environments include loam and sand with sparse vegetation cover. Very highly erodible soils include sand and fine gravel with very sparse vegetation.

In addition to the guidelines in section 13.1.3, extra care is required to minimise damage to vegetation and soil exposure on erodible soils, particularly on crests and upper slopes of dunes where the potential for erosion is greatest.

Minimise tracks on coastal dunes and take extra precautions to protect unstable soils and vegetation. Often vegetation is all that is holding the dune together and anything that causes vegetation death will decrease stability. Where possible, locate tracks in swales between dunes, preferably in hind-dune areas (except where drainage is poor). Only build tracks with steep gradients when the soil structure will permit positive and steady traction.

Tracks that cut through the dune system to the beach must not be aligned perpendicular to the beach. This will expose the track to onshore winds and increase erosion and sand loss. Align tracks at an angle to the direction(s) of the prevailing winds, wherever possible. This will minimise loss of sand from the beach and reduce maintenance costs.

Prevent or at least minimise side-cuts into the dunes. Protect side-cuts with a layer of brush placed over the exposed sand or use jute matting, or revegetation.

Protect heavily used tracks on steep dunes by laying a board-and-chain track or sand ladder from the crest to the bottom. Protect the track edges with scrub, jute mesh or similar materials, and fence the sides of the track. Specifications for vehicle board-and-chain ladders are available in Coastal dune management: a manual of coastal dune management and rehabilitation techniques (Department of Land and Water Conservation 2001).

Protect drainage lines and mid- and lower slopes, as these areas are the most prone to erosion and sedimentation. Refer to the Forest practices code (Forest Practices Board 2000). Construct cross-drains at approximately right angles to the water flow, with an outlet for water to discharge into the surrounding vegetation. Take advantage of natural drainage points. Follow drainage guidelines for tracks in Table 6, ‘Maximum spacing between cross-drains on snig tracks’ in the Forest practices code. Install culverts or bridges where needed to protect conservation values, such as tidal flushing of wetland areas and passage of fish. Refer to Chapter 12 Stormwater and crossings.

Avoid building tracks in wet conditions (except in emergency situations), as ruts can form, causing water to bypass culverts, cross-drains and natural drains.

Repair boggy sections with rock, matting (bark or brush), or cording (small logs) to prevent further damage and allow vehicle or pedestrian access. Drain and backfill any standing puddles with suitable material. Where boggy sections and/or puddles have
been bypassed causing multiple tracks, rehabilitate the bypasses after repairing the main track. Restore rutted tracks with backfilling, but provide adequate drainage to prevent scour recurring. Regularly inspect roads and tracks so that problems can be quickly (and more easily) managed.

13.1.5 Special considerations for car parks

In addition to the guidelines in section 13.1.3, special consideration and planning is required for car parks, to ensure that they are located and constructed in a way that minimises impacts on the coastal environment.

Detailed technical drawings for car parks are available in the Coastal management specification manual (Green Skills Inc 2010).

Figure 13.3 Erosion due to vehicle access across sandy areas can be managed with board-and-chain installations (sand ladders). Source: © Coastal dune management: a manual of coastal dune management and rehabilitation techniques (Department of Land and Water Conservation 2001)
• Avoid placing car parks in sensitive sites. Do not excavate foredunes and other unstable sands. Wherever possible, concentrate facilities and access in particular areas.
• Consider changes to recreational usage and the associated impacts that may result from new or upgraded access and car parking.
• Allow sufficient room for boat-towing cars to turn, where necessary.
• Allow for expansion or changes to future use.
• Mark boundaries with bollards, rocks or other structures.
• Provide walkways from the car park to the coastal location, to avoid widespread impacts.
• Plan for managing runoff from large hardened surface areas. Provide adequate stormwater drainage – otherwise water could channel down beach accessways, leading to erosion and costly maintenance.
• Treat stormwater from car parks to remove sediments and hydrocarbons before the stormwater enters natural waterways. Water sensitive urban design features, such as vegetated dispersal or filtration fields or settling ponds, can be used. Refer to Chapter 12 Stormwater and crossings.
• Consider placing oil and silt arrestor pits on lines draining parking areas. An oil and silt arrestor pit is typically a formed concrete pit that contains baffles to slow the flow, to allow silt to settle, and also trap oils by forcing the flow of water through a submerged outlet, keeping the oil on top of the stilled water.
13.1.6 Controlling off-road vehicle access

Vehicle access to beaches needs to be very carefully managed and in many areas it is illegal or should be prevented. Vehicles are a hazard to other beach users and can harm the coastal environment in a number of ways, including destruction of shorebird nesting sites, compaction of sand which impacts on animals living in the sand (meiofauna), erosion of fragile dune areas, destruction of wetlands and introduction of weeds and diseases.

Where vehicle access is permitted, encourage visitors to use designated access tracks through the use of markers, signs and fencing and by working with recreational vehicle groups and tourism operators to increase awareness of coastal values and threats.

Where 4WD vehicles are crossing sand dunes indiscriminately, encourage drivers to use one main track. This might be achieved by upgrading and stabilising the main track, as most drivers prefer good tracks. The other tracks can then be rehabilitated.

Manage public access to reduce the potential for damage by off-road vehicles. Consider road barriers such as very big rocks or bollards for protecting values where other measures, such as signs, have failed to prevent illegal activities.

Very big rocks can be used as a barrier. Landscaping them into the ground makes them harder to move and less confrontational in appearance. A line of rocks in the open can be seen as a challenge by users who feel disenfranchised or aggrieved by the barriers.

Regular inspections and maintenance will be required, to ensure that barriers remain in place and are working effectively.

13.1.7 Ongoing maintenance of roads and car parks

To remain in good condition, all roads and vehicle tracks require regular maintenance. It is important to maintain a stable surface and a functional drainage system, particularly in steep terrain or on very erodible soils. This will minimise erosion and sediment entering watercourses from roads.

Carry out inspection and maintenance at regular intervals or more often, as required.

Roads and tracks in coastal areas are highly susceptible to coastal processes and the harsh coastal environment. Some roads and vehicle tracks on soft sediment shorelines are currently under threat of erosion due to shoreline recession. Inspect roads...
and vehicle tracks after extreme storms and coastal inundation events such as king tides.

Detailed guidelines for maintaining roads and access tracks are contained in the Tasmanian reserve management code of practice (PWS et al. 2003) and include the following:

- In steep terrain and high and very high erodibility class soils, patrols should be carried out regularly and after heavy rain. As a minimum, inspect roads at least twice a year (in autumn and winter).
- Assess condition using knowledge of user types, expected standard of road and Australian Standard risk assessment procedures.
- Inspect and maintain silt traps and sumps.
- Regularly and systematically monitor and maintain crossing structures (e.g. bridges and fords) particularly wooden structures. This should be done by qualified persons e.g. engineers for elevated structures.
- Clear table drains and culverts.
- Protect culvert outlets to prevent scouring.
- Fill settlement cracks.
- Replace drainage structures before failure.
- Replace or remove crossing structures prior to their physical collapse, to avoid impeding water flow.
- Restore the road structure and/or construct water bars to prevent erosion.
- Clean or replace guideposts and traffic warning signs.
- Identify tracks or roads that are only used infrequently or not at all and consider closing them.

