Handbook for Design and Operation of

Rural and Regional Transfer Stations




Department of **Environment and Conservation** NSW

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Contents

Abbreviations

AS	Australian Standard
BSC	Ballina Shire Council
CSC	Cowra Shire Council
DA	Development Application
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A	Environmental Planning and Assessment
GIS	Geographic Information System
GTCC	Greater Taree City Council
HHW	Household Hazardous Waste
KSC	Kempsey Shire Council
LEP	Local Environment Plan
LGA	Local Government Area
MRF	Materials Recovery Facility
MSC	Maroochy Shire Council
NSW	New South Wales
OH&S	Occupational Health and Safety
POEO	Protection of the Environment Operations
REF	Review of Environmental Factors
REP	Regional Environmental Plan
RRC	Resource Recovery Centre
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
TPA	Tonnes per Annum
VENM	Virgin Excavated Natural Materials
WMC	Waste Management Centre
WMF	Waste Management Facility
WWCC	Wagga Wagga City Council

Disclaimer

This Handbook is intended to assist in the design of transfer stations to maximise the efficient operation of the facility and maximise resource recovery. It does not constitute legal advice on any issue, or provide any advice or inference regarding regulatory compliance. Councils and other users should seek and rely on their own advice in relation to issues such as environmental licensing Occupational Health and Safety and planning approvals in relation to specific facilities. The Department accepts no responsibility for errors or omissions in the Handbook or for any loss or damage arising from the use of the Handbook.

Preface

Councils participating in the development of this Handbook provided candid comments on the planning and operational issues that have needed to be addressed in development, commissioning and ongoing operation of transfer stations in their areas.

Each of the Councils have their own systems in place to monitor performance and occupational health and safety issues at their facilities. These highlight some of the unique challenges inherent with operating transfer station facilities which are an important element in rural and regional waste management and resource recovery systems. This document records these challenges and the experiences of numerous Councils in responding to these challenges. It also showcases some of the innovative and pragmatic solutions adopted by rural and regional councils with limited financial resources.

Each of the Councils who participated in the development of this handbook is committed to continuous improvement of their internal management, safety, and quality assurance processes.

1. Introduction

1.1 Overview

This Handbook has been formulated to assist local Councils (and others) that wish to develop resource recovery and/or waste transfer facilities in rural and regional areas in New South Wales (NSW).

The Department of Environment and Conservation (NSW) Sustainability Programs Division commissioned this Handbook with the objective of providing council officers and the consulting industry with a resource and tools to design and operate transfer stations for their particular application, drawing on the successful experiences sourced from other councils.

Whilst guidelines have been developed by other agencies that provide advice and guidance on construction and operational issues associated with transfer station design and operation, this Handbook seeks to provide further practical information based on real-life examples of existing facilities.

This Handbook includes:

- A catalogue of examples of existing transfer stations and recovery facilities;
- Recommended design principles for a number of generic facility categories;
- Example facility layout plans and/or schematic diagrams showing material flows and operational aspects;
- Recommended facility operating principles and practices, including occupational health and safety (OH&S), environmental management and local community engagement; and
- Estimates of construction and operational costs to assist councils budget for capital and recurrent expenditure.

1.1.1 What is a transfer station?

Transfer stations play an important role in a community's total waste management system, serving as a link between a community's solid waste collection program and a final waste disposal facility.

While facility ownership, sizes, and services offered may vary significantly amongst transfer stations, they generally all allow for:

- Recovery of a variety of resources from the local community; and
- Consolidation of waste from multiple sources (including collection vehicles and self-haul trailers) into higher-volume transfer vehicles for more economical transport to disposal sites.

Increasingly, transfer stations play an important role in the overall waste management infrastructure network by providing means of consolidating and managing recyclables and waste. This is particularly important in rural and regional areas where efficient transport logistics determine the overall feasibility of providing waste and recovery services.

In its simplest form, a transfer station is a facility with a designated receiving area where waste collection vehicles and/or small self-haul customers discharge their waste. The waste is then loaded into larger vehicles (eg: transfer trailers) for long-haul transport to a final disposal site (typically a landfill, treatment facility, materials recovery facility (MRF), or reprocessing plant).

Ideally, there is no long-term storage of materials at a transfer station. Waste and recyclables are consolidated and loaded into larger vehicles for movement off site. The speed at which this is done largely depends on whether the facility is a rural or regional site, since the regional facilities are likely to be serviced more often than the rural facilities.

1.2 Handbook objectives

The intent of this Handbook is to promote best practice in the design and operation of rural and regional transfer stations and resource recovery facilities in New South Wales.

This Handbook will assist users identify the steps required in order to plan, design, construct and operate a rural or regional transfer station facility. Each of these steps occurs at various stages of the overall planning and development process. An overview of key project stages and steps as considered in this Handbook is provided in Table 1.

1.3 Who should use the Handbook

This Handbook can be used by stakeholders involved in the establishment, operation or management of resource recovery and waste transfer facilities including:

- Those involved in planning, siting, design, construction and operation;
- Operators, managers, equipment suppliers and contractors ; and
- Local communities that use or accommodate these facilities.

1.4 How to use the Handbook

In this Handbook:

- There is a step-by-step outline for all key stages involved in the development of a transfer station from the initial identification and need for the facility, through to its design, construction, and operation;
- Chapters are structured so that the user can easily read chapters of interest only; and
- Key principles and ideas for each development stage are linked to real-life case studies and examples.

Checklists are included in Chapter 11 of this document that may be used to assist ensure that all key steps and project stages have been considered (and allowed for as required) before embarking on the development of resource recovery or transfer station facility.

1.5 Acknowledgements

GHD and the NSW Department of Environment and Conservation would like to thank the many NSW Councils and regional waste management groups that assisted in the preparation of this document.

Special thanks to Councils and organisations that provided advice and examples of existing and future transfer stations that have been used as case studies, namely:

- Ballina Shire Council
- Bathurst Regional Council
- Blayney Shire Council
- Cairns Water
- Clarence Valley Council
- Cooma Monaro Shire Council
- Cowra Shire Council
- Greater Taree City Council
- Hastings Council
- Kempsey Shire Council
- Maroochy Shire Council (QLD)
- Orange City Council
- Snowy River Shire Council
- Wagga Wagga City Council and
- Wingecarribee Shire Council.

Table 1. Key steps and processes at each stage of planning, development and operation

Stage	Steps and Processes
Project Drivers	• Determine the reasons for developing a transfer station and/or combined resource recovery facility. • Undertake a project needs assessment.
Planning and Development	• Undertake a site selection assessment process incorporating factors such as: > Planning requirements; > Area of land required; > Buffer distances required; and > Applying these in the context of any local and unique features of the site • Identify community consultation requirements including: > Reasons and/or need for consultation processes; > Appropriate level of consultation; > Timelines for consultation activities; and > Associated costs. • Understand the planning approval process. • Incorporate the above into risk assessment, design, construction and operational aspects of the development.
Risk Assessment	• Understand of the two main types of risk assessment including: > Financial risk assessment; and > Operational risk assessment. • Undertake these risk assessments during the design phase of the development.
Design and Construction	• Analyse alternative options for site layout incorporating factors such as: > Design for size/throughput; > Requirements for supervised/unsupervised sites; > Design for OH&S considerations; > Materials handling; > Design for flexibility; > Implementation of appropriate environmental controls; > Cost; > Design to maximise resource recovery; and • Consider data management systems (weighbridge versus no weighbridge) in design.

Stage	Steps and Processes
Design and Construction	• Decide on the types of structures that can be used for a transfer station including: > Enclosed structures; and > Open structures. • Incorporating flexibility into the design and construction of the facility including catering for: > Population growth; and > Geographics and topography. • Understand the type and frequency of supervision that may be required for the construction phase. • Determine key milestones for the construction period. • Prepare and identify an interim (or temporary) transfer facility whilst the new facility is under construction; and • Management of traffic and noise impacts.
Operation	• Understand and plan activities related to the day to day operation of the site including; > Housekeeping; > Staff training; > Environmental management controls; > Ongoing promotion of occupational health and safety; > Community education; and > Scavenging and material recovery.

2. Project Drivers and Needs Assessment

2.1 Background driving transfer station development

2.1.1 Solid waste management

There is a nationwide trend in solid waste disposal towards the construction of large regional landfills rather than maintaining small, rural, and often unsupervised landfill sites. The move towards having fewer but larger engineered landfills with increased environmental controls and opportunities for improved resource recovery is aligned with current waste management and environmental legislation in NSW.

There are increasing regulatory and social pressures on local councils to meet more stringent environmental and social criteria. However, it is often not economically viable for rural Councils to upgrade existing landfills to meet these requirements. When Councils are faced with this situation a number of scenarios are common. These are outlined below:

- Council closes smaller landfill sites but upgrades one landfill (normally the largest in the local area) to meet environmental requirements.
- Council may then also decide to build a transfer station at the remaining landfill site with the intention to keep small vehicles away from the active tipping area and to implement increased resource recovery activities.
- In the instance where there is insufficient land available at the landfill site, Council may opt to build a new transfer station on new land (a Greenfield site) that may already be owned for Council or that may be acquired by Council for this purpose. In this situation small vehicles may not be permitted entrance to the landfill site at all.
- Council closes all landfills and constructs a new transfer station on either an old landfill site or at a Greenfield site in order to transport waste to a larger regional landfill.
- Council closes all existing landfills and constructs a new fully engineered landfill with required environmental controls.

The cost of building a new landfill may be significantly more than the cost of upgrading an existing landfill or electing to close all sites and construct one or more transfer stations. This is because construction of a new landfill to meet the design, operating and monitoring requirements, significantly adds to construction, operating, closure and post-closure monitoring costs.

In addition to regulatory requirements, public opposition can make siting a new landfill near population centres difficult. Communities may also be unsupportive of meeting the costs associated with upgrading an existing landfill or construction a new landfill, and therefore can place additional pressure on Councils to close existing facilities and look for alternatives.

2.1.2 Role in improving resource recovery

As well as providing a service for solid waste disposal, transfer stations play an important role in improving the viability of recovering recyclable and reusable materials from rural and regional areas.

In rural and regional areas, an economically viable solution to providing resource recovery services may be to consolidate materials from smaller towns and villages for more efficient transport to regional reprocessing facilities. In such cases, a transfer station serves as the critical link, as materials are consolidated before transport, making it more cost effective.

2.1.3 Opportunities for Regional co-operation

To further improve the viability of resource recovery from rural and regional areas, consideration should be given to broader resource recovery networks, regional strategies, transport economics/logistics and potential for regional co-operation.

Identification and investigation of opportunities for regional co-operation is encouraged when assessing the drivers for transfer station development. Regional co-operation can assist to develop a more affordable waste infrastructure network that meets the needs of the wider community. This in turn provides greater financial, environmental, and social incentives for the development of efficient services for recovery of resources from rural and regional areas.

2.2 Feasibility and Needs Assessment

The purpose of a needs assessment is to determine the current and future waste management requirements of the region and to determine if a transfer station will be supported and a viable option for a community.

A needs assessment for the potential development of a waste transfer station or resource recovery facility can be used to:

- Determine what types of wastes and recoverable materials should be accepted;
- Quantify the tonnage or volume of each type of waste and recoverable material;
- Consider potential growth rates in the region and the impact on future requirements for waste management;
- Examine the potential environmental, social, and financial impacts of the proposal under various scenarios (for example reduced waste generation compared to present, increases in required transfer distances due to the closure of the regional landfill, cost of construction and operation where only certain types of materials are accepted at the proposed facility); and
- Compare the predicted impacts for potential waste management options other than construction of the proposed facility (for example long-haul to the nearest landfill without an intermediate transfer point).

The outcome of the needs assessment should be the basis for a decision to either support or reject the development of a transfer station/resource recovery facility. A needs assessment should therefore always be conducted before any further steps are undertaken.

Note: *Important information collected during the needs assessment process (including the types and quantities of materials for acceptance/transfer/processing) should be considered in the later stages of development including the specification of design criteria for waste infrastructure. See Chapter 8 for further detail of how this information can be used.*

2.2.1 Why use waste transfer stations?

The main reasons for using a transfer station are:

- To improve the viability of resource recovery; and
- To reduce the cost of transporting waste and recyclables to disposal and reprocessing facilities.

Consolidating smaller loads from collection and self-haul vehicles into larger transfer vehicles reduces haulage costs by enabling collection crews to spend less time travelling to and from more distant disposal sites and more time collecting waste. This also reduces the associated vehicle maintenance costs, as well as overall traffic, air emissions and road wear and tear.

Transfer stations service the needs of a specific local community, but also play an important role in the overall infrastructure network for waste and recyclables management. Transfer stations may also be used to facilitate regional approaches to resource recovery and waste management.

Compared to landfill facilities, transfer stations also provide:

- A safer facility for small vehicles to access and use;
- A cleaner and more pleasant facility for customers to use;
- A chance for waste to be screened prior to disposal so that;
  - > Increased recyclables can be separated from the waste stream; and
  - > Permits identification of wastes that are inappropriate for direct landfill disposal (including hazardous wastes, batteries, whole tyres, etc);

- Flexibility in selecting waste disposal options; and
- Increased convenience for customers since transfer stations can be located closer to town than the traditional landfill disposal facilities.

2.2.2 Is a waste transfer station right for your community?

Deciding on whether the development of a transfer station is the most appropriate strategy for a community should be based on an assessment of environmental, social and economic factors. In undertaking this assessment, the potential for regional co-operation should also be considered.

To assist in making this determination an assessment may be undertaken by in-house Council staff utilising local knowledge and experience where available. Alternatively, the services of a third-party consultant may be used where necessary.

External consultants are familiar with both the technical and regulatory issues that must be addressed in developing a successful waste transfer station. They are also able to undertake the required financial, social, and environmental analysis with a report provided to summarise the potential extent of these impacts.

Regardless of whether the assessment is undertaken in-house or by an external contractor (or combination of both) – it is then up to Council to determine if the potential impacts are acceptable (and to proceed with the development) or if alternative waste management strategies should be considered.

