



A STUDY INTO THE
FEASIBILITY OF A
NATIONALLY CONSISTENT
SYSTEM FOR TRACKING
CONTROLLED WASTES

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DEPARTMENT OF THE ENVIRONMENT

FEASIBILITY OF A NATIONALLY CONSISTENT SYSTEM FOR TRACKING THE MOVEMENTS OF CONTROLLED WASTES

Feasibility Analysis

Final Report

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EXECUTIVE SUMMARY

An estimated 98% of controlled (hazardous) waste in Australia is generated, transported and disposed or treated within a single state or territory. As a result, data charting the end-to-end cycle of this waste is collected and managed through a tracking regime informed by the jurisdiction's own definitions, gaps, rules and responsibilities.

The challenge is that waste does not operate in a closed system neatly defined by state and territory borders, which presents challenges for Australia's patchwork of tracking schemes in terms of optimising the outcomes for hazardous waste. These include a small but significant number of exemptions from tracking, poor alignment of jurisdictional hazardous waste codes and a lack regulatory visibility across borders that hampers the capacity to develop a whole-of-system approach to waste tracking.

A partial umbrella solution has been the National Environment Protection (Controlled Waste between States and Territories) Measure, which provides a consistent set of rules for wastes moved across internal domestic borders. But a consistent national dataset for hazardous waste – including both interstate and intrastate flows – has been identified as desirable in multiple reports and under Priority 4 in the National Waste Policy. The NEPM's exclusive focus on interstate movements does not address intrastate arisings, movements and fates.

The key benefits of an umbrella framework are: a more comprehensive picture of hazardous waste arisings, flows and fates; better alignment with international reporting obligations; and the promise of streamlining operations for waste transporters and receival facilities, potentially reducing waste costs. The greatest of these benefits is improved picture clarity, which will help target policy interventions, inform regulatory benchmarks across jurisdictions and enhance market intelligence.

The Department of the Environment (DoE) has commissioned Hyder Consulting to characterise the current state of hazardous waste tracking and data management in each jurisdiction, then explore options for developing a more consistent national dataset. A desktop review and a series of workshops around the country followed by direct industry consultation has resulted in a range of key findings.

A strong move towards electronic systems, with Queensland now beginning to explore a transition that will ultimately see all mainland states running online systems. Most advanced economies run paper-based tracking schemes, but best practice is moving to electronic. The US is expecting to this year introduce an electronic scheme based on a common national 'eManifest' document allowing one-stop submission to the federal EPA and all interested states. The US and Canada have also made significant progress on the so-called Single Window Initiative, which aims to provide a central electronic portal to manage the data and permitting on cross-border movement of a range of goods, including hazardous waste.

Mixed government views on the balance in hazardous waste tracking between its core regulatory role and the provision of data to inform policy. Regulators' perspectives on the appropriate role(s) of the tracking regime were highly influential in determining the level of acceptance about the need for a national dataset and around willingness to change existing regimes. In general there was greater acceptance of a national role around tracking interstate movements than there was for intrastate movements, which remain the concern of a single regulator. Other key issues were greentape reduction, competing funding priorities and the potential win/loss of landfill levy revenue.

Strong waste industry support for a consistent national tracking system that goes beyond data to include waste codes, approvals timelines and other operational rules. The unanimous industry support for reform speaks of a general frustration with the current plethora of systems and a clear sense of the benefits of consistency. These include reduced regulatory burden,

optimised in-house management and billing systems, reduced waste contractor confusion and levelling the competitive playing field by closing loopholes in tracking schemes.

A raft of recent – and planned – activity in many states to upgrade their tracking systems or regulatory architecture. This includes a whole new tracking system in South Australia based on the electronic NSW scheme, a thorough overhaul of the system in Western Australia, the introduction of electronic licencing in NSW and initial steps in Queensland to overhaul its hazardous waste regulations. Any proposed reforms will need to be conscious of the sunk investment jurisdictions have made in upgrading and tailoring their tracking schemes for regulatory purposes.

Data management options

Six IT options have been crafted, each with a singular focus on data rather than the underlying state and territory regulatory regimes that remain expressions of their individual priorities and approaches to protecting health and the environment. However, some options may require a level of cooperative amendment to intrastate regulations, for example to find a common approach to waste codes between the descriptive method in NSW and SA and the sub-codes used in Victoria and Western Australia.

The options also consider ways to stage implementation in order to address concerns about the resourcing and cost of the reforms. The recommended option is to develop a transparent, centralised reporting and analytics capability that can be used directly by DoE, jurisdictions, industry and the community. The states and territories will supply the required data in either a standard format (CSV, HTML or spreadsheet) or via a developed web portal, allowing DoE to transform, map (to a standard set of codes) and load the data to a central database for reporting and analysis. This option of a common back-end database minimises the cost and complexity of reform for the jurisdictions and provides DoE with greater data analytics to drive decision making, insight and greater public reporting.

A potential second stage is to develop a standardised electronic reporting template across all jurisdictions to further standardise reporting. This common front-end in its own right is relatively easy and inexpensive, but the process to determine and agree requirements, standardise code sets, business rules and business processes is expected to be lengthy and costly. These discussions could happen either in parallel or subsequent to stage one, depending on the agreed appetite for developing a national dataset.

1 INTRODUCTION

The movement of controlled waste within and between Australian jurisdictions is managed through regulations and guidelines. As with many developed policy areas, it is the purview of each state and territory to dictate the requirements regarding hazardous waste management and movement. The approaches taken by the states and territories regarding both the management and tracking of controlled waste varies considerably, the latter covering a range of paper based and electronic systems.

There is a further requirement at federal level to collect, analyse and report on this data as part of Australia's international obligations under the Basel Convention and the OECD framework covering transboundary movements of wastes.

Some steps have been taken toward greater unification of hazardous waste management in Australia. The National Environment Protection (Movement of Controlled Waste between States and Territories) Measure (NEPM) requires the tracking and reporting of controlled waste movements between jurisdictions with the primary aim of minimising the impacts on human health and the environment. A key goal of the NEPM is improved consistency between the states and territories around hazardous waste categorisation – including definitions, codes and coverage – and of the waste tracking systems they use.

Despite some progress, a deeper alignment of tracking and monitoring systems incorporating intrastate movements has yet to be realised. The result is instances of multiple counting; varying methods for classifying wastes, sources and fates; differences in interpretations of a waste, such as whether lead acid batteries should be coded for lead or acid; and varying metrics.

Given intrastate movements account for 98% of transported hazardous waste, this lack of alignment is the single greatest barrier to developing a more consistent national picture. This inconsistency undermines the robustness of Australia's international reporting obligations, limits the ability of government policy makers and industry decision makers to target their interventions, and hampers operating efficiencies for the waste industry.

There are a significant number of barriers that restrict this progress, including:

- misalignment of priorities and regulations
- limited resources and budget across states and territories
- poorly integrated systems for tracking controlled waste across borders
- inherent limitations in IT architecture and systems
- lack of overarching data governance agreements and processes.

One further downside of misaligned jurisdictional systems is the limited visibility on interstate movements, with only Victoria requiring in-state approval for shipments beyond its borders and none requiring the closure of waste tracking certificates by the receiving facility. This is a potential weak point in the tracking of hazardous waste nationally given the receiving state regulator will have no insight or oversight of the generator. Anecdotal evidence from waste industry stakeholders suggests under-the-radar movements are a live issue, which in turn undermines the Basel Convention principle of prior informed consent for all transportation of hazardous waste.

Findings from past reports

The federal Department of the Environment (DoE) has commissioned a number of reports in the last few years that provide additional context and insight for assessing the feasibility of a nationally consistent tracking scheme for hazardous wastes.

In 2011 the *Australian Waste Classifications* report highlighted major inconsistencies in waste data generally, including noting: “Even where jurisdictions adopt comparable approaches to classifications, different terms may be applied to comparable wastes. For example, ‘hazardous waste’ is designated as ‘regulated waste’ in Queensland, ‘listed waste’ in South Australia, ‘controlled waste’ in Tasmania and Western Australia, and as ‘prescribed industrial waste’ in Victoria.”

In 2013 the *Hazardous Waste Data Summary* (KMH, 2013) – and the companion *Hazardous Waste Data Assessment* – studied the information on hazardous waste generation in Australia, including waste that is disposed/treated within one jurisdiction and that crosses state, territory or national borders. It found little data has been collated and published on intrastate hazardous waste generation and highlighted the challenge posed by inconsistencies in waste classification, data collection and waste tracking systems.

The authors were required to make a number of assumptions to fill data gaps in order to estimate the total amount of hazardous waste generated within Australia. The data compilation in the assessment report, based on jurisdictions’ available tracking system data, estimated almost 4.4 million tonnes of hazardous waste were generated in Australia in 2010-11. The summary report’s attempt to normalise the data, by applying standard definitions and using estimations to cover gaps, increase the generation figure by 49% to 6.46 million tonnes, with all the variation coming from movements inside state and territory border. In effect, intrastate tracking regimes did not track 2.06 million tonnes of hazardous waste.

There was no consistent bias. The assessment report estimated that NSW generated 260,920 tonnes of hazardous waste in 2010-11, but the summary report normalised that to 1.59 million tonnes by including a number of exempted wastes, such as contaminated soils, waste oils, batteries and clinical waste. Victoria and Western Australia each generated around 950,000 tonnes, according to their respective tracking system data, but normalisation increased generation in Victoria to 1.33 million tonnes and reduced it in Western Australia to 760,000 tonnes. Or take Queensland, where data from the tracking system claimed 2010-11 generation of 1.45 million tonnes and the normalisation exercise increased that to 1.93 million – only for state government figures released two years later to put it at 921,000 tonnes¹.

The report also pointed to a potential lack of coordination within regulatory agencies between regulatory personnel, who manage the data tracking and collation systems, and those seeking strategic information from analysis of this data. It recommended, but did not detail, exploring cooperative federal-state government projects “with a view to analysing hazardous waste data both at the collated and individual transaction level (if appropriate), to assist in informing future waste management policy and priorities”.

In 2014, Blue Environment et al mapped the jurisdictional classification and coding of hazardous wastes to their appropriate category under the Basel Convention’s 47 Y-codes. The conversion was designed to assist in the compilation of standardised jurisdictional and national reports, suitable for publication by the Federal Government and for provision to the Basel Convention secretariat. Among recommendations relevant to this study were:

- consider mechanisms for obtaining ongoing data on the fate of hazardous waste in order to eliminate the discrepancies between the data presented for Basel and the (then) proposed National Waste Data System
- address deficiencies in data recording and tracking in relation to contaminated soils (all jurisdictions except Victoria) and asbestos (WA and NSW).

¹ State of Waste and Recycling in Queensland 2013

In 2015 the *Hazardous Waste Infrastructure Needs and Capacity Assessment* (Blue Environment et al) provided DoE with an indication of Australia's capacity and shortcomings in the management of hazardous waste. It reiterated limitations relating to hazardous waste data that could potentially be resolved with a uniform hazardous waste tracking system, including differences in tracking and classification methods, imperfect industry compliance (especially in the early years of system operation) and differences in the codes.

The report projected 2.8% average annual growth in hazardous waste volumes over the next 20 years, from about 5.7 million tonnes (Mt) in 2013-14 up to 9.9 Mt in 2033-34. Of the largest six waste types – oils, contaminated soils, asbestos, alkalis, grease trap waste and tyres – the first three are subject to various tracking exemptions and exclusions. The report also flagged a range of emerging wastes that are currently not tracked:

- new Stockholm Convention wastes the Federal Government is assessing for ratification, including HBCDs (eg brominated flame retardant), Persistent Organic Pollutants (eg recycled plastics in ewaste) and PFOs (eg fire-fighting foams and washwaters)
- contaminated biosolids
- lithium ion batteries
- non-toxic salts from coal seam gas.

This series of recent reports highlight how differences in the way Australian jurisdictions classify and track hazardous waste can undermine an accurate assessment of the generation, flows and fate of this sensitive waste stream. Some of the emerging waste streams present challenges to tracking systems and will need to be carefully considered, though the issues have not explored here. Table 1-1 highlights the top 10 waste streams in terms of the data gaps and exemptions.

This report outlines the various controlled waste tracking systems currently in use across Australia and explores potential options that could deliver a more consistent and holistic approach to tracking controlled waste.

Table 1-1 The top 10 gaps in waste tracking coverage (Blue Environment, 2015)

Waste	Jurisdictions not tracking
Asbestos	NSW, WA (NSW has just started tracking)
Contaminated soils	NSW, WA, Qld
Grease trap	NSW, SA
Animal effluent & residues	NSW
Contaminated biosolids	All
Fly ash from power stations	All
Tyres	NSW, SA, Victoria (NSW has started tracking)
Clinical waste	NSW
Waste pharmaceuticals, drugs & medicines	NSW
Lithium ion batteries	All (Not classified as hazardous, but sometimes burst into flames)

2 REVIEW OF JURISDICTIONS

The management of controlled waste is governed under regulatory regimes enacted by each jurisdiction and administered by the relevant state or territory agency. Hazardous waste is typically viewed as discrete from broader waste policies and goals, with no state or territory waste strategies other than Tasmania setting any management objectives or targets, apart from household hazardous wastes.

The review of controlled waste tracking practices in Australia jurisdictions has been undertaken to determine the similarities and differences in regulations, policy and procedures.

2.1 NATIONAL

DoE administers Australia's international treaties covering hazardous waste, which include the Basel Convention on the Control of the Transboundary Movements of Hazardous Waste and their Disposal and the equally descriptive OECD Decision on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations.

Basel requires an annual report on the international movement of hazardous waste and basic numbers around domestic waste generation. The OECD framework aims to provide a more explicit means of controlling movements of such wastes by including aspects such as the waste's industry of origin and final fate. It adopts the Basel waste definitions for simplicity, but the clarity of the picture is limited by the fact it does not integrate with Australia's ANZIC industry codes, nor provide any taxonomy around the preference of fates, including whether treatment is a final fate or simply a waystation.

DoE also administers and implements the federal *Hazardous Waste (Regulations of Exports and Imports) Act 1989*, which enables Australia to comply with specific Basel obligations. The objective of the Act and regulations is to regulate the export, import and transit of hazardous waste to ensure it is managed in an environmentally sound manner to protect people and the environment, both inside and outside Australia.

Under the Act, DoE operates a notification and permit system for international movements, which includes information from the states and territories on issues such as local markets and the track record of the applicant.

Finally, DoE is an observer member of the multi-jurisdiction National Environment Protection (Controlled Waste between States and Territories) Measure, which governs movement of hazardous wastes between jurisdictions. Established in July 1998, and last updated in 2010, the NEPM was implemented and administered by the laws and arrangements the participating jurisdictions consider necessary. It provides a protocol or framework for developing and integrating state and territory systems for the management and movement of controlled waste.

There are 75 'controlled wastes' on the NEPM list (Appendix B), though by convention there are 15 general categories of NEPM waste that are often used to simplify hazardous waste tracking reporting (Table 2-2).

Table 2-2 High level NEPM waste categories

NEPM '15' Code	NEPM 15 Waste Description
A	Plating and heat treatment
B	Acids
C	Alkalis

NEPM '15' Code	NEPM 15 Waste Description
D	Inorganic chemicals
E	Reactive chemicals
F	Paints, resins, inks, organic sludges
G	Organic solvents
H	Pesticides
J	Oils
K	Putrescible / organic waste
L	Industrial washwaters
M	Organic chemicals
N	Soil / sludge
R	Clinical and pharmaceutical
T	Miscellaneous

This compares to 55 Y-codes that Australia must report on under the Basel Convention (Table 2-3). Blue Environment in 2014 mapped the hazardous waste tracked by each jurisdiction into the most appropriate Basel Y-code, in some cases mapping multiple NEPM codes into a single Y-code and in others splitting a single NEPM code into more than one Y-code.

Table 2-3 Basel Y codes

Basel Convention	
Y1	Clinical wastes from medical care in hospitals, medical centres and clinics
Y2	Wastes from the production and preparation of pharmaceutical products
Y3	Waste pharmaceuticals, drugs and medicines
Y4	Wastes from the production..... of biocides and phytopharmaceuticals
Y5	Wastes from the manufacture..... of wood preserving chemicals
Y6	Wastes from the production, formulation and use of organic solvent
Y7	Wastes from heat treatment and tempering operations containing cyanides
Y8	Waste mineral oils unfit for their originally intended use
Y9	Waste oils/water, hydrocarbons/water mixtures, emulsion
Y10	Waste substancescontaining or contaminated with PCBs, PCTs, PBBs
Y11	Waste tarry residues ... from refining, distillation and any pyrolytic treatment
Y12	Wastes from production..... of inks, dyes, pigments, paints, etc
Y13	Wastes from production.....resins, latex, plasticizers, glues, etc
Y14	Waste chemical substances arising environment are not known
Y15	Wastes of an explosive nature not subject to other legislation
Y16	Wastes from production, formulation and use of photographic chemicals...

Basel Convention	
Y17	Wastes resulting from surface treatment of metals and plastics
Y18	Residues arising from industrial waste disposal operations
Waste having as constituents	
Y19	Metal carbonyls
Y20	Beryllium; beryllium compounds
Y21	Hexavalent chromium compounds
Y22	Copper compounds
Y23	Zinc compounds
Y24	Arsenic; arsenic compounds
Y25	Selenium; selenium compounds
Y26	Cadmium; cadmium compounds
Y27	Antimony; antimony compounds
Y28	Tellurium; tellurium compounds
Y29	Mercury; mercury compounds
Y30	Thallium; thallium compounds
Y31	Lead; lead compounds
Y32	Inorganic fluorine compounds excluding calcium fluoride
Y33	Inorganic cyanides
Y34	Acidic solutions or acids in solid form
Y35	Basic solutions or bases in solid form
Y36	Asbestos (dust and fibres)
Y37	Organic phosphorus compounds
Y38	Organic cyanides
Y39	Phenols; phenol compounds including chlorophenols
Y40	Ethers
Y41	Halogenated organic solvents
Y42	Organic solvents excluding halogenated solvents
Y43	Any congener of polychlorinated dibenzo-furan
Y44	Any congener of polychlorinated dibenzo-p-dioxin
Y45	Organohalogen compounds other than ... (e.g. Y39, Y41, Y42, Y43, Y44)
Categories of wastes requiring special consideration (Annex II)	
Y46	Wastes collected from households
Y47	Residues arising from the incineration of household wastes

Basel Convention	
Additional waste categories not included in Y-codes	
1	Other metal compounds
2	Other inorganic chemicals
3	Other organic chemicals
4	Putrescible/ organic waste
5	Waste packages and containers containing Annex 1 substances in concentrations sufficient to exhibit Annex III hazard characteristics
6	Soils contaminated with residues of substances in Basel Y-codes 19-45
7	Sludges contaminated with residues of substances in Basel Y-codes 19-45
8	Tyres

In Australia the controlled waste NEPM spells out a raft of issues for consideration by the states and territories, from hazardous waste definitions to waste tracking certificate information requirements to data report regimes. For example, the NEPM 75 wastes possess one or more of the characteristics in Table 2-4.

