First edition

Australian standard for waste and resource recovery data and reporting

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**Abbreviations**

|  |  |
| --- | --- |
| ANZSIC | Australia and New Zealand Standard Industrial Classification |
| C&D | construction and demolition |
| C&I | commercial and industrial |
| the Department | the Australian Government Department of Agriculture, Water and the Environment |
| MSW | municipal solid waste |
| RDF | refuse derived fuel |
| WRR | waste and resource recovery |
|  |  |
|  |  |

# Introduction

## Context

This document (the standard) was developed on commission to the Australian Government’s Department of Agriculture, Water and the Environment (the Department) and establishes a national standard for data and reporting on waste and resource recovery (WRR).

National waste reporting relies on data from industry, states and territories and the Australian Government. The standard is intended to provide guidance to each of these sources.

Primary responsibility for waste regulation and policy rests with the states and territories. To a significant extent, state and territory data systems have developed independently – each has its own set of classifications, terminology and reporting systems that may be embedded in legislation, policy, regulation and licences. Differences between these systems increase costs and uncertainty for national waste businesses, make it harder to align state and territory policies, and increase the difficulty in compiling national reports and data sets.

There is a national drive for alignment and harmonisation of waste data systems. The National Waste Policy Action Plan (Commonwealth of Australia 2019) sets a national target (#7) to: ‘make comprehensive, economy-wide and timely data publicly available to support better consumer, investment and policy decisions’. Many of the 80 items in the Action Plan relate to achieving better, more nationally-harmonised, waste definitions, classifications, data and reporting, including:

#3.8 Explore how to better align reporting systems to agreed national classifications and definitions for data and reporting, to improve sharing of information, by 2020

#7.2 Implement agreed national data and reporting improvements, harmonised data classifications and definitions for reporting, and sharing arrangements across jurisdictions, by 2022.

State and territory waste data and policy specialists have broadly agreed that national standardisation of data and reporting is a worthy long-term goal, while recognising the time, cost and other difficulties in implementation.

## Role and target audience

The standard targets those who generate, collect, collate, transform and report data from waste-receiving facilities, including:

* the Commonwealth
* states and territories
* industry bodies that collect and use waste data
* regional waste management groups
* municipal councils
* waste auditors
* consultants, academics and analysts.

The states and territories are major stakeholders. The standard is intended to be a reference for their opportunistic and voluntary adoption when convenient. This builds on experience with the[Australian Hazardous Waste Data and Reporting Standard](https://www.environment.gov.au/protection/waste/publications/australian-hazardous-waste-data-reporting-standard), which was established in 2017[[1]](#footnote-1).

The standard is intended to drive reporting at all levels of the waste hierarchy, from waste avoidance through to disposal. This first iteration has little focus on the higher levels of the hierarchy. This is expected to develop over time, encompassing circular economy measures and issues.

The standard is not intended to instruct primary data providers (WRR facilities). Regulation of these facilities is a matter for the states and territories.

## Objectives of the standard

The objectives of the standard are:

1. to promote timely, efficient, coordinated, high quality, accurate, consistent and comprehensive measurement and reporting of waste generation and management in Australia
2. to improve national waste data and reporting
3. to guide reporting requirements under government funding or grant programs
4. to promote the convergence of state and territory data systems over time
5. to provide guidance to industry, auditors and analysts
6. to maximise the return of value to data providers.

Achieving these objectives will:

* better inform governments, the community and the market
* contribute to the development and harmonisation of policy and regulation.

## About this document

This first edition is a revision of the discussion draft released for state and territory comment in April 2021. It includes sections on definitions, scope, classifications, cross-boundary flows, data tasks and processes, and data management. Appendices are provided on how this document was developed (Appendix A), the history of national waste reporting (Appendix B), typical compositions of various product and mixed material loads (Appendix C), how waste is considered in export and import codes (Appendix D), and densities and weights of some common wastes and recovered materials (Appendix E).

# Definitions

1. Definitions

The standard needs to contain definitions sufficient to ensure it is understood and to clarify actual or potential ambiguity in national conversations on waste data. The definitions do not comprehensively cover all waste terminology. They were developed following reviews of pre-existing standards and literature[[2]](#footnote-2), with input from industry and government. The list may be enhanced over time. Definitions of infrastructure types are given in Table 5.

In any regulatory context, these definitions are subservient to those in the relevant legislation or regulation.

Table Definitions

|  |  |
| --- | --- |
| Term | Definition |
| Alternative fuels and raw materials | Non-traditional fuels and raw materials that are co-processed in cement kilns or other thermal facilities, potentially including refuse derived fuels, solid recovered fuels, spent catalysts, waste solvents and others. |
| Biosolids | Stabilised organic solids produced by wastewater treatment processes. |
| Bulky waste | See ‘hard waste’. |
| By-product | Incidental or secondary product made in the manufacture of another product. |
| Certified compostable plastics | Plastics that are suitable for microbial treatment in either (a) commercial composting or anaerobic digestion facilities as evidenced by conformity with Australian Standard AS 4736:2006, or (b) home composting as evidenced by conformity with AS 5810-2010. |
| Circular economy | Looking beyond the current take-make-waste extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources, and designing waste and pollution out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. It is based on three principles: design out waste and pollution; keep products and materials in use (ideally at their highest and best value); and regenerate natural systems. |
| Collection efficiency | The weight of discarded materials collected for recovery divided by the weight of waste generated. |
| Combustible waste | Waste that can readily catch fire and burn, including, but not limited to, organic waste, paper and cardboard, plastics, textiles, rubber, leather, some hazardous wastes and some composite wastes. |
| Commercial and industrial (C&I) waste | Waste that is produced by institutions and businesses, including offices, schools, restaurants, retail and wholesale businesses, and industries such as manufacturing. Also includes waste from primary and secondary production, such as mining and minerals processing.  Encompasses waste from all Australia and New Zealand Standard Industrial Classification (ANZSIC) codes except Division E and Group 753. |
| Compostable | A characteristic of a material that allows it to biodegrade, generating a relatively homogenous and stable humic-like substance. |
| Construction and demolition (C&D) waste | Waste produced by demolition and building activities, including road and rail construction and maintenance and excavation of land associated with construction activities. Consistent with ANZSIC Division E. |
| Core waste | Waste that is generally managed by the WRR sector, comprising solid waste and liquid hazardous waste, and generated in the municipal, construction and demolition, and commercial and industrial sectors, and including biosolids. Generally excludes, to the extent they can be identified, wastes from primary production. |
| Disaster waste | Debris and other waste resulting from disaster events including floods, bushfires and cyclones. |
| Disposal | Processes through which wastes are collected and processed or placed in an approved facility without deriving significant productive use. Includes deposit in landfill and incineration.  For data reporting purposes, the quantity of waste allocated to the fate ‘disposal’:   * *includes* residuals that are sent to landfill or otherwise disposed of * *includes* waste used for landfill cover or capping[[3]](#footnote-3) * *excludes* landfill cover or capping materials that are not waste[[4]](#footnote-4) * *excludes* soil used for landfill construction * *excludes* building and demolition waste used for on-site roads to the extent this material is not subject to a waste levy * *may exclude* (and does exclude from national reporting) landfill waste that produces methane gas used for energy recovery estimated using standard greenhouse gas measurement methods * is reported as wet weight. |
| Energy recovery | Processes through which wastes are collected, sorted and processed to recover energy in usable form, for example process heat, steam or in electricity generation.  For data reporting purposes, the quantity of waste allocated to the fate ‘energy recovery’:   * *excludes* residuals from energy from waste facilities that are recycled or sent to landfill or otherwise disposed of * *may include* (and does include in national reporting) landfill waste that produces methane gas used for energy recovery estimated based on standard formulas used in greenhouse gas reporting * is reported as wet weight. |
| Energy recovery rate | The weight of materials used for energy recovery (excluding residuals) divided by the weight of waste generated. |
| E-waste | Electrical or electronic waste, comprising any equipment, device or thing that is no longer wanted or working and was in some way dependent on, or designed for the generation, transfer or measurement of, an electric current and/or an electromagnetic field and designed for a supply voltage not exceeding 1000 volts for alternating current and 1500 volts for direct current. |
| Fate | The ultimate destination of a waste. The possible fates are waste reuse, recycling, energy recovery, disposal and long-term storage. |
| Hard waste | Bulky household waste that is too large to fit in kerbside bins. May also include recyclable material not accepted in household recycling bins. Sometimes called ‘bulky waste’. |
| Hazardous waste | Waste that, by its characteristics, poses a threat or risk to public health, safety or to the environment. Comprises wastes that cannot be imported to or exported from Australia without a permit under the *Hazardous Waste (Regulation of Exports and Imports) Act 1989*, and wastes within an Australian jurisdiction that are regulated within that jurisdiction as requiring particularly high levels of control. |
| Inert | A substance that has little or no chemical reactivity. Thus ‘inert waste’ is waste that has few or no putrescible materials. |
| Landfill rate | The weight of waste materials disposed of in landfill (excluding cover, construction and capping materials) divided by the weight of waste generated. |
| Local recycled material utilisation rate | The weight of recycled material used locally divided by the total weight of recycled material. ‘Local’ can refer to a region, state, or the whole country. |
| Management type | A classification of a waste management process based on the fate of most wastes that pass through it, for example, a recycling fate. |
| Material flow analysis | An analytical method to quantify flows and stocks of materials within a system. |
| Municipal solid waste (MSW) | Waste produced by households or collected by, or on behalf of, a municipal council. Includes waste from:   * street bins * street sweeping * litter and dumping clean ups * aquatic litter traps * municipal parks and gardens * street tree prunings * council facility operations (consistent with ANZSIC Group 753) * transfer stations (other than waste readily identifiable as arising from commercial operations).   Excludes waste:   * collected by, or on behalf of, a municipal council from businesses * from road works undertaken by, or on behalf of, a municipal council. |
| Organic waste | Waste that is derived from biotic processes. Includes food, garden organics, wood and biosolids. Typically excludes paper and cardboard, textiles, natural latex-based rubber, leather and nappies but may include them under some circumstances (for example, when considering methane emissions from landfills). Excludes plastics and synthetic rubber. |
| Packaging | Material that is used to protect or contain a product during transportation, storage, marketing or use. Packaging can also be an item that is physically attached to, or included with, a product or its container for the purpose of marketing the product or communicating information about the product. |
| Post-consumer waste | Material generated by households or by commercial, industrial and institutional facilities in their role as end-users of products which can no longer be used for their intended purpose. This includes returns of material from the distribution chain. |
| Primary production | The conversion of natural resources into primary products, usually for use as raw materials by other industries. |
| Putrescible | Liable to decay and decompose. |
| Recovered materials | Waste materials separated, sorted or processed for the purposes of waste reuse, recycling or energy recovery. |
| Recovery | An abbreviation of ‘resource recovery’. |
| Recovery rate | An abbreviation of ‘resource recovery rate’. |
| Recyclable | A characteristic of a product, packaging or associated component that can be diverted from the waste stream through available processes and programs and can be collected, processed and returned to productive use in the form of raw materials or products, excluding those used for producing energy. |
| Recyclables | Wastes suitable for recycling. |
| Recycled content rate | The weight of recycled material in a product or material divided by total weight of the product or material. |
| Recycling | Activities through which wastes are collected, sorted, reprocessed (including through composting), and/or converted into raw materials for use in a production system, excluding for energy.  For data reporting purposes, the mass of material allocated to the fate ‘recycling’:   * *includes* all materials received by a reprocessing facility that are processed to the point of being suitable for remanufacturing or return to productive use, whether immediately used or stored for later sale or use * *includes* weight losses to the atmosphere during the processing of wastes (for example, moisture, carbon dioxide from organics degradation) * *excludes* residuals that are sent to landfill or otherwise disposed of * *excludes* materials received at a recycling facility but not yet processed * is reported as wet weight. |
| Recycling facility | A facility that forms part of a system to produce raw materials from waste, excluding for energy. Includes facilities that sort, clean, grade and reprocess. |
| Recycling rate | The weight of materials allocated to the fate recycling divided by the weight of waste generated. Can be applied to specific materials, source streams, communities or industries, in which case the ‘waste generated’ component is restricted to those materials, streams, communities or industries. |
| Refuse derived fuel (RDF) | A fuel derived from solid waste not produced to a specification. |
| Remanufacturing | Processing of secondary materials to make new products. |
| Reprocessing | Processing of recovered materials to make raw materials for use in making new products or direct use. May also be called ‘secondary processing’. |
| Reprocessing efficiency | The weight of materials recovered through a reprocessing operation divided by the weight of materials entering he reprocessing operation. |
| Residual waste | Waste determined by its owner to be unsuitable for recovery. |
| Resource recovery | Activities through which wastes are collected, sorted, processed (including through composting), and/or converted into raw materials for use in a production system.  For data reporting purposes, the quantity of waste allocated to the fate ‘resource recovery’ is the sum of the quantities allocated to waste reuse, recycling and energy recovery. |
| Resource recovery rate | The weight of materials allocated to the fates waste reuse, recycling or energy recovery divided by the weight of waste generated. Can be applied to specific materials, source streams, communities or industries, in which case the ‘waste generated’ component is restricted to those materials, streams, communities or industries. |
| Return to productive use | Use of recovered materials for a beneficial purpose, including energy recovery.  For data reporting purposes, the quantity of material recorded as ‘returned to productive use’ comprises secondary materials that have entered into a remanufacturing operation, an energy from waste facility, or have been directly used. |
| Reuse | Reallocation of products or materials to a new owner or purpose without reprocessing or remanufacture, but potentially with some repair (for example, repair of pallets for resale, tyre retreading). |
| Scrap materials | A generic term used to describe unprocessed waste materials that are anticipated to be mostly recycled. |
| Secondary materials | A term applied to recovered materials that have been processed to the point of being suitable for remanufacturing or other return to productive use. |
| Secondary material utilisation rate | The weight of secondary material in a production or consumption system divided by total weight of all material in the production or consumption system. |
| Solid recovered fuel | A fuel derived from solid waste produced to meet a specification. |
| Solid waste | Waste that: can have an angle of repose of greater than 5 degrees above horizontal; or does not become free-flowing at or below 60oC or when it is transported; or is generally capable of being picked up by a spade or shovel. |
| Sorting efficiency | The weight of materials sent from a sorting process to reprocessing divided by the weight of materials collected for sorting. |
| Source separation | Sorting of waste materials at the point of waste generation prior to transfer to a WRR facility. |
| Source stream | Either municipal solid waste (MSW), commercial and industrial (C&I) waste or construction and demolition (C&D) waste. |
| Stock | An aggregation of material in a process or in use. |
| Waste | Materials or products that are unwanted, surplus, discarded, rejected, abandoned or left over, including those materials or products intended for or managed by reuse, recycling, energy recovery, treatment, storage and disposal.  Waste-derived materials cease to be waste and transition to being ‘secondary materials’ when the following conditions are met:   * they are to be used for a specific purpose * a market or demand exists * they fulfil the technical requirements for the specific purposes and meet the existing legislation and standards applicable to products * their use will not lead to overall adverse environmental or human health impacts.   The transition from waste to secondary materials is generally deemed to occur at the out-going gate of a reprocessing facility when the outputs require no further processing prior to being returned to productive use. |
| Waste and resource recovery (WRR) facility | A site at which the primary function is waste management. |
| Waste and resource recovery (WRR) sector | Businesses that undertake collection, storage and/or management of wastes, excluding the wastewater treatment industry. |
| Waste avoidance | Activities to avoid or minimise waste generation, including reuse, repair, product sharing systems, substitution of services for products and preferential purchasing. |
| Waste category | A primary classification of wastes and recovered materials. |
| Waste generation | The process of producing waste.  For data reporting purposes, the quantity of waste generated is the sum of the quantities of materials allocated to waste reuse, recycling, energy recovery, disposal, stockpiles and treatment. |
| Waste infrastructure | A collective term for WRR facilities. |
| Waste infrastructure type | A category of waste infrastructure based on materials received and primary processing methods. |
| Waste management | Processes through which wastes are collected, handled, sorted, processed, transformed or placed, including for disposal, storage or resource recovery. |
| Waste reuse | Reuse of a product or material that has entered a WRR facility (for example, the sale of goods from a reuse shop). |
| Waste stockpile | An accumulation of waste, whether or not reprocessed and whether or not in infrastructure approved for this purpose |
| Waste storage | An accumulation of waste in infrastructure approved for that purpose for a limited time, such that materials are readily retrievable. |
| Waste storage (long-term) | Waste storage where there is a plan and a reasonable expectation that wastes will be stored for more than 10 years. |
| Waste storage (short-term) | Waste storage where there is a plan or a reasonable expectation that wastes will be stored for less than 10 years. |
| Waste sorting | The process of separating mixed wastes into more homogenous material types. |
| Waste sub-type | A tertiary classification of wastes and recovered materials. |
| Waste treatment | The removal, reduction or immobilisation of hazardous characteristics to enable the waste to be sent to its final fate or further treatment. |
| Waste type | A secondary classification of wastes and recovered materials. |
| Wet weight | The weight including naturally occurring moisture at a given measurement point, without data manipulation to exclude moisture. |

