



8 September 2023

- Alex Kirkham
Senior Specialist Waste Planning
Te Kaunihera o Tāmaki Makaurau - Auckland Council
Level 1 North
Te Wharau o Horotiu Bledisloe House
Tāmaki Makaurau Auckland

Dear Alex

TĀMAKI MAKAURAU AUCKLAND WASTE SOIL ASSESSMENT 2017-2022

1.0 Introduction

Auckland Council (AC, the 'client') has engaged Pattle Delamore Partners Limited ('PDP') to undertake a review of waste soil disposal to cleanfill and managed fill in the Tāmaki Makaurau Auckland region. The review has focussed on the period 2017-2022 and provides an update to an earlier assessment prepared by Tonkin and Taylor for the period 2013 to 2017.

1.1 Objective and Scope

The objective of the assessment was to provide estimates of the volumes of soil being generated and disposed of in the Tāmaki Makaurau Auckland region, as well as volumes of soil that are being transported outside of the Tāmaki Makaurau Auckland region.

In order to achieve the objective, the following scope of works was undertaken:

- Review the currently available information from AC on:
 - Key fill sites accepting managed and clean fill (e.g., annual monitoring reports and tonnages of accepted material, summary consent data).
 - Earthworks activity/Building/Resource consent numbers and summary data for soil movements.
 - Related solid waste information – i.e., municipal solid waste tonnages (for correlation of associated waste soils).
 - Population demographics.
- A targeted information review for relevant information on generation of clean and managed fill – i.e., recent NZ-based waste audits.
- Conduct targeted interviews with local landfill operators (2 No) to address how this material is incorporated in tonnages.

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- Review Statistics NZ website for relevant supporting data (i.e. population and economic demographics re construction industry and waste generation/classification).
- Statistical assessment of relevant data.
- Preparation of this summary letter report detailing the scope of work, relevant data included in the assessment and a 'best estimate' for clean and managed fill tonnages for the Auckland region for the period 2017 – 2022.

2.0 Information Review

Information collected and reviewed for this assessment has included the following:

- Population demographics sourced from the Statistics New Zealand website.
- Consents lodged with AC and recorded in their database. This included the consent sub-types demolition, dwelling, earthworks (both residential and non-residential), landfill discharge, minor household unit, network utilities/infrastructure and quarry.
- Soil data entered into the AC online web portal by waste collectors and waste facilities. This includes the following three categories of data:
 1. Waste Collectors input tonnages they collect, and where they take it to.
 2. Waste Facilities input tonnages that come into their facility.
 3. Waste Facilities input tonnages that leaves their facility, and where they send it to (Destination Facility).
- Interviews with select contractors operating in Tāmaki Makaurau Auckland.
- Information provided anonymously by landfill operators in the Auckland and Waikato Region.

3.0 Estimates of Cleanfill and Managed Fill

Due to the limited availability of data and uncertainties in the various sources, two different approaches were used these included:

- 'Top down' approaches using nationwide estimates of cleanfill and managed fill and adjusting these using gross domestic product (GDP), building consents and population estimates.
- 'Bottom up' approaches based on the consents database provided by AC and adjusted to include information relating to fill disposal outside of the Tāmaki region.

3.1 Top Down Estimates

A study commissioned by MfE for the purposes of increasing the landfill levy provides some of the most recent estimates of the total tonnage of waste disposed of to class 3, 4 and 5 fills in Aotearoa for the year 2019 (MfE, 2019). The study estimated 73,579 tonnes of waste to Class 3 and 4 sites, and 4,341,180 tonnes of waste to Class 5 sites. Giving a total of 4,414,759 tonnes to managed fill and cleanfill facilities.

Using this estimate and the 2019 Gross Domestic Product (GDP) for all of Aotearoa (sourced from Statistics NZ), a tonnes / GDP value was derived. By taking the Aotearoa GDP for each of the other years in the assessment period (2017 – 2022), and adjusting it based on the tonnes / GDP value for 2019, an estimate of the tonnage to cleanfill and managed fill / Aotearoa GDP was determined.

