

APP203816 Method 240 SL Herbicide

Māori Impact Assessment (MIA)

for Notified Category C, Hazardous Substance Application

KEY DETAILS

Applicant	<i>Bayer CropScience Pty Ltd</i>
Active ingredient(s)	<i>Aminocyclopyrachlor</i>
Purpose	<i>Herbicide for controlling wilding conifers, gorse, broom, blackberry, thistles, other woody plants, broadleaf weeds and vines</i>
End-user	<i>Commercial operators (contractors)</i>
Use method	<i>Aerial, ground-based boom spray</i>
Environment	<i>Farmland, conservation estate, open spaces</i>
Hazard classifications	<i>Hazardous to the terrestrial environment – Hazardous to soil organisms</i>

This report is prepared by Kaupapa Kura Taiao under s 58(1)(a) of the Hazardous Substances and New Organisms Act 1996 (“the Act / HSNO”).

Executive Summary

Kaupapa Kura Taiao (the EPA’s Māori Policy and Operations team) has undertaken an assessment to consider potential impacts of Method 240 SL Herbicide (Method 240 SL) on the economic, social, and cultural well-being of Māori, and the relationship of Māori with the environment, pursuant to sections 5(b), 6(d) and 8 of the HSNO Act.

Method 240 SL is likely to have a positive effect on the relationship of Maori and their culture and traditions with their environment and taonga, including culturally significant species, resources, and places, and the customary values, practices and uses associated with these taonga.

Method 240 SL is likely to have a positive effect on the ability and capacity of Māori to maintain their economic, social, and cultural well-being.

Ngā Mātāpono o Te Tiriti o Waitangi (the Principles of the Treaty of Waitangi) have been considered in relation to this application – no issues arise in this regard.

1. Purpose and scope of this MIA

The purpose of this MIA is to inform the decision maker on the potential impacts on the relationship of Māori and their culture and traditions with their environment and taonga, and any issues that arise under the principles of The Treaty of Waitangi (Te Tiriti o Waitangi) from the application for Method 240 SL. The MIA also provides advice to the decision maker on any potential impact on the capacity of Māori to maintain and enhance economic, social and cultural wellbeing.

The MIA is an assessment under s 6(d) and 8 of the Act. Advice is also provided on any implications arising under s 5(b) of the Act. To provide context to the findings in this assessment, a description of the Māori world view and the relationship of Māori with their environment is included as Appendix A.

2. Ngā here ture (Statutory obligations)

Section 5(b) provides that to achieve the purpose of the Act, the decision maker must recognise and provide for the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social, and cultural wellbeing and for the reasonably foreseeable needs of future generations.

Section 6(d) of the Act obliges all persons exercising functions, powers, and duties under the Act, to achieve the purpose of the Act, to take into account the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, valued flora and fauna, and other taonga.

In accordance with section 8, the decision maker is required to take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

The Treaty principles most relevant to assessing and deciding this application are:

- The principle of active protection of Māori interests.
- The principle of partnership.

3. Assessment of impacts on cultural receptors

3.1. Impact on Papatūānuku (Land and soils)

Method 240 SL is not likely to have a significant impact on Papatūānuku (land and soils) including Te Aitanga a Punga (soil dwelling organisms). See section 3 in Appendix A for more information regarding Papatūānuku.

3.2. Impact on Ngā otaota (Plants)

As the intended range of target species is reasonably broad i.e. wilding conifers, gorse, broom, blackberry, thistles, other woody plants, broadleaf weeds and vines, Method 240 SL could be used in a variety of receiving environments, for example: Recreation areas, waterways, parks, reserves, and conservation estate; Arable land, pastoral farmland, high country runs; Rural and urban environments, and; Industrial sites and infrastructure networks e.g. within road reserves, drainage reserves, railway corridors, and waste management facilities.

Many of these receiving environments are publicly accessible places or private land where taonga plant materials may be gathered for uses such as kai (food), rongoā (medicine and healing), raranga (weaving), mahi toi (art), and ritenga (rituals).

Method 240 SL is proposed to be applied using individual plant treatments and wide dispersive methods. The latter include ground-based broadcast spraying and aerial spraying. Individual plant treatments, where individual specimens are targeted as opposed to broadcast spraying tracts of vegetation, include basal bark treatment, cut stump / stem treatment, trunk injection, and spot spaying, using hand held equipment, knapsack sprayers, and precision spraying from helicopter.

Māori are likely to prefer individual treatments over wide dispersive methods, as the former have smaller exposure footprints than the latter, and therefore less potential to adversely affect culturally significant receptors.

