Reclaiming Resources: Optimising Soil Reuse in Infrastructure and Development

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Wasteful soil practices costs New Zealand infrastructure and developers billions of dollars in direct costs and time each year. Inefficient use of this finite resource costs New Zealanders billions more in emissions from cartage and disposal, losses of landfill airspace, valuable soil resources, and increased pressure on roading networks. We have a solution, and we seek financial support to create a framework for the beneficial reuse of soil.

1. Introduction

The purpose of this white paper is to summarise the discussion and findings from a WasteMINZ[1] workshop (the workshop) held in May 2024 entitled '*Can you dig it? The problem with the reuse of soils*' and to deliver them to our core audience. This core audience includes the Minister for the Environment, the Minister for Transport, the Minister for Housing, the Minister for Infrastructure, each of their respective ministries, and the Minister for RM Reform.

Our overall objective is to obtain support and funds from Central Government to develop and implement a framework to optimise soil reuse ("the framework") in order to deliver cost savings and assist with building the Aotearoa New Zealand economy. The proposed working group will develop the framework for individuals and organisations to identify and engage soil management options at the top of the waste hierarchy (see Figure 1), promoting reduction and reuse initiatives and reducing surplus soil being disposed of at landfill, as current practises encourage.

At a very high level, the framework would include guidance on what alternatives to landfilling are available – for example, soil mixing/blending, encapsulation, transfer of fit-for-purpose soils from donor to receipt sites; exploring what types of site can be used for soil reuse; identifying if soil transfer hubs are relevant tools to allow access to surplus soil materials for all types of users in all regions, as both suppliers and receivers of surplus soil material; and, the centralised controls and management required for this process and these sites.

[1] Waste Management Institute New Zealand Incorporated

Figure 1: Waste hierarchy[2]

Establishing the framework strongly aligns with the waste hierarchy by identifying areas in which surplus soil waste can be 'designed out' of the building and infrastructure process and optimising our ability to reuse materials already in use. This will reduce project costs and improve project efficiencies. In turn this should reduce associated operational and embodied carbon emissions through limiting unnecessary excavation and cartage of 'waste' soils and the fill required to replace them.

2. The Issue

A large volume of soil is being treated as waste material and is being disposed of at landfill sites throughout Aotearoa New Zealand. This is due to a range of factors (detailed below in Section 4). Recent improvements in the measurement requirements for soils and other wastes being disposed at landfill sites allows us to understand the scale of the issue.

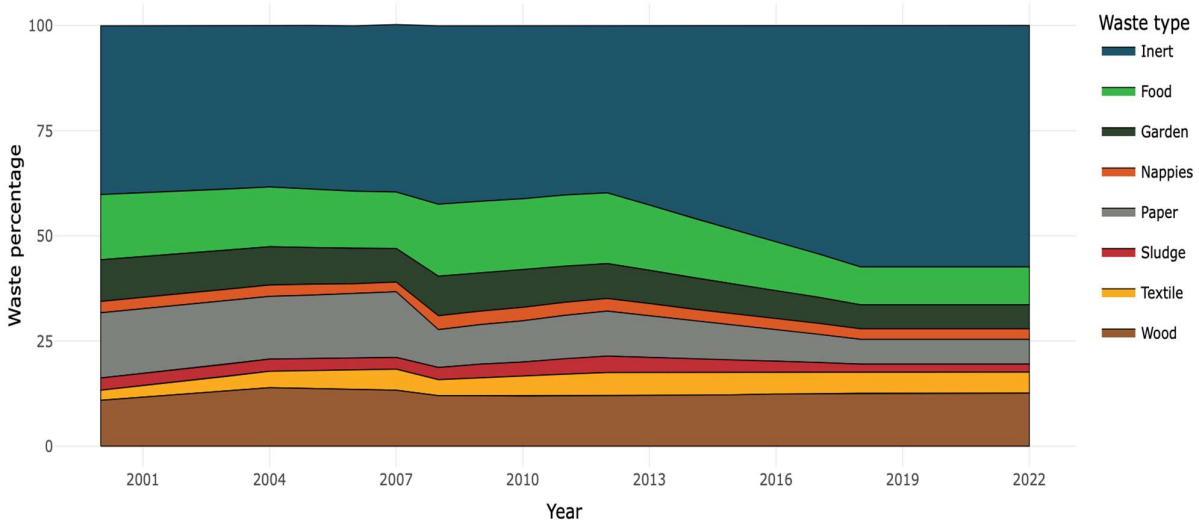
Chart 1 shows the percentage composition of waste disposed at Class 1 landfills nationwide since 2000. Soil is included and expected to comprise the majority of the dark blue 'inert' category, accounting for over 54% of the material disposed as Class 1 waste in the 2022 calendar year.

