Whenua parakino / Contaminated land guidance

Waka Kotahi NZ Transport Agency

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WAKA KOTAHI NZ TRANSPORT AGENCY

New Zealand Government

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Contents

Background

Waka Kotahi NZ Transport Agency is responsible for maintenance and development of transport network projects across the country. As a result of hazardous activities and industries, both past and present, projects may encounter contaminants in soil, and therefore management of contamination needs to be considered and planned for in advance.

Managing contaminants in soil to protect human health must meet the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (the NES-Soil). In addition, regional and unitary plans often require consideration of ground contamination to protect human health and the environment. There are also requirements for protecting the health and safety of workers disturbing contaminants in the Health and Safety at Work Act (HSWA), particularly requirements for managing risks from asbestos in soil.

This guidance reflects Waka Kotahi policy and environmental requirements, as well as national guidance and legal requirements. This document has been prepared as a high-level guideline that can be used to understand requirements for managing soil contamination for the protection of human health and the environment.

1.1. Document outline

This guidance document includes the following key features:

- General guidelines for identifying and assessing soil contamination,
- Regulatory requirements for projects on contaminated land,
- Basics of soil and water sampling and analysis for contamination, and
- Reporting requirements at the end of a project.

1.2. Document audience

This document is intended for project managers, network managers, property staff and consents planners who have overall responsibility for planning and executing a project, whether that project is a new road or maintenance of existing roads, or the acquisition and disposal of land. Project managers may be a contractor's project manager or a Waka Kotahi staff member. While this document has been produced for Waka Kotahi use, many of the concepts and legislative requirements are applicable for other road controlling authorities who may be undertaking capital or maintenance works.

After reading this document, users should have a high-level understanding of contaminated land considerations that are relevant to roading construction and maintenance projects. This document will provide a framework to prompt project managers to consider the implications of contaminated land for their projects at an early stage. In addition, by providing minimum expectations and outcomes, Waka Kotahi aims to improve communication between project managers and contractors, to encourage a coordinated response to contaminated land across the roading network.

1.3. Waka Kotahi policy and associated guidance

Under the State highway environmental plan (2008) Waka Kotahi is committed to ensuring the removal, placement and disposal of contaminated soils is achieved in accordance with best practices. This ensures that human health and ecological receptors are not adversely impacted by Waka Kotahi projects.

Z19 Taumata Taiao is the Waka Kotahi environmental and sustainability standard. The environmental screen associated with the standard triggers the contaminated land process and is completed regardless of a project size. This guidance is intended to complement the requirements of the environmental screen in relation to assessing risks associated with contaminated land. Links to the key documents can be found below:

- Z19 Taumata Taiao – Environmental and sustainability standard
- Z19 Environmental Screen
- Erosion and Sediment Control Guidelines for State Highway Infrastructure

1.4. Drivers for investigating and managing contaminants in soil.

Contaminated land poses a risk to human and environmental health, particularly when soil is disturbed by activities such as earthworks, as these activities can expose contaminants and potentially release them into the air and waterways. Soil can become contaminated from different activities or accidents – both current and historic. Contaminated soil may not be obvious when first looking at a site. Contamination is often overlooked and can cause problems down the track in a project, or create a potential financial liability for Waka Kotahi and contractors.

Some of the issues arising from soil contamination being encountered during a project are:

- Health and safety risks during road construction and maintenance activities over the lifetime of the road;
- Adverse impacts to sensitive environments from disturbance of contaminated land causing discharges during construction and maintenance activities;
- Impacts to construction methodologies, timeframes and costs, to manage soil contamination – especially if offsite disposal is required;
- Ongoing liability for contamination, including runoff of contaminants into the environment or neighbouring properties; and
- Resource consenting risks and requirements, potentially resulting in lengthy delays or unexpected costs to a project.

Contamination risks can be managed efficiently if they are identified and assessed early in a project. Waka Kotahi requires that contamination risks are considered at the options assessment stage of a new project. If the project changes, for example the location or extent of earthworks changes, the original assessment of contamination may not be sufficient to characterise the full extent of potentially contaminated soil. Likewise if unexpected contamination is encountered further investigation may be required. Refer to Section 3 for further detail on when contamination investigations should take place.

1.5. Contaminated land and Waka Kotahi projects

Issues with contaminated land primarily arise when ground disturbance activities are undertaken. Activities for Waka Kotahi where contaminated land needs to be considered include:

- Designing new roads, particularly route selection, land purchase and earthworks cut and fill design;
- Construction of new roads;
- Construction of new stormwater basins and swales;
- Maintenance or repair of road surfaces;
- Maintenance or upgrades of road verges;
- Road re-surfacing;
- Maintenance or construction of bridges, culverts, or railway level-crossings; and
- Land disposal

The following key question needs to be answered at an early stage of the project – *"will soil contamination affect the design, costs, and delivery of a project?"*. To answer this question, certain steps need to be followed to determine if contamination levels are high enough, and exposure likely enough, that the health of people (workers and the public) could be negatively impacted. If contamination risks are low, soil with low levels of contamination can be considered during the project design phase and potentially beneficially re-used on site. If residual contamination risks are identified and managed appropriately, beneficial re-use of soil can save significant costs to a project by avoided landfill disposal, in line with our carbon reduction and resource efficiency targets. Note that approval from relevant Waka Kotahi personnel (e.g. property, environmental planning) should be sought prior to re-using soil on site, particularly if ongoing management is required.

Soil with low levels of contamination can be beneficially re-used on site

Landfill disposal is a costly option, considering transport costs and high landfill gate fees for contaminated soil. In some cases, soil may need to be disposed to landfill because it is not geotechnically suitable for re-use on the site. Early consideration of contamination in the design phase can minimise the amount of soil sent to landfill, while addressing residual risks to the health of workers, the public and the environment.

Specific considerations for Waka Kotahi projects and investigations

Waka Kotahi aims to achieve industry best-practice when investigating and managing contaminated land. It is important to note that investigations associated with Waka Kotahi projects are likely to differ to many other types of contaminated land investigations, due to the long and narrow nature of the network. In addition to national legislation and guidance, the following should be considered by SQEPs undertaking investigations on behalf of Waka Kotahi:

- Due to the location of many state highways alongside areas of high natural significance, ecological receptors may need to be considered in addition to human health.
- Consideration of guidelines other than the NES-Soil may be necessary to better understand risks to a variety of receptors, particularly if soil is being re-used or placed elsewhere on site.
- Consideration of areas planned for stormwater facilities, and the risks of placing contaminated soil in areas that may be used for stormwater facilities.
- Land designations associated with projects can often be long and narrow, which can pose challenges for storage and management of contaminated soils.

Case study: Contamination discovery during a roundabout upgrade

A contaminated land investigation was conducted at the beginning of an upgrade project, and it was identified that pits for former petroleum underground storage tanks (USTs) were likely to be present within the project area. This made sense because the site nearby had historically been used as a petrol station, but the records for the site were not complete. As the location of the pits was not well understood, shallow soil samples in the expected area of the USTs were collected and tested to the intended depth of earthworks. Results from pre-works testing did not indicate the presence of significant contamination, so a contaminated soil management plan (CSMP) was prepared to guide the works and the council granted consent for the work to proceed. Thinking that the risk of contamination had been adequately assessed, the project manager gave the “green light” for the project to start.

During the site works two concrete bunkers for the former USTs were discovered. Soil testing around the bunkers indicated high levels of petroleum hydrocarbon contamination. The intended finished surface levels required the removal of both bunkers. The expense to remove the bunkers, and remediate the surrounding soil, would have been significant so the project manager enquired with the regional council about their legal obligations under the Resource Management Act and regional plan rules. The regional council was advised of the soil contamination, who raised concerns regarding possible contamination of nearby groundwater bores (used for drinking water supply) if the contaminated soil was left in place. The outcome was a decision to remove the contaminated soil to landfill, which removed the ongoing risk to the environment. However, there were lengthy project delays and additional costs for earthworks and disposal.

In retrospect, if a more detailed investigation had been conducted before the earthworks began, time and costs for the bunker removal could have been budgeted in the project. A more detailed investigation, including identifying the exact location and depths of the tank bunkers and collection of soil samples from around the bunkers, would have provided the necessary information for managing the excavation and saved time and cost to the overall project.

2. Legal obligations for projects on contaminated land

This section contains a brief summary of the main regulations and rules that apply to soil disturbance on contaminated land. This provides a high-level assessment of legal obligations at a national level in New Zealand, and additional regulations may apply in local situations. The advice of a planner should be sought if there is any uncertainty over the legal requirements for a project.

2.1. Resource Management Act 1991

Contaminated land is defined under the Resource Management Act 1991 (RMA) as land with hazardous substances in or on it that are reasonably likely to have significant adverse effects on the environment (including human health). The Ministry for the Environment's hazardous activities and industries list (HAIL) is used by councils as a guide to identify potentially contaminated sites, and they often hold information on HAIL activities in a contaminated land register. Contaminated land is subject to the provisions of the NES Soil and rules in district and regional plans, discussed in more detail in the following sections.

2.1.1. The NES Soil

The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES Soil) is the primary legislation for managing the risks of contaminated land to human health. Compliance with the NES Soil is managed by territorial authorities. Under the NES Soil, a site is considered potentially contaminated if it is "more likely than not" that HAIL activities have occurred on the site. For example, if a site contains underground storage tanks for petroleum hydrocarbon storage, the site will be subject to the NES Soil. If there is no information on previous HAIL activities at a site, or a PSI shows that HAIL activities do not meet the "more likely than not" test, the NES Soil does not apply.

If the "more likely than not" test shows that HAIL activities have occurred on the site, consent under the NES Soil may be required if any of the following activities are proposed:

- Removal or replacement of an underground fuel storage system
- Soil sampling for contamination;
- Soil disturbance, including earthworks, trenching, pot-holing, etc., and off-site disposal of soil;
- Subdividing the site into smaller properties; and
- Changing the land use e.g. conversion of a site from a commercial land use to a residential land use.

If the NES Soil applies to a project, consent will be required if the soil disturbance volumes and off-site disposal soil volumes exceed the following criteria:

- ***Soil disturbance: 25 m^3 per 500 m^2 of project area per calendar year***
- ***Off-site disposal: 5 m^3 per 500 m^2 of project area per calendar year***

For Waka Kotahi projects, it is likely that soil disturbance will be the key activity where the NES Soil will apply.