# Scope

To the extent practicable, states, territories and other data providers should seek to collect and report data covering the full scope included in this standard, consistent with national reporting.

1. Geographical scope

Data should be collected and collated covering waste:

* generated in all states and territories of Australia excluding Norfolk Island and the Australian Antarctic Territory (except to the extent they send materials to the mainland or Tasmania)
* imported into Australia.

Imports are to be reported separately, and not included in waste generation. Exports are included in waste generation. For national reporting, waste will be attributed to the state or territory where it was generated to the extent practicable.

1. Temporal scope

Data should be collected at least annually and reported by financial year (1 July to 30 June). Waste should be attributed to the year it was generated.

1. Fate scope

State, territory and national waste and resource recovery reporting should encompass at a minimum:

* waste disposal
* energy recovery
* recycling
* waste reuse.

1. Materials scope

The national scope of waste reporting is ‘core waste’ plus ash. Core waste is defined in Table 1. Its component categories are itemised in Table 3, and include hazardous wastes. For clarity, core waste excludes, to the extent these can be readily distinguished:

1. liquid non-hazardous wastes
2. soil used for landfill cover or capping that was purchased or excavated onsite[[5]](#footnote-5)
3. soil-based wastes from mining and mineral processing
4. pre-consumer waste that is recycled on-site as part of a manufacturing process
5. wastes from agriculture, forestry and fisheries (primary production)[[6]](#footnote-6)
6. waste used for producing energy on the same site where more than 50% of the waste was generated.

Data on non-core waste will be included in national data sets as enabled by data availability, data methods, stakeholder demand and budget, with the expectation reporting will expand and improve over time. Non-core waste will be reported separately from the headline data. Reporting of non-core waste may cover part or all of wastes 1 to 6 as listed above.

National data will also cover wastes and recovered materials that are targeted by specific programs or of specific stakeholder interest, exercising caution to avoid double counting in primary data sets. These wastes and recovered materials will include:

* materials generated from container deposit systems
* packaging, e-waste and other products subject to product stewardship programs
* household hazardous waste collections.

# Classifications for WRR data and reporting

The set of standard national classifications is a central component of this standard. National classifications have been developed on waste source streams, materials and infrastructure. These are presented and further developed here. Additional classifications are presented on mixed material loads, geographical destinations and productive uses.

Adoption of standardised classifications over time should help to ensure the compatibility of data collected and reported in different jurisdictions and processes. However, it is recognised that amendments to pre-existing state and territory classifications are costly and difficult, potentially affecting licences, policies and historical trends. Standardisation will take time.

1. Classification of source streams

Waste should be reported as arising from one or more of the following source streams, which are defined in Table 1:

* municipal solid waste (MSW)
* commercial and industrial (C&I) waste
* construction and demolition (C&D) waste.

Materials retain their source stream classification during and after processing. For example, a materials recovery facility that receives only MSW would report residuals delivered to a landfill as MSW.

States and territories should establish systems for requiring waste receiving facilities to classify and report the source streams of the wastes they receive based on its primary origins and its contents as set out in Table 2.

Notwithstanding the prescriptions in Table 2, when reporting aggregated data, effort should be made to estimate the portions of MSW collected as part of the C&I stream, and of C&I waste reported in the MSW stream.

To the extent practicable, reported C&I waste should be partitioned:

* by subdivision for ANZSIC divisions C and D
* by division for other ANZSIC divisions.

Table Classifying waste loads by source stream

|  |  |
| --- | --- |
| Waste characteristics | Source stream |
| 95% or more of the materials originate from a commercial construction or demolition operation, including:   * construction or demolition of a dwelling * road works, including those undertaken for or on behalf of a municipal council | C&D |
| 95% or more of the materials originate from households (excluding commercial construction or demolition of a dwelling) | MSW |
| 95% or more of the materials originate from the operations of a municipal council or its contractors, excluding road works | MSW |
| 95% or more of the materials originate from the operations of businesses, institutions or governments (other than a municipal council) | C&I |
| Less than 95% of the materials originate within a particular source stream | To the extent possible, classify by percentage in each stream. If not possible, classify as originating in the largest source stream. |
| Contains mostly building and demolition waste of uncertain origin | C&D |
| Contains mostly materials of uncertain origin that are not building and demolition wastes and are delivered by a commercial operation | C&I |
| Contains mostly materials of uncertain origin delivered by a private citizen | MSW |
| Container deposit system returns | MSW, except where there is strong evidence they originate from commercial sources (for example, offices or events), in which case C&I |
| Disaster waste that cannot be readily partitioned by source stream | C&D |

1. Classification of materials

Data on core waste and ash materials should be classified in accordance with the framework set out in Table 3. Types and sub-types may be further divided so long as these further divisions can be grouped to those shown in the table. For clarity, core waste includes hazardous wastes and excludes the wastes listed in points 1 to 6 in Item 5 (page 9).

Attributes of waste materials may be recorded and reported where appropriate. Attributes may encompass:

* container deposit system eligibility
* packaging or not
* combustibility
* source application
* destination application
* pre- or post-consumer
* synthetic or natural fibre
* recyclable via kerbside systems or not
* banned from landfill
* potentially hazardous.