Table 2-4 Characteristics of controlled wastes

Dangerous Goods Class (UN Class)	UN Code	Characteristic
1	H1	Explosive
3	H3	Flammable liquid
4.1	H4.1	Flammable solid
4.2	H4.2	Substances or wastes liable to spontaneous combustion
4.3	H4.3	Substances or wastes which, in contact with water, emit flammable gases
5.1	H5.1	Oxidising
5.2	H5.2	Organic peroxides
6.1	H6.1	Poisonous (acute)
6.2	H6.2	Infectious substances
8	H8	Corrosives
9	H10	Liberation of toxic gases in contact with air or water
9	H11	Toxic (delay or chronic)
9	H12	Ecotoxic
9	H13	Capable of yielding another material which possesses H1-H12
		Other reasons

The NEPM outlines the information that is required to be provided when transporting controlled waste, although this information can be provided in a manner approved by the relevant state or territory of origin. Table 2-5 shows who is required to provide what information.

Table 2-5 Waste transport certificate information requirements

Waste Producer	Transporter	Facility Operator
Description of the waste	Name and address of transporter	Type of treatment facility
Physical nature of the waste	Vehicle registration number	Date of receipt at facility
Waste codes	Name of transit State / Territory	Any discrepancies noted in producer or transporter information
UN numbers and codes	Transport licence number	
Dangerous goods classes	Date of transport	
Packaging group number	Type of transport	
Amount of waste		
Type of package		
Facility name and address		
State / Territory destination		
Name and address of waste producer		
Producer's telephone number and emergency contact number		
Consignment authorisation number		
Producer identification number		
Date of dispatch		

Before transporting waste to another jurisdiction the waste producer must obtain a consignment authorisation from an agency (typically an EPA or similar) within the destination jurisdiction, or a facility delegated by that agency. The destination jurisdiction must issue or refuse a consignment authorisation within five working days following receipt of a completed application.

Each participating state or territory should ensure that records of the data generated by the tracking system are kept for at least 12 months. That data reveals a range of shortcomings in the approvals regimes regulating interstate movements of controlled waste in Queensland and South Australia²: Among the findings of the annual NEPM report for 2012-13 is that 42% of consignments from NSW into Queensland did not officially arrive and 60% from Victoria had no authorisation, while 88% of loads from Western Australia into South Australia had non-matching documentation and 21% waste data issues.

The other states and territories had clean import records, although anecdotal evidence gathered during the stakeholder engagement process suggests no jurisdictions are immune from under-the-radar movements and other leakage from their tracking systems, raising questions about the official data. Any such discrepancies undermine the Basel principle of prior informed consent by jurisdictions.

The information outlined in Table 2-5 is also typical of what the state and territories require when tracking controlled waste for intrastate purposes. Typically the producer, transporter and

² National Environment Protection Council 2012–13 Annual Report

facility operator will each keep a copy of the waste transport certificate, with copies sent to EPAs (or relevant agency) where required. These requirements are explored further below.

Despite this range of instruments, none of them alone or in combination provide the level of detail on hazardous waste across Australia required to: drive domestic policy, including waste sources, internal country flows and final fates; and fully meet Basel report requirements and foundation principles.

2.2 NEW SOUTH WALES

Controlled waste (referred to as hazardous waste in New South Wales) is legislated under the Protection of the Environment Operations (Waste) Regulation 2014, which outlines the requirements for tracking waste within, out of and into NSW. The NSW EPA administers the regulations in regards to controlled waste tracking, with the main focus being on minimising risk to the environment.

NSW operate an in-house electronic waste tracking system that covers both intrastate and interstate movement (movements *into* NSW) of controlled waste. Waste transported from NSW to other jurisdictions is tracked using a five docket paper system in line with the requirements of the receiving jurisdiction.

The electronic system has been in place since 2005 and has undergone a number of upgrades during this time to improve functionality. As the system has been developed in-house it is relatively easy to make changes/improvements – providing there is a budget allowance. Having been developed in-house, NSW has also offered to donate the system to other jurisdictions looking to implement an online tracking system.

The electronic system allows users to select data from drop down lists and stores previous waste transport certificate information for use in subsequent documentation. A user name and password is required to obtain access to the system and various access levels can be requested, ranging from view only to create and update. The reporting system, which stores data on the EPA system, is capable of a number of functions that interrogate the database, with custom reports produced by EPA staff using Crystal Reports.

A hard copy waste transport certificate is still required to accompany the waste during transport, however one of the main benefits of the electronic system to waste generators is they do not need to complete quarterly reporting as the data can be easily accessed and consolidated by the EPA. Waste can also be tracked online so waste generators are aware of the progress of their consignment. In the event the online system is unavailable, waste can be tracked using the paper based system and entered into the online system at the receiving facility.

The simplified process for undertaking hazardous waste tracking within NSW is shown below. A consignment authorisation is provided by the receiving facility after which, once the waste transport certificate has been filled out, the waste can be transported from the producer's premises to the receiving facility. The information required in NSW tracking documentation is similar to that described in Table 2-5.

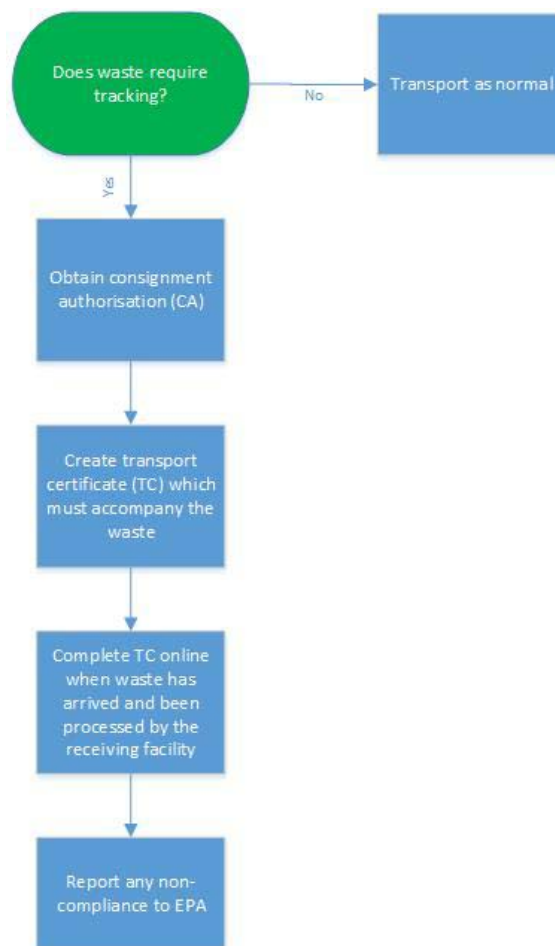


Figure 2-1 NSW hazardous waste tracking process

NSW aligns to the NEPM when tracking interstate movements of controlled waste, however there are differences in those wastes that are tracked when transported to an intrastate location. It has just started tracking asbestos and tyres, but the remaining wastes that do not require tracking when transported intrastate are:

- animal effluent and residues
- containers and drums that are contained with residues of waste referred to in this list
- encapsulated, chemically fixed, solidified or polymerised wastes referred to in this list
- filter cake contaminated with residues of substances that are referred to in this list
- grease trap waste
- soils contaminated with a substance or waste referred to in this list
- tannery waste including leather, dust, ash, sludge and flours
- wool scouring waste.

Along with the wastes listed above, the NSW Waste Regulation set out a provision that allows the EPA to exempt wastes from waste tracking where there are strong commercial recovery options. There are currently five wastes that are exempt from tracking:

- zinc wastes destined for reuse

- waste batteries destined for reuse
- spent pickle liquor destined for reuse
- non-hazardous waste hydrocarbon oil destined for recycling
- tracking of clinical and other specified wastes.

While not a large number of omissions and exemptions, some of these streams account for considerable volumes of waste, notably contaminated soils, asbestos and oily wastes.

2.2.1 STRENGTHS AND WEAKNESSES

A number of criteria have been considered in a qualitative sense when assessing the strengths and weaknesses of the NSW system, as outlined in Table 2-6.

Table 2-6 NSW hazardous waste tracking system strengths and weaknesses

Criteria	Intrastate tracking	Interstate tracking
Interstate and intrastate compatibility	Strength – online system covers all intrastate and incoming interstate hazardous waste movements	Strength – online system covers all intrastate hazardous waste movements and is able to be used for all incoming interstate hazardous waste movements
Real time analysis, reporting and management	Strength – up to date data is available, system capable of running reports and data is easily stored	Strength – interstate system operates in the same way as the intrastate system
Coverage of controlled wastes	Weakness – number of controlled wastes are not tracked or have been exempted	Strength – waste that must be tracked interstate follows the 'NEPM 75'
Alignment of coding and descriptions	Strength – codes and descriptions match NEPM	Strength – codes and descriptions match NEPM
Ease of updating system	Strength – developed in-house so providing budget is available no major constraints	Strength – online system is based on the same platform as the intrastate system
Data quality and accuracy	Strength – system has a number of in-built integrity checks and user error is reduced through use of drop down boxes and limited free text fields	Strength – interstate system offers the same checks and balances as intrastate
Prior informed consent	Strength – CAs are required from receiving facilities before waste is transported and the online system keeps NSW EPA generally up-to-date with hazardous waste movements	Weakness – For hazardous waste slated to <i>leave</i> NSW the EPA has no knowledge of this until the WTC paperwork is received

2.3 VICTORIA

Controlled waste (referred to as prescribed industrial waste) in Victoria is legislated under the Environmental Protection (Industrial Waste Resource) Regulations 2009, which outline the requirements for tracking prescribed industrial waste. EPA Victoria administers the regulations in regards to prescribed industrial waste tracking, with a key focus being on encouraging industry to utilise industrial waste as a resource, born in part from a severe constraint on hazardous waste disposal capacity.

Victoria has an electronic controlled waste tracking system that is supported by a traditional paper based system. Interstate tracking is undertaken using a paper based system. The electronic system was introduced in March 2013 and so far is used for approximately half of controlled waste movements. However, electronic certificates only cost 50c compared to \$5 for a paper version, so it is anticipated that usage will increase over time as pre-purchased paper certificates are used up.

The electronic system was developed by a third party and it is expensive to alter or update. All data (paper-based and electronic) is entered in a web-based portal and is stored on the Victorian EPA's IBIS system. The paper certificates are also entered by a third party data entry company on behalf of EPA but does not include all details on the form; for example, consignments are included as attachments.

Information provided via the electronic system is stored unaltered and can be extracted as required for reporting to the DoE. The information on paper submissions may be changed when entered into the system, mainly to correct information gaps and errors.

The Victorian waste codes are slightly different from those used under the NEPM. Overall there are 97 waste codes (compared to 75 NEPM codes) with the main differences being in the 'J' and 'N' codes (oils and soil/sludge). It is also noted that the definitions for particular wastes vary compared to NEPM descriptions. Previous work done by Blue Environment has mapped Victorian waste codes into NEPM and then Basel codes, however there is still confusion in industry when a different code is used for the same waste when working in different jurisdictions.

The generator has more responsibility regarding controlled waste tracking in Victoria compared to other jurisdictions, the logic being that waste generators should know the composition of their waste better than a contractor. The controlled waste tracking documentation process in Victoria is highlighted below.

Table 2-7 Victorian prescribed industrial waste tracking stakeholder responsibilities

Stakeholder	Responsibilities
Waste Generator	Have a valid consignment number Complete waste transport certificate (WTC) and provide to transporter Ensure transporter has valid permit/licence Ensure transporter fills out relevant sections of WTC before waste leaves the premises Keep information for two years
Waste Transporter	Provide and confirm relevant WTC details Ensure vehicle has valid permit/licence Keep hard copy documentation in the vehicle

Stakeholder	Responsibilities
Waste Receiver	Complete relevant sections of WTC Confirm receipt of waste Report on discrepancies Keep information for two years

The Victorian hazardous waste regime has some unique characteristics borne of a desire to more closely influence the fate of the material. Opposition by community groups to any new hazardous waste containment sites in the state saw the Victorian Government opt to create tiered hazard ratings in a bid to encourage resource recovery.

It categorises 'prescribed industrial wastes' for the purposes of determining where it can be disposed of. Category A is the most contaminated and Category C the least contaminated, depending on chemical thresholds. This also ties in with landfill levies, which range from \$250 per tonne for Category B to \$70 per tonne for Category C and \$30 per tonne for packaged waste asbestos to encourage correct disposal. Category A is banned from landfill, while material that has been processed for reuse can get a secondary beneficial reuse exemption from categorisation.

Unlike other jurisdictions, waste producers must seek approval from the Victorian EPA before transporting hazardous waste out of the state, rather than simply having to notify the agency as in other jurisdictions. Prior approval is not required for polychlorinated biphenyls (PCBs) or liquid wastes. Victoria allows 20 days to make a determination. As with other regimes, the waste producer would also be required to obtain a consignment authorisation from the destination jurisdiction.

2.3.1 STRENGTHS AND WEAKNESSES

While the use of paper compared to the electronic system in Victoria is approximately 50:50, for the purposes of this assessment the electronic system has been considered the predominant waste tracking system.

Table 2-8 Victorian prescribed industrial waste tracking system strengths and weaknesses

Criteria	Intrastate tracking	Interstate tracking
Interstate and intrastate compatibility	Strength – online system is able to be used for all intrastate and incoming interstate hazardous waste movements	Strength – online system is able to be used for all intrastate and incoming interstate hazardous waste movements
Real time analysis, reporting and management	Strength (notional) – up to date data is available from electronic tracking but not from paper, while the system is capable of running reports and data is easily stored	Strength (notional) – online system can be used for interstate movements
Coverage of controlled wastes	Strength – there are no blanket exemptions, with industry required to apply for secondary beneficial reuse exemption if tracking is not believed to be necessary	Strength – NEPM 75 are tracked interstate

Criteria	Intrastate tracking	Interstate tracking
Alignment of coding and descriptions	Weakness – a number of sub codes and descriptions vary from those in the NEPM	Weakness – when transporting PIW from Victoria the guidelines refer to Victorian waste codes which vary from those in the NEPM
Ease of updating system	Weakness – would require a third party to undertake the programming and is an expensive exercise	Weakness – would require a third party to undertake the programming and is an expensive exercise
Data quality and accuracy	Strength (notional) – the data entered via the online system is of good quality with reasonable accuracy, though confidence dips with the paper system	Strength (notional) – the data entered via the online system is of good quality with reasonable accuracy, though confidence dips with the paper system
Prior informed consent	Strength – CAs are required from receiving facilities before waste is transported and the online system allows the Victorian EPA to be generally up-to-date with hazardous waste movements	Strength – outgoing movements of PIW requires approval from the Victorian EPA before the movement is undertaken, other than PCBs and liquid waste

2.4 QUEENSLAND

Hazardous (regulated and trackable) waste in Queensland is managed under the Environmental Protection Regulation 2008, which outlines the requirements for tracking these wastes. The Department of Environment and Heritage Protection (DEHP) administers the regulations, which aim to prevent illegal waste dumping that has the potential to cause environmental harm.

The system currently in use is mostly paper-based, although larger companies are able to provide data in spreadsheet format. DEHP is in the early stages of developing an electronic system, with the paper-based and spreadsheet options retained for the foreseeable future. Development and implementation of the electronic system is likely to take at least 12 months.

The Queensland Waste Avoidance and Resource Productivity Strategy (2014–2024) noted the regulated waste framework is under review. A draft is expected to be released in 2015, with an expectation it will follow the lines of Victoria's Prescribed Industrial Waste model, allowing more flexibility in lower threshold categories. From a data perspective, proposed changes including providing more certainty about what wastes are regulated and gathering additional information for baseline data.

While there is considerable overlap between regulated and trackable wastes, they do not completely match. Schedule 7 of the regulations list 77 regulated wastes, while Schedule 2E lists 70 trackable wastes. Fire debris and washwaters is the only non-regulated waste that must be tracked. Among wastes that are regulated but do not have to be tracked are food processing waste and vegetable oils, pesticides, oxidising and reducing agents and hydrocarbon/water mixtures. Nevertheless, the transporter must still keep a record for these wastes detailing the date of pickup, a description and quantity of waste, plus its origin and destination.

When transporting trackable waste out of Queensland the jurisdiction receiving the waste must authorise its acceptance and issue a consignment number before transportation. For trackable

wastes coming into the state, approval must be granted by DEHP and a consignment number issued. However, Queensland experiences a significant number of discrepancies around hazardous waste movements into the state, with the most recently available numbers from 2012-13 revealing 181 instances of consignment non-arrival, 139 movements without authorisation and 84 cases of non-matching documentation³. The NEPC reports sheets home the nearly half the Queensland discrepancies to a small number of waste companies transporting oils, grease, tyres and clinical wastes from northern NSW.

Queensland waste handlers can apply for an exemption to their waste tracking obligations where they can demonstrate the waste does not possess environmentally significant characteristics. Exemptions are based on:

- type of contaminants
- level and/or concentration of contaminants
- level of environmental risk
- whether the waste is a dangerous good.

2.4.1 STRENGTHS AND WEAKNESSES

Table 2-9 Queensland regulated waste tracking system strengths and weaknesses

Criteria	Intrastate tracking	Interstate tracking
Interstate and intrastate compatibility	Weakness – a different paper based certificate is required for intrastate movements and incoming interstate movements	Weakness – a different paper based certificate is required for intrastate movements and incoming interstate movements
Real time analysis, reporting and management	Weakness – can take months for data from the paper certificates to be entered in the system	Weakness – can take months for data from the paper certificates to be entered in the system
Coverage of controlled wastes	Weakness – small loads (250kg) are not captured under the regulations	Strength – NEPM 75 are tracked interstate
Alignment of coding and descriptions	Strength – the Qld waste codes and descriptions align reasonably well with NEPM codes	Strength – codes and descriptions align well with NEPM
Ease of updating system	Strength – system is relatively basic (spreadsheet) and updating can be done in house	Strength – system is relatively basic (spreadsheet) and updating can be done in house
Data quality and accuracy	Weakness – manually entering data creates potential errors	Weakness – manually entering data creates potential errors

³ National Environment Protection Council 2012–13 Annual Report

Criteria	Intrastate tracking	Interstate tracking
Prior informed consent	Weakness – CAs are not required, with the generator only required to nominate the disposal/treatment/storage facility	Weakness – For regulated waste slated to <i>leave</i> QLD the DEHP has no knowledge of this until the WTC paperwork is received

2.5 WESTERN AUSTRALIA

The key implementation framework relating to controlled waste tracking in Western Australia is the Environmental Protection (Controlled Waste) Regulations 2004, which sit under the *Environment Protection Act 1986*. It is administered by the Department of Environment Regulation (DER) and aims to minimise transport risks and illegal dumping, inform policy and provide a level commercial playing field.

To determine if waste is controlled requires information about its composition, pH, flashpoint and/or the process that generated the waste, such as a septic tank. The regulations only apply to loads of more than 200kg or 200 litres. Controlled wastes are listed in Schedule 1 of the Regulations, which includes some definitions that are different from other jurisdictions:

- Bulk controlled waste – means a controlled waste that is transported in a “tank” (with each vehicle and driver to be specifically licenced)
- Packaged controlled waste – means a controlled waste that is transported otherwise than as a bulk controlled waste (with all vehicles and drivers listed, but only the transport company licenced).