Based on the authors' collective experience, much of that soil would likely have been safe, in that it would not have posed a risk of harm to human health and/or the environment (i.e. when compared with relevant contaminated land guideline criteria)[3] and therefore could, and should, have been reused instead.

[2] From *Te Rautaki Para – The New Zealand Waste Strategy (pp.15)*

[3] The relevant contaminated land guidance in this case could refer to regional permitted activity criteria for environmental discharges and/or the soil contaminant standards of the Resource Management *(National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health)* Regulations 2011 (NES-CS)

Chart 1: Waste percentages per waste type in Class 1 Landfills[4]



Across all landfill classes reporting for 2022/23[5] shows the volume of inert material, likely to be predominantly soils, disposed to landfill in Aotearoa New Zealand was between 3.5M - 3.8M tonnes[6]. In reality, this volume was likely much greater due to the following:

- Only six months of Class 3 and 4 disposal data is included, as these sites only began reporting in January 2023. (These landfills principally accept soil material and smaller volumes of inert construction and demolition waste).
- Class 5 sites (also only accepting soil) are not presented in this data set.

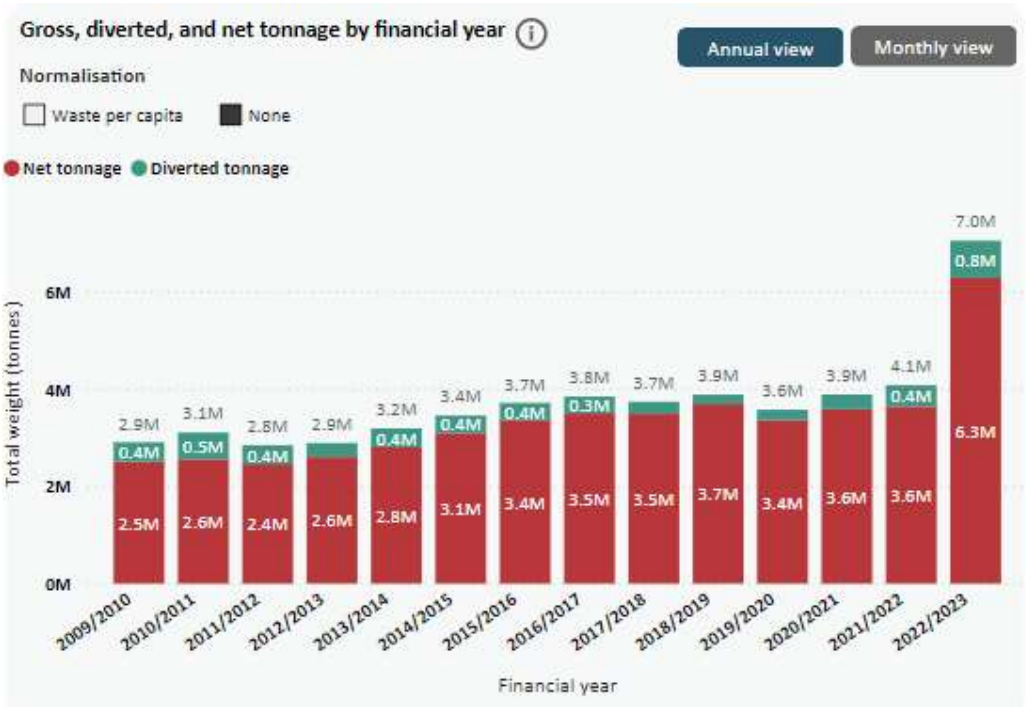
Estimates by our experienced authors anticipate the actual volume of soil disposed at all landfill classes during the 2022/2023 period to be between 4.5M - 7.5M tonnes. This volume roughly equates to an approximate total cost to projects of around $1.35B - $2.25B[7] to dispose these soils.