13.2 Walking tracks and trails

This section deals predominantly with walking tracks along the coastline. However, some tracks are shared by a variety of user groups and land managers are increasingly recognising the importance of catering for these multiple uses.

Coastal tracks and trails provide access to foreshore areas, linkages between coastal sites and, in some instances, recreational opportunities for various user groups such as mountain-bike riders and horseriders. The design of coastal tracks needs to consider the purpose of the track, the user groups, the local coastal processes and the natural and cultural values of the area.

Careful planning and quality construction by skilled and trained track workers are the keys to success and can greatly reduce the cost and amount of future maintenance. Planning for ongoing maintenance is essential. Before approving new tracks, consider the capacity and resources available to maintain the existing ones.

13.2.1 Legislation and approvals for tracks and trails

In addition to legislation set out in Appendices 1 and 2 covering coastal planning, environmental management and natural and cultural values, the Civil Liability Act 2002 reduces the likelihood of public liability issues on Crown land.

Tracks cannot be constructed on public land without the authority of the land manager. The land manager may be the local council or DPIFWE (Crown Land Services or Parks and Wildlife Service). Assessments and approvals may be required to protect natural and cultural values. Land managers should commit to ongoing maintenance and allocate the appropriate resources.
13.2.2 Planning new tracks and upgrading existing tracks

Before considering the creation of a new track or trail it is important to review the existing track network with the local community. It might be possible to improve existing tracks first. New tracks should not be constructed if there is not the capacity to maintain the new track – or even existing tracks.

Consider the need for and purpose of the track.

• Is the track to provide access to the foreshore or coastal features?
• Is it a linear track to allow travel from one location to another?
• Is it a multi-purpose track?

Answering these questions will help identify the expected usage of the track, the type of track required and the potential funding required for ongoing maintenance.

It is important to identify and consult the intended user groups to ensure the track’s suitability for those users. Consider track sharing, to suit multiple user groups, access for the mobility impaired and the protection of the attractiveness of the area. Consultation with the local community is essential to identify local values and issues and to ensure support for new tracks and approaches to providing access, especially if planning new tracks or closing old ones. Consider upgrading existing tracks for multi-use or disabled access.

Community groups such as Coastcare groups are often interested in access management and it is important to consult them when planning track work. They often have valuable local knowledge about visitor use and particular problems.

Design tracks so that they are visually pleasing and suit the natural environment, and are easy for visitors to find (e.g. use poles to mark where paths enter beaches).

Consult specialists, to identify and protect all natural and cultural values. Many coastal areas contain important Aboriginal heritage relics and sites. Some dunes and other sandy landforms have geoheritage values. Other natural values such as threatened species or important vegetation communities may be present.

Contact Aboriginal Heritage Tasmania, a desktop search will determine if an assessment and/or permit is required. Aboriginal heritage officers will be able to guide your work activities to minimise any damage to Aboriginal heritage.

Investigate the incidence of acid sulfate soils (ASS) and if necessary take precautions to minimise their disturbance. Refer to Chapter 11 Soil management and earthworks, section 11.4.

Consider the impacts of potential climate change such as increased inundation levels due to sea level rise and extreme storms. New tracks in coastal foreshore areas need to consider the latest IPCC predictions for sea level rise and incorporate these into the design or site selection. It is important that tracks do not destabilise coastal areas through removal of vegetation, channelling of water or increased wind erosion.

The Trails Tasmania strategy (Inspiring Place Pty Ltd 2007) provides primary and secondary criteria to assist with assessment and approval of new track proposals.

Thorough planning is the only way to ensure sustainability of the track and the coastal environment and will help establish partnerships; provide information that could be used for funding.
applications or sponsorship proposals; and may help identify strengths and weaknesses.

**Site selection**

Careful planning and choosing the appropriate site will minimise impacts and future maintenance needs.

- Accessways and tracks through sand dunes should be sited in natural gullies. Avoid creating tracks on dune crests. Unvegetated dunes, cliff tops, wetland edges and potential landslip zones are unstable areas and may be unsuitable.
- Avoid works on or near beaches and foredunes, unless they are required to provide access to the shoreline.
- Avoid or minimise interference with the natural coastal processes and reduce exposure to severe wave action.
- Avoid disturbing significant natural or cultural heritage values.
- Choose already disturbed sites where people want to go (e.g. where people usually cross dunes), wherever possible. This will lead to greater public acceptance and use of these tracks. Aim to reduce the number of access points through dune systems.
- Follow the contours of the land where appropriate. This will often be more cost-effective and have less impact on the landscape than other options.

*Figure 13.6 Coastal path at Bellerive designed for multi-use. © Leah Page*
13.2.3 Guidelines for track construction in coastal areas

Design

It is important that structures comply with Australian Standards and with the requirements of relevant land use zoning, management plans and track management strategies.

Tracks and structures that provide access for mobility impaired people should be considered where required or appropriate, particularly for features such as viewing points and beaches.

Classify tracks according to recognised track classification schemes, using the six classes detailed in AS 2156 Australian Standards: AS 2156 Part 1 Walking tracks. Classification and signage.

Do not create infrastructure unless absolutely necessary. Minimise the construction of bridges and walls. This will make the track cheaper to construct and cheaper and easier to maintain.

Avoid creating new tracks in areas infected with *P. cinnamomii* (root rot) or uninfected areas if the vegetation type is highly susceptible to the disease (such as coastal heath vegetation) or there are threatened plants or communities that require protection. Washdown stations will be required on existing tracks that move from infected areas to uninfected areas. Consider re-routing such tracks if possible.

For multi-use tracks, vehicle barriers should be wide enough for bike riders to pass through the opening without having to dismount. For horse trails, provide step-over barriers to prevent vehicle access. Consider overhead clearance under trees and install signs at a height that can be read by horseriders.

Technique

All staff and contractors should be briefed on the environmental considerations for the site and any restrictions or specific work practices that must be implemented. Provide appropriate supervision to ensure that environmental standards are being met.

Ensure that all machinery and vehicles are free from weeds and diseases prior to bringing them on site. If weeds and disease are present at the site then ensure that tools, boots, vehicles and machinery are cleaned at a suitable location before leaving the site. Only import material from sites that are free from disease and weeds. Refer to Chapter 8 Weed and disease management.