Table Classification of core waste and ash materials

|  |  |  |
| --- | --- | --- |
| Category | Type | Sub-type |
| 1. Building and demolition materials[[7]](#footnote-7) | Asphalt |  |
| Bricks, concrete and pavers | Brick rubble |
| Whole bricks |
| Concrete |
| Pavers |
| Ceramics, tiles and pottery | Ceramics |
| Tiles |
| Pottery |
| Plasterboard & cement sheeting | Plasterboard |
| Cement sheeting |
| Soil, sand and rock not contaminated above any threshold requiring classification as contaminated soils (N120) | Virgin excavated natural material |
| Other soil |
| Foundry sand |
| Other sand |
| Rock or stone |
| Rubble | Rubble comprising <10% soil |
| Rubble comprising >10% soil |
| 1. Metals | Iron and steel |  |
| Aluminium |  |
| Non-ferrous metals (ex. aluminium) | Copper |
| Non-ferrous metals (ex. aluminium and copper) |
| Mixed metals |  |
| 1. Organics | Food organics[[8]](#footnote-8) |  |
| Garden organics8 |  |
| Timber | Packaging and pallets |
| Other |
| Sawdust |  |
| Biosolids (non-contaminated) |  |
| Other organics |  |
| Mixed organics |  |
| 1. Paper & cardboard | Cardboard | Waxed |
| Not waxed |
| Polymer coated paperboard | Aseptic |
| Gable top |
| Hot cup and cold cup |
| Other |
| Newsprint & magazines | Newsprint |
| Magazines |
| Office paper |  |
| Mixed paper and cardboard |  |
| 1. Plastics | Polyethylene terephthalate (PET) (1) |  |
| High density polyethylene (HDPE) (2) |  |
| Polyvinyl chloride (PVC) (3) |  |
| Low density polyethylene (LDPE) (4) |  |
| Polypropylene (PP) (5) |  |
| Polystyrene (PS) (6) |  |
| Certified compostable plastics |  |
| Other plastics (7) |  |
| Mixed plastics |  |
| 1. Glass | Glass from food and beverage containers[[9]](#footnote-9) | Amber glass packaging |
| Flint glass packaging |
| Green glass packaging |
| Glass fines |
| Other and mixed glass packaging |
| Other glass | Window glass |
| Glass fibre insulation |
| Other glass |
| 1. Textiles, leather & rubber (excl. tyres) | Textiles | Wearable clothing[[10]](#footnote-10) |
| Unwearable clothing10 |
| Carpet |
| Other and mixed textiles |
| Leather & rubber (excl. tyres) | Leather |
| Rubber (excl. tyres) |
| 1. Ash | Ash | Fly ash from coal-fired power stations |
| Bottom ash from coal-fired power stations |
| Bottom ash[[11]](#footnote-11) from thermal waste processing |
| 1. Hazardous wastes | Plating and heat treatment (A) | Sub-types as listed in Schedule A of the National Environment Protection (Movement of Controlled Waste Between States and Territories) Measure, including liquid hazardous wastes, reported in accordance with the [Australian hazardous waste data and reporting standard](https://www.environment.gov.au/protection/waste/publications/australian-hazardous-waste-data-reporting-standard). |
| Acids (B) |
| Alkalis (C) |
| Inorganic chemicals (D) |
| Reactive chemicals (E) |
| Paints, resins, inks, organic sludges (F) |
| Organic solvents (G) |
| Pesticides (H) |
| Oils (J) |
| Food-derived haz. wastes (K100, K110) |
| Other haz. organic wastes (K140, K190) |
| Organic chemicals (M) |
| Contaminated soils (N120) |  |
| Asbestos (N220) |  |
| Other soil/sludges (other N) | Sub-types as described above |
| Clinical and pharmaceutical (R) |
| Tyres (T140) |  |
| Other miscellaneous (other T) | Sub-types as described above |
| 1. Unclassified materials |  |  |

**Waste products**

Data on product wastes may sometimes be needed (for example, for product stewardship programs) or may sometimes be collected because it is easier to classify by product than directly allocating to material types. Quantities of product wastes may be allocated to the material types listed in Table 3 using known or typical composition values (see Appendix C).

Examples of product types for which data may need to be separately collected include:

* end-of-life vehicles
* e-waste
  + televisions and computers
  + mobile phones
  + white goods and other large appliances
  + batteries other than used lead acid batteries
  + cables
  + other
* used lead acid batteries
* fluorescent light globes/tubes
* paint
* nappies
* mattresses
* carbon fibre goods
* fibreglass goods.

1. Classification of mixed material loads

Many vehicles presenting at WRR facilities carry loads of mixed materials. Mixed material loads should be classified in accordance with the list presented below. Tonnages may be allocated to the material types listed in Table 3 using known or typical composition values (see Appendix C).

Table Classification of mixed loads

|  |  |
| --- | --- |
| Primary source stream | Mixed material load type |
| MSW | 1. Domestic commingled recyclables (no CDS, glass included) |
| 1. Domestic commingled recyclables (no CDS, glass separate) |
| 1. Domestic commingled recyclables (CDS, glass included) |
| 1. Domestic commingled recyclables (CDS, glass separate) |
| 1. Mixed domestic MSW kerbside residuals (organics service) |
| 1. Mixed domestic MSW kerbside residuals (no organics service) |
| 1. Garden organics |
| 1. Food and garden organics |
| 1. Mixed domestic hard waste |
| 1. Street litter bins |
| 1. Street cleaning waste |
| 1. Residuals from materials recovery facilities |
| 1. Residuals from mechanical biological treatment |
| C&I | 1. C&I commingled recyclables |
| 1. Mixed C&I waste residuals |
| 1. Residuals from C&I sorting operations |
| 1. Quarantine waste |
| C&D | 1. Mixed building and demolition wastes for recycling |
| 1. Mixed building and demolition residuals |
| 1. Residuals from C&D recycling facilities |
| 1. Disaster waste, where not readily reportable by material type or classified as hazardous |
| Varied | 1. Residuals from metals recovery facilities (shredder floc) |
| 1. Residuals from pulping of recycled paper and cardboard |
| 1. Unclassified materials |

1. Reallocating product wastes and mixed loads to material classes

WRR data and reporting should aim for comprehensive coverage within the material classes presented in Table 3. To facilitate this, recorded tonnes of product wastes and mixed material loads should be reallocated to materials using measured composition values. Where the composition of a particular flow has not been measured, typical composition values may be used.

Appendix C of this standard provides a set of typical compositions for some types of product waste and mixed material loads. This appendix should be further developed over time. Contributions based on reputable sources and measurements are invited.

States and territories should undertake regular composition audits of key mixed waste streams with the aim of maintaining representative composition data to allow allocation of mixed loads to the materials in Table 3. This may include bin audits for MSW and landfill audits for C&I and C&D wastes.

1. Classification of destinations

Waste and recovered materials leaving a WRR facility should be classified by geographical destination type as follows, with reference to the WRR facility from which the materials are leaving:

* same jurisdiction – capital city
* same jurisdiction – regional (region should be specified)
* another Australian jurisdiction (should be specified)
* export overseas.

1. Classification of productive uses

Secondary materials leaving a WRR facility for return to productive use should have these uses be classified as follows:

* reuse
* civil construction
* soil improvement, land rehabilitation and mulch
* manufacture of new products similar to those from which the recovered material was derived
* manufacture of other products
* fuel.

1. Classification of infrastructure

Non-hazardous waste infrastructure should be classified according to the framework set out in Table 5. Where more than one type of waste infrastructure is present at a site, it may be classified as distinct facilities.

‘Primary management type’ refers to the management applicable to most of the material that passes through a facility.

A classification of hazardous waste infrastructure is given in the [Australian hazardous waste data and reporting standard](https://www.environment.gov.au/protection/waste/publications/australian-hazardous-waste-data-reporting-standard).

Table Classification of non-hazardous waste infrastructure

| Waste infrastructure type | Activities | Primary management type |
| --- | --- | --- |
| Aluminium reprocessing facility | Reprocesses recovered aluminium. | Recycling |
| Anaerobic digestion facility | Processes organic waste using anaerobic digestion technology. | Recycling[[12]](#footnote-12) |
| C&D waste recycling facility | Sorts and/or reprocesses building and demolition materials. | Recycling |
| Container deposit scheme drop-off facility | Accepts beverage containers for refund under a container deposit scheme. Includes over-the-counter exchanges, reverse vending machines, automated depots and any other facility where deposits on eligible containers can be redeemed. | Recycling |
| E-waste drop-off facility | Accepts e-waste, which is subsequently transported offsite for further processing. | Recycling |
| E-waste recycling facility | Reprocesses e-waste for recycling. | Recycling |
| Glass beneficiation facility | Processes glass packaging by cleaning, sorting and making into furnace-ready cullet and mixed glass fines. | Recycling |
| Glass reprocessing facility | Reprocesses or remanufactures glass cullet into new glass products. | Recycling |
| Landfill – inert | Accepts inert waste for disposal to land. | **Disposal** |
| Landfill – putrescible | Accepts putrescible (or biodegradable) waste for disposal to land. | **Disposal** |
| Materials recovery facility (MRF) | Sorts, aggregates and bales mixed recovered materials (comprising mainly packaging) for further sorting or reprocessing. MRFs may be said to undertake primary sorting of these materials. | Recycling |
| Mattress recycling facility | Reprocesses waste mattresses. | Recycling |
| Mechanical biological treatment facility | Processes mixed putrescible waste and includes a biological treatment process. | **Disposal (NSW)** |
| Recycling (other states) |
| Metals recovery facility | Sorts and prepares mixed recovered metals for reprocessing or remanufacturing (including scrap metal yards). | Recycling |
| Organics recycling facility | Processes food, garden and/or other organic wastes to manufacture beneficial products. | Recycling |
| Paper and cardboard recycling facility | Pulps and reprocesses recovered paper and cardboard. | Recycling |
| Plastics recovery facility | Sorts and prepares mixed or partially sorted recovered plastics for reprocessing or remanufacturing. | Recycling |
| Plastics reprocessing facility | Reprocesses or remanufactures recovered plastics. | Recycling |
| Refuse derived fuel facility | Produces fuel from recovered materials. | Energy from waste |
| Reuse shop | Sells materials or products diverted from the waste stream. Sometimes referred to as a ‘buy back centre’, ‘recycle market’ or ‘tip shop’. | Waste reuse |
| Rubber recycling facility | Reprocesses or remanufactures rubber. | Recycling |
| Steel reprocessing facility | Reprocesses or remanufactures recovered steel. | Recycling |
| Textile recycling facility | Reprocesses or remanufactures textiles. | Recycling |
| Thermal energy from waste facility | Generates energy from waste-derived materials using thermal technology, and has an energy efficiency of at least 0.65 calculated using the formulae and methods set out in EC (2011). | Energy from waste |
| Transfer station | Accepts waste and other materials, which are transported offsite for further processing and disposal. | Recycling (unless dedicated to residual waste only) |
| **Disposal (if dedicated to residual waste only)** |
| Other metals reprocessing facility | Reprocesses or remanufactures recovered metals other than steel. | Recycling |
| Other recycling facility | Sorts, cleans, grades and/or reprocesses recovered materials and does not fit any of the definitions given above. | Recycling |
| Other waste facility | Accepts waste for reuse, recycling, energy recovery or disposal and does not fit any of the definitions given above. | Not classified (may vary) |

# Government recording of cross-boundary flows

1. Inter-jurisdictional imports and exports

States and territories should measure or estimate, record and report:

* imports of waste and recovered materials into their jurisdiction from other Australian jurisdictions
* exports of waste and recovered materials out of their jurisdiction to other Australian jurisdictions.

Reporting should encompass, to the extent practicable:

* tonnes
* jurisdiction of origin or destination
* waste categories and types
* source streams.