A key group of target plants is wilding conifers. These self-sowing and rapidly spreading trees are an issue in many places across Aotearoa, particularly in the central North Island and South Island high country where dense incursions are changing the ecological and visual character of entire landscapes. Some of the most severe incursions occur within iconic landscapes widely marketed for international and domestic tourism, and are located mostly within the rohe of Ngāi Tahu.

Landscapes, and the geographical features within them, are also important because they are an integral part of Māori identity, and are often cited in pepeha (tribal sayings) to identify oneself to others.

Wilding conifers also outcompete native species in scrubland and regenerating native bush that provide a habitat and food source for culturally significant fauna. Such areas are common in Aotearoa.

Method 240 SL has potential to harm to culturally significant otaota (plants) including iconic species such as pūhā (smooth leafed sowthistle), harakeke (NZ flax) and kawakawa (NZ pepper tree). As Method 240 SL is specifically designed to kill plants and vegetation, fatality of valued otaota is expected within target areas, especially in relation to wide dispersive application methods.

In respect of wilding conifers, treatments where Method 240 SL is delivered directly into the crown, foliage or stems of individual trees are likely to be favoured by Māori over wide dispersive applications, as this would limit cultural by-kill and reduce chemical load on the environment.

Irrespective of whether Method 240 SL is used on public or private land, Māori may be concerned about the potential for cross boundary spray drift or overspray to affect taonga species within adjoining land and waterways, especially in relation to wide dispersive applications.

The controls proposed to be assigned to Method 240 SL should be sufficient for minimising any potential adverse effects associated with this substance.

In addition to controls, other aspects of the use pattern for Method 240 SL may be reassuring to Māori. For example, spraying Method 240 SL in late spring or summer during active plant growth periods to maximise absorption will reduce availability of this substance for run-off and leaching. Furthermore, applications are not likely to target the same area annually, thereby enabling taonga plants to re-establish. It is noted a study provided by the applicant indicates that at 12 months post-application, Method 240 SL did not appear to impair establishment of pūhā (sow thistle) at multiple spray trial sites.

Method 240 SL will only be used by professionals (e.g. commercial spraying contractors) who are likely to be appropriately trained and follow industry-accepted practices and standards. It will not be available for home use by novices. As such, Method 240 SL would likely be applied with due diligence and care to minimise any adverse impacts on environments and communities.

In terms of raising awareness of potentially exposed cultural resources, access to private land is controlled and landowners / land users have an opportunity to advise gatherers where Method 240 SL has been or is planned to be used. It is anticipated that applications in public areas will be managed appropriately including use of signage and exclusion zones to protect gatherers and the general public.

On a contrary note, it is acknowledged that in some circumstances Māori may prefer that gorse was not eliminated at certain locations due to the ecological benefits it offers as a nursery crop for regenerating native bush. Gorse protects self-sown and bird-sown native seedlings until they push through and collapse the gorse canopy, thus enabling rapid restoration of revegetated areas. Also, it

is noted that some unwanted plants e.g. broom and tree lupin provide a source of food for iconic manu such as tūi (parson bird) and kererū (NZ pigeon).

See section 4 in Appendix A for more information regarding ngā otaota.

3.3. Impact on Ngā manu, me ngā ngārara (Birds and reptiles)

Method 240 SL is not likely to have a significant impact on culturally important species of manu (birds) or ngārara (reptiles). See section 5 in Appendix A for more information regarding manu and ngārara.

3.4. Impact on Te Aitanga Pepeke (Arthropods)

There is insufficient information to assess the extent to which Method 240 SL may potentially harm culturally significant species of pepeke (arthropods) including ngā mū haenga (pollinator insects) such as ngaro huruhuru (native bees), ngaro tamumu (hoverflies), and pepe (butterflies and moths). The latter group include pepe puri (ringlet butterflies) and pepe para riki (copper butterflies), as well as the non-pollinating tāwhana (looper moths).

In addition to pī honi (honey bees) and pī rorohū (bumble bees), which are economically important to Māori producers in terms of crop pollination and honey production, other beneficial pepeke potentially affected by Method 240 SL include native species of ngaro wīwī (hunting wasps), ngaro whiore (ichneumonid wasps), and various pūngāwerewere (spiders). To these may be added various prey species of valued manu (birds) and moko (lizards) such as ngāi kihikihi / whitiwhiti (long legged and jumping insects i.e. Orthoptera), pāpapa (beetles), and ngarongaro (flies).

There is a considerable body of lore relating to these pepeke. Māori would be keen to protect all culturally or economically significant pepeke from the effects of Method 240 SL. See section 6 in Appendix A for more information regarding Te Aitanga Pepeke.