This problem affects all development and infrastructure projects – from small residential subdivision through to large transport and infrastructure projects, each being impacted at a scalable nature. Costs for smaller projects could be in the order of thousands to tens-of-thousands of dollars, and hundreds-of-thousands to millions on larger infrastructure projects including tunnel, road and rail corridors. Direct and indirect emissions impacts from the excavation and cartage of these soils is not currently measured, ergo difficult to quantify, but it can be seen to be significant.

Chart 2 below visually shows the impact that Class 3 and 4 data (albeit only 6 months of data from these sites is included in the chart) has had on the overall tonnages reported; which can be seen to be significantly increasing in 2022/23 with the improved reporting requirements placed on landfills by the Ministry for the Environment. In addition, Chart 2 shows (by contrast) the low proportion of waste tonnage diverted from landfill.

[4] Data from https://environment.govt.nz/facts-and-science/waste/waste-facilities-and-disposal/
[5] MfE reporting period: 1 July 2022 – 30 June 2023
[6] This data is estimated as a % of the total waste tonnage disposed to landfill for the same time period.
[7] Based on an average rate of $300 per tonne of disposed waste to a Class 1 landfill.

Chart 2: Gross, diverted and net tonnage by financial year[8]



There are many reasons why landfill disposal is often the 'default' option, such as, but not limited to: lack of available space on the project site, lack of donor/recipient site linkages, perceived liability concerns, advice from consultants, regulatory interpretation/requirements, the creation of consenting burdens, the tagging of land as contaminated and the effect this has on land value perceptions, risk of construction programme delay, and geotechnical and ground contamination constraints.

However, there are downsides to this practice (again, not limited to): a net loss of valuable soil resources and associated storage space for water and nutrients, unnecessarily filling our landfill spaces with inert materials (reducing landfill lifespans), soil movements between rohe, increased pressures on roading networks to transport soil, and emissions from excavation and truck movements, with soils sometimes hauled hundreds of kilometres to the nearest available or lowest cost disposal site.

These issues are well acknowledged within the civil works and associated industries, and the majority agree that greater diversion of surplus soil from landfill is required.

There is currently no national framework that documents and provides national consistency for endorsed alternatives that can achieve the range of outcomes sought. The purpose of this proposal is to begin to remedy that.

[8] Data from https://environment.govt.nz/facts-and-science/waste/waste-facilities-and-disposal/

3. Workshop summary

The workshop was attended by around 80 people representing several civil works industry areas (contaminated land, geotechnical, and civil engineering); local and national landfill and cleanfill operators (Fulton Hogan and city/district/unitary authorities); aggregate extraction and supply companies (Fulton Hogan); government and council-controlled organisations (CCOs) such as Watercare, Land Information New Zealand (LINZ), Kāinga Ora, New Zealand Defence Force (NZDF); local and regional authority employees including regulators and hazardous materials officers; industry bodies including Civil Contractors New Zealand (CCNZ); and several delegates from the Ministry for the Environment.

Attendees reflected on the current practises of soil stripping and removal in Aotearoa New Zealand and looked at flagship projects (the Christchurch Northern Corridor, Auckland Council and NZDF examples), where reuse/redesign initiatives worked or are working well. Unfortunately, these examples are inconsistent in their application, and few-and-far-between.

Presentations also explored international reuse initiatives with examples from the United Kingdom (the DoW:CoP – CL:AIRE)[9], the Netherlands, USA and Australia (VicTrack)[10]. Circular economy for soils models have started to be introduced internationally over the last decade, including in Europe (c. 2015); UK, Germany and Belgium; Japan; and New South Wales (2014). A survey of European stakeholders[11] concluded that the best strategies to manage excavated soils in urban areas included: relevant categorisation of material quality, regulatory, organisational (project planning and management), and logistic and economic improvements.

We also heard that increasing pressure from local councils to deliver on waste management and minimisation plans (i.e. reducing waste to landfill by up to 50% by 2030) will place additional pressure on several prominent CCOs, such as Watercare in their future biosolids management.