These GDP based estimates of waste to cleanfill and managed fill sites for all of Aotearoa were then pro-rated to Tāmaki Makaurau by using the GDP values for Tāmaki Makaurau for the period 2017 – 2022.

The same approach described above was taken using numbers of building consents in Aotearoa and Tāmaki Makaurau¹, and population estimates for Aotearoa and Tāmaki Makaurau¹. These estimates are provided in Table 1.

Table 1: Top Down Estimates of Cleanfill and Managed Fill in Tāmaki Makaurau (tonnes) ¹

Estimate based on	2017	2018	2019	2020	2021	2022
GDP	1,479,256	1,573,453	1,663,109	1,740,640	1,784,293	1,967,742
Building Consents	1,172,918	1,388,698	1,619,710	1,767,296	2,149,727	2,213,382
Population	1,440,879	1,467,212	1,490,708	1,519,879	1,510,924	1,503,033

Notes:

1. GDP, building consents and population data sourced from Statistics New Zealand <https://infoshare.stats.govt.nz/> accessed August 2023.

The assumptions behind these top down estimates are that GDP, building consents and population are linked to economic growth, which is in turn linked to expansion in the economic sectors that are major sources of waste (e.g., agriculture, manufacturing, transport, tourism, energy, and construction).

The previous assessment (T&T, 2017) also used a similar approach for estimating amounts of cleanfill and managed fill in Tāmaki Makaurau. In that report, it was noted that estimates based on GDP and building consent data seemed to provide the best estimate of waste volumes.

3.2 Bottom Up Estimates

To compliment the top down approach estimates of cleanfill and managed fill were derived using information exported from the Auckland Council consents database. This included land use consents and discharge consents with further sub-categories of Landfill Discharge, Earthworks Residential, Earthworks Non-Residential and Minor Household Unit.

3.2.1 Consented Cleanfills and Managed Fills in the Tāmaki Region

An estimate of the total volumes recorded in each consent for consented cleanfills and managed fills was undertaken by completing a word search for “cleanfill and “managed fill” in the AC consents database. After this filtering, the total consented volumes recorded for each site were divided by the length of the consent. This approach assumes that the rate of filling at a site remains steady across the entire length of the consent. In reality this is unlikely to be true, with many sites filling faster, and therefore closing before the consent ends.

Following this methodology, the total volume of soil being disposed of, to consented cleanfill and managed fill sites is estimated to be 858,899 m³/year. Applying a density of 1.442 t/m³ gives a total of 1,238,532 t/year.

As noted above, this is a simplistic interpretation and is subject to a number of assumptions and uncertainties (these are discussed further in Section 4.1). This approach is expected to underestimate the total amount of waste soil being disposed of. A significant shortcoming is that this estimate does not account for waste soils that might be disposed of at facilities outside of the Tāmaki region (e.g., in the Northern Waikato).

¹ Sourced from Statistics New Zealand <https://infoshare.stats.govt.nz/> accessed August 2023

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3.2.2 Earthworks Consents in the Auckland Council Database

In addition to searching for consented cleanfills and managed fills, the AC consents database was searched for consents which contained the words “cleanfill” or “managed fill” and also included a numerical value for the volume of soil being disturbed (this could include both cut and fill volumes). Combining all consents that matched the above criteria over the period 2017-2022 gave total volume of soil of 15,224,376 m³. Applying a density of 1.442 t/m³ gives a total of 21,953,550 t.

As discussed, this estimate includes both cut and fill volumes and is therefore an overestimation of the volume of waste soil being generated (as some of this soil will be reused on the same site it was generated on). It is also important to note that this estimate includes future capacity, i.e., it includes volumes from consents that extend into the future and have not yet been completed.

3.2.3 Information From Fill Operators

To provide further checks on the estimates being produced, a select number of fill facilities were approached to provide an indication of fill quantities over the period. Information on quantities received per year for the period 2017-2022 was provided by two fill sites: a cleanfill operation located with the Tāmaki region, and a clean and managed fill facility located just outside of the Tāmaki region in the northern Waikato.