Take precautions to minimise disturbance to acid sulfate soils (ASS). A rotten-egg smell or yellow deposits when digging are likely indicators of ASS. Minimise the potential for causing sedimentation of watercourses in track design, construction and maintenance. Refer to Chapter 11 Soil management and earthworks.

Use staff trained and skilled in designing, auditing, maintaining and constructing tracks. Poor design or construction will lead to high ongoing maintenance costs. There are highly skilled and experienced contractors that can be engaged to construct coastal access and tracks. In addition, organisations like Conservation Volunteers Australia can provide a valuable labour force when supervised by an experienced track worker.

For construction work, use hand tools in preference to machinery as this will minimise the impact on the site and reduce the risk of introducing weeds and diseases. Take precautions to prevent the spread of weeds and diseases by cleaning hand tools and work wear.
Make the most of natural features and use natural, local materials wherever possible. These will provide a more attractive result and will often be more durable.

Tracks that cut through the dune system to the beach must not be aligned perpendicular to the beach. This will expose the track to onshore winds and increase erosion and sand loss. Align tracks at an angle to the direction/s of the prevailing winds, wherever possible. This will minimise loss of sand from the beach and reduce maintenance costs.

Align tracks on the uphill side of large trees to minimise damage to tree root systems.

In well-protected dunes with little foot traffic, no additional track surface is required. A natural sandy path is the most attractive surface, if it is not exposed to excessive wind erosion.

In busier or windy sites, a protective surface is often necessary to reduce wind and water erosion, and to improve public safety. Choose local materials such as stone, gravel or bush timber to create a more natural appearance, wherever possible. If using sawn timber, try to construct the track with gentle curves.

Gravel is generally most suitable on fairly level paths. Gravel paths should be about 100mm high to allow rainwater to run off. Define the edges with free-draining crushed rock and boulders. Sometimes it is necessary to retain the edges of tracks. This is best done with drystone walls using local materials wherever possible.

Minimise water crossings whenever possible as they create the most potential to affect water quality, through erosion and washing of sediments into the waterway. Hardened track structures may be required, such as culverts and bridges. Seek engineering advice for the construction of bridges. In some instances, the use of rock may be all that is required to harden the trail over boggy or soft terrain. Refer to Chapter 12 Stormwater and crossings.

Controlling the movement of water on the track through good design is paramount for minimising erosion and reducing track maintenance. Running water will erode the track, whilst pooling water will create boggy areas and rot structures. Divert water and encourage it to sheet across the track not flow along it. Create regular grade reversals (zigzags) or grade dips (undulations) to ensure water will flow across and not along the track. A slope of fall of 3–5° will encourage water to sheet and not channel across the track.

Water bars (wood or rock across the track at angles to divert water) can be used to assist track drainage but are not ideal as they require maintenance to keep them working well and can be a tripping hazard.

Consult with the Aboriginal community and seek advice and permission where it is not possible to avoid the cultural site. A permit to conceal sites can be issued by Aboriginal Heritage Tasmania where appropriate. Generally, middens can be protected...
by the laying of geotextile material on top of them and then laying the track gravel or rock over the top. This creates a semi-permeable layer that prevents the track material mixing with the Aboriginal relic material. Regular maintenance will identify when the geotextile material is becoming exposed and the track material needs to be topped up. If any new sites or artefacts are discovered, stop work and contact Aboriginal Heritage Tasmania.

### 13.2.4 Walking track classifications

The Australian Standards (AS2156.1-2001) provide information to guide the design of tracks and suitable facilities and management. Six classes of walking tracks are defined in the Standards. Generally these classify the tracks from easy to advanced or severe. Mountain-bike and horseriding tracks have different classification systems to reflect their specialised use.

<table>
<thead>
<tr>
<th>Track Classification</th>
<th>Description</th>
<th>Inspection interval</th>
<th>Management considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>High numbers of visitors incl. those with impaired mobility.</td>
<td>30 days or less</td>
<td>Facilities such as toilets and car parking, signage. Steps must be accompanied by ramps.</td>
</tr>
<tr>
<td>Class 2</td>
<td>High numbers of visitors.</td>
<td>90 days or less</td>
<td>Facilities such as toilets and car parking, signage. Minimal use of steps.</td>
</tr>
<tr>
<td>Class 3</td>
<td>Slightly modified natural environment.</td>
<td>6 months or less</td>
<td>May have facilities such as toilets. Steps may be common. Limited interpretation signage</td>
</tr>
<tr>
<td>Class 4</td>
<td>Undisturbed natural environments with defined and distinct tracks.</td>
<td>6-12 months and after storm events</td>
<td>Minimal signage, minimal facilities.</td>
</tr>
<tr>
<td>Class 5</td>
<td>Indistinct tracks, remote locations.</td>
<td>6-18 months</td>
<td>Signage only for management purposes.</td>
</tr>
<tr>
<td>Class 6</td>
<td>Unmanaged tracks. Users responsible for public safety.</td>
<td>Not managed for public risk</td>
<td>Facilities and signage generally not provided.</td>
</tr>
</tbody>
</table>

There are also standards for mountain-bike trails, produced by the International Mountain Bike Association (IMBA) which could be considered for multi-use tracks.
Case Study 13.1: Track redevelopment at Alum Cliffs, Kingborough, southern Tasmania

The Alum Cliffs track near Kingston is a high-profile community asset managed by Kingborough Council. By 2007 large sections of the track were closed because it was unsafe and causing damage to coastal values, including Aboriginal heritage sites. It was very steep in some places, with inappropriate water crossings over gullies.

Timber steps and structures were very old and in need of maintenance, and in some places the track was dangerously close to unstable cliffs. Sections of the track were suffering erosion due to poor design, and sand loss on Kingston Beach was making access to the shoreline difficult in places.

Kingborough Council was committed to reopening the track and undertook an assessment/audit in 2007 which recorded all major features, issues and boundaries with a GPS, and deemed that many of the issues could be managed with realignment of the track and replacement of old structures.

The council received input from a tracks and trails advisory group with representatives from key community groups such as dog walkers, walking clubs and Coastcare groups.

Work was undertaken by experienced track workers, rerouting sections of the track to avoid the Aboriginal heritage sites and to take the track away from the cliff edge. Steep sections were improved by following the gullies and this enabled water crossings to be relocated more appropriately. Water crossings were also improved with the installation of bridges so that water flow was no longer inhibited. Track gradients and alignments were modified to address drainage and erosion concerns.

The track is a Class 3 with all-natural surfaces except for a midden area that could not be avoided. A permit from Aboriginal Heritage Tasmania was issued to conceal the midden and geotextile was laid underneath a gravel surface to protect the heritage material.

The track has been reopened and the modifications have protected vegetation, cultural heritage and waterways; reduced erosion; improved safety; increased ease of maintenance; and even resolved some conflicting user issues.