1. International imports (states and territories)

States and territories should measure or estimate, record and report data from the waste sector on imports of waste and recovered materials from overseas. To the extent practicable, reporting should encompass:

* tonnes
* jurisdiction of origin
* port of entry
* waste category and type
* source stream
* reason for import, using the categories – reuse, recycling, energy recovery, treatment (hazardous waste), disposal and long-term storage.

1. International imports and exports (Australian Government)

The Australian Government will record and report flows of wastes and recovered materials into and out of Australia using the system for mapping trade codes to waste given in Appendix D of this standard and using the data categories tabulated below.

Table Data categories for reporting exports and imports of waste and recovered materials

|  |  |
| --- | --- |
| Export data categories | Import data categories |
| Australian Harmonized Export Commodity Classification (AHECC) code | Harmonized system (HS) code |
| Waste category (and type where practicable) | Waste category (and type where practicable) |
| Gross weight (tonnes)[[13]](#footnote-13) | Gross weight (tonnes) |
| Value (free on board) ($AU) | Raw value (free on board) ($AU) |
| Financial year | Financial year |
| State or territory of origin | State or territory of final destination |
| Port of loading | Port of entry |
| Destination (country) | Country of origin |

1. Waste flows spanning years

Some waste or recovered materials may be generated in one year but go to its fate in another year due to stockpiling. States and territories should take steps to measure, record and report flows of core wastes into and out of stockpiles, supplemented by reports on the total size of the stockpile (see details in Item 18).

Waste that has entered a stockpile in a particular year should be counted in the generation data for that year. When it is removed from the stockpile and taken to some fate, it should be retrospectively added to the fate data for the year it was generated (see Item 31).

# Government data tasks and processes

1. Defining and obtaining data from primary providers

States and territories should establish mandatory systems to collect and collate data from:

* WRR facilities and other facilities that received more than some threshold quantity of waste or recovered materials in the reporting year
* waste generators that manage waste via on-site storage above some threshold quantity.

Threshold quantities should be set at levels below which the waste quantity or flow is immaterial to a broad understanding of waste quantities or flows at the regional, state or national level.

Voluntary reporting systems should be established for:

* WRR facilities and other facilities that received less than the threshold quantity of waste or recovered materials in the reporting year
* *ad hoc* facilities (such as construction sites undertaking on-site processing for off-site use) where the waste quantities collectively managed exceed some threshold quantity.

1. Data to be collected

States and territories should establish systems for WRR facilities and other facilities that received more than the relevant threshold quantity of waste, recovered materials or secondary materials to report data (at least aggregated, but load-by-load where appropriate) in relation to:

1. Each load of waste, recovered materials or secondary materials entering the facility
   * date
   * quantity, comprising
     + measured weight, if available
     + estimated weight, if a reliable site-specific density is known
     + volume, otherwise
     + confirmation that weight is estimated, where applicable
   * source stream, based on the classification set out in Item 6
   * jurisdiction of origin
   * waste category, consistent with Table 3
   * waste type, when the load is consistent with any of the types in Table 3
   * waste sub-type, when the load is consistent with any of the types in Table 3
   * productive use based on the classifications set out in Item 11 [[14]](#footnote-14).
2. Each load of waste, recovered or secondary materials leaving the facility
   * date
   * quantity, comprising
     + measured weight, if available
     + estimated weight, if a reliable site-specific density is known
     + volume, otherwise
     + confirmation that weight is estimated, where applicable
   * waste category, consistent with Table 3
   * waste type, when the load is consistent with any of the types in Table 3
   * waste sub-type, when the load is consistent with any of the types in Table 3
   * geographical destination based on the classifications set out in Item 10
   * if the destination is a WRR facility
     + details sufficient to identify whether the material is to be disposed of or recovered
     + details sufficient to identify the destination
     + infrastructure type based on the classification set out in Table 5
   * if the load contains only materials leaving the facility for return to productive use, the type of productive use based on the classifications set out in Item 11.
3. On-site short-term stores or stockpiles exceeding 1,000 tonnes at the start or end of the reporting period, by waste category and type consistent with Table 3 (in tonnes or, if not known, cubic metres)
   * total size at the start of the reporting period
   * total size at the end of the reporting period
   * additions during the reporting period
   * removals during the reporting period.
4. Capacities (in tonnes or, if not known, cubic metres)
   * the maximum quantity of material that can be legally received at the facility per year in aggregate and by waste category and type consistent with Table 3
   * the maximum quantity of material that can be processed at the facility per year without substantial upgrade or amended approvals in aggregate and by waste category and type consistent with Table 3
   * for landfills only, the estimated remaining available airspace (net of liner and capping) over the whole of the site that has planning approval to accept waste (not just operational cells), calculated using the average site compaction density.

Reporters should undertake quality checks and data cleaning prior to reporting. The aggregated data reports should be based on records that are retained and are auditable.

1. Collection frequency and reporting timeliness

States and territories should collect waste data at least annually but preferably quarterly or monthly.

States and territories should seek to continuously improve the timeliness of their reporting to the public and the Australian Government.

1. Data collection mechanisms

Data collection mechanisms should involve as little manual handling as possible. States and territories should move towards fully automated data uploads.

1. Current process for developing the National Waste Report

A process for producing a national waste report was established in REC and BE (2015) and agreed in a meeting of the national waste data working group in July 2015. The process has become more flexible and iterative since that time but the steps set out below have been adhered to.

1. The Australian Government will issue annual national waste reporting tools to the states and territories for data input within six months of the end of the data period. The national data component within the tool will be as up-to-date as possible prior to issue.
2. States and territories should enter data for the relevant period data into the national waste reporting tool, negotiating changes to the tool as needed. This process should be complete within 12 months of the end of the data period.
3. The Australian Government will collate draft data and complete trend analysis and issue to the states and territories for review.
4. The Australian Government will issue a draft National Waste Report within 15 months of the end of the data period and publish the final report within 18 months of the end of the data period.
5. Review schedule for this standard

This standard will be reviewed at least once every two years following release of the National Waste Report.

# Data management

1. Data units

The primary unit for reporting waste and resource recovery is tonnes (wet weight). Where quantity data is recorded in volumetric units, it should be converted to wet weight using known or typical density values. Appendix E of this standard provides typical density values for some common types of waste and recovered materials. This appendix should be further developed over time. State and territory contributions are invited.

1. Data measurement

To the extent practicable, data should be based on measurements taken on weighbridges maintained and calibrated in accordance with National Measurement Institute guidelines (currently NMI 2008). States and territories should use available mechanisms to encourage or require the use of weighbridges, especially on larger facilities. Weighbridge operators should be appropriately trained, including on how to identify and record categories consistent with this document. Where estimates are used, the sources and age of input values used for those estimates should be documented and reported.

1. Data validation

Reporters should undertake quality checks and cleaning prior to reporting or transfer to states and territories, which should do likewise before transfer to the Australian Government. The checks should consider completeness, accuracy, consistency and reasonableness. In particular, checks should look for:

* unit errors (such as mistaking kilograms for tonnes)
* inconsistent categorisation of wastes from the same company or of the same type
* major gaps
* major differences from previous years (for example, in the quantity of a particular waste category).

Significant errors should be identified and removed. Suspect data should be identified.

1. Data gaps

National reporting requires comprehensive coverage. Unless and until data collection and collation is comprehensive and mandatory, data gaps may occur. Significant data gaps should be filled through research and best estimates based on transparent logic, applied consistently over time, and documented. To the extent possible, margins of error should be estimated as gaps are filled. Where there are gaps in state or territory data provided for national reporting, they may be filled by the Australian Government or its representatives.

Methods for filling significant data gaps may be developed and documented in this standard to ensure jurisdictions use similar approaches.

1. Amendments to historical data

To the extent practicable, the historical data record should be maintained by updating historical methods to take into account any methodological changes. Changes to historical data back to 2006-07 should be reported to the Australian Government.

1. Data quality and uncertainty

States and territories should maintain programs to continually improve the quality of their waste and resource recovery data. Annual reports should report on data quality from throughout the collection and collation process, including, but not limited to:

* numbers of facilities missing from the data
* gaps that have been filled through estimation
* past errors corrected
* the proportion of reported waste generation derived from
  + weighbridge measurements
  + mandatory reporting.

Waste data collators should attempt to capture, record and report the degree of uncertainty associated with the captured data, including the estimated error margin. It is recommended that the following default error margins are assumed:

* weighbridge ± 0.5% (Davis et al. 2010)
* volumetric estimate – case-by-case estimate
* conversion of volume to weight using site-specific density factors ± 15%
* conversion of volume to weight using default density factors ± 25%.

Audits commissioned with the intention of providing a representative compositional understanding of a waste stream and fate should apply waste categories that aim to ensure the proportion of materials in the category ‘other’ (or similar) represent less than 5% of the total.

1. Metadata

Waste data collators should record with their data:

* the applicable data period
* the date of receipt
* the name, position and organisation of the provider
* the method(s) of measurement
* any assumptions made in deriving the recorded values
* validation checks undertaken
* estimated uncertainty.

1. Data confidentiality

Noting the intention of target seven the National Waste Policy Action Plan (Commonwealth of Australia 2019) for publicly available data to support better consumer, investment and policy decisions, the Australian Government may consider waste and resource recovery data commercial-in-confidence if either:

* a state or territory specifically advises the Australian Government to that effect and provides supporting information, or
* in the Australian Government’s view, each of the following apply
  + public release of that data could reasonably be expected to have significant adverse impacts on the commercial interests of one or more of the original providers of that information
  + the damage to those commercial interests outweighs the public interest in publication of that information
  + the information is not available elsewhere in the public domain.

1. Indicators and metrics

The primary performance indicators of waste management and materials recovery are set out in Table 7. For national reporting, these indicators and metrics will be calculated to cover:

* a whole financial year
* the combined sum of core wastes and recovered materials plus ash
* each category of core waste.

Additional indicators and metrics may be developed over time to better capture progress towards a circular economy.