Due to the close proximity to Tāmaki Makaurau, information provided by the landfill operator of the northern Waikato site indicates that 90% of the fill material received originates from the Tāmaki Region, with the balance being from Waikato and Bay of Plenty sites. Thus, an adjustment factor of 90% was applied to the totals reported for this site to give an estimate of the amount of material coming from Tāmaki.

The data from these sites is summarised in Table 2.

Table 2: Cleanfill and Managed Fill Received at Select Fill Sites (tonnes)

Fill Site Location	2017	2018	2019	2020	2021	2022
Tāmaki	110,000	120,000	235,000	205,000	260,000	315,000
Northern Waikato ¹	410,303	331,110	213,468	373,942	155,615	190,731

Notes:

1. Values have been adjusted from the totals reported by the fill site based on an estimate from the fill operator that 90% of the fill received originates from Tāmaki Makaurau.

Based on the information in Table 2, it appears a significant amount of soil from Tāmaki Makaurau is being disposed of outside of the region, particular when considering that there are a number of fill sites located just to the south and north of the Council boundary, not just the one site that is shown in Table 2. This was also noted in the previous assessment (T&T, 2017), where it was estimated that approximately 150,000 tonnes of fill was being exported to sites such as these outside of the Tāmaki region. The previous estimate is less than the amount suggested by the current data.

3.2.4 Other Information from Auckland Council

Auckland Council maintain an online web portal for licensed waste transporters and disposal facilities to record waste movements within Tāmaki Makaurau. Summary information specifically related to soils database was provided for review and is shown in Table 3 below.

There are three categories related to soil:

1. Waste Collectors input tonnages they collect, and where they take it to.
2. Waste Facilities input tonnages that come into their facility.
3. Waste Facilities input tonnages that leaves their facility, and where they send it to.

Consequently, some waste soils may be reported twice, i.e., by the Waste Collector company tipping at a facility, and also by the Waste Facility receiving the material.

Cleanfills do not require licences and therefore do not report tonnage data to AC, however some cleanfills will be included in the tonnages reported by Waste Collectors as a 'Destination Facility'. In addition, AC noted that some soil may be entered in the 'Construction and Demolition Waste' category (due to it being co-mingled with C&D waste). Consequently, this will not be captured in the data reported here.

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Table 3: Waste Soil Reported via AC Online Portal (tonnes) ¹						
Reporting Category	2017	2018	2019	2020	2021	2022
Waste Collectors	40,911	26,139	874,752	24,149	57,016	47,510
Waste Facilities - incoming	175,375	126,543	116,812	45,435	143,594	348,619
Waste Facilities - outgoing	47,286	20,805	1,032	35,329	79,735	76,757
Notes:						
1. Information provided by AC.						

Information provided by AC indicates that reporting via the online portal is incomplete and only represents a small fraction of the total soil movements. As a result, this information has not been used further in this assessment.