Ongoing work will involve improving drainage where required and realignment of some sections that are impacting on sensitive vegetation or unstable foreshores.

Figure 13.8 Crossing upgrade on Alum Cliffs track. The old water crossing was steep and hazardous. The new water crossing is further up the slope and improves the gradient of the track but, most importantly, the bridge does not impede water flows and protects the banks from erosion. © Johannes May
13.2.5 Audits and maintenance of tracks and trails in coastal areas

Existing tracks and trails should be audited before new tracks are considered. Auditing enables an inventory of tracks to be created and identification of any hazards or maintenance required.

Auditing also enables tracks to be classified according to the Australian Standards. These classifications provide guidance for maintenance schedules and may also provide a mechanism for land managers to prioritise maintenance of their track network.

Create and implement an audit and maintenance plan, which should ensure that all issues identified during an audit are addressed before the next audit.

Before constructing new tracks, develop a maintenance plan. Do not create new tracks unless the plan indicates that there will be sufficient resources to maintain them.

Maintenance plans should ideally be part of a broader management plan that identifies a risk management process, hazard inspection guidelines, annual maintenance program and clarifies management roles and responsibilities.

Many coastal tracks cross over multiple land tenures. It is important that land managers work together to map and determine which sections of the track they are responsible for, and to establish clear and consistent management guidelines.

Alternatively a lease or licence agreement will enable one management authority to take on management and public liability for the entire track so that a consistent management approach is applied.

Identify areas where one well-constructed track could replace numerous poorly constructed (or not maintained) tracks. Rehabilitate or close tracks that are hazardous, or where the landform or vegetation is being damaged. Identify areas under pressure from overuse or creation of illegal tracks.

Tracks in coastal areas are highly susceptible to the impacts of coastal processes and the harsh coastal environment. Some tracks on soft sediment shorelines are currently under threat of erosion due to shoreline recession. Inspect tracks after extreme storms and coastal inundation events such as king tides.

Inspect the track for hazards, checking the condition of the track against the elements of classification in AS2156.1-2001. These include assessments of the condition of the track surface including the height of trip hazards (such as tree roots), track width, structures and signage, erosion or damage, obstructions, and the condition of vegetation along the edge of the track – in particular, overhanging limbs or overgrown vegetation.

Techniques include photopoints, recording GPS points of hazards and areas requiring maintenance, and making observations about level of use and potential for increased pressure (such as new local subdivisions).
13.3 Boardwalks, steps, sand ladders and viewing platforms

This section deals with the installation of hard structures on coastal tracks to provide access to beaches and coastal areas or to protect sensitive coastal values.

Hard access structures such as boardwalks and steps can provide for improved access to coastal areas and enhanced recreational experiences. They can also provide protection for sensitive areas and landscapes whilst allowing visitors access to enjoy these environments.

Hard structures can be made from a variety of materials, with new products (such as recycled plastics) being developed all the time. All are expensive to install and must satisfy building approvals to meet Australian Standards and require a high level of ongoing maintenance. Do not consider new structures unless there is the capacity and resources to maintain them. Plan for their replacement in approximately 20 to 25 years and prepare an asset management plan and asset replacement plan for all structures on tracks.

In high-use coastal areas and adjacent coastal facilities, such structures are often necessary to provide access whilst minimising impacts such as destabilisation of dunes.

Special care will be required during construction to prevent and control erosion as sandy shorelines are often unstable and subject to erosion. Structures that extend across the shore must be appropriately designed and placed to minimise damage from salt water and wave action.

Figure 13.9 Boardwalk at Windermere Bay protecting fragile coastal vegetation. © Derwent Estuary Program
13.3.1 Legislation and approvals for hard access structures

In addition to legislation set out in Appendices 1 and 2 covering coastal planning, environmental management, and natural and cultural values, the Civil Liability Act 2002 reduces the likelihood of public liability issues on Crown land.

Track structures on public land require the authority of the land manager. The land manager may be the local council or DPIPWE (Crown Land Services or Parks and Wildlife Service). Assessments and approvals may be required to protect natural and cultural values. Land managers should commit to ongoing maintenance and allocate the appropriate resources.

Structures must comply with the Building Act 2000 and Building Regulations 2000.

13.3.2 Guidelines for boardwalks, steps and sand ladders

In addition to the considerations detailed in section 13.2.2 and 13.2.3 the following guidelines are specific to hard access structures in coastal areas.

Aim to minimise infrastructure in the coastal zone. Consolidate access structures in areas that are less susceptible to storm surges and general coastal processes. Take into account the latest IPCC predictions for sea level rise and plan structures to withstand these within their lifetime. Steps and boardwalks are relatively expensive to construct and maintain. It is preferable to locate them at the more protected ends of beaches where severe wave erosion is less likely.

Structures that provide access for the mobility impaired should be considered where required or

Figure 13.10 Steps encroached on by erosion were becoming unsafe and have since been removed. © Chris Sharples
appropriate, particularly for features such as viewing points and beaches.

It is important that structures comply with Australian Standards. Steps or other structures crossing Crown land, which includes all land below high water mark, require formal assessment and approval.

Adapt the design and placement to suit the site conditions. Avoid perching structures on top of dunes. Use existing blowouts and gullies for structures and avoid attempting to provide access over the foredune, as it is subject to movement and variability.

Timber is a commonly used material but new products, such as prefabricated recycled plastics are available. If using timber ensure it is durable and environmentally responsible. Hardwood boards are expensive but will outlast pine in some circumstances (depending on exposure to moisture) and are less inclined to warp and become hazardous. However quality hardwood can be hard to source; oversized pine is usually used and can last about 15 years. The durability of the timber is improved by treatment with preservative followed by surface coating.

Plan for ongoing future maintenance by establishing a maintenance regime to ensure structures are inspected regularly.

**Boardwalks and steps**

Boardwalks are useful for controlling access and protecting highly sensitive or fragile areas. Steps are useful for providing access through foredunes or down steep coastal foreshores. Steps can be completely elevated timber structures or a timber...
and gravel combination built into the contour of the land. Whilst the installation of boardwalks and steps will involve some disturbance, they minimise ongoing disturbance and erosion due to foot traffic, making them useful in high-use areas.

In areas with high visitor numbers, the boardwalk width should allow for two-way flow and have step runners (guides along the edges of the steps) to discourage walkers from deviating around the steps and causing erosion.

Protect the edges of boardwalks with scrub, jute mesh or similar materials and consider fencing alongside to encourage people to stay on the track.