Table Measures of waste management performance

|  |  |  |  |
| --- | --- | --- | --- |
| Indicator | Unit | Application | Definition |
| Waste generation per person | kg per capita | 1. Each category of core waste and recovered material.  2. The combined sum of core wastes and recovered materials plus ash. | The quantity of waste generated in the reference year  *divided by* the jurisdictional population in December of that year. |
| Recycling rate | % | The quantity of waste to the fate ‘recycling’ in the reference year that was generated in that year[[15]](#footnote-15) *divided by* the quantity of waste generated in the reference year. |
| Recovery rate | % | The quantity of waste to the fates ‘recycling’ and ‘energy recovery’ in the reference year that was generated in that year15 *divided by* the quantity of waste generated in the reference year. |
| Return to productive use | tonnes | 1. Each category of core waste and recovered material.  2. The combined sum of core wastes and recovered materials plus ash. | The quantity of secondary materials that have entered into a remanufacturing operation, an energy from waste facility, or were directly used in the reference year. |
| Local recycling rate | % | 1. Each category of core waste and recovered material.  2. The combined sum of core wastes and recovered materials plus ash. | The quantity of waste to the fate ‘recycling’ in the reference year that was not exported and was generated in that year15  *divided by* the quantity of waste generated in the reference year. |
| Local recovery rate | % | The quantity of waste to the fates ‘recycling’ and ‘energy recovery’ in the reference year that was not exported and was generated in that year15  *divided by* the quantity of waste generated in the reference year. |
| Secondary material utilisation rate | % | Categories and types of core recovered materials that can be readily associated with consumption and for which data is available[[16]](#footnote-16). | The quantity of a secondary material consumed in Australia in the reference year *divided by* the total quantity of the material consumed in the reference year. |
| The combined sum of core wastes and recovered materials plus ash[[17]](#footnote-17). | The quantity of secondary material consumed in Australia in the reference year *divided by* the total quantity of all materials consumed in Australia in the reference year excluding those not relevant to flows of core waste[[18]](#footnote-18). |

References

APC (Anne Prince Consulting 2014) ACT NOWaste MRF Audit Report, online at <https://www.cityservices.act.gov.au/__data/assets/pdf_file/0019/1131841/2014-ACT_MRF-audit-report_2014-FINAL.pdf>

Banks CJ, Chesshire M, Heaven S and Arnold R (2011) Anaerobic digestion of source-segregated domestic food waste: Performance assessment by mass and energy balance, *Bioresource Technology*, **102**, 2 (January), pp. 612-620, online at <https://www.researchgate.net/publication/46009085_Anaerobic_digestion_of_source-segregated_domestic_food_waste_Performance_assessment_by_mass_and_energy_balance>

BE (Blue Environment), Randell Environmental Consulting, Ascend Waste and Environment and Little Sketches (2018) Improving National Waste Data and Reporting (revised v2), prepared for the (now) Department of Agriculture, Water and the Environment, March, online at <https://www.environment.gov.au/system/files/resources/de91c360-1995-475c-bc9f-f0c4c85b7692/files/improving-national-waste-data-and-reporting.docx>

BE and AWE (Blue Environment and Ascend Waste and Environment 2019) *Australian Hazardous Waste Data and Reporting* Standard, prepared for the (now) Department of Agriculture, Water and the Environment, July, online at [*https://www.environment.gov.au/system/files/resources/3b8179ea‑c9ce‑4b51‑939c‑deca12abd6a7/files/aus‑hazwaste‑data‑reporting‑standard‑2019.pdf*](https://www.environment.gov.au/system/files/resources/3b8179ea-c9ce-4b51-939c-deca12abd6a7/files/aus-hazwaste-data-reporting-standard-2019.pdf)

Commonwealth of Australia (2019) *National Waste Policy Action Plan 2019*, prepared by the Australian Government, state and territory governments and the Australian Local Government Association, online at <https://www.environment.gov.au/protection/waste/publications/national-waste-policy-action-plan>

Davis L, Karl C, Cai D, Bunker J, Germanchev A, Eady P and Blanksby C (2010) *On-board mass monitoring of heavy vehicles: results of testing program*, *Road and Transport Research*, 19(1), pp.3-17.

Dai Q, Kelly J and Elgowainy A (2016) *Vehicle materials: material composition of US light-duty vehicles*, Agronne National Laboratory, online at <https://greet.es.anl.gov/files/light-duty-vehicle-2016>

EC (European Commission 2011) *Guidelines on the Interpretation of the R1 Energy Efficiency Formula for Incineration Facilities Dedicated to the Processing of Municipal Solid Waste According to Annex II of Directive 2008/98/EC on Waste*, online at <https://ec.europa.eu/environment/waste/framework/pdf/guidance.pdf>

Hyder Consulting (2011) *National Waste and Recycling Reporting: A More Uniform Approach to Data*, prepared for the Department of Sustainability, Environment, Water, Population and Communities

NMI (National Measurement Institute 2008) *Weighbridge operators manual: a guide for operators who conduct public weighings*, [PDF 1.4MB] online at: <https://www.industry.gov.au/sites/default/files/2019-03/weighbridgeoperatorsmanual.pdf>

Pita F and Castilho A (2018) Separation of Copper from Electric Cable Waste Basedon Mineral Processing Methods: A Case Study, *Minerals*, **8**, 57, online at <https://www.researchgate.net/publication/328832229_Separation_of_Copper_from_Electric_Cable_Waste_Based_on_Mineral_Processing_Methods_A_Case_Study>

REC & BE (Randell Environmental Consulting and Blue Environment 2015) *NWDCRS Supporting Documentation: SOPs, Reporting Tool User Guide, and Reporting Guidance*, prepared for the (now) Department of Agriculture, Water and the Environment, August

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| 1. How this document was developed |

**Appendix A How this document was developed**

The Department commissioned Blue Environment, supported by Envisage Works, to develop this document in late 2019. In early 2020, the consultants notified the states and territories and peak industry bodies that the work would be undertaken and invited ideas for scope and content.

The consultants and the Department prepared workshop papers covering the rationale for a standard, the literature review, the target audience, and the agenda for workshops with the states and territories, and diagrams showing state and territory data systems as understood through national reporting.

In November and December 2020, three forums were held, with participation from the Department, all states and territories and the Australian Bureau of Statistics. The meetings addressed:

1. *State of play*, which aimed to understand the state of waste data and reporting across the nation from a range of perspectives.
2. *Role and scope*, which discussed the role, uses, objectives and scope, including a draft table of contents.
3. *Detailed content*, which considered a number of proposed elements of the standard selected for their importance, complexity, uncertainty and chance of covering them in a short period of time.

An outline document was then released for comment by states and territories, peak industry bodies and major companies. The document was further developed based on feedback and additional research and analysis, leading to a full draft.

A fourth government forum was held in May 2021 to discuss the draft. Written comments were requested and received from the Department, ACT, NSW, Vic, WA and the Australian Bureau of Statistics. The consultants then revised the draft to produce this version.

It is understood that this document will be further revised over time as required.

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| 1. A history of national waste reporting |

**Appendix B A history of national waste reporting**

National waste reporting was first attempted in the mid-1990s to measure progress in implementing the 1992 *National Waste Minimisation and Recycling Strategy.* This first attempt had little success, mainly because the scope, categories and comprehensiveness of the data collected by each state and territory did not match the proposed system and there was little appetite to change.

During the 2000s, the Department commissioned several snapshots of national waste quantities titled *Waste and Recycling in Australia*. Data quality and comprehensiveness improved over time, but differences between these reports meant trends could not be readily compiled. There were concerns from the states and territories about the transparency of the data transformations used to create a common national platform.

Following the 2009 *National Waste Policy*, the Department released the first National Waste Report in 2010 using 2006‑07 data. It subsequently commissioned a ‘method report’ (Hyder Consulting 2011) to describe what data would be collected and how it would be transformed. This was applied in the *National Waste Report 2013* (using 2010‑11 data), which was released with a calculation workbook so states and territories could track how their data had been transformed. Subsequently, a procedural document was released describing the whole process and setting out a slightly revised method (REC and BE 2015). This was agreed to by all states and territories in mid‑2015. Accompanying the document was a Microsoft Excel tool established to implement the agreed method, into which states and territories would enter their data and in which it would be transformed to standardised output tables and charts.

On completion of the agreed method, process and tool, the available historical data was revisited and transformed for consistency with the agreed approach, producing, in four separate tools, a historical record back to 2006‑07. Data for 2007‑08, 2011‑12 and 2012‑13 are absent from this record. It was initially intended that the Department would develop a national waste data system for storing and querying the national data record over time, but this did not proceed.

The *National Waste Reports* for 2016, 2018 and 2020 were produced by consultants. Each incorporated an additional two data years and presented trends back to 2006‑07. A National Waste Database was developed to house data for all years.

Detailed reporting and analysis of hazardous waste was undertaken in separate *Hazardous Waste in Australia* reports in 2015, 2017 and 2019.

A national consultation on improving Australia’s waste data and reporting took place in late 2017 and early 2018, culminating in an ‘improvements’ report (BE et al. 2018). This informed subsequent reporting changes and the 2019 *National Waste Policy Action Plan*.

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| 1. Typical compositions of waste products and mixed material loads |

**Appendix C Typical compositions of waste products and mixed material loads**

In accordance with Item 9, the following composition factors can be applied to allocate quantities of waste products and mixed waste loads to the material categories in Table 3. These values are provided based on best available estimates but compositions may vary widely depending on particular circumstances. Specific data should be used when available.

At the time of writing, composition data are available for only a fraction of the listed product wastes and mixed material loads. This table may be updated from time-to-time. Contributions based on reputable sources and measurements are invited.

Table Typical compositions of waste products and mixed material loads

| Waste product or mixed material load | building and demolition materials | Metals | Organics | Paper & cardboard | Plastics | Glass | Textiles, rubber & leather | Other | Sources and notes |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Batteries |  | 85% |  | 5% | 10% |  |  |  | Internet searches |
| Cables |  | 40% |  |  | 60% |  |  |  | Pita and Castilho (2018). May vary widely by cable type |
| Carbon fibre |  |  |  |  | 10% |  |  | 90% | Internet searches |
| Domestic commingled recyclables (CDS, glass included) |  | 3% |  | 49% | 8% | 28% |  | 11% | Population-weighted average of NSW and SA municipal council surveys |
| Domestic commingled recyclables (no CDS, glass included) |  | 3% |  | 48% | 9% | 28% |  | 12% | Population-weighted average of Vic and WA municipal council surveys |
| Fibreglass |  |  |  |  | 50% | 50% |  |  | Internet searches |
| Lead acid batteries |  | 70% |  |  | 10% |  |  | 20% | Industry sources. The metals are lead compounds and the ‘other’ is acid (hazardous waste sub-types D220 and B100 respectively). |
| Mattresses |  | 45% | 5% | 1% | 27% |  | 20% | 2% | Derived from information kindly provided by Soft Landing |
| Mixed domestic MSW kerbside residuals (no organics service) | 4% | 4% | 57% | 13% | 15% | 5% | 3% |  | National waste reporting tool 2018-19 (based on landfill audits and the National Greenhouse and Energy Reporting (Measurement) Determination |
| Nappies |  |  | 90% |  | 10% |  |  |  | Internet searches |
| Residuals from materials recovery facilities |  | 6% | 2% | 10% | 10% | 30% | 2% | 40% | APC (2014) |
| Residuals from metals recycling facilities (shredder floc) |  | 10% |  |  | 45% |  | 25% | 20% | Sustainability Victoria market summary report on shredder floc |
| Televisions and computers |  | 56% |  |  | 27% | 10% |  | 7% | Collated data from National Television and Computer Recycling Scheme co-regulatory arrangements |
| Vehicle (light duty) |  | 80% |  |  | 9% | 3% | 6% | 2% | Dai et al. (2016). Metals are iron and steel (64%), aluminium (11%) and non-ferrous (5%). |
| White goods and other large appliances |  | 60% |  |  | 20% | 10% |  | 10% | Blue Environment estimate |

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| 1. Waste in export and import codes |

**Appendix D Waste in export and import codes**

This table maps Harmonised System (HS) codes (which apply to exports and imports), and Australian Harmonized Export Commodity Classification (AHECC) codes (which apply to exports only) to waste categories and types. This map is referred to in Item 14 of this standard, and was developed over several years based on research and analysis. Exports are best analysed through AHECC codes. Imports can be analysed through HS codes only[[19]](#footnote-19). The list is up-to-date at the time of writing, taking into account recent AHECC code changes for waste glass and waste plastics. Further changes may be required as new codes are developed to provide for the bans on export of paper and cardboard or tyres.