Western Australia’s electronic Controlled Waste Tracking System (CWTS) was established in 2003, with a paper option for those unable to access the electronic system for any reason. The transporter is the key to the system. The company opens an electronic Controlled Waste Tracking Form and gives a printed copy to the driver, who returns it at completion of the job. Once the receival facility has entered its data online confirming receipt, the transporter electronically submits the information to DER by closing out the form. A significant amount of funding (~\$500,000) was invested in updating the CWTS and there is currently no future budget for enhancements and support, which is being transitioned into the DER.

The CWTS was developed by Amri-star for DER and an online user interface populates data into the SQL Access database. The system is integrated into an Oracle database (for licence invoicing) and will integrate into the Industry Licensing System for correlation with waste facilities licensed under the *Environmental Protection Act 1986*. The software has an interface for all users, with different levels of access/editorial rights and permissions for truck drivers, data entry and managers. DER inspectors and administration officers can see an additional level of fields to what the industry can see. The interface limits free text fields to minimise the opportunity for data entry errors or non-compliant transactions. For example if a waste type is populated, only facilities licensed to accept that waste will appear. Anomalies in data entry are also flagged, for example discrepancies in litres/ tonnages received.

There is approximately 90% compliance with use of the electronic system and if the paper system is used this information is manually entered into the CWTS to ensure data is kept in a single location. Part of the uptake has been the price difference between paper and electronic forms. Operators can buy a book of paper forms from the DER at a cost of \$1010 (20 triplicate forms at \$50.50/form), which includes the administration cost of DER manually entering the transaction in the system. Each electronic form is charged at \$39.50 per transaction.

Adding the ability to fill out the consignment authorisations for interstate movements online – superseding the manual system – has been beneficial and reduces duplication. However, hardcopies for interstate agencies are still generally required.

DER has capped the license fee at 2004 levels (\$225/license with a \$60/year renewal fee) to avoid discouraging industry from registering vehicles, facilities and drivers, but has increased the cost per transaction to reflect a user pays system, where the cost is transparent to the waste holder and covered by the transporter.

Reports can be generated on any of the information that is captured in the CWTS. For reports that are run regularly the DER administrators can re-run the query at any time, adjusting the date ranges as appropriate. For unique reporting enquiries it may require some additional programming or manual manipulation of data.

CWTFs are valid for 7 days from pick up of bulk controlled waste and 21 days for packaged controlled waste, and cease to be valid as soon as any part of the waste is unloaded, except at an approved transit facility or during a truck-to-truck transfer. They must be closed within 14 days of unloading. For paper forms, which come in triplicate, the transporter gives one copy to the receival facility, retains one and within 14 days of unloading must submit the final copy to DER, which inputs the data into the electronic system.

A 2013 report for the federal DoE concluded Western Australia was the only state where asbestos data could not be identified, that it covered limited categories of contaminated soil and was one of only two that includes septic wastes (with Queensland)⁴.

Reforms in 2014 introduced a new categorisation system that converted Western Australia's previous 81 categories to more closely match the NEPM categories and made some minor amendments to mirror the 2010 NEPM changes. Like Victoria, Western Australia added some additional sub-categories, for example codes for lead (D220) and lead acid batteries (D221). It also broadened the definition of waste to "any matter that is within the definition of waste in the NEPM for the Movement of Controlled Waste between states and territories".

2.5.1 STRENGTHS AND WEAKNESSES

Table 2-10 Western Australia controlled waste tracking system strengths and weaknesses

Criteria	Intrastate tracking	Interstate tracking
Interstate and intrastate compatibility	Strength – online system is able to be used for all intrastate and incoming interstate hazardous waste movements.	Strength – online system is able to be used for all intrastate and incoming interstate hazardous waste movements.
Real time analysis, reporting and management	Strength – up to date data is available, system capable of running reports and data is easily stored	Strength – up to date data is available, system capable of running reports and data is easily stored
Coverage of controlled wastes	Weakness – small loads aren't captured and asbestos is not tracked intrastate	Strength – NEPM 75 are tracked interstate

⁴ Hazardous Waste Data Summary, April 2013

Criteria	Intrastate tracking	Interstate tracking
Alignment of coding and descriptions	Strength – descriptions and codes generally align with the NEPM, some additional sub-codes have been added to address some areas of confusion	Strength – codes and descriptions align well with NEPM
Ease of updating system	Weakness – would require a third party to undertake the programming and is an expensive exercise	Weakness – would require a third party to undertake the programming and is an expensive exercise
Data quality and accuracy	Strength – the data captured via the online system is of good quality with reasonable accuracy	Strength – the data captured via the online system is of good quality with reasonable accuracy
Prior informed consent	Weakness – CAs are not required, with the generator only required to nominate the disposal/treatment/storage facility.	Weakness – For regulated waste slated to leave WA the DER has no knowledge of this until the WTC paperwork is received

2.6 SOUTH AUSTRALIA

Controlled waste (referred to as listed waste) in South Australia is legislated under the *Environmental Protection Act 1993* with the requirements relating to waste tracking implemented through transport and environmental protection licences. The South Australian EPA administers the act and environmental protection licences. The driver behind tracking waste movement in South Australia is to help minimise effects on human health and the environment.

In March 2015 South Australia launched an electronic tracking scheme for intrastate waste and in July 2015 will extend this to incoming interstate waste, although a paper-based scheme will remain in place as a back-up across the scheme. The system traces its roots back to the NSW online tracking system, which was provided over two years ago. The system has been altered to align with the requirements of the *Environmental Protection Act* and cost approximately \$200,000 to adjust.

The front end user interface did not change dramatically compared to the NSW system, merely adding a requirement for vehicle registration (NSW licences the transport company, not to individual vehicle). The main focus was on the back-end database, where changes included:

- new default settings
- removing NSW waste exemptions and levy requirements
- populating it with local licensing information.

Some aspects of the NSW system were adopted, including introducing consignment authorisations for waste generators and the use of waste descriptions to aid coding (as opposed to implementing more sub-codes).

South Australia's waste codes align well with those used under the NEPM and retain the requirement for generators, transports and receipt facilities to fill out the relevant sections of waste tracking certificates. A hard-copy certificate must still accompany every load.

2.6.1 STRENGTHS AND WEAKNESSES

Table 2-11 South Australia listed waste tracking system strengths and weaknesses

Criteria	Intrastate	Interstate
Interstate and intrastate compatibility	Strength – online system is able to be used for all intrastate and incoming interstate hazardous waste movements.	Strength – online system is able to be used for all intrastate and incoming interstate hazardous waste movements.
Real time analysis, reporting and management	Strength – up to date data is available, system capable of running reports and data is easily stored	Strength – up to date data is available, system capable of running reports and data is easily stored
Coverage of controlled wastes	Weakness – small loads aren't captured and asbestos is not tracked intrastate	Strength – NEPM 75 are tracked interstate
Alignment of coding and descriptions	Strength – descriptions and codes generally align with the NEPM – some additional sub-codes have been added to address some areas of confusion	Strength – codes and descriptions align well with NEPM
Ease of updating system	Weakness – would require a third party to undertake the programming and is an expensive exercise	Weakness – would require a third party to undertake the programming and is an expensive exercise
Data quality and accuracy	Strength – the data captured via the online system is of good quality with reasonable accuracy	Strength – the data captured via the online system is of good quality with reasonable accuracy
Prior informed consent	Weakness – CAs are only required when waste is transported interstate	Weakness – For listed waste slated to leave SA the EPA has no knowledge of this until the WTC paperwork is received

2.7 TASMANIA

Controlled waste tracking in Tasmania is legislated under the Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010. The regulations for controlled waste tracking, administered by the Department of Primary Industries, Parks, Water and Environment (EPA division), were first proposed in 2000 and came into effect in February 2010, with the intention of developing a waste tracking portal.

However, an exemption was immediately put in place to defer introduction of the scheme due to issues repurposing an old system and the pressure caused by the global financial crisis. While organisations/individuals must be licensed as a controlled waste transporter or handler, the tracking exemption remains in place.

Tasmania utilises the standard paper based system for the interstate movements of controlled waste. Data is manually entered into a spreadsheet, where it is stored and backed up within the EPA's IT system. This data is not used to predict market trends or for major analytical studies

but more from a compliance perspective. The data collected is aggregated and input into the Basel reporting spreadsheet provided by the DoE.

From a reporting perspective Tasmania's waste codes are aligned to those under the NEPM, with some additional lines for items such as tyres under the Waste Management Regulations.

2.7.1 STRENGTHS AND WEAKNESSES

Table 2-12 Tasmania controlled waste tracking system strengths and weaknesses

Criteria	Intrastate tracking	Interstate tracking
Interstate and intrastate compatibility	Weakness – currently only an interstate system	Weakness – currently only an interstate system
Real time analysis, reporting and management	Weakness – up to date information is generally not available until it is entered into the spreadsheet	Weakness – up to date information is generally not available until it is entered into the spreadsheet
Coverage of controlled wastes	Weakness – exemption on controlled waste tracking for intrastate movements means coverage is poor	Strength – NEPM 75 are tracked interstate
Alignment of coding and descriptions	Strength – descriptions and codes generally align with the NEPM, though additional sub-codes have been added to address some areas of confusion	Strength – codes and descriptions align well with NEPM
Ease of updating system	Weakness – considerable effort would be required, from a time and money perspective, to develop and implement an intrastate tracking system	Strength – currently uses a spreadsheet, which is relatively straightforward to update, but would be difficult to implement a national online system given budget constraints
Data quality and accuracy	Weakness – the data acquired through interstate movements is reasonable however no data is currently captured internally	Strength – the data acquired through interstate movements is reasonable and the relatively small tonnages make this task simpler compared to larger jurisdictions using a paper based system
Prior informed consent	Strength – while there is no formal intrastate tracking system, operators are required to have been given approval by the receiving facility before accepting controlled waste	Weakness – the Tas EPA provides consignment authorisations for incoming waste and requires the waste producer to complete a WTC for outgoing movements, however formal approval to not required for outgoing movements

2.8 NORTHERN TERRITORY

The key legislative instruments in the Northern Territory relating to controlled waste tracking are the *Waste Management and Pollution Control Act* and the *Dangerous Goods (Road and Rail Transport) Act*. The aims of these Acts are, respectively, to protect the environment in the Northern Territory and reduce the risks of personnel injury, death, property damage and environmental harm.

The NT EPA administers the WMPC Act, which is currently under review. At this stage it is not known whether that will result in changes to the legislation to introduce controlled waste tracking.

The Northern Territory does not have an intrastate controlled waste tracking system, with licensed operators providing annual reports to the EPA on volumes of controlled waste moved within the Territory. This data is then used to calculate the breakdown of hazardous waste types for national reporting requirements. The NT EPA note that often the paper certificates are of poor quality as they can often be incomplete or illegible.

The NT EPA has been provided with the NSW EPA's system used for tracking controlled waste. However, this has not been implemented yet and, like Tasmania, NT EPA is monitoring the success of the NSW system integration into the South Australian market.

While there has been an admission that controlled waste tracking intrastate needs to be addressed the highly complex issues associated with it often push this to the bottom of the list. However the WMPC Act is being reviewed and a push around controlled waste may drive action on this issue.

2.8.1 STRENGTHS AND WEAKNESSES

Table 2-13 Northern Territory controlled waste tracking system strengths and weaknesses

Criteria	Intrastate tracking	Interstate tracking
Interstate and intrastate compatibility	Weakness – currently only an interstate system	Weakness – currently only an interstate system
Real time analysis, reporting and management	Weakness – up to date information is generally not available due to time taken to receive and manually enter data from the paper certificates	Weakness – up to date information is generally not available due to time taken to receive and manually enter data from the paper certificates
Coverage of controlled wastes	Strength – while controlled wastes are not tracked intrastate there is requirements to report and all those waste listed in the regulations	Strength – NEPM 75 are tracked interstate
Alignment of coding and descriptions	Strength – descriptions and codes generally align with the NEPM	Strength – descriptions and codes align with the NEPM
Ease of updating system	Weakness – considerable effort would be required, from a time and money perspective, to develop and implement an intrastate tracking system	Weakness – considerable effort would be required, from a time and money perspective, to develop and implement an intrastate tracking system

Criteria	Intrastate tracking	Interstate tracking
Data quality and accuracy	Weakness – the data acquired through interstate movements is reasonable however no data is currently captured internally	Strength – the data acquired through interstate movements is reasonable
Prior informed consent	Weakness – there is no formal intrastate tracking system or NTEPA consignment authorisation, however operators are required to be licenced	Weakness – the NT only needs to approve waste <i>entering</i> the territory from other jurisdictions, although the NTEPA receives WTC documentation after the waste has been transported

2.9 AUSTRALIAN CAPITAL TERRITORY

Controlled waste in the Australian Capital Territory is legislated under the *Environmental Protection Act 1997* with the requirements relating to interstate waste tracking implemented through the Environmental Protection Regulation 2005. The ACT EPA administers the regulations, with the main driver being to protect the environment from pollution and its effects.

Intrastate waste tracking is dealt with under the act, where transportation of regulated waste is classified as a Class A activity and requires an environmental authorisation. It relates to regulated waste, which includes group A, group B, group C, hazardous and industrial waste, but explicitly does not cover waste consisting only of stabilised asbestos in bonded matrix or more than two tonnes of unwanted tyres.

While the ACT EPA does not track hazardous waste when the movements are intrastate, there is a requirement for licence holders to record and retain information on each load of waste transported. This is reported to the ACT EPA quarterly.

Interstate movements align 1:1 with the NEPM, hence 75 wastes are tracked. The ACT EPA must approve any imports into the territory and has access to the NSW electronic system to confirm exports have been appropriately transported and disposed or treated.

3 INTERNATIONAL REVIEW

A high level review across international jurisdictions has been undertaken to highlight the differences and similarities in hazardous waste tracking regimes around the world. To further explore the lessons from successful and unsuccessful initiatives, deeper analysis has been undertaken of the key measures and reforms employed in three similar economies, the United States, Canada and New Zealand.

3.1 HIGH LEVEL REVIEW

Country	Tracking system	Strengths	Weaknesses
Canada (interstate only)	<p>Paper-based manifests. Sequentially completed by parties from generator through to final recipient.</p> <p>Receiver has three days to return consignment note to: the generator; last authorised carrier; and the authorities of the province where the waste originated and terminated.</p>	Three day submission requirement increases transparency.	Definitional issues among provinces (states) and with the federal scheme.
European Union (trans-border only)	<p>Paper-based. Generators and transporters keep a record of the quantity, nature and origin of the waste, plus transport mode and destination.</p> <p>Also notice for prior consent provided to authority in origin country, which forwards to counterparts in transit and destination countries.</p>	The EU list of hazardous wastes is binding on all EU countries, though they can expand it.	Limited regulatory insight given reporting regime.
France	Paper-based manifests. The receiver returns the sequential manifest (BSD) to the generator (rather than regulator).	Generator bears cost of the scheme.	Limited regulatory insight given reporting regime.
New Zealand	<p>Online WasteTRACK (for liquid waste only).</p> <p>Open access internet-based tracking system from generator to transporter to receiver.</p> <p>System includes register of "approved" transporters / receivers.</p>	<p>Easy to use for all parties, encourages industry best practice.</p> <p>Some regulatory efficiencies as regulator can increase focus on generators not using WasteTRACK.</p>	<p>No regulatory underpinning.</p> <p>Weak regulatory oversight as operation is outsourced to private operator.</p> <p>Funding support from government.</p> <p>No solid waste tracking.</p>

Country	Tracking system	Strengths	Weaknesses
Philippines	Online and paper manifests. Generator logs online job to get paper manifest, transporter then requires separate approval for transport plan, and final receiver has two days to log receipt of waste and 45 days to log Certificate of Treatment.	Allows faster regulator response as receiver must log receipt within two days.	Multiple layers of approval - to generator, transporter and receiver. Generator manually pays fees to receive receipt number to generate initial approval.
United Kingdom (England and Wales only)	Consignment details are recorded either electronically or as paper-based records and then submitted to Environment Agency (EA). Receiver returns completed form quarterly to the EA and generator.	Scheme cost covered by generators buying consignment notes.	Quarterly return reduces regulatory oversight.
United States	Paper-based manifests. Each party that handles the waste signs the manifest and retains a copy for themselves.	Provides national uniformity and benchmark while allowing some state flexibility.	Generates considerable paperwork. Incoming electronic scheme expected to save more than US\$75 million per year for government and industry.

3.2 CASE STUDIES

There are many commonalities in the hazardous waste tracking regimes studied. Many are based on multi-sheet manifests to track the waste from generator through to disposal or treatment, but there is growing interest in electronic tracking schemes. But as is clear from the above review of Australian jurisdictions and the myriad reports for DoE in recent years, the capacity for tracking schemes to provide a holistic data picture is in the details. Three countries have been selected for deeper analysis based on the similarity of their economies but diversity of approach and success.

3.2.1 UNITED STATES

Hazardous waste regulations in the United States come under with the 1976 *Resource Conservation and Recovery Act* (RCRA), which sets definitions and covered waste, minimum standards and reporting requirements for the whole country. To avoid regulatory discrepancies and redundancy, the US Environment Protection Agency developed its hazardous waste transporter regulations together with the Department of Transportation (DOT), under its *Hazardous Materials Transportation Act* regulations.

RCRA Subtitle C establishes a national cradle-to-grave tracking scheme for hazardous waste, under the administration of the EPA. It also provides for states to develop their own hazardous waste regimes, including tracking, as long as they are “equivalent to, consistent with, and no less stringent than the federal program”.

Internationally, the US is a signatory to – though not a ratified member of – the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. As a non-party, it has instead negotiated direct agreements with the OECD and specific countries.

The EPA is expected to this year release a major reform to the Hazardous Waste Manifest System (HWMS) by launching a long-awaited electronic manifest system. It is expected to slash compliance costs, improve transparency and establish for the first time a national repository of manifest data and a means to efficiently share that data with RCRA-authorized state partners and the public.

While very different from Australia's hazardous wastes regime with its Basel annual reporting requirement and devolved regulatory environment, the US provides some valuable insights on the issues and opportunities created by a centralised system with regional variation.

The tracking regime

The US tracks the offsite transportation of 5.35 million tonnes of the more than 40 million tonnes of RCRA hazardous wastes generated each year. Hazardous waste is defined via two main criteria:

- Characteristic hazardous wastes: exhibit any of four characteristics, ignitability, corrosivity, reactivity or toxicity; and
- Listed hazardous wastes: based solely on the specific process that generates them, which is automatically considered hazardous waste regardless of whether the waste shows any of the above characteristics of hazardous waste.