3.5. Impact on Ngā wai koiora (Aquatic habitats)

Method 240 SL is not likely to have a significant impact on ngā wai koiora (aquatic habitats) including taonga species of ika (fish), tuna (freshwater eels), koura/kēwai (freshwater crayfish), kākahi (freshwater mussels), and kowhitiwhiti (watercress).

However, some Māori may have a level of discomfort about Method 240 SL potentially entering surface water or groundwater that is used for domestic or stock water supply systems, irrespective of whether or not the concentrations of Method 240 SL are regarded as being below levels of concern for human health in a western epidemiological sense.

In view of the biocidal, persistence, and leaching attributes of Method 240 SL, there is a possibility that run-off from treated areas could harm culturally significant otaota in the surrounding environment. Irrigation using water contaminated with this substance could adversely affect crops and pasture, as well as pose harm to plants where water tables are shallow as a result of uptake through root systems.

The controls proposed to be assigned to Method 240 SL should be sufficient for managing potential adverse effects on these receptors. See section 7 in Appendix A for more information regarding ngā wai koiora.

3.6. Impact on Taha hauora (Human health and well-being)

Method 240 SL it is not likely to have a significant impact on taha hauora (human health and well-being) even if personal protective equipment (PPE) is not used. Therefore it is anticipated that all four dimensions of taha hauora would be protected for users, these being: Taha tinana (physical well-being); taha wairua (spiritual well-being); taha hinengaro (mental and emotional well-being) and; taha whanaunga (family and social well-being). The controls proposed to be assigned to Method 240 SL will help to protect taha hauora. See section 8 in Appendix A for more information regarding taha hauora.

3.7. Impact on kaitiakitanga and manaakitanga (environmental guardianship and due care)

Method 240 SL is likely to have a positive impact on the ability of Māori to exercise kaitiakitanga and manaakitanga (environmental guardianship and due care). This is because Method 240 SL can help to restore culturally significant landscapes, ecosystems, taonga species, and land productivity – which are outcomes that mana whenua and kaitiaki can endorse knowing that Method 240 SL is a relatively 'green' herbicide.

See section 9 in Appendix A for more information regarding kaitiakitanga and manaakitanga, as well as section 2 (Ngā taonga tuku iho / Cultural legacies) for further context.

4. Ngā hua (Benefits)

Method 240 SL provides a less harmful alternative to other substances, including 'tank mixes', that are used for controlling wilding conifers, gorse, broom, blackberry, thistles, other woody plants, broadleaf weeds and vines. Using Method 240 SL to control these pest plants will produce environmental, social, economic and operational benefits for those involved in conservation and land-based industries, many of whom are Māori.

It is noted the submission from Ngāi Tahu, in whose rohe wilding conifer invasion is a serious environmental issue, supports this application with conditions. Also, Ngāi Tahu has expressed concern in recent years about about the use of tank mixes for these purposes, which availability of Method 240 SL may help to resolve.

Appendix A of the EPA staff report for this application shows a comparison of hazard classifications between Method 240 SL and currently approved treatments for controlling wilding conifers. Method 240 SL has a superior hazard classification profile to the other substances listed in Appendix A.

The benefits of using Method 240 SL on wilding conifers could potentially be seen at the landscape scale in Te Tai Tokerau (Northland), Te Kāhui Maunga / Waiariki (Central North Island / Volcanic Plateau), Te Tau Ihu (Nelson – Marlborough), Waitaha (Canterbury), Ōtākou (Otago) and Murihiku (Southland).

It is noted that aerial applications of Method 240 SL will enable pest plants to be eradicated in difficult-to-access places where alternative ground-based control methods are not practical. This would be supported by many Māori, especially those who are concerned that the number of exotic plant species in Aotearoa now outnumber indigenous ones.

Aerial applications of Method 240 SL would enable eradication of wilding conifers where severe incursions have established dense cover (i.e. self-sown forest) over extensive areas of land.

Retaining as much of the natural character of these landscapes and their ecosystems as possible is important for ecological sustainability and tourism, which Māori are heavily invested in.

In addition to altering landscapes and ecosystems, wilding conifers and other invasive plants such as gorse and broom pose a fire hazard and can have a negative economic impact by reducing grazing area on farmland.

5. Analysis of impact

There is a widely held preference amongst Māori for not using chemicals in the environment, including for pest management purposes. However, where chemical-free methods of managing pest plants are not viable, and the consequences of not controlling pest plant incursions have potential to impact on Māori, many Māori may accept the use of chemical treatments if the adverse effects can be managed.