- Considering a typical truckload of soil is approximately 10 m^3, the NES Soil criteria will likely apply to most earthworks involving heavy machinery. Hand-digging of soil is unlikely to require NES Soil consent. Consideration of the NES Soil criteria at an early stage of the project means that the works can often be designed to stay within the criteria, for example by designing or planning a project to re-use excavated soil within the site works as backfill, thereby minimising the amount of soil for off-site disposal.

It is worth noting that the volume thresholds are stated "per calendar year". MfE states in the NES Soil Users' Guide that, "a person could remove this amount on two consecutive days, with each day considered as occurring in consecutive years". Project managers should consider the timing of soil disturbance in order to determine the correct NES volume thresholds for a project. If there is any doubt, consult with a member of the Waka Kotahi environmental planning team, or the subject matter expert in the Safe and Sustainable Standards team.

If the soil disturbance is a permitted activity under the NES Soil, no consent is required if the following conditions are met:

- Controls must be in place to minimise exposure of people (e.g. site workers and the public) to contaminants. For example, soil must be kept damp to minimise the generation of dust. These controls are usually described in a Site Management Plan (SMP) for the works;
- The soil must be re-instated to an erosion-free state within 1 month of the works, for example by covering with a layer of compacted material;
- Any soil taken away from the site must be disposed to a licensed facility. If soil contaminant concentrations are above natural background levels of contaminants, soil cannot be disposed to a cleanfill;
- The soil disturbance cannot last longer than 2 months; and
- Any existing structure that contains contaminated soil must not be compromised. For example, if contaminated fill is covered with a clean, compacted layer, this layer must not be damaged.

If the above criteria are not met, consent will be required and the assistance of a SQEP is necessary. **Figure 2.1** details the process for assessing whether an NES consent is required.

In many cases, roads are a designation under the RMA so consent may be waived for certain aspects of a project if details are provided to the consenting authority in an Outline Plan of Works (OPW). However, the NES Soil prevails over designations, so any project on an identified HAIL site (which is also a designation) will be subject to the provisions of the NES Soil. Some councils impose additional conditions on soil disturbance on HAIL sites, such as regional consents for discharges to water or land and district council consents for earthworks.

In accordance with the NES Soil, investigations of contaminated land need to be completed, or reviewed, by a suitably qualified and experienced practitioner (SQEP). A SQEP is typically an employee of an engineering or environmental consultancy who has experience in assessing and managing contaminants in soil. Further information on choosing a SQEP can be found in Section 3.5.

2.1.2. Territorial Authority rules

In addition to the implementation of the NES Soil, territorial authorities also have rules around earthworks volumes, soil disturbance volumes, noise and other environmental fields. Project planner should seek the advice of a planner if there is any doubt regarding what consents are required from a territorial authority for a project.

2.1.3. Regional plan rules

Regional councils establish rules for protection of the environment in regional plan documents. Generally, regional plan rules specify that an activity on a site cannot release contaminants into water, ground, or into air, at concentrations that pose a risk to the environment. For example, sediment discharged from a contaminated site during earthworks must be controlled if it may run-off into a local stream. Often petrol stations can have hydrocarbon plumes that can extend into neighbouring properties and potentially Waka Kotahi land.

In situations where soil will be re-used on an adjacent site, consent may be required to deposit contaminated soil on the ground. It is outside the scope of this document to describe all the regional plan rules related to contaminated land. Project managers should seek the advice of a planner if the project site is potentially contaminated, if your project involves discharges to water, land or air, or if you are seeking to deposit soil on another site (other than a landfill or other licensed disposal facility).

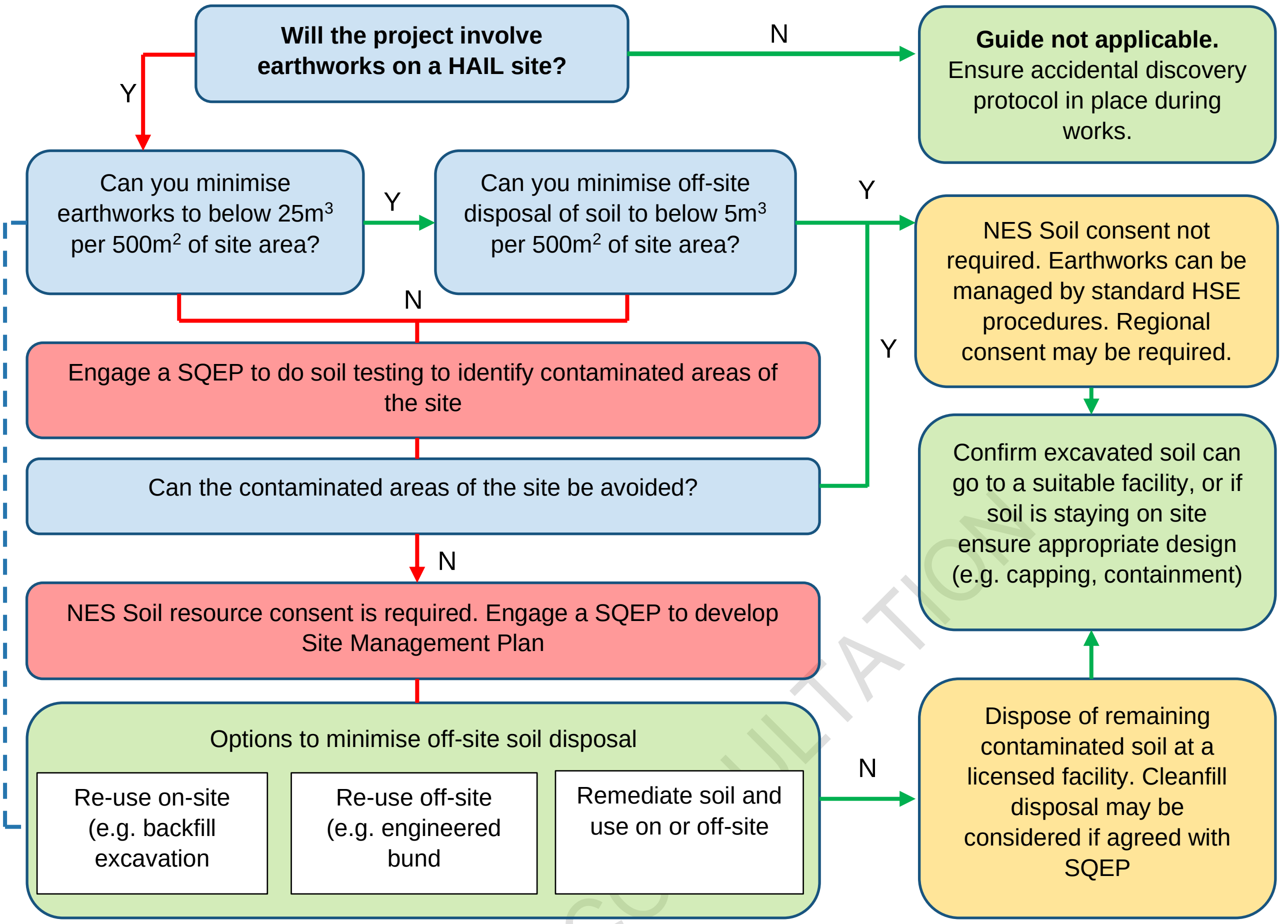


Figure 2.1. Flowchart for managing contaminants in soil

2.2. Contaminated Land Management Guidelines

The Ministry for the Environment (MfE) has published a series of guidelines for assessing and managing contaminated land (a complete list can be found in Appendix A). The Contaminated Land Management Guidelines (CLMG) is a series of five documents detailing the requirements for reporting, investigation, risk assessment, and information management on contaminated land. Additional information is available on the MfE website.

The CLMG documents are incorporated into the NES Soil by reference, and all site investigations and reporting must be completed in general accordance with the CLMGs. Project managers should be aware of the guidelines and confirm that project investigations are completed by a SQEP in general accordance with the CLMGs. CLMG1 describes minimum reporting for contaminated sites, including PSIs, DSIs, Site Validation Reports (SVR), and Remediation Action Plans (RAP). CLMG5 provides minimum requirements for soil sampling and analysis.

2.3. Health and Safety at Work Act 2015

All persons conducting a business or undertaking (PCBUs), including Waka Kotahi, have obligations under the Health and Safety At Work Act 2015 (HSWA) to protect the health and safety of workers and others, and take steps to minimise or eliminate workplace risks. For contaminated soil, workers may be exposed by physical contact with soil or airborne soil particles like dust. Key contaminants in the road network that must be considered include lead from historic emissions from the use of leaded petrol, organic contaminants (e.g. coal tar), and vapours (e.g. spilled petrol or solvents).

One of the key workplace hazards is inhalation of airborne contaminants including asbestos fibres, resulting in potentially severe health effects on workers involved in soil disturbance. While asbestos is not associated with most road construction materials, it is likely that some sites will contain asbestos from building materials and infrastructure (e.g. pipe lagging, contaminated fill material). The Health and Safety at Work (Asbestos) Regulations 2016, and the companion Guidelines for the Assessment and Management of Asbestos in Soil (BRANZ, 2017) provide a national framework for identifying, managing, and removing asbestos.

An overview of the required management controls for asbestos-contaminated soil is included as Appendix C. A licensed asbestos assessor or competent person (who could be a SQEP) must be consulted before soil is disturbed or sent for off-site disposal if asbestos is known to be present before works start, or is discovered during the works.

2.4. Heritage and archaeological features

Waka Kotahi project sites may include heritage and archaeological features that require consideration before site works commence. Such sites are often related to pre-1900 activities, but certain post-1900 sites are also protected. The Heritage New Zealand Pouhere Taonga Act 2014 defines those sites that require archaeological consideration, and the requirements for working on those sites (including monitoring and seeking authorisation from Heritage New Zealand). For archaeological sites, the project manager must seek the advice of an archaeologist or planner to comply with the regulations and obtain approvals from Heritage New Zealand for soil disturbance. Further information can be found in the Waka Kotahi guidance documents below:

- Historic heritage impact assessment guide for state highway projects

P45 – Accidental Archaeological Discovery Specification

2.5. Māori engagement

Te Ara Kotahi, is the Waka Kotahi Māori Strategy which provides strategic direction on how to work with and respond to Māori as the Crown's Treaty partner. The strategy incorporates ngā uara / values mātāpono / principles for working together, as well as recognising, respecting and upholding the principles of Te Tiriti o Waitangi.