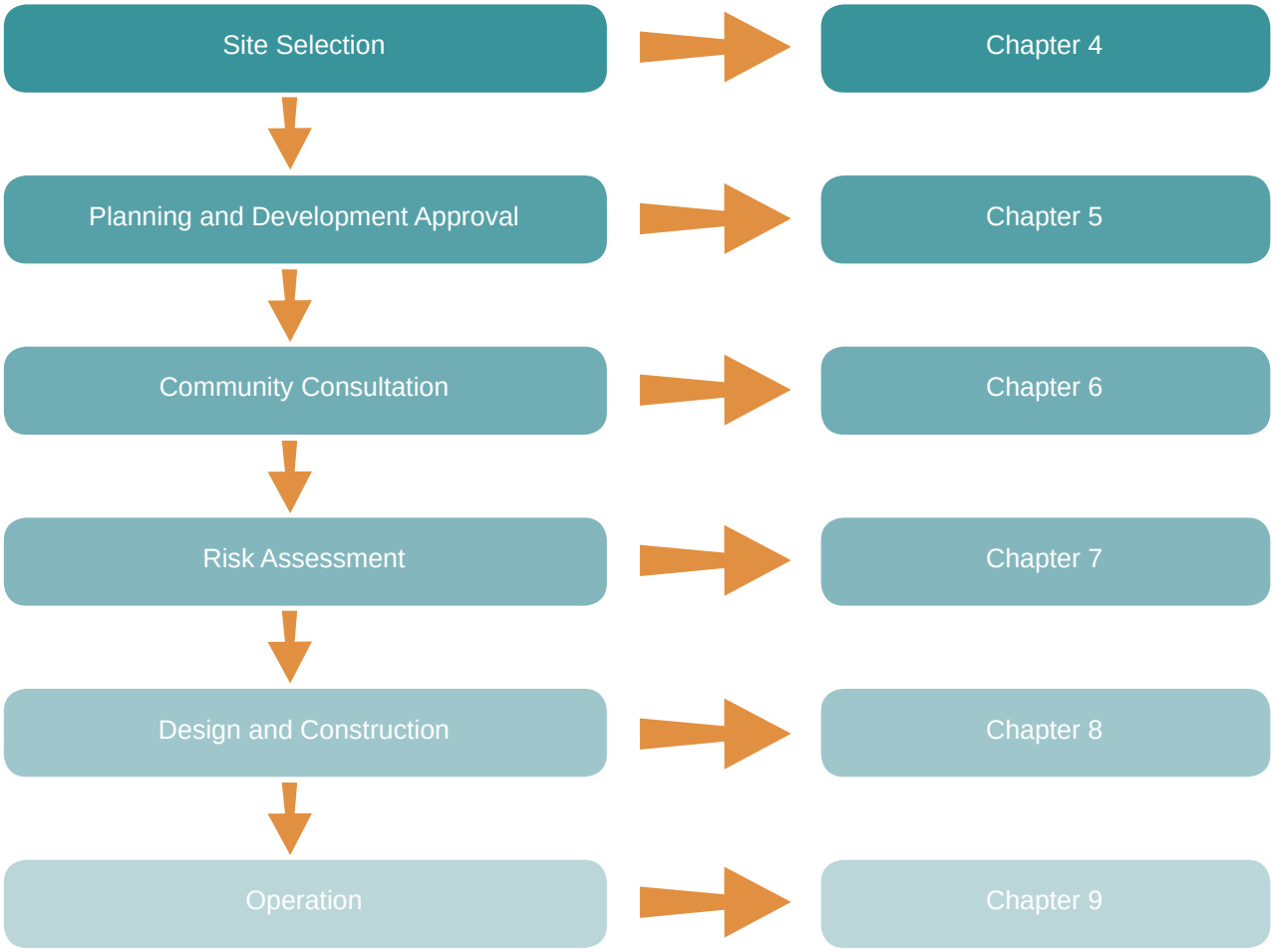
Table 1 lists factors that may be considered in assessing if a transfer station is right for your community.

Table 2. Factors for consideration when assessing the need for a transfer station

General Area	Issues
Environmental	Potential savings in landfill air space and increased resource recovery from the operation of a transfer station. Other possible environmental benefits from operation of a transfer station as compared to other alternate waste strategies. For example improved protection of ground and surface water quality from reduced reliance on small landfills. Distance waste and recyclables would need to be hauled – do additional transport impacts offset potential environmental benefits from a reduction in waste to landfill?
Social	Impact on level of service provided to the community. Impact on communities surrounding the proposed transfer station site. Comparison of social impacts associated with alternate waste strategies. Potential flexibility of transfer station design to meet community requirements for waste and recyclables acceptance and management both now and in the future. Probable growth areas and future requirements for resource recovery from these areas.
Economic	Community willingness and capacity to pay – impact on domestic waste management charges and gate fees. Financial risk from changes in assumed construction and operating costs. Future financial risk from possible changes in haulage distances and materials disposal/processing costs. Comparison of estimated financial costs and risks associated with alternate waste strategies. Possible long-term savings from extension of remaining landfill life at regional landfill sites (due to increased recovery and separation of wastes at transfer stations).
Potential for regional co-operation	Opportunities for regional strategies and co-operation and the impact of this on potential service viability including impact on transport logistics. Future waste infrastructure requirements on a local and regional scale.

3. Planning and Development Process

After determining a need for the development of a transfer station there are a number of key project planning and development stages that should be allowed for. These stages can be considered as follows:



Refer to the relevant Chapters as indicated above for further information about each of these key project stages. Checklists are provided in Chapter 11 to assist Councils to confirm that key issues from each of the above project stages have been considered.

4. Site Selection

4.1 Overview

Identifying a suitable site for establishment of a waste transfer station can be a challenging. It is therefore useful to undertake a transparent site selection process to determine an appropriate site for development.

Criteria used in the assessment should include technical, environmental, economic, social and political factors. Criteria in each of these areas should be considered in order to ensure a balanced approach to identification of a preferred site. Criteria may be weighted to reflect the perceived relative importance of particular local concerns (for example protection of the local environment) or project objectives (for example maintenance of costs below a certain level).

These issues can be demonstrated more clearly through examples. A site may be large enough to accommodate all required functions and possibly future expansion, but might not be located central to the area where the waste is generated. Another example is that sites with extensive buffer zones may not be available in more suburban areas of regional centres. Sites considered less than ideal in terms of technical criteria (say due to lack of existing services and utilities), may still be the best option when considering overall transport, environmental, and economic considerations.

An additional set of issues that must be addressed relates to public concern or opposition, particularly from people living or working near the proposed site. The relative weight given to each criterion used in selecting a suitable site will vary by the community's needs and concerns. Whether the site is in an urban, suburban, regional or rural setting will also play a role in the final site selection.

It is important that a site selection identification and assessment process be undertaken for any planned transfer station development. To assume that locating a transfer station on a former landfill site is the best site choice without a rigorous assessment process could result in a number of issues at later stages of development and operation.

4.2 Equality considerations

During the site selection process, steps should be taken to ensure that siting decisions are not imposing a disproportionate burden upon low-income or minority communities groups. This means not overburdening a community with negative impact facilities that can create various environmental and health and hence quality of life concerns.

These are just a few of the reasons equality needs to be considered when selecting a site for a waste transfer station. It should also be noted that this concern could be more relevant in larger cities; although it can also become a problem in larger regional centres.

4.3 Community consultation

A siting process that includes community consultation is integral to developing a transfer station. The local community must be a legitimate partner in the facility siting process to integrate community needs and concerns in the decision-making process. The consultation process can also build good communication and trust between Councils and local communities. Further detail on the community consultation process is provided in Chapter 6.

4.4 Siting criteria

Criteria should be developed for identifying and evaluating potential development sites. These criteria may be derived from community consultation sessions, environmental requirements (for example minimum buffer distance), as well as from specific Council requirements. Broadly speaking, criteria should be specified for planning, technical, environmental, and community and social concerns. Examples of relevant criteria include those listed in Table 3. These criteria are outlined further in the following sections of this Chapter.

Table 3 Example of site assessment criteria

Category	Criteria
Planning	• Appropriate zoning • Land ownership • Available buffers • Not in an environmentally sensitive or inappropriate area
Technical	• Integration with existing and future waste network • Opportunities for Regional co-operation • Centrality • Accessibility • Existing services and utilities • Size of area required
Environmental	• Geology • Groundwater • Surface Water • Ecology • Visibility • Traffic • Topography • Noise • Dust • Odour • Amenity
Community and Social	• Environmental Impacts • Social Impacts

Each site can also be assessed on a regional, local and site level (see the Orange HUB Case Study in Chapter 29). Undertaking a regional based assessment however may not be applicable for many smaller rural sites.

It is important that siting criteria be developed before identifying potential transfer station sites. This will help to ensure that the assessment is unbiased. It should be understood that a site might not meet all criteria, in which case each criterion's relative weighting and importance should be considered.

4.5 Planning

4.5.1 Zoning

It may be preferable that the site is located in an area of permissible zoning. This can reduce the time required to complete the relevant planning and approvals processes. However, this shouldn't discount the possibility of rezoning if essential economic and social analysis indicates it to be a preferable option.

4.5.2 Cluster zoning

Siting waste transfer stations exclusively in areas where their development is permissible with consent, for example in an industrial zone[1], can lead to a condition known as 'cluster zoning'.

By having restrictive zoning, transfer stations are naturally pushed into a few areas. Some industrial zones have 'waste management facilities' as one of the prescribed usages, which can reduce planning and development process time.

However, clustering of industrial facilities may have negative impacts on neighbouring residents, such as increased traffic, noise, odour and litter. These issues however need to be addressed at the local planning and development level of Council to ensure overall equity for the community.

4.5.3 Environmentally sensitive or inappropriate areas

Federal, state or local planning instruments and environmental regulations may prohibit siting a waste transfer station in sensitive areas. In the case where it is allowed, special engineering design and construction techniques may be required which subsequently incur additional costs.

Development in environmentally sensitive areas is likely to attract strong community opposition and it is best to avoid siting waste and recycling facilities in these areas wherever possible. An area that would be considered as *'environmentally sensitive or inappropriate'* may include a site within 250 metres of an area of significant environmental or conservation value identified under relevant legislation or environmental planning instruments including:[2]

- National parks;
- Historic and heritage areas, buildings or sites protected under the Heritage Act or National Parks and Wildlife Act or areas on the register of the National Estate;
- Areas covered by a conservation agreement or identified as a critical habitat under the Threatened Species Conservation Act;
- Areas zoned under a LEP or REP for environmental protection purposes, eg: high conservation, scenic, scientific, cultural or heritage; and
- Other areas protected under the National Parks and Wildlife (NP&W) Act, Crown Lands Act, Fisheries Administration Act or any other legislation.

Inappropriate areas may also include prime agricultural land, wetlands, floodplains parks and reserves.

Waste transfer stations are in some cases built on former landfill sites. Where it is the case that a former landfill site is poorly located (for example on a floodplain or adjacent to a waterway), construction of a transfer station may still occur on the site provided no feasible alternatives exist, appropriate environmental controls are included in the design, environmental risks are acceptable to the appropriate authorities, and the relevant planning and development approvals can be obtained.

4.5.4 Buffers

Buffer distances are required to minimise impact on surrounding areas. Even if located within an appropriately zoned area where development is permissible, ideally the site should not be located less than 250 metres from the nearest residence or sensitive receiver not associated with the facility (such as a dwelling, school, or hospital).

The distance between the transfer station, residential properties and sensitive receivers should be maximised where possible. This would assist control potential noise, odour, and traffic impacts from the proposed development and thus reduce the likelyhood of opposition from the local community. Hence choosing a site that is further away from residential properties is also likely to result in less opposition from the local community.

Other than physical distance there are various other forms of buffers that can assist to minimise impacts including those that are natural and those that are constructed. These should be incorporated into the site layout at the design stage of the project. Natural forms of buffers include open spaces, trees and shrubs and constructed forms include landscaping and walls.

[1] This is provided an example only. Council's should check all relevant planning instruments to determine permissibility of proposed developments within designated land use zones.

[2] Based on 'Landfilling EIS Guidelines' Department of Urban Affairs and Planning (1996).

4.5.5 Land ownership

The preferred location for establishment of a new facility may be on a site already owned by Council. This would reduce costs associated with land acquisition and may also reduce the overall timeline for planning and development as sales negotions (for land) would not be required.

4.5.6 Use of technology to assist in site selection

Computer geographic and graphical programs can be used to assist in identifying an appropriate site. It is useful to map each of the exclusionary constraints (based on planning and environmental instruments and regulations) to enable communities to visualise clearly and easily which areas are inappropriate.

Geographic Information Systems (GIS) are a useful way to do this since the data is electronic and overlays can be applied to view possible areas for the site. Councils normally have in-house specialist GIS and planning development officers that could undertake the required data collection and mapping.

4.6 Technical

4.6.1 Integration with existing and future waste network

Following from the initial feasibility and needs assessment, an assessment of the potential for the site to be integrated into the existing and future waste network should be carried out. This should assess the extent to which the new facility (waste transfer station and/or resource recovery facility) will complement the existing waste network. The main points to be considered in this assessment include:

- Would the facility be located to service remote areas with no access to kerbside collection or other waste and recycling services?
- Would the facility be located at the site of a former landfill to provide an ongoing waste service to the local residents of that area following landfill closure?
- Would the construction of the facility in the proposed site assist in increasing the efficiency of waste service provision?

4.6.2 Opportunities for Regional co-operation

To improve the viability of resource recovery from rural and regional areas, consideration should be given to broader resource recovery networks, regional strategies, transport economics/logistics and potential for regional co-operation.

Identification and investigation of opportunities for regional co-operation is encouraged at the early planning stages and as part of the site selection process. Regional co-operation can assist to develop a more affordable waste infrastructure network that meets the needs of the wider community. This in turn provides greater encouragement for the development of efficient services for recovery of resources from rural and regional areas.

4.6.3 Centrality

Assessment of centrality differs to the criterion outlined in Section 4.6.1 because the objective of this assessment is to select a site for the facility that is located a reasonable travel distance from the various sources of waste as well as other waste infrastructure for mixed waste disposal or reprocessors for recyclables.

The ‘reasonable’ travel distance can be calculated based on the volume of waste received from each major waste source and economic transport distances. Consideration should also be given to probable growth areas.

The location of the transfer station must also take into account how far residents will need to travel to access the facility. This is an important question to which there is no one single best answer. Residents in remote areas may be willing to travel further than residents in regional areas to access waste facilities as they are used to travelling long distances to access particular services. However, where there are a number of residents in a remote area, Councils may need to consider having one or more remotely located facilities to service smaller communities. Determining an ‘acceptable’ distance for residents to travel should be undertaken in consultation with the affected communities.

4.6.4 Access

Transport to the site, particularly for large transfer vehicles, should ideally be confined to access via main and/or secondary roads in order to minimise impacts on residential areas, smaller rural roads, and to minimise the need for additional road upgrades.

The site should not be constrained (ie: have a high risk of being inaccessible) by seasonal variants such as flooding. Where possible, a site located on a terminating road is preferred. Or if on a continuing road, there should be some form of traffic control device (or allowance to permit the future construction of such devices) to allow for traffic to both enter and leave the area in a safe manner. For example, it would be undesirable to locate a facility off a main highway if there was only a single-lane running in either direction and no space to permit the construction of a designated turning lane off the main road.

4.6.5 Utilities and services

For regional facilities it is preferred for the site to have existing access (or be able to obtain access with relative ease) to utilities and services such as water, electricity, sewerage which otherwise cost significant amounts to establish.

