



Ministry for the  
**Environment**  
*Manatū Mo Te Taiao*

# Regulation of jettisoned material from space launch vehicles under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012: Proposed changes

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# Message from the Minister

Space rocket launches are a new activity for New Zealand. The Government wishes to help develop a peaceful, safe, responsible, and secure space industry that meets New Zealand's international obligations.

A component of this is appropriate environmental regulation. This discussion document deals with the effects in New Zealand's Exclusive Economic Zone (EEZ) of the deposit of jettisoned material from space launch vehicles. Some of this material will burn up in the atmosphere but some material may reach the Earth's surface and settle on the seabed.



Last year, regulations made this activity permitted for up to five years in specific areas suitable for immediate launches. Since then, we have been considering how to manage the activity in the wider EEZ and continental shelf. We are now proposing to make the activity permitted subject to conditions in a wider area to the north, east and south of New Zealand. This is similar to the approach we take to regulating the environmental effects of seismic surveying, marine scientific research, and prospecting and exploration for petroleum (excluding exploration drilling).

The Government has commissioned an environmental risk assessment which assesses the effects of the activity throughout the whole area of the EEZ and continental shelf where it would be feasible for rockets to deposit material. Adverse effects are assessed to be minor or less than minor for the level of activity proposed by Rocket Lab, a ground-breaking business granted resource consents to build and launch space vehicles into space from the Mahia Peninsula. Although the effects may become more significant after 100 launches in the same area, the proposed conditions would limit the number of launches so that this threshold is not reached.

This is a practical approach to the regulation of the environmental effects in the EEZ of this novel industry for the foreseeable future.

I welcome feedback on the proposals. Our 'Bluegreen' approach to this issue is about enabling new technologically advanced industries to locate and prosper in New Zealand while ensuring we maintain New Zealand's high environmental standards.

A handwritten signature in black ink, appearing to read 'Nick Smith', written in a cursive style.

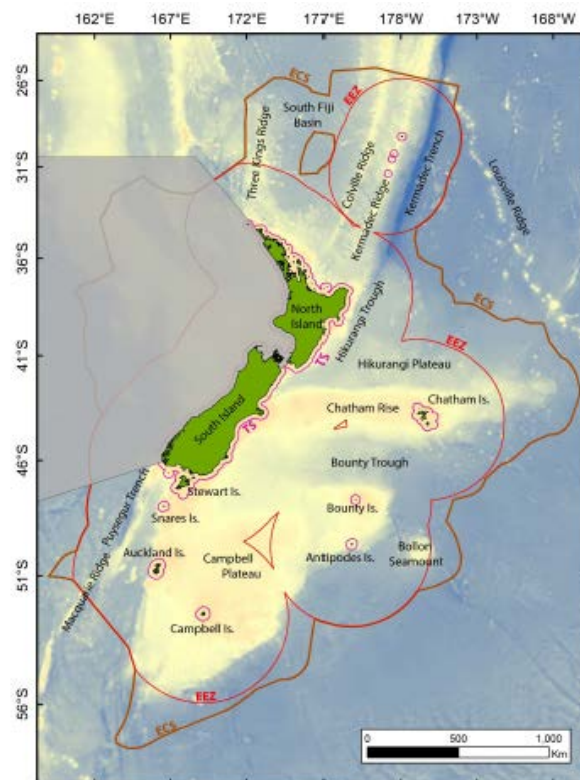
Hon Dr Nick Smith  
Minister for the Environment

# Managing the deposit of jettisoned material from space vehicle launches under the EEZ Act

## What is the Government considering?

The Government is considering making regulations under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) to classify the deposit of jettisoned material from space vehicle launches on the seabed throughout New Zealand's Exclusive Economic Zone (EEZ) and extended continental shelf, excluding the area to the west of New Zealand, as shown in figure 1.

**Figure 1: Area of the wider EEZ and continental shelf considered in risk assessment (shaded area not included)<sup>1</sup>**



Space vehicle launches are a new activity in New Zealand and are expected to result in the deposit of some material on the seabed in the Exclusive Economic Zone (EEZ). The activity is currently managed as a permitted activity within some authorised areas under the Exclusive Economic Zone and Continental Shelf (Environmental Effects—Permitted Activities) Regulations 2013 (Permitted Activities regulations). This is a short-term provision that applies until October 2021. The Government is currently considering how best to manage the activity in the wider EEZ and extended continental shelf, in a way that ensures natural resources are sustainably managed and New Zealand fulfils its international obligations. The Government anticipates that in time the activity will be undertaken in a broader area than is currently permitted, to launch more small satellites into lower earth orbit. This expanded activity could

<sup>1</sup> Source: NIWA

have an effect on the environment and existing interests in the EEZ and continental shelf. The way the activity is regulated should be proportionate to the level of these effects, and allow for the consideration of non-environmental impacts.

The Government proposes to allow the deposit of jettisoned material from space vehicle launches in a wider area of the EEZ and extended continental shelf to the north, east, and south of New Zealand (the area shown in figure 1) by making it a permitted activity in regulations under the EEZ Act.

**The Government seeks your feedback on this proposed classification and whether it is the most appropriate for managing the likely effects.**

## Why is a permitted activity classification proposed?

The EEZ Act regulates environmental effects by restricting certain types of activities that might take place in the waters and seabed of the EEZ and continental shelf. These include constructing or placing a structure on the seabed; disturbing the seabed in a manner likely to have effects; dumping material or depositing anything on the seabed; discharging hazardous substances; and creating noise that can have an adverse effect on marine life. The activities that have been regulated under the EEZ Act so far are mostly those associated with the oil and gas industry, seabed mining, and dumping of waste on the seabed.

Under the EEZ Act, regulations can classify activities in four different ways:

- (a) **prohibited activities** must not be undertaken. For example, dumping of waste not listed in the Act is prohibited
- (b) **discretionary activities** require a fully notified marine consent. The marine consent can set out conditions to manage the way the activity is undertaken. This is the default requirement for activities that have not been otherwise classified
- (c) **non-notified discretionary activities** also require marine consent, which can set out conditions, but the consent doesn't have to be publicly notified. Exploration drilling for petroleum is managed under this classification
- (d) **permitted activities** may be undertaken without a marine consent, and the regulations can specify terms and conditions that apply to the activity. Marine scientific research, and prospecting and exploration for petroleum (excluding exploration drilling) are managed under this classification, as is the deposit of jettisoned material from a space vehicle within authorised areas (until 2021).

You can read more about the process for classifying an activity under the EEZ Act on page 15 of this discussion document.

Currently, the deposit of jettisoned material on the seabed in the EEZ or on the continental shelf outside the authorised areas has not been classified so it is a discretionary activity, and a person would need a fully notified marine consent to undertake the activity.

The Government proposes to make the deposit of jettisoned material from space vehicle launches on the seabed in a wider area of the EEZ and extended continental shelf (shown in figure 1) a permitted activity. The Minister considers that this classification would be appropriate because:

- it upholds the purpose of the EEZ Act to promote sustainable management of natural resources and protect the environment from pollution, and meets the act's statutory requirements;
- it is consistent with the permitted status the activity already has in some areas; and

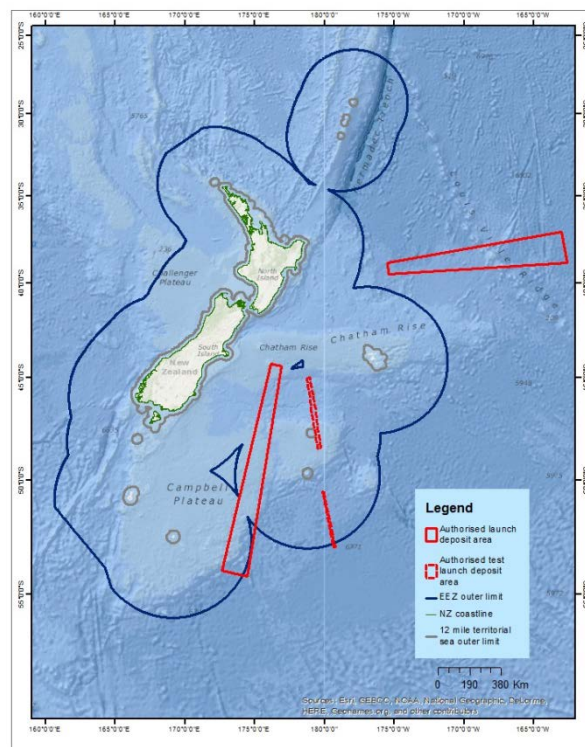
- it is consistent with the classification afforded to other activities with effects of a similar or greater scale.

This consultation only considers how the EEZ Act can best promote the sustainable management of the natural resources of the EEZ and continental shelf. It does not address effects on land, the coastal marine area, or the high seas. Effects in these areas are managed under other legislation, including the Civil Aviation Act 1990, Maritime Transport Act 1994, and Resource Management Act 1991.

## What would a permitted activity classification look like?

In the Permitted Activity regulations under the EEZ Act, the deposit of jettisoned material on the seabed is currently a permitted activity within two launch deposit areas and two test launch deposit areas, shown in figure 2. The current provisions apply for a period of five years – at the end of 20 October 2021 they will be revoked, and there will be no permitted classification for the activity.

**Figure 2: Authorised launch and test launch deposit areas<sup>2</sup>**



These areas and time limit are suitable for launching test rockets and some operational rockets from the Mahia Peninsula. The Government is considering how to manage the activity in the wider EEZ and continental shelf into the future, in a way that promotes sustainable management of natural resources. The way the activity is managed also needs to ensure New Zealand fulfils its international obligations, regulation is proportionate to the level of effects, and non-environmental impacts are considered.