4.0 Summary

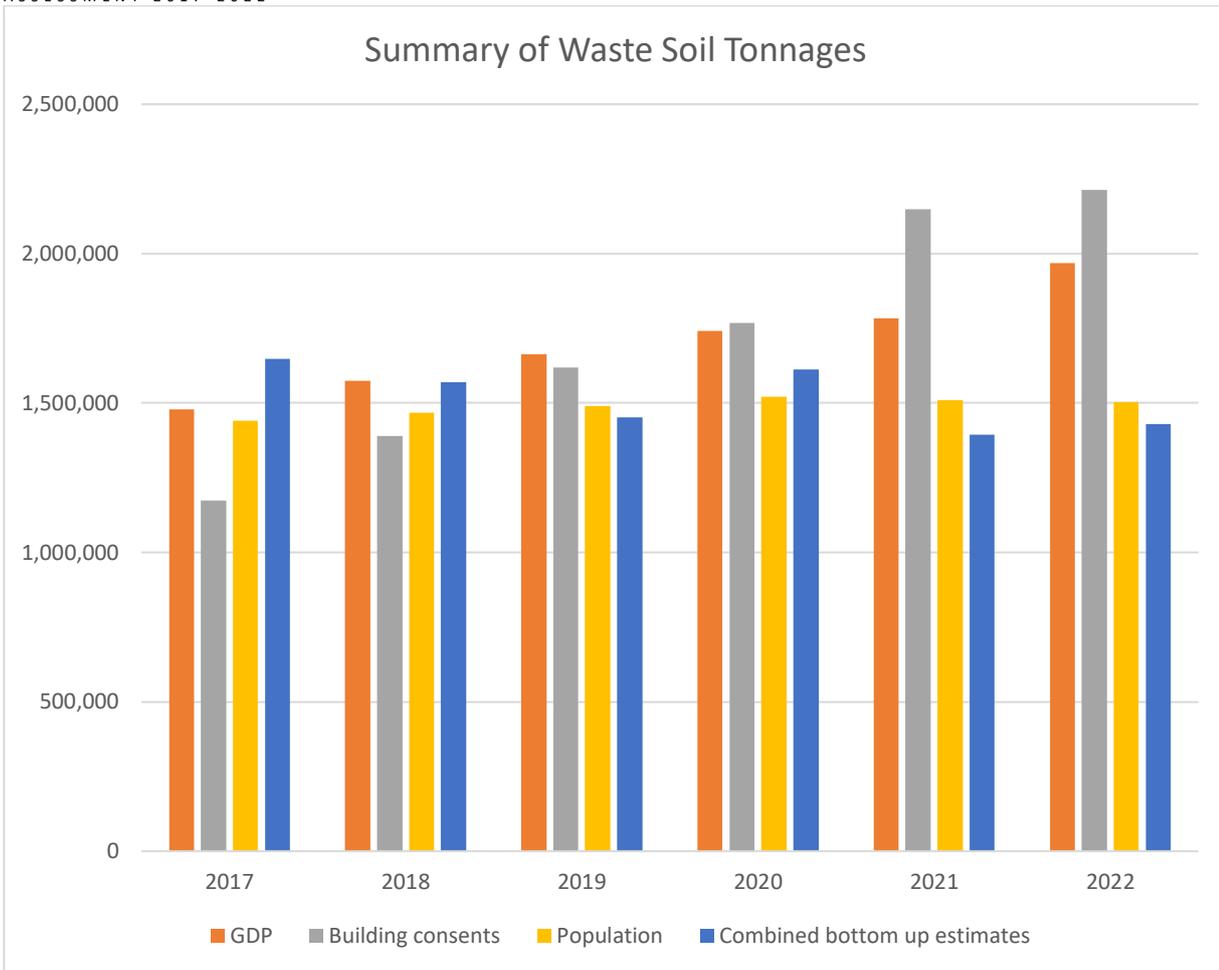
A summary of the estimates used in the assessment is provided in Table 4 and a plot of these estimates is provided in Figure 1. This includes the top down estimates (using GDP, building consents and population for the Tāmaki region), and the bottom up estimate using the AC consents database information and including the data from the north Waikato fill site.

Table 4: Summary of Waste Soils (tonnes)

Top Down Estimates						
Estimate based on	2017	2018	2019	2020	2021	2022
GDP	1,479,256	1,573,453	1,663,109	1,740,640	1,784,293	1,967,742
Building consents	1,172,918	1,388,698	1,619,710	1,767,296	2,149,727	2,213,382
Population	1,440,879	1,467,212	1,490,708	1,519,879	1,510,924	1,503,033
Bottom Up Estimates						
Source	2017	2018	2019	2020	2021	2022
AC cleanfill and managed fill consents	1,238,532	1,238,532	1,238,532	1,238,532	1,238,532	1,238,532
Northern Waikato fill site ¹	410,303	331,110	213,468	373,942	155,615	190,731
Combined	1,648,835	1,569,642	1,452,001	1,612,474	1,394,148	1,429,263
Notes:						
1. Values have been adjusted from the totals reported by the fill site based on an estimate from the fill operator that 90% of the fill received originates from Tāmaki Makaurau.						