The HWMS is based on a set of forms, reports and procedures designed to track the life cycle of hazardous waste, from the generator facility through to the off-site treatment, storage and disposal facility (TSDF). The paper document, required by both the EPA and DOT, has multiple copies of a single form containing information on the type and quantity of the waste being transported, instructions for handling the waste, and signature lines for all parties involved in the disposal process. Each party that handles the waste signs the manifest and retains a copy, while the receiving facility returns a signed copy to the generator confirming the waste has been received. Some states, such as California, also require a copy be sent to the relevant state agency, which is the common practice in Australia.

A key feature of the RCRA system is consistency of the paperwork nationally, which ties together all the schemes, whether state or federal. Notably, it was only in March 2005 that the EPA published regulations mandating national use of a revised Uniform Hazardous Waste Manifest, giving states 18 months to update their systems. Previously, authorised states had been allowed to modify their manifests or add new forms, but the EPA in 2005 said “the proliferation of many state-specific manifest forms ... hampered the movement of hazardous waste”. All states now use the same manifest template but are permitted to add their own waste streams and waste codes (in addition to federal codes) to cover state-specific requirements. Maryland, for example, adds a host of military-related hazardous wastes.

One benefit of the HWMS is that it provides a detailed picture of on-ground national outcomes through the RCRAInfo information system. Hazardous waste transporters, facility operators and large generators (more than one tonne per month) are required to submit formal Hazardous Waste Reports through RCRAInfo. The information is aggregated to produce the *National Biennial RCRA Hazardous Waste Report*, which includes facility status, regulated activities and compliance histories, plus detailed data on the generation of hazardous waste from large quantity generators and on waste management practices from TSDFs.

There are two further points. As the name implies, the reporting cycle is every two years, but this appears inadequate given one of the perceived advantages of the coming electronic

scheme is more timely reporting. Secondly, as with much hazardous waste information the full report is only available to the US EPA and state agencies, but the EPA periodically uploads specific data into the publically available Envirofacts Data Warehouse to increase transparency in the sector.

A key downside of the HWMS is that the multi-layer scheme is costly and somewhat cumbersome. The EPA estimates the HWMS generates between 4.6 and 5.6 million paper manifests per year, at an annual government administration cost of around US\$297 million - around US\$109 million in federal costs, US\$150 million in state costs and US\$23 million a year to comply with RCRA biennial reporting. No compliance cost burden on industry was available, although it will be considerable given the scheme covers approximately 160,000 entities in at least 45 industries.

Relationship between jurisdictions

One of the key aspects of the US arrangements from an inter-jurisdictional perspective is the way legislative and enforcement responsibilities cascade from the US EPA to the state agencies. The states can request EPA authorisation to implement their own hazardous waste program in place of the federal regime, as long as it is at least as rigorous as the federal standards. Many states have done so.

The conditions for authorisation are closely spelled out. The state program must cover all the federally defined hazardous wastes and adopt a set of hazardous waste characteristics equivalent to the federal rules. It must include provisions for permitting, compliance evaluation, enforcement, public participation and sharing of information.

The tracking requirements are similarly specific. The state proposal must include a description of the state manifest tracking system and base its manifests on the federal template. It must also describe the procedures the state will use to coordinate information with other approved state programs and with the federal program regarding interstate and international shipments. In the case of interstate shipments for which the manifest has not been returned, the state program must provide for notification to the receiving state, or to the EPA in the case of unauthorised states.

The RCRA also prevents states from introducing any feature “which unreasonably restricts, impedes or operates as a ban on the free movement across the state border of hazardous wastes from or to other states for treatment, storage, or disposal at facilities authorised to operate under the federal or an approved state program”.

States also cannot restrict the federal EPA’s right to inspect any generator, transporter or TDSF. However, the EPA will normally first allow the state a reasonable opportunity to conduct a compliance evaluation inspection. The states must provide to the EPA (on request) any information obtained or used to administer the state program, while the EPA shall furnish to authorised states any information they need to implement the approved program, with some caveats around confidentiality.

International movements

The US has not ratified the Basel Convention, but it does draw upon it to inform a multilateral agreement with the members of the OECD and bilateral agreements with Canada, Mexico, Costa Rica, Malaysia and the Philippines.

The NAFTA countries (US, Canada and Mexico) have similar requirements for regulating the transboundary shipments of hazardous waste based on prior informed consent, under which a material regulated as a hazardous waste in one country may only be exported to another with the importing country’s prior consent.

A hazardous waste generator or primary exporter submits to the EPA a notice of intent to export, including quantity and type of waste and the destination; the EPA requests the consent of the receiving country and any transit countries; then issues an Acknowledgment of Consent that must accompany the shipment. For export movements to Mexico and Canada it must also attach a copy to the RCRA uniform manifest, which since 2005 includes a section for exports.

The 2011 *Crossing the Border* report by the Commission for Cooperation (CEC) found: “A major limitation of the current paper-based reporting process for hazardous waste import/export is that it does not provide optimal support for monitoring compliance or enforcement. Inefficient information exchange, processing backlogs, incompatibility of existing information systems, limited integration among border agencies, and limited public access to information also impair the process. In addition, there is a lack of control during the shipping process due to the inability to share real time information on shipments.”

The CEC sponsored a project that from 2014 has seen some permit data exchanged electronically. Further, the US and Canada is developing a Single Window initiative that aims to provide a single, online portal for submitting all import and export related information, including hazardous waste movements (see Section 3.2.3 for more).

Issues and directions

In 2001 the EPA launched a discussion on the development of an electronic manifest scheme, using drop-downs and pre-populated forms and allowing generators to track their shipments and meet some of their recordkeeping requirements. In 2012 the Hazardous Waste Electronic *Manifest Establishment Act* required the EPA to establish an online tracking scheme – which is due to launch in October this year.

The e-Manifest system will introduce new data management possibilities that could ultimately simplify the RCRA biennial reporting requirements and consolidate various federal and state reporting requirements for domestic and transboundary shipments.

It has been a surprisingly lengthy evolution given the rapid advance in tracking technologies, with retailers these days routinely using bar code tracking to monitor shipments of products around the world. However, only part of the challenge is the digital platform needed to underpin it, with much of the 14-year journey centring on efforts to bring disparate groups together. It is illustrative of the challenges in building any new centralised system serving multiple agendas and stakeholders, even with the existing RCRA architecture providing the regulatory umbrella.

The EPA initially proposed developing scheme standards and letting private sector entities develop their own systems, including large generators, transporters, waste management firms and IT vendors. It accepted strong feedback in favour of a single national system rather than the decentralised and privatised approach, agreeing to develop and host the service on its Central Data Exchange (CDX).

The e-Manifest system will be available to track shipments of state-only hazardous wastes, even between states with different regulations, as long as the generator, transporter and receiving facility elect to use the system, which will be voluntary. Stakeholders generally agreed the e-Manifest should be an optional means to track waste shipments and receipts for the regulated RCRA hazardous waste transporters, rather than a technology requirement for the entire user community. The EPA rejected the push to narrow the interface to transporters only, but accepted the voluntary option and will ensure it is capable of incorporating data from paper manifests through manual data entry (for an additional fee).

However, it strongly expects the e-Manifest to be broadly adopted due to economic savings and convenience of electronic submission. Additionally, as more users join the e-Manifest system the cost of maintaining a paper system will fall on a smaller and smaller group of paper users, likely resulting in increasing fees for paper submissions.

The EPA estimates the administrative burden will be reduced by between 300,000 and 700,000 hours, cutting costs by 25%, or more than US\$75 million per year. It intends to release more detailed cost and benefit estimates for industry more broadly within the Regulatory Impact Analysis for the fee rule. Prominent among the non-economic benefits are:

- Improved access to higher quality and more timely waste shipment data
- Nearly real-time shipment tracking capabilities for users
- Enhanced manifest inspection and enforcement capabilities for regulators
- More rapid notification and responses to problems or discrepancies encountered with shipments or deliveries
- Greater access for emergency responders about the types and sources of hazardous waste that are in movement between generator sites and waste management facilities
- One-stop manifest copy submission to EPA and to all interested states through the Exchange Network architecture
- Greater transparency for the public about completed hazardous waste shipments to or from their communities.

3.2.2 NEW ZEALAND

New Zealand has a decentralised approach to hazardous waste management, resulting in many agencies having a role including the Ministry for the Environment and regional councils and territorial authorities.

It is a party to the Basel Convention and the OECD rules, but there is little regulatory activity given the low volumes of hazardous waste generated by the country's small industrial base. The 2002 New Zealand Waste Strategy included targets to develop a comprehensive policy including transport rules by 2005 and a 20% increase in recovery and recycling for priority hazardous waste by 2012, but the 2010 version makes little mention of hazardous waste.

Further, there is only a "working definition" of hazardous waste, which has no legal status, and there is no mandatory hazardous waste tracking regime. The voluntary online WasteTRACK system for liquid wastes was introduced in 2006, but it has failed to thrive and the central government will no longer fund the scheme from June 30 this year.

The tracking regime

WasteTRACK is a version of Western Australia's 2003 Controlled Waste Tracking System that has been modified for online use and solely for liquid wastes (which are hazardous by definition). The joint industry-government initiative is operated under licence to the Ministry for the Environment by a company called Liquid Systems.

The internet-based database consolidates manifest, facility and carrier data to track hazardous wastes from generation, through transport to treatment or disposal. The transporter is the key operator in the process. Each time a shipment is requested by a waste generator, a registered transporter creates a tracking form with a unique number that follows the waste load from pickup through to a registered treatment/disposal.

The information includes the waste generator, the quantity and category of waste and where it is to be treated/disposed. The transporter prints off the tracking form, which can be used as a job sheet. The treatment/disposal facility logs into WasteTRACK and verifies the waste received is the same as specified on the tracking sheet, then the transporter closes the tracking form. There

are several different levels of access, with managers able to perform more tasks and see more information than a driver or data entry operator.

While quite a simple structure, the central government in December 2014 wrote to territorial authorities announcing it would cease funding from June 30, 2015 and had no intention to replace it. The pending closure illustrates a number of flaws in the tracking scheme.

The system was designed to leverage off the industry's Liquid and Hazardous Wastes Code of Practice, with only code-compliant companies permitted to register, but it was also envisioned that it would in time be underpinned by federal regulations. There was no federal follow through and, while a few councils require its use via their trade waste bylaws and regional council discharge consents, not many have done so. As a result, few hazardous waste generators have picked it up.

Second, it has been limited by the heritage of its industry backers, the New Zealand Water and Wastes Association (now Water New Zealand) and the Liquid Waste Contractors Special Interest Group. While there are 15 waste categories within the system, broken into 92 sub-categories, in practice it has only been used to manage liquid wastes.

Third, it does not cost the generator to log a job nor the transporter to process it. As a result, the scheme has no revenue flow and has all along been subsidised by the government.

Fourth, the voluntary nature of the scheme has meant it never delivered the promised industry-wide insights to inform policy development nor the regulatory efficiency of identifying those adopting best practice, and therefore by default those who did not.

Finally, the government said its decision to pull out of the scheme was because the IT architecture lacked the rigour and robustness to adequately deal with industry and government requirements, and it was not willing to fund extensive upgrades.

Relationship between jurisdictions

More broadly, the New Zealand EPA administers international agreements that control the import/export of hazardous waste, while local authorities are responsible for “the prevention or mitigation of any adverse effects of the storage, use, disposal, or transportation of hazardous substances” under the *Resource Management Act* (RMA) 1991.

The Guidelines for the Management of Hazardous Waste developed in 2002 provide a good basis for a coordinated approach between jurisdictions, including a framework and forms for record-keeping that span generation, storage, transportation, treatment and disposal. As it stands, however, there are no specific tracking requirements for hazardous waste, which largely falls through gaps of the both the *Hazardous Substances and New Organisms Act* and the Land Transport Rule (Dangerous Goods).

The RMA provides tools that enable local authorities to place controls on the use of land for the purposes of addressing adverse effects of the storage and transportation of hazardous wastes. However, these tools are only designed to control the environmental effects of storage and transport of hazardous wastes, not actively manage the tracking of such wastes.

International movements

New Zealand restricts the international movement of hazardous and other wastes for final disposal through the Imports and Exports (Restrictions) Prohibition Order (No 2) 2004. It is a signatory to the Basel Convention, the OECD decision and the Waigani Convention, which prohibits export to any Pacific Island Forum countries. The EPA must grant a permit for any import or export.

Issues and directions

The defunding of the WasteTRACK system will likely see the cessation of hazardous waste tracking in New Zealand for the foreseeable future, although there have been some early stage industry discussions about alternative options.

3.2.3 CANADA

Canada's hazardous waste tracking regime closely resembles that of Australia, with all levels of government having some role in managing hazardous wastes but limited connectivity between province (state) hazardous waste regimes and the federal regulations that control transboundary movements under the *Canadian Environmental Protection Act 1999*.

Provincial and territorial governments establish measures and criteria for licensing hazardous waste generators, carriers and treatment facilities, in addition to controlling movements of wastes within their jurisdictions. The federal government regulates transboundary movements of hazardous wastes and hazardous recyclable materials, in addition to negotiating international agreements.

Canada is a signatory to the Basel Convention and guided by the OECD Decision on the Control of Transboundary Movements of Wastes for Recovery Operations. Significantly, it has also ratified the 1986 Canada–US Agreement on Transboundary Movement of Hazardous Waste, which substantially shapes primary definitions of hazardous waste at all jurisdictional levels as most provinces end up working with the US on import/export movements.

That agreement has also seen Canada (and Mexico) make an explicit inclusion of hazardous recyclable materials in the tracking requirements, because the US waived the need to track recyclables. Australia extended its tracking to include recyclables in 1996, but Canada went further and introduced some variations in the requirements and exemptions for hazardous recyclables, both at the federal and provincial level. For example, intrastate shipments of hazardous recyclables in Alberta do not require a PIN registered transporter and need only a basic “recycled docket” printed off the environment department’s website, not a formal tracking manifest.

Another key interest point in the Canadian system is the transparency of the ground-up provincial system versus the top-down transboundary one. Unlike the semi-centralised US system that aggregates all data nationally in a biennial report, Canada does not produce any periodic nationwide data that covers all hazardous waste, including domestic. On the other hand, its single system for tracking all transboundary movements is more comprehensive and responsive than the comparable US system, including an annual report on the export and import of hazardous waste and hazardous recyclable materials.

Most provinces have paper-based tracking systems but Ontario has developed an electronic regime, while Environment Canada is developing an electronic tracking system for all transboundary movements.

The tracking regime

In 2005 Canada is estimated to have generated about 6 million tonnes of hazardous waste, around 17% of the US volume that year. Generation is concentrated in four provinces, Ontario, Quebec, Alberta and British Columbia, which have the most advanced hazardous waste regulations and tracking schemes. At the other end of the scale provinces such as Nova Scotia have no tracking, relying purely on the federal Transportation of Dangerous Goods Regulations to provide safeguards.

Ontario, which has the most comprehensive regulatory system for hazardous wastes, began tracking hazardous waste in 1985 and updated the scheme in 2002 to introduce the Hazardous

Waste Information Network (HWIN). It allows generators, carriers and receivers to register their activities and process electronic manifests online, although it does allow paper permits in order to tie in with the other provinces and the federal government, all of which use variations on the multiple copy paper manifest.

In general, Part A of the paper manifest is prepared by the generator (consignor), Part B by the transporter and Part C by the receiver (consignee), who must then send the completed manifest within three days of receiving the waste to the generator, the last authorised carrier and the authorities of the province where the waste originated and terminated.

The exceptions to the decentralised provincial responsibilities is the tracking of hazardous waste shipments between provinces, which comes under the federal Interprovincial Movement of Hazardous Waste Regulations, and for international movements via the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (EIHWHRMR).

Environment Canada administers the transboundary regimes and uses the Canadian Notice and Manifest Tracking System (CNMTS) to collect, store and process information on inter-provincial and international movement of hazardous waste/recyclable material. It is still in the early stages of electronically exchanging information with regulated companies and the Canada Border Services Agency (CBSA) – and still uses paper-based communications with the US and provinces – but the shift to greater electronic exchange is gathering pace. The vision is the new system would be accessible by not only program staff but by other internal partners in program delivery as well as regulates and competent authorities in other jurisdictions.

Relationship between jurisdictions

No intrastate provincial information is shared with Environment Canada, which only tracks transboundary movements. However, some provinces are more aligned with the federal tracking system than others. For example, in British Columbia the standard movement manifest includes a section for international movements, which complies with the federal EIHWHRMR regime. The Ontario and federal regimes have been designed to largely harmonise in terms of coverage, but do not overlap entirely. Ontario includes categories of "liquid industrial wastes" and "registerable solid wastes", while the federal regulations require manifesting for "corrosive solid wastes", which are not covered in the province.

In 2006 there were discussions at the national/inter-jurisdictional level about greater harmonisation, including issues such as hazardous waste/recyclables definitions, tracking and information sharing and classification codes. However, it failed due to disagreements on the information sharing mechanisms and the allocation of costs.

International movements

There are about 34,000 movements of hazardous waste/recyclables between the US and Canada per year. Despite the volume, multiple reports have raised questions about the efficacy of the tracking processes.

The Commission for Environmental Cooperation (CEC) 1999 report, *Tracking and Enforcement of Transboundary Hazardous Waste Shipments in North America*, concluded the processes and systems were deficient with respect to the quality, quantity and timing of information. The CEC's 2011 Crossing the Border report found: "The availability, usefulness and comparability of data related to hazardous waste generation and disposal remains a challenge. In addition, greater efforts must be directed towards the sound management and appropriate monitoring of these wastes and materials as they are transported across North American borders."

The key response in Canada (and the US) has been the Single Window Initiative, which consolidates multiple reporting requirements for cross-border movements into a single electronic report, which is then distributed the appropriate agencies. The customs service in

effect becomes a central clearing house, streamlining information flow and reducing compliance and administration costs. Late last year CBSA included Environment Canada as a partner agency for hazardous waste movements; the US Customs and Border Protection refers to its' single window as the International Trade Data System.

Issues and directions

While the Canadian Council of Ministers of the Environment (CCME) does have on its agenda a desire to harmonise and streamline environmental regulation, it has not returned to hazardous waste regimes since 2006. The key active change at the moment is Environment Canada's development of an electronic system tracking system for transboundary movement of waste, which will include the submission of notices, the issuance of permits and other types of information exchanges required by the tracking regulations.

3.3 LEARNING FOR AUSTRALIA

The range of countries reviewed demonstrate a remarkably common general approach to tracking hazardous waste, typically based on multi-copy manifests with responsibilities along the waste chain from generator to transport and receipt facility. However, the case studies have highlighted some of the finer differences between regimes that go a long way to dictating operational effectiveness.

- For the US, disparate manifests for states running their own schemes proved a barrier to waste movements, despite the overarching *Resource Conservation and Recovery Act*. States now use an approved basic template but are permitted to add wastes and codes as justified by individual circumstances.
- This central template will ease the shift to a single electronic manifest (e-Manifest) which will be available to track shipments of state-only hazardous wastes, even between states with different regulations, as long as the generator, transporter and receiving facility elect to use the system. It will allow one-stop submission to the EPA and all interested states through the Exchange Network architecture.
- Ineffective and inefficient monitoring of international movements between Canada, the US and Mexico is driving a push towards online consolidation, via a so-called Single Window Initiative. The online portal for submitting all import and export related information, including hazardous waste movements, will efficiently distribute the information to the relevant partner agencies.
- Canada, which most closely resembles the Australian model, highlighted the need to tackle the allocation of reform costs and how information would be shared.
- The New Zealand experience suggests international treaties are only as compelling as the national government is prepared to enforce. Further, industry is reluctant to voluntarily move to an electronic scheme unless encouraged by government and underpinned by a robust, user-friendly electronic scheme and a strong business case.
- The US EPA developed its hazardous waste transporter regulations together with the Department of Transportation to avoid conflicting requirements.