Attendees were then tasked with identifying key obstacles currently faced that will need to be addressed to enable a reuse framework to start becoming embedded in our soil management systems. These obstacles are discussed in Section 4, with recommendations in Section 5.

4. Key obstacles identified at the workshop

The workshop attendees identified that there is currently no support in terms of framework, guidance, industry toolboxes, or consistent/standardised methods for soil reuse, and the following key obstacles currently preventing soil reuse in Aotearoa New Zealand for the Contaminated Land Sector were identified:

4.1 No drivers or guidance for soil reuse

There is currently no national requirement or guidance for the reuse of surplus soils.

[9] *Definition of Waste Code of Practise – Contaminated Land, Applications in Real Environments (CL:AIRE)*

[10] Victorian Rail Track Corporation, Victoria, Australia.

[11] Hale, SE, et al (2021) The Reuse of Excavated Soils from Construction and Demolition Projects: Limitations and Possibilities; *Sustainability* 13, no. 11: 6083; https://doi.org/10.3390/su13116083

The Ministry for the Environment's Contaminated Land Management Guidelines (CLMGs): Numbers 1 – 5[12,13,14,15,16], are key documents used for investigating, reporting and managing contaminated land. The Technical Guidelines for Disposal to Land[17] is a key document for siting, designing, constructing and managing the various classes of landfill. The overarching regulatory acts and standards concerned include the Resource Management Act and the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*)* Regulations 2011 (the NES-CS).

These guidelines are 'go-to' reference documents for contaminated land practitioners, are incorporated by reference into legislation, and adherence is commonly required by resource consent conditions. Although not strictly their role, these documents do not actively promote or encourage sustainable soil re-use practices, rather, they are silent on the matter.

In our view, the status-quo of digging and dumping will continue until we have soil reuse guidance referenced in guidelines, or regulations are amended or gazetted which promote soil reuse.

4.2 Existing regulatory hurdles

Current guidelines, regulations and plan rules foster the perception that soil containing contaminants 'above background' is 'contaminated' and infers an unsuitable or unacceptable risk.

The definition of 'cleanfill' varies between regional plans, legislation and technical documents. The Technical Guidelines for Disposal to Land[18] bases the waste acceptance criteria (WAC) for Class 5 cleanfill sites on 'natural background', meaning soil containing contaminants even marginally above natural background cannot be considered cleanfill. Unfortunately, this enables the perception that 'if it's not cleanfill, it must be contaminated', and further 'if it's above natural background, it must be contaminated'.

The NES-CS, which has become the key legislative driver for investigating and manging contaminated land in Aotearoa New Zealand, does not help with this perception. Generally speaking, for soil disturbance on HAIL[19] sites, consent is required under the NES-CS when soil contaminant concentrations are shown to be above 'background'.

Many councils have standard sets of conditions for NES-CS consents, including disposal conditions such as 'any/all soil removed from the site shall be deposited at a facility that holds a consent to accept the relevant level of contamination' or similar, meaning the consent holder is required by their

[12] Ministry for the Environment. 2021. Contaminated land management guidelines No 1: Reporting on contaminated sites in New Zealand (Revised 2021). Wellington: Ministry for the Environment
[13] Ministry for the Environment. 2003. Contaminated land management guidelines No 2: Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2011). Wellington: Ministry for the Environment
[14] Ministry for the Environment. 2004. Contaminated land management guidelines No 3: Risk Screening System. Wellington: Ministry for the Environment
[15] Ministry for the Environment. 2006. Contaminated land management guidelines No 4: Classification and Information Management Protocols. Wellington: Ministry for the Environment
[16] Ministry for the Environment. 2021. Contaminated land management guidelines No 5: Site investigation and analysis of soils (Revised 2021). Wellington: Ministry for the Environment
[17] WasteMINZ. 2016. Technical Guidelines for Disposal to Land - Revision 3.1 (Revised September 2023)
[18] WasteMINZ. 2016. Technical Guidelines for Disposal to Land - Revision 3.1 (Revised September 2023)
[19] Hazardous Activities and Industries List, MfE, 2011

consent to dispose of the soil at a licensed landfill. These conditions tend to eliminate the ability to easily reuse and/or divert surplus soil from landfill sites.