Table Map from trade codes to categories and types of waste or recovered material

| HS Code | AHECC code | AHECC description | Link to waste or recovered materials | | % waste or recovered materials | |
| --- | --- | --- | --- | --- | --- | --- |
| Category | Type | Exports | Imports |
| 050690 | 5069000 | Bones and horn-cores, unworked, defatted, simply prepared, treated with acid or degelatinised and powder and waste of these products (excl. those cut to shape; and ossein and bones treated with acid) | Organics | Agricultural organics | 50% | 50% |
| 051199 | 05119942 | Animal products not elsewhere specified or included (incl. horsehair and waste thereof and natural sponges); and dead animals of Chapter 01, unfit for human consumption (exc. blood meal) | Organics | Agricultural organics | 100% | 100% |
| 180200 | 18020000 | Cocoa shells, husks, skins and other cocoa waste | Organics | Agricultural organics | 100% | 100% |
| 230210 | 23021000 | Bran, sharps and other residues, whether or not in the form of pellets, derived from the sifting, milling or other working of maize (corn) | Organics | Agricultural organics | 100% | 100% |
| 230230 | 23023000 | Bran, sharps and other residues, whether or not in the form of pellets, derived from the sifting, milling or other working of wheat | Organics | Agricultural organics | 100% | 100% |
| 230240 | 23024020 | Brans, sharps and other residues, whether or not in the form of pellets, derived from the sifting, milling or other working of cereals (excl. those of maize (corn) or of wheat) | Organics | Agricultural organics | 100% | 100% |
| 230250 | 23025000 | Bran, sharps and other residues, whether or not in the form of pellets, derived from the sifting, milling or other working of leguminous plants | Organics | Agricultural organics | 100% | 100% |
| 230310 | 23031000 | Residues of starch manufacture and similar residues, whether or not in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230320 | 23032000 | Beet-pulp, bagasse and other waste of sugar manufacture, whether or not in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230330 | 23033000 | Brewing or distilling dregs and waste, whether or not in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230400 | 23040000 | Oil-cake and other solid residues, resulting from the extraction of soya-bean oil, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230500 | 23050000 | Oil-cake and other solid residues, resulting from the extraction of ground-nut (incl. peanut) oil, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230610 | 23061000 | Oil-cake and other solid residues of cotton seeds, resulting from the extraction of fats or oils, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230620 | 23062000 | Oil-cake and other solid residues of linseed, resulting from the extraction of fats or oils, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230630 | 23063000 | Oil-cake and other solid residues of sunflower seeds, resulting from the extraction of fats or oils, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230641 | 23064100 | Oil-cake and other solid residues of low erucic acid rape or colza seeds, resulting from the extraction of fats or oils, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230649 | 23064900 | Oil-cake and other solid residues of rape or colza seeds (excl. low erucic acid rape or colza seeds), resulting from the extraction of fats or oils, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230650 | 23065000 | Oil-cake and other solid residues of coconut or copra, resulting from the extraction of fats or oils, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230660 | 23066000 | Oil-cake and other solid residues of palm nuts or kernels, resulting from the extraction of fats or oils, whether or not ground or in the form of pellets | Organics | Agricultural organics | 100% | 100% |
| 230690 | 23069010 | Oil-cake & other solid residues, resulting from the extraction of vegetable fats or oils, whether or not ground or in pellets (excl. of cotton, sunflower, rape or colza seeds; linseed; coconut; copra; palm nuts or kernels; HS 2304 or 2305) | Organics | Agricultural organics | 100% | 100% |
| 230800 | 23080000 | Vegetable materials, vegetable waste, vegetable residues and by-products, whether or not in the form of pellets, of a kind used in animal feeding (excl. goods which are included in any other more specific heading), not elsewhere specified | Organics | Agricultural organics | 100% | 100% |
| 251720 | 25172000 | Macadam of slag, dross or similar industrial waste, whether or not incorporating pebbles, gravel or broken or crushed stone cited in HS 251710 | Other | Other unclassified materials | 100% | 100% |
| 252530 | 25253000 | Mica waste | Other | Other unclassified materials | 100% | 100% |
| 261800 | 26180000 | Granulated slag (slag sand) from the manufacture of iron or steel | Other | Other unclassified materials | 100% | 100% |
| 261900 | 26190000 | Slag, dross (excl. granulated slag), scalings and other waste from the manufacture of iron or steel | Other | Other unclassified materials | 100% | 100% |
| 262011 | 26201100 | Hard zinc spelter (excl. that obtained from the manufacture of iron or steel; and those of HS 2618, HS 2619 and HS 7112) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 262019 | 26201900 | Slag, ash and residues containing mainly zinc (excl. hard zinc spelter; those obtained from the manufacture of iron or steel; and those of HS 2618, HS 2619 and HS 7112) | Hazardous (excl. tyres) | NEPM D230 | 100% | 100% |
| 262021 | 26202100 | Leaded gasoline sludges and leaded anti-knock compound sludges | Hazardous (excl. tyres) | NEPM D220 | 100% | 100% |
| 262029 | 26202900 | Slag, ash and residues containing mainly lead (excl. leaded gasoline sludges and leaded anti-knock compound sludges; those from the manufacture of iron or steel; and those of HS 2618, HS 2619 and HS 7112) | Hazardous (excl. tyres) | NEPM D220 or D300 | 100% | 100% |
| 262030 | 26203000 | Slag, ash and residues containing mainly copper (excl. those from the manufacture of iron or steel; and those of HS 2618, HS 2619 and HS 7112) | Hazardous (excl. tyres) | NEPM D190 or D300 | 100% | 100% |
| 262040 | 26204000 | Slag, ash and residues containing mainly aluminium (excl. those from the manufacture of iron or steel; and those of HS 2618, HS 2619 and HS 7112) | Hazardous (excl. tyres) | NEPM D300 | 100% | 100% |
| 262060 | 26206000 | Slag, ash & residues containing arsenic, mercury, thallium or their mixtures, for the extraction of arsenic or those metals or for manufacture of their chemical compounds (excl. from the manufacture of iron or steel; HS 2618, 2619 & 7112) | Hazardous (excl. tyres) | NEPM D130 (arsenic) or D120 (mercury) or D180 (thallium) or D300 (if contaminant not clear) | 100% | 100% |
| 262091 | 26209100 | Slag, ash and residues containing antimony, beryllium, cadmium, chromium or their mixtures (excl. those from the manufacture of iron and steel; and those of HS 2618, HS 2619 and HS 7112) | Hazardous (excl. tyres) | NEPM D170 (antimony) or D160 (berylium) or D150 (cadmium) or D140 (chromium) or D300 (if contaminant not clear) | 100% | 100% |
| 262099 | 26209900 | Slag, ash and residues containing metals, arsenic or their compounds (excl. those of HS 262011 to HS 262091; those from the manufacture of iron and steel; and those of HS 2618, HS 2619 and HS 7112) | Hazardous (excl. tyres) | NEPM D130 (arsenic), range of D possibilities for other metals or D300 (if contaminant not clear) | 100% | 100% |
| 262110 | 26211000 | Ash and residues from the incineration of municipal waste (excl. those of HS 2618, HS 2619 or HS 2620) | Hazardous (excl. tyres) | N150 (fly ash); D300 or other types of D wastes (bottom ash) | 100% | 100% |
| 262190 | 26219000 | Slag and ash, not elsewhere specified (incl. seaweed ash (kelp)) (excl. ash and residues from the incineration of municipal waste and those of HS 2618, HS 2619 or HS 2620) | Ash | Ash | 100% | 100% |
| 271091 | 27109100 | Waste oils containing mainly petroleum oils and oils obtained from bituminous minerals and also containing polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs) | Hazardous (excl. tyres) | NEPM M100 | 100% | 100% |
| 271099 | 27109900 | Waste oils containing mainly petroleum oils and oils obtained from bituminous minerals (excl. waste containing polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs)) | Hazardous (excl. tyres) | NEPM J100 | 100% | 100% |
| 300692 | 30069206 | Waste pharmaceuticals | Hazardous (excl. tyres) | NEPM R120 | 100% | 100% |
| 380400 | 38040000 | Residual lyes from the manufacture of wood pulp, whether or not concentrated, desugared or chemically treated (incl. lignin sulphonamides) (excl. tall oil, sodium hydroxide and sulphate pitch (tall oil pitch)) | Hazardous (excl. tyres) | NEPM C100 | 100% | 100% |
| 382510 | 38251000 | Municipal waste, as specified in Note 4 to this chapter | Hazardous (excl. tyres) | Y46 hazardous waste (Basel code) | 100% | 100% |
| 382520 | 38252000 | Sewage sludge, that is, sludge arising from urban effluent treatment plant (incl. pre-treatment waste, scourings and unstabilised sludge) (excl. stabilised sludge suitable for use as a fertiliser of Chapter 31) | Hazardous (excl. tyres) | NEPM N205 | 100% | 100% |
| 382530 | 38253000 | Clinical waste, that is, contaminated waste from medical research, diagnosis, treatment or other medical, surgical, dental or vet procedures, often containing pathogens, pharmaceutical substance & body fluids and require special disposal | Hazardous (excl. tyres) | NEPM R100 | 100% | 100% |
| 382541 | 38254100 | Waste halogenated organic solvents, that is, wastes containing mainly halogenated organic solvents, not fit for further use as presented as primary products, whether or not intended for recovery of the solvents | Hazardous (excl. tyres) | NEPM G150 | 100% | 100% |
| 382549 | 38254900 | Waste organic solvents, that is, wastes containing mainly organic solvents, not fit for further use as presented as primary products, whether or not intended for recovery of the solvents (excl. waste halogenated organic solvents) | Hazardous (excl. tyres) | NEPM G110 | 100% | 100% |
| 382550 | 38255000 | Wastes of metal pickling liquors, hydraulic fluids, brake fluids and anti-freeze fluids, not fit for further use as presented as primary products, as specified in Note 6 to this chapter | Hazardous (excl. tyres) | NEPM J120 (hydraulic, brake and anti-freeze fluids); B100 (pickling liquors) | 100% | 100% |
| 382561 | 38256100 | Wastes from chemical or allied industries mainly containing organic constituents (excl. HS 382510 to HS 382550), as specified in Note 6 to this chapter, not elsewhere specified or included | Hazardous (excl. tyres) | Not classifiable | 100% | 100% |
| 382569 | 38256900 | Wastes from chemical or allied industries (excl. those mainly containing organic constituents; and HS 382510 to HS 382550), as specified in Note 6 to this chapter, not elsewhere specified or included | Hazardous (excl. tyres) | Not classifiable | 100% | 100% |
| 391510 | 39151001 | Waste, parings and scrap of polymers of ethylene with a specific gravity of <0.94 (excluding those of a single thermoplastic material, transformed into primary forms) | Plastics | Low density polyethylene (LDPE, LLDPE) (4) | 100% | 100% |
| 391510 | 39151002 | Waste, parings and scrap of polymers of ethylene with a specific gravity of >0.94 (excluding those of a single thermoplastic material, transformed into primary forms) | Plastics | High density polyethylene (HDPE) (2) | 100% | 100% |
| 391520 | 39152001 | Waste, parings and scrap of polymers of styrene expanded (excluding those of a single thermoplastic material, transformed into primary forms) | Plastics | Expanded polystyrene (EPS) (6) | 100% | 100% |
| 391520 | 39152002 | Waste, parings and scrap of polymers of styrene (excluding of polymers of styrene expanded and those of a single thermoplastic material, transformed into primary forms) | Plastics | Polystyrene (PS), extruded polystyrene (XPS), rigid polystyrene and other polystyrenes (6) | 100% | 100% |
| 391530 | 39153001 | Waste, parings and scrap of polymers of vinyl chloride unplasticised (excluding single thermoplastic material, transformed into primary forms) | Plastics | Unplasticised polyvinyl chloride (uPVC) (3) | 100% | 100% |
| 391530 | 39153002 | Waste, parings and scrap of polymers of vinyl chloride (excluding those of polymers of vinyl chloride unplasticised and of a single thermoplastic material, transformed into primary forms) | Plastics | Plasticised polyvinyl chloride (pPVC) (3) | 100% | 100% |
| 391590 | 39159093 | Waste, parings and scrap of polymers of ethylene terephthalate (excluding those of a single thermoplastic material, transformed into primary forms) | Plastics | Polyethylene terephthalate (PET) (1) | 100% | 100% |
| 391590 | 39159094 | Waste, parings and scrap of polymers of propylene (excluding those of a single thermoplastic material, transformed into primary forms) | Plastics | Polypropylene (PP) (5) | 100% | 100% |
| 391590 | 39159095 | Waste, parings and scrap of plastics (excluding those of polymers of ethylene, styrene, vinyl chloride, ethylene terephthalate or propylene; and those of a single thermoplastic material, transformed into primary forms) | Plastics | Other (7) | 100% | 100% |