Usually for large projects engagement will be undertaken for a range of environmental issues well before works start, in accordance with the Hononga ki te iwi framework. Early and regular engagement during a project will ensure that any issues can be communicated and addressed quickly.

In relation to whenua parakino / contaminated land, all soils have mauri, and disturbance or movement of soil may not be appropriate in some circumstances. Māori perspectives on managing soil should also be considered if there are sites of significance, wāhi tapu, mahinga kai, or silent file areas nearby, in addition to heritage considerations outlined in Section 3.4 above.

Waka Kotahi has some excellent resources that may assist when seeking to engage with Māori for a project, detailed below. The Te Mātangi Māori partnerships team should be contacted in the first instance if there are any queries on Māori engagement for a project.

3. Identification and assessment of contaminated land

Waka Kotahi uses a Business Case Approach (BCA) for any investment requiring NLTP funding support. Z19 Taumata Taiao describes this process in more detail, but Figure 3.1 outlines the basic process below and how environmental considerations fit in with the BCA stages. It is recommended that the assessment processes described below are undertaken in accordance with the BCA framework, to make the process as efficient as possible. The following sections 3.1 – 3.4 should be referenced to assist with the contaminated land questions in the Environmental Screen.

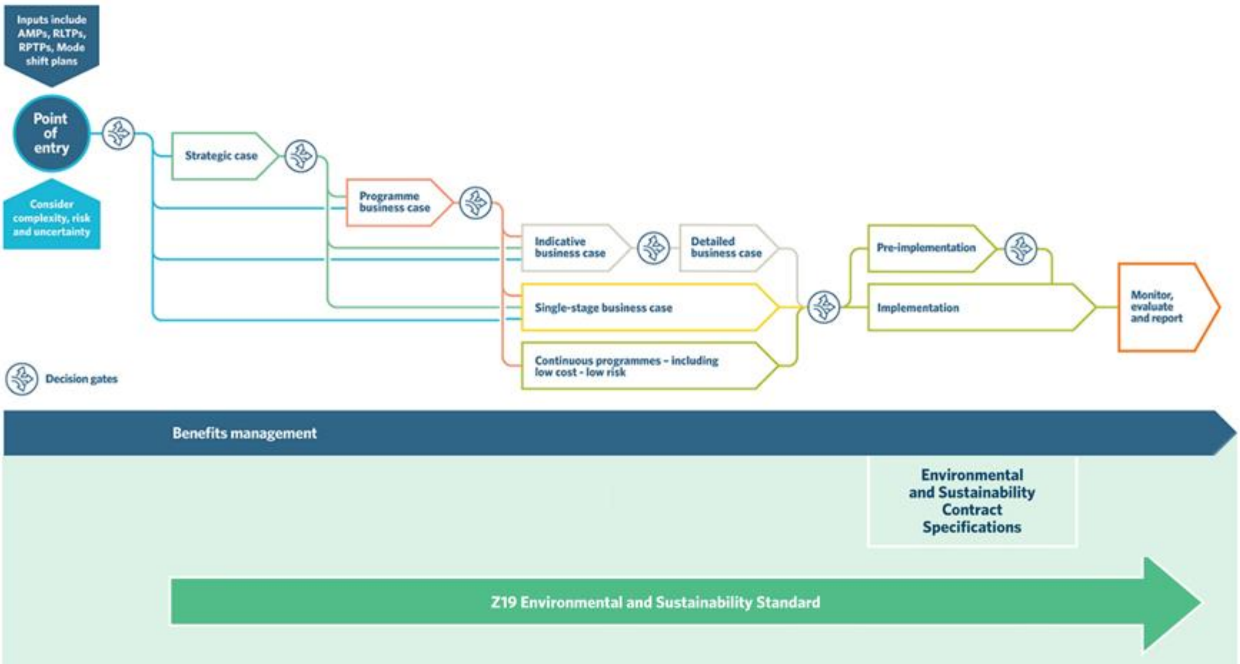


Figure 3.1. Waka Kotahi BCA framework and interaction with Z19 Taumata Taiao

3.1. The hazardous and activities Industries List (HAIL)

The Ministry for the Environment (MfE) has published a Hazardous Activities and Industries List (HAIL) that includes many of the potential sources of soil contamination in New Zealand. There are 53 activities listed in the HAIL that have the potential to have contaminated soil, including activities such as landfills, service stations, intensive horticulture and sheep dips. Existing roads may cross properties where HAIL activities have occurred in the past, and proposed road alignments could pass over land where historic or current HAIL activities have occurred.

The HAIL is used by councils as a starting point for determining whether a piece of land is contaminated and is subject to the provisions of the NES Soil. If a project involves soil disturbance on a HAIL site, there is a need for further investigation and management of soil contaminants. If there is an accidental discovery of contaminated land then this guide and applicable regulations outlined under Section 2 should be followed. The following sections provide guidance on identifying potential HAIL sites and developing a preliminary understanding of potential risks to human health and the environment arising from soil contaminants.

3.1.1. Contaminated soil not listed on the HAIL

In addition to the HAIL activities outlined above, and particularly across the Waka Kotahi network, there may be historic sources of contamination in roading materials (e.g. coal tar binder that was used in roads until the 1980s) or from vehicles (e.g. lead from petrol, metals from brake lining wear) that result in soil contamination within the road network, that may not come from activities listed on the HAIL. Other contamination sources may be accidental such as spills of petrol, or runoff of contaminants from neighbouring contaminated sites.

3.1.2. Acid sulphate soils, naturally elevated contaminants, and biological contaminants

Acid sulphate soils are naturally occurring, resulting from salts in seawater mixing with soil when sea levels were higher around 5,000 – 10,000 years ago. Their effects are more severe in warmer climates, and in New Zealand they have been known to occur in low lying areas of Northland, Auckland and Bay of Plenty regions. When undisturbed acid sulphate soils are relatively harmless, however when they are disturbed and react with oxygen, they can generate large amounts of sulphuric acid, iron, aluminium and heavy metals. This can lead to acidification of water and soil, and leaching of heavy metals, which can cause ecological harm to flora and fauna. They can also cause harm to infrastructure such as concrete and steel due to the corrosive nature of the acidic water they can generate.

In areas where acid sulphate soils may be encountered controls for managing the disturbance of the soils should be implemented to ensure that ecological receptors are not harmed during any disturbance. The design of any structures proposed to be placed in areas where acid sulphate soils may be found should also be considered.

In some areas of the country contaminants in soil can be naturally elevated, for example arsenic in peat soils. If this soil needs to be excavated (i.e. for geotechnical reasons) then there may be implications for where it can be taken to. It is recommended that advice is sought from a SQEP and the disposal facility where the soil is proposed to be disposed of if sampling indicates naturally elevated levels of contaminants in soil.

In areas where there is potential to be kauri dieback disease there may be implications for soil disposal and placement elsewhere on or off site. While the testing for *Phytophthora agathidicida* (the pathogen responsible for the disease) is outside the scope of this document any site management plans written for contaminated land purposes should consider the implications that kauri dieback disease may have on soil disposal options.

3.2. Initial desktop study

An initial assessment of the potential for contamination issues is required at the start of all Waka Kotahi projects as part of the environmental screen. The screen is a requirement under Z19 Taumata Taiao and the initial desktop study could take place during the indicative business case (IBC) or detailed business case stage, depending on the size of the project. At the minimum the project manager, or a suitably qualified and experienced practitioner (SQEP) on their behalf, shall complete a desktop study of the potential for the project to encounter contaminated ground. Preliminary identification of contaminated land in preparation for land disturbance can simply be an enquiry to the regional council for any records about soil contamination in the project area. However, councils may not hold records for each of the activities included on the HAIL. Project managers should review the HAIL and consider whether any of the listed activities could have occurred on the site.

If the project includes resurfacing of a road built before 1980, there is a chance that an older road surface containing coal tar may be buried beneath the current surface (see **Error! Reference source not found.**B). Check the age of the road in question when planning maintenance activities, and investigate if previous works in the area encountered any soil contamination.

A desktop study should include the following actions as a minimum:

- Check the regional council contaminated land register (often available through links on the regional council website) for the presence of any HAIL activities in, or immediately adjacent to the project area. If the project area covers a number of land parcels, each parcel must be reviewed for potential HAIL activities;
- Review Waka Kotahi information and files to assess whether any information is held about the site, or if any investigations have already taken place. Discuss with the contamination specialist in the Safe and Sustainable Standards team;
- Review historical aerial photographs to assess historic land use. Aerial photographs are available on Retrolens (retrolens.nz), and are often available on council websites;
- If the project involves an existing road, check relevant Waka Kotahi information sources to assess whether the presence of coal tar might be likely or not;
- Determine if soil contamination has been encountered or investigated on previous projects at, or near the project area where it could potentially impact the soil or groundwater quality, for example a service station with a potential hydrocarbon plume. Information on previous contamination reports can be obtained from a contaminated sites enquiry to the regional council, or may be available through a SQEP with experience investigating the project area; and
- Conduct a walkover of the properties/sites identified in the project area and note any structures or visible signs that may indicate the presence of a contamination source. Ensure that permission has been granted by property team or landowner.

If there is no indication that HAIL activities occurred in the project area, then works can proceed without the need for further assessment. However, further investigation is required if there is potential for contamination. Even if there is no evidence of HAIL activities, project managers should include provisions for unexpected discovery of contamination in project environmental management plans (see Section **Error! Reference source not found.**).

If the desktop study shows that HAIL activities are identified, or suspected to be, within the project area further investigation may be necessary to meet regulatory requirement under the NES Soil and regional plan rules. Depending on the quantity of soil that will be disturbed, and the potential for off-site discharges of contaminated soil (e.g. into air or water) a SQEP may need to be engaged to complete the mandatory investigation and reporting.

For small volumes ($<5m^3$) of ground disturbance (e.g. hand digging) in a defined area, additional investigations are generally not required and the works may proceed as a Permitted Activity under the NES Soil (See Section 2.1.1 and Figure 2.1). For all projects it is recommended that a site management plan (SMP) is developed to manage potential risks to site workers and the general public and manage off-site discharges.