Other activities with similarly low effects are managed as permitted activities, and those classifications apply throughout the whole EEZ and continental shelf. The space launch industry is new to New Zealand and in an early phase of development—but as it matures it is

<sup>2</sup> Sources: Esri, GEBCC, NCAA, National Geographic, DeLorme, HERE, Geonames.org and other contributors.



likely that operators will want to launch rockets on other flight paths that could deposit material outside the current authorised areas.

The Minister has considered what the likely effects of the activity would be, throughout the whole area of the EEZ and extended continental shelf over which space vehicle launches could reasonably occur in the future. It is very unlikely that rockets will be launched westward (due to the effects of the rotation of the Earth), but rockets could feasibly be launched on flight paths to the north, east and south of New Zealand. Space vehicles will not be launched over land. The area included in the assessment is shown in figure 1.

The likely environmental effects were assessed in an ecological risk assessment carried out by the National Institute for Water and Atmospheric Research (NIWA).<sup>3</sup> A panel of experts considered the potential ecological impacts of threats arising from the fall of debris on different classes of environment in the assessment area pictured in figure 1. They concluded that the ecological risk was low for a splashdown of the largest likely deposit of rocket debris (40 tonnes) in New Zealand in the foreseeable future (although deposits from a vehicle like Rocket Lab's Electron will be much smaller). The study considered the way effects could accumulate with repeated launches and the effects of other activities, and concluded that it was likely that 50 deposits of 40 tonne of debris could be made in the same general area without increasing the environmental risk above the risk resulting from fishing alone.

You can read more about the ecological risk assessment on page 17.

Fishing and shipping interests operating in the area where debris is deposited are the main interests likely to be affected by the routine effects of the activity. Due to the low density of vessels in the assessment area, the very low chance of impact from a fragment, and the existing precautionary warning systems, these effects are not likely to be significant.

You can read more about the considered effects on existing interests on page 19.

The Permitted Activity regulations would be changed to permit the activity in a wider area of the EEZ and extended continental shelf, and set conditions. The Government is proposing that the changed regulations set out that jettisoned material may be deposited on the seabed, as long as—

- the total number of launches does not exceed 100;
- all material jettisoned from the space vehicle is deposited within the area to the north, east and south of New Zealand (shown in figure 1) and the person undertaking the activity avoids impacts on seamount closure areas; and
- the person undertaking the activity complies with pre-activity and post-activity requirements.

You can read more about the proposed conditions on page 24.

## How can I have my say?

**You are encouraged to comment on whether all the likely effects of the activity have been appropriately considered, and whether the proposed classification and conditions on the activity are appropriate.**

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<sup>3</sup> (Lamarche, et al., April 2017)

There are questions posed throughout this document to help guide your response. These questions are summarised on page 33. They are a guide only and all comments are welcome. You do not have to answer all the questions.

**Submissions close at 5.00 pm on Wednesday 13 September 2017.**

You can find more information about how to make a submission on page 31.

# Information to inform your submission

## Space vehicle launches in New Zealand

### Space activities are a new development opportunity for New Zealand

New Zealand's location is considered advantageous for space launches as it provides access to particular launch angles, and relatively uncongested seas and airspace to enable frequent launches.

In September 2015, Wairoa District Council granted Rocket Lab (a company registered in the United States with a New Zealand subsidiary) resource consents to build and launch space vehicles from the Mahia Peninsula.

Rocket Lab plans to provide regular launch services to a growing international small satellite industry. The company has developed a small, two-stage liquid-fuelled orbital launch vehicle (the Electron) capable of lifting a 150 kg payload to a 500 km sun-synchronous orbit.<sup>4</sup>

Rocket Lab conducted its first test launch on 25 May 2017—you can find more information about this test launch on page 28. It plans to provide dedicated commercial launch services no later than 2018 and eventually scale up to one launch per week.

### A new regulatory regime will govern New Zealand space activities

The Government has developed a new regulatory regime to govern outer space and high-altitude activities conducted from New Zealand or by New Zealanders overseas.

The Outer Space and High-altitude Activities Act was passed in July 2017 and will come into force on 21 December 2017. The objectives of the Act are to facilitate the development of a New Zealand-based space industry and its safe and secure operation. The Act also enables New Zealand to manage the risks associated with space activities, ensure that space activities are consistent with the national interest, and comply with certain international obligations associated with space activities and space technologies.

The Outer Space and High Altitude Activities Act 2017 establishes a licensing regime for space vehicle launches, payloads (such as satellites), space launch facilities, and certain high-altitude vehicles. It doesn't manage the effects of the activity on the environment and existing interests. These are managed under environmental laws including the Resource Management Act 1991 and the EEZ Act.

### This proposal is concerned with the effects of jettisoned material deposited in the EEZ

After a space vehicle is launched and before it reaches orbit, material from the vehicle is jettisoned and falls back to Earth. While much of it will burn up in the atmosphere, some proportion of the material could reach the surface and be deposited in the EEZ. For a two-stage launch vehicle like Rocket Lab's Electron, the jettisoned components will be:

- **stage one** of the launch vehicle, which is automatically jettisoned when empty of propellants. Stage two of the launch vehicle continues to climb and accelerate, releasing—

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<sup>4</sup> Technical terms used in this document are explained in the Glossary on page 43.

- **an aerodynamic nose fairing**, shortly after stage one, and—
- **two stage-two batteries**, which are jettisoned from stage two of the launch vehicle further in its climb, before it enters orbit and releases its payload.

Stage one is expected to break up into fragments due to a combination of temperature-induced reduced structural strength, inertia loads from rapid tumbling, and high aerodynamic loads applied to the sides of the stage. Fragments are expected to range in size from <math>0.01\text{ m}^2</math> to  $6.5\text{ m}^2$  and weigh from 0.03 kg to 360 kg. The expected fragmentation is further detailed in appendix C.

Over the course of a number of months, stage two will lose altitude, re-enter the atmosphere and completely burn up.

The Electron launch vehicle carries no explosives, toxic materials, or radionuclides. It has the following primary components.

- **Carbon fibre composite** is an efficient, lightweight, high strength material composed of a polymer reinforced with carbon fibres, which are chemically inert and do not react with seawater. It is the primary structural material of the launch vehicle. As the components fall, friction with the atmosphere increases their temperature and some or all of them will burn up in the atmosphere.
- **Liquid oxygen and kerosene (RP-1 analogue) propellants** are used on both the first and second stages of the launch vehicle. Both have proven safety and benign handling characteristics. Liquid oxygen, if released to the atmosphere, rapidly boils and returns to the atmosphere as gaseous oxygen. RP-1 kerosene is a highly refined grade of hydrocarbon with low density, a thin surface film and rapid evaporation.
- **Non-toxic pressurised cold gases** operate all inflight pneumatics systems to provide tank pressurisation, cold-gas manoeuvring thrust in space, and stage separation mechanisms.
- **Inconel engines** each have a mass of approximately 20 kg and are mounted to the thrust section of the launch vehicle. Inconel is an inert, high-performance, corrosion resistant nickel alloy. The launch vehicle uses nine engines for stage one and a single engine for stage two. At stage one separation, the thrust section is likely to separate from the stage, return to Earth's surface and land in the EEZ.
- **Lithium batteries** are mounted at the rear of the launch vehicle with the engines. The launch vehicle carries thirteen of these high-powered batteries for stage one. Stage two carries one battery to orbit, and jettisons two others as each becomes exhausted during flight. The batteries have a low auto-ignition temperature of  $150\text{ }^{\circ}\text{C}$ , which means they are highly likely to burn up in the atmosphere before reaching Earth's surface. The batteries contain no lead, acid, mercury, cadmium, or other toxic heavy metals.

It is possible that any material jettisoned from the vehicle which does not burn up during descent will land in the waters of the EEZ, sink to the seafloor, and be deposited on the seabed.

## **The deposit of jettisoned material is currently permitted within authorised areas**

Last year, the Exclusive Economic Zone and Continental Shelf (Environmental Effects—Permitted Activities) Regulations 2012 were amended to make the deposit of material on the seabed from space vehicle launches a permitted activity within four authorised areas (two for test launches and two for launches other than test launches). These changes came into force

on 21 October 2016. They apply for five years, until the end of 20 October 2021 (after which time they will be revoked and the permitted activity classification will no longer apply).

The classification<sup>5</sup> applies to space vehicles that jettison nothing other than the following materials during normal operation:

- (a) aluminium, brass, copper, Inconel, nickel, steel, and zinc; and
- (b) adhesive, cork, foam, paint, glass fibre composite, carbon fibre composite, plastic, lithium batteries, and printed circuit boards.

It is proposed that the changed regulations would apply to the same materials.