4 STAKEHOLDER PERSPECTIVES

Through March and April 2015 Hyder facilitated workshops in each state and territory (except the ACT) and directly contacted industry stakeholders to confirm the existing context of hazardous waste tracking, understand the priorities of key actors and assess the scope for national reform spanning interstate and intrastate tracking regimes.

Hosted in each case by the environment agency charged with managing hazardous waste in the jurisdiction, some workshops combined government and key industry personnel, others (on request) were government-only. Either way, Hyder directly pursued further industry input through phone calls and an email questionnaire.

The key industry target was the waste management sector given it has the primary interface with the hazardous waste tracking system. This included mature hazardous waste specialists, the major waste contractors and facility owners, along with other stakeholders such as Cement Australia. The response from waste generators was minimal, which is unsurprising given few have any significant interaction with the tracking system and are unlikely to be significantly impacted by reforms that concentrate on data requirements.

The outcomes revealed considerable variation in perspectives and priorities, both among jurisdictions and between government and industry. Reconciling them in pursuit of some form of nationally consistent hazardous waste tracking system will require careful consideration of options, staging and scope.

4.1 NEED, WILLINGNESS AND READINESS

4.1.1 THE NEED FOR CHANGE

There are three strands to the case for developing a nationally consistent hazardous waste tracking system encompassing all flows nationally: greater clarity on arisings, flows and fates; improved international reporting; and greater efficiency and insight for industry.

One of the clearest messages from the consultation was strong waste industry support for reform. In fact waste companies were unanimous in calling for greater consistency to reduce the regulatory burden of multiple, incompatible jurisdictional systems. There was no such unity among the states and territories. While the desirability of greater synergy around interstate movements was broadly accepted by all states and territories, they were very mixed views on the need to include intrastate data in the reform process.

The case for further national coordination of interstate flows is relatively clear, focusing on operational efficiencies. Flows are already reported nationally through the Controlled Waste NEPM and currently have minimal interface with regulatory regime of the jurisdiction of origin, with only Victoria regulating exports (of non-liquid wastes) to other states and territories.

Addressing interstate flows would also help reduce friction points between jurisdictions, particularly around waste codes and classifications. For example, Victoria has a sub-code for dry cleaning waste (G130) but South Australia uses the main NEPM code G150, meaning the SA EPA has to adjust the coding on any incoming loads to comply with its requirements. Interstate reforms could also address a range of more minor compatibility issues outlined in Section 4.5.

However, interstate waste flows account for only an estimated 2% of transported hazardous waste. Excising intrastate movements from consideration effectively neuters the goal of improving the overall national data picture, yet there were much more conflicted positions around the need to include intrastate regimes in any national data reforms.

Most jurisdictions viewed their intrastate systems as reasonably robust, particularly those with electronic systems as they typically include built-in data integrity checks and help minimise data entry error. NSW, Victoria and WA each self-assessed their data quality at four or more points out of five. This rating focuses on the standard of existing inputs and arrangements. It does not take a higher level view that addresses the whole-of-system issues identified in the suite of recent reports (Section 0), including:

- lack of public information on hazardous waste generation and sources
- significant gaps in coverage due to exemptions and differing interpretations
- poor visibility on waste fates interstate as waste transport certificate responsibilities do not cross borders
- a challenge for the DoE to bring the data together into a meaningful national whole.

The lack of a whole-of-system approach contributes to waste either avoiding or leaking out of the tracking regime. An example from a Victorian stakeholder (but with broader relevance): in Victoria there is no apparent linkage between the expected volumes from site assessments or clean-ups/audits and actual tracked transport volumes. In a connected system, if 1,000 tonnes of Category A highly contaminated soil or waste was identified in a site assessment, then 1,000 tonnes of tracked Category A transport should be verifiable within the system.

As it stands, there is no way to monitor how effectively the tracking system is covering all arisings. Creating such a link is likely to be a complex and costly exercise, but is outside the scope of this report. However, the issue can be exacerbated by leakage between states given the originator jurisdiction has limited visibility into disposal or treatment of loads leaving its borders, with the exception of Victoria.

The absence of a broader perspective reflects a general drift in the priority given to hazardous waste in recent years. Where states and territories once had public ambitions around hazardous waste, it typically rates only a minor mention in most waste strategies these days, rarely with targets attached. Hazardous waste remains an important issue for environment agencies but attention has tended to centre on higher volume, more amenable waste streams.

The trend has resulted in prioritisation of regulatory and operational issues for hazardous waste over broader strategic and policy goals. Waste industry participants in the Queensland workshop, and variously echoed in other workshops, noted that for all the data collected and internationally reported, industry has seen little evidence over the last decade that it has had a beneficial impact on policy development, performance benchmarking or assessment of infrastructure capacity and requirements.

Addressing these sorts of broader needs requires comprehensive information. The tracking reforms challenge is to develop options that secure jurisdictional support for addressing both interstate and intrastate tracking, either by limiting the jurisdictional changes or by staging their introduction in a more palatable way.

Industry

The major stakeholder group outside of government is the waste industry, which is largely responsible for managing the interface with the tracking system. The challenges for industry in the current network of tracking arrangements were clear, leading to added operational cost and delay, complicating internal business systems and skewing the competitive playing field.

The consultation teased out a range of issues. Incompatible systems in each jurisdiction add to the cost of waste services across the economy. First, it layers in additional compliance cost for the waste industry. JJ Richards, for example, employs 2-3 full time staff in head office, has trained depot managers and administration staff at every site and runs several driver training schemes. Veolia estimates around 20 hours per week per facility is spent on compliance, and another 20 hours per week for each state transport business.

Incompatible systems also add operational cost for the industry. The most cited need is to improve the clarity and consistency of waste codes and classifications. Despite efforts by several governments to improve alignment with the NEPM codes, there is still considerable confusion among operators. For facility operators, incorrectly coded wastes result in trucks being held up on weighbridges while clarification is obtained; for transporters they may be diverted to appropriately licenced facilities. While the frequency of the problem requires further definition, the frequency with which it was raised in workshops suggests it represents a real cost to business.

Paper systems were another hold up for facility operators (as well as a challenge for environment agencies). They lack the program logic of electronic systems that prevents loads being directed to inappropriate systems, a prone to being incorrectly filled out and can be illegible, especially the lower pages of the multi-carbon copy forms. This also leads to a particular gripe about interstate systems, which are largely paper based (other than Western Australia and inflows to NSW) and are consistently rated by industry as less user friendly and effective than intrastate ones.

One unexpected finding was that the argument about the need for robust government data to inform company investment decisions was not widely made. There are two possible explanations. Most of the information required for regulatory purposes is already routinely captured by companies in their business systems for billing/account management or technical and waste management purposes. Companies may well have a better idea of waste sources than government.

Another possibility is some doubt about the utility of government data for industry. For data to guide investment decisions it must be current (one stakeholder said no more than three months old) so real-time trends can be assessed. Further, the level of data aggregation required before any information can be released publicly limits its usability for granular business planning.

From a commercial aspect, companies were actually more interested in levelling the playing field by bringing more rigour around the process in order to eliminate sub-standard operators who don't track and record information appropriately – or avoid the system completely, as discussed above. A system that is not adequately joined up from generation through to final fate is a vulnerable system.

Most of the workshops sounded out the issue of smaller companies that may not have the processes and skills to effectively operate within the system. It is compounded by the confusion experienced by smaller waste producers, such as dental clinics and photo labs, who don't have specialised staff to handle waste issues, let alone consignment authorisations for specific waste streams. The response by clinical waste company Sterihealth has been to develop a descriptive framework for customers that outlines what waste types they can include, but does not cite NEPM codes as they are not relevant or informative for industry.

For industry, the need for greater national consistency is clear. Like state and territory governments it largely focuses on operational issues rather than a higher level perspective. Unlike the states and territories, an interstate-only focus is just a start, with a clear position coming through the consultation for reforms to embrace intrastate systems. According to one waste industry figure: "I really don't care what system and codes are used, the greatest cost is the opportunity cost of not being able to run a single [business] system."

4.1.2 WILLINGNESS AND READINESS TO CHANGE

Willingness and readiness to change are not the same thing. Willingness refers to an organisation's beliefs and attitudes and the degree to which it could be brought "on board" the reforms. Readiness for change, on the other hand, refers to the degree to which an organisation

could feasibly adapt to the change and considers factors such as capacity, resourcing and IT infrastructure.

Willingness to change is related to the perception of the need for change, as addressed above, but is also a factor of priorities, the complexity of change, existing systems and perceived costs and benefits. It is also worth noting upfront that willingness – and readiness – to embrace national data reforms will depend on the specific options recommended (Section 5), but it is possible to make some judgements about the disposition of agencies and industry in regards to the broad reform agenda.

Government

Two themes strongly at play across all governments are regulatory reduction and efficiency dividends – the need to reduce the compliance burden for industry and to respond to tighter public budgetary conditions. This broad backdrop, combined with the relative weight given hazardous waste among competing environment agency priorities, has created an atmosphere of caution within most jurisdictions around reforms to hazardous waste tracking.

Driving reform in such an environment requires a compelling cost-benefit case, broad internal and external support and a model that minimises the cost to government. This suggests the need for various high level strategies, including preferential development of least cost options, phasing of the reform package and building a level of support within the senior ranks of environment agencies to generate the internal capital to push the reforms up the agenda.

Beyond the general appetite for reform is the complex terrain of hazardous waste management itself, with a range of policy and regulatory backdrops, sunk investments in systems and differing potential opportunities.

One key question is the jurisdictions' views of the role of their tracking schemes, in particular the balance between its core regulatory function and the broader provision of strategic information on hazardous waste. The answer is strongly influenced by the objectives of each jurisdiction around hazardous waste generally. For example, Victoria encourages higher hierarchy outcomes for hazardous (prescribed industrial) waste through its risk classifications (A, B and C), with high risk Category A waste banned from landfill and a state-wide goal to eliminate landfilling of medium risk Category B waste by 2020. In principle, the EPA sees greater data and real-time information as desirable to inform that policy driver.

NSW, on the other hand, mostly leaves the policy leverage to the overall waste levy rather than specific hazardous waste measures. While its data is arguably the best of all jurisdictions, it sees the task of the tracking scheme as almost entirely regulatory, focusing quite tightly on minimising risks from hazardous waste movement, treatment and disposal. Data capture for other purposes is a by-product. While not ruling out adjustments to its tracking system, the NSW EPA requires a compelling business case to do so.

The other jurisdictions generally fall somewhere between Victoria and NSW in their view of the reform imperative, although there appears little appetite among the three jurisdictions that do not run active regimes, Tasmania, ACT and the Northern Territory. The Department of Environment Regulation (DER) in Western Australia set some markers for its support for a national reporting system: it reduces duplication in the overall hazardous waste reporting system; maintains the existing regulatory framework in WA; and doesn't require significant amendments to the existing data capture system.

Another core variable is how jurisdictions see the balance of opportunity and risk in a more nationalised approach, which could reduce barriers to waste flows. As NSW has just amended its waste regulations to clamp down on flows of non-hazardous wastes to Queensland, which was taking with it potential waste levy revenue, it could be reluctant to embrace reforms that make hazardous waste border crossings any easier. While not nearly of the same volume,

estimated at some 19,780 tonnes in 2012/13 (Appendix A), it nevertheless represents revenue leakage for the NSW government and waste facilities.

Indeed the Queensland workshop discussed the opportunity for the state to become a hub for treatment and recycling of wastes if the regulatory processes for importing waste from other states and territories could be streamlined.

That competitive tension may also exist inside states. The Northern Territory EPA summed it up neatly, noting better data would support the government's industry development policy by potentially informing investments in the recycling sector, but additional data collection requirements would raise costs in the economy by making waste services more expensive.

Willingness to devote resources to implementing change must also be seen in the context of broader agency priorities and projects, particularly in the hazardous waste area. For example South Australia has just introduced a version of the NSW electronic system after two years of tweaking and testing, plus reviewing its licencing arrangements, so its main focus is on bedding down those changes rather than exploring further reform. Table 4-14 highlights some of the key issues in each agency likely to impact their willingness to explore national data arrangements.

Table 4-14 Willingness and readiness for national tracking reform

State	Willingness	Readiness	Other issues
NSW	Sees tracking as purely regulatory and needs a strong cost-benefit case to justify changes for non-regulatory reasons	A mature electronic system managed and adaptable internally; very experienced team; funded by waste levy (no user fees)	Tightening (electronic) tracking of all wastes through reforms to its waste regulations; and licencing going online
Victoria	In general the most interested in reforms to drive policy objectives around hazardous waste	Electronic system but managed externally; slow transition from paper; its system is the most distinct from other states; limited funds for reform	A separate data integration scheme is already underway among the various environment agencies
Queensland	Sees upsides in smoothing interstate movements as long as changes to its intrastate system and regulations are minimal	Less data experience than others given no landfill levy, though introduced online tracking system for non-hazardous several years ago in readiness for levy	Overhauling its broader hazardous waste regulations (looking to Victorian classification model); developing electronic tracking
WA	Open to national level data reforms on certain conditions: no duplication, maintains existing regulatory framework and minimal change to existing data capture system	Long-standing electronic system; recent system redevelopment provided good skills/insight but investment winding down	Has strengthened its electronic system in recent years and more closely aligned its codes with the NEPM
SA	Open to discussion on national reforms; currently chair of the Controlled Waste NEPM Implementation Committee	Considerable investment in customising NSW version is now winding down; hazardous waste staff freed up from data entry	Focus this year on introducing customised version of the NSW system

State	Willingness	Readiness	Other issues
Tasmania	Tas EPA keen to improve tracking but it is not on the broader government agenda	No tracking scheme currently and minimal resources to devote to it	Currently watching SA's experience adapting the NSW electronic scheme
NT	Conflicting dynamics, with interest in supporting recycling investments but wary of increasing waste costs	No tracking scheme currently and minimal resources to devote to it	Is reviewing its waste legislation; watching SA's experience adapting the NSW electronic scheme
ACT	No intrastate disposal or treatment facilities pushes hazardous waste down the priority list	No tracking scheme currently and minimal resources to devote to it	Asbestos issues with 'Mr Fluffy' housing has increased pressure on already limited resources

Industry

The waste industry is far more willing to embrace national reforms to hazardous waste tracking than the jurisdictions. This is partly for the reasons outlined above, but the strength of support for reform speaks of a general frustration with current systems and a clear sense of consistency benefits. It also reflects the fact that the implications for their business systems are far fewer and less complex than for government (depending on the data option adopted). While diverse internal business systems are used by waste companies (Section 4.3), few saw much difficulty in accommodating changes to aspects such as codes and classifications.

South Australia's introduction in March of an entirely new architecture is the biggest change to any jurisdictional scheme in recent years, and the waste contractors there have not required major changes to their systems. The key requirement has been populating the EPA tracking system with information on a considerable number of waste generators, vehicles and facilities, which the EPA has been supporting.

Nevertheless, there are several caveats. Any amendments that did require significant changes to business systems could be expensive as they tend to be customised systems from third party providers. The Western Australian waste companies noted they were prepared to invest in any revisions to business systems where the expenditure will result in an efficiency saving, such as exchange of information that reduces duplication. Equally, they supported a user pays system where government and industry share costs relative to the benefit achieved.

Secondly, there was no clearly preferred option between the various state schemes, other than a definite call for the electronic option. Operators generally favoured the scheme with which they were most familiar and criticised other schemes as confusing and awkward. This was even the case within companies, as representatives attending workshops in different states expressed differing views on the merits of the relevant local scheme. Ultimately, representatives with national responsibilities were generally indifferent to the set of codes and conditions, as long as they were nationally consistent.

Finally, there is a level of scepticism about the ability of governments to deliver multi-jurisdictional reforms to hazardous waste. Several companies cited prior consultations and reports, driven at both state and federal government levels, whose recommendations were never picked up. They remain cautious about the capacity to now on deliver on policy reform in the current environment.

4.2 REGULATORY SYSTEMS

The federalised nature of waste management responsibilities in Australia complicates the reform process. Unlike the US with its overarching national hazardous waste legislation and a common (though differentiated) tracking manifest, reform here tends to be a cooperative process from multiple jurisdictions. A key question therefore is just how the tracking system sits within existing government systems, because this has the potential to influence the complexity and willingness to change. Here we consider the implications for the key tiers of government.

From a Federal Government perspective there are several powers relevant to hazardous waste. The *Hazardous Waste (Regulations of Exports and Imports) Act*, which gives voice to Australia's international obligations to Basel and OECD, draws its power from the Constitution's external affairs powers, Section 51(xxix). In principle this wide-ranging power combined with the corporations power, Section 51(xx), gives the Federal Government the ability to mandate a nationally consistent tracking scheme for hazardous waste to meet those treaties. The introduction of a federal scheme under these powers, similar to the *Water Act 2007* that creates a single management arrangement for Murray Darling Basin water issues, would require a strong cost-benefit case and a considerable investment of resources, time and political will.

In practice the Federal Government has focused on joint arrangements with the states and territories through the NEPM for Controlled Wastes, attempting with limited success to drive greater consistency across the board by focusing on interstate movements. Changing the NEPM, perhaps to drive even greater data and systems consistency between the states/territories, would be another lengthy process due to the need for collective agreement.

From a state/territory government perspective, the caution around tracking system reform is principally a factor of its integration with the rest of the regulatory regime (Figure 4-2). Tracking is largely a management and enforcement tool of the licencing regime, which in turn is an expression of waste regulations.