If surplus soil from a HAIL site identified in the project area is sent for off-site disposal, soil testing will be required to inform disposal options (see Section **Error! Reference source not found.**). Confirm testing r equirements with the disposal facility prior to soil being sent for off-site disposal.

For HAIL sites where soil disturbance volumes will exceed the NES Soil permitted activity thresholds (e.g. where earthmoving equipment will be used), further investigation must be completed in order to inform an application for consent under the NES Soil. At a minimum, the project manager or contractor will have to engage a SQEP to:

- Complete a Preliminary Site Investigation (PSI), see Section 3.4;
- If indicated to be required in the PSI, complete a Detailed Site Investigation (DSI), see Section 3.5;

If NES Soil consent is required for a project, any reports produced will need to be submitted to the local council as part of the consent application and for their records.

3.3. Conceptual site models

The information gathered in the desktop study will provide a basis for developing a Conceptual Site Model (CSM) for the HAIL sites. This should be undertaken by a SQEP. A CSM is a tool that can be a useful starting point to visualise how contaminated land poses a risk to people or the environment. A CSM prompts consideration of potential sources of contamination, pathways for contamination to spread, and receptors including workers, the public, neighbouring properties and the environment.

A general CSM is shown in **Figure 3.2** below, and CSMs can be tailored to specific activities and specific sites. In many cases, a written description that describes (a) contamination sources, (b) exposure pathways (e.g. dust, water), and (c) potential receptors (e.g. site workers and the public) is sufficient for a CSM. It is important to note that CSMs developed for Waka Kotahi projects will likely be different to other contaminated land investigations. For example, ecological considerations may warrant greater consideration with an associated larger focus on relevant sampling and analysis, and consideration of guidelines other than the NES-Soil.

Development of a CSM is a good first step in any project involving contaminated land and should be refined as knowledge about contamination increases during the project.

3.4. Preliminary Site Investigation (PSI)

Commissioning a PSI is generally advised if it is likely that a HAIL activity occurred at the site, or the project area is large and may cross some sections of land where a HAIL activity may have occurred. A PSI can take place during the IBC or DBC stage, depending on the size of the project.

A Preliminary Site Investigation (PSI) must be done on any identified HAIL site, before works begin.

A PSI is a high-level assessment completed by a SQEP focused on identification of HAIL activities and provides important information to inform a risk assessment. A PSI involves a comprehensive desktop exercise (refer Section 3.2) and usually a site visit to observe the site. Limited soil samples may be taken to get an initial understanding of soil contamination levels, to investigate areas of the site that have potential HAIL activities, or to inform potential disposal options for surplus soil.

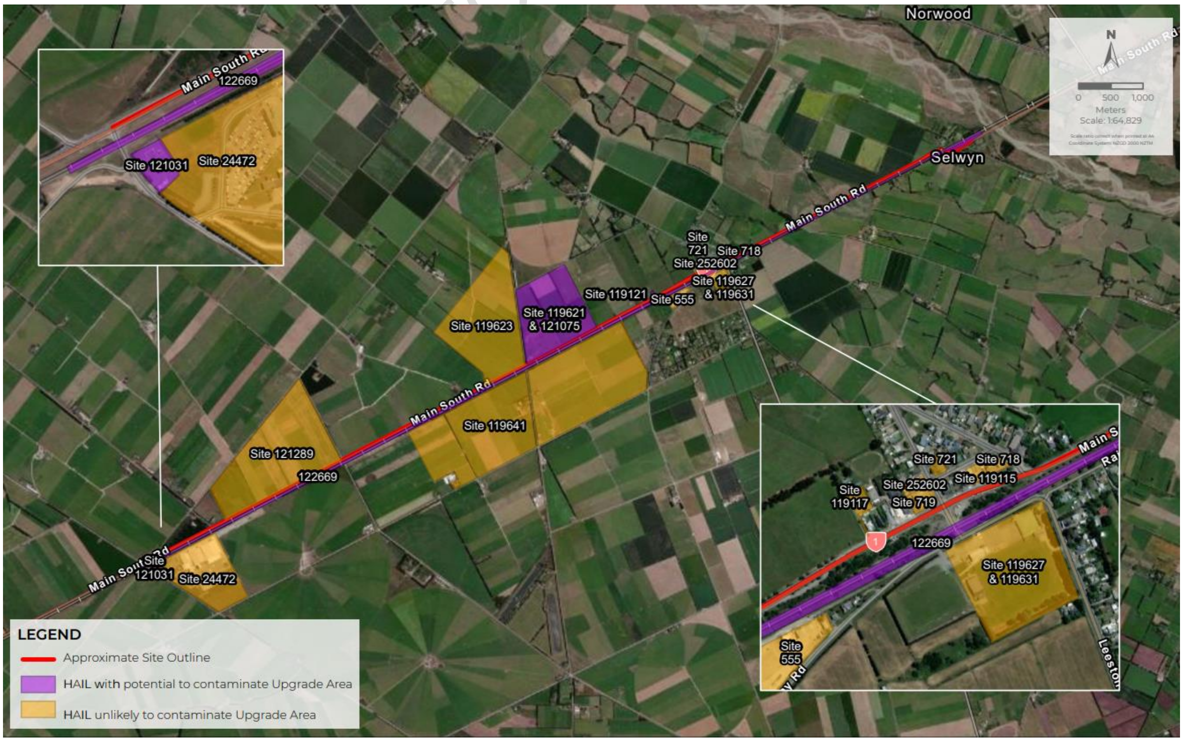


Figure 3.4.1. An example of HAIL activities identified in a PSI for a Waka Kotahi project

3.5. Detailed Site Investigation (DSI)

Depending on the results of a PSI there may be further work to do to identify the nature and extent of contamination in a project area. This can be completed by commissioning a DSI, undertaken by a SQEP. The DSI includes sample collection and analysis, and an assessment of the extent and type of contamination in the work area. A DSI can be conducted during the DBC of the project to assist with risk identification and assessment and consenting. By this stage the likely extent of works should be reasonably well known, and the investigation can focus on the relevant HAIL areas that may be disturbed by the project. Having this information upfront can assist with procurement as project contamination risks and potential costs are better established.

DSIs can also be conducted during the construction phase – the advantage of this is that land that may have been inaccessible during the pre-construction phase is now available for investigations. A DSI done early in a project (i.e. prior to the construction phase) will provide useful information to inform the project design and construction methodology. Also, it can take several weeks – months after soil sampling has been completed for laboratory results to be available and to write a report. If consent is required, the soil disturbance will not be allowed to go ahead until the council receive the DSI. A DSI is usually included as an appendix in an Assessment of Environmental Effects (AEE), as this gives the council an idea of the risks involved in disturbing the contaminated soil. If the DSI shows soil contamination at levels that may pose a risk to site workers, the public, or the environment, the council will likely require further investigation, or provision of a Site Management Plan to accompany the consent application.

An important aspect for both PSI and DSI is they should be tailored to the construction footprint of the project. It is generally unnecessary to investigate areas of the site where soil disturbance is not planned, even if HAIL activities have occurred in those areas in the past. In some situations where soil conditions are consistent across a site, previous soil testing results from areas outside the project footprint may be included in a DSI. The information from the PSI and/or DSI should be used to update or expand any CSM that has been developed for the project.

Choosing a Suitably Qualified and Experienced Practitioner

A contaminated land consultant needs to be selected carefully, as costs can be significant if contaminated land is not identified at the earliest possible stage, or if it is dealt with incorrectly.

While there is no strict criteria in the NES Soil for determining whether a person is a SQEP, there is guidance on determining who is a SQEP in the NES Users' guide and Appendix E of CLMG 5 (revised 2021). One of the best ways of determining whether someone is a SQEP is to check whether they hold a current Certified Environmental Practitioner (Site Contamination Specialist) accreditation. If there is any doubt, consider discussing with the Contaminated Land SME in the Safe and Sustainable Standards team.

It is worth bearing in mind that not all environmental consultants are suitably qualified to undertake all types of site assessment and investigation work. For example, a consultant may be experienced in surface soil sampling but may not be experienced in dealing with hydrocarbon plumes from leaking tanks, or similarly may not be experienced or insured for asbestos assessment. While not essential, it is helpful if a consultant can demonstrate a track record of quality work on projects or contaminants of a similar nature.