With respect to Method 240 SL, detrimental impacts to Māori could include short term localised impacts on taonga plants (by-kill), and the possibility of contaminating surface and groundwater potentially used for water supply and irrigation (albeit not significantly affecting taha hauora).

Careful use of Method 240 SL may generate the following ecological, social, cultural, and economic benefits for Māori: Protection of landscapes and their cultural associations; Protection of ecosystems and culturally significant species; Regeneration of native bush and habitats, and; Maintaining land productivity and economic opportunities. These benefits are important for maintaining the long term well-being of Māori in whose rohe wilding conifers and other invasive pest plants pose a threat to Māori relationships with the environment.

It is likely that many Māori would be supportive of this application. This is because Method 240 SL offers multiple long term benefits that are consistent with, and support the exercise of, kaitiakitanga (intergenerational and regenerative sustainability). While Method 240 SL has some drawbacks, these can be addressed by stipulating controls. Furthermore, Method 240 SL is less harmful to people and the environment than other substances currently used for the same purposes.

The controls proposed to be assigned to Method 240 SL should be sufficient for managing the impact of any effects on Māori.

The overall impact on the relationship Maori have with their environment and taonga is likely to be positive, and is unlikely to adversely affect the ability of Māori to exercise kaitiakitanga.

The overall impact on Maori economic wellbeing (arising from the impact on the environment and taonga) is likely to be positive.

The overall impact on Maori social wellbeing (arising from the impact on the environment and taonga) is likely to be positive. This includes impacts on Māori ways of life and taha hauora (human health and well-being).

The overall impact on Maori cultural wellbeing (arising from the impact on the environment and taonga) is likely to be positive. This includes potential impacts Māori may experience in relation to their customary practices, traditions, beliefs, institutions, and lore.

6. Te Tiriti o Waitangi (Treaty of Waitangi)

The Principles of the Treaty of Waitangi have been considered in relation to this application and no concerns arise under the Treaty Principles, as summarised below.

Māori interests are being actively protected in relation to this application.

The decision makers on this application are making a decision informed by a Maori perspective.

The EPA considers it is acting in good faith, and is acting reasonably and fairly, in respect of this application. Mātauranga Māori and tikanga Māori are being respected.

7. Kupu whakatepe (Conclusion)

7.1. Impact on the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social and cultural well-being

This application is likely to have a positive effect on the ability and capacity of Māori to maintain their economic, social, and cultural well-being.

7.2. Impact on the relationship of Māori and their culture and traditions with their environment and taonga

This application is likely to have a positive effect on the relationship of Māori and their culture and traditions with their environment and taonga, including culturally significant species, resources, and places, and the customary values, practices and uses associated with these taonga.

7.3. Ngā Matapono o Te Tiriti o Waitangi (Treaty of Waitangi principles)

The active protection principle: the Crown has a duty to actively protect Māori interests.

No issues arise.

The informed decision making principle: the Crown has a duty to make informed decisions.

No issues arise.

The partnership principle: to act fairly, reasonably, and in good faith.

No issues arise.

Dated: 21/12/21

Appendix A

1) Ngā here whakapapa (Genealogical obligations)

Māori have a holistic and intergenerational view of the environment based around whakapapa (genealogies) and whanaungatanga (relationships) connecting people and all things in the world, living and non-living, animate and inanimate. Māori cultural beliefs and environmental frameworks use kinship, personification and metaphor to explain the origins of, and interrelationships between, all things. These beliefs and frameworks are maintained and transmitted to successive generations through kōrero o mua (traditional narratives), mātauranga (knowledge systems) and tikanga (customary values and practices).

According to Māori creation traditions, Tāne-mahuta (deity of humans, forests and forest-dwelling species) procreated birds, insects, trees, plants and humans. As progeny of Tāne, all of these organisms share whakapapa (genealogy) with one another and are closely related. Since birds, insects, trees and plants were created before humans, the former have tuākana (senior sibling) status in relation to humans who are teina (junior siblings). This tuākana – teina relationship dictates that careful consideration be given to potential risks and impacts on plants and animals and places a responsibility on people to exercise tiakitanga (guardianship, due care and diligence).

Fish and other aquatic species are descendants of Tangaroa (deity of the sea and water-dwelling species). Many of Tangaroa's descendants live in the domain of Maru (tutelary guardian of fresh water). Again, whakapapa obliges us to ensure that the best interests of these related and interconnected elements are taken care of.

Any use of, or effects on, organisms and natural resources need to be contemplated within this fundamental construct. Compelling justification is required for any detrimental impacts.