At smaller rural facilities however, connection to the electricity grid or main town water supply may not be necessary, particularly where the site is only open a limited number of hours per week. In these cases the use of portable infrastructure such portaloos (for example as in use at the Blayney transfer station, see Chapter 31), generators, and rainwater tanks may be used.

4.6.6 Land area required

The area required for specific transfer stations varies significantly, depending on the:

- Volume of each waste type to be transferred;
- Rates at which waste will be delivered to the site and removed from the site;
- Functions to be carried out on site (for example use solely for waste transfer operation or additional sheds to be provided to house Councils collection and service vehicles, stockpiling of recyclables such as garden organics and concrete for crushing and shredding);
- Size and type of vehicles that will be accessing the site; and
- Types of customers the facility is intending to serve.

Locating a site of sufficient size is critical to operating efficiencies and minimising impacts on the surrounding community. Engineering input can establish preliminary size criteria based on conceptual design.

Sufficient space for onsite roadways, queuing and parking is necessary at a transfer station. The space required largely depends on whether there will be commercial and small vehicles permitted on site or whether the site just permits small vehicles. If the site is going to permit both types of vehicles then allowance needs to be made in the road design for sufficient road width and appropriate gradients/curves to ensure safe and efficient manoeuvring of large and long vehicles.

Allowance for future expansion is another important factor when considering the land area required. This may mean allowing for an increase in waste to be received (due to increased population or economic activity) or may include allowing for additional resource recovery facilities to be implemented in the future. In either case, planning for future expansion is a key factor in choosing a site. Having sufficient area available can increase operating efficiency and result in significant future cost savings due to not needing to relocate the facility and being able to increase the throughput at the site if required.

Space for resource recovery activities and for community education facilities is another factor to be considered when choosing a site. The transfer station itself in many cases is only one part of the entire site operation. Activities such as mulching/composting, metal recycling, reuse centres, and

community education centres can also be located at the site. Making allowances for these activities is important to ensure that roads and infrastructure on the site are planned in a way that optimises the use of the particular site without the need to restructure when expansion is required.

4.7 Environmental

Note: *many of the issues listed below which are suggested to be considered in the site selection process are those that would also need to be considered in a detailed EIS process. Preliminary examination of these issues at the initial site selection stage will therefore assist in selecting a site that will have reduced (or at least manageable) environmental impacts.*

4.7.1 Land use

The facility should be located at a site where the facility operations are compatible with surrounding land uses. This is largely controlled through zoning requirements as outlined in Section 4.5.1.

4.7.2 Geology

When choosing a site it is important to consider the local geology before proceeding. The site should also be geologically stable and minimise potential for groundwater pollution. This is particularly relevant for Greenfield sites.

Where a transfer station is to be potentially located on a former landfill site, consideration should be given as to the additional cost of design, construction, and maintenance of the facility as a result of the former landfill activities. For example potential ground movement and landfill gas generation.

4.7.3 Groundwater

The site chosen should minimise the potential to pollute any groundwater resource, in particular important resources currently in use (or known but yet to be developed).

4.7.4 Surface water/erosion potential

It is important to find out whether the potential site is within an identified drinking water catchment including areas that are within the vicinity of groundwater bores (that are able to be used for drinking water).

4.7.5 Ecology

The selected site should ideally require minimal clearance of natural vegetation for development.

4.7.6 Visibility

Sites should be assessed considering the potential visibility of the proposed transfer station and resource recovery facility from the nearest resident or road. Some sites may have ample opportunity to permit a facility to be well screened due to other existing structures or natural landforms. Where this is not the case, there may be opportunities to reduce visibility through the use of buffers, landscaping, or enclosed sheds (see the Cowra case study, Photo 27.1, for an example of good visual screening from the main access road using landscaping).

It is important that any proposed facility is located and designed such that it is not an unacceptable eyesore to the surrounding community.

Visibility may not be considered a particularly relevant criterion to include in the site selection assessment where the transfer station is to be located in a very remote area with a low population.

4.7.7 Traffic

Generally there are a number of peak periods experienced by transfer stations and/or resource recovery facilities:

- Small vehicle customers generally peak from 1pm to 4pm, just after lunch and in the late afternoons on weekends;
- Commercial customers may peak at various times throughout the day depending on the commercial activity in the area; and
- Waste collection vehicles (either Council or commercial) may peak in the mornings following completion of kerbside waste and recycling collections.

It is important to identify potential peak times for vehicle movements in and out of the transfer station and where possible, select a site located away from areas that already have peak periods during these times (such as school children pick-ups).

4.7.8 Topography

Site topography can be taken advantage of to reduce the prevalence of potential wind blown litter and to minimise the number of vantage points that the site is visible from (as outlined in Section 4.7.6).

The impacts of site topography on construction requirements should also be carefully considered. It is ideal to have a gently sloping site that can be taken advantage of when constructing the waste transfer platform to reduce the amount of excavation works and additional fill requirements. This can assist in helping keep design and construction costs to an affordable level for both rural and regional facilities. Examples of existing facilities that utilise natural sloping topography in their design include Blayney (see Chapter 31) and Bathurst (see Chapter 36).

A significantly steep site would be undesirable where it was to be frequented by large vehicles and where there would be significant additional construction costs due to excavation works required or stabilisation against potential land slippages.

4.8 Community

Many community concerns relating to site selection generally relate to the factors outlined in the planning, technical and environmental issues outlined above. Hence by considering these criteria the main concerns of the community would be generally considered in the site selection process.

Additional issues to consider in the site selection process may be raised through consultation with the community. For example, preliminary consultation with residents surrounding the Wauchope landfill indicated the community were in favour of selecting a Greenfield site for the proposed new transfer station rather than it being constructed on the existing landfill site (see Chapter 20 for further detail on the site selection process for the Wauchope transfer station).

4.9 Example of potential site evaluation

When comparing potential sites, it is useful to present the information in a table format for easy comparison of results. A scoring mechanism for criteria (example shown in Table 4) may also be used to ensure a consistent approach to assessing each potential site.

When using a scoring system the criteria are often listed against the attributes associated objectives and targets. The more quantitative the target set, the clearer it is to rate the attribute.

Further to setting a scoring system, the scores for specific criteria may be weighted based on their relative importance. The relative importance (weighting) of each criterion could be based on either Council requirements or outcomes of community consultation. For example, centrality may be considered a higher concern than other criterion where the potential cost impacts from long-distance haulage are significant.

Table 4. Example of scoring for assessment criteria

Criteria	Objective / Target	Possible score
Zoning	Site to be located in a zone for which development of the facility is permissible	1 – Zoning permits development of the facility 2 – Change in land use zoning required to permit the development 3 – Change in land use zoning required to permit the development but unlikely to be achieved
Land ownership	If possible, site to be located on land already owned by Council	1 – Land owned by Council 2 – Vacant land 3 – Currently occupied land that can potentially be acquired 4 – Occupied land with little scope for easy acquisition
Buffers	To minimise potential impacts on the surrounding residences by having minimum 250m buffer zone	1 – Greater than 250m to the nearest residence and ample opportunity for natural visual screening 2 – Greater than 250m to the nearest residence but limited opportunity for screening 3 – Less than 250m to the nearest resident
Centrality	Minimise transport distances to regional landfill site and recycling facilities. Desired transport distance = max. 50km to landfill, max. 70km to nearest MRF.	1 – Less than 50km to regional landfill, less than 70km to nearest MRF 2 – Less than 50km to regional landfill and greater than 70km to nearest MRF OR 2 – Greater than 50km to regional landfill and less than 70km to nearest MRF 4 – Greater than 50km to regional landfill and greater than 70km to nearest MRF

It is also useful to present the site assessment results in a table in order to communicate clearly how the results were found. An example of this is shown in Table 5. If using a scoring system the total score for each site can be easily compared when using this format. In the example below the scores have not been further weighted.

Table 5. Example – comparison of sites

Criteria	Site 1		Site 2		Site 3	
	Comment	Score	Comment	Score	Comment	Score
Zoning	Change in zoning required	2	Permissible in zoning	1	Permissible in zoning	1
Land ownership	Owned by Council	1	Owned by Council	1	Occupied property with entrenched heavy industry	4
…	…	..	..	..	…	..
Total		X		X		X

5. Planning and Development Approval

5.1 Overview

Part of the site selection process will involve consideration of existing land use and zoning. Once a site is selected (or a potential sites have been narrowed to a short list) it is important to determine the planning and development process that would be applicable for the proposed transfer station development. The approvals process and development application (DA) requirements will vary based on the proposed site location, activities to be undertaken on site, and the expected throughput.

It is important that planning and development approval requirements are fully scoped and understood for all potential developments, even those on former landfill sites. Do not make the mistake of assuming that development of a transfer station would be permissible at an existing or former landfill site, or at a site that is currently used for other related waste management activities. Always confirm planning and other statutory requirements as early as possible.

5.2 Summary of statutory framework behind the approvals process

The approvals process will depend on relevant legislation and planning policies. Legislation and policies to consider in the planning phase includes at a minimum:

- Commonwealth legislation;
- State legislation;
- State Environmental Planning Policies (SEPPs);
- Regional Environmental Plans(REPs); and
- Local Environmental Plans (LEPs).

5.3 Is development consent required?

It is important to determine if development consent will be required, and if so, who is the Consent Authority.

The Environmental Planning and Assessment Act 1979 (EP&A Act) outlines requirements for development consent in NSW. The EP&A Act and EP&A Regulation (2000) also outline requirements for environmental studies or reports to accompany the DA and requirements for public participation in the event that an environmental study is required.

5.3.1 Who is the Consent Authority?

If development consent is required, the Consent Authority may be either local Council or the NSW Minister for Planning depending on the classification of the development.

5.4 Points to consider

Consider obtaining expert advice at the initial planning stage to determine:

- Is development consent required for the proposed development?
- Who will be the consent authority?
- What licences will be required for operation?
- Are there any potential limitations on development given the preferred site for development? and
- Is an EIS or SEE required to accompany the development application?

Discussions should involve local planning officers and relevant environmental agencies.

6. Consultation

Waste transfer stations and/or resource recovery facilities serve the local community and should be customised to the community's particular circumstances and needs. Community consultation and inclusion in the development process should always be undertaken no matter what the scale of the project. The community should be included as early in the planning and decision-making process as possible, as this means that concerns can be resolved as soon as possible.

It is recommended that where possible consultation is undertaken with personnel involved in the operation of waste facilities. This may include existing council staff and wider consultation with waste service providers and other Councils. The purpose of this consultation would be to gain an appreciation of lessons learned through the operation of existing waste management facilities and to verify that ideas for potential transfer station design and operation reflect operational realities.

6.1 Need for community engagement and consultation

The proposal for a waste transfer station may be met with strong community opposition and the way in which the developer handles this can significantly effect the success of the project.

Communities may raise issues or potential impacts that the developers were either not aware of or were aware of, but did not view the aspect as a significant issue for further consideration. In such cases, the developer needs to provide the community with sufficient consultation to ensure that their concerns are noted and adequately addressed. Possible concerns (and more common concerns) from your community may include:

- Safety and health impacts
- Waste generation sources and types
- Litter cleanup inside and outside facility
- Operating hours
- Site selection
- Reason for site development
- Costing and how this will effect the resident
- Likely costs of using the facility
- Noise
- Odour and
- Dust.

The type of engagement and consultation required will be a factor of the size of the facility, population number, types of wastes to be accepted, and whether an EIS is required for the site (see Section 6.2 for more information on determining the appropriate level of consultation).

Community consultation normally takes place throughout the project development phase, initiating at the planning and design stage, and is complemented by a formalised education program towards the end of the project to prepare for the operational phase of the transfer station.

Public opposition to a proposed transfer station development can be greatly reduced through ensuring appropriate community engagement and consultation. The issues causing public opposition may result from the following actions:

- The community not being (or feeling like they were not) informed sufficiently through the community consultation process;
- The community feel that the information provided was either insufficient or was probably sufficient but was provided on a level that was not understood properly by residents;
- The community feel that there are additional issues that were not sufficiently covered and would like additional information;

- The community have other personal or political issues (ie: the not-in-my-back-yard syndrome) with the site in which case no amount of community consultation will evolve support from the resident; and
- The education program implemented for the transfer station operation phase was not adequate enough to guide customers in using the new facility.

Various levels of community consultation will be discussed in Section 6.2.

6.2 Appropriate level of community consultation

The community should be informed, on a regular basis, of issues that can have an impact on their environment. Furthermore, consultation with the community should be ongoing and certainly not restricted to the development phase of the project. The level of consultation should be specifically tailored for each individual project and largely depends on:

- The population size of the community;
- Size and throughput of the facility that is proposed;
- Whether an EIS is required for the proposed development;
- Whether the proposed site is already facing community opposition; and
- Council's existing relationship with the community.

Examples of types of consultation activities that may be relevant to a proposed transfer station development include:

- Mail outs (newsletters, feedback forms);
- Information packages for residents surrounding a proposed development site;
- Press releases and advertisements (local newspapers, pamphlets);
- Establishment of a free-call information telephone line, reply paid mailing addresses for comments and submissions, and a project email address;
- Community meetings/forums/workshops;
- Engagement through a community reference group (see Section 6.3); and
- Information days.

An example of the different consultation activities and associated timing for a potential small development in a remote rural area compared to a large development in a regional area is provided in Table 6. Note that the consultation strategies outlined in Table 6 are provided as examples only and are not suggested to be best or recommended practice for a particular situation.

Table 6. Example of potential timing of consultation activities

Project Stage	Small transfer station in rural/remote area	Large transfer station in regional area
Needs assessment		Community made aware of potential development of facility through a waste management plan or feasibility study. Consultation with users of existing facilities to determine service expectations for potential new transfer station and resource recovery facility.
Site selection	Community forum with residents in the local township of the preferred site for development to determine concerns and issues about design and operation.	Mail out (newsletters, feedback forms) to residents surrounding the potential (or short-listed) sites. Community meeting with stakeholders to determine concerns and issues about site selection.

Project Stage	Small transfer station in rural/remote area	Large transfer station in regional area
Initial Planning		Press releases in local newspaper advertising proposed development and asking community to register interest for future consultation activities. Community meeting with stakeholders to determine concerns and issues about design and operation (including environmental impacts).
Design		Community forum with specialist consultants presenting the outcomes of relevant environmental studies. Councils to explain how raised community concerns have been considered in the final designs. Information Package supplied to residents expressing interest in the project.
Development Approval	Advertisement of lodged DA seeking comments.	Advertisement of lodged DA seeking comments and advertising EIS (if required).
Construction		Potential open-day site visits.
Operation	Regular distribution of education material to the general community and customers of the facility.	Regular distribution of education material to the general community and customers of the facility.

Methods employed to undertake any consultation activity should be suited for the purpose. For example, if hosting a community meeting the meeting should be scheduled at time most likely to be convenient for the greatest number of interested stakeholders. Similarly the venue should be accessible and central.