Figure 13.12 Gravel and timber step design. Source: Coastal dune management: a manual of coastal dune management and rehabilitation techniques (Department of Land and Water Conservation 2001)
The risers (the vertical part of a step) can be constructed with treated timber logs or railway sleepers, with sand placed behind the timber to provide a step. Geotextile can be used to reduce potential loss of fill around steps. Anchor the risers firmly (e.g. by driving reinforcing rod or galvanized pipe through them into the ground (see Figure 13.12). Potential sea level rise and eroding beaches can create costly maintenance problems. A ‘sacrificial’ lower section on timber steps will save money, as only the lower part of the structure will be damaged by storm surges. The lower section is separate from the upper section and can be replaced. Refer to the technical drawings for steps and stairs in the Coastal management specification manual (Green Skills Inc 2010).

Sand ladders (board-and-chain)

Sand ladders are better than steps on some steep dune faces (e.g. on eroding beaches). Ladders work best if erosion is caused mainly by walkers or wind rather than waves.

Ensure board-and-chain slats are a suitable distance apart for easy walking (e.g. 150–200mm between 100mm-wide boards). As a general guide, increase the spacing on steeper slopes (e.g. on sand ladders) to make them safer to climb. Refer to the Coastal dune management: a manual of coastal dune management and rehabilitation techniques (Department of Land and Water Conservation 2001).

Sand ladders on sand-dune faces need to be flexible, so they can adjust (or be adjusted) to the changing dune profile (e.g. after storm waves). Inspect boards regularly to see whether they need lifting or replacing.
Sand ladders may not be suitable in high-use areas or where access needs to cater for a broad cross-section of the community. For example, some elderly people find it hard to walk on sand ladders and the rungs can be a trip hazard if the sand does not build up around them.

Sand ladders are suitable in situations where the level of use is causing erosion but is not high enough to warrant a more expensive structure, and in highly dynamic coastal environments where the risk of loss or damage to hard structures is too high to warrant more expensive steps or boardwalks.

**13.3.3 Viewing platforms**

Viewing platforms can be built to provide safe viewing places, while at the same time protecting sites from overuse. They can be interesting and attractive structures if they are well designed to suit the site. It is best to integrate them with existing structures such as steps and boardwalks.

Viewing platforms must be designed by engineers and constructed to the Australian safety standards so that they are not a hazard to users, and checked by an engineer after construction. They should be designed to be aesthetically pleasing, blend into the landscape, and be easy for visitors to find.

The *Coastal management specification manual* (Green Skills Inc 2010) has detailed drawings and specifications for constructing viewing platforms.

*Figure 13.14 A lookout platform of stone and gravel was built to protect a shell midden at Redbill Point, Bicheno. Source: Community Coastcare handbook (Thorp 2005).*
Case Study 13.2 Minimal impact viewing platform design

Conventional beach access construction methods can cause extensive disturbance to dune systems and the surrounding environment. In the past, heavy machinery has been used to ram poles and dig large holes for footings.

When Central Coast Council collaborated with Turners Beach Coastcare group to undertake the installation of a viewing platform at Turners Beach, environmental considerations were paramount. They ensured that the design and installation of the structure had minimal impact on the environment and integrity of the natural dune system. This was largely due to the new innovative Mega Anchor System that enabled anchors to be driven into the sand with minimal disturbance and without the need for heavy machinery.

They also incorporated fibreglass-reinforced plastic for the decking. This type of decking allows for natural movement of water, air, sunlight and sand through the structure, enabling plants to re-establish underneath, which will maintain the stability of the dune.

The platform has also been modified to cater for mobility impaired people, affording them the opportunity to view the beach.

Figure 13.15 The viewing platform at Turners Beach incorporates mesh flooring to allow water, air, sand and light to penetrate to the vegetation below. Its location on the foreshore required the installation of rock to protect the structure from wave action. Geotextile sand containers or local rock material are other options. © Justin Smith

Figure 13.16 The Mega Anchor design minimised disturbance of the dune during installation. © Justin Smith
13.3.4 Ongoing maintenance of hard access structures

Structures require regular auditing and maintenance to make sure they are in good condition. They are very susceptible to damage from wind and waves and can easily become a hazard to the public.

Carry out regular safety inspections in accordance with Australian Standards specifications. Inspect structures regularly and after heavy rain, wind, unusually high tides and storm events.

Check:

- the condition of structures
- the condition of vegetation beside the track (including weeds and diseases)
- the extent of erosion (depth and width).

Remember that structures subject to sand burial (e.g. on foredunes) will need regular lifting and adjustments to compensate for shifting sands.

Identify structures that are only used infrequently or no longer used, and consider removing them. Consult the local community and assess cultural significance before closing structures. Detailed guidelines for maintaining and closing tracks are in the *Tasmanian reserve management code of practice* (PWS et al. 2003).

13.4 Fences and other access control measures

This section deals with fences and other access control measures in coastal foreshore areas. Specialised fences can also be used to assist in dune stabilisation and this is covered in *Chapter 6 Coastal landscape management*.

Fences and other measures are often necessary to control access and protect unstable or fragile coastal soils, vegetation and wetlands from damage by people, vehicles or livestock.

Fences and other barriers such as bollards, may be installed to protect dunes, saltmarshes or wildlife habitats from pedestrians, or to confine foot and vehicular traffic to defined tracks and to stop people forming new tracks in sensitive areas. Barriers are useful to delineate car parks.

13.4.1 Legislation and approvals for fencing and access control

In addition to legislation set out in *Appendices 1 and 2* – covering coastal planning, environmental management, and natural and cultural values – assessments and approvals may be required to protect natural and cultural values.

Fences and other access control structures cannot be erected on public land without the authority of the land manager. The land manager may be the local council or DPIPW (Crown Land Services or Parks and Wildlife Service). Land managers should commit to ongoing maintenance and allocate the appropriate resources.
13.4.2 Types of access control

The types of works selected will depend on the purpose, budget and the site conditions and may include any or all of the following:

Logs, bush timber or bollards can be used to delineate areas.

Track markers made from treated pine posts with an identifying colour and/or symbol can be used along beach access tracks and may be all that is required to control access. They are much cheaper to install and maintain than fencing and have minimal visual impact. Refer to Case Study 13.1.

Very big rocks can be used to block vehicle access. Large rocks and bollards are useful for restricting vehicle access, but 4WD users have been known to remove them.

Fences can be used to control access (e.g. plain wire, wire mesh and post and rail; see Table 13.2).

Signs may be used strategically to complement other access control measures and foster sustainable behaviour. See section 13.5 Signage.

13.4.3 Bollards

Bollards can be used to manage public access by providing access for pedestrians and excluding vehicles. Consider making bollards an attractive feature by decorating them with coastal themes.

Bollards can be expensive and are most appropriate for urban or high-use areas. A simple cheaper alternative is a treated pine post.

Very big rocks are useful in less urban environments,

Figure 13.17 Large rocks and bollards can be used to stop vehicle access onto a walking track. Source: Community Coastcare handbook (Thorp 2005)
to prevent vehicle access. Refer to section 13.1.6 Controlling off-road vehicle access.