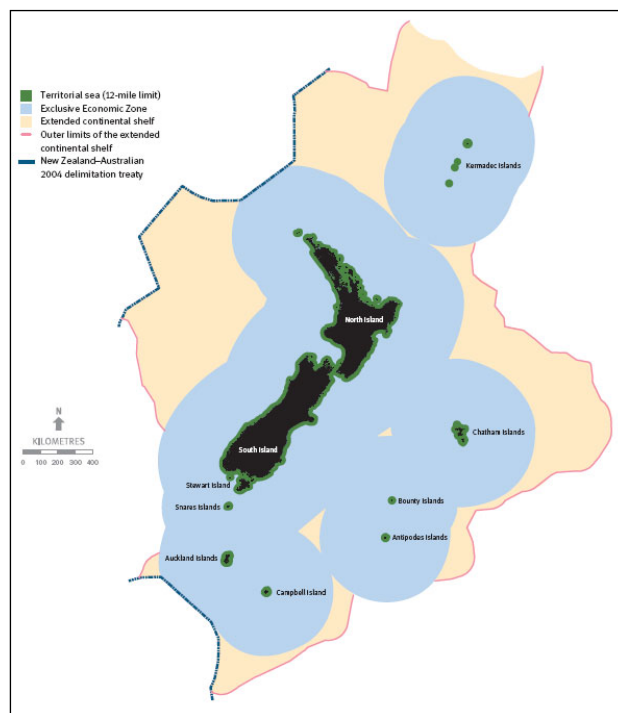
## New Zealand's Exclusive Economic Zone (EEZ)

### The EEZ and extended continental shelf encompass some 575 million hectares—more than twenty times the area of New Zealand's land mass

New Zealand's territorial sea extends from the line of mean low water springs to twelve nautical miles offshore.

The exclusive economic zone (EEZ) is the area from the outer limit of the territorial sea (12 nautical miles) to 200 nautical miles offshore. New Zealand has sovereign rights over both the seabed and the waters in this zone, about 405 million hectares. New Zealand's EEZ is one of the largest in the world. Some of New Zealand's sovereign rights over the seabed extend beyond 200 nautical miles in some places, across the extended continental shelf. The extended continental shelf covers some 170 million hectares outside the EEZ. The extent of the territorial sea, EEZ and extended continental shelf are shown in figure 3.

**Figure 3:** Extent of New Zealand's territorial sea, EEZ and continental shelf<sup>6</sup>



<sup>5</sup> Section 8A of the Exclusive Economic Zone and Continental Shelf (Environmental Effects—Permitted Activities) Regulations 2013, as amended in 2016

<sup>6</sup> Source: NIWA.

The EEZ Act manages the effects of activities carried out in New Zealand's Exclusive Economic Zone (EEZ) and extended continental shelf on the environment and existing interests. It has been in force since June 2013.

## The EEZ Act is one piece of the marine management regime

A number of pieces of legislation make up the regulatory system that manages activities in the territorial sea, EEZ and continental shelf. The EEZ Act forms part of this system by providing explicit consideration of environmental effects associated with activities. Other marine management regimes relevant to the effects of space launch activities include the:

- Fisheries Act 1996
- Marine Mammals Protection Act 1978
- Marine Reserves Act 1971
- Maritime Transport Act 1994
- Resource Management Act 1991
- Wildlife Act 1953.

The nature and effect of other marine management regimes is an important consideration under the EEZ Act. For example, the Maritime Transport Act manages the safety of ships travelling through the EEZ.

## Iwi/Māori and the EEZ Act

Section 12 of the EEZ Act explains how the EEZ Act recognises and respects the Crown's responsibility to give effect to the principles of the Treaty of Waitangi.

Iwi/Māori interests in the ocean include safeguarding taonga and mahinga kai (food gathering locations and resources), spiritual practices, customary rights, and commercial and recreational fishing. Iwi/Māori resource management ethos provides for sustainable use so marine biodiversity is enhanced and is not subject to unacceptable risks.

## New Zealand's international obligations

Section 11 of the EEZ Act states that "the Act continues or enables the implementation of New Zealand's international obligations" including the United Nations Convention on the Law of the Sea 1982 (UNCLOS) and the Convention on Biological Diversity 1992. There are no international conventions that specifically and comprehensively regulate for the deposit of jettisoned material on the seabed. The general obligations that do apply include those under UNCLOS and the Convention on Biological Diversity. As well as the general obligations under these international agreements, New Zealand has general obligations under, for example, the Convention for the Protection of the Natural Resources and Environment of the South Pacific Region 1986 (Noumea Convention).

**UNCLOS:** Under UNCLOS, States exercise sovereign rights over their EEZ and continental shelf for the purpose of exploring it and exploiting its natural resources. This right must be exercised with due regard to the rights of other States and in accordance with the duty to protect and preserve the marine environment, including taking necessary measures, as consistent with UNCLOS, to prevent, reduce and control marine pollution. This includes evaluating as far as practicable the risks and effects of pollution on the marine environment. Where there are reasonable grounds for believing that planned activities under a State's jurisdiction or control may cause substantial pollution of, or significant and harmful changes to, the marine

environment, the State must assess the potential effects of such activities on the marine environment and publish relevant reports or provide them to appropriate international organisations.

**Convention on Biological Diversity:** The Convention on Biological Diversity reiterates that States have the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction (Article 3). The Convention on Biological Diversity also requires States to provide environmental impact assessments of proposed projects likely to have significant adverse effects on biological diversity to avoid or minimise such effects and, where appropriate, allow for public participation in such procedures.

**Noumea Convention:** The Noumea Convention includes a requirement that parties shall endeavour to take all appropriate measures consistent with international law to prevent, reduce and control pollution of the Convention Area (which includes New Zealand's EEZ). Where it is within a party's capabilities, they must also assess potential effects of 'major projects' so appropriate measures can be taken to prevent or minimise harmful impacts on the Convention Area and, where appropriate, invite public comment on major projects. What constitutes a major project is not defined.

## **The EEZ Act promotes sustainable management and protects from pollution**

The purpose of the EEZ Act is to:<sup>7</sup>

- (a) promote the sustainable management of natural resources of the EEZ and continental shelf, and
- (b) in relation to the EEZ, continental shelf and waters above the continental shelf beyond the outer limits of the EEZ, protect the environment from pollution by regulating or prohibiting the discharge of harmful substances and the dumping or incineration of waste or other matter.

Under the EEZ Act, sustainable management means managing the use, development, and protection of natural resources in a way, or at a rate, that enables people to provide for their economic well-being while:

- (a) sustaining the potential of natural resources (excluding minerals) to meet the reasonably foreseeable needs of future generations
- (b) safeguarding the life-supporting capacity of the environment
- (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

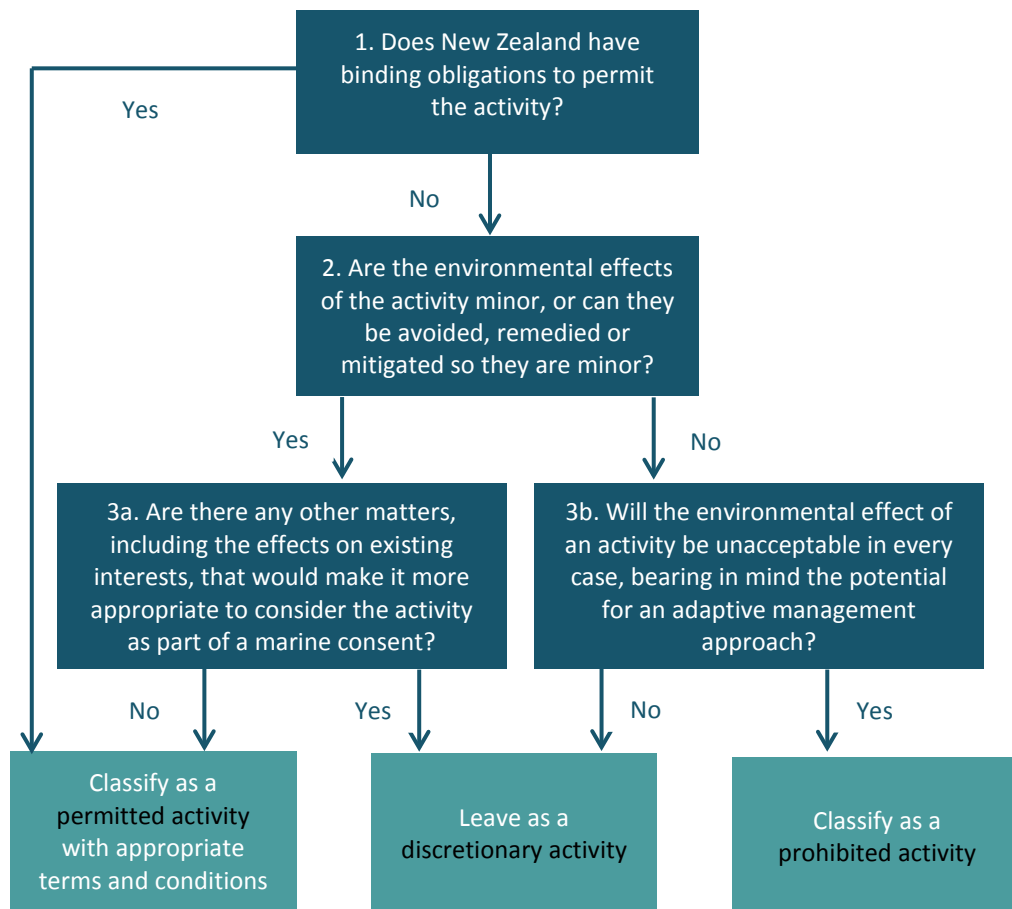
The EEZ Act restricts certain types of activities that might take place in the waters and seabed of the EEZ and continental shelf. These include constructing or placing a structure on the seabed; disturbing the seabed in a manner likely to have effects; dumping material or depositing anything on the seabed; discharging hazardous substances; and creating noise that can have an adverse effect on marine life.

Section 27 of the EEZ Act provides for regulations to be made prescribing standards, methods, or requirements. This can include regulations to classify activities. figure 4 shows the process for classifying activities.