Whilst the development of a transfer station will trigger a formalised consultation process, ongoing consultation with the community may not need to be so formalised. For example, it may involve spending a short amount of time on a regular basis on site at waste management facilities talking to staff and customers on an informal basis.

6.3 Community reference groups

Community reference groups can be used to obtain feedback and community input at the planning and development phase of a transfer station as well as throughout ongoing operations.

Membership of a community reference group may include representatives from:

- Local residents in the vicinity of the proposed development
- Local and peak environment groups
- Business groups
- Council officers
- Facility operators and contractors and
- Customers.

Membership may be open or by invitation only. Ideally membership of each community reference group would be limited to a workable number (say a maximum of fifteen to twenty persons) with members being representative of all relevant stakeholder groups.

Community reference groups are usually independently chaired and operated under agreed terms of reference. Terms of reference outline the group aims and objectives, roles and responsibilities of members, terms of membership, and operating procedures including how often the group should meet.

Community reference groups provide a forum for addressing community concern about the activities associated with transfer stations and resource recovery facilities. They provide opportunity for developing an ongoing community relationship, and encourage trust, understanding, and partnerships through open and accountable processes.

In addition to providing input about a particular transfer station development, a community reference group may be used to provide ongoing input and feedback on overall waste strategies and programs. Input by a community reference group may include for example:

- Identification of community concerns about potential impacts from a facility including noise, odour levels, and air quality;
- Input in determining facilities and services to be included in a proposed development;
- Assistance in development of educational, communicative, participatory, and consultative materials for waste management;
- Advice and recommendations on issues associated with resource recovery at a facility as well as wider resource recovery in the local community;
- Feedback on development of key performance indicators for operations; and
- Opinion on environmental, social, and financial issues associated with design and operation of proposed facilities and their future operation.

6.4 Contracted versus in-house consultation

There are various advantages and disadvantages involved with using either contracted resources to undertake consultation (such as a specialist community engagement consultant) or using in-house Council staff. These are outlined in Table 7.

Table 7. Contracted versus in-house community consultation services

	Contractor	In-house Staff
Advantages	Objective person to listen and report issues who is set apart from Council.	Council may have staff experienced in consulting with their local community on a wide range of issues.
	Specialist in preparing consultation materials (such as newsletters, advertising, etc).	Council may already have good relationships with the community, these would be further increased through a well run open consultation process.
	Specialist facilitation skills.	Lower cost (if done efficiently).
	Dedicated resource committed to managing the consultation process.	Less time required if Council already have good/ reasonable relationship then rapport building stage could be omitted.
Disadvantages	Higher cost.	Potentially less experience in dealing with community consultation and facilitation in waste management issues compared to specialist contractors.
	May take longer to build rapport with local community, particularly where more than one consultant is involved on the project.	If there is significant public opposition the Council member has to handle the issues directly and when in a small rural community this can impact on social relationships.
	Potentially longer time program required where there is a large amount of background knowledge to be obtained prior to undertaking the consultation activities and where time is needed to develop rapport with the community.	

6.5 Examples of community consultation undertaken

Examples of different types of consultation undertaken for various transfer station developments that was reportedly well executed, suited the requirements for the proposed facilities, and achieved the required aims of consultation include:

- Wagga Wagga's Gregadoo Facility (see Chapter 15)
- Hastings' new Wauchope facility (see Chapter 20)
- Orange HUB facility (see Chapter 29) and
- Wingecarribee's Moss Vale facility (see Chapter 30).

6.6 Consultation with council staff and waste contractors

Operators and staff involved in the current running of waste facilities or provision of waste services can often provide valuable information about lessons learnt from past experience. For example, they may highlight difficulties customers experience with particular signage terminology (such as the term 'inert' or commingled) or common practices for how waste is unloaded from vehicles. Importantly, they can also provide information about issues associated with waste and recyclables collection from existing sites (for example problems with vehicle access and manoeuvring space).

Information from this consultation, even provided in anecdotal form, is valuable and should be considered when determining an appropriate design for a proposed facility. If possible, consultation with the staff that will run the facility should also be undertaken. Opportunities for this to occur may be more likely to be in the case where a transfer station is to be built on an existing landfill site.

7. Risk Assessment

A risk assessment should be undertaken to identify potential hazards and risks associated with the proposed development. (Reference is made to Australian/New Zealand Standard 4360:2004) Prior to actual development and operation of the proposed facility, the risk assessment would be used as a tool to identify possible design methods to eliminate identified risks. This is particularly important where it is proposed to operate an unsupervised site, or where it is proposed to operate a large regional site with large platforms and various plant and equipment to be moving about the site.

Following design and construction, the risk assessment should be updated and used as a basis for the Operational Risk Management Plan (refer Section 9.1 for OH&S requirements for operation).

7.1 Environment and safety risk

7.1.1 When should a risk assessment be done?

As noted above, it is recommended a risk assessment for potential operations be undertaken prior to design and construction, with later amendments for ongoing operation. A risk assessment must also be undertaken for the construction phase of the project.

By law (under Clause 9(3) of the Occupational Health and Safety Regulation 2001), an employer must ensure that effective procedures are in place, and are implemented, to identify hazards:

- Immediately prior to using premises for the first time as a place of work; and
- Before and during the installation, erection, commissioning or alteration of plant in a place of work; and
- Before changes to work practices and systems of work are introduced; and
- Before hazardous substances are introduced into a place of work; and
- While work is being carried out; and
- When new or additional information from an authoritative source relevant to the health or safety of the employees of the employer becomes available.

7.1.2 Factors to be considered in a risk assessment

Factors that should be considered in the risk assessment include:

- Occupational health and safety risks
- Environmental risks
- Other risks to employees and the general public.

Councils may have formalised procedures for undertaking a risk assessment, or alternatively relevant Australian standards for risk assessment could be used. Information about how to undertake a risk assessment is also available from NSW WorkCover.

7.1.3 Insurance Considerations

Consultation should be sought from Council's Risk Manager and insurance providers regarding the potential risk and insurance implications from any proposed development.

7.2 Other types of risk

Other than environmental and OH&S risks, two other elements of risk associated with the potential development of a waste transfer station or resource recovery facility include:

- Financial risk; and
- Reputation and political risk.

7.2.1 Financial risk assessment

A financial risk assessment can be used to identify the potential financial risk to Council from the proposed development, as well as the financial viability of the transfer station and/or resource recovery facility itself. The level of financial risk depends on the potential construction and operating arrangements. For example, will the full cost of construction and operation be the responsibility of Council? Or, will the facility be built, owned, and operated by a contractor at a set cost to Council?

Undertaking a financial risk assessment is an important process that can be used to assist in determining appropriate waste management charges and gate fees for the proposed facility. Information from the initial feasibility and needs assessment process (refer Section 2.2) can be used to assist in undertaking the financial risk assessment.

7.2.2 Reputation and political risk

There may be reputation and political risk associated with the potential development and operation of waste facilities where an inappropriate site is selected, or where the facility is poorly designed, operated, and maintained. Whilst it is unlikely that a reputation and political risk assessment be undertaken, the potential impacts should be considered when undertaking site development and determining operating and maintenance contracts.

8. Design and Construction

Once a suitable site has been selected to accommodate the transfer station and/or resource recovery facility, the site-specific design process can begin. The design process can be arduous as there are many factors that need consideration including external and internal site-specific constraints.

Transfer station design must consider issues such as leachate, landfill gas, and storm and ground water management, particularly as many transfer stations are located on or within the boundaries of former landfills. If constructed over an old landfill site, the design must also consider ground stability and differential settlement. Examples of special design and construction considerations built-into facilities located on former landfill sites include:

- Allowance for ground movement (see case study on Orange City Council's Ophir Road Facility, Section 28.4.5);
- Requirements for raising buildings and structures off ground-level; and
- Landfill gas vents (example, see case study on Wingecarribee's Moss Vale Resource Recovery Centre (RRC), Section 30.4.7).

The design process must consider both customer and transfer vehicles, operational equipment and technology and minimise risks to both employee and customer safety and the environment. As a rule, risk should be considered and assessed throughout the design process in terms of both facility design and ongoing operational management.

8.1 Design for what throughput and composition?

Assessment of likely types and quantities of waste delivered to and processed at the site should be undertaken during the site selection process to ensure that sufficient room is available for undertaking proposed onsite activities. Detailed current and projected rates need to be developed so that detailed design can be undertaken.

Detailed design needs to consider not only the inputs to the facility but also the likely residence time in terms of stockpiling and processing. This information should be used to assess appropriate types of materials handling equipment to be used at the site, and to appropriately size required transfer bins, storage containers, and storage areas for recyclables and recoverable items.

8.1.1 Types and sources of waste

Assessment of the types of waste that will mainly be delivered to the site can be used to:

- Narrow down potentially suitable materials handling processes;
- Identify further opportunities to increase resource recovery;
- Assess potential impacts from having covered/uncovered areas of the transfer station and resource recovery facility; and
- Ensure any roofs or sheltered areas (if provided) are adequately sized.

Examples of how the above considerations feed into the design process are provided in Table 8.

Table 8. Examples of how to consider impacts of types and sources of waste during the design process

Consideration	Examples
Potentially suitable materials handling processes	Facilities that service only a small community and accept only domestic type wastes may be able to have waste collected in the same types of receptacles that are used for existing kerbside or commercial collections, saving money in collection and transfer costs – see examples of the Comboyne transfer station (Chapter 23 and Blayney transfer station (Chapter 31). Where facilities receive large amounts of bulky wastes it may be unsuitable to use conveyors or compaction systems (unless specifically designed to deal with these types of materials) – see example of the Maclean transfer station retrofit (Section 35.3). Where customers to the site will be transporting materials in bins that require lifting, the site should be designed to try and minimise the risks associated with the manual handling of these bins – see example of the Ballina WMF (Section 19.5).
Opportunities for resource recovery	Where materials dropped-off at the site will include a significant amount of self-hauled items, there are opportunities to establish reuse centres for acceptance of reusable household items – see example of Wagga Wagga City Council's Gregadoo facility (Chapter 15) and Orange City Council's Ophir Road Facility (Chapter 28). Where only small quantities of waste and recyclables are anticipated, resource recovery at selected sites may be limited to only collection of glass and plastic containers (typical components of domestic waste stream) – see example of the Mangoplah rural transfer station (Chapter 17).
Covered versus uncovered areas of the transfer station	Where materials will be mainly delivered to the transfer station from bulk collection vehicles that can be unloaded without requiring the driver to exit the vehicle, there may be less requirement to provide a covered drop-off area to protect customers from rain. Where it is anticipated that a large amount of recyclables and reusable items will be potentially recovered then an appropriately sized covered area should be provided – see example of covered areas provided at Wingecarribee (Section 30.4.4).
Height of shelters	If materials will be delivered to the site, or collected from the site, using large vehicles, the height of shelters must be sized appropriately with allowance for possible future changes in vehicle sizes in the future. For example, if the drop-off point for kerbside recyclables or garbage is undercover, the roof height must support the maximum operating height of collection vehicles. Note: proposed materials handling procedures will also impact on the required height of shelters, see Section 8.4.4.

8.1.2 Materials handling

Choice of materials handling processes and required infrastructure should take into account the type and composition of materials, and where materials will be transport to for final disposal or reprocessing.

Selection of appropriate materials handling equipment should take into account:

- OH&S (see Section 8.2 for further detail);
- Available technologies for handling different material types;
- Transport economics;
- Capital constraints;
- Target residence times for on-site storage of different materials; and
- Regulatory compliance.

Available technologies

Typical materials handling infrastructure used as rural and regional transfer stations are outlined in Table 9.

Table 9. Typical Waste Handling in Rural and Regional Transfer Stations

Infrastructure	Description	Examples of where in use
Skip bins and containers	Materials may be deposited directly into skip bins and containers of various sizes. Containers used for collection of recyclables may be as small as 240L where mobile garbage bins (similar to those used for kerbside collections) are used. Similar collection vehicles would collect these bins to those that undertake kerbside collections. Various size collection vehicles can collect larger skips for recyclables. Skip bins for mixed waste may range from 1m^3 to 70m^3. Various heights and widths are available (note: the bin and skip sizes will impact on platform and railing heights). Bulk bins larger than 5m^3 are typically roll-on/roll-off bins that are loaded onto transfer vehicles (using a hook-lift mechanism) for haul to landfill. Transfer stations that utilise skip bins up to 4.5m^3 in capacity may have these collected by either a rear or front-load compaction vehicle.	Various, for example Babinda, Ballina, and Comboyne
Walking-floor trailers	Rather than depositing materials into skips, materials may be loaded directly into the top of walking floor trailers. Walking floor trailers are available in various sizes up to 120m^3.	Wingecarribee
Push-pits	Push-pits are used for management of residual mixed waste. Waste is first emptied into a pit and then into moved into a container or trailer using site plant. Due to additional handling of waste involved, push-pits can require more staff for efficient operation compared to directly loading waste into skips or containers. However there may be opportunities for additional separation of recyclables and reusable materials from the mixed waste stream (provided there is sufficient staff available to undertake this task). Push-pits should be sufficiently wide and shallow to allow for safe and efficient manoeuvring of plant in the drop-off area. Construction of the push-pit at a raised level above the container or trailer (that waste is emptied into) can assist minimise time required for waste handling.	Bathurst and Kempsey

Infrastructure	Description	Examples of where in use
Permanent walking-floor	Wastes can be emptied directly onto a permanent walking floor. This arrangement is similar to a push-pit, only rather than using plant to move the waste from the floor to the transfer container or trailer, the waste is moved across by the 'walking' mechanism. Again, there are increased opportunities for additional separation of recyclables and reusable materials from the mixed waste stream using this type of technology.	Buderim facility
Compactors and balers – various	Various types of compactors and balers can be used for either mixed waste or separated recyclables. Waste and recyclables can be compacted into trailers and containers using a mechanical ram. Or where it is unfeasible to purchase a stationary compactor for high compaction, some compaction of materials into skips and containers may be achievable through the use of existing plant such as front-end-loaders. Balers are typically used to increase the density of cardboard, paper, aluminium, steel, and plastics. It is also possible to now bale mixed wastes. Baled mixed waste can be wrapped in biodegradable plastic that assists in controlling leachate, litter, and odour during waste transport and landfilling. An advantage of baling materials is that they can be transported easily on flat-bed trucks without requiring special containers or a semi-trailer (depending on vehicle payload). If considering baling, you must first check that down-stream processors will accept the materials in baled form.	Wingecarribee and Buderim

Transport economics

Transport costs are a highly significant factor for rural and regional transfer stations and resource recovery facilities. To minimise transport costs and achieve transport efficiencies it is important to design and operate facilities such that transport vehicles carry loads up to (as close as possible) the legal load limit of the vehicle. This means sizing skips or bales taking into account the payload of potential transfer vehicles and average density of materials for transfer.