| 400300 | 40030000 | Reclaimed rubber, in primary forms or in plates, sheets or strip, whether or not mixed with virgin rubber or other added substances, provided that the product has the essential character of reclaimed rubber | Textiles, leather & rubber | Leather & rubber (excl. tyres) | 100% | 100% |
| 400400 | 40040000 | Waste, parings and scrap of rubber (excl. of hard rubber (HS 4017)) and powders and granules obtained therefrom | Tyres | Tyres | 100% | 100% |
| 401211 | 40121100 | Retreaded pneumatic rubber tyres, of a kind used on motor cars (incl. station wagons and racing cars) | Tyres | Tyres | 100% | 100% |
| 401212 | 40121200 | Retreaded pneumatic rubber tyres, of a kind used on buses or lorries | Tyres | Tyres | 100% | 100% |
| 401213 | 40121300 | Retreaded pneumatic rubber tyres, of a kind used on aircraft | Tyres | Tyres | 100% | 100% |
| 401219 | 40121900 | Retreaded pneumatic rubber tyres (excl. those of a kind used on motor cars (incl. station wagons and racing cars), buses, lorries and aircraft) | Tyres | Tyres | 100% | 100% |
| 401220 | 40122000 | Used pneumatic rubber tyres, whether or not subject to recutting or regrooving | Tyres | Tyres | 100% | 100% |
| 401290 | 40129000 | Solid or cushion rubber tyres, rubber tyre treads (incl. interchangeable tyre treads) and rubber tyre flaps | Tyres | Tyres | 100% | 100% |
| 401700 | 40170000 | Hard rubber (e.g. ebonite) in all forms (incl. cellular variety, waste & scrap); articles of hard rubber not specified in other chapters (incl. vats; troughs; knife handles & knobs, grip-handles and the like; sanitary and hygienic articles) | Textiles, leather & rubber | Leather & rubber (excl. tyres) | 10% | 10% |
| 411520 | 41152000 | Parings and other waste of leather or of composition leather (excl. old footwear (HS 6309) and parings and waste of raw hides or skins (HS 0511)), not suitable for the manufacture of leather articles; and leather dust, powder and flour | Textiles, leather & rubber | Leather & rubber (excl. tyres) | 100% | 100% |
| 440131 | 44013100 | Sawdust and wood waste and scrap, in the form of pellets | Organics | Timber | 100% | 100% |
| 440139 | 44013901 | Sawdust and wood waste and scrap, agglomerated, in logs, briquettes or similar forms (excluding in the form of pellets) | Organics | Timber | 100% | 100% |
| 440140 | 44014090 | Sawdust and wood waste and scrap, not agglomerated, excluding sandalwood | Organics | Timber | 100% | 100% |
| 450190 | 45019000 | Waste cork and crushed, granulated or ground cork (excl. agglomerated cork of HS 4504) | Organics | Other organics | 100% | 100% |
| 470620 | 47062000 | Pulps of fibres derived from recovered (waste and scrap) paper or paperboard | Paper & cardboard | *Not a waste type* | 100% | 100% |
| 470710 | 47071000 | Recovered (waste and scrap), unbleached, kraft paper or paperboard or corrugated paper or paperboard | Paper & cardboard | Cardboard | 100% | 100% |
| 470720 | 47072000 | Recovered (waste and scrap) paper or paperboard, made mainly of bleached chemical pulp, not coloured in the mass | Paper & cardboard | Office paper | 100% | 100% |
| 470730 | 47073000 | Recovered (waste and scrap) paper or paperboard, made mainly of mechanical pulp (for example, newspapers, journals and similar printed matter) | Paper & cardboard | Newsprint & magazines | 100% | 100% |
| 470790 | 47079000 | Waste and scrap paper or paperboard (incl. unsorted waste & scrap) (excl. unbleached kraft or corrugated (470710); that made mainly from bleached chemical pulp, not coloured in the mass (470720); or made mainly of mechanical pulp (470730)) | Paper & cardboard | More than one type | 100% | 100% |
| 510310 | 51031000 | Noils of wool or of fine animal hair | Textiles, leather & rubber | Other organics | 100% | 100% |
| 510320 | 51032000 | Waste of wool or of fine animal hair (incl. yarn waste, but excl. garnetted stock and noils of wool or of fine animal hair) | Textiles, leather & rubber | Other organics | 100% | 100% |
| 510330 | 51033000 | Waste of coarse animal hair (incl. yarn waste but excl. garnetted stock) | Textiles, leather & rubber | Other organics | 100% | 100% |
| 510400 | 51040000 | Garnetted stock of wool or of fine or coarse animal hair | Textiles, leather & rubber | Other organics | 100% | 100% |
| 520210 | 52021000 | Cotton yarn waste (incl. thread waste) | Textiles, leather & rubber | Textiles | 100% | 100% |
| 520291 | 52029100 | Cotton garnetted stock | Textiles, leather & rubber | Textiles | 100% | 100% |
| 520299 | 52029900 | Cotton waste (excl. yarn waste, thread waste and garnetted stock) | Textiles, leather & rubber | Textiles | 100% | 100% |
| 550510 | 55051000 | Synthetic fibre waste (including noils, yarn waste and garnetted stock) of man-made fibres | Textiles, leather & rubber | Textiles | 100% | 100% |
| 550520 | 55052000 | Artificial fibre waste (including noils, yarn waste and garnetted stock) of man-made fibres | Textiles, leather & rubber | Textiles | 100% | 100% |
| 630900 | 63090020 | Worn clothing and other worn textile articles | Textiles, leather & rubber | Textiles | 100% | 100% |
| 631090 | 63109000 | Used or new rags, scrap twine, cordage, ropes and cables and worn out articles of twine, cordage, rope or cables, of textile materials, sorted | Textiles, leather & rubber | Textiles | 50% | 50% |
| 700100 | 70010001 | Glass in the mass, other waste and scrap of glass, processed into furnace-ready fines and/or cullet | Glass | Glass | 100% | 100% |
| 700100 | 70010002 | Glass in the mass, other waste and scrap of glass, processed into non-furnace-ready fines and/or cullet | Glass | Glass | 100% | 100% |
| 700100 | 70010091 | Glass in the mass, cullet and other waste and scrap of glass, not elsewhere specified | Glass | Glass | 100% | 100% |
| 711230 | 71123000 | Ash containing precious metal or precious metal compounds of a kind used principally for the recovery of precious metal | Ash | Ash | 100% | 100% |
| 711292 | 71129200 | Waste and scrap of platinum, metal clad with platinum and other waste and scrap used principally for the recovery of platinum (excl. ash and sweepings containing other precious metals) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 711299 | 71129900 | Waste and scrap of precious metals and metals clad with precious metals (excl. gold and platinum); other waste and scrap containing these precious metals of a kind used principally for the recovery of these metals (excl. ash) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 720410 | 72041000 | Waste and scrap of cast iron | Metals | Steel | 100% | 100% |
| 720421 | 72042101 | Waste and scrap of stainless steel | Metals | Steel | 100% | 100% |
| 720429 | 72042912 | Ferrous waste and scrap, and remelting ingots of iron and steel (excl. waste and scarp of cast iron and alloy steel) | Metals | Steel | 100% | 100% |
| 720430 | 72043001 | Waste and scrap of tinned iron or steel | Metals | Steel | 100% | 100% |
| 720441 | 72044100 | Ferrous turnings, shavings, chips, milling waste, sawdust, filings, trimmings and stampings | Metals | Steel | 100% | 100% |
| 720449 | 72044901 | Ferrous waste and scrap (excluding waste and scrap of cast iron, alloy steel, stainless steel, in tin plate and tinned iron or steel) | Metals | Steel | 100% | 100% |
| 740400 | 74040012 | Refined copper waste and clean scrap (excl. copper waste and scrap of primary cells, primary batteries and electric accumulators) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 740400 | 74040018 | Refined copper waste and scrap (excl. clean, and copper and waste scrap of primary cells, primary batteries and electric accumulators) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 740400 | 74040022 | Waste and scrap of copper-zinc base alloys (brass) (excl. waste and scrap of primary cells, primary batteries and electric accumulators) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 740400 | 74040030 | Waste and scrap of copper alloys (excl. copper-zinc base alloys (brass) and copper waste and scrap of primary cells, primary batteries and electric accumulators) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 750300 | 75030001 | Nickel waste and scrap, excluding waste and scrap of primary cells, primary batteries and electric accumulators | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 760200 | 76020010 | Scrap beverage cans of aluminium | Metals | Aluminium | 100% | 100% |
| 760200 | 76020090 | Aluminium waste and scrap (excl. beverage cans) | Metals | Aluminium | 100% | 100% |
| 780200 | 78020000 | Lead waste and scrap; excluding waste and scrap of primary cells, primary batteries and electric accumulators | Hazardous (excl. tyres) | Non-ferrous metals (excl. aluminium), D220 | 100% | 100% |
| 790200 | 79020001 | Zinc waste and scrap; excluding waste and scrap of primary cells, primary batteries and electric accumulators | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 800200 | 80020000 | Tin waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 810197 | 81019700 | Waste and scrap of tungsten (wolfram) | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 810297 | 81029700 | Molybdenum waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 810330 | 81033000 | Tantalum waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 810420 | 81042000 | Magnesium waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 810530 | 81053000 | Waste and scrap of cobalt | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 810600 | 81060000 | Bismuth and articles thereof (incl. waste and scrap) | Metals | Non-ferrous metals (excl. aluminium) | 10% | 0% |
| 810730 | 81073000 | Cadmium waste and scrap | Hazardous (excl. tyres) | NEPM D150 | 100% | 100% |
| 810830 | 81083000 | Titanium waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 810930 | 81093000 | Zirconium waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 811020 | 81102000 | Antimony waste and scrap | Hazardous (excl. tyres) | NEPM D170 | 100% | 100% |
| 811100 | 81110000 | Manganese and articles thereof (incl. waste and scrap) | Metals | Non-ferrous metals (excl. aluminium) | 10% | 0% |
| 811213 | 81121300 | Beryllium waste and scrap | Hazardous (excl. tyres) | NEPM D160 | 100% | 100% |
| 811222 | 81122200 | Chromium waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 100% | 100% |
| 811252 | 81125200 | Thallium waste and scrap | Hazardous (excl. tyres) | NEPM D180 | 100% | 100% |
| 811292 | 81129229 | Germanium, vanadium, gallium, hafnium, indium, niobium (columbium) and rhenium, in unwrought or in powder forms or waste and scrap | Metals | Non-ferrous metals (excl. aluminium) | 10% | 0% |
| 844331 | 84433105 | Machines which perform two or more functions of printing, copying or facsimile transmission, capable of connecting to automatic data processing machine or a network (excl. printers of 84431) | Other | E-waste | Transactions having a reported value of less than $2500 per tonne | 0% |
| 844332 | 84433207 | Printers, copying machines or facsimile machines, capable of connecting to an automatic data processing machine or to a network (excl. those which preform two or more functions of printing, copying or facsimile transmission and printers of 84431) | Other | E-waste | 0% |
| 844339 | 84433908 | Printers, copying machines or fax machines (excl. those which perform two or more functions of printing, copying or fax & capable of connecting to an ADP machine or network, machines capable of connecting to an ADP machine or network & HS 84431) | Other | E-waste | 0% |
| 847130 | 84713011 | Portable automatic data processing machines, weighing not more than 10 kg consisting of at least a central processing unit, a keyboard and a display. | Other | E-waste | 0% |
| 847141 | 84714121 | Automatic data processing machines, comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined, weighing more than 10 kg | Other | E-waste | 0% |
| 847149 | 84714930 | Auto data processing machines, weighing more than 10 kg, presented in the form of systems, (excl. machines comprising in the same housing at least a central processing, input & output unit, whether or not combined) | Other | E-waste | 0% |
| 847150 | 84715040 | Processing units (excl. those of 8471.41 or 8471.49), whether or not containing in the same housing one or two of the following types of unit: storage units, input units and output units | Other | E-waste | 0% |
| 847180 | 84718060 | Units of automatic data processing machines (excl. processing units, input or output units and storage units) not elsewhere specified | Other | E-waste | 0% |
| 847290 | 84729003 | Office machines, including typewriters and word-processing machines (excluding office machines of HS 847210, 847230, 8443, 8470, 8471 and office machines specified elsewhere in the AHECC) | Other | E-waste | 0% |
| 852859 | 85285903 | Monitors, not incorporating television reception apparatus (excluding capable of directly connecting to and designed for use with an automatic data processing machine of heading 8471 and cathode-ray tube monitors) | Other | E-waste | 0% |
| 854810 | 85481001 | Waste and scrap of primary cells, primary batteries & electric accumulators, spent primary cells, spent primary batteries & spent electric accumulators | Hazardous (excl. tyres) | NEPM D (no. depends on major metal present) | 100% | 100% |