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<sup>7</sup> Section 10(1) of the EEZ Act.

**Figure 4: Process for classifying activities**



The matters that the Minister must consider when making regulations under section 27 are set out in section 33 of the EEZ Act—you can read what these matters are in appendix B.

### Changes to the regulations should meet set objectives

Through previous public consultation, a set of objectives have been developed for regulations made under the EEZ Act.<sup>8</sup> The objectives of the regulatory changes proposed here draw on the purpose of the EEZ Act and matters required to be considered by the Minister for the Environment when making regulations under the EEZ Act. These objectives are to:

- ensure the natural resources of the EEZ and continental shelf are sustainably managed
- ensure New Zealand fulfils its obligations under relevant international law and conventions relating to the marine environment
- ensure activities are regulated in a manner proportionate to the level of effects and that processes are cost-effective
- provide for the consideration of non-environmental impacts, including on existing interests, iwi and other matters set out in the EEZ Act, in a manner proportionate to the scale and effects of activities.

<sup>8</sup> Ministry for the Environment. 2012. *Managing our oceans: A discussion document on the regulations proposed under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill*. Wellington: Ministry for the Environment.



appendix A shows an assessment of how well the proposal would meet the objectives.

## Understanding the effects of the deposit of jettisoned material

To classify an activity, the Minister needs to understand the likely effects.

In the Act, an 'effect' refers to any:<sup>9</sup>

- positive or adverse effect
- temporary or permanent effect
- past, present, or future effect
- cumulative effect that arises over time or in combination with other effects
- potential effect of high probability
- potential effect of low probability that has a high potential impact.

According to the EEZ Act, regulations must not provide for an activity to be permitted if, in the Minister's opinion—

- (a) the activity has or is likely to have adverse effects on the environment or an existing interest that are significant in the circumstances; and
- (b) it is more appropriate for the adverse effects of the activity to be considered in relation to an application for a marine consent.

Both the European Space Agency and NASA recommend that jettisoned material and re-entry debris from space is directed into the ocean to minimise the risks to human life. There are not likely to be any effects on human health from this activity.

### Effects on the environment

NIWA completed an Ecological Risk Assessment (ERA) of the impact of debris from space launches on the marine environment in April 2017. A panel of 11 experts was convened to assess the various environmental risks in the EEZ. This group included experts in a range of marine science areas including a various marine ecology disciplines, geophysics, fisheries, acoustics, chemistry and toxicology.

The assessment expanded on a previous study conducted in 2016. The earlier (2016) study considered material jettisoned from test rockets and small Electron rockets launched from the Mahia Peninsula, and deposited in four distinct areas (two for test launches and two for other launches). That study considered a single splashdown to consist of approximately 1 tonne of debris—the amount of debris jettisoned from one small Electron-type rocket, assuming no combustion of components during descent.

The recent (2017) study increased the assessment area to encompass the EEZ and extended continental shelf to the north, east and south of New Zealand—the area shown in figure 1. In this study, the panel considered a single splashdown to consist of 40 tonnes of debris—the amount of debris likely to originate from the largest vehicle proposed to be used in New

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<sup>9</sup> Section 6(1) of the EEZ Act.

Zealand in the foreseeable future. They considered that the deposit is composed of the same materials as the Electron rocket, and contains no explosives, toxic materials, or radionuclides.

The ERA panel considered the potential ecological impacts of threats arising from the fall of debris on components of the ecosystem throughout the assessment area.

The ERA considered six benthic environment classes in the EEZ:

- shelf
- upper slope
- northern mid-depths
- southern mid-depths
- deep and very deep waters
- seamounts.

In each of these classes, they considered a number of ecosystem components:

- benthic invertebrate community
- demersal fish and mobile invertebrates
- air-breathing fauna (marine mammals and seabirds)
- sensitive environments
- pelagic community.

The panel considered the risk to those components from jettisoned debris. They assessed the risk of the following threats:

- direct strike causing mortality
- noise disturbance
- toxic contaminants
- ingestion of debris
- smothering of seafloor organisms, preventing normal feeding and/or respiration
- provision of biota attachment site
- floating debris

The risk assessment used a level 1 likelihood-consequence approach, which means the panel made qualitative assessment of each effect—both how likely it is to occur (remote to likely), and how severe the effect would be if it did occur (negligible to catastrophic). The risk is a product of both of those components. The panel also took into account the level of confidence in the information available.

The panel determined that “the ecological risk to all ecosystem components of each environmental class from the activities considered [in the study] is low.” This was mainly because the consequence from a single splashdown of 40 tonnes of debris at any point was not severe—on a scale of 0 to 5, the **consequences** of potential effects were scored as either 0 (negligible) or 1 (minor). This score took into account how much of the habitat would be affected if the effect occurred; what the functional impact would be on the population, community or habitat; and how long the habitat and affected species would take to recover after the effect.

The **likelihood** of potential effects was considered to range from 1 (remote) to 6 (likely). Even for the effects that were widely expected to occur, like the provision of biota attachment sites

and floating debris, the consequence of the effect if it did occur was so low that the overall risk was considered minor.

The overall risk level of a single 40 tonne splashdown was the same as the level of risk that was assessed for up to 100 repeated launches of the Electron rocket in the 2016 study.

In both the 2017 assessment and the one conducted in 2016, the main aspects of risk were—

- direct strike and smothering impacts on sensitive benthic environments and benthic invertebrate communities, and
- effects of noise on air-breathing fauna at the sea surface.

The panel looked at the way the effects of debris deposits could accumulate, both with the effects of fishing activities, and with repeated launches in the same area. Since, in this study, the amount of debris from each launch was large, the panel felt that the risk would remain minor up to 100 repeated launches in one general area, and could be moderate after 100 and high at 1000. For the smaller Electron rockets considered in the 2016 study (which are representative of the type of launch vehicles likely to be operated from New Zealand in the near term), risk levels were considered to increase from minor to moderate with 1000 to 10,000 launches in the authorised areas. The panel concluded that the environmental risk would not be increased over that resulting from fishing alone for up to 50 launches depositing 40 tonnes of debris in an area.

The report highlighted the need to monitor the distribution of actual rocket flight paths and debris deposit—since the local impact will be lower if the debris is widely distributed than if it is consistently deposited in a small area where sensitive benthic habitats are concentrated. It will also be lower if a high proportion of the jettisoned components burn up in the atmosphere than if all the debris survives descent is deposited on the seabed. The report recommended reviewing the data after 50 launches, when more information will be available.

You can access the full 2017 NIWA report, [Ecological risk assessment of the impact of debris from space launches on the marine environment](#), on the MfE website. The 2016 report, [Marine ecological risk assessment of the cumulative impact of electron rocket launches](#), is also available.

### Questions

1. Do you agree that the environmental effects described are the main environmental effects likely to occur as a result of the activity? If not, why not?
2. Do you agree with the scale of the described environmental effects? If not, why not?
3. Are there any other environmental effects that you are aware of that the Government should consider? If so, what are they?

## Effects on existing interests

The EEZ Act considers effects both on the environment and on existing interests. Existing interests are:<sup>10</sup>

- (a) any lawfully established existing activity, whether or not authorised by or under any Act or regulations, including rights of access, navigation, and fishing

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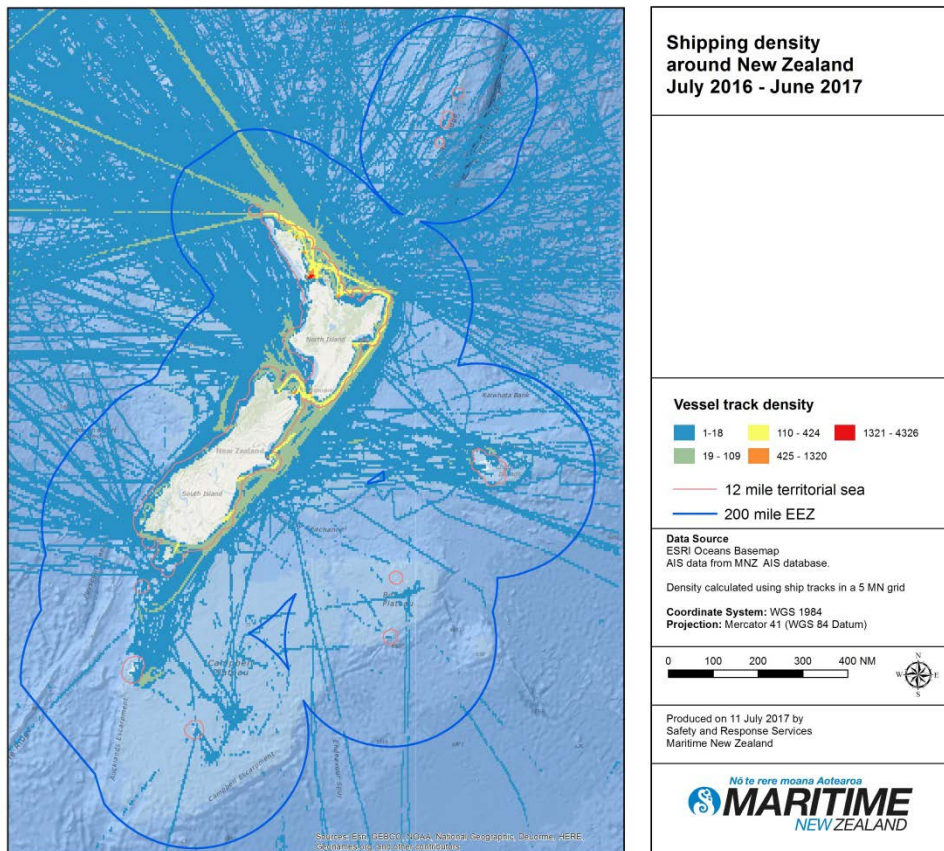
<sup>10</sup> Section 4 of the EEZ Act.