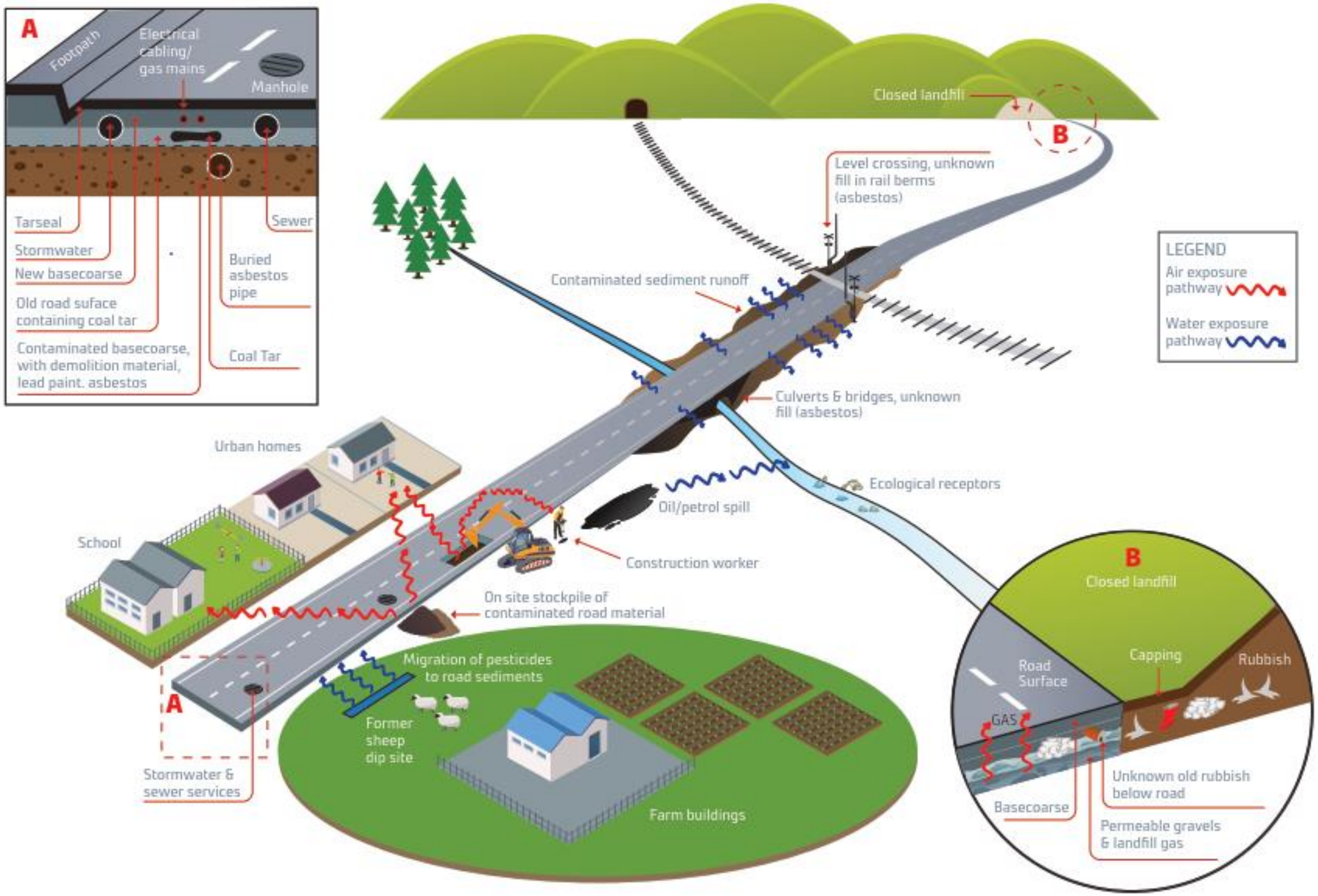


Figure 3.2. A generalised Conceptual Site Model (CSM) for Waka Kotahi soil disturbance activities.

4. Basics of soil and water sampling

The following sections provide a basic overview of soil and water sampling methodologies. Waka Kotahi expects that sampling will be undertaken by a suitably qualified employee of a consultancy firm, with SQEP oversight of the sampling plan and results. This guidance outlined below may be used to check the suitability of soil and water sampling plans developed by contractors or consultants on Waka Kotahi projects.

4.1. Soil sampling

Soil sampling should be completed by a SQEP to obtain reliable results and meet the requirements of the MfE guidelines. Sampling must be done in general accordance with MfE's CLMG5. The minimum requirements and considerations for soil sampling are provided in the following subsections.

4.1.1. Sample locations and depth

Soil samples must be collected in the area of proposed soil disturbance. The number of soil samples should be in general accordance with CLMG5. Soil samples may be collected from the ground surface, the walls or floor of test pits, from soil scooped out with an excavator bucket, or from hand-augers/boreholes. The sampling depth should be selected to (a) match the proposed soil disturbance depth, and (b) provide information on different soil types throughout the soil profile. For example, it is common to encounter layers of fill material on top of natural soils. Soil samples should be taken from within fill layers, as well as from natural soils. Sample locations can be used to delineate an area of known contamination, such as around an identified spill area to determine the quantity of soil that may need disposal to a licensed landfill.

4.1.2. Sample handling

The soil encountered should be logged in accordance with the NZ Geotechnical Society "Guidelines for the classification and field description of soils and rocks for engineering purposes". It is important that soil samples are logged accurately, because some soil acceptance criteria used in New Zealand is specific to certain soil types. In addition, identification of non-contaminated natural soils that are suitable for cleanfill disposal, or re-use at other sites, can save costs to a project. Soil samples should be collected into laboratory-supplied containers that are specific to the types of contaminants that may be present, filling the container completely. For example, if asbestos is a contaminant of concern, the laboratory will provide 500 ml capacity containers. It is important to contact the laboratory in advance of sampling so they can send the appropriate sample containers. If samples are collected into the wrong containers, the laboratory will not be able to achieve a sufficient level of detection for contaminants and the samples may need to be re-taken. Sample jars must be labelled immediately (using indelible ink) and held in a clean, chilled container (e.g. a chilly bin with pre-frozen ice packs). At the end of each day, samples should be sent to the laboratory under Chain of Custody documentation, or held cold until a batch of samples is sent to the laboratory (within the appropriate sample holding times specified by the laboratory). Sampling equipment should be decontaminated between samples using a scrubbing brush and a bucket of Decon90 (a phosphate-free detergent) and rinsed in a bucket of clean water.

4.1.3. Health and safety

Any underground services must be identified and traffic management plans put in place prior to sampling. Rupture of underground services, including small water pipes and fibre-optic cables often found in shallow soil, can delay a project and result in significant cost. At a minimum, consult the BeforeUDig website to obtain service plans, and consult a professional service locator to identify and mark out underground services.

Staff who collect samples must operate under an appropriate Health and Safety Plan or Job Safety Analysis, tailored to soil sampling risks (e.g. traffic hazards, physical strain, encountering underground services, working around earthmoving equipment, confined spaces). Staff should use appropriate personal protective equipment (PPE) including nitrile gloves (changed to a fresh pair between samples), dust masks, suitable clothing, and eye protection. Field staff should not enter unsupported excavations, or test pits, to collect soil samples – it is safer to collect samples from the excavator bucket. Good communication between field staff and contractors during site works is essential, including daily briefings, and timely discussions if new situations arise. Investigations should cease if it is determined that sampling presents too much of a risk to field staff and contractors.

4.2. Water sampling

The purpose of water sampling is to determine the impact of contaminated land on surface water receptors (e.g. nearby streams or rivers) or groundwater. For most Waka Kotahi projects, discharges of contaminants will arise from dewatering of excavations, or construction-phase stormwater. If impacts to groundwater are identified, there may be a requirement for ongoing monitoring of groundwater for "passive discharges" from a contaminated site. The need for ongoing groundwater monitoring will be informed by the DSI and any consent conditions for the project.

Water sampling will likely comprise of collecting surface water samples from either a nearby stream, or a test pit or groundwater monitoring well. Samples may also be collected from stormwater retention ponds or other sediment treatment devices, though samples are often collected downstream of any stormwater treatment system after reasonable mixing with the water body.

The minimum requirements for collecting water samples are like those for collecting soil samples as above, with the following additional requirements.

4.2.1. Sample collection

Use a clean unpreserved bottle provided by the laboratory to collect water. A sampling pole (e.g. Mighty Gripper) with a bottle attached can be used to reach the middle of a stream or into a test pit. Collection of water samples from groundwater bores requires more specialised equipment and should only be done by a SQEP with experience in groundwater monitoring. For certain types of water samples, the laboratory will provide a bottle that contains a small amount of preservative. Fill any bottles containing preservative from the unpreserved bottle. Care must be taken not to overfill the preserved bottle as this will dilute or remove the preservative and will affect the results. Do not leave an air gap in the bottle. Screw the cap on tightly to all bottles, complete the label with an indelible pen, and place into a chilled container. Care should also be taken to avoid contamination of the bottle caps while collecting the sample. The container should be shipped to the laboratory the same day as sample collection (if possible) with Chain of Custody documentation.

4.2.2. Health and safety

Working near water is risky, and there is an increased risk of slips and falls around test pits, stream banks, and other areas where sampling takes place. The Health and Safety Plan or Job Safety Analysis must include measures to prevent accidents and injuries. It is recommended that a spotter is used to assist the person collecting the samples, with the spotter situated in a safe area of the site within visual contact and speaking distance. Sampling from a floating structure, or boat, should only be undertaken by trained professionals.

4.3. Laboratory analysis

The decision on what contaminants to test for in a soil or water sample should be informed by the results of the PSI and should reflect the identified HAIL activities on the site. The contaminants of interest should be determined before soil or water samples are taken, in order to ensure the correct sampling containers are used. For example, soil samples that will be tested for asbestos must be collected in a separate, larger container than the container needed for heavy metals analysis. An SQEP should select contaminants for analysis, in accordance with national guidelines and local regulations. Analysis must be completed by a laboratory that is accredited by International Accreditation New Zealand (IANZ), with experience in the analysis of contaminants in soil and water samples.

5. Contaminated land management options

Decisions on managing contaminated land can have a significant impact on the costs and timeframes for a project. Within the legal requirements for managing contaminated land there are opportunities to minimise costs and time delays, as well as incorporating sustainable soil management practices. Various management options should be considered at the outset of a project before applying for consents or other authorisations. The following sections describe management options that can be considered for Waka Kotahi projects.

5.1. Alterations to the road design or route

The information from the desk-study for potential HAIL sites can be used in the early stages of project design to identify areas where soil contamination is likely to be an issue. These areas can potentially be avoided, or the design can include options that minimise soil disturbance. For example, avoiding deep foundations on potentially contaminated land can reduce costs for disposal of any surplus soil.

In situations where Waka Kotahi is purchasing land, or negotiating land ownership for roading projects, it is important to understand any soil contamination issues. The need for consents, or ongoing monitoring of a contaminated site, should be considered at an early stage of the project to have a clear understanding of cost and consenting implications. For contaminated land that is already owned by Waka Kotahi, constraints can be included in the risk register for a project.

5.2. Reducing soil disturbance

The design phase of a project is the best time to identify opportunities for reducing the volume of soil disturbed during a project. As a result, off-site disposal costs can be minimised and carbon footprint due to transport emissions reduced. Reducing soil disturbance will also reduce potential health and safety issues during the project and may avoid the need for NES Soil consent by staying within the permitted activity criteria. Finally, off-site discharges of contaminants to the environment will be reduced if the volume of soil disturbance is minimised.

The following options can be considered to reduce soil disturbance volumes:

- Establish the grade line to match the ground line as much as possible;
- Balance cut and fill volumes so that the difference between them is minimised;
- For structures such as bridges, design alternative foundation options including shallow foundations, or in-situ stabilisation of existing soils to increase geotechnical stability;
- Construct above-ground infrastructure instead of in-ground infrastructure;
- Use alternative methods of excavation such as hydrovac, horizontal drilling, and other techniques that minimise the use of large earthmoving equipment and reduce the extent of soil disturbance; and

Manage "over-excavation" by having early discussions with contractors, and potentially including performance standards in contracts. Hand excavation can reduce overall excavation volumes in some smaller projects, as long as sufficient health and safety measures are in place for workers (e.g. PPE, appropriate tools, prevention of strain injuries, fatigue management).