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|  |
| 1. Densities and weights of common wastes |

**Appendix E Densities and weights of common wastes**

In accordance with Item 23, Table 10 and Table 11 provide default density values for common materials and mixed waste loads, and Table 12 provides default weights for common product wastes.

Densities and weights may vary widely depending on load type and circumstances. Reporters should use their own density values where:

* sound evidence is available and can be cited
* their densities or weights are significantly different from those recorded below.

The values were compiled mainly from recommended values in documents provided by Qld, SA, Vic and WA (using averages where they varied), supported by other references[[20]](#footnote-20) and industry knowledge. Additional or amended values may be provided over time. Users are requested to report anomalies or suggest better values based on reputable sources or measurements. Evidence should be provided.

Table Densities of waste and recovered materials

| Category | Type | Sub-type | Density (t/m3) |
| --- | --- | --- | --- |
| Building and demolition wastes | Asphalt |  | 0.79 |
| Bricks, concrete and pavers | Bricks | 1.20 |
| Concrete | 1.50 |
| Ceramics, tiles and pottery | Ceramics | 0.75 |
| Tiles | 0.47 |
| Plasterboard and cement sheeting | Plasterboard | 0.23 |
| Cement sheeting | 0.50 |
| Soil, sand and rock | Soil | 1.20 |
| Sand | 1.60 |
| Rock or stone | 1.58 |
| Rubble |  | 1.36 |
| Mixed building waste |  | 0.72 |
| Metals | Ferrous metals | Mixed | 0.50 |
| Steel cans | 0.09 |
| Steel cans - baled | 0.50 |
| Steel cans - flat | 0.13 |
| Aluminium | Mixed | 0.16 |
| Aluminium cans | 0.03 |
| Aluminium cans - baled | 0.22 |
| Aluminium cans - flat | 0.09 |
| Non-ferrous metals |  | 0.14 |
| Organics | Food organics |  | 0.46 |
| Garden organics | Garden organics - loose | 0.15 |
| Garden organics - compacted | 0.26 |
| Timber |  | 0.21 |
| Sawdust |  | 0.33 |
| Biosolids |  | 0.72 |
| Other organics |  | 0.30 |
| Paper and cardboard | Paper | Loose | 0.09 |
| Compacted | 0.20 |
| Cardboard | Loose | 0.04 |
| Compacted | 0.11 |
| Polymer coated paperboard | Loose | 0.04 |
| Plastics | Plastic containers | Loose, whole | 0.01 |
| Baled | 0.14 |
| Glass | Glass from food and beverage containers, whole | | 0.34 |
| Textiles, leather and rubber (excl. tyres) | Textiles | Mixed textiles | 0.15 |
| Clothing | 0.10 |
| Carpet | 0.80 |
| Leather and rubber (excl. tyres) | Leather | 0.25 |
| Rubber (excl. tyres) | 0.30 |

Table Densities of mixed material loads

|  |  |
| --- | --- |
| Mixed material load | Density (t/m3) |
| Domestic commingled recyclables | 0.06 |
| Mixed domestic MSW kerbside residuals | 0.14 |
| Mixed domestic hard waste | 0.11 |
| Street cleaning waste | 0.70 |
| Mixed C&D waste | 1.23 |
| Residuals from materials recovery facilities | 0.31 |
| Residuals from metals recycling facilities (shredder floc) | 0.41 |
| Residuals from pulping of recycled paper and cardboard | 0.90 |
| Disaster waste | 0.72 |
| Quarantine waste | 0.30 |

Table Mass per item of product wastes

|  |  |  |
| --- | --- | --- |
| Type | Sub-type | kg |
| E-waste | Mobile phone | 0.14 |
| White goods and other large appliances | 52 |
| Mattress |  | 35 |

1. The current version of this document is BE and AWE (2019). It provides detail on hazardous waste data and reporting. However, because hazardous waste is included in core waste, it is also covered in this document, albeit at a lesser level of detail. It is assumed here that hazardous waste data will be managed noting the content of the *Australian Hazardous Waste Data and Reporting Standard*. [↑](#footnote-ref-1)
2. Including AS/NZS 3831:1998 *Waste management – glossary of terms*; ISO 14021 *Environmental labels and declarations*; AS/NZS 5377:2013 *Collection, storage, transport and treatment of end-of-life electrical and electronic equipment*; Hyder Consulting (2011) National *waste and recycling reporting: A more uniform approach to data*, prepared for the Department; Randell Environmental Consulting (2015) *National Waste Data Classification and Reporting System supporting documentation: standard operating procedures, reporting tool user guide, and reporting guidance*, prepared for the Department; Blue Environment (2018) [Improving national waste data and reporting](https://www.environment.gov.au/protection/waste/publications/improving-national-waste-data-reporting); Equilibrium (2013) [A stock-take of waste-related standards, specifications and guidelines](https://www.environment.gov.au/system/files/resources/8d0db8da-28dc-4517-874c-791d162a8119/files/stocktake-standards.pdf); SRU (Sustainable Resource Use 2012) *Australian* [Waste Definitions : Defining Waste Related Terms by Jurisdiction in Australia](https://www.environment.gov.au/system/files/resources/f3403579-8378-418d-8410-6578749189c6/files/australian-waste-definitions.pdf); the Association of Victorian Regional Waste Management Groups (2013) *Data Collection and Reporting Guidelines*; the [System of Environmental-Economic Accounting central framework](https://seea.un.org/content/seea-central-framework) chapter 3 (physical flow accounts); the OECD reporting framework; and the [EU waste legislation 2018](https://eur-lex.europa.eu/eli/dec_impl/2019/1004/oj). [↑](#footnote-ref-2)
3. For example, contaminated soil, building and demolition wastes, any cover material for which a gate fee was paid, or waste-derived materials for which no option other than landfill is available. [↑](#footnote-ref-3)
4. For example, soil excavated on-site or purchased. [↑](#footnote-ref-4)
5. See Table 1 definition of ‘disposal’ for more detail. [↑](#footnote-ref-5)
6. For organic materials, it is not always straightforward to distinguish wastes from natural residues. Case-by-case decisions may need to be made and should be justified. [↑](#footnote-ref-6)
7. Contrasts with ‘construction and demolition’, which refers to a source stream rather than a set of material types. [↑](#footnote-ref-7)
8. For mixed food organics and garden organics (FOGO) collections, the proportions of each component should be reported based on measurements or estimates. [↑](#footnote-ref-8)
9. Not all glass containers are recyclable, e.g. many perfume bottles. [↑](#footnote-ref-9)
10. ‘Wearable’ clothing is, at the time of disposal, suitable for reuse or resale. ‘Unwearable’ clothing is soiled, torn or otherwise damaged and not suitable for reuse or resale. [↑](#footnote-ref-10)
11. Fly ash from sources other than coal-fired power stations is classified as hazardous and should be reported under type ‘Other soil/sludges (other N)’ and sub-type ‘N150 Fly ash, excluding fly ash generated from Australian coal fired power stations’. [↑](#footnote-ref-11)
12. Anaerobic digestion could potentially be considered as both a form of energy recovery (as it generates methane usually used for its energy value) and a form of recycling (as it generates digestate usually used as an organic soil conditioner). It is understood that anaerobic digestion applied to solid organic wastes generally results in a mass of digestate that greatly exceeds the mass of methane generated. Accordingly, anaerobic digestion is classified here as a form of recycling, rather than energy recovery. [↑](#footnote-ref-12)
13. Gross weight includes packaging. The Australian Bureau of Statistics can also provide quantity data excluding packaging but the units vary, including numbers of items and volume. Use of gross weight is therefore recommended. [↑](#footnote-ref-13)
14. Relevant only for secondary materials accepted for remanufacturing. [↑](#footnote-ref-14)
15. The definitions of recycling and recovery rates take into account that some materials may be generated and stored in one year, then released from storage for recycling (or energy recovery) in a different year. The implication of this definition is that previously published recycling or recovery rates may need to be subsequently revised when the fate of stored materials is resolved. [↑](#footnote-ref-15)
16. The Australian Government published Australian secondary material utilisation rates for 2018-19 for glass, metals, paper and cardboard, plastics and tyres. Potentially, similar measures could also be calculated for asphalt, iron and steel, aluminium, non-ferrous metals (ex. aluminium) and other materials. This is more difficult on the sub-national scale. [↑](#footnote-ref-16)
17. This has not yet been attempted but may become possible at the national scale in the future. [↑](#footnote-ref-17)
18. Non-relevant flows may include fossil fuels, agricultural by-products, soil and rock. [↑](#footnote-ref-18)
19. Imports are further classified by 10-digit HTISC codes. No HS codes have been identified that include both HTISC codes containing waste and HTISC codes not containing waste. [↑](#footnote-ref-19)
20. <https://www.epa.nsw.gov.au/your-environment/waste/classifying-waste/virgin-excavated-natural-material>

    <https://www.nabers.gov.au/file/2267/download?token=GY-n9HxK> [↑](#footnote-ref-20)