The use of compactors and balers for either waste and or recyclables can increase the density of materials for transfer (see Table 10). This has advantages of both reducing the volume of materials (less storage space required and potentially less frequent collections) as well as maximising the mass the materials that can be collected by one transfer vehicle. This is particularly important for transfer of recyclables that are often lightweight.

The cost of compaction should however be considered against the potential costs associated with direct haul of uncompacted materials. Compaction costs include the additional costs of any plant or equipment, as well as staff labour costs.

Table 10. Typical Densities

Material	Typical uncompacted density (t/m^3)	Achievable compacted densities (t/m^3)
Mixed waste	0.1 – 0.3	0.3 – 0.7
Cardboard	0.05 – 0.1	0.2 – 0.4
Paper	0.05 – 0.08	0.2 – 0.7
Plastics	0.02 – 0.05	0.2 – 0.4
Aluminium	0.02 – 0.05	0.2 – 0.8
Steel	0.05 – 0.1	0.4 – 0.9

Capital constraints

Waste management infrastructure should be selected considering both capital and ongoing operational costs. Capital costs may include purchase of plant and equipment and construction works required for safe implementation and operation. Operational costs may include staff time required to operate the plant, as well as fuel and maintenance costs.

Assessment of the feasibility of implementing materials handling equipment should also consider possible cost savings. For example the high cost of implementing a walking floor and compaction system at the Buderim facility (in Maroochy) is being offset by increased revenue from recovery of materials (see Chapter 14 for further information on this facility).

Advanced materials processing technologies may not be feasible for implementation at sites with low throughput. At such sites, the use of simple collection and transfer technology (such as the use of skip bins with no compaction of waste materials) may be the best fit for purpose design (see for example the design of rural transfer stations at Collingullie, Chapter 18 and Uranquinty, Chapter 16 in the Wagga Wagga local government area).

Residence time for on-site storage

Transfer of mixed wastes off-site should be undertaken as regularly as possible to assist in controlling litter, vermin, and odours. Where possible, all waste should be cleared from the transfer station at the end of each operating day. However, this is often not feasible in most rural and some regional areas. In such cases, waste containers must be appropriately sized to be able to hold the volume of materials that will be generated between collections.

Determining bin sizes and the number of bins to be provided is therefore, a critical issue in transfer station design and construction, and should be undertaken with allowance for potential delays between offsite waste collection services.

Regulatory Compliance

All infrastructure and handling procedures should be reviewed against relevant regulations and site permits to ensure compliance.

8.1.3 Storage and transfer containers

Identifying the number and types of storage areas and containers required for efficient operation of the transfer station should be undertaken prior to finalising the site layout. This will depend on the selected procedures for materials handling and desired residence time for on-site storage.

Proper planning of storage areas and transfer containers should permit flexibility to manage changes in throughput and to deal with unforeseeable events that may delay offsite transfer of waste and recyclables.

8.2 Site layout

In developing the site layout plan three general considerations should be paramount:

- Safety
- Efficiency and flexibility; and
- Maximisation of resource recovery.

With these considerations in mind a conceptual site plan should be developed of the transfer facility. The conceptual design should include the layout of major features including access points,

roadways, buildings, parking lots, utilities, surface water drainage features, fences, buffer areas, future expansion areas, adjacent land uses and landscaping.

Once a site layout has been developed it should be passed on to all or as many stakeholders (including employees and contractors) as is feasible for their consideration and feedback collected and incorporated.

It should be noted, that an overwhelming conclusion from the case study investigations was the correlation between a well designed and maintained site and the cooperation of customers in obeying directions and separating materials, and general cleanliness and positive attitude of customers. Well-designed sites were the easiest sites to maintain and run were also cleaner, safer and un-congested.

8.2.1 Site topography

The prevailing natural topography of the site should be utilised wherever possible to take advantage of existing wind barriers and visual screens. Existing slopes can be used to provide benches and to divert water flows from operational areas.

8.2.2 Efficiency and flexibility

A site layout should clearly indicate designated collection and storage areas for all materials accepted at the site, as well as vehicle parking areas, staff facilities, and operational areas to undertake any on-site processing (for example garden organics mulching).

The site layout should also indicate vehicle turning areas and possible areas for expansion of future activities on site. The size of available expansion areas should be consistent with predicted requirements for future growth and proposed future onsite activities.

8.2.3 Maximise resource recovery

Site layout can greatly impact on resource recovery. Design and site layout features that will assist maximising resource recovery include:

- Where drop-off points for recyclables and reusable items are clearly marked and easily accessible;
- Drop-off points for recyclables and reusable items are located in the same area as for mixed waste, or preferable, located prior to the mixed waste drop-off point (or for reuse centres, potentially prior to the site entrance);
- There are lower (or no fees) charged for disposal of source separated recyclables (this is an operational rather than design feature); and
- Sufficient space is allowed for any manual sorting required to be undertaken by operators.

Examples of site layouts that influence increased recovery include Cowra Shire's transfer station where a large site area is devoted to separation of materials, with only a small drop-off point for mixed waste (see Section 27). Customers to Wingecarribee's Moss Vale RRC are also provided with a number of drop-off points for various recoverable materials prior to reaching the drop-off point for mixed wastes (see Section 30.4.

There is less opportunity for maximising recovery of recyclables where a site layout is confusing, or customers are required to travel around various parts of the site more than once to access different drop-off points. For example, this is one of the operational issues under review at the MacLean and Port Macquarie transfer stations (refer Section 35.4 and Section 21.1).

8.2.4 Traffic

Controlling traffic movements about the site are a key concern when trying to maximise safety in site layout. Transfer stations help to reduce overall regional traffic flows by consolidating smaller loads into larger vehicles. However large traffics flows may be developed in the immediate area

of the facility. This should be considered in the site selection phase of development in terms of impact on the local traffic flows, but further detailed consideration is necessary in the design stage as to reduce the impact of traffic on congestion both outside the immediate area of the facility and within the facility itself.

Surrounding Area

Consideration should be given to:

- Providing adequate space within the facility so that customers waiting to enter do not interrupt traffic flows on public roads, nearby residents or businesses or general operation of the facility; and
- Designing safe intersections with public roads.

Facility

The facility itself should incorporate, as much is as possible, one-way traffic flow, particularly in areas used by the public. Consideration should also be given to minimising intersections, separation of public and transfer operational vehicles, and development of a one-way weighbridge if dual weighbridges are not a feasible cost effective addition.

The site layout should take into consideration the types of vehicles that are likely to frequent the site including both customer and operational vehicles. Particular attention should be given to accommodating residents needing to reverse trailers. Directing traffic flow through or along a tipping area where there are a number of drop-off points for the same type of material can assist reduce the need for customers to reverse up to bins, hence reducing potential queuing time.

Consideration should also be given to the likely routes taken by each vehicle type through the facility in particular noting turning circle arcs, room for reversing, queuing, space and access for operational vehicles during operational hours and contingences for breakdowns and emergency vehicles.

8.3 Site gatehouse and weighbridge

8.3.1 Gatehouse

The gatehouse should be designed to allow for efficient management of traffic flow, inspection of incoming waste types and quantities, and collection of customer data and gate fees.
To make this as easy as possible, the gatehouse should be designed such that the gatehouse attendant is able to:

- See approaching traffic in both directions (vehicles accessing and leaving the site);
- Screen (view wastes) from the seating position;
- Prevent vehicles from accessing the site prior to having data recorded and the appropriate fee paid; and
- Talk to customers without being required to exit the gatehouse building. Customers should also not need to exit their vehicles to talk to the gatehouse attendant.

Design features that can assist achieving the above aims include installation of closed circuit television (CCTV) cameras, ensuring the windows on the gatehouse are adequately positioned to see both incoming and exiting traffic (talking account of potential sun glare), using alarms to indicate when vehicles are in position, using boom gates to control access to the site, and ensuring there is adequate signage, alerting customers to the gatehouse operation.

The design of the gatehouse and weighbridge will depend on whether a single or double weighbridge is in use, and if customers are required to be weighed on both the way in and out. Depending on Council requirements, small vehicles may not require weighing as these customers may be charged on a volume basis.

Where customers are only weighed on the way in, or a dual-weighbridge is in use, then separate clearly-marked entrance and exit lanes should be provided. If a single weighbridge is planned this has the disadvantage that the gatehouse attendant will be on the opposite side of the vehicle to the driver either on the way in or out.

The site design should accommodate potential vehicle queuing (determine estimated queuing time based on peak customer estimates), and systems need to be in-place to prevent potential 'stand-off' or head on collision situations at the weighbridge. For example, using boom gates located sufficiently far back from the weighbridge on both the site entrance and exit.

At sites with low customer patronage, the gatehouse attendant may be able to leave the gatehouse to undertake other tasks (nearby) between serving customers. This results in greater utilisation of staff and improved job satisfaction. However for this to be possible, the gatehouse would need to be located sufficiently close to the area in which work was being undertaken so that the attendant can return to serve customers as required.

8.3.2 Requirements for a site weighbridge

Under recent changes to the *Protection of the Environment Operations (Waste) Regulation 2005* (POEO Regulation) waste facilities **required to pay the waste levy** under Section 88 of the *Protection of the Environment Operations Act 1997* (POEO Act) that also receive more than 10,000 tonnes of waste a year will be required to install an approved weighbridge by 1 September 2006, unless exempted in writing by the NSW EPA[3].

The cost of weighbridge installation and additional staffing requirements (for operation of the weighbridge) may not be feasible for facilities not subject to the mandatory requirement. The cost of installing a site weighbridge and gatehouse can range from $60,000 to over $100,000 depending on weighbridge size and type.

The length and capacity of the weighbridge should be adequate for the longest and heaviest vehicle that will be accessing the facility. It should be sited far enough within the site boundary to allow for queuing onsite and a straight approach to the weighbridge.

Advantages of using a weighbridge and data recording software has the benefits of allowing:

- Electronic recording of exact type and quantity of materials disposed of at each site;
- Consistent application of fee charging structure through application of fees on a tonnage rather than volume basis;
- Improved ability to set fees for different waste types at a level that more appropriately reflects the true cost associated with their management; and
- Greater understanding of type and volume of materials requiring disposal, thus also providing increased possibility to identify opportunities for improved resource recovery.

The use of a lead acid battery operated hand-held data recording systems may be a suitable alternative where unfeasible to install and operate a weighbridge. Hand-held data recording systems could be used to enter information about the type and volume of waste delivered to the site, fee charged for waste disposal, and to print a detailed receipt for customers.

Alternatively, a manual docket system could be used at small rural sites. Council administration staff would then need to manually enter docket numbers and fees charged into the data management system. In either case, the levying of fees would still be dependant on the visual assessment and estimate of waste loads undertaken by the site operator.

8.3.3 Allowance for future gatehouse and weighbridge

Where installation of a weighbridge and gatehouse is not required at present, or is not affordable to the community, the site design should incorporate provisions for future construction and installation of a gatehouse and weighbridge.

[3] Note it is only facilities which are required to pay the levy that are required to install weighbridges if they take more than 10,000 tonnes of waste. Waste transfer facilities do not have to pay the levy and therefore are not subject to mandatory requirements for installation of a weighbridge.

8.4 Design for OH&S

Site design should attempt to eliminate as much as possible potential risks associated with the future operation of the facility. This is important for all sites, but particularly relevant for unsupervised sites.

Safety objectives that should be factored into site design include the following.

8.4.1 Minimise risk of falls and reversing over platform edges

There is a high risk of potential falls where transfer stations utilise raised platforms for unloading materials into skips and pits. Methods to minimise the risk of falls may include:

- Eliminate or minimising the gap between the platform edge and skips (where appropriate) by either covering the gap, or placing the skips as close as possible to the platform edge;
- Use concrete lips to prevent cars and trailers reversing too close to the platform edge;
- Minimise the height of platforms where possible by selecting skips with appropriate dimensions, or using skips with adjustable/ moveable sides;
- Place guard rails along platform edges; and
- Have the lip of the skip bin higher than the edge of the platform.

There is a trade-off between protecting against the risk of falls using guard rails or having the height of the bin higher than the platform edge and manual handing injuries. In either case, customers are required to lift loads over the barriers, increasing the risk of manual handling injury. It is also more difficult to unload materials from trailers and car boots. Therefore the height of any guard rails and skip bins needs to be carefully considered.

8.4.2 Minimise risk of vehicle and plant accidents

Methods to eliminate or minimise risk of vehicle and plant accidents include:

- Have clear signage indicating location of drop-off points so customers can move in and around the site as quickly and efficiently as possible;
- Maximise one-way traffic flow about the site;
- Have separate access points and roads for small and large vehicles where possible;
- Have small vehicle accident procedures in place (for example being prepared for trailer breakdowns);
- Ensure segregated areas have been included in site design to allow for potentially dangerous plant such as crushers and grinders to be operated away from general access areas for customers;
- Ensure there is sufficient space allowed for vehicle turning and manoeuvring;
- Provide drop-off points for certain materials in the main transfer station area, with larger stockpiles of materials kept in a separate area not accessible to small-vehicle customers;
- Use rails or line markings to assist customers to reverse into required drop-off positions; and
- If customers are required to reverse into position to drop-off items, ensure turning paths are designed to make reversing as easy as possible and that customers can reverse whilst looking over their left shoulder.

Further information about the importance of traffic flow in site layout is provided in Section 8.2.4.

8.4.3 Minimise manual handling risks

Site features should facilitate easy unloading of materials from all types of vehicles and containers wherever possible. As noted above, this often conflicts with safety and an acceptable balance must be achieved.

Examples of attempts to achieve this balance include the use of a modified skip bin with a lowerable side to allow for easy unloading of trailers such as those used at Ballina and planned for Wauchope transfer station (see Sections 19.5 and 20.3). Other examples include the use of a permanent guard rail along the platform edge that has a lower height at the drop-off point such as that in use at Cairncross and Taree transfer stations (see Sections 22 and 24.4).

Considering how materials will be transported to the site can eliminate some manual handling risks. For example, where customers self-haul waste in bins or containers, it may be possible to provide a bin-lifting device to assist emptying.

Manual handling risks for staff and operators should also be eliminated where possible. This should be done by ensuring selected infrastructure (including bins and containers) can all be moved by machines. This requires that all storage areas are appropriately sized and designed to accommodate containers and moving plant. Insufficient space for efficient collection and storage of recyclables can also result in additional manual and double handling of materials for site staff and recyclables collection contractors.

8.4.4 Minimising damage to buildings and structures

The use of heavy vehicles and plant within a transfer station and resource recovery facility will ultimately result in some form of damage to buildings and structures. Methods to eliminate or minimise this risk include:

- Design any shelters or structures so that support beams and drain pipes are not located in areas where heavy vehicles and plant will be required to move;
- Ensure sufficient cleared area is available for plant and equipment to undertake required tasks with ease;
- If using a push-pit, ensure the pit is wide enough for operation of plant within the pit area;
- Design shelters high enough to accommodate not only the height of the largest vehicle accessing the site (such as a tipping vehicle), but also the operating height of any plant. There should also be some clearance to allow for possible future changes in vehicle and plant sizes and operating heights; and
- Ensure there are guards in place, or guide rails to assist transfer drivers correctly position skips and trailers into the correct position.