- (b) any activity that may be undertaken under the authority of an existing marine consent granted under section 62
- (c) any activity that may be undertaken under the authority of an existing resource consent granted under the Resource Management Act 1991
- (d) the settlement of a historical claim under the Treaty of Waitangi Act 1975
- (e) the settlement of a contemporary claim under the Treaty of Waitangi as provided for in an Act, including the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992
- (f) a protected customary right or customary marine title recognised under the Marine and Coastal Area (Takutai Moana) Act 2011.

The effects of the activity on existing interests will most likely be limited to shipping and fishing vessels, where there is a very low risk of impact from falling fragments.

Maritime New Zealand (MNZ) has created maps showing vessel tracks and density in New Zealand waters between July 2016 and June 2017. The density map (figure 5) indicates that vessel density is highest at the ports (up to 4 236 ships per year per grid section on a 5 nautical mile grid) and the territorial sea (between 1 and 424 ships). Ship density is generally lower in the EEZ, with most areas receiving 18 or fewer vessels per grid section annually. This low density, along with good existing warning systems, indicates that the scale of the effects will be small.

**Figure 5: Shipping density around New Zealand July 2016 - June 2017<sup>11</sup>**



The area where material could be deposited from each space vehicle launch is long and very narrow. On the narrow axis, it will be no more than 30 nautical miles wide, although some of

<sup>11</sup> Source: Maritime New Zealand

the deposit areas will be narrower than this. Rocket Lab has modelled the risk of a vessel in the deposit area being directly impacted by a fragment from launch of an Electron vehicle as less than 1 in 100,000. Modelling of impacts in the deposit area is based on NASA's Debris Assessment Software suite, which meets the requirements of the United States' Federal Aviation Authority and is based on NASA's experience over the past 50 years.

Confidence in the impact modelling is supported by the fact no one has ever been injured by space debris or jettisoned material, even though more than 5400 tonnes of it is believed to have reached Earth's surface over the past 40 years.<sup>12</sup>

There are already systems in place to notify other users of the sea of potential hazards. The systems will not be affected by any changes to regulations under the EEZ Act, but continue to operate and notify users about rocket activities.

MNZ (through the Maritime Operations Centre) is responsible for sending out coastal navigational warnings, while Land Information New Zealand (LINZ) coordinate, collect and issue long range radio navigational warnings that are broadcast to ships in New Zealand waters.

LINZ publishes fortnightly New Zealand notices to mariners to advise mariners of matters affecting navigational safety. They are available on the LINZ website and can be received via email. Rocket Lab also communicates directly with vessels in the vicinity of the launch site directly by radio using publically notified marine VHF channels. On the day of a launch, local authorities periodically notify maritime traffic of the current status of the marine exclusion zones. Even though the possibility of impact with a vessel is remote, vessels may choose to move out of the area where material could be deposited during the brief period of time that fragments are expected to reach Earth's surface. This could result in some relocation of fishing effort over time if the same flight path were continually used.

As of July 5 2017, there were 380 applications awaiting assessment under the Takutai Moana Act 2011. This Act is concerned with rights within the marine and coastal area (within the 12 nautical mile boundary), which is unlikely to be affected by jettisoned debris. Any activity classification made under the EEZ Act will apply to the activity only in the EEZ and extended continental shelf (and the area above it). The deposit of jettisoned material on the seabed in the EEZ and extended continental shelf is not expected to affect the marine and coastal area.

#### Questions

4. Do you agree that the existing interests described are the main existing interests? If not, why not? Please describe any other existing interests you are aware of that could be affected by the activity.
5. What do you think the main effects will be on existing interests? Please provide any information you have in relation to those effects.

## Economic effects

Sapere Research Group (Sapere) undertook an independent economic impact analysis of the development of a space launch industry in New Zealand.<sup>13</sup> The analysis was based on a

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<sup>12</sup> (MacDiarmid, et al., August 2016)

<sup>13</sup> Sapere. June 2016. *Economic Impact Analysis of the Development of a Rocket Industry in New Zealand*.

situation where the number of possible launches per year is between 52 (one a week) and 120 (the maximum number consented by Wairoa District Council).

Sapere identified the following types of economic benefits:

- additional employment by Rocket Lab to scale up to launch capacity
- additional activity and employment in supplying industries (industries that supply Rocket Lab with intermediate inputs (components) and other linked industries in the supply chain)
- space tourism – international visitors or New Zealanders watching space vehicle launches, and members of the satellite industry or their clients attending the launch of their satellites
- construction and launch activities – Rocket Lab building or upgrading facilities for space vehicle launches including satellite dishes, launch pads
- cluster effects – development of related clusters, for example in the areas of satellite manufacture/technology, carbon composites or 3D printing
- aspiration effects – achievements in aerospace have been shown to have a significant impact in motivating prospective students and researchers into the field
- knowledge and technology spill-overs – the benefits from technology, information and knowledge that is generated by Rocket Lab (or its key suppliers) being applied in other companies or sectors of the economy
- prestige effects – enhancements to national prestige resulting from having a space industry
- human capital effects – benefits to New Zealand from an increased proportion of highly skilled personnel in the population.

Sapere found that the immediate economic benefits are likely to be felt by the company owners and investors, those employed in New Zealand by Rocket Lab, and key New Zealand-based component suppliers. The majority of the economic impacts in New Zealand are likely to accrue to a small number of related companies.

Indirect benefits are likely to be in sectors with high import ratios, such as the import of titanium powder for 3D printing, whilst spill-over benefits may be limited given the commercially sensitive nature of the space industry.

Overall, Sapere estimated that the establishment of a space vehicle launch industry could directly contribute around \$30 – \$80 million per year in value-add to the New Zealand economy (\$400 – \$1,550 million over a 20 year period). These are summarised in table 1 below. You can access the full study on [the New Zealand Space Agency webpage](#) on the Ministry of Business, Innovation and Employment (MBIE) website.

**Table 1: Benefits to New Zealand from the development of a space vehicle launch industry<sup>14</sup>**

Effect	Definition	Magnitude (millions)*
Direct effects	Activity and employment by Rocket Lab and its key suppliers. Key suppliers are those who directly supply parts of the launch vehicle.	\$13.5 - \$35 per year (\$270 - \$700 over 20 years)
Indirect effects	Activity and employment by industries who supply intermediate goods and services to Rocket Lab and its key suppliers.	\$49 - \$149 per year (\$80 - \$280 over 20 years)

<sup>14</sup> Source: Sapere. June 2016. *Economic Impact Analysis of the Development of a Rocket Industry in New Zealand*.

Effect	Definition	Magnitude (millions)*
	Intermediate goods are those produced by one first/industry that are used in the production process of another. Also include tourism and launch infrastructure build.	
Induced effects	Activity and employment that is the result of spending by those employed directly or indirectly owing to Rocket Lab's activities.	\$2.25 - \$7.5 per year (\$45 - \$150 over 20 years)
Catalyst effects	Other benefits not counted about where Rocket Lab's activities have acted as a catalyst to benefits being realised, including: <ul style="list-style-type: none"> <li>aspirational effects</li> <li>research and design spill-overs</li> <li>easier access to satellites for New Zealand industry.</li> </ul>	Catalyst effects (excluding satellite access): \$1.5 - \$5.5 per year (\$30 - \$110 over 20 years) Satellite access: \$8 - \$17 per year (\$160 - \$340 over 20 years)

\* Direct, indirect and induced effects have been discounted at a rate of 8%. Catalyst effects, which are more speculative, have been discounted at a rate of 50%.

### Questions

- Do you agree that the economic effects described are the main economic effects likely to occur as a result of the activity? If not, why not?
- Do you agree with the scale of the described economic effects? If not, why not?
- Are there any other economic effects that you are aware of that the Government should consider? If so, what are they?

## Proposed management of the activity

The Minister's preliminary view is that the deposit of jettisoned material from space vehicle launches on the seabed in the wider EEZ and extended continental shelf is not likely to have adverse effects on the environment or an existing interest that are significant in the circumstances.

As a result, the Minister's present view is that the requirements of the current discretionary classification are disproportionate to the level of effects. The process of getting a marine consent can be time consuming and costly, as it is designed to enable consideration of activities that have the potential for significant and ongoing adverse effects. Since this activity isn't likely to have significant or ongoing adverse effects, it is appropriate to review the classification.

The Minister's preliminary view is that classifying the deposit of jettisoned material from space launch vehicles as a permitted activity is consistent with the purpose of the EEZ Act because the minor adverse effects of the activity will not impact the potential of natural resources to meet the needs of future generations, or affect the life-supporting capacity of the environment. A permitted classification with conditions would provide for the protection of the environment, while enabling economic activity of benefit to people undertaking the activity and to the New Zealand economy.

When developing regulations to classify an activity as permitted, the Minister must:<sup>15</sup>

- make full use of the information and other resources available to him or her

<sup>15</sup> Section 34 of the EEZ Act.

- base decisions on the best available information
- take into account any uncertainty or inadequacy in the information available.

If, in relation to the making of a decision under this Act, the information available is uncertain or inadequate, the Minister must favour caution and environmental protection.