5.3. Re-using / managing soil onsite

In many situations, excavated soil can be re-used on the site to minimise off-site disposal volumes and costs, as well as reduce emissions. This can often be a more sustainable use of soil rather than transporting it to landfill, in relation to the reduction in carbon associated with transport, and from a beneficial re-use of the soil. This is an important consideration if Waka Kotahi is using the Infrastructure Sustainability (IS) Rating Scheme. Re-use of excavated soil can also reduce the costs to import fill material, subject to geotechnical considerations. It is important to consider whether the contaminated soil will be suitable to be re-used on site, and that it will not harm human health or ecological receptors. To prevent erosion and off-site discharges from temporary stockpiling of contaminated soil, the stockpiles must be stabilised using sprayable polymers, geotextile coverings or clean soil caps.

Examples of soil re-use options include:

- Construction of engineered containment cells to encapsulate contaminated soils. When covered with a layer of compacted clean material, a containment cell may provide a long-term solution for managing certain types of contaminated soil. Cells need to be protected by a thick or strong layer to prevent water intrusion, tree root intrusion, and erosion. Volatile contaminants that generate a vapour may require a containment cell with an impermeable barrier and vapour management system;
- Construction of site features including bunds, hillocks for noise control and visual amenity, and other landscaping features; and
- For sites with a large area, and for soil with low levels of contaminants, soil may be spread across an area of the site and stabilised with hydroseed or planting of native species. Soil testing and analysis may be required to ensure the soil does not pose a risk to site users or nearby ecological receptors. In some cases, it may be appropriate for the area to be used for grazing, subject to testing that shows that livestock will not be affected by contaminants.

There are now also options for re-seeding and hydroseeding soil with New Zealand native seeds. Reseeding sites or site verges with native plants can have additional benefits for promoting stream health, reducing long term maintenance of a site and improving the visual amenity of the site.

It is important that a Long Term Site Management Plan (LTSMP) is developed in situations where soil with contaminant concentrations that exceeds guideline values is re-used on a site. The LTSMP will provide a record of the types of contaminants that remain on site, and the measures that need to be followed to prevent the disturbance of the area. For example, an LTSMP will include measures to manage erosion, and generation of contaminated water and dust during excavation and construction activities. The LTSMP should be retained within an Asset Owners Manual so that contractors are aware of any ongoing maintenance requirements.

In some situations, it may be appropriate to re-use soil on an adjacent property or on a separate property within the Waka Kotahi network. Before soil is re-used on another property, you must determine whether consent is required for this activity. Unless the soil is clean material, with concentrations of contaminants that are within the range of natural background concentrations, you will likely require a consent from the regional council. You should seek the advice of a SQEP in situations where you are seeking to re-use contaminated soil on an off-site location.

5.4. Unexpected contamination

Unexpected contamination can also be encountered during site works. Any of the following indicators may reveal unexpected contamination:

- Strong odours when breaking into soil;
- Stained and discoloured soil or water in excavations;
- Visible asbestos fragments or fibres; and
- Fill material that originated from an unknown source.

If these indicators are observed, work needs to stop in that area. It is useful to take photos and write a description of what has been observed, then cover the ground with an impermeable barrier. If clean soil is used to cover unexpected contamination, the clean soil will likely become contaminated and should be managed in the same manner as the contaminated soil. A SQEP should be contacted to assess the contamination and provide advice on how to manage it. Often this will require soil sampling and preparation of an investigation report. Considerations and minimum requirements for soil and water sampling are outlined in Section 4. The NES Soil may also apply to the works following the discovery of any unexpected contamination, and the requirements outlined in Section 2.1.1 should be followed.

Records to indicate that the above steps have been completed shall be kept with the project files, and included in any completion reporting (e.g. Site Validation Report, Project Completion Report).

5.5. Soil remediation options

For some projects involving large amounts of contaminated soil, or where soil is heavily contaminated and cannot be re-used or managed on site, soil remediation may be considered. Soil remediation may be a good option where site characteristics, or the distance to off-site disposal facilities, requires alternative management methods to the traditional “dig and dump” approach. The drawbacks of soil remediation include an increased amount of time for planning works, costs for plant and equipment, ongoing monitoring and maintenance of infrastructure.

In order to design a soil remediation system, you need a robust understanding of the nature and concentrations of soil contaminants and the characteristics of the soil. An SQEP with experience in remediation design in all cases will need to design s soil remediation strategy. A full assessment of soil remediation options is outside the scope of this document, but the following examples provide high-level information on options that can be considered for Waka Kotahi projects.

Examples of soil remediation

- Monitored natural attenuation (MNA) involves using physical, chemical, and biological processes within soils to reduce organic contaminants. In New Zealand this is typically associated with service stations where there may have been a hydrocarbon leak from a underground storage tank. Native micro-organisms can be encouraged to degrade certain contaminants (e.g. petroleum products) over an extended period of time. MNA has limited application to inorganic contaminants such as metals and asbestos. However, these chemicals may be stabilised as a result of natural aging processes (e.g. complexation of metals to reduce water solubility, alterations of soil chemistry to minimise leaching of contaminants).

- Soil mixing involves mixing contaminated soils with relatively clean soils, either in-place or at a specialised facility. The effect of soil mixing is a reduction in the average soil contaminant concentration. Soil mixing may be suitable for situations where contamination is relatively diffused (e.g. horticultural areas where persistent pesticides were used). The technique may attract a high level of scrutiny from regulators, who often consider the technique as a way of fixing a problem by simply diluting it. Soil mixing is not appropriate for highly contaminated sites, or for reducing contaminant concentrations for off-site disposal. In particular, the extra volume of soil generated by soil mixing may make off-site disposal prohibitively expensive.

- Soil washing uses water or another solvent to separate contaminants from soil particles, leaving a liquid waste stream that can be sent for treatment. Soil washing involves pre-treatment to homogenise soil particles to a specific particle size, and separate treatment of coarse and fine-grained soils. Disadvantages of soil washing include the need for sufficient space and mixing equipment, control of air discharges (e.g. dust, mist, and vapours), and the need for treatment and disposal of large volumes of wash water. Design and operation of a soil washing remediation system requires a high-level of technical understanding from a SQEP.

5.6. Soil disposal options

The most common method for managing surplus contaminated soil is to transport the soil to a disposal facility. This method, often referred to as “dig and dump”, is popular because contamination is usually removed from the work site and the ongoing management of the soil contamination is taken over by the disposal facility. Although this is generally the most popular option, it is increasingly at odds with Waka Kotahi sustainability goals and objectives. It is recommended that other options outlined above in Sections 5.1 – 5.6 are considered before soil is removed to a disposal facility.

The types of soil disposal facilities are described in Table 5.1, along with a description of the risks and relative costs for different options.

In extreme situations, for example where soil contaminants are of a type that are banned for disposal to landfill, soil must be shipped overseas to an advanced treatment facility. It is unlikely that Waka Kotahi projects will result in soil that must be sent overseas, because of the areas where the roading network are located (i.e. generally away from large-scale industrial facilities such as pesticide manufacturing plants).

5.6.1. Impact of the Waste Disposal Levy Changes

It is worth noting that waste levy charges are being progressively increased from 2021 – 2024 across landfills, managed and controlled fills. Further information on the levy increases can be found on the MfE website. The aim of increasing the levy is to encourage and incentivise material reuse and recycling, rather than disposing of material.

The levy does not apply to cleanfills (class 5) but the definition of cleanfills under the Waste Minimisation Act restricts their definition to facilities that only accept virgin excavated natural material (VENM). This differs from the MfE cleanfill guidelines that were produced in 2002, that allowed for the deposition of weathered asphalt (bitumen). For Waka Kotahi this means that bitumen disposal for capital and maintenance projects will likely incur a levy as it is not considered to be cleanfill under the Waste Minimisation Act and associated waste levy regime.

Table 5.1. Soil disposal options

Option	What can be disposed?	What are the associated risks and costs?
Clean fill (Class 5)	Natural, inert material that contains contaminants concentrations below natural background levels. For contaminated sites, or for sites where HAIL activities are likely to have occurred, cleanfill disposal is not allowed unless testing shows that contaminant concentrations are below background levels. Liquid waste and treated contaminated soil (e.g. stabilised soil) are not acceptable for cleanfill disposal.	Most sites that have been developed for roading purposes will not contain high levels of contaminants. However, diffuse sources of contamination (e.g. soil contaminated with lead from historical petrol emissions), and point sources (e.g. coal tar, underground storage tanks) may be present on Waka Kotahi projects, and soil from these areas will not be acceptable for cleanfill disposal. If contaminated soil is improperly disposed to cleanfill it may need to be removed at the generator's (i.e. Waka Kotahi or contractor's) cost. Cleanfill disposal is the cheapest off-site disposal option, and usually requires no additional consents or approvals.
Managed (Class 3) & controlled fill (Class 4)	Surplus soil and other material (e.g. building materials) that contain contaminants at concentrations above background levels. Material that is suitable for cleanfill disposal is also suitable for managed fill disposal. Managed fills have more controls than cleanfills to manage discharge of contaminants in leachate. However, highly contaminated soils and liquid waste are not suitable for disposal to managed fill.	Managed and controlled fills operate under consents that allow them to discharge contaminants to the environment. The capacity of these facilities to receive large amounts of low-level contaminated soil may be unsuitable for projects with large amounts of surplus soil. Managed and controlled fills are generally inconsistent across the country in terms of their environmental management. Inappropriate disposal of highly contaminated soil may result in legal implications and costs for removal of contaminated soil. Soil testing is required for disposal of low-level contaminated soil to a managed or controlled fill. Note that managed and controlled fills are not available in some parts of the country.
Landfill (Class 1 and 2)	Engineered facilities with a relatively high level of environmental controls. Landfills often have a system for collection of leachate that is generated through breakdown of the waste. Contaminated soil may be accepted at a landfill, subject to the waste acceptance criteria. Soil testing is generally required to determine total concentrations of contaminants, and to assess whether the soil will generate contaminated leachate. Class A landfills accept soil with high levels of contaminants, including asbestos. Class B landfills can accept waste that typically contains 10 times less contamination than what is acceptable at a Class A landfill.	Soil testing, organised and completed by a SQEP, is required before disposal to landfill. Liquid and sludge wastes will likely require some form of treatment so that the landfill machinery can handle them. There are relatively few landfills in New Zealand that can accept highly contaminated soil (often only 1 - 3 per region), so transport costs may be high to take soil to a distant disposal location. Disposal of asbestos waste requires special handling (e.g. sealed trucks, wrapping of soil) and is typically more expensive than disposal of other contaminated soil. Note also that waste levy charges for Class 1 facilities are increasing progressively from 2021 onwards.