8.5 Design for environmental protection

Key features of site design to account for environmental protection are summarised in Table 11.

Table 11. Design measures for environmental protection

Impact	Design measures
Litter	• Provide covers for skip bins and containers; • For raised platforms, minimise or eliminate the gap between the drop-off point and the container or skip bin; • Enclose materials unloading, loading, and storage areas where possible; • Design structures to account for prevailing wind direction; • Include litter traps to protect the stormwater drainage system; • Incorporate natural wind-breaks into site design and landscaping where possible; • Install litter screens or fences around the site perimeter; and • Educate customers to cover all loads when travelling to and from the site.
Odour	• Locate potential odour sources away from and downwind of sensitive receptors; • Pave and grade unloading and waste storage areas (including skip storage areas) to facilitate cleaning (where feasible); • Minimise on-site storage times for putrescible waste (check local regulations and EPA requirements for overnight storage); • Provide roofs for unloading and waste storage areas to stop ingress of water (where feasible); • Ensure that enclosed facilities are well ventilated; and • Design any ponds accepting leachate to ensure aerobic conditions are maintained.
Dust	• Use hardstand for all operating, storage, unloading and loading areas; • At regional sites if dust is considered likely to be a significant issue, minimise the use of sealed roads where possible; and • Minimise areas of exposed earth through suitable landscaping.
Noise	• Centralise noisy activities; • Maximise distances from noisy activities to the nearest receivers; • Enclose noisy operations where possible; and • Design internal and external roads to minimise noise.
Ecology and aesthetics	• Design site layouts to minimise disturbance of existing vegetation; • Design facilities to blend in with natural surroundings; • Use natural screening where possible to limit site visibility, or enclose facilities as appropriate; and • Incorporate landscaping throughout the site design and layout.

Impact	Design measures
Stormwater management	• Design stormwater drains, sumps, and first flush systems to prevent stormwater runoff from entering the active waste disposal and resource recovery areas; • All drainage structures should be designed in accordance with relevant design criteria including those specified in Managing Urban Stormwater: Soils and Construction (Landcom, 2004). Where required, approvals licences should be obtained for the drainage structures from local council, NSW EPA, and/or the Department of Natural Resources; • Maintain undisturbed and rehabilitated/revegetated area as filters for sediment; • Minimise disturbed areas on the site; • Ensure that water falling in the waste storage area does not leave the site untreated; • Cover waste disposal and storage areas where possible; • Install drain covers and trash racks in drain systems; and • Design storage areas for liquid wastes, household hazardous wastes (HHW) and dangerous goods to contain spills.
Contamination /Environmental harm	• Receival and storage areas for liquid wastes and HHW should be designed in sheltered and bunded areas with adequate ventilation; • Segregate storage areas for liquid and HHW from other materials where possible; • Ensure design allows for onsite storage of spill kits in appropriate locations; • Display prominent signs regarding the handling of liquid and HHW; and • Design storage areas to minimise risk of spills entering storm water drains or sewers.

8.6 Roofing and cover

Requirements for cover will vary between sites according to the size and throughput of the facility (average number of customers per day), the types of materials that are accepted, and onsite storage times. One of the greatest considerations when determining which parts of a site to cover will likely be the associated cost.

Typical shelters provided at transfer stations may include:

- No shelter at unsupervised site or small rural sites with limited customers;
- Roof (carport-type) structure over customer drop-off points and/or materials;
- Cover over and around waste storage points (roof + one side);
- Partially enclosed (two or three sided) structures; and
- Fully enclosed structures.

Advantages of providing cover include comfort and convenience for customers and staff. Where the cost of covering the whole footprint of the main transfer station area is prohibitive, it may be possible to cover only one or some of the drop-off points.

There are usually significant benefits in keeping materials dry. Undercover storage of cardboard is recommended. However where it is not feasible to provide a sheltered enclosure for recyclables, this can be achieved by ensuring a lid over the collection container for cardboard.

Any liquid and hazardous materials (including waste oil and lead acid batteries) should be stored in appropriately bunded and covered areas.

Note: *the shape and size of any shelters can affect visual impacts and potential wind effects across and through a transfer station. These potential effects should also be considered when designing shelters.*

8.7 Weather

Local weather conditions can greatly impact on the efficient operation of proposed facilities, as well as possible environmental impacts from the site. The proposed site design and layout should therefore, take account of prevailing local weather conditions.

Wind direction and strength will affect litter, dust and odour. It may be possible to attempt to control these impacts through the use of appropriately designed structures around materials drop-off and storage points such as windbreaks or enclosed shelters.

Other methods to control litter include installing litter collection fences and covering waste storage bins where possible. If designed poorly, structures can actually result in amplifying wind effects by creating eddy-currents in and around waste storage areas that in turn result in greater litter. Large flat structures placed against prevailing strong winds may be subject to damage.

Strong winds can also be dangerous is materials are unsecured. Storage cages or skips may need to be provided for materials such as scrap metal if collected in a windy area.

The shape and size of shelters should also consider sun movement throughout the day. Where the objective of a shelter is to provide protection against sun and rain, the roof should be angled accordingly. Eaves may also need to be provided to prevent rain and sun ingress into areas containing wastes, particularly hazardous wastes. For example Port Macquarie transfer station currently has a covered, well segregated and bunded area for storage of chemical and hazardous items – however the storage area is located along the exposed northern side of the transfer station and hence ingress of light and rain into the area is identified as an issue (see Section 21.1).

Sites located in high-rainfall areas should ensure that drainage requirements are incorporated into the site design. Hazardous materials and waste oil storage areas should be designed to account for the potential high rainfall by being sufficiently raised above ground level. The Babinda transfer station in Queensland is located in a wet tropics world heritage area, many lessons have been learnt at this facility about the importance of adequate site design to address wet weather impacts (see the case study in Chapter 13 for further detail).

8.8 Signage

Clear and consistent signage should be prominently displayed at the entrance to the site, and throughout the site.

Signage at the site entrance should state:

- Opening hours of the facility;
- Accepted and prohibited materials;
- Disposal fees and charges for different wastes and recyclables;
- Name and contact details of site owner and operator; and
- After hours contact details.

If a gatehouse and weighbridge is incorporated in the site design, there should also be clear signage at the entrance indicating when and how vehicles should progress onto the weighbridge. Signs at the site entrance should also remind customers to cover their loads.

Within the site, signs should indicate:

- Traffic flow;
- Directions to drop-off points for various materials;
- Potential hazards including handling and storage of hazardous materials;
- Penalties for littering, inappropriate disposal of hazardous items, or other offences;
- Location of emergency equipment;
- Materials to be collected in each container or skip bin; and
- Exits.

Signs within the facility may also be designed with an educational purpose, for example to report progress in achieving increasing diversion of waste from landfill, hence encouraging the community to take an active role in pursuing greater resource recovery.

To ensure signs are clearly understood by the majority of employees and site visitors, they should be designed to include simple images where possible and use commonly understood terms. For example, some members of the public may not understand the terms ‘commingled’ and ‘inert’. Signs for commingled recyclables may therefore include some explanation such as ‘Commingled (mixed) recyclables’ in addition to one of the standard images for commingled recyclables. Signs for inert wastes may include the description ‘Inert (builders) waste’.

All safety signs should comply with the relevant Australian Standards (see for example AS 1319 – 1994, Safety signs for the occupational environment). Standard recycling signs are available from the NSW Department of Environment and Conservation, Sustainability Programs Division.

8.9 Site security

Supervised sites with limited opening hours should be adequately secured outside normal operating hours, and always attended when open. To prevent intruders (including animals) facilities should be secured by perimeter fencing (at least 2m high) and lockable gates. CCTV may also be installed at regional sites.

8.10 Utilities and staff facilities

Site design should incorporate required utilities and staff facilities for safe and efficient operation of the transfer station and/or resource recovery centre. The level of utilities and facilities to be provided varies between rural and regional sites, and according to the type and quantities of materials received.

8.10.1 Site utilities

At a minimum, each facility should have access to adequate water supply to meet requirements for fire control, drinking, washing. These requirements may be met through the use of rainwater tanks at sites not connected to towns water. Booster pumps may be required to supply water for fire-fighting at the required pressure.

Other utilities that may be incorporated into the site design include:

- Sewerage services – septic tanks or portable toilet facilities may be appropriate for rural sites with limited operating hours.
- Power – provided either through the electricity grid or using generators as required. Some rural sites may not require power where there is no plant or equipment in operation at the site.
- Lighting – required for buildings and shelters, or where the operating hours would result in work being undertaken past dusk (refer to relevant standards for lighting for further detail).

8.10.2 Staff facilities

Staff facilities should be provided at all supervised sites, even those with limited operating hours. At a minimum, all sites should include provisions for hand washing, a sheltered area for protection against wind, sun, and rain, and a place for site operators to sit. Ideally they should also include toilet facilities. These minimum requirements are likely to be all that is required at remote rural sites. Examples of adequate facilities provided at rural sites include a portable structures used at Comboyne and Blayney transfer stations (see Chapters 23 and 31).

At larger regional sites, required staff facilities may include a lunch-room, toilet facilities, and office area. Staff facilities may be located at the gatehouse, on the transfer station, or in both locations.

8.11 Education facilities

Site design may also include allowance for construction of an education facility. An education facility may consist of a room in which Council (or contractors) can present information to school groups or other interested community groups. Displays about recycling, composting, and other resource recovery initiatives can be hosted in the education facility.

There are many benefits from incorporating education facilities in the building design for resource recovery facilities. This can allow for inclusion of a viewing platform or window that allows for observation of the MRF operation. Alternatively, where this is not possible, part of a sheltered area (potentially within a section of a reuse centre) may be designated for running and promoting various educational programs. This is undertaken for example at Wingecarribee's Moss Vale RRC (see Section 30.3).

8.12 Materials of construction

Selection of construction materials should be undertaken giving consideration to the appropriate standard of construction to support proposed activities, and the potential damage that may incur during operation. Wherever possible, principles of sustainable construction should also be considered in materials selection process.

8.12.1 Sustainable construction

In many cases the costs of construction can be minimised through utilising recycled materials. This is applicable for both small rural sites, as well as larger regional facilities. For example, retaining walls for rural transfer stations in Wagga Wagga have been constructed using low cost recycled steel and cement blocks (see Section 16.1 and 18.1 for further detail).

Resource efficiency in design and construction can be accomplished by utilising materials that are:

- Natural, plentiful or renewable;
- Locally available, saving energy and resources in transportation;
- Salvaged, refurbished, or remanufactured;
- Contain recycled content or that are reusable or recyclable; and
- Durable.

8.12.2 Protection against potential damage from plant

Construction materials for walls and barriers should be selected taking into account possible plant that will be operating in the area. For example if bulky and heavy materials such as timber and scrap steel are to be moved about the site using a front-end loader, the storage bays for these materials should be constructed to minimise the potential damage from the operation of the loader (see for example lessons learnt at the Cowra WMC, Section 27.5). Similarly if loaders are operating in push-pits, potential damage to the push-pit walls should be avoided by selecting an appropriate strength material for their construction.

Note: *compaction densities vary according to the size and operating pressure of the unit.*

9. Operation

This chapter describes operating issues and suggests practices to minimise the potential impact of transfer station operations on staff and the surrounding community.

9.1 Occupational Heath and Safety

Under NSW legislation it is the duty of employers to provide and maintain a working environment that is safe for both employees as well as visitors to work sites. Duties of employers as outlined in Part 2 Section 8 of the NSW Occupational Health and Safety Act 2000 include:

For employees:

An employer must ensure the health, safety and welfare at work of all the employees of the employer.

That duty extends (without limitation) to the following:

- Ensuring that any premises controlled by the employer where the employees work (and the means of access to or exit from the premises) are safe and without risks to health;
- Ensuring that any plant or substance provided for use by the employees at work is safe and without risks to health when properly used;
- Ensuring that systems of work and the working environment of the employees are safe and without risks to health;
- Providing such information, instruction, training and supervision as may be necessary to ensure the employees' health and safety at work; and
- Providing adequate facilities for the welfare of the employees at work.

For others at a workplace:

An employer must ensure that people (other than the employees of the employer) are not exposed to risks to their health or safety arising from the conduct of the employer's undertaking while they are at the employer's place of work.

Identification of hazards and the preparation of a hazard and risk management plan should be undertaken prior to the design and development of the transfer station (as outlined in Chapter 7 Risk Assessment). The risk management plan should be regularly reviewed and updated once the transfer station is operational.

9.1.1 Common OH&S risks associated with transfer stations and resource recovery facilities

OH&S risks at facilities will differ depending on site layout and design, and types and volumes of wastes received. Hence it is important to ensure hazard and risk management plans are developed specific for each site.

Risks however that are commonly evident at many types of waste management facilities include:

- Injury from mobile plant and equipment (collisions);
- Injury during operating fixed plant and equipment such compactors and crushers;
- Manual handling injury;
- Falling off high platforms;
- Contact with sharp or corrosive materials;
- Contact with toxic or otherwise hazardous materials and asbestos; and
- Inhalation of dust or other offensive air borne particles.

9.1.2 Methods to manage operational OH&S risk

A site specific OH&S and risk management plan should be prepared, and staff regularly trained and informed about OH&S requirements. There are Standards and Guidelines that can be referred to help in setting up an OH&S management system. For example the Australian/New Zealand Standard 4804:2001 (Occupational health and safety management systems) provides general guidelines on OH&S principles, systems and supporting techniques. WorkCover NSW provides fact sheets and information to assist in preparing hazard and risk management plans.

A Job Safety Analysis should be conducted for all tasks that occur onsite. These should be prepared by employees and reviewed by a supervisor or the OH&S site representative.

Ideally much of the risk associated with a transfer station operation would be eliminated (or minimised) through appropriate design (as outlined in Section 8.4). Where it is not possible to eliminate the risk through design, ongoing operations should attempt to control the risk according to the following hierarchy.

9.1.3 Methods to manage risks associated with hazardous and dangerous goods

Throughout operations all efforts should be made to minimize the risks associated with management of liquid wastes, hazardous wastes, and dangerous goods. Operational procedures to minimize these risks include:

- Training of staff in appropriate management practices including:
  - > Identification and isolation of hazardous materials;
  - > Loading, unloading, and storage;
  - > Spill containment procedures;
  - > Emergency procedures; and
  - > Use of personal protective equipment.
- Removal of HHW and dangerous goods from site (by a licensed contractor) for appropriate disposal/recycling as soon as practicable;
- Provide spill kits adjacent to storage areas for HHW, liquid wastes and dangerous goods (including lead acid batteries);

Table 12. Control of operational OH&S risks

Hierarchy	Strategy	Examples
1 – Eliminate	Change work practices to avoid the risk	Do not permit customers to lift bins over transfer station railings
2 – Minimise	Modify operations to minimise risks	If bins need to be lifted over a railing into a skip bin provide a bin lifting mechanism for customers
		Ensure staff on hand to assist in lifting heavy loads using approved and safe group lifting techniques
3 – Control	As a last resort, and as an interim measure, control the risk	Ensure there is sufficient signage indicating potential risk associated with lifting etc.