2) Ngā tikanga tuku iho (Cultural legacies)

Any substance that poses risk to the web of life, and the plants and creatures within it, is an issue for Māori. The importance to Māori of ensuring that valued species flourish cannot be overstated historically or contemporarily. In former times, mahinga kai (food resources), rongoā (medicine) and pūeru (textiles) were critical for sustaining Māori communities and whānau. Wild plants and animals formed a critical part of the food supply. Valued native and introduced species are essential for continuing customary practices and meeting cultural obligations, especially in respect of showing manaaki (hospitality) to guests on the marae, providing whānau with traditional kai, healing people using age-old remedies, and performing rituals in accordance with proper method and material.

Hazardous substances that may potentially harm or adversely interfere with culturally significant receptors are not favoured by Māori. Any level of contamination of cultural receptors by hazardous substances is undesirable – irrespective of the quantity of contaminants coming into contact with the receptors, period of exposure, and the nature, scale and intensity of adverse effects.

Hazardous substances can engender both direct and indirect impacts on Māori interests. Direct impacts are the positive or adverse effects on culturally significant receptors such as taonga species. Indirect impacts are the consequential effects, that is, how such impacts affect the ability of Māori to express their culture, in particular customary practices and usages associated with the affected culturally significant species.

3) Papatūānuku (Land and soils)

Hazardous substances have potential to adversely affect soils, minerals and lifeforms in the earth's lithosphere, which is personified in Papatūānuku (earth mother), the wife of Ranginui (sky father), from whom all living things originate. This is concerning to Māori due the potential for directly poisoning or defiling Papatūānuku. Affected lifeforms could include culturally significant earth-dwelling creatures belonging to a realm known as Te Aitanga a Punga (the progeny of Punga) e.g. noke / toke (earthworms), iroiro (nematodes), ngūharu (greasy cutworm), tūtaeruru (grass grub), pihareinga (crickets), and huakita (bacteria).

Papatūānuku is central to Māori creation stories and represents many things to Māori. Whenua (land) and soils (one), which provide a basis for life, are personified in Papatūānuku and are fundamentally important to Māori identity. The inextricable link between Māori and whenua is reflected in the term 'tangata whenua' meaning people of the land. Whenua provides a tūrangawaewae – a place where a person can stand and feel they belong. Whenua also means placenta. Humans are born of Papatūānuku, are sustained by her placenta (the land) and return to her upon death. Similarly, it is Māori tradition following childbirth to return the placenta to Papatūānuku by burying it in a significant place. Māori are concerned to protect these cultural associations in relation to hazardous substances.

Any adverse impacts on soil environments, including potential effects on life forms such as worms and naturally occurring bacteria, would be regarded as culturally undesirable. This is particularly the case in respect of noke / toke (earthworms) which are taonga species. Noke / toke are important to Māori because they:

- Are a source of food for culturally significant species e.g. tarāponga (red billed gull), kōtare (kingfisher) and pūtangitangi (paradise shelduck)
- Are used in traditional fishing methods e.g. toitoi tuna (eel bobbing)
- Are a part of the Māori cosmogeny e.g. stories concerning Māui and the mortality of humans
- Have geographical significance through incorporation into place names e.g. Te Tai Tokerau (Northland)

4) Ngā otaota (Plants)

Māori value plants in a multifaceted way that recognises their tangible and intangible uses as well as historical and contemporary importance. Some plants retain special significance even when their uses change or they are no longer used but have 'remembered' cultural value. This worldview respects past and evolving relationships between people and plants, and connects Māori with their culture and history. There is hardly a facet of classical Māori culture that did not somehow connect with plants.

With respect to Te Marae o Tāne (terrestrial ecosystems), hazardous substances may potentially harm culturally significant plants used for food, medicine, weaving, building materials and other end-uses, for example, pūhā (sow thistle), kawakawa (pepper tree), harakeke (flax), toetoe (toetoe grass), poroporo (kangaroo apple), koromiko (NZ willow), kohukohu (chickweed), kopakopa (NZ plantain) and paewhenua (common dock).

The importance of harakeke to Māori contemporarily and historically in terms of textiles, equipment, art, ornamentation, medicine, symbolic value and other associations cannot be overstated. Pūhā is an iconic Māori vegetable and has a variety of medicinal uses.

The multifaceted value of plants is exemplified in rarauhe (bracken fern). In pre-contact times, rarauhe was the most important wild vegetable – its starchy underground stems and tender young shoots were a staple food. Survival of Māori in Aotearoa depended on rarauhe when cultivated crops of kūmara (sweet potato), taro (arum) and uwhi (yam) failed, so remains respected today.