The Minister's preliminary view, based on the information available, is that there will be no significant adverse effects on the environment or existing interests from the deposit on the seabed of jettisoned material from space vehicle launches. However, given that space vehicle launches are a relatively new activity in New Zealand, there is a degree of uncertainty in the information that can only be resolved by the activity taking place. It is proposed that the permitted activity classification takes a precautionary approach by setting appropriate conditions on the activity.

## **Proposed conditions**

Section 29(2) of the EEZ Act provides that "If regulations provide for an activity to be a permitted activity, the regulations may specify terms and conditions that apply to the activity."

The current conditions for managing the activity within four specific areas are set out in Section 8A and Schedule 4A of the Permitted Activities regulations. You can see the wording of these conditions in appendix D.

The Government is proposing some changes from the conditions that are currently in place to manage the activity in the wider EEZ. The proposed changes are summarised in table 2.



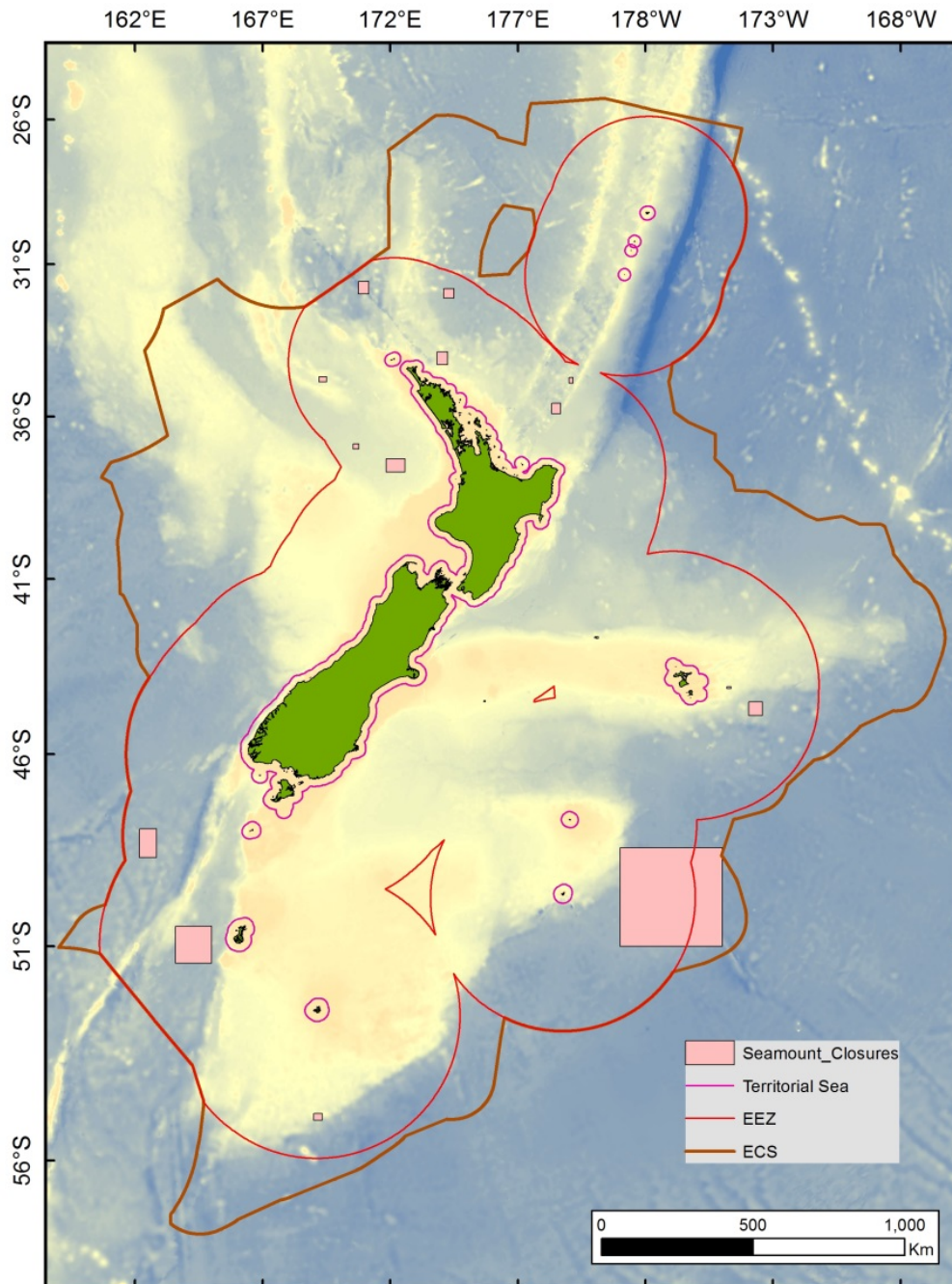
**Table 2: Comparison of current and proposed conditions**

	Current condition	Options for conditions under proposed regulations	Rationale
<p><b>Limits on number and frequency of launches</b></p>	<p><i>Limited to:</i></p> <p><i>(a) 100 launches (other than test launches) in total and no more than 1 launch per week, depositing material within the two authorised launch deposit areas; and</i></p> <p><i>(b) 10 test launches in total, depositing material within the two authorised test launch deposit areas.</i></p>	<p>Limited to 100 launches in total, depositing material within the area shown in figure 1.</p>	<p>The 2017 risk assessment indicates that the risk to the environment from a single launch would be minor and is expected to remain minor up to 100 repeated launches depositing material in a general area.</p> <p>The proposed condition would take a precautionary approach to ensure that this 100-launch threshold is not exceeded anywhere in the EEZ or extended continental shelf.</p> <p>It aligns with what is currently permitted but widens the area where deposits can occur to that shown in figure 1.</p>
<p><b>Restrictions on area</b></p>	<p><i>Activity is restricted to authorised launch deposit and test launch deposit areas (as shown in figure 2).</i></p>	<p><i>Restriction on area is widened to include the whole EEZ and extended continental shelf to the north, east and south of New Zealand shown in figure 1. Operators are required to avoid depositing material in seamount closures. Seamount closures in the New Zealand environment are shown in figure 6.</i></p>	<p>The risk assessments indicate that the effects of the activity are not likely to be significant in the wider EEZ and continental shelf. It is therefore considered appropriate for a permitted classification to apply throughout this area.</p> <p>A condition to avoid impacts on sensitive seamount environments is proposed as a precautionary measure to account for the uncertainties with the deposit of material on the seabed after it has landed in the water.</p>

Current condition	Options for conditions under proposed regulations	Rationale
		<p>The regulations apply only to the EEZ and extended continental shelf and do not permit the activity in the territorial sea (the area within 12 nautical miles of New Zealand’s mainland or offshore islands).</p>
<p><b>Pre-activity requirements</b></p>	<p><b>At least 5 working days before a launch, notify the EPA of:</b></p> <ul style="list-style-type: none"> <li>• <i>proposed date and time</i></li> <li>• <i>predicted flight path</i></li> <li>• <i>authorised deposit area where material may be deposited</i></li> <li>• <i>any additional proposed actions to avoid, mitigate, or remedy adverse effects</i></li> </ul> <p><i>The EPA must publish this information.</i></p> <p><b>At least 24 hours before the launch, confirm the final date and time.</b></p>	<p><b>At least 14 calendar days before a launch, notify the EPA of:</b></p> <ul style="list-style-type: none"> <li>• <i>proposed date and time</i></li> <li>• <i>predicted flight path</i></li> <li>• <i>area where material may be deposited</i></li> <li>• <i>any additional proposed actions to avoid, mitigate, or remedy adverse effects</i></li> </ul> <p><i>The EPA must publish this information.</i></p>
<p><b>Post-activity requirements</b></p>	<p><b>Quarterly or after 10 launches (whichever happens first), report to the EPA:</b></p> <ul style="list-style-type: none"> <li>• <i>date and time of each launch</i></li> </ul>	<p><b>No more than 5 working days after the launch, confirm the final date and time, and whether there were any deviations from the information provided in the pre-activity report.</b></p>

Current condition	Options for conditions under proposed regulations	Rationale
<ul style="list-style-type: none"> <li>• <i>observed flight path(s)</i></li> <li>• <i>as far as is reasonably practicable, the area where jettisoned material landed</i></li> <li>• <i>summary of any complaints of breach of conditions that were received and how they were addressed.</i></li> </ul> <p><i>The EPA must publish this information.</i></p>	<p><b><i>Quarterly or after 10 launches</i></b> (whichever happens first), report to the EPA:</p> <ul style="list-style-type: none"> <li>• <i>date and time of each launch</i></li> <li>• <i>observed flight path(s)</i></li> <li>• <i>as far as is reasonably practicable, the volume of material and the area where jettisoned material landed</i></li> <li>• <i>summary of any complaints of breach of conditions that were received and how they were addressed.</i></li> </ul> <p><i>The EPA must publish this information.</i></p>	<p>The proposed post-activity reporting also includes a requirement to report on the estimated volume of the material that is jettisoned. This information will address uncertainties around the scale of the activity and its associated impacts.</p> <p>All other post-activity reporting requirements remain unchanged.</p>

**Figure 6: Seamount closures in the New Zealand environment**



For these conditions to operate effectively, it will be important that operators are able to predict accurately the area where debris is likely to be deposited from any given launch and estimate after a launch where the debris landed. It will also be important that the EPA is able to verify the information reported by the operator.