Maintain visual amenity by landscaping around bollards and other barriers.

Regular inspections and maintenance will be required to ensure barriers remain in place and are working effectively.

13.4.4 When to use fencing in coastal areas

Fencing can be expensive both to install and maintain. Regular maintenance is essential to ensure that damaged fences do not become a public hazard. Before installing fencing in coastal areas it is important to clearly identify the problem to be managed and consider whether fencing is the best option. There are other access control measures that may be less expensive and more effective.

Fencing is a useful way to keep livestock and vehicles off dunes and out of wetland and saltmarsh areas, where they can be very destructive.

It can delineate public spaces, control human access to the foreshore and keep people off sand dunes or out of vegetation.

Temporary fencing can protect shorebird nests or recently planted vegetation. It could also be used to prevent access to hazards such as eroded shorelines – in particular, steep dune faces or cliff faces changed as a result of storms. (The type of fencing required will depend on the severity of the risk.)

13.4.5 Guidelines for fencing in coastal foreshores

Fencing is a specialised task and there a number of qualified and experienced fencing contractors around. It is important to choose good quality materials and experienced contractors or staff to get the best result. Many different techniques and materials are available; the appropriate choice will be determined by the reason for the fence and budgetary constraints. Some fencing contractors offer workshops to train staff and community groups.

Planning

Ensure that land tenures have been correctly identified and, where there is more than one land manager, that agreement has been reached on the type of fence and the responsibilities for ongoing maintenance.

The installation of fencing will involve disturbance to vegetation and soil; consult specialists and identify natural and cultural values before works commence. When selecting the site, consider Aboriginal heritage values and natural values such as penguin rookeries.

Adapt the design and placement to the site conditions. Avoid unstable areas such as unvegetated dunes, cliff tops, wetland edges and potential landslip zones, unless the structures are built to protect public safety or sensitive sites. Avoid visually prominent locations (e.g. dune tops and beaches), as far as possible.

Consider the latest IPCC predictions for sea level rise when planning fencing projects and determine the level of risk of failure for the expected life span of the fence. Consider not just sea level rise but also increased frequency of storms.
Whenever possible, locate fences on the sea front well back from the highest waves; otherwise they are likely to be washed away by storms. Only fence on the seaward side of the dunes if absolutely necessary. It is important to keep people off the foredunes but fences on receding beaches will require very high levels of maintenance as they become dislodged and damaged by high tides and storm events.

It is important to allow for wildlife movement by raising the fence above the ground and using widely spaced mesh at the base of the fence. Consider also the placement of the fence to minimise impacts on wildlife movement. There are specific fencing techniques for protecting wildlife such as penguins. Refer to Chapter 10 Wildlife and pest management.

**Design**

Select the appropriate structure for the conditions. Plain wire fences are relatively cheap and easy to construct and maintain. Fencing suppliers will supply designs and costings for little or no cost. The advantages and disadvantages of fencing types used on dunes are compared in Table 13.2.

A simple drip-line fence (Figure 13.18) or even a string fence provides a psychological barrier rather than a physical barrier and can be used to protect sensitive sites. A drip-line fence is just a single wire covered in black polypipe tubing looped between low treated pine posts (75-100mm) and fastened by stapling.

**Table 13.2 Comparison of dune fence types** (Adapted from NSW Department of Land and Water Conservation 2001, Coastal dune management: A manual of coastal dune management and rehabilitation techniques)

<table>
<thead>
<tr>
<th>Fence type</th>
<th>Recommended location</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drip line</td>
<td>Along seaward side of dunes.</td>
<td>Simple and cheap. Easy to maintain.</td>
<td>Psychological barrier only.</td>
</tr>
<tr>
<td>Plain wire</td>
<td>Along access tracks where wave damage or sand burial unlikely.</td>
<td>Cheap. Simple to erect. Easy to maintain.</td>
<td>Less of a deterrent. Rusts.</td>
</tr>
<tr>
<td>Galvanised wire</td>
<td>As above.</td>
<td>Does not rust.</td>
<td>Slightly more costly. Easy to vandalise.</td>
</tr>
<tr>
<td>Wire mesh</td>
<td>Landward sides and along access tracks on medium- to high-use beaches where there is little risk of damage.</td>
<td>Height is a greater deterrent. Strong.</td>
<td>Expensive. High maintenance. Rusts. Difficult to lift.</td>
</tr>
<tr>
<td>Post and rail</td>
<td>On high- to medium-use beaches where there is little risk of wave damage or burial. Around public amenities.</td>
<td>Looks good. Strong, durable. Low maintenance.</td>
<td>Very high initial cost.</td>
</tr>
</tbody>
</table>
A simple temporary fence built from garden stakes and bailing twine or hazard tape is suitable for delineating temporary exclusion zones such as around nesting shorebirds or areas that have recently been revegetated.

**Installation**

All staff and contractors should be briefed on environmental considerations for the site and any restrictions or specific work practices that are required to protect coastal values. Provide appropriate supervision to ensure environmental standards are being met.

Ensure all machinery and vehicles are free from weeds and diseases prior to bringing them on site. If weeds and disease are present at the site then ensure that tools, boots, vehicles and machinery are cleaned at a suitable location before leaving the site. Refer to Chapter 8 Weed and disease management.

Take precautions to minimise disturbance to acid sulfate soils (ASS). A rotten-egg smell or yellow deposits when digging are likely indicators of ASS. Minimise the potential for causing sedimentation of watercourses in track design, construction and maintenance. Refer to Chapter 11 Soil management and earthworks.

Time works to avoid significant wildlife events such as shorebird and penguin breeding season where appropriate.

Figure 13.1.8 A simple dripline fence can act as a psychological barrier to keep people off fragile dune areas. © Peter Lingard.
Plant native vegetation adjacent to the fence to make it look more attractive. Over time the vegetation might provide enough of a barrier and allow for the removal of the fence.

Do not attach geotextiles to access control fences; otherwise sand will accumulate in the accessway.

If fencing in conjunction with board-and-chain accessways (sand ladders), ensure enough space is left between the ends of the boards and the fence to allow for regular lifting of the boards when they are covered in sand.
Case Study 13.3: Non-fencing access control using trail markers at Southern Beaches

The Southern Beaches Landcare/Coastcare group in south-east Tasmania was frustrated with the degradation of the foreshore due to informal tracks and encroachments affecting the dunes, headlands and cultural and natural heritage.

The group consulted broadly with the local community and worked closely with the local council and the Parks and Wildlife Service to develop a passive approach to access management. Rather than fencing off areas of the dunes, they used bollards painted in different colours and with different bird images (painted by a local artist) to denote the different tracks.

The attractive track-marking has made it easy for people to ‘stick to the track’, protecting the dunes without the need for fencing; thereby minimising infrastructure and ongoing maintenance. This low-impact solution does not interrupt peoples’ enjoyment of the beach or impede the free movement of native animals and the dynamic movement of sand.