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The top down estimates represent the total amount of cleanfill and managed fill being generated, and the bottom up estimates are representative of the amounts of cleanfill and managed fill being disposed of (being consents for cleanfill and managed fill sites and the data from the northern Waikato fill site). If all disposal sites were accounted for, these estimates should match, however in reality not all disposal sites are accounted for by the consents data (e.g., cut fill operations and small sites not requiring consents are not captured). As such, the difference between these two estimates is considered to represent a combination of the soil that is being disposed of to unconsented sites, and the soil that is being disposed of outside of the region.



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Figure 1: Plot showing summary of estimates of waste soil (managed fill and cleanfill) tonnages in Tāmaki Makaurau

4.1 Limitations on Estimates

There are significant uncertainties and limitations with the estimates. These include:

- The top down estimates are themselves based on an estimate of cleanfill and managed fill provided in an MfE report from 2019, which is in turn based on data from 2017. There is no uncertainty reported with these estimates.
- Consent data often includes both cut and fill values, so potential for double counting and overestimation of soil amounts.
- Not all consents record soil volumes, estimate approximately 10-30% of consents do not contain volumes. Results in underestimation of volumes.
- Search was restricted to ‘new’ consents within the search period (2017-2022). Does not account for existing consents which are still open and hence may still be receiving soil. Results in underestimation of volumes.
- Small cleanfill sites do not require a consent and therefore are not accounted for in the database. Results in underestimation of volumes.
- Soil used as cover at managed fill and municipal fill sites may not be accounted for in the consents database.

5.0 Conclusion

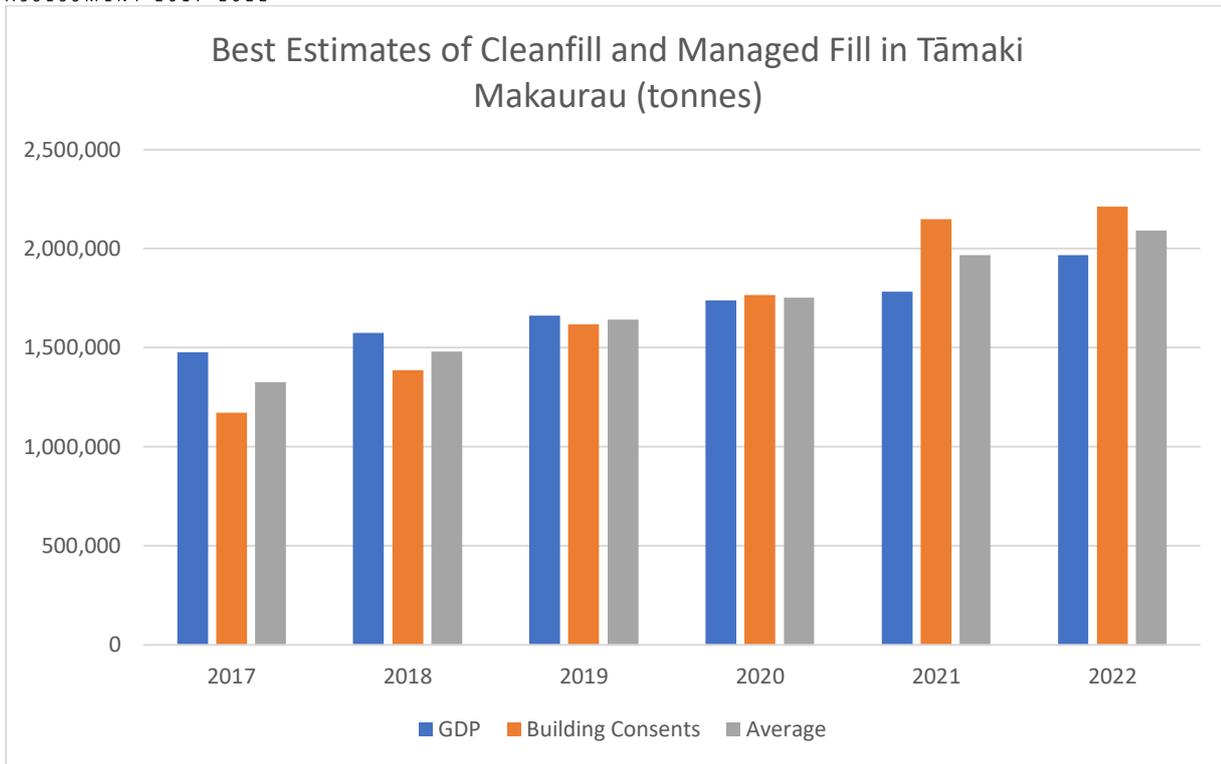
Based on the information reviewed for this assessment, the final estimate of clean and managed fill from the Tāmaki Makaurau region is provided in Table 5 and a plot of the estimates is provided in Figure 2.