Further, NES-CS consents will often include a condition regarding importation of material. Standard wording for these conditions will often be 'The consent holder shall ensure that all fill imported to the site complies with the definition of 'clean fill' per The WasteMINZ Technical Guidelines for Disposal to Land' or similar. As an example, over the past 5 years in the Waikato region alone, approximately 4M tonnes of soil has been disposed of to Class 3 landfill sites – and likely a similar volume to Class 4 and 5 sites – that based on pre-acceptance testing results, would have been suitable for reuse for a range of land uses (see Chart 3). Restrictive consent conditions such as this do not allow the consent holder to reuse surplus material from other sites that although shown to be 'above background', is entirely suitable for the intended land-use of their site (i.e. residential, recreational, commercial, etc).

Re-using soil other than 'cleanfill' will also often require regional council consent.

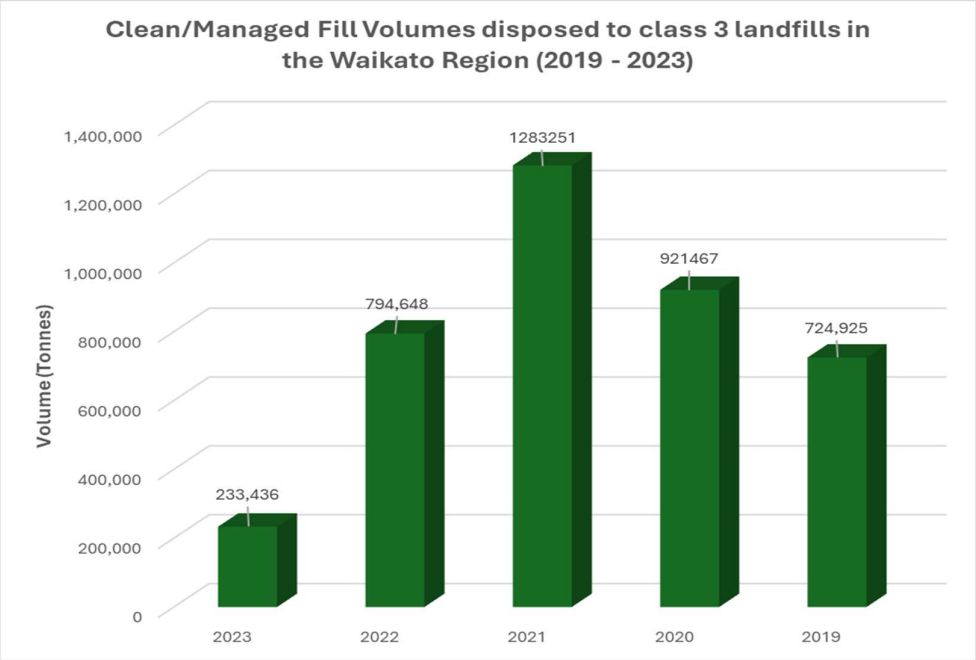
Many regional plans also have rules that directly or indirectly reference cleanfill and/or background, particularly in the context of earthworks, or discharges of solid contaminants to land, which are relevant to soil reuse. For instance, some regional rules state that any soil discharged to land cannot 'increase contaminant concentrations', even if it is shown to be suitable for the intended use at the receiving site.

More often than not, developers will not have the appetite for applying for another resource consent. It will likely not have been considered in the project programme, so the cost/effort associated with project delays and consenting will outweigh the benefits and may even be close to or the same as the cost of landfill disposal.

These matters all contribute to soil being unnecessarily disposed to landfill.

As an example, over the past 5 years in the Waikato region alone, approximately 4M tonnes of soil has been disposed to Class 3 landfill sites – and likely a similar volume to Class 4 and 5 sites – that based on pre-acceptance testing results, would have been suitable for a range of land uses, see Chart 3.

Chart 3: Class 3 landfills Cleanfill/Managed Fill disposal / Waikato Region (2019 –2023)[20] [21]



4.3 The perceived liability of 'contaminated' land

Contaminated soils above background are often perceived as a liability.