Rarauhe is tied into bundles for catching kōura / kēwai (freshwater crayfish), and is used to line and insulate crop storage facilities to keep kūmara and other root crops dry. It is also used to treat a range of medical complaints including burns, headache, colds, influenza, diarrhoea, constipation and seasickness. In former times, it was used as a soil binder in the construction of ramparts for defensive fortifications.

Rarauhe is also very symbolic. Along with other fern species it is used as a metaphor for leadership, succession, natural life cycles and intergenerational sustainability. For example, the whakataukī or

proverbial saying 'Mate atu he tētēkura, ara mai he tētēkura' (As one fern frond dies another rises to take its place) encompasses these notions. Similarly, the young curled shoots of rarauhe emerging from the ground are sometimes generically referred to as 'pikopiko' (not to confuse with pikopiko the shield fern), a term commonly used as a metaphor for the younger or next generation of people. Such idioms are often used to embellish whaikōrero (speeches) and literature.

5) Ngā manu me ngā ngārara (Birds and reptiles)

Manu (birds) have always had a prominent place in Te Ao Māori as a food resource, skins and feathers for clothing and personal ornamentation, environmental and seasonal indicators, spiritual guardians and many other tangible and intangible uses.

Hazardous substances have potential to harm culturally significant manu (birds) that might come into contact with the substance either directly or indirectly. At-risk species may include pīwakawaka (fantail), tauhou (waxeye), pīhoihoi (pipit), kotare (kingfisher), karoro (black-backed gull), tarāpunga (red-billed gull), weka (woodhen), ruru (morepork), kererū (NZ pigeon), tūī (parson bird), korimako (bellbird), pūkeko (swamp hen), pūtangitangi (paradise shelduck), pēpera (grey duck) and rakiraki (mallard duck) feeding on foliage, seeds, buds, flowers, insects, spiders and other prey exposed to the substance. The last five listed above are currently game birds, while the kererū was formerly an iconic food species and highly valued for its attractive plumage.

Pīwakawaka have deep symbolic meaning in kōrero o mua (traditional narratives) and Māori lore. Pīwakawaka are associated with death; Māori regard them as a harbinger of death when seen inside a house. According to some traditions it was the fantail that caused Maui's death which resulted in the mortality of humans.

Kererū was the most important food bird for Māori and its feathers were used to beautify cloaks. It was highly valued as a seed distributor and forest regenerator because it was the only bird big enough to swallow and disperse the largest seeds of native species e.g. taraire and karaka trees.

Great orators and singers are compared with the melodious tūī, as in the kīwaha (saying) 'me he korokoro tūī' (just like the throat of a tūī). Tūī are also highly regarded for their ability to mimic the sounds of other creatures and humans.

Māori admire the kōtare for being an alert sharp-sighted sentry. This bird perches motionless, then attacks its prey in a sudden blur. The word kōtare sometimes referred to elevated platforms in pā from which sentries watched out for enemies.

The kawau is a metaphor for imminent action and people who are primed for action or ready to implement a plan. This is evident in the saying 'Kua mārō te kakī o te kawau' (The shag's neck has stiffened), referring to the rigid out-stretched neck of the kawau prior to launching into flight. Its alternative name 'koau' (a word play on 'ko au', literally 'it is me') is used in the proverb 'ko te koau anake e whakahua i tana ingoa, ko au, ko au, ko au' (Only the black shag proclaims its own name, it's me, it's me, it's me) in reference to conceited or egotistic people. Kupe, one of the first explorers of New Zealand, had a pet shag that was said to be the 'eye of the ancestor', a special bird with insights into ancient knowledge.

Māori sometimes kept karoro (black-backed gulls) as pets – they trained them to eat the caterpillars that infested kumara crops. Some birds became tame enough to follow people around, while others had their wings clipped to stop them flying away. Tarāpunga (red-billed gulls) around Lake Rotorua are considered tapu by the Te Arawa people as the shrieking of gull colonies warned them of a pending attack by northern Ngāpuhi marauders led by Hongi Hika in 1823.

Māori associate matuku with nobility and grace. The kōtuku (white heron) in particular has mythical status for Māori because of their rarity and beauty. The epithet 'te kōtuku rerenga tahi' (the white heron of a single flight) is given to distinguished guests who seldom visit and people of rare ability or achievement. While the elegant matuku-moana (white-faced heron) is reasonably abundant, other herons are much less common as befits their status as special beings.

Even though pīhoihpoi are small, they were sometimes used as food by Māori in former times. According to Te Ara: The Encyclopedia of New Zealand (2015), Māori warriors sometimes used a tactic known as manu kāwhaki (decoy bird) which mimicked the pīhoihpoi's movement whereby they would pretend to retreat, and lure the enemy into an ambush.