Table 5: Best Estimates of Cleanfill and Managed Fill in Tāmaki Makaurau (tonnes)						
Estimate based on	2017	2018	2019	2020	2021	2022
GDP ¹	1,479,256	1,573,453	1,663,109	1,740,640	1,784,293	1,967,742
Building Consents ¹	1,172,918	1,388,698	1,619,710	1,767,296	2,149,727	2,213,382
Average	1,326,087	1,481,075	1,641,409	1,753,968	1,967,010	2,090,562
Uncertainty (-25%)	994,565	1,110,806	1,231,057	1,315,476	1,475,258	1,567,922
Uncertainty (+25%)	1,657,609	1,851,344	2,051,762	2,192,460	2,458,763	2,613,203
<i>Notes:</i>						
1. GDP and building consents data used in the estimates is sourced from Statistics New Zealand https://infoshare.stats.govt.nz/ accessed August 2023.						

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Given the uncertainty and gaps in the consent data, an average of the ‘top down’ estimates based on GDP and building consents is considered to be the best estimate. As these values are based on estimates of the amount of cleanfill and managed fill that is generated, these estimates are also considered to take into account waste soils that are disposed of to unconsented sites, municipal solid waste facilities (e.g., as cover material), and waste soils that are disposed of outside of the Tāmaki region.

As outlined in Section 4.1, there is significant uncertainty in the estimates and as such, an uncertainty of +/- 25% has been included.



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Figure 2: Plot showing summary of estimates of waste soil (managed fill and cleanfill) tonnages in Tāmaki Makaurau

6.0 Data Gaps and Recommendations

In undertaking this assessment, a number of data gaps have been identified:

- Information from licensed waste contractors and facilities reported via the online soil portal. The system is in place for reporting this information, however it is understood it is not being used as frequently as it could. If possible, all licensees should be encouraged to accurately provide this information.
- Fill volumes are not consistently captured in consent information. One option could be to have a requirement that estimated volumes of excess fill must be included in consents. These volumes could then be recorded in a specific field within the AC consents database which would allow the values to be easily extracted for future reporting.
- Collaboration with Government agencies. With the expansion of the national waste disposal levy, disposal facility operators now have obligations under the Waste Minimisation (Calculation and Payment of the Waste Disposal Levy) Regulations 2009 to record waste tonnage and report this to MfE. A request was made to MfE for provision of this data for the Tāmaki region, however it was turned down due to restrictions on the information that central government can provide to councils. This type of information would be very useful for future waste assessments, and it is recommended that potential options for receiving this data are investigated (e.g., formal confidential agreements, anonymised data etc.).

7.0 References

MfE, 2019. Reducing waste: a more effective landfill levy – consultation document. Wellington: Ministry for the Environment.

T&T, 2017. Assessment of Cleanfill and Managed Fill in Auckland. Letter report prepared for Auckland Council as part of the report Auckland's Waste Assessment 2017.

8.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Te Kaunihera o Tāmaki Makaurau - Auckland Council and others (not directly contracted by PDP for the work), including T&T and fill operators. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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Yours sincerely

PATTLE DELAMORE PARTNERS LIMITED

Prepared by

Reviewed by

James Conway

Gerald Strayton

Service Leader - Contaminated Land

Technical Director

Approved by

Rod Lidgard, CEnvP SC

Technical Director – Contaminated Land

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