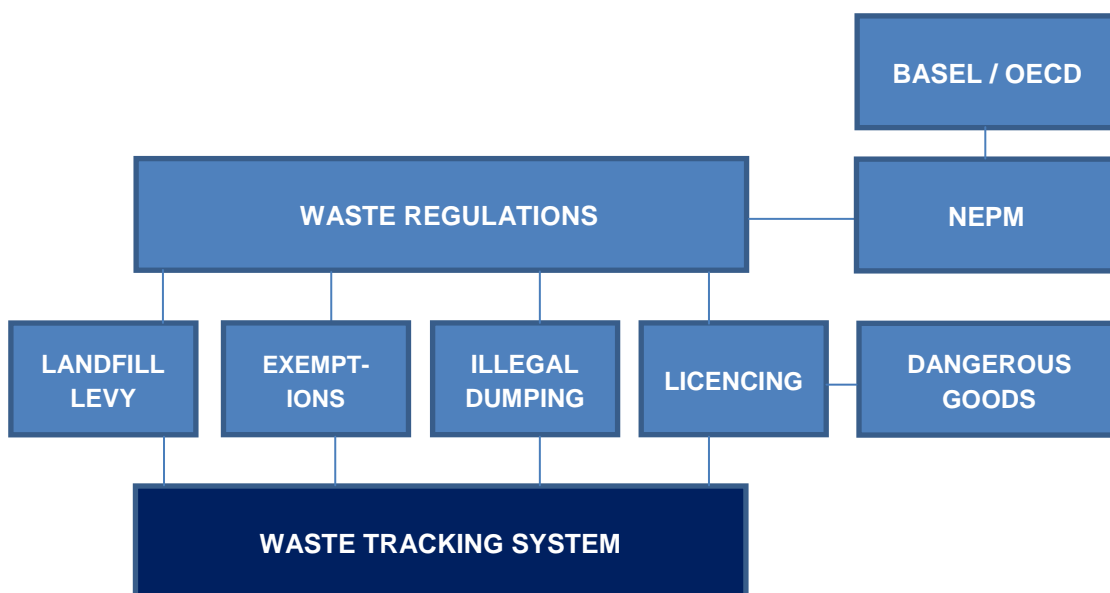


Figure 4-2 Waste tracking supports key aspects of waste regulations.

The waste regulations define key operational aspects of waste tracking, including waste definitions, alphanumeric codes, omissions and exemptions, thresholds, responsibilities and reporting frequency and form. One example: NSW licences the transport firm, Victoria and SA the company and its individual vehicles; and WA the company, vehicles and drivers.

Any proposed reforms to tracking will need to be considered in the light of their consequential impact on licencing and other parts of the regime. Much will depend on the option adopted, but even at a conceptual level there were differing views of the difficulty associated with changing the tracking scheme.

South Australia did not need to amend its *Environmental Protection Act* or regulations to introduce the electronic tracking system from NSW. The only change required was to its licencing forms, simply from mandating and explaining the paper system to allowing electronic or paper. It instead changed the IT system to meet its parameters.

In Queensland, DEHP generally agreed that alignment of codes would probably be relatively easy to implement, possibly through an Operational Policy or similar rather than a change in regulation. The NSW EPA, on the other hand, noted Environment Protection Licences are linked to the NEPM codes, so any change to those codes would flow through to the EPLs. This may be relatively painless for NSW given it is shifting to an electronic licencing system, with IT upgrades planned within the next 12 months, but a larger administrative task for other states.

Exemptions pose a bigger issue in trying to collect a national picture. While all states report the NEPM categories on interstate movements, there are major gaps in terms of intrastate movements. For some exempted wastes there may be options for to DoE collect information from other sources, such as Sydney Waste for grease trap waste, but there appear to be few such alternatives and it opens yet another question around the compatibility of data.

Finally, dangerous goods transporting regulations, which set out the requirements for transporters to safely move hazardous shipments, partially overlap – and occasionally contradict – controlled waste regulations in some states. An example from Tasmania sees, a company that is highly trained at delivering dangerous good unable to take away the quantity that wasn't needed as it was then deemed a controlled waste and required a NEPM authorisation to ship back offshore. The issue has been explored further in a separate DoE report.

4.3 TECHNOLOGY SYSTEMS

The other legacy issue that must be considered is the technology that underpins the tracking system, from both a government and waste industry perspective. These systems are expensive and highly tailored to the needs of the existing paradigm, and as such represent sunk costs – there is no obvious way to recoup the investment should the requirements change radically.

4.3.1 FEDERAL GOVERNMENT

Reporting to the Federal Government was until recently a highly manual process that saw each jurisdiction submit their own spreadsheets and the DoE spend considerable time massaging and making assumption about the data to make suitable for sending to the Basel Convention secretariat and OECD.

Two years ago it streamlined the process by mapping jurisdictional waste codes into the 75 NEPM codes and then into 47 Basel Y codes. That map has been used to populate a tailored spreadsheet for each jurisdiction, introducing major efficiencies for the federal and state/territory governments. According to the South Australia EPA, it has cut the reporting time by two thirds.

However, every year the DoE still makes use of internal and external resources to validate and manipulate the data in a bid to cover gaps, consider outliers and exercise a level of quality control.

4.3.2 STATE GOVERNMENT

As detailed in Section 2, a mix of electronic and paper-based tracking schemes are used across Australia, representing various levels of maturity in the systems.

Paper-based systems are labour intensive and costly, with more time spent on manual data entry than on enforcement. Queensland typically processes 6,000-8,000 dockets per week and even so there is generally a lag in entering data of several months, although this is improving. Victoria outsources the data entry but acknowledges inefficiencies and inaccuracies in the process. In South Australia, the shift to electronic has freed an employee from data entry to focus on data analysis and response. It is also expected to save \$40,000 a year in avoided printing of waste tracking forms, a significant dividend from the technology transition.

Until two years ago there were only two electronic schemes operating in the country, in Western Australia and NSW, but in the near term online systems will be completely rolled out across the mainland states. The only jurisdictions without an electronic option will be those that do not have any form of formal tracking scheme – Tasmania, NT and the ACT.

This on the surface presents a unique opportunity as it for the first time establishes a common technology platform that in principle creates the prospect of a common approach to tracking. In practice it is not so simple.

First, the systems are not all built on the same architecture and as a result are not compatible. The NSW and SA systems are built in-house on a Microsoft (.net) platform, Victoria stores its data in an SAP business warehouse program and Western Australia a platform built by Perth-based Amristar. Even where the same platform has been used, such as NSW and its sibling South Australian system, they are not fully compatible as they remain expressions of the respective regulatory regimes. South Australia's two years tweaking the system to meet local needs has rendered it unable to usefully 'talk' to the NSW system.

And as noted in a Queensland workshop, many of the problems that waste contractors experience relate to the fundamental processes rather than the platform, so a shift to electronic without changing the overall processes will not necessarily solve all issues. Interestingly, the uptake of the electronic system in Victoria has plateaued at around 50% since its launch in 2013, despite a price incentive to use the electronic scheme and promised operational efficiencies.

Acknowledging these limitations, there are potential consistency upsides from the electronic evolution. For example, NSW and South Australia allow other jurisdictions access to their systems to a prescribed security clearance level, allowing the agency in the originator state to confirm the fate of a load from their domain. While this does not extend to automated reporting or closure of transport certificates, the function provides a potential basis for greater transparency across jurisdictions. Developed to its full extent over time, this could close off one area of leakage from a jurisdiction's data system.

Another useful data sharing feature in the NSW system, retained by South Australia, is the ability for companies to directly interface directly with the EPA system. Several companies including Transpacific Industries (TPI) has taken advantage of the feature, uploading information directly from their business systems into the EPA database. TPI worked with the EPA for a year to meet the data quality standards but it now provides significant efficiencies for both the company and EPA. No other jurisdiction has a similar arrangement, although DER in Western Australia is prepared to consider it if any company is prepared to fund development of the interface.

Electronic systems across the mainland states will have other benefits. They will ensure a reasonably comparable reporting timeframe, given near real-time reporting is one of the great

advantages of the technology. Those running paper-based systems acknowledged a sometimes considerable lag in entering data from the dockets into their databases, undermining the potential to determine a comprehensive snapshot for any particular point in time. Upload waste transport certificate information immediately, however, and an electronic system allows users to run any number of reports and query any data.

A less tangible benefit of the rise of electronic systems is the creation of paradigm in each state where government and industry users are familiar with electronic reporting. This common baseline – including operator experience, expected process efficiency and investment in technology such as mobile report equipment – creates a context where a national electronic front-end systems interface could be considered.

Table 4-15 Inside the tracking systems

	NSW	Victoria	Qld	WA	SA	Tas	NT	ACT
Reporting format	Electronic (paper allowed)	Electronic and paper	Paper and spread-sheet	Electronic (paper allowed)	Electronic (paper allowed)	N/A	N/A	N/A
Where stored?	EPA servers	EPA's IBIS system	EPA servers	Industry Licensing System	EPA servers	N/A	N/A	N/A
Data management technology	Microsoft SQL database	SAP business warehouse	Oracle database	Oracle database (custom)	Microsoft SQL database	N/A	N/A	N/A
Data quality (1-5, self-assessed)	4+	4 (Paper:<4)	3	4	4+	N/A	N/A	N/A
Who maintains the system?	Internal	External	N/A	External	Internal	N/A	N/A	N/A

4.3.3 INDUSTRY

A wide variety of management information systems are used in the waste industry. Many of the large waste companies run company-wide enterprise resource planning (ERP) systems from brand names such as SAP or Microsoft Dynamics NAV/Enwis (ENTERprise Waste Information Software).

These are often customised with bolt-ons or supported by spreadsheets developed internally. For example, Toxfree's has embedded its own data conversion rates built into its system based on a panel of internal experts and experience in average weights of loads.

Transporters use bespoke platforms such as Veolia's paperless tracking system or adapt freight management systems such as ImageSoft or ViewPoint. Facility tracking also uses internal 'waste logs' within billing systems or spreadsheets. Smaller companies typically use spreadsheets to manage work flow.

The consensus from the larger firms consulted is that amended data requirements for regulatory tracking schemes should be fairly easily to accommodate, but major changes to their systems

would be costly as they require supplier support. As noted, TPI took the initiative to invest in a systems update to meet the NSW EPA's data quality requirements.

4.4 RISKS AND OPPORTUNITIES

As with any change there are risks and opportunities. Stakeholder feedback on risks did not coalesce around any particular issues, probably due the consultation focus on opening up discussion on the feasibility of the broad reform agenda rather than assessing specific data options.

Despite that, a range of risks can be distilled from the workshop discussions. The most obvious risk is failure to get buy-in from all jurisdictions to the idea of a nationally consistent tracking scheme for hazardous waste. Winning the case for reform and exploring least costs options are critical in building support for a national data solution.

The other risks for consideration are:

- Disagreement over the data/technology solution
- Failure to secure funding
- A blow out in the delivery cost or timing of the data solution
- Delay or disruption in making related changes, at jurisdictional and company level
- Too much data aggregation for national reporting hides gaps/trends
- Any reporting changes may confuse small operators and generators.

Some of these risks and issues are briefly discussed in Section 4.5. There are few organically arising opportunities given the ambivalence of most jurisdictions about the need to include intrastate systems in a national data project. Among the synergies in timing that offer some scope for exploration are:

- Queensland's review of hazardous waste regulations and intention to introduce an electronic tracking scheme
- The growing NSW focus on tracking non-hazardous waste in the amendments to its waste regulations, and its planned migration to electronic licencing
- South Australia's adoption this year of an amended NSW electronic tracking scheme
- Western Australia nearing completion of several-year overhaul of its tracking arrangements
- The Northern Territory's review of its waste regulations.

4.5 OTHER ISSUES

4.5.1 THRESHOLDS

There is inconsistent application of thresholds at which tracking schemes apply, making it potentially problematic when seeking to move small loads of items such as batteries across borders.

In Queensland tracking applies to hazardous waste loads of 250kg or more, although smaller loads will be captured in facility reporting data and the datasets could potentially be reconciled if national requirements dictate.

The threshold in Western Australia is 200kg or 200 litres of liquid waste, although this only applies to the transporter. All individual waste holders are required to use a licenced transporter, so they are captured under the legislation even with smaller quantities of waste. The transporter is picked up under the threshold if they are doing a 'run' that takes their load over the 200kg/litre threshold, which the industry sees as an appropriate level given it would be very rare for loads to be less than that.

Some states stipulate loads must be commercial. NSW applies a “common sense” test to what dictates a commercial sized (and therefore trackable) load, although this would seem hard to define if it came to a prosecution. South Australia has no minimum load and no commercial-only filter.

Another challenge of tracking small, ad hoc loads from retail premises is the contractor’s administration cost can outweigh the revenue from the collection. Many participants were open to looking at national thresholds that may make the system more user friendly for contractors serving small generators.

One of the challenges with thresholds is that a benchmark figure does not take into account the toxicity of the waste and so treats cyanide the same as oily wastewater. An option is to explore application of risk-based thresholds similar to Victoria’s A, B and C categories, although the framework would need to be able to account for amalgamated loads of different wastes.

Table 4-16 What thresholds do jurisdictions apply to their tracking schemes?

Jurisdiction	Tracking threshold
NSW	Common sense test of a “commercial” load
Victoria	50 kg or 50 litres
Queensland	250 kg
Western Australia	200 kg or 200 litres
South Australia	No minimum
NT	N/a
ACT	N/a

4.5.2 DOUBLE COUNTING

Frequently raised but never resolved was the issue of double counting, where hazardous waste that is aggregated in a transfer station or the residual from a treatment process enters the tracking system for a second time. As a result it is counted again, which distorts generation figures. It is a common issue for all jurisdictions, although Queensland attempts to address it using a ‘storage’ code for transfer stations to indicate any waste moving through it has not reached its final destination.

4.5.3 APPROVALS TIMEFRAMES

There is also some variation in approvals regimes, notably with Victoria. Its regulations allow 20 business days to approve an export shipment, where other jurisdictions apply the NEPM-recommended five days. When the Victorian process is added to that of the receiving jurisdiction it can take 25 working days to approve an application, which has the potential to cause frustration for companies exporting from Victoria.

4.5.4 PROBLEM WASTES

A number of waste streams were cited as particularly problematic. Concern was raised around export of scrap cars and tyres for recycling, in particular the potential abuse of the export codes

by some operators incorrectly describing products as tyre crumb. Brine wastes from coal seam gas fields were cited in Queensland as a particular issue for that state.

4.5.5 WHO PAYS FOR CHANGES?

A common question from all state and territory governments was around the cost of changes and the availability of funding to adapt data or related systems. In particular, the issue of a full or partial financial contribution by the Federal Government was raised in the context of a national reform agenda.

5 OPTIONS AND RECOMMENDATIONS

This section sets out the options and recommendations for addressing the DoE needs and objectives for improving the data around the generation and management of controlled waste. The options need to address the high level DoE objective to explore a nationally consistent approach to tracking controlled waste in Australia that:

1. Fulfils reporting requirements – domestic and international
2. Drives towards better quality information based on timely, accurate and consistent data of known lineage
3. Enables data analytics to drive decision making and insight while also:
 - Providing data to industry and other stakeholders
 - Aggregating data
 - Providing time-based analysis
 - Identifying opportunities for improvements in data capture to improve the quality of data
 - Identifying value back to the states (e.g. identification of loss of levy revenue; risky flows; no closed loop knowledge of disposal)
 - Assisting in driving change at state level (e.g. more consistent processes and code sets and timelines).
4. Delivers improvements in:
 - Reporting to meet international obligations
 - Internal reporting.
5. Enables policy setting and development to:
 - Reduce waste generation
 - Increase recycling and recovery.
6. Increases visibility of hazardous waste generation, flow and disposal (end-to-end), in particular intrastate movements
7. Provides jurisdictions that do not have regulated tracking schemes with a developed system and defined implementation pathway. This covers Tasmania, ACT and Northern Territory.
8. Provide a nationally consistent data set for industry.

While all are objectives for DoE, objectives 1-6 are seen as the higher priority. The options presented below aim to address each of the objectives.

5.1 OPTIONS

The following options have been developed to address the objectives. Further detail on each option is provided in the subsequent sections.

Table 5-17 Six options for a consistent national data regime

	Option	Description
1	Deploy the NSW waste management system across the other states	Roll out the NSW electronic system to all other states and territories, in order of priority. South Australia has recently gone with this option and implemented a customised version.
2	DoE access to state/territory electronic systems	DoE is provided with either back-end or front-end access to state/territory systems, where it is able to extract all required data. This would only apply to states and territories that have an electronic system in place.

	Option	Description
3	Develop a single national system for the tracking of controlled wastes to be used by all states and territories and covering all waste movements	The development of a new standard tracking system (both front- and back-end) for all states and territories. This would utilise a standard interface, functionality and back-end database. The solution will also have built in reporting and analysis capabilities.
4	Develop a centralised data collection, reporting and analysis solution	Creation of either a web front-end to capture the required data collection for DoE, or continue to provide in a standard spreadsheet. Develop a data layer to extract the data from either web front-end or spreadsheets and use automated logic to map, validate and load data to a central reporting and analysis repository for DoE purposes. This can be extended to provide the required reporting and analysis capabilities to not only DoE but also to all states and territories and other stakeholders
5	Standard front-end, with disparate back-ends	The creation of a standard front-end for all states and territories, with disparate databases. This will provide a standard interface and functionality for all jurisdictions. Consideration of the required back-end will need to occur to cater for those states and territories currently using a paper based system.
6	Do nothing	Leave the existing situation as it is, that is a mix of paper-based and electronic systems, spreadsheets and processes.

While the Do Nothing option has been included, it is not seen as viable as it does not assist DoE in achieving the objectives it has set out for monitoring and reporting of controlled waste. It does not provide the required solution for sophisticated reporting and analysis; it does not move the states and territories forward in standardising the management of controlled waste; and it does not provide non-tracking jurisdictions (Tasmania, ACT and Northern Territory) with an electronic system to manage controlled waste. Therefore, Do Nothing is not feasible and is not discussed in detail below.

5.1.1 DEPLOY NSW WASTE TRACKING SYSTEM

This option takes the currently deployed solution in NSW and implements it across all states and territories, noting that South Australia has recently gone down this path. It is noted that in consultation with South Australia regarding this option, the EPA implemented their own instance of the solution, that being a separate database to NSW. It was also heavily customised to meet their requirements and regulatory needs.

What it will and won't deliver

Based on the objectives set out above, this option will deliver objectives 1, 2, 6, 7 and 8. While each state and territory will have their own instance, this option will provide a standard solution, based on the NSW system, for states, territories and industry to manage controlled waste. This will also help to deliver standard business processes and potentially standardisation of code sets. It will require agreement from all jurisdictions for this to be achieved.

This option will not deliver objectives 3, 4 and 5, this being the required solution to automate the process of extracting data from each electronic system and loading it to a central repository for reporting and analysis by DoE to facilitate decision making and policy development.

Table 5-18 Pros and cons of rolling out the NSW system

Pros	Cons
Provides the same system base across all jurisdictions – but not exactly not same instance of system	Can be quite lengthy to successfully complete based on the two year timeframe from South Australia
Provides a standard interface for all jurisdictions	Can be quite costly for each jurisdiction to implement – a high level estimate from South Australia was at least \$200,000 which is seen as a conservative cost as it may not have included all of the change management and training costs
Provides the ability to standardise processes and code sets	Each jurisdiction will need to customise the solution based on their own requirements
Provides much of the required functionality	It does not resolve DoE issues with reporting and analysis of the data – in particular regulatory reporting and identifying trends, gaps and issues
Can provide an electronic system to those jurisdictions currently running a paper-based system	Significant change management and training required
	Does not provide a single system nationally – that is a single front-end and database. Therefore it will require a high level of governance to make sure no one deviates significantly from their peers in other states.
	Does not provide the economies of scale as each implementation is a separate instance.

Potential stages for implementation

As this option will deliver separate instances of the same solution, implementation across all states and territories can be done simultaneously. However given the nature of the change this is not recommended. While an implementation planning study would need to be conducted, it is recommended that for this option, those states with a current paper based system implement the solution first. Those with electronic systems would be the final phases for implementation.