Pūkeko were admired for their bold scheming and determination. In former times the tenacious and mischievous pūkeko raided gardens for kūmara and taro. Stubborn, annoying people are compared to the bird and said to have 'taringa pākura' or pūkeko ears (pākura is another name for pūkeko) i.e. headstrong people who ignore or don't listen to advice. Pūkeko feature in stories of how the kiwi lost its wings in which all forest birds refuse to come down from the trees to eat the bugs on the ground and save the forest, except the kiwi which was willing to give up its colours and the ability to fly. The pūkeko's excuse was that the forest floor was too damp and it didn't want to get wet feet, so was punished by having to live in swamps.

Hazardous substances can also pose risks to ngārara (reptiles), in particular moko (lizards) such as moko tāpiri (common gecko) and mokomoko (common skink). Moko are important in kōrero o mua (traditional narratives) and Māori lore. Moko are considered by Māori to be harbingers of bad luck and symbolise death. They are associated with Whiro - the deity of darkness, disease, evil and death. Māori generally feared moko and placed these in burial caves as guardians to watch over the dead.

6) Te Aitanga Pepeke (Arthropods)

Hazardous substances have the potential to harm culturally significant arthropods belonging to a domain within Te Marae o Tāne (terrestrial ecosystems) known to Māori as Te Aitanga Pepeke (insect world) and 'Te Tini o Hakuturi' (the multitude of bow-legged ones). These vulnerable species include wētā, rō (stick insects), pūngāwerewere (spiders), kēkerengū (cockroaches), pōpokorua (ants), hiore kakati (earwigs), ngaro iro (blowflies, houseflies), tūpanapana (click beetles), kurikuri (ground beetles), pāpaka nguturoa (weevils), mūmūtawa (ladybirds), mōwhitiwhiti (grasshoppers) and pepe (moths and butterflies).

Te Aitanga Pepeke, including ngarongaro (flies), pāpapa (beetles), pepe (moths and butterflies), pūngāwerewere (spiders) and wakapīhau (centipedes), are culturally significant due to the part they play in Māori cosmogeny and environmental lore. This is evident in kōrero o mua (traditional narratives) involving pepeke which contain lessons or, as Pākehā would have it, the 'moral of a story'. For example, according to kōrero o mua, the insects and birds saw a man named Rātā fell a large tree to make a waka without appropriate ritual or authority to do so. They were angry about this and twice re-erected the tree after he had felled it, resulting in great shame for Rātā. However, upon realising and making good his mistake, Rātā was assisted by the insects and birds to build his waka. This cautionary tale is a reminder that natural resources should be used wisely and with due care and diligence. It also signals that mistakes are acceptable if they are corrected and lessons are learnt from them.

Māori recognise the important role that pepeke play in the web of life as predators, scavengers and as a food source for other creatures. Several culturally significant pepeke are beneficial for humans. These include mūmūtawa (ladybirds), pūngāwerewere (spiders) and ngaro wīwī (hunting wasps) prey on a range of pest insects and mites, while ngaro huruhuru (native bees) and ngaro tamumu (hoverflies) are pollinators.

Additionally, pī rāwaho (introduced bees) including pī honi (honey bees) and pī rorohū (bumble bees) are economically important as pollinators and, in the case of honey bees, producers of honey. A significant number of Māori work with agricultural systems or ecosystems where pollination is essential to the healthy functioning of those systems. Also, an increasing number of apiarists are Māori. It is noted that some substances pose risks to bees and may have the potential to impact on Māori bee keeping activities.

This is important because beekeeping enables natural resources to be harvested without damaging ecosystems or needing to own the resources on which bees forage. It provides a source of employment and income that can support Māori wishing to live in their hau kāinga (traditional home communities) particularly in remote areas.

As indicated by the Māori term 'Te Tini o Hakuturi' (the multitude of bow-legged ones) – the word 'tini' meaning numerous, countless and prolific – the use of hazardous substance in some circumstances is not likely to coMIAomise overall populations of impacted culturally significant arthropods, and locally affected numbers of pepeke can be expected to recover reasonably quickly.