### **Information about Rocket Lab's first test launch**

The only space vehicle launch in New Zealand so far (a test launch) took place on 25 May 2017. The final post-activity report to the EPA is due on 24 August 2017 and you can find it [here](#). Early information from Rocket Lab indicates that while the space vehicle followed the predicted flight path, it did not reach orbit and part of the material was jettisoned slightly

earlier than expected. Rocket Lab's information indicates that no materials landed in the Bounty Islands marine reserve or other marine reserve areas.

Rocket Lab accurately predicted the flight path of the launch vehicle and was able to reasonably estimate where jettisoned material fell, which will be helpful information for understanding the scale and impacts of the activity in the future.

The maximum amount of material that could have been deposited from the launch (assuming none burned up) is significantly less than the volume assumed in the latest risk assessment and the materials deposited were those assessed in the risk assessment.

Systems for notifying vessels of potential hazards are managed by Maritime NZ and operated for the test launch on 25 May 2017. A Notice to Mariners (NOTMAR) was published on the Land Information New Zealand (LINZ) website on 12 May with details of the launch. In addition, the Rescue Coordination Centre NZ (RCCNZ) and Maritime NZ broadcasted navigation warnings to shipping in the area six times per day for five days before launch and published the warning online. Two vessels inside or near the area in the NOTMAR were contacted by Royal NZ Air Force aircraft on 23 May, but none were known to be in the vicinity on the day of launch. Rocket Lab and relevant authorities are reviewing aspects of the launch, including how well the notification system operated.

#### Questions

9. Do you agree that the deposit of jettisoned material from space launch vehicles on the seabed in the wider EEZ and continental shelf should be classified as permitted? If not, how should the activity be classified or regulated?
10. Do you agree with the terms and conditions proposed for the activity? If not, what changes would you propose and why?
11. Do you agree that the activity should avoid depositing material in seamount closures?
12. Do you know of any other sensitive environments that should be avoided? If so, why should they be avoided? What do you think are the likely effects of the activity on those environments?

# Implementing the classification

## Timeframe for implementation of the regulations

Following consultation, officials will analyse submissions and provide advice to the Minister, who will then decide whether to proceed with the proposed activity classification or revise the proposals. If it is decided to proceed, regulations would be made before the end of 2017.

## What implementation of a permitted activity classification could cost

The EPA would incur administrative costs if the deposit on the seabed of jettisoned material from space launch vehicles in the wider EEZ and continental shelf is classified as a permitted activity. Costs would include evaluation of reports and notification of activities on the EPA website, and would partly be recovered from the person undertaking the activity. These costs are likely to be less than the costs of administering the discretionary process for marine consent decisions, which the EPA would be required to do under the current system.

The costs to the person undertaking the activity of complying with conditions are unlikely to be significant given that much of the necessary information would be produced as part of normal business operations.

## Next steps

The Government proposes to progress work to classify the deposit of jettisoned material from space launch vehicles on the seabed in the EEZ and extended continental shelf as a **permitted activity, subject to conditions** in regulations under the EEZ Act.

Following consultation, officials will analyse submissions and provide advice to the Minister, who will then decide whether to proceed with the proposed activity classification or revise the proposals. If it is decided to proceed, regulations would be made before the end of 2017.

The policy decision will have regard to comments received under consultation, and you are invited to submit your comments now.

# Making a submission

You can make a submission in three ways:

- use our online submission tool, available at <https://submissions.mfe.govt.nz/consultations/regulation-of-jettisoned-material-from-space-launch-vehicles-under-the-exclusive-economic-zone-and-continental-shelf-environmental-effects-act-2012-proposed-changes/make-a-submission>
- download a copy of the submission form to complete and return to us. This is available at <http://www.mfe.govt.nz/consultations/regulation-jettisoned-material-space-launch>. If you do not have access to a computer, a copy of the submission form can be posted to you
- write your own submission.

To ensure your point of view is clearly understood, you should explain your rationale and provide supporting evidence where appropriate.

If you are posting your submission, send it to Regulation of jettisoned material from space launch vehicles, Ministry for the Environment, PO Box 10362, Wellington 6143 and include:

- the title of the consultation (Regulation of jettisoned material from space launch vehicles)
- your name or organisation,
- postal address,
- telephone number, and
- email address.

If you are emailing your submission, send it to [slvconsultation@mfe.govt.nz](mailto:slvconsultation@mfe.govt.nz) as a:

- PDF, or
- Microsoft Word document (2003 or later version).

**Submissions close at 5.00 pm on Wednesday 13 September 2017.**

## What will happen to my submission?

### Developing regulations

All submissions will be considered after the submission period closes on 13 September 2017. Officials will analyse submissions and provide advice to the Minister, who will then decide whether to proceed with the proposed activity classification or revise the proposals. If it is decided to proceed, regulations will be made before the end of 2017.

### Publishing and releasing submissions

All or part of any written submission (including names of submitters) may be published on the Ministry for the Environment's website, [www.mfe.govt.nz](http://www.mfe.govt.nz). Unless you clearly specify otherwise in your submission, the Ministry will consider that you have consented to website posting of both your submission and your name.

Contents of submissions may be released to the public under the Official Information Act 1982, following requests to the Ministry for the Environment (including via email). Please advise if you have any objection to the release of any information contained in a submission and, in particular, which part(s) you consider should be withheld, together with the reason(s) for withholding the information. We will take into account all such objections when responding to requests for copies of, and information on, submissions to this document under the Official Information Act.

The Privacy Act 1993 applies certain principles about the collection, use and disclosure of information about individuals by various agencies, including the Ministry for the Environment. It governs access by individuals to information about themselves held by agencies. Any personal information you supply to the Ministry in the course of making a submission will be used by the Ministry only in relation to the matters covered by this document. Please clearly indicate in your submission if you do not wish your name to be included in any summary of submissions that the Ministry may publish.

## Who can I contact if I have questions?

Please direct any queries to:

Phone: +64 4 439 7400

Email: [slvconsultation@mfe.govt.nz](mailto:slvconsultation@mfe.govt.nz)

Postal: Regulation of jettisoned material from space launch vehicles, Ministry for the Environment, PO Box 10362, Wellington 6143



# Questions to guide your feedback

## Environmental effects

1. Do you agree that the environmental effects described are the main environmental effects likely to occur as a result of the activity? If not, why not?
2. Do you agree with the scale of the described environmental effects? If not, why not?
3. Are there any other environmental effects that you are aware of that the Government should consider? If so, what are they?

## Effects on existing interests

4. Do you agree that the existing interests described are the main existing interests? If not, why not? Please describe any other existing interests you are aware of that could be affected by the activity.
5. What do you think the main effects will be on existing interests? Please provide any information you have in relation to those effects.

## Economic effects

6. Do you agree that the economic effects described are the main economic effects likely to occur as a result of the activity? If not, why not?
7. Do you agree with the scale of the described economic effects? If not, why not?
8. Are there any other economic effects that you are aware of that the Government should consider? If so, what are they?

## Proposed classification

9. Do you agree that the deposit of jettisoned material from space launch vehicles on the seabed in the wider EEZ and continental shelf should be classified as permitted? If not, how should the activity be classified or regulated?

## Terms and conditions

10. Do you agree with the terms and conditions proposed for the activity? If not, what changes would you propose and why?
11. Do you agree that the activity should avoid depositing material in seamount closures?

12. Do you know of any other sensitive environments that should be avoided? If so, why should they be avoided? What do you think are the likely effects of the activity on those environments?

### **Other comments**

Do you have any other comments you wish to make?

# Appendix A: Assessment against objectives

Table 3 assesses the proposed classifications against the objectives described on page 16.

**Table 3: An assessment of the permitted classification for the deposit on the seabed of jettisoned material from space vehicle launches against the Government's objectives**

Objectives	Assessment of preferred option
The natural resources of the EEZ and continental shelf are sustainably managed	<p>Will provide certainty of environmental protection through conditions set in regulations</p> <p>Will provide certainty for users that they are able to comply with conditions</p> <p>Will ensure sustainable management by allowing for the use of marine resources while sustaining their future potential and the environmental integrity of the EEZ</p>
New Zealand fulfils its obligations under relevant international conventions relating to the marine environment	<p>Meets relevant international obligations under UNCLOS, the Convention on Biological Diversity and the Noumea Convention:</p> <p>The permitted activity classification complies generally with these international obligations because:</p> <ul style="list-style-type: none"> <li>• the probability of significant adverse effects from the activity is low, and conditions can be set in regulations to avoid, remedy or mitigate effects on the environment, biodiversity and existing interest</li> <li>• to satisfy the Noumea Convention requirements, the Minister needs to consider whether the activity is a 'major project' for the purpose of the Noumea Convention. Through consultation with experts, including NIWA, officials have assessed the routine environmental effects of the activity as not significant, and concluded that the activity is therefore unlikely to be considered a major project.</li> </ul> <p>although public participation is low (consultation on regulations only), this is proportionate to the likely level of effects on the interests of the public and iwi/Māori</p>
Activities are regulated in a manner proportionate to the level of effects and processes are cost-effective	<ul style="list-style-type: none"> <li>• Cost effective for the Government in terms of monitoring through conditions</li> <li>• Imposes low compliance costs on users</li> <li>• Conditions are proportionate to the likely effects of the activity</li> </ul>
Provide for the consideration of non-environmental impacts, including on existing interests, iwi and other matters set out in the EEZ Act, in a manner proportionate to the scale and effects of activities	<p>Effect on existing interests and iwi likely to be low</p> <p>Public participation is low (consultation on regulations only), but this is proportionate to the likely level of effects on the interests of the public and iwi</p>

# Appendix B: Matters to be considered when developing regulations

According to section 33 of the EEZ Act:

- Section 33 and section 34 (information principles) apply when the Minister is developing regulations for the purposes of section 27
- the Minister must have regard to any comments made under section 32(2) (consultation)
- the Minister must take into account certain matters, listed below.