Barriers to overcome

A number of barriers would need to be overcome to implement this option:

- Agreed standardisation of code sets, business rules and business processes across all jurisdictions
- Gaining agreement from those states with an existing electronic system, such as Victoria and Western Australia, to implement this option after spending significant time and money on their own systems
- Any required legislative / regulatory changes to provide uniformity nationally.

Estimated cost (implementation and operation)

The estimated cost for implementation is based on the estimates received from South Australia. A back of the envelope estimation was that it cost in the order of \$200,000 over two years, mainly attributed to internal resource costs.

The view is that this may have been a conservative amount given the timeframe and number of resources assigned to the project. A more likely figure is that this is somewhere between \$250,000 and \$350,000. Based on this it is expected that on average each jurisdiction will spend a similar amount. Should jurisdictions that already have electronic tracking undertake this option, further costs for data migration would need to be added, in the range of \$100,000 to \$200,000 per implementation.

Should this solution be adopted in each jurisdiction outside of NSW and South Australia, this would bring the total cost to somewhere between \$1.75 million and \$2 million.

Ongoing support costs for maintenance of the system, infrastructure, licenses and the like is expected to be in the order of \$50,000 to \$150,000 per annum for each jurisdiction.

5.1.2 DOE DATA ACCESS TO ELECTRONIC SYSTEMS

The option enables DoE to gain access to those jurisdictions with an electronic system and extract the data it requires. This will most likely require direct back-end access to extract data and system access to the front-end to verify any data. This option will require each jurisdiction with an electronic system to review and potentially modify their system should there be any security concerns with access to data.

What it will and won't deliver

This option will not directly deliver any of the stated objectives. It will only deliver the ability for DoE to gain access to data for extraction and verification, with all reporting and analysis still being of a manual nature.

Table 5-19 Pros and cons of a data access agreement

Pros	Cons
Less expensive to execute and implement first off than other options	Only addresses data issues for jurisdictions with an electronic system
Provides access to raw data whenever DoE require it	It does not provide a tracking system to jurisdictions without systems
	It does not resolve DoE issues with reporting and analysis of the data – in particular regulatory reporting and identifying trends, gaps and issues
	It does not resolve mapping issues with code sets, standard business processes and rules
	The whole of life cost is expensive as there is still the need to manually undertake reporting and analysis by DoE

Pros	Cons
	Requires resources that intimately understand each of the jurisdictions' systems and data model
	Greater risk of misinterpreting state based data

Potential stages for implementation

This option is only viable for jurisdictions with an electronic system. Therefore implementation can occur simultaneously. Consideration needs to be given as to the required security arrangements and what DoE can and cannot access with respect to the data and what system changes need to occur to facilitate this.

Barriers to overcome

The main barrier to overcome will be the ability for DoE to gain agreement from each of the jurisdictions for direct access to the data. The level of access would be negotiated with the state and territory governments but would be down to the facility and compliance level data that several jurisdictions indicated would be sensitive.

Estimated cost (implementation and operation)

The estimated cost will depend on any security and access changes required to existing electronic systems. Should this not be a concern for any jurisdiction then the implementation cost will be minimal as the only tasks required will be for each jurisdiction will be to provide access and any training about the data, data model and system.

The total cost in this scenario is expected to be in the order of \$25,000 to \$50,000. Should any system require modifications for security and access, the cost is expected to increase to the order of \$50,000 to \$150,000.

There are no on-going costs to support this solution, however significant costs remain to manually extract, transform, load, report and analyse data on a regular basis.

5.1.3 DEVELOP A NATIONAL WASTE TRACKING SYSTEM

The option is to undertake development of a national waste tracking system (for controlled waste) to be implemented in each jurisdiction as a greenfields project. They will share the same front- and back-end. All data required for reporting and analysis will be taken from a single database. The solution will also contain reporting and analysis capability.

What it will and won't deliver

This option will deliver all of the objectives set out above. It will provide the required functionality, standardise processes and code sets and provide the automated capability required for reporting and analysis to support decision making and policy development.

Table 5-20 Pros and cons of a centralised holistic tracking scheme

Pros	Cons
Standard system – one instance that each jurisdiction uses	It will require a very lengthy development cycle – implementation may take years
Single standard reporting and analysis environment	May be difficult to obtain agreement from all jurisdictions with regards to functionality and requirements
Provides a standard interface for states, territories and industry	High cost with a high risk of cost blow out and
Provides the ability to standardise processes and	

Pros	Cons
code sets	changes during lengthy development cycle
Provides the required functionality	Requires significant resource input from each jurisdiction over a lengthy period
Provides an electronic system to those jurisdictions currently running a paper based system	Potentially difficult to co-ordinate activities across all jurisdictions
Provides economies of scale once implemented – single support function, hosting and licensing	Potential legislative barriers for each jurisdiction to use a standard system
	Significant change management and training activities required

Potential stages for implementation

The adoption of this option will require strong project management expertise to be able to manage stakeholders, scope, schedule and budget. It will also require a strong system development lifecycle experience. Detailed planning will be required in terms of implementation options, with these being:

- Implementation of all functionality by each jurisdiction
- Implementation of functionality in a phased manner across all jurisdictions.

The first step will be to develop and implement the required project governance and undertake high level requirements for a national system.

Barriers to overcome

A number of barriers would need to be overcome with implementation of this option:

- Any required legislative / regulatory changes to provide uniformity nationally
- Acceptance of each jurisdiction to commit to a lengthy project, particularly those that have recently implemented an electronic system
- Commitment of each jurisdiction to provide resources
- Agreed standardisation of code sets, business rules and business processes across all jurisdictions
- The required funding, given it is the most expensive option by a significant margin.

Estimated cost (implementation and operation)

Typical large system development projects of this size within a greenfields environment cost upwards of \$6 million as they are a lengthy and difficult process. This is required to cover items such as:

- Infrastructure, environments and hardware
- Tools and technology – licensing
- Resources covering subject matter experts, project management, business analysts, developers, testers, infrastructure experts, training and change management and communication experts
- Data migration
- For a national project, travel required between jurisdictions.

Ongoing costs for infrastructure, environments, hardware, licensing and maintenance of the system via required resources is expected to be in the order of \$250,000 to \$300,000 per annum. There is potential if desired to commercialise the reporting and analytics solution as part of this option in providing access to the data and reports to waste industry consultants.

Note that the cost for infrastructure, environments, hardware and licensing will be dependent on what can be leveraged from the existing DoE technical environment.

5.1.4 DEVELOP A DATA COLLECTION, REPORTING AND ANALYSIS SOLUTION

This option primarily focuses on providing a transparent, centralised reporting and analytics capability that can be used directly by DoE, jurisdictions, industry and the community.

The intention is that each jurisdiction will supply the required data to DoE in a standard format – either via a CSV, HTML or spreadsheet. An alternative is to enter data via a developed web portal, however given the nature and volume of the data it will be easier for each jurisdiction to provide this via a file. This data will then be taken, transformed, mapped (to a standard set of codes) and loaded to a central database for reporting and analysis.

Figure 5-3 provides an overview of the proposed option. Note that the source system jurisdictions are examples only, states such as Tasmania will provide a direct file.

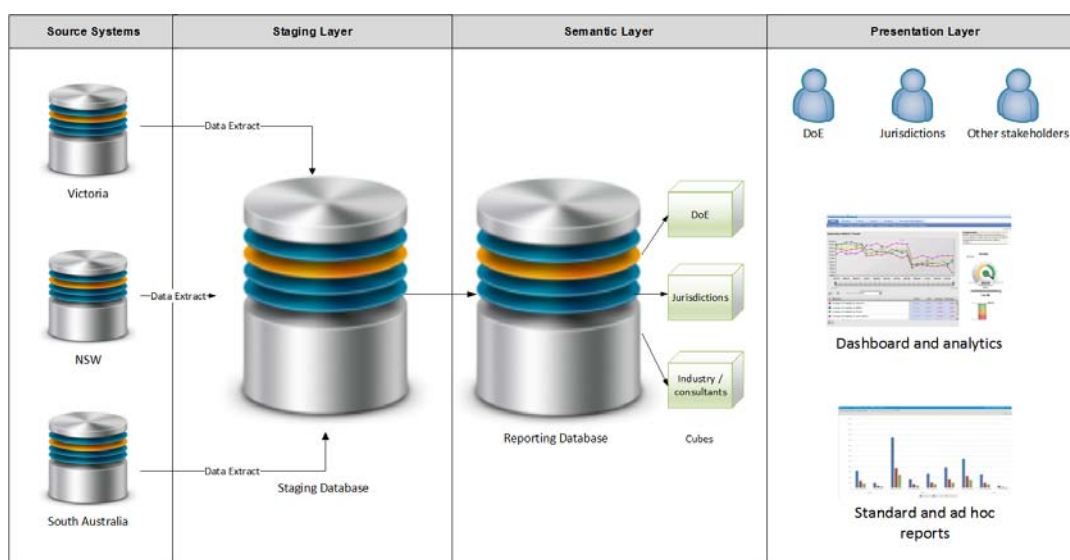


Figure 5-3 The proposed data extraction and reporting solution

This solution will provide:

- Landing place for jurisdictions to provide the required data in an agreed format
- Staging layer to:
 - Import files and load to a staging database
 - Map data from all jurisdictions to a common format (e.g. all code sets to NEPM). The solution will contain mapping tables for all code sets.
 - Cater for other jurisdictional differences (e.g. reporting requirements; timing of reporting etc)
 - Load data into a central reporting database with automated checking and validation
- One reporting database for the generation of standard reports – may be detailed and/or aggregated
- Cubes for analysis by DoE, jurisdictions and other stakeholders. The number of cubes required will be based on business and security requirements
- The presentation of reports and analysis activities will be via a chosen technology.

What it will and won't deliver

This option will deliver on objectives 1, 2, 3, 4, 5 and to some degree objective 6 by providing significant capability for DoE to report on and analyse data so fulfil reporting obligations, identify gaps and issues in the data, drive analytics and answer questions on why things happen and drive policy setting and development. This solution will not meet objectives 7 and 8, which were seen as second tier priorities.

Table 5-21 Pros and cons of a single, national database

Pros	Cons
Automated mapping process from each state to the national set	Data supplied to DoE is still in the form of spreadsheets or files
Automated reporting	Jurisdictions will continue to use their own systems
Provides analysis capability to DoE	Does not provide more sophisticated tracking capabilities for jurisdictions with paper based systems
Easy ability to share and publish data	Does not provide a uniform system nationally for jurisdictions and industry – in particular will not provide all required data for intrastate flows, only the identification of it
Move from manual preparation of collated data to automated for DoE	
Mapping is in a system and is visible and exposed to DoE	
Removes existing smarts for mapping code sets to national reporting from the current spreadsheet	
Removes some year-on-year reliance on consultants to validate data	
Increased reporting and analysis capability to drive identification of gaps in data (data attributes and flow of waste)	
Less impact on jurisdictions than the development and implementation of new systems	
Minimal legislative / regulatory changes required	

Potential stages for implementation

Detailed planning will be required in terms of implementation options, with these being:

- Implementation of all functionality by jurisdiction
- Implementation of functionality in a phased manner across all jurisdictions.

It is recommended that functionality of reporting and analysis be delivered in a phased manner to all jurisdictions. A key critical step will be to obtain agreement on the required mapping of all code sets.

Barriers to overcome

A number of barriers would need to be overcome with implementation of this option:

- Any required legislative / regulatory changes to provide uniformity nationally – in particular code sets
- Acceptance of each jurisdiction to commit to the project.

Estimated cost (implementation and operation)

Typical reporting and analytical projects of this size cost between \$500,000 and \$1 million. This is required to cover items such as:

- Infrastructure, environments and hardware
- Tools and technology – licensing
- Resources – covering subject matter experts, project management, business analysts, data architect, ETL (extract, transform and load) developers, report developers, testers, infrastructure experts, training and change management and communication experts
- For a national project, any required travel between jurisdictions.

Ongoing costs for infrastructure, environments, hardware, licensing and maintenance of the system via required resources is expected to be in the order of \$200,000 to \$250,000 per annum. There is potential if desired to commercialise this solution in providing access to the data and reports to waste industry consultants.

Note that the cost for infrastructure, environments, hardware and licensing will depend on what can be leveraged from the existing DoE assets and the sophistication of the tools required, which is dependent on the business requirements.

5.1.5 STANDARD FRONT END WITH DISPARATE BACK ENDS

This option primarily focuses on providing a standard user interface (front-end) to each jurisdiction with disparate back-ends for each. This provides the same look and feel and functionality to each jurisdiction with each of their data held in separate databases.

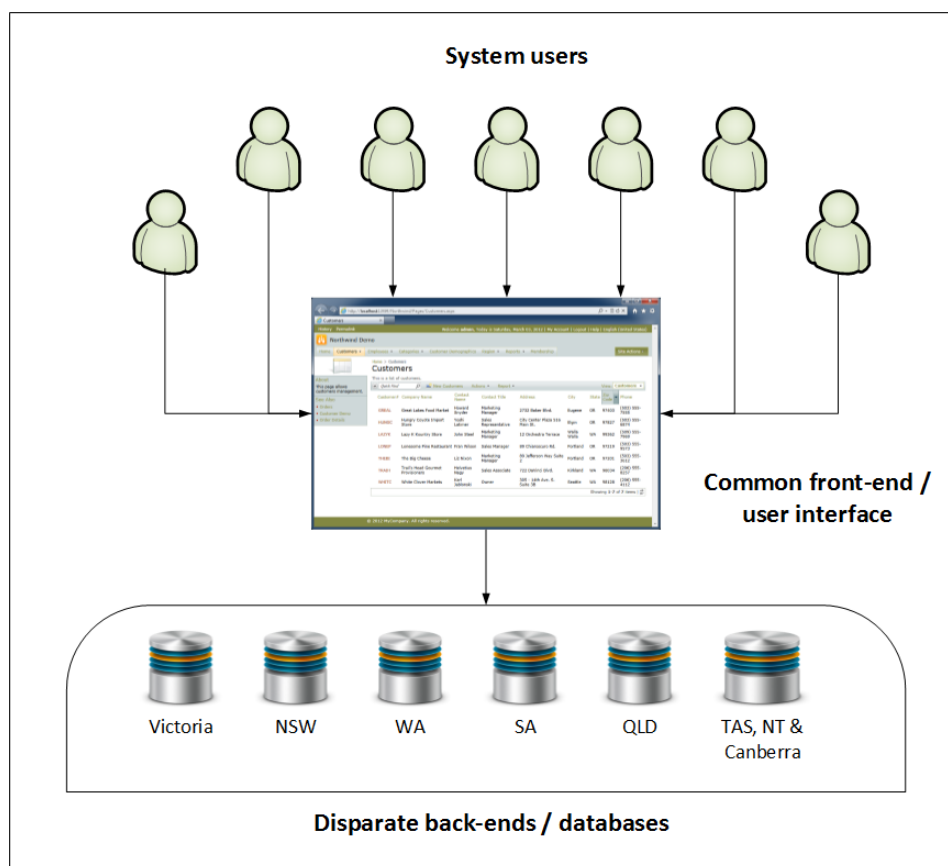


Figure 5-4 Conceptual common front-end electronic manifest.

This solution will provide a:

- A single interface for all users, a single set of processes and business rules across all jurisdictions
- An electronic system for those jurisdictions running a paper based system
- The ability to then store each jurisdictions data in their own database.

For those jurisdictions currently operating paper based systems, a common back end will need to be defined between them to write data back to. Should this be the case, consideration needs to be given as to whether this option is only for those jurisdictions because adding Victoria, Western Australia, NSW and South Australia may result in a solution that mirrors Option 3.

What it will and won't deliver

This option will deliver on objectives 2, 6, 7 and 8 by providing significantly increased capability to jurisdictions using paper based systems and a standard user interface, processes and business to manage controlled waste data. It will not meet objectives 1, 3, 4 and 5 to deliver automated and more sophisticated reporting and analytical capabilities.

Table 5-22 Pros and cons of a common interface

Pros	Cons
Provides the same user interface and functionality across all jurisdictions and other stakeholders	May be quite lengthy to implement based on the agreements required across jurisdictions
Provides the ability to standardise processes, business rules and code sets	Requires significant jurisdictional resources
Provides much of the required functionality	Implementation would need to deal with all the differences in the options for drop downs etc – this may be impossible to fit.
Can provide an electronic system to those jurisdictions currently running a paper based system	Implementation could not begin until all codes sets resolved, business rules, business processes and other requirements are confirmed and agreed. This may be a lengthy process.
	Significant work required to map the front end data attributes to existing jurisdiction back end databases
	Significant work required to design and build a back end database for jurisdictions with paper based systems.
	May require rework of existing back end databases if mapping cannot occur
	It does not resolve DoE issues with reporting and analysis of the data – in particular regulatory reporting and identifying trends, gaps and issues
	Significant change management and training required
	Does not provide a single system nationally – that is a single back end database.
	Does not provide all of the economies of scale as they are mainly separate instances from a back end perspective.

Potential stages for implementation

Detailed planning will be required in terms of implementation options, with these being:

- Implementation of all functionality by jurisdiction
- Implementation of functionality in jurisdictions with paper based systems as a priority
- Implementation of functionality in a phased manner across all jurisdictions.

A key critical step will be to obtain agreement on the required mapping of all code sets and agreement of business rules, business processes and requirements.

Barriers to overcome

A number of barriers would need to be overcome with implementation of this option:

- Any required legislative / regulatory changes to provide uniformity nationally
- Agreed standardisation of code sets, business rules and business processes across all jurisdictions
- Acceptance of each jurisdiction to commit to the project, including resources.

Estimated cost (implementation and operation)

While the development of a front-end in its own right is relatively easy and inexpensive, the process to determine and agree requirements, standardise code sets, business rules and business processes is expected to be lengthy and costly. In addition, the integration and mapping required to write to existing back end databases and design and build a back end database for jurisdictions using paper based systems will also be costly.

It is anticipated that the cost of this option will be in the order of \$2.5 million to \$3.5 million. This is required to cover items such as:

- Infrastructure, environments and hardware
- Tools and technology – licensing
- Resources covering subject matter experts, project management, business analysts, data architect, data developers, testers, infrastructure experts, training and change management and communication experts
- For a national project, any required travel between jurisdictions.

Ongoing costs for infrastructure, environments, hardware, licensing and maintenance of the system via required resources is expected to be in the order of \$250,000 to \$350,000 per annum.

Note that the cost for infrastructure, environments, hardware and licensing will be dependent on what can be leveraged from existing DoE assets.

5.2 RECOMMENDATIONS AND COSTINGS

Based on the requirements, feedback from each jurisdiction consulted and the objectives of DoE, it is found that options 1, 2 and 3 are not viable, these being:

- Deploy the NSW waste management system across the other states
- DoE access to electronic systems
- Develop a new nation systems for the tracking of controlled wastes to be used by all states and territories.

Option 6, Do Nothing has already been discounted. The reasons for options 1, 2 and 3 being discounted are presented in the table below.