The group wanted to give something back to the community and make it easy for people to do the right thing. The local community has embraced the track marking and appreciate the convenience of being able to find ‘their’ track home through the dunes.

The implementation of this project has reduced the ad-hoc development of tracks through the foreshore and enabled the natural regeneration of degraded areas.
13.4.6 Ongoing maintenance of fences and access control structures

Fences and other access control structures require regular maintenance to ensure they are in good condition. This is important to protect public safety and to minimise erosion and damage to vegetation. Structures should be subject to regular safety inspections in accordance with Australian Standards specifications.

- Inspect fences regularly and after unusually high tides or storm events.
- Check structures are in place and secure and not a hazard to the public.
- Fences may need to be re-strained.
- Wire fences on foredunes will usually need to be replaced in time, due to sand blasting and corrosion. Posts will be undermined and dislodged on receding beaches, due to wave action.
- Where more than one land manager/owner is involved it is important to reach an agreement for ongoing fence maintenance.

13.5 Signage

This section provides tips and guidelines for installing signs with minimal impact on coastal environments and for creating signage that conveys messages to visitors about coastal values and areas (interpretative signage). Hazard and safety signs must meet Australian Standards; their design is not covered in this manual.

Signs are valuable tools for communicating messages to visitors. A well-designed sign can persuade visitors to understand and appreciate an area and to behave in an environmentally responsible manner. Involving the local community can assist with providing local content for the sign, and may reduce vandalism.

Temporary signs are useful to help keep people off sites while work is in progress, or vegetation is being regenerated. Signs are often used in addition to fences and other structures to control access to certain sites.

When the cost of signs is spread over their expected life, they are relatively cheap compared with other forms of communication, such as brochures and face-to-face communication. However, signs do require some maintenance and will need replacing after some years.

13.5.1 Legislation and approvals for signage

Permission from the land manager will be required before installing any signs. Most local councils have a sign policy and may require formal approval before installation. Land managers should commit to ongoing maintenance and allocate the appropriate resources.

Due to the disturbance required to install signage, assessments and approvals may be required to protect natural and cultural values such as Aboriginal heritage sites. Seek specialist advice about wildlife and vegetation values and consult Aboriginal Heritage Tasmania.
Before designing a sign:

- identify the message (e.g. keep dogs away from penguin habitat)
- identify the target audience (e.g. dog owners)
- consider whether a sign is the best means of communicating your message: would other ways be better (e.g. a community meeting or distributing brochures)?

13.5.2 Uses of signs

Signs are used in coastal areas to provide instruction or direction, convey hazard or safety information and to provide information on the coastal values or interesting features in the area.

Interpretation signs are used to convey information and messages in a way that engages people’s interest. They can help people understand what is special or interesting about an area and motivate them to modify their activities for the protection of coastal vegetation, wildlife or heritage.

All interpretive, educational and information signs should be of a high quality and follow principles of good graphic design (e.g. clear, attractive layout) and readability (e.g. the size and style of the print).

Develop signs in partnership with the land manager/s to help meet their goals and to conform to their standards.

Use a sign to:

- manage access and protect coastal vegetation, wildlife or cultural heritage
- inform people about facilities, regulations and hazards
- inform people about the special features of the local area, so they come to appreciate its values
- raise community awareness and understanding about conservation projects such as rehabilitating eroded areas, and protecting nesting shorebirds
- raise the profile of agencies, and gain support for projects

Figure 13.22 Signs can provide important information and look great at the same time, like the recreational fishing limit information signs at boat ramps and popular fishing spots. © Leah Page
13.5.3 Sign installation

Ensure all planning has been done and approvals acquired. Consultation with specialists is essential to identify and protect all natural and cultural values. Many coastal areas contain important Aboriginal heritage places. Some dunes and other sandy landforms have geoheritage values. Other natural values such as threatened species or important vegetation communities, may be present.

Community groups are often interested in signage in their local area and it is important to consult with them when planning new signs. The local knowledge of local values, visitor use and particular problems can be valuable.

All staff and contractors should be briefed on environmental considerations for the site and any restrictions or specific work practices that should be implemented. Provide appropriate supervision to ensure environmental standards are being met.

Ensure all tools are free from weeds and diseases prior to bringing them on site. If weeds and disease are present at the site then ensure that tools, and workwear are cleaned at a suitable location before leaving the site. Refer to Chapter 8 Weed and disease management.

Take precautions to minimise disturbance to acid sulfate soils (ASS). A rotten-egg smell or yellow deposits are likely indicators of ASS. Refer to Chapter 11 Soil management and earthworks.

Site selection

Consider other existing signs and the overall quantity of signage in the area. Too much signage can look unattractive and puts people off reading their messages.

Where possible, place signs on existing structures (e.g. walls and poles). Before attaching signs to historic buildings, check whether this is appropriate and seek permission.

Place directional signs and warning signs where they are easily noticed (e.g. near car parks and at the start of tracks to the beach). A car park is often a good place for signs as the traffic may discourage vandalism.

Place signs about 4m away from the far side of a fence or out of reach of cars, to discourage vandalism.

Avoid placing signs above eye level, as far as possible. Signs that project above the skyline are unsightly and detract from the aesthetic qualities of natural areas. Consider the neighbours when deciding where to put the sign — if it irritates residents (e.g. by spoiling their view) they might not be respect it.

Interpretation signs do not need to be as highly visible as warning or directional signs. As a rule, place the middle of interpretation signs at the average adult hip height.

Orientation

Wherever possible place signs so that they are not facing due north, as sunlight will shorten their life.

If there is a map on the sign, orient it in a way that relates to the surrounding landscape and will make sense to viewers.
13.5.4 Sign manufacture

When planning signs, consider their design, construction, materials, durability, maintenance and compatibility with the landscape. Follow the land management authority’s requirements for sign design, materials and construction. Refer to the Tasmanian reserve management code of practice (PWS et al. 2003).

If they are well made and properly installed, signs should not require much maintenance over their lifetime. Consider the level of vandalism in the area and the level of exposure to the elements, and choose materials that will require minimal maintenance. Various materials are available – consult sign manufacturers, as technological advances are constantly providing new products.

Many manufacturers now use a combination of materials (including UV-protective coating and vandal-proof surfaces) and some offer five-year guarantees. It is often worth paying for more expensive materials of higher quality if they will last longer and need less maintenance.

Many smaller warning and directional signs are prefabricated in recycled plastic or aluminium. Routed treated timber is cheap, attractive and suitable for simple directional signs.

Signs need a durable finish or cover, backing, stand and posts. To protect the sign from wind vibration and other damage, firmly attach the panel to a rigid backplate or other flat surface. Gluing or framing the panel is better than drilling holes for bolts, because this can cause corrosion.