6. Reporting requirements

In addition to the PSI and DSI documents described in Sections 2.4 and 2.5, there may be additional reporting requirements for projects involving disturbance of contaminated soil. In situations where a resource consent is required for a project, the regional council or district council will likely include consent conditions that require submission of the following key documents.

6.1. Site Management Plan

For all projects involving soil disturbance on contaminated land a Site Management Plan (SMP) is an important document. CLMG 1 recommends that a SMP includes procedures for managing the aspects listed below. For Waka Kotahi projects these can be included in an Environment and Social Management Plan (ESMP) along with other environmental considerations. P47 Environmental, social and cultural management during construction outlines the Waka Kotahi minimum standards for managing environmental, social and cultural impacts.

- Community relations – it is important that people who live nearby to a project, and businesses that may be affected by the works, are taken into consideration. This could involve an extensive consultation process for major projects, simply providing information or approaching a defined contact person for smaller projects with less impact on neighbours.
- Stormwater and soil management – soil disturbance often results in discharges of sediment to stormwater, and this discharge should be minimised as much as possible. Depending on the scale of the project, the SMP will include engineering provisions for managing stormwater contamination (e.g. installation of silt fences, daily cover of exposed excavations). Regional councils often include specific provisions in plan rules for managing stormwater discharge, including the requirement for a specific Erosion and Sediment Control Plan (ESCP).
- Noise and odour control – noise generated during earthworks will usually be considered and managed by the contractor as part of their standard work procedures. Odour related to volatile soil contaminants (e.g. coal tar, petroleum contamination) may require specialist consideration and management approaches, as well as consultation with neighbours and local businesses to minimise the impact of odour on their operations.
- Dust control – generation of contaminated dust during earthworks needs to be considered and controls in place. Like noise controls, contractors will generally address dust control as part of standard work procedures. Dust control measures need to be more stringent for certain contaminants, particularly asbestos where the risk of dust exposure is much higher.
- Contingency plans to respond to site incidents – the SMP must outline procedures and responsibilities in situations where contaminants are unexpectedly discharged to the environment (e.g. spills), and where unexpected contamination is discovered (see Section **Error! Reference source not found.**).
- Proposed long-term site management – depending on the type of earthworks, soil contamination may remain in place after a project is complete. The SMP should describe methods for identifying areas of contamination and any structures designed to contain contamination (e.g. engineered containment cells) are not compromised in future works. In some cases, ongoing monitoring of discharges in air and water (including groundwater monitoring) will be required. Sometimes this information is provided in a separate document that presents the post-earthworks condition of the land, and the necessary controls required for future disturbance.
- Occupational safety and health issues and measures – the SMP must describe specific health and safety measures related to soil contaminants to protect the health and safety of workers. These measures include provision of appropriate personal protective equipment (PPE), established exclusion zones for highly contaminated areas, and potential ongoing monitoring of worker health and safety (e.g. physical examinations if workers are exposed to contaminated soil for long periods).

For Waka Kotahi operations, the above elements can be included in an Environmental Management Plan, which is a requirement for most projects.

6.2. Site Validation Report (SVR)

A Site Validation Report (SVR) is completed at the conclusion of a project involving contaminated soil to demonstrate that the project objectives have been achieved in accordance with the Site Management Plan. The SVR documents any variances from the original project plan and confirms that the project met the conditions of any regional or district (e.g. NES Soil) consents for the project. Any testing results of remaining in-situ soils, after contaminated soil has been removed, should be included in the SVR. The SVR should also provide evidence of appropriate off-site disposal of any contaminated soil, including waste disposal dockets for disposal to cleanfill, managed fill, or landfill. If soil has been re-used within the site, the SVR will document where the soil was placed and what management measures were put in place. The SVR will also describe any incidents or unexpected contamination discovered during the works. If further testing was undertaken, for example to investigate a spill or an area of unexpected contamination, the SVR will include details of the testing and any further risk assessment completed by the SQEP. A copy of the report should be provided to environment@nzta.govt.nz.

Often, the requirements of a SVR are met by a Works Completion Report. The appropriateness of a Works Completion Report depends on the scale of the works and the degree of soil contamination, and advice may be sought from a SQEP to ensure the appropriate level of reporting. The details and location of any contaminated soil remaining on-site should be recorded in the Asset Owners Manual, ideally with GIS location data accompanying it.

Appendix A: Guidelines and resources for contaminated land

- MfE, 2012. Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Ministry for the Environment, Wellington. Available at www.mfe.govt.nz/publications/rma-land-hazards/users-guide-national-environmental-standard-assessing-and-managing.
- Ministry for the Environment Contaminated Land Management Guidelines (CLMG). Available at www.mfe.govt.nz/land/risks-contaminated-land/managing-contaminated-land/contaminated-land-management-guidelines:
    - CLMG No. 1 – Reporting on contaminated sites in New Zealand (Revised 2021).
    - CLMG No. 2 – Hierarchy and application in New Zealand of environmental guideline values (Revised 2011).
    - CLMG No. 3 – Risk screening system (2004).
    - CLMG No. 4 – Classification and information management protocols (2006)
    - CLMG No. 5 – Site investigation and analysis of soils (Revised 2021)
    - PFAS (per- and poly-fluoroalkyl substances) investigation, response and funding guidance (2019)
- MfE, 2011. Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand. Ministry for the Environment, Wellington. Available at www.mfe.govt.nz/publications/hazards/guidelines-assessing-and-managing-petroleum-hydrocarbon-contaminated-sites-new.
- MfE, 1997. Guidelines for assessing and managing contaminated gasworks sites in New Zealand. Ministry for the Environment, Wellington. Available at www.mfe.govt.nz/publications/hazards/guidelines-assessing-and-managing-contaminated-gasworks-sites-new-zealand.
- New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
- WorkSafe, 2016. Approved Code of Practice Management and Removal of Asbestos. WorkSafe New Zealand, Wellington. Available at https://worksafe.govt.nz/topic-and-industry/asbestos/management-and-removal-of-asbestos/.

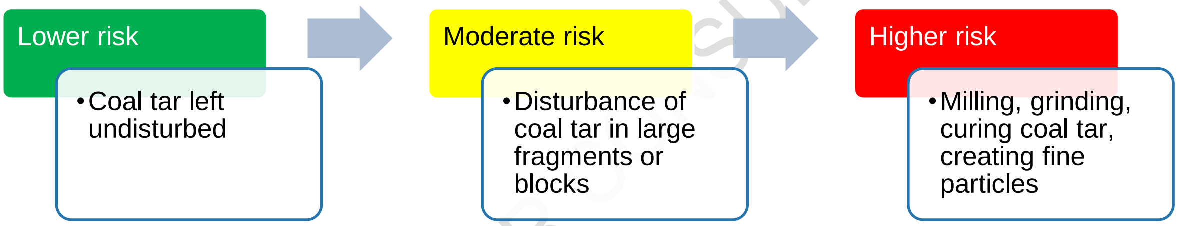
Appendix B: Coal tar

Coal tar was used in road surface binders and road surface treatments around New Zealand until the 1970s and as up to as late as the 1980s in some areas such as Christchurch. Coal tar contains high levels of polycyclic aromatic hydrocarbon (PAH) compounds, much higher than bitumen, and these can present risks to human health and the environment if not managed appropriately. Coal tar can also be costly to dispose of as it can only be disposed of to facilities that are consented to receive it, such as Class 1 landfills. Waka Kotahi is in the process of developing a full guidance document for assessing and managing coal tar. Until the guidance is published project and network managers should be aware of the potential for encountering coal tar. The sections below outline the high-level considerations when assessing the risk of encountering coal tar, and how it should be managed when encountered.

B1 Health and environmental concerns from exposure to coal tar

Coal tar in road surfaces and impacted pavements is unlikely to present a significant risk to worker or public health in its undisturbed form. However, during maintenance and rehabilitation activities where coal tar is disturbed, contaminants may become exposed and mobilised through dust and other small particles.

The key risk of coal tar to the environment is the discharge of particles of coal tar as sediment and deposition in streams, rivers and harbours. PAHs are toxic to animals as well as humans, so environmental controls should focus on preventing fine the generation of fine grained particles and controlling the transport of sediment off site.



B2 Potential for encountering coal tar

The early identification of coal tar risk allows for a better project planning and outcomes. Cost effective solutions for disposal of waste materials can be considered, and appropriate health and safety and environmental controls can be more efficiently implemented. Table 1 below outlines the potential likelihood of encountering coal tar across the Waka Kotahi network. If there is a likelihood of encountering coal tar a SQEP should be engaged to undertake testing and provide advice on management and disposal options.

Likelihood of encountering coal tar	
Road built after 1980	Unlikely to be present.
Older roads in urban areas, particularly near gasworks sites	Higher likelihood of encountering coal tar.
Regional roading network	Lower likelihood in general, but increasing for roading near railway lines.
Road built before 1980 with low disturbance – i.e. never repaved/low number of underground services	Possibly present, with the distribution of coal tar relatively consistent.
Road built before 1980 and significant disturbance (repaving, stripping, significant underground services)	Possibly present but the distribution of coal tar may be inconsistent.