Table 5-23 Reasoning behind discounted options

No.	Option	Reasons
1	Deploy the NSW waste management system across the other states	<p>Appetite from many of the jurisdictions to undertake this is not apparent. Many have recently invested significantly in their own systems and also stated they are already under resourced to undertake their existing work.</p> <p>It does not achieve many of the priority objectives being sought by DoE.</p> <p>Based on the South Australia experience, it is quite a lengthy process, meaning value will not be delivered in any short period of time.</p> <p>It does not necessarily provide the uniformity desired as each jurisdiction will have their own instance of the solution. This also makes it difficult to govern uniformity.</p>

No.	Option	Reasons
2	DoE access to electronic systems	It does not achieve any of the priority objectives being sought by DoE.
3	Develop a new national system for the tracking of controlled wastes to be used by all states and territories.	<p>Appetite from many of the jurisdictions to undertake this is not apparent. Many have recently invested significantly in their own systems.</p> <p>It requires significant investment of resources from each jurisdiction over a lengthy period of time to achieve the uniformity required. They also stated they are already under resourced to undertake their existing work, so commitment to a lengthy project will be hard to achieve.</p> <p>High cost and higher risk on budget and schedule overrun due to the volume of work, standardisation, collaboration and agreement required between the jurisdictions.</p>

5.2.1 RECOMMENDED OPTION

It is recommended that in the first instance DoE progress with Option 4, the development of a centralised data collection, reporting and analysis solution. The reasons for this are:

1. It achieves the priority objectives being sought by DoE, including:
 - Fulfills reporting requirements – domestic and international
 - Drives towards better quality information based on timely, accurate and consistent data of known lineage
 - Enables data analytics to drive decision making and insight
 - Improvements in internal and external reporting
 - Enables policy setting / development
 - Increases visibility of hazardous waste generation and flow and disposal (end-to-end), in particular intrastate movements
2. It automates the process once data is received from the jurisdictions to validate, map and load data in a consistent manner for reporting and analysis
3. It does not impact significantly on each of the jurisdictions in terms of resources required
4. There is minimal change for the jurisdictions
5. Value is able to be delivered quickly and incrementally to DoE, the jurisdictions and other stakeholders
6. The implementation and on-going costs are not prohibitive to gain business case approval. It does not require multiple millions of dollars as per the other options. This may be a key criteria given the current fiscal budget environment.

The consultation with DoE also highlighted the objective of encouraging Tasmania and the territories to introduce tracking regimes. While an important goal, this was confirmed to be a second priority over the need to have consistent data provided and reported on via Option 4. Therefore it is recommended that in the first instance DoE proceed with Option 4 to begin delivering value and in 2016 re-evaluate Option 5, Standard front-end with disparate back-ends with a view to:

- Gaining a better understanding of the effort and cost required

- Gaining a better understanding of whether the appetite is there from the jurisdictions – at this point appetite is not there to participate in a national project due to their current resource constraints.

Proceeding with this recommendation means that Option 4 can be completed, and if Option 5 is approved it can be implemented at a later date. It is envisaged that Options 1, 2, and 3 will most likely still not be feasible in future.

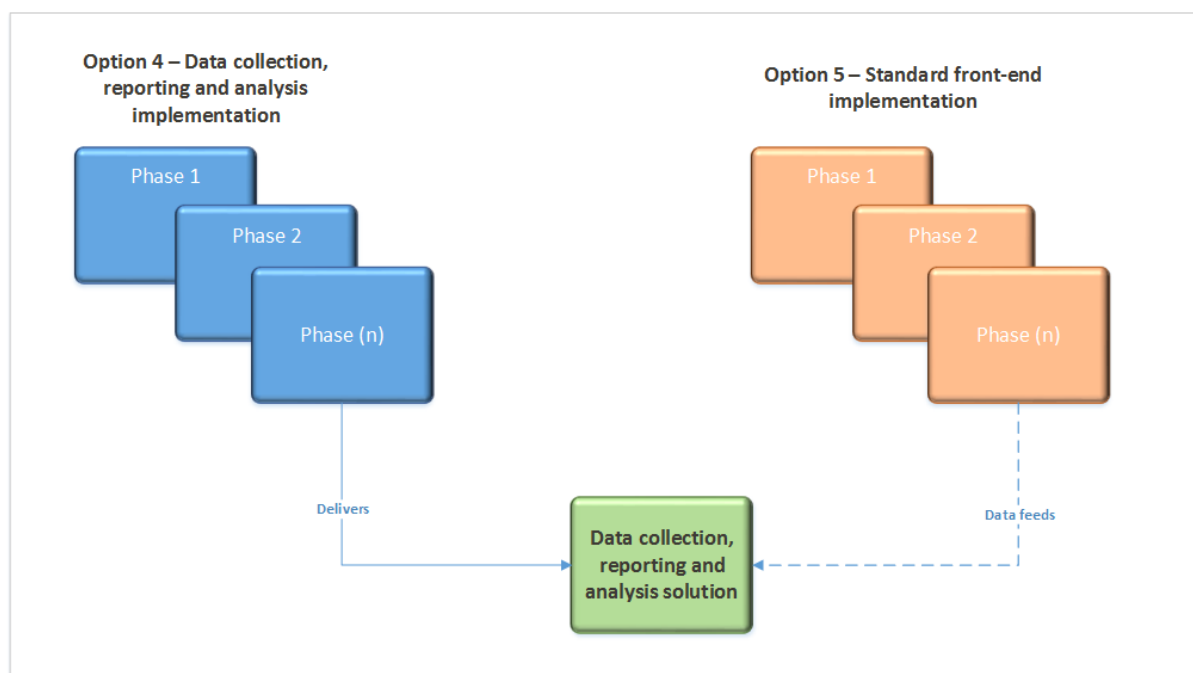


Figure 5-5 High level implementation of options.

Option 4 is expected to be implemented in a phased manner, delivering value quickly and consistently to all stakeholders. Should Option 5 proceed, it is likely that it will also be delivered in a phased manner. This becomes a data source to feed into the reporting and analysis solution, this being a source system as part of the figure for Option 4 – Proposed Solution. It will need to be determined at the time whether any changes are required to the reporting and analysis solution to bring in the data if the type of data or format is altered.

There are various factors that will impact on the cost of Option 4, including:

- Choice of tools
- The quality of the data quality
- Number of stakeholders to consult
- Number of data sources
- Number of reports to be developed
- The clarity and volume of requirements
- The amount of historical data to be taken on.

What is needed?

The solution will need to address business, functional, technical and data requirements, including statutory reporting. The specific requirements of the solution are detailed below.

Solution Architecture

- Architecture for the solution, including the flow of data from each jurisdiction through to its end state to be used for reporting and analysis. This also includes how the data will be secured and making the data available to each jurisdiction.

Information Architecture

- Creation of standard data definitions and codes
- Data models
- Data Modelling Tool for development of data models.

Data Quality

- Data Cleansing to achieve and maintain required quality standard
- Data Quality Tool to ensure collected and stored data is of standard dictated by the quality plans.

Data integration

- Integration and transformation of data from disparate sources to standard formats ready for load into central database
- ETL (Extract Transform Load) Tool to enable data to be integrated and transformed.

Data warehouse

- Data warehouse as the central repository to support reporting and analysis requirements and that will serve as the source of truth for all reporting and includes a metadata repository
- ETL Tool to enable data to be loaded into and transformed within the warehouse.
- Data Modelling Tool for development of data models.

Business Intelligence

- Access provided via the internet so it is accessible by all entities
- Self service capability
- Define and build standard reports
- Business Intelligence Tools to provide access to data within the warehouse to end users across all entities, enabling access to pre-built reports as well as analytical capability.

Infrastructure

- Hardware required to support the solution
- Multiple environments
- Servers for databases and ETL, quality and BI tools.

Breakdown of implementation costs

The estimated costs have been broken down by the services required to build and deliver a solution, and the cost of the required infrastructure and tools.

Table 5-24 Cost breakdown for Option 4

Description	Cost
Technical consulting	\$250,000 - \$440,000
Change management	\$50,000 - \$140,000
Project management	\$100,000 - \$160,000
Total: Professional Services	\$400,000 – \$740,000

Data modelling tool	\$5,000 - \$10,000
Data quality tool	\$10,000 - \$20,000
Extraction, Transformation & loading tool	\$25,000 - \$60,000
Reporting tool	\$40,000 - \$60,000
User licences	\$20,000 - \$40,000
Hardware & DB's	\$50,000 - \$70,000
Total: Infrastructure and tools	\$150,000 – \$260,000
IMPLEMENTATION COST FOR OPTION 4	\$550,000 – \$1,000,000

expenditure

It is estimated that a project of this nature will take approximately six to nine months to deliver and should be done in an agile manner so that functionality and value is delivered incrementally rather than in one big bang.

The cost associated with infrastructure and tools will be incurred up front at the beginning of the project. As mentioned previously, the infrastructure and tool costs and their timing may vary depending on whether existing department infrastructure and tools can be leveraged or a solution provider is appointed and provides the tools as part of its service, and whether they charge upfront or on a monthly basis.

The worst case scenario is that \$150,000 to \$260,000 will be required upfront at the beginning of the project for infrastructure and tools. Assuming the project is delivered over three phases with each spanning 2-3 months, the estimated service costs are outlined in the table below.

Table 5-25 Phasing of implementation costs

Timing	Cost
Phase 1	\$150,000 - \$300,000
Phase 2	\$100,000 - \$220,000
Phase 3	\$100,000 - \$220,000
TOTAL	\$350,000 - \$740,000

5.3 NEXT STEPS

The recommended next step for DoE is to undertake the completion of a formal business case and high level requirements to undertake Option 4, 'Develop a centralised data collection, reporting and analysis solution'. While Option 5 can be considered in the longer term, as noted above this should be revisited in 2016 and therefore should not form part of the next steps at this time.

Once a business case and high level requirements have been developed and approved, it is recommended that DoE seek an expert external provider to begin project implementation. These services are expected to be procured via RFQ or RFT. The high level requirements will form part of the RFQ/RFT.

6 REFERENCES

Blue Environment et al. (2014). *Improving Australia's reporting on hazardous waste under the Basel Convention*.

Blue Environment et al. (2014). *Reporting hazardous waste under the Basel Convention - guidance to states and territories*.

KMH Environmental. (2013). *Hazardous Waste Data Assessment*.

National Environment Protection Council. (2014). *Annual Report 2012 - 2013*.

SKM. (2012). *Review of Australia's international waste related reporting obligations*.

APPENDIX A

NEPM MOVEMENTS

NEPM Waste Movement 2012-13 – Tonnes

	IMPORT										
		NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Ex. Terr	SUM
EXPORT	NSW		28,566	19,780	0	14,632	0	418	0	0	63,396
	VIC	31,317		2,040	0	16,089	0	38	0	0	18,167
	QLD	15,375	3,118		0	1,859	0	132	0	0	1,991
	WA	5,642	639	21		2,393	0	0	0	0	2,393
	SA	4,027	1,079	156	0		10	0	0	0	10
	TAS	4,219	678	327	0	6,767		0	0	0	0
	ACT	12,576	0	0	0	31	0		0	0	0
	NT	170	4	18	0	2,753	0	0		0	0
	Ex. Terr	0	0	5	0	0	243	0	0		248
	SUM	73,326	5,518	527	0	9,551	243	0	0	0	

NEPM Waste Movements 2012-13 - Consignments

	IMPORT										
		NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Ex. Terr	SUM
EXPORT	NSW		1,756	3,332	0	428	0	667	0	0	6,183
	VIC	2,064		96	0	603	0	3	0	0	702
	QLD	1,102	209		0	99	0	9	0	0	108
	WA	320	79	4		282	0	0	0	0	282
	SA	199	308	26	0		1	0	0	0	1
	TAS	233	95	21	0	33		0	0	0	0
	ACT	1,980	0	0	0	1	0		0	0	0
	NT	9	1	5	0	296	0	0		0	0
	Ex. Terr	0	0	1	0	0	23	0	0		24
	SUM	5,907	692	57	0	330	23	0	0	0	

Discrepancies in consignments of imported controlled waste into NSW 2012-13

Discrepancy	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Consignment non-arrival		0	0	0	0	0	0	0
Transport without authorisation		0	0	0	0	0	0	0
Non-matching documentation		0	4 (0.36%)	0	0	0	5 (0.25%)	0
Waste data		0	0	0	0	0	0	0

Discrepancies in consignments of imported controlled waste into Victoria 2012-13

Discrepancy	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Consignment non-arrival	0		0	0	0	0	0	0
Transport without authorisation	0		0	0	0	0	0	0
Non-matching documentation	0		0	0	0	0	0	0
Waste data	0		0	0	0	0	0	0

Discrepancies in consignments of imported controlled waste into Queensland 2012-13

Discrepancy	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Consignment non-arrival	1400 (42%)	(35 (37%))		2 (50%)	1 (4%)	7 (33%)	0	1 (15%)
Transport without authorisation	1600 (48%)	57 (60%)		0	3 (11%)	0	0	1 (20%)
Non-matching documentation	166 (5%)	4 (4%)		1 (25%)	4 (15%)	8 (38%)	0	0
Waste data	0	0		0	0	0	0	0

Discrepancies in consignments of imported controlled waste into Western Australia 2012-13

Discrepancy	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Consignment non-arrival	0	0	0		0	0	0	0
Transport without authorisation	0	0	0		0	0	0	0
Non-matching documentation	0	0	0		0	0	0	0
Waste data	0	0	0		0	0	0	0

Discrepancies in consignments of imported controlled waste into South Australia 2012-13

Discrepancy	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Consignment non-arrival	184 (43%)	230 (38%)	35 (35%)	76 (27%)		15 (46%)	0	65 (22%)
Transport without authorisation	0	0	0	0		0	0	0
Non-matching documentation	235 (55%)	90 (15%)	63 (64%)	248 (88%)		21 (64%)	1 (100%)	233 (79%)
Waste data	55 (13%)	18 (3%)	17 (18%)	59 (21%)		3 (9%)	0	32 (11%)

Discrepancies in consignments of imported controlled waste into ACT 2012-13⁵

Discrepancy	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Consignment non-arrival	0	0	0	0	0	0		0
Transport without authorisation	0	0	0	0	0	0		0
Non-matching documentation	0	0	0	0	0	0		0
Waste data	0	0	0	0	0	0		0

⁵ There were no movements into Tasmania or the Northern Territory in 2012-13.

APPENDIX B

NEPM 75

NEPM '15' Code	NEPM 15 Waste Description	NEPM '75' Code	NEPM 75 Waste Description
A	Plating and heat treatment	A100	Waste resulting from surface treatment of metals and plastics
		A110	Waste from heat treatment and tempering operations containing cyanides
		A130	Cyanides (inorganic)
B	Acids	B100	Acidic solutions or acids in solid form
C	Alkalis	C100	Basic solutions or bases in solid form
D	Inorganic chemicals	D100	Metal carbonyls
		D110	Inorganic fluorine compounds excluding calcium fluoride
		D120	Mercury; mercury compounds
		D130	Arsenic; arsenic compounds
		D140	Chromium compounds (hexavalent and trivalent)
		D150	Cadmium; cadmium compounds
		D160	Beryllium; beryllium compounds
		D170	Antimony; antimony compounds
		D180	Thallium; thallium compounds
		D190	Copper compounds
		D200	Cobalt compounds
		D210	Nickel compounds
		D220	Lead; lead compounds
		D230	Zinc compounds
		D240	Selenium; selenium compounds
		D250	Tellurium; tellurium compounds
		D270	Vanadium compounds
		D290	Barium compounds (excluding barium sulphate)
		D300	Non-toxic salts
		D310	Boron compounds
		D330	Inorganic sulfides
		D340	Perchlorates
		D350	Chlorates
		D360	Phosphorus compounds excluding mineral phosphates

NEPM '15' Code	NEPM 15 Waste Description	NEPM '75' Code	NEPM 75 Waste Description
E	Reactive chemicals	E100	Waste containing peroxides other than hydrogen peroxide
F	Paints, resins, inks, organic sludges	F100	Waste from the production, formulation and use of inks, dyes, pigments, paints, lacquers and varnish
		F110	Waste from the production, formulation and use of resins, latex, plasticisers, glues and adhesives
G	Organic solvents	G100	Ethers
		G110	Organic solvents excluding halogenated solvents
		G150	Halogenated organic solvents
		G160	Waste from the production, formulation and use of organic solvents
H	Pesticides	H100	Waste from the production, formulation and use of biocides and phytopharmaceuticals
		H110	Organic phosphorous compounds
		H170	Waste from manufacture, formulation and use of wood-preserving chemicals
J	Oils	J100	Waste mineral oils unfit for their original intended use
		J120	Waste oil/water, hydrocarbons/water mixtures or emulsions
		J160	Waste tarry residues arising from refining, distillation, and any pyrolytic treatment
K	Putrescible / organic waste	K100	Animal effluent and residues (abattoir effluent, poultry and fish processing wastes)
		K110	Grease trap waste
		K140	Tannery wastes (including leather dust, ash, sludges and flours)
		K190	Wool scouring wastes
L	Industrial washwater	-	Not listed in Schedule A List 1 of NEPM. Heading reported as part of "15" in NEPM annual reporting
M	Organic chemicals	M100	Waste substances and articles containing or contaminated with polychlorinated biphenyls, polychlorinated naphthalenes, polychlorinated terphenyls and/or polybrominated biphenyls
		M150	Phenols, phenol compounds including chlorophenols
		M160	Organo halogen compounds—other than substances referred to in this Table or Table 2
		M170	Polychlorinated dibenzo-furan (any congener)

NEPM '15' Code	NEPM 15 Waste Description	NEPM '75' Code	NEPM 75 Waste Description
		M180	Polychlorinated dibenzo-p-dioxin (any congener)
		M210	Cyanides (organic)
		M220	Isocyanate compounds
		M230	Triethylamine catalysts for setting foundry sands
		M250	Surface active agents (surfactants), containing principally organic constituents and which may contain metals and inorganic materials
		M260	Highly odorous organic chemicals (including mercaptans and acrylates)
N	Soil / sludge	N100	Containers and drums that are contaminated with residues of substances referred to in this list
		N120	Soils contaminated with a controlled waste
		N140	Fire debris and fire wash waters
		N150	Fly ash, excluding fly ash generated from Australian coal fired power stations
		N160	Encapsulated, chemically-fixed, solidified or polymerised wastes referred to in this list
		N190	Filter cake contaminated with residues of substances referred to in this list
		N205	Residues from industrial waste treatment/disposal operations
		N220	Asbestos
		N230	Ceramic-based fibres with physico-chemical characteristics similar to those of asbestos
R	Clinical and pharmaceutical	R100	Clinical and related wastes
		R120	Waste pharmaceuticals, drugs and medicines
		R140	Waste from the production and preparation of pharmaceutical products
T	Miscellaneous	T100	Waste chemical substances arising from research and development or teaching activities, including those which are not identified and/or are new and whose effects on human health and/or the environment are not known
		T120	Waste from the production, formulation and use of photographic chemicals and processing materials
		T140	Tyres
		T200	Waste of an explosive nature not subject to other legislation