There is a common misconception that 'if it's not clean, it's contaminated', so even lightly contaminated soils suitable for reuse are often seen as a liability or a risk by developers, landowners or prospective landowners, with concerns being related to health risk and/or effect on property value. To minimise this perceived risk area, the default approach (still encouraged by some environmental consultants and civil contractors) has simply been the bulk removal and disposal of soil, i.e., 'dig-and-dump' and backfilling with imported 'clean' material. This is further enabled by the aforementioned lack of alternatives, including incentives, supporting reuse rather than disposal.

'Background' is poorly defined and inconsistently applied within planning rules and regions, leading to overly conservative practices resulting in landfill disposal of surplus soils. Better definition of 'background', including 'urban ambient' concentrations of common contaminants is required. There is also opportunity ensure current soil guideline values adequately cater for naturally occurring contaminants to avoid natural, uncontaminated soil going to landfill."

[20] Data included in Chart 3 is sourced from annual compliance reports for Class 3 sites, which is publicly available upon request to Waikato Regional Council.

[21] Lower volumes in 2023 are not an indication of a reduction in soil disposal, one landfill site in the Waikato is located on the regional boundary and alternates filling between two pits in different regions.

4.4 The relative ease of landfilling

In general, landfilling surplus soils in Aotearoa New Zealand is too easy and there is a lack of readily available alternatives.

There are no drivers seeking alternatives to landfill disposal; the dig-and-dump option is still being promoted by some environmental consultants and civil contractors for convenience. It is also readily encouraged and accepted by councils through the resource consenting process as discussed in Section 4.2.

The increasing cost pressure from landfill levies set by the Ministry for the Environment does not seem to be dissuading developers from disposing of surplus soil to landfill. This suggests a current lack of tools and alternatives available to disincentivise these practises.

5. Workshop recommendations and proposed next steps

The workshop and subsequent discussions identified several key recommendations, which, if endorsed and supported by the Ministry for the Environment, will see Aotearoa New Zealand on course to achieving its goal under the overarching purpose of the Waste Minimisation Act 2008, which is to "encourage waste minimisation and decrease waste disposal to protect the environment from harm and provide environmental social, economic and cultural benefits".

The primary recommendation is to **establish a Ministry for the Environment-funded, industry-led working group to develop a pathway toward creating and operating the framework in Aotearoa New Zealand**. We suggest this group sits within WasteMINZ, and comprises representatives from this author group, other WasteMINZ sector groups, central and local/regional government, tangata whenua, land developers, and various other technical disciplines.

The author group considers that the development of the framework should address the following two critical points:

- What the framework would look like in Aotearoa New Zealand.

This would include creating a roadmap for the establishment of the framework, including general commentary around the infrastructure required and the needs from several key stakeholders. This process is likely to take the form of several workshops facilitated by this working group to establish these needs and is required to ensure that once imagined, this framework is successful.

- What work is required to establish and maintain the framework in Aotearoa New Zealand.

This would include planning steps and creating guideline documentation and educational material, behaviour change campaigns to overcome the key obstacles outlined above, and could include:

- Gap analysis of current guidelines, creation of new guidelines, and revision of existing guidelines; including those which foster the perception that soil containing contaminants 'above background' is 'contaminated'.
- Creating a national guideline document for the reuse of surplus soils.
- Education/campaigning around soil contamination and fit-for-purpose soils versus background and cleanfill definitions.

- Developing and promoting alternatives to landfill.

Key considerations

There are many communities throughout Aotearoa New Zealand who have a critical stakeholding in the development and implementation of the framework. Each of these communities has a variety of needs and expectations when it comes to surplus soil use, and each needs to be consulted and acknowledged for the part they have to play in generating, implementing and maintaining the framework in Aotearoa New Zealand.

6. Conclusion

A coordinated transition to the soil reuse framework in Aotearoa New Zealand will enable a practical, risk-based approach to managing surplus soils, offering significant economic, social, and environmental benefits.

The authors of this white paper, on behalf of WasteMINZ, request an audience with the Minister for the Environment to discuss the findings of the workshop as presented in this white paper summary; and, to discuss the steps required to confirm financial support to create a framework for the beneficial reuse of soil.