The best sign supports are posts made from galvanised pipe, which can be powder-coated. Sturdy treated pine posts are suitable for timber and some metal signs. Set the supports well into the ground – to a depth of a third or more of the post height.

Marine grade aluminium is best for interpretation signs near the coast. Anodised aluminium signs, which can incorporate detailed photos and images, are very attractive. They are expensive but long-lasting, and scratches don’t destroy the picture. Screen-printed signs and printed vinyl are cheaper options.

A scratch-resistant top, which can be removed and replaced if damaged, is useful if vandalism is likely to be an issue. Inspect signs regularly for damage. Unless visible damage is repaired promptly, it is likely to encourage further vandalism.

A simple design for a sign and sign shelter is available in the Coastal management specifications manual (Green Skills Inc 2010).
13.5.5 Sign design

Use colours and materials that are attractive and sympathetic to the surroundings. The old saying that a picture is worth a thousand words is especially true for signs. Attract readers by incorporating images (e.g. local photos and illustrations) that reflect their interests – surfing, fishing, boating, weather – or make the sign a work of art.

Minimise the amount of information on the sign; use the fewest possible words to convey the message. The text should be easy to read from a distance of about 5m.

The most effective messages are positive and non-threatening. If people know why they are being requested to do or not do something, they are more likely to cooperate.

Consider colour-blind people, particularly when designing maps (e.g. do not use red text on brown/green backgrounds).

Signs about management issues (e.g. no driving on the beach, no camping, day use only, no fires) should be short, simple and easy to understand. The widely understood international pictograms are useful for conveying these messages to non-readers.

Ensure roadside signs comply with the state-wide Integrated visitor information system. (Graham & Associates and HMT Planning 1999).

13.5.6 Ongoing maintenance of signs

Create an inspection and maintenance schedule for all signs.

Check structures are secure and not becoming a hazard to the public. Signs that are damaged or no longer needed should be removed, unless they have historic value.

Clean up vandalism and contact the manufacturer if replacement parts or cover plates are required.

Figure 13.24 A sign at Park Beach encourages people to respect the area. The sign incorporates work by local artists and is placed so as not to obstruct the view of the surf from the car park. © Leah Page

Figure 13.25 Signs can be a work of art like this bird sign at Medeas Cove in St Helens. Source: Community Coastcare handbook (Thorp 2005)
**13.6 Tools and resources**

Complete details of all printed publications listed here are provided in a reference list at the end of the Manual. Other tools and resources including websites are collated in Appendix 5.

**Aboriginal Heritage Tasmania**

Desktop searches for Aboriginal heritage sites


**Coastal Values data**

Vegetation, species habitat and geomorphic values data for a 100m-wide coastal strip of the northern, southern and north-western Tasmania NRM Regions. Available on the LIST


**Foreshore values mapping**

Provides baseline information on the condition of foreshores and identifies pressures for measuring impacts on key marine and coastal ecosystems. Available on the LIST


Indicative mapping of Tasmanian coastal vulnerability to climate change and sea level rise (Sharples 2006)

**Natural Values Atlas**

Provides authoritative, comprehensive information on Tasmania’s natural values. To access, download a free registration form from the website


**Smartline or coastal vulnerability maps**

Maps of coastal landform types and their vulnerability to sea level rise can be found under ‘Climate Change’ layers on the LIST and the OzCoasts website. The data is presented as a ‘smart line’ following the coastline, with information on the geology of the coast readily interpreted for particular coastal areas.


[www.ozcoasts.org.au](http://www.ozcoasts.org.au)
Roads, vehicle tracks and car parks

Acid sulfate soils
Predictive maps of possible acid sulfate soil occurrence
www.thelist.tas.gov.au/

Austroad publications
Available for download from the Austroads website. Registration is required to download these products. Registration and products are free.
http://www.onlinepublications.austroads.com.au

• Austroads 2003, AP-G1/03: Rural road design—A guide to the geometric design of rural roads (8th edn).
• Austroads 2003, AP-R217/03: Environmental considerations for planning and design of roads + reference CD ROM.
• Austroads 2003, AP-R180/00: Road runoff & drainage: Environmental impacts and management
• Austroads 2003, AP-R185/01: Environmental risk management guidelines and tools for road projects
• Austroads 2003, AP-R232/03: Guidelines for treatment of stormwater runoff from the road infrastructure

Forest practices code (Forest Practices Board 2000)

Road classifications, geometric designs and maintenance standards for low volume roads (Guimmarra 2001)

Transport Tasmania
Roadworks specifications, Road hazard management guide, and Technical advice sheets
• Roadworks specification R75 – Environmental protection
• Roadworks specification R76 – Roadside maintenance
• Roadworks specification R34 – Drainage maintenance (August 2003)
www.transport.tas.gov.au

Tracks and trails

Australian Standards
• AS 2156 Part 1 Walking tracks. Classification and signage
• AS 2156 Part 2 Walking tracks. Infrastructure design
• AS 1428.1 – 1428.2 Design for access and mobility
• AS/NZS ISO 31000:2009, Risk management - Principles and guidelines
Replaces AS 4360-2004 Risk management as the leading resource for risk management.

Austroads
AGRD06A/09 Guide to traffic engineering practice Part 6A - Pedestrian and cyclist paths
Available for download from the Austroads website. Registration is required to download these products. Registration and products are free.
http://www.onlinepublications.austroads.com.au
International Mountain Biking Association trail difficulty rating system

http://www.imba.com/resources/freeriding/trail-difficulty-rating-system

Tasmanian reserve management code of practice (Parks and Wildlife Service et al. 2003)

Track infrastructure design manual (Hobart City Council, in prep)

Track maintenance manual (Hobart City Council, in prep)

Trail planning guidelines: Guidelines to assist with the planning, design, construction and maintenance of sustainable recreational trails in Tasmania (Sport and Recreation Tasmania, in prep)

Trails Tasmania strategy (Inspiring Place Pty Ltd 2007)

Improving recreational trail opportunities and preparing inventory of existing trails


Hard access structures, fencing and access control

Coastal dune management: A manual of coastal dune management and rehabilitation techniques (NSW Department of Land and Water Conservation 2001)

Coastal management specification manual (Green Skills Inc 2010)

Tasmanian reserve management code of practice (PWS et al. 2003)

Wallaby proof fencing: A planning guide for Tasmanian primary producers Statham & Statham 2010)

Guidelines for excluding wildlife with fencing, but also includes features such as wombat gates for allowing wildlife access.

Signage

Australian Standards

• AS 2156 Part 1 Walking tracks. Classification and signage
• AS 2899.1-1986 Public information symbol signs – General information signs

Draft sign manual (Parks and Wildlife Service 2000)

Sign manual (Angel & McArthur 1995)