7) Ngā wai koiora (Aquatic habitats)

Waterways and wetlands are extremely important to Māori as they provide food, medicine and raw materials for a wide range of uses and were stewarded carefully in former times to ensure they remained productive and sustainable. Aquatic species formed a staple element of Māori diets and these remain highly valued today. Māori developed sophisticated technologies for managing, harvesting and processing the bounty of aquatic systems. They also observe that otaota wai (aquatic plants) and pūkohu wai (algae) are valuable to waterways as they help to purify water by absorbing nutrients, and stabilising sediment from streams and rivers, and stabilising sediment – which is important for maintaining balance within and between Te Marae o Maru (freshwater ecosystems) and Te Marae o Tāne (terrestrial ecosystems). The relationship of Māori with, and dependence on, waterways and the resources within is encapsulated by the saying 'Ko au te awa, ko te awa ko au' (I am the river and the river is me).

In respect of Te Marae o Maru, hazardous substances entering waterways may have potential to adversely affect culturally significant ika (fish), mawhiti (crustaceans), kaiwhao (molluscs) and otaota wai (aquatic plants). This includes food species such as tuna (freshwater eels), inanga (whitebait), kōura / kēwai (freshwater crayfish), kākahi (freshwater mussels) and kowhitwhiti (watercress), and prey species that spend all or part of their lifecycle in waterbodies, for example kōuraura (shrimp), pūpū wai māori (water snails), piriwai (mayflies) kapowai (dragonflies), hoehoe (water boatman) and hoe tuarā (backswimmer). The importance of tuna (freshwater eels) to Māori is widely known and extends well beyond being a key traditional food source. Kowhitwhiti (watercress) is an iconic Māori vegetable.

Further in respect of Te Marae o Maru, some hazardous substances may adversely affect kekakeka (duckweed) and other aquatic plants including pūkohu wai (algae), which are a food source for culturally significant species and offer a habitat and protection for small fish and invertebrates in addition to other ecological functions.

8) Taha hauora (Human health and well-being)

Hazardous substances may adversely affect taha hauora (human health and well-being), including the dimensions of: *Taha tinana* – physical health and well-being; *Taha hinengaro* – mental and emotional well-being; *Taha wairua* – spiritual health and well-being obtained through the maintenance of a balance with nature and the protection of mauri, and; *Taha whānaunga* – the responsibility to care for and share in the collective, including relationships, co-workers and social cohesion, and be connected to, people and things that foster a sense of belonging, enjoyment, well-being and safety.

Hazardous substance may compromise the ability of people to protect themselves or others where it is used. Ensuring the collective welfare and fostering a sense of well-being and safety amongst all involved is important for maintaining taha hauora.

Māori are interested to know about how hazardous substances may potentially effect vulnerable or disadvantaged groups such as kaumātua (older persons), tamariki (children) in particular ngā kōhungahunga (toddlers), ngā tūroro (the sick and infirm), ngā kūware (the unknowing or innocent), me ngā ūmanga (particular occupations).

Hazardous substances may potentially raise concerns in relation to the following issues:

- Oranga pai me te toiora - quality of life and enjoyment of healthy life styles.
- Reduction of mauri (vital essence) and manawaroa (resilience) of individuals.
- Hauātanga - impairment of functions and potential to participate fully at work, home or in society.
- Mate ā ira (genetically linked diseases), or interference with ira tangata (human genes) and ira atua (divine elements) of which human beings are coMIAised.
- Interference with whakapapa (genealogy) and whanaungatanga (family relationships).

- Mate pukupuku - cancer related conditions.
- Te whānau tamariki - issues concerning fertility, pregnancy, birth and developmental defects.
- Ngā whakakino ki ngā pūnaha ā tinana - adverse effects on body organs and/or systems.

Māori may have higher registration rates than non-Māori for medical conditions associated with particular hazardous substances, and may be more likely to be hospitalised than non-Māori for these afflictions. Furthermore, Māori may be increasingly or highly represented in occupations or activities where they may be potentially exposed to particular hazardous substances. As such, Māori may be disproportionately affected by a hazardous substance as a demographic group.

9) Kaitiakitanga and manaakitanga (environmental guardianship and due care)

Kaitiakitanga can be interpreted roughly as the environmental and cultural guardianship exercised by mana whenua enabling protection of resources for the current and future welfare of people and the environment. Kaitiakitanga seeks to maintain balance and harmony within the environment from a perspective of intergenerational and regenerative sustainability. Manaakitanga is about valuing people, acting with goodwill and beneficial purpose, showing respect, caring for and protecting the well-being of people and the environment. Manaakitanga extends to physical, spiritual, social and economic well-being – which can manifest in dimensions of taha hauora (human health).

Keeping people safe and minimising environmental impacts is consistent with the practice of kaitiakitanga and manaakitanga. Protecting the economic well-being, social well-being and lifestyles of those who may potentially be affected by a hazardous substance aligns with the practice of manaakitanga.