- Ensure spill kits stored onsite are appropriate for management of the likely spills to be encountered;
- Provide a safety shower and/or eyewash facilities in accordance with the *Code of Practice for Storage and Handling of Dangerous Goods* (WorkCoverNSW, 2005) where workers may come into contact with corrosive or toxic substances wherever possible;
- Establish procedures for safe storage, spill containment, materials handling and emergency response. Procedures should be documented in the Site Operations Manual or site specific OH&S and risk management plan;
- Display prominent signs regarding the handling of hazardous wastes and prohibition of behaviours such as smoking; and
- Maintain current Material Safety Data Sheets on-site for any hazardous substances or dangerous goods commonly received, stored or used on-site.

9.2 Managing for resource recovery

Some types of wastes are not suitable for handling at a waste transfer station. These wastes may be one or more of the following:

- Prohibited at the disposal facility where the waste is being sent;
- Difficult to handle; and/or
- Dangerous.

The advantage of a transfer station is that it gives the opportunity for waste screening to be undertaken. Some customers may attempt to hide prohibited wastes within mixed wastes, or items that are more expensive to dispose of underneath cheaper items (such as garden organics). To manage this, some facilities have staff located on the waste transfer platform that are responsible for helping customers unload wastes to ensure that the waste is disposed of correctly. This helps to both screen for unacceptable wastes and gives opportunities to increase resource recovery.

For instance the attendant may notice an item that has potential to be sold in the reuse centre rather than being sent to landfill. It is also common for attendants to scavenge from the waste disposal area to recover items that are recyclable.

Where it is not viable to have an attendant located at the transfer platform to provide constant personal supervision, a CCTV and a PA system may be used to assist in providing direction to customers on how to correctly separate their waste loads (see Gregadoo case study, Section 15.5).

The following sections provide examples of materials that may be recovered. Deciding what materials to target for recovery should occur following discussions with collection contractors, reprocessors, and customers and following assessment of feasibility.

9.2.1 Domestic type recyclables

State and Federal Governments have adopted significant waste minimisation policies aimed at reducing waste to landfill for both the environmental and practical benefits.

The operator should endeavour to recycle as much general recyclable materials as practicable. This can be achieved through advising customers of where recyclables should be placed, explaining to customers the benefits of separating recyclables from general waste, or recovering recyclables from the general waste stream.

To aid resource recovery, transfer station operators may consider recycling:

- Glass containers;
- Aluminium cans;
- Steel cans;
- PET plastic containers;
- HDPE plastic containers; and
- Paper and cardboard.

To help promote customer sorting the recycling area should always be maintained in a clean, organised and presentable condition. The operator should also ensure the timely transport of the materials in order to minimise the build-up of materials on site.

The separation and recovery of all the above items may not be feasible at all rural and regional sites depending on available quantities, existing collectors and reprocessors within the regional area, and transport and processing costs.

9.2.2 Items for resale

If the transfer station includes provisions for item resale, the items should be stored securely on the site in such a manner that the site is maintained in a clean, accessible and safe condition, and the items do not obstruct access to any site infrastructure, including fire hydrants located in the vicinity of the resale area, and recycling and waste disposal areas.

9.2.3 Garden organics

Consideration should be given to sorting garden organics received at the site. Organics suitable for use as firewood may be separated for this purpose. Other organic material may be separated, stockpiled and mulched.

Noxious weeds entering the site should not be placed in the garden organics stockpile. Instead, all noxious weeds should be disposed of as waste to landfill.

If organics processing is to be undertaken on site (such as mulching or composting), sufficient area should be available for safe and efficient plant operation and receiving, storing, and processing organics[4] and any residuals.

There are a number of environmental issues associated with onsite organics management including potential impacts on surrounding air and water quality (from leachate and surface water runoff), risk of fire and other hazards, and amenity impacts.

The Department of Environment and Conservation *Environmental Guidelines for Composting and Related Organics Processing Facilities* (2004) provides guidance for organics facility planning and environmental management techniques. The guidelines are relevant to composting and related organics processing facilities that are required to hold environment protection licences under Schedule 1 to the POEO Act 1997, however facilities that are not required to be licensed may also find useful information in the document relating to the management of organics.

Councils and operators proposing onsite management and processing of garden organics should refer to the *Environmental Guidelines for Composting and Related Organics Processing Facilities* (2004) for further information.

9.2.4 Timber

If timber is separated at the site it should be placed within a stockpile at least 50m clear of all combustible items. It may be possible to either sell the timber to the public, or mulch timber along with bulky garden organics.

Treated timbers should not be placed in this stockpile, but disposed of to landfill.

9.2.5 Mattresses

Some metal recyclers now provide recycling services for mattresses where mattresses are collected from waste facilities and taken to a recycling facility where the metal springs are separated out for recycling. Transfer station operators may therefore wish to consider separate stockpiling of mattresses for recycling subject to service feasibility.

9.2.6 Motor oil

Materials that may pose a risk to the environment, such as waste oil containers should be stored in bunded areas so that any leaks and spills will be contained. Where possible site staff should be responsible for decanting of any waste oils into the waste oil collection tank (if provided).

Containers of oil that are too large to decant into the oil collection tank should be stored in a bunded area or on spill trays as per EPA guidelines.

[4] This may include requiring sufficient area to allow turning of compost piles for example.

9.2.7 Cooking fats and oils

Several of the case study facilities support initiatives whereby cooking fats and oils are collected at the waste depots for subsequent reuse in the community as stockfeed or bio-diesels. Cooking fats and oils (if accepted at transfer stations) can be segregated onto bunded pallets or storage containers for collection and recycling.

Cooking fats and oils can be recycled into biodiesel fuel. Councils may wish to look for businesses that can provide this service in their local area or encourage new businesses to provide this service.

9.2.8 Scrap metal

Large quantities of scrap metal are often generated in rural and regional areas. Customers should be encouraged to separate scrap metal as much as possible and sufficient stockpile areas should be maintained to accommodate onsite storage until collection.

Metal recyclers should be contacted for further information about the potential cost (and revenues) from scrap metal recycling. It is advised that you contact one of the many steel scrap recyclers. Some even offer community donations for scrap collected.

9.2.9 Tyres

Whole tyres can be recovered and stockpiled until there is sufficient quantity for processing.

9.2.10 Lead Acid Batteries

Lead acid batteries can be segregated from general waste and placed on a pallet for recycling or sale. Facilities for lead acid battery recovery may be limited to car and truck batteries in rural areas, however the feasibility of recovering typical household and mobile phone batteries may also be assessed.

9.2.11 Concrete, bricks and tiles (building and demolition materials)

Operators may endeavour to separate and stockpile concrete, bricks and tiles at a transfer station for later processing (crushing). Crushed aggregate may be suitable for reuse as site haul-road base (particularly useful at landfill sites), or used in other Council engineering and service works.

9.2.12 Clean fill

Virgin Excavated Natural Materials (VENM) delivered to a transfer station may be stockpiled in a location where it can be easily used for resale or onsite construction.

9.2.13 Scavenging

Scavenging is an issue that needs to be carefully managed due to the associated OH&S risk. Both staff and the public may undertake unauthorised scavenging during the day or at night. There are ways to manage scavenging with staff through incentive schemes similar to that imposed at the Wingecarribee Council facility (see Wingecarribee case study in Section 30.5). In this case, incentives are provided for staff that increases resource recovery through gift vouchers at the reuse centre.

Scavenging by the public however is a separate issue. Customers should be prevented from entering bins to retrieve wastes. Falling into skips whilst scavenging is a serious concern (particularly where there is a deep drop) and must be addressed through staff supervision, safety rails, signage and/or surveillance. Some Councils have used hooks to retrieve materials placed in bins (see Ballina case study in Section 19). Site security should be maintained to prevent unauthorised access to the facility outside operating hours, particularly at night[6].

[5] N/A

[6] Applicable for sites with restricted access.

9.3 Staff training

Staff training is an important factor in managing the operation of a waste transfer station and/or resource recovery facility. Training should be provided in risk assessment and hazard identification, occupational health and safety requirements environmental management, and customer service. Training relevant to transfer station and resource recovery centre operations includes that listed in Table 13.

Table 13. Staff training

Topic	Subjects
Waste acceptance and transfer offsite	Identification of wastes and hazards
	Accepted wastes
	Covering waste loads
	Requirements for offsite transport
	Recording waste data
Emergency and safety	OH&S requirements and site safety plan
	Emergency response plan
	Confined space requirements
	Manual handling of waste
	First Aid
	Personal protective equipment
	Risk identification and management processes (and plan)
Financial	Budgets and credit control*
	Record keeping
Leadership and teamwork	Personnel supervision*
	Monitoring and review of personnel performance*
	Teamwork and effective workplace relationships*
Operating systems	Policy/management systems/procedures
	Waste audit and assessment*
	Operations audit and assessment*
	Use of site plant and equipment
	Storage and covering of wastes (including waste segregation)
	Site maintenance requirements
Customer service	Customer relationships and providing effective customer service
	Customer inquiries and complaints procedures
	How to educate the public about waste management issues
Environment	Environmental management systems and strategies
	Potential environmental impacts from operations and appropriate controls
	Environmental policies and procedures when transporting waste

*May not be relevant for all staff

9.4 Hours of operation

Transfer station operating hours need to accommodate the customers that are using the facility. If there are commercial collection vehicles using the facility then the hours of operation need to account for the schedules that these vehicles operate under (eg: early morning shifts result in a peak period mid-morning during the week). However if there are only small vehicles using the facility then hours of operation need to accommodate for peak periods of use. Appropriate opening times should be determined in consultation with the community the facility is being designed to service.

The normal operating hours for a site may extend beyond the hours it is open to the public in order to allow staff time to safely perform cleaning duties, general maintenance, and other required tasks. For example, Cowra Shire Council operates a transfer station which is open to the public 6 days per week. The Cowra facility is closed to the public on Mondays. This allows staff to safely move materials from the small-vehicles drop-off areas to larger stockpile areas at the rear of the site using site plant (further information provided in the Cowra case study in Section 27.6).

9.5 Staff resources

Sufficient staff should be employed at a site to allow for safe and efficient operation. More staff would be required where there are number of resource recovery activities undertaken onsite, and where there are requirements for frequent operation of plant and equipment.

All sites with limited operating hours should be staffed such that supervision and security is maintained at all times when the site is open.

9.6 Complaints management

Procedures for dealing with public complaints should be outlined in a documented complaints management system. Complaints should be formally registered and addressed by management.

9.7 Environmental management

9.7.1 Aesthetics

The aesthetic appearance of a transfer facility is important as it helps to promote better customer behaviour, which results in more efficient operations. Maintenance of aesthetic appearance should include:

- Regular cleaning and litter patrols:
- Landscaping; and
- Clear and efficient signage.

9.7.2 Traffic

Traffic management should include not only traffic flows within the facility but those entering and leaving the site. It is good practice to develop a traffic management plan that should include input from not only employees of the site but contractors and the general public.

9.7.3 Litter

All practicable measures should be taken to minimise litter generation and confine litter arising from the operation of the transfer station within the boundaries of the site. Where possible, all transfer station infrastructure should be designed to face a direction that provides the greatest protection against the prevailing winds.

Other control measures may include:

- Undertaking resource recovery and stockpiling within a bunded disposal area;
- Maintaining small active waste disposal and resource recovery areas; and
- Use of mobile litter fences around the active areas, if required.

Further, all litter should be cleared regularly from within the site and outside the site boundary, and customers entering and leaving the site should be required to cover all loads. Patrols on surrounding roads are also a worthwhile

9.7.4 Odour

Odour can have a significant impact on the amenity of adjoining properties. The most common form of odour control undertaken by facilities includes:

- Placing covers over waste where possible; and
- Having putrescible wastes regularly collected from site.

9.7.5 Vermin

While use of pesticides and baits may be required, the preferred methods of vermin control include covering of waste and good housekeeping. If pesticides are used, care should be taken to ensure that pesticides do not enter stormwater or leachate or pose an airborne pollution hazard or nuisance.

The operator should also ensure that any stormwater ponds are kept free of mosquito breeding larvae and that water does not pond in any other location that may propagate mosquito breeding.

9.7.6 Stormwater

There are three main types of stormwater generated on a waste transfer station site:

- Clean stormwater runoff from undisturbed areas of the site (or rehabilitated / revegetated areas of former landfill sites);
- Potentially sediment laden stormwater runoff from disturbed areas of the site and resource recovery operations; and
- Potentially leachate contaminated stormwater runoff from the waste receival area.

The fundamental approach to stormwater management should follow the operations listed below:

- Maintain undisturbed and rehabilitated / revegetated area as filters for sediment;
- Minimise disturbed areas on the site;
- Require regular cleaning and removal of litter from around the site;
- Cover waste left overnight at the facility or stored onsite during windy periods;
- Divert stormwater runoff from car parking, driveways and hard paved areas into a stormwater treatment system capable of removing litter, sediments and oil products;
- Ensure that water falling in the waste storage area does not leave the site untreated, by a placing a series of bund walls along the site perimeter or through the use of roofing. Treatments include litter racks and settlement ponds;
- Implement spill containment procedures and ensure appropriate training of staff and availability of equipment and materials for spill clean-up;
- Storage of HHW, lead acid batteries, and liquid wastes in bunded and covered areas;
- Maintain all surface water management facilities in good operating condition this includes periodic cleaning and maintenance; and
- Comply with all surface water management regulations and licence conditions.

9.7.7 Leachate

Leachate is deemed to include all water that has come into contact with waste. A range of appropriate measures should be implemented to minimise leachate generated during the operation of the site. This primarily involves implementing measures such as:

- Diverting upstream stormwater runoff from waste receival areas; and
- Minimising exposed areas at the waste receival areas through the use of roofs etc.

9.7.8 Noise

The impact of noise arising from the transfer station operations on all surrounding areas should be minimised. This can be minimised by implementing such measures as:

- Maintaining all plant and machinery in proper working order;
- Ensuring all vehicles accessing the site use the designated access roadways; and
- Operating plant and equipment within specified working hours;
- Bunding and use of natural barriers.

9.7.9 Dust

All practicable measures should be taken to minimise dust emissions arising from the operations of the facility. These should include:

- Sealing and/or watering access roads;
- Enforcement of speed limits; and
- Enclosing drop off areas and using water sprays.