## Matters to be taken into account under section 33(3) of the EEZ Act

- (a) any effects on the environment or existing interests of allowing an activity with or without a marine consent, including—
  - (i) *cumulative effects; and*
  - (ii) *effects that may occur in New Zealand or in the waters above or beyond the continental shelf beyond the outer limits of the exclusive economic zone; and*
- (b) the effects on the environment or existing interests of other activities undertaken in the exclusive economic zone or in or on the continental shelf, including—
  - (i) *the effects of activities that are not regulated under this Act; and*
  - (ii) *effects that may occur in New Zealand or in the waters above or beyond the continental shelf beyond the outer limits of the exclusive economic zone; and*
- (c) the effects on human health that may arise from effects on the environment; and
- (d) the importance of protecting the biological diversity and integrity of marine species, ecosystems, and processes; and
- (e) the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species; and
- (f) New Zealand's international obligations; and
- (g) the economic benefit to New Zealand of an activity; and
- (h) the efficient use and development of natural resources; and
- (i) the nature and effect of other marine management regimes; and
- (j) best practice in relation to an industry or activity; and
- (k) in relation to whether an activity is classified as permitted or discretionary, the desirability of allowing the public to be heard in relation to the activity or type of activity; and
- (l) any other relevant matter.

# Appendix C: Expected fragmentation of stage 1

**Table 4:** Expected fragmentation of stage 1 of the Electron space launch vehicle<sup>16</sup>

Component	Fragment count	Fragment mass (kg)	Fragment area (m <sup>2</sup> )
Connector	4	0.02 to 0.04	<0.01
Cables and mounts	103	0.02 to 0.04	<0.01
Structure	12	0.03 to 0.06	<0.01
Vent assembly	6	0.04 to 0.07	<0.01
Structure	14	0.06 to 0.10	<0.01
Controller assembly	6	0.10 to 0.16	<0.01
Valve	2	0.11 to 0.18	<0.01
Structure	1	0.11 to 0.19	<0.01
Valve assembly	1	0.17 to 0.28	<0.01
Structure	1	0.17 to 0.29	0.05
Connector	3	0.20 to 0.33	<0.01
Structure	6	0.22 to 0.36	<0.01
Miscellaneous small parts	31	0.24 to 0.40	0.01
Structure	3	0.33 to 0.56	<0.01
Controller assembly	3	0.38 to 0.63	<0.01
Structure	1	0.38 to 0.64	<0.01
Controller assembly	1	0.41 to 0.69	0.01
Structure	1	0.47 to 0.79	0.02
Sensor assembly	1	0.61 to 1.02	0.01
Valve assembly	1	0.76 to 1.27	0.02
Structure	1	0.92 to 1.54	0.03
Controller assembly	2	0.97 to 1.61	0.02
Valve assembly	1	1.01 to 1.68	0.02
Valve assembly	1	1.01 to 1.69	0.02
Structure	1	1.09 to 1.82	<0.01
Structure	15	1.10 to 1.83	0.23
Spring assembly	4	1.82 to 2.13	0.02
Actuator assembly	6	1.28 to 3.03	<0.01
Controller assembly	1	2.25 to 3.74	0.02
Battery component	15	2.85 to 4.75	0.02

<sup>16</sup> Source: Rocket Lab.

Component	Fragment count	Fragment mass (kg)	Fragment area (m <sup>2</sup> )
Structure	1	3.35 to 5.59	0.3
Pump assembly	1	5.03 to 8.39	0.03
Gas cylinder	6	5.17 to 8.62	0.09
Structure	4	9.69 to 13.17	3.29
Structure	4	19.21 to 25.61	6.52
Battery	13	15.68 to 26.13	0.08
Cylinder	1	17.21 to 28.68	1.14
Stage 1 motor assembly	1	307.4 to 355.9	1.92

# Appendix D: Conditions in the Permitted Activities regulations

The following sections are taken from the Exclusive Economic Zone (Environmental Effects-Permitted Activities) Regulations 2013:

## **Section 8A Deposit of material on seabed from launch of space vehicle**

- 1) *The deposit on the seabed of material jettisoned from any test launch of a space vehicle from New Zealand is a permitted activity if the person undertaking the activity complies with the conditions in subclause (2).*
- 2) *The conditions are that—*
  - (a) *there are no more than 10 space vehicle test launches in total; and*
  - (b) *all material jettisoned from the space vehicle is deposited within any authorised test launch deposit area; and*
  - (c) *the person complies with the pre-activity requirements in Schedule 4A; and*
  - (d) *the person complies with the post-activity requirements in Schedule 4A.*
- 3) *The deposit on the seabed of material jettisoned from any launch (other than a test launch) of a space vehicle from New Zealand is a permitted activity if the person undertaking the activity complies with the conditions in subclause (4).*
- 4) *The conditions are that—*
  - (a) *there are no more than 100 space vehicle launches (other than test launches) in total; and*
  - (b) *there is no more than 1 space vehicle launch per week; and*
  - (c) *all material jettisoned from the space vehicle is deposited within any authorised launch deposit area; and*
  - (d) *the person complies with the pre-activity requirements in Schedule 4A; and*
  - (e) *the person complies with the post-activity requirements in Schedule 4A.*

## **Schedule 4A Pre-activity and post-activity requirements for deposit of material on seabed from launch of space vehicle**

### **Pre-activity requirements**

- 1) *The person undertaking the activity must provide the EPA with the following information no later than 5 working days before the planned space vehicle launch:*
  - (a) *the proposed date and time of the launch; and*
  - (b) *the predicted flight path or paths of the launch; and*
  - (c) *the authorised test launch deposit area or authorised launch deposit area in which the material jettisoned from the space vehicle is expected to land; and*
  - (d) *details of any additional proposed actions to avoid, mitigate, or remedy adverse effects of the activity on existing interests.*
- 2) *The person undertaking the activity must provide the EPA with the final date and time of the planned space vehicle launch no later than 24 hours before the launch.*

- 3) *The EPA must publish on its Internet site the information provided under subclause (1) as soon as is reasonably practicable after the person provides it.*

## **2 Post-activity requirements**

- 1) *The person undertaking the activity must provide the EPA with a post-activity report, which must be provided quarterly or after 10 consecutive launches (whichever happens first).*
- 2) *A post-activity report must include the following information:*
  - (a) the date and time of each space vehicle launch; and*
  - (b) the observed flight path of each space vehicle launch; and*
  - (c) as far as is reasonably possible, each area in which the material jettisoned from each space vehicle landed; and*
  - (d) if the person received any written complaint alleging that the conditions for undertaking the activity were breached,—*
  - (e) a summary of each complaint; and*
  - (f) an explanation of how the person dealt with each complaint.*
- 3) *The EPA must publish a post-activity report on its Internet site as soon as is reasonably practicable after the person provides it.*



# Glossary

<b>Auto-ignition</b>	The lowest temperature at which a fuel spontaneously ignites in normal atmosphere without an external source of ignition.
<b>Benthic</b>	The flora and fauna found on the bottom, or in the bottom sediments, of a sea or lake.
<b>Biota</b>	The animal and plant life of a particular region, habitat, or geological period.
<b>Cumulative effects</b>	Effects that accumulate or arise over time or in combination with other effects.
<b>Demersal</b>	The zone of the water column that is closest to the seabed.
<b>Dumping</b>	The disposal into the sea of waste or other matter or ships, aircraft, or structures.
<b>Deposit</b>	The act of placing anything or organism in, on, or under the seabed.
<b>Ecosystem</b>	A biological community of interacting organisms and their physical environment.
<b>Fairing</b>	An external metal or plastic structure whose primary function is to produce a smooth outline and to reduce drag.
<b>Fauna</b>	The animals of a particular region, habitat, or geological period.
<b>Invertebrates</b>	An animal lacking a backbone.
<b>Mahinga kai</b>	Food-gathering practices and traditional Māori foods including indigenous shellfish, inland fish (tuna [eels], freshwater kōura [crayfish]) and plants (pūhā, kūmara etc).
<b>Payload</b>	An object that is placed in outer space by means of a launch vehicle, or, as the case may be, placed above the upper limit of controlled airspace by means of a high altitude vehicle.
<b>Pelagic</b>	Water that is not close to the shore or the bottom of the ocean (usually in the depth range 0 – 1000 m). Fish that live in the water column in the open ocean are often referred to as pelagic.
<b>Phytoplankton</b>	Microscopic organisms that inhabit the upper layer of the oceans and bodies of fresh water. These organisms obtain their energy from sunlight.
<b>Pneumatics</b>	The branch of physics or technology concerned with the mechanical properties of gases.
<b>Propellants</b>	Substances used to propel a rocket, commonly a combination of fuel and an oxidiser.
<b>Launch vehicle</b>	A rocket used to carry a payload from Earth's surface into outer space.

<b>Substrate</b>	The surface or material on or from which an organism lives, grows, or obtains its nourishment.
<b>Sun-synchronous orbit</b>	A geocentric orbit that combines altitude and inclination in such a way that the satellite passes over any given point of the planet's surface at the same local solar time.
<b>Zooplankton</b>	Plankton consisting of small animals or the early life stages of some species (eg, juveniles of many fish species), some of which migrate through the water column on a daily basis down to depths > 300 m. Zooplankton obtain their food by eating other organisms, including phytoplankton.

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