Table 1: Likelihood of encountering coal tar in the Waka Kotahi network

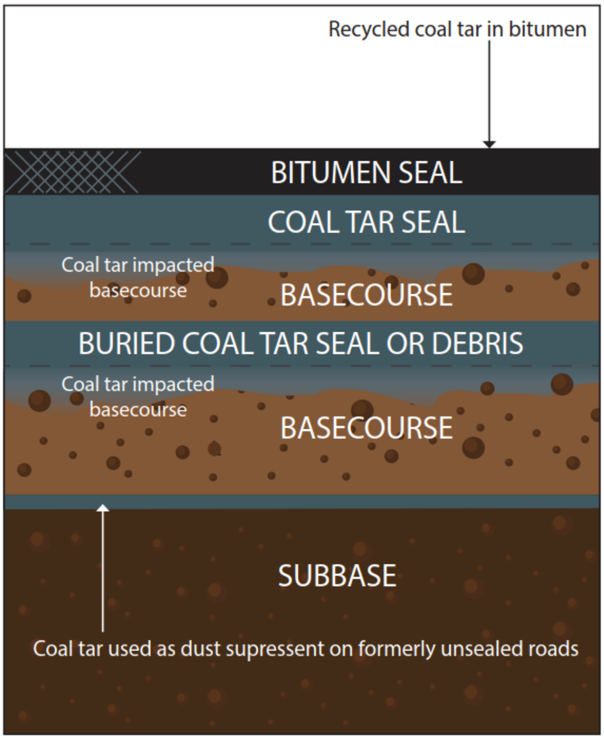


Figure 1: Example of the potential vertical distribution of coal tar within the pavement profile

B3 Managing coal tar when it is encountered

The main options for the management of coal tar are outlined below:

- **Leave materials in place - overlay with new pavement or seal**, and minimise the disturbance of coal tar impacted materials;
- **Excavate and dispose** the coal tar materials with appropriate handling and disposal to a facility licensed to receive these materials;
- **Treatment or stabilisation options** through materials recycling and stabilisation;
- **Excavation and re-burial onsite** resulting in encapsulation of coal tar materials under or beside the roadway; and
- **Excavation and re-burial offsite (within the designation)** resulting in encapsulation of coal tar materials in bridge abutments or other areas with large fill volume requirements.

Each approach has advantages and disadvantages. The specifics of the project will determine the most appropriate and cost-effective strategy - often a combination of strategies will be required. The management approach should consider implications on future maintenance and upgrade activities.

For maintenance projects where the removal of coal-tar impacted surfaces or pavements is required, excavation and offsite disposal is likely to be the only available management option.

All management options must meet both engineering and regulatory requirements.

B4 Disposal of coal tar and coal tar contaminated materials

Coal tar, coal tar contaminated bitumen and basecourse or subgrade containing coal tar cannot be disposed at a cleanfill. If there are visual or olfactory indications of coal tar, or field or laboratory testing indicates the presence of coal tar then the material must not be disposed at a cleanfill facility. Coal tar materials must be disposed to a facility licensed to receive such materials. A SQEP will be best placed to make that assessment.

Appendix C: Summary of controls for managing asbestos-contaminated soil

C1 Unexpected asbestos management procedures

Asbestos contamination in soil is common across developed sites, across the whole country. Asbestos containing materials (ACM) were used in a wide variety of building, infrastructure, and construction applications. Fibres or fragments of ACM may have been released to ground from the disturbance or demolition of historic infrastructure, for example removal of asbestos underground pipes.

This appendix provides a high-level overview of the requirements for managing asbestos contaminated soil. The procedures set out in this section are required to be implemented where ACM is identified through pre-works investigations (e.g. building surveys) or if asbestos is discovered in the ground during soil disturbance work.

Additional controls may be required for works involving structures or buildings that include ACM. The contractor shall seek advice from a Licensed Asbestos Removalist where this may arise. An Asbestos Management Plan or Asbestos Removal Control Plan may be required in accordance with the Health and Safety at Work (Asbestos) Regulations 2016 (Asbestos Regulations).

C1.1 Level of Control

In order to help achieve compliance with the Asbestos Regulations, WorkSafe New Zealand has prepared an Approved Code of Practice: Management and Removal of Asbestos (ACoP, September 2016). The key requirements of the Asbestos Regulations and ACoP are that works involving asbestos contaminated soils must be undertaken with appropriate asbestos controls in place and that contaminated soil removed from site must be taken to an approved disposal site. The ACoP refers readers to the New Zealand Guidelines for the Assessing and Managing Asbestos in Soil (GAMAS), (BRANZ 2017) for further guidance on the level of control required.

In all situations where asbestos may be present in soil, a Suitably Qualified and Experienced Person (SQEP) must be engaged to investigate.

The GAMAS specify increasing levels of control and oversight over the release of airborne asbestos fibres as the concentration of asbestos in soil increases. As the concentration of asbestos in soil may not be known in advance of works, or in the event of unexpected discovery, the following investigations are proposed:

- The SQEP shall inspect the work area and review the proposed works against the observed asbestos conditions, including any available soil testing data and asbestos condition surveys of nearby structures, to assess the potential presence of asbestos in soils;
- If there is evidence that asbestos is present in soil, the SQEP will complete sampling and testing of soil for asbestos in accordance with the GAMAS;
- The soil testing results will be compared to the soil guideline values (SGV) for asbestos in the GAMAS. If the soil sampling results indicate that the works need to be undertaken as Class A or Class B works (where concentrations of ACM, friable asbestos or asbestos fibres exceed the SGV, or fibres or fragments of asbestos are visible on the soil surface), the Contractor shall engage the services of a Licensed Asbestos Removalist; and
- The Licensed Asbestos Removalist shall determine what notification and additional asbestos management controls may be required, including the requirement for an asbestos removal control plan.

The following procedures provide guidance on anticipated asbestos controls, however, for Class A or Class B works the appropriateness of these procedures must be confirmed by the Licensed Asbestos Removalist in consultation with the SQEP.

C1.2 Air monitoring

If the soil sampling and testing results indicate that the works need to be undertaken as Class A works, then air monitoring must be implemented. Air monitoring requirements shall be determined by the SQEP or an independent licensed asbestos assessor. Air monitoring is not required for lower classes of asbestos removal works (Class B, asbestos-related works, and unlicensed asbestos works) if it is certain that airborne asbestos will not be released from soil disturbance, and appropriate personal protective equipment (PPE) are used by site workers. In certain situations, a licensed asbestos assessor or SQEP will recommend air monitoring where the works are proposed to be undertaken near sensitive locations, such as residential areas or playgrounds.

C1.3 Establishment of asbestos works area

In addition to the general site establishment requirements set out in a SMP or other site documents, the following shall be completed prior to commencement of any disturbance of asbestos-contaminated soil:

- Establish the asbestos work area by fencing and appropriate signage, including dust barriers where necessary. The controls should be sufficient to prevent accidental access to the site from the general public or site workers that do not understand the asbestos controls;
- Establish an access way to the asbestos work area;
- Establish a truck loading area and decontamination area adjacent to the asbestos work area, to prevent machinery and trucks from trafficking asbestos contaminated soil outside the asbestos work area;
- Obtain permits for disposal of asbestos-contaminated soil a suitably licensed disposal facility, if required;
- Provide PPE, including P2 dust masks as a minimum, disposable or dedicated cloth overalls, and disposable gloves;
- Complete health and safety inductions prior to allowing workers to operate within the asbestos work area, including works required as part of the site establishment; and
- Notify WorkSafe before starting works.

Personal protective equipment

Personal protective equipment shall comply with the requirements set out in Table 6 of the GAMAS. At a minimum during unlicensed asbestos work, workers undertaking disturbance of asbestos-containing soil shall:

- Wear respiratory protection during excavation works. The minimum respiratory protection requirement is a P2 dust mask;
- Wear Tyvek overalls to prevent asbestos fibres collecting within the folds of clothing; and
- Wear boot covers to prevent asbestos fibres being tracked outside the works area, or alternatively a boot wash shall be established at the entrance/exit of the works area.

For unlicensed asbestos work, no PPE is necessary if air monitoring shows that asbestos fibres are less than 0.01 fibre/mL. In the absence of air monitoring or previous data, soil sampling may be required to inform any additional requirements for PPE. The requirements for PPE in asbestos-related works, Class B, or Class A situations are described in the GAMAS with reference to concentrations of friable asbestos and asbestos fibres in soil.

Segregation

Any soil removed from the asbestos work area must be kept separate from all other excavated soils to prevent cross contamination. It is preferable that the soil be excavated directly onto trucks for removal. If stockpiling is required the following apply:

- Asbestos contaminated soils must be placed in a fenced area and warning signs erected;
- Contaminated soil stockpiles shall be placed on sheeting, or similar, to prevent contamination of underlying clean material; and
- The stockpile shall be covered with geotextile or a polythene cover to prevent rainfall induced erosion and dust.

Decontamination

Decontamination of personnel and portable equipment must be carried out to reduce risks to worker health and safety, and limit the migration of contaminants (from waste material, soil, water, equipment and PPE) away from the asbestos works area. All personnel and equipment involved in soil disturbance activities in the asbestos work area must be thoroughly decontaminated before leaving the area.

Decontamination procedures shall comply with the requirements set out in the GAMAS (refer to Table 6 and 7 of the document). In addition, works involving asbestos may require:

- A personnel decontamination unit to be available; and
- Wash down water and sediment to be collected for treatment. Alternatively, runoff from equipment wash down may be allowed to collect on a layer of non-woven geotextile fabric which can then be rolled up for disposal.

Contaminated soil management

If asbestos contaminated soil is to remain on site it shall either be encapsulated beneath hard pavement (concrete or asphalt) or the following to prevent direct contact:

- Installation of a physical barrier comprising Bidim A19 or similar (non-woven geotextile). The bidim shall extend at least 1m over adjacent ground and shall be anchored with steel pins at 2m spacing. Where joints are required, a minimum of 500mm overlap is recommended;
- Installation of geogrid (Fortrac type 55 or similar) across the same area, to prevent the bidim from being ruptured in future works. This needs to be placed and pinned in the same manner as the physical barrier; and
- Cover the encapsulation cell with a minimum 200 mm thickness of clean soil.

In all cases the location of the encapsulation area shall be recorded by survey and incorporated into the Site Management Plan, the Asbestos Management Plan, and the Site Validation Report for the works, as required.

If asbestos-containing soil is to be removed from site, it must be disposed to a facility licensed to receive the appropriate level of asbestos contaminated waste.

Validation

Validation requirements (if any) shall be determined by the SQEP in general accordance with the MfE Contaminated Land Guidelines and GAMAS. Validation may include sampling of excavations, reporting on any incidents or accidents, and confirmation that the works proceeded in accordance with any site management plans, including records of disposal of any soil sent off-site.