9.7.10 Containment of hazardous waste and dangerous goods

All practicable measures should be taken to minimise the risk of environmental harm from the acceptance and onsite storage of hazardous waste and dangerous goods. Operational measures to minimise this risk include those outlined in Section 9.1.3.

9.8 Housekeeping

Housekeeping is a very important issue part of the operational procedures of a site. The housekeeping of a site increases the sites aesthetics and communicates a sense of pride to its customers. Customers are also more likely to use a clean and tidy site more often, and to use it more appropriately (ie the way it was intended to be used).

9.9 Instilling organisational culture

Related to achieving good housekeeping and overall management is the need to foster an organisational culture at each site which reflects pride, drive to maximise resource recovery, awareness of health and safety issues, and desire to provide customers with the best service possible.

Two facilities can be designed and constructed in an identical manner, but without an appropriate workplace culture the operations of each site will vary greatly.

Instilling organisational culture requires commitment from management as well as all staff and operators. Management leading by example can have a major impact on improving site operations. This should involve taking an active role an interest in the activities undertaken at each site, and regularly visiting sites to talk to workers and address operational issues.

9.10 Ongoing consultation with the community

Development and operation of a waste transfer station or resource recovery facility can be met with strong community opposition. Community concerns associated with ongoing operations may include concern over health and safety, environmental, and amenity impacts.

Engagement of the local community from the initial stages of planning and development and throughout ongoing operations can assist reduce community opposition. Methods for ongoing consultation post commissioning may include:

- Regular mail outs or press releases to the community informing of operations, new initiatives/developments at a site, service performance and achievement of waste reduction and resource recovery targets (if applicable);
- Establishment of a free-call telephone line providing service information;
- Complaints management system that ensures all complaints are documented and followed up in a timely manner;
- Regular community meetings/forums/ workshops;
- Engagement through a community reference group; or
- Management regularly spending time on site talking to staff and customers on an informal basis.

The level of ongoing consultation provided and types of activities undertaken should be tailored based on local conditions and community needs and expectations.

Further information about community consultation, including the use of community reference groups is provided in Chapter 6.

10. Cost Estimates

Below are typical cost items that should be considered when estimating initial establishment and ongoing operational costs for a proposed facility.

Cost estimates are provided as a guide only; they should not be used for the purpose of budgeting or setting gate fees and charges. Cost estimates may not be applicable in all regions given differences in the local availability of building materials. Detailed cost estimates should be calculated after consulting with construction contractors, technology providers, and equipment manufacturers.

Allowance for miscellaneous costs (including contingencies should be allowed for up to 20% of the total estimated costs. Allowance for supervision, project management, and contractor on-costs of up to 20% should also be allowed for.

Table 14. Design and planning

Item	Cost estimate
Approvals and licences (not including, SEE REF, or EIS).	Up to $10,000
SEE, REF, or EIS	Up to $200,000
Design drawings and documentation	Up to $60,000
Geological surveys and testing	Up to $30,000
Community consultation	Up to $50,000
Council resources required for the administration and management of the design and planning phase	Make allowance for staff time and resources

Cost estimates for construction are provided in Table 15. Allowance should also be made for construction labour, and any required scaffolding, portable offices, and utilities for contractors to be provided in the construction phase.

Table 15. Construction

Item	Cost estimate
Site clearing[i]	$1 – $2/m^2
Earthworks	Balanced cut and fill in soil: $10 – $20/m^3 Crushed rock fill (laid and compacted): $50 – $100/m^3
Concrete	Reinforced 25 MPa concrete slab on fill (up to 300mm thick): $150 – $200/m^3
Pavements	Sprayed bitumen[ii]: $15 – 25/m^2 Bituminous concrete (25mm) with kerbing and drainage[iii]; $30 – $40/m^2 Brick, block, or slab paving[iv]: $30 – $60/m^2
Roadworks	Crushed limestone/rock/blue metal 100mm thick: $10 – $20/m^2 200mm thick: $15 – $30/m^2 300mm thick: $25 – $35/m^2 'Suburban' type road with concrete kerbs 6m to 8m wide: $200 – $350/m
Retaining walls (concrete blockwork)[v]	Up to 1m high: $200 – $300/m^2 Up to 2m high: $500 – $700/m^2
Retaining walls (keystone system blockwork)[vi]	Up to 1m high: $200 – $300/m^2 Up to 2m high: $300 – $400/m^2
Sheds and shelters	$100 – $300/m^2 for shed type structure[vii] $400 – $600/m^2 for warehouse type structure with roller shutters, small offices, and amenities
Electrical works (including lighting)	Seek contractor estimate based on site design
Plumbing works	Seek contractor estimate based on site design
Drainage and stormwater treatment	Seek contractor estimate based on site design
Rainwater tank/s	$2,000 – $50,000 each
Landscaping	Up to $20,000
Fences (metal mesh)	$50 – $100/m
Gates	Mesh gates: $300 – $500 (1m wide) $700 – $1,500 (3m wide) Automatic gate: $2,000+

[i] Removal of medium to light vegetation

[ii] Includes 100mm crushed rock basecourse

[iii] Includes 100mm crushed rock basecourse

[iv] on prepared foundation

[v] Blockwork including reinforced concrete footing, blockwork reinforcement, excavation, subsoil drainage and crushed rock backfill

[vi] Keystone system blockwork including levelling base, joint pins, and crushed rock backfill

[vii] Does not include ground slab

Cost estimates for plant and equipment (provided in Table 16) does not include any additional costs of freight. These are estimated costs for the outright purchase of new equipment. Discounted costs may be achieved where second-hand equipment is purchased.

Table 16. Plant and equipment

Item	Cost estimate per unit
Site weighbridge and gatehouse	$70,000 – $120,000 each
Bins and containers	Mobile garbage bins 140L to 360L: $40 – $80/bin Plastic crates up to 1m^3: $200 – $500 Metallic skips and containers: 1 – 5m^3: $1,000 – $5,000 10 – 20m^3: $5,000 – $12,000 30 – 40m^3: $10,000 – $20,000 50m^3 +: $20,000+
Static compactor	$5,000 – $50,000
Baler	$5,000 – $20,000
Front-end-loader	$200,000 – $300,000
Walking floor	$100,00 – $300,000

Typical items included in the sit fit-out may include those listed in Table 17.

Table 17. Site fit-out

Item	Cost estimate
Boom gates	$5,000 – $10,000
Fire fighting equipment	Up to $10,000
Signage	Up to $10,000
Hand/guard rails	$50 – $200/m
Wheelstops	$20 – $50/m

Ongoing costs of operation should be estimated taking into cost items such as those included in Table 18.

Table 18. Ongoing operations

Item
Labour – when estimating labour requirements consider staff required for: • Gatehouse operations • Supervision of reuse centre or on the transfer station platform • Operation of plant and equipment including compactors, balers, front-end-loaders etc • Undertaking onsite processing of garden organics and concrete • Site maintenance, including litter patrols and landscaping • Emptying of pits of skips at regular intervals (where there is an onsite landfill, or stockpile areas)
Site administration and management – including preparation of operational and risk management plans and procedures
Staff training
Licence Fees
Insurances
Utilities costs
Contractor charges for mulching or crushing
Plant and equipment maintenance
Fuel, oil, etc for plant and equipment
Lease fees for plant and equipment (if not purchased outright)
Supplies for operation (including any bags, bale ties, pallets, etc required)
Haulage costs for waste and recyclables
Disposal costs for waste and recyclables at facility they are transferred to
Potential revenue from on sale of recyclables
Education and advertising materials

11. Checklists

A series of checklists have been prepared to assist Councils confirm that key issues have been considered for the various stages of development.

This checklist is provided for guidance purposes only. It does not cover any specific requirements of building standards, WorkCover (OH&S) guidelines, and other relevant Australian Standards.

Checklist 1 – Needs and feasibility analysis

Key Requirement	Considered
1. Has a needs analysis been prepared and documented?	☐
2. Does the needs analysis consider:	
2.1. Likely customers of the facility?	☐
2.2. Tonnage or volume of each type of waste and recoverable material that will be accepted?	☐
2.3. Potential growth rates in the region and the impact on future requirements for waste management?	☐
2.4. Where waste and recyclables from the facility will be transported to?	☐
2.5. Who will buy the resources recovered (and at what prices)?	☐
2.6. Potential environmental, social, and financial impacts of the proposal under various cost scenarios?	☐
3. Have alternate waste management options (not just transfer) been identified?	☐
4. Does the needs analysis provide a comparison of predicted environmental, social, and financial impacts of alternate waste management options?	☐
5. Has a financial assessment been undertaken?	☐
5.1. Does the feasibility assessment consider costs of alternate waste transfer/ transport systems?	☐
5.2. All costs and potential savings associated with the proposed development including capital costs, operating costs, and potential savings in landfill air space?	☐
6. Does the needs and feasibility assessment should benefits to the community from undertaking the proposed development?	☐
7. Have the findings of the needs assessment been shared with the community?	☐

Checklist 2 – Site Selection

Key Requirement	Considered
1. Is there opportunity to involve the community in the site selection process?	☐
2. Have siting criteria been established that address planning, technical, environmental, and community and social requirements?	☐
3. Prior to assessing sites, have you determined the area required for the facility and associated infrastructure, taking into account future growth and expansion?	☐
4. At a minimum, have the following criteria been considered in the site selection process:	
4.1. Planning	
4.1.1. Appropriate zoning	☐
4.1.2. Land ownership	☐
4.1.3. Available buffers	☐
4.1.4. Avoidance of environmentally sensitive or inappropriate areas	☐
4.2. Technical	
4.2.1. Integration with existing and future waste network	☐
4.2.2. Centrality	☐
4.2.3. Accessibility	☐
4.2.4. Existing services and utilities	☐
4.2.5. Size of area required	☐
4.3. Environmental	
4.3.1. Geology	☐
4.3.2. Groundwater	☐
4.3.3. Surface Water	☐
4.3.4. Ecology	☐
4.3.5. Visibility	☐
4.3.6. Traffic	☐
4.3.7. Topography	☐
4.3.8. Noise	☐
4.3.9. Odour	☐
4.3.10. Dust	☐

Checklist 3 – Planning and development

Key Requirement	Considered
1. Has advice been sought and Council planning staff consulted to determine requirements for development consent?	☐
2. Is development consent is required for the proposed development?	☐
3. Who will be the consent authority?	☐
4. What licences will be required for operation?	☐
5. Are there any potential limitations on development given the preferred site for development?	☐
6. Is an EIS or SEE required to accompany the development application?	☐

Checklist 4 – Consultation

Key Requirement	Considered
1. Has a community consultation plan been developed that identifies affected stakeholders and an appropriate level of consultation?	☐
2. Does Council have the required skills and available resources to undertaken consultation in-house, or should a specialist consultant be engaged?	☐
3. Has consultation been undertaken with Council staff and waste contractors?	☐
4. Are there methods in place to ensure that outcomes of consultation are considered in the final site design and operation?	☐
5. Does the consultation and community engagement plan address ongoing consultation once the facility is operational?	☐

Checklist 5 – Risk assessment

Key Requirement	Considered
1. Has an environment, health, and safety risk assessment been undertaken for proposed facility based on the draft concept design?	☐
2. Has Council's Risk Manager and insurance provider/s been contacted and consulted to discuss the outcomes of the risk assessment and insurance implications from the proposed development?	☐
3. Does Council require a financial risk assessment to be undertaken?	☐
4. If yes to the above, has a financial risk assessment been prepared?	☐
5. Are the outcomes of the environment, health, and safety and financial risk assessments acceptable to Council?	☐
6. What is the extension of reputation and political risk from the proposed development?	☐

Checklist 6 – Design and construction

Key Requirement	Considered
1. If the proposed facility is to be constructed on a former landfill site, have the potential impacts of landfill gas, leachate, and ground movement been incorporated in the design?	☐
2. Has an assessment been undertaken to determine the most suitable materials handling techniques based on estimated waste types and quantities, and staffing requirements?	☐
3. Does the site layout make best use of site topography?	☐
4. Is there sufficient space available in all designated work and storage areas to allow for efficient operations, and flexibility for future expansion of activities?	☐
5. Has the site been designed to maximise resource recovery by locating drop-off points for recyclables and reusable items prior to the mixed-waste drop-off point?	☐
6. Are roads and traffic areas adequately sized to allow for safe movement of vehicles, including turning of large transfer trailers?	☐
7. Has the risk of traffic accidents been minimised through the use of one-way traffic flow where possible, and appropriate traffic controls (such as roundabouts, give-ways, etc) at intersections?	☐
8. Are approaches to the site entrance, weighbridge, and drop-off points sized to accommodate potential queing?	☐
9. If a gatehouse and weighbridge is not required at present, is there allowance for future installation?	☐
10. Has the site design been developed to eliminate or control OH&S risks?	☐
11. Are design measures in place for the control of litter?	☐
12. Is the facility designed to prevent stormwater pollution?	☐
13. Is the facility designed to reduce noise impacts on staff and surrounding properties?	☐
14. Is the facility designed to minimise odour and dust?	☐
15. Does the facility design incorporate natural screening where possible, or appropriate structural design to minimise potential aesthetic impacts?	☐
16. Have prevailing weather conditions been accounted for?	☐
17. Is there adequate, clear, and consistent signage allowed for throughout the site?	☐
18. Are proposed site security measures appropriate?	☐
19. Have appropriate staff facilities been incorporated in the design?	☐
20. Are required utilities considered in the design?	☐
21. Is there an opportunity to incorporate provisions for an education facility?	☐
22. Have materials of construction been selected taking into account opportunities to use recyclable and renewable materials, and strength and quality standards required for safe and efficient operation?	☐
23. Has a risk and environmental management plan been prepared for construction works?	☐

Checklist 7 – Operation

Key Requirement	Considered
1. Have operational and management procedures been documented and implemented?	☐
2. Has a site specific OH&S and risk management plan been documented and implemented?	☐
3. Are management and safety plans readily available to staff on site?	☐
4. Are staff regularly provided with management and OH&S training?	☐
5. Are staff trained in looking for opportunities to increase resource recovery?	☐
6. Are staff trained in appropriate management and handling of HHW?	☐
7. Are the operating hours of the facility suited to meet the needs of the majority of customers?	☐
8. Are controls in place to manage potential environmental impacts associated with:	
8.1. Traffic?	☐
8.2. Litter?	☐
8.3. Visual amenity?	☐
8.4. Odour?	☐
8.5. Vermin?	☐
8.6. Stormwater runoff?	☐
8.7. Leachate?	☐
8.8. Noise?	☐
8.9. Dust?	☐
8.10. Management of HHW?	☐
9. Is the importance of housekeeping regularly emphasised to staff?	☐
10. Are management actively promoting a workplace culture that reflects pride, drive to maximise resource recovery, awareness of health and safety issues, and desire to provide customers with the best service possible?	☐

Continued… Refer to Part 2 for Sections 12-24

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