Proposal for a

Fiordland Marine Regional Pathway Management Plan

Under the Biosecurity Act 1993

March 2016

Contents

1. Introduction

1. The purpose of this Proposal for a Fiordland Marine Pathway Management Plan is to minimise the risk of marine pests being transported into the Fiordland Marine Area (FMA). Appendix 1 shows a map of the FMA.

2. The iconic nature of the Fiordland marine environment is under threat from exotic marine pests being carried in on local and visiting vessels. Vessels of all types and sizes can provide a pathway for marine pests. Specifically, pests can attach to hulls, niche areas and gear and in pockets of residual seawater and bilge water. Simply keeping these areas clean means that marine pests are unable to attach, there is no pathway, and Fiordland is protected. The provisions to achieve this are straightforward – clean vessel standards are proposed to prevent pest attachment and a Fiordland Clean Vessel Pass is proposed to ensure vessel owners/operators meet the standards.

3. The proposal addresses the requirements for a Regional Pathway Management Plan defined in the Biosecurity Act 1993. As such, it presents a rare opportunity to intervene **before** the event - in the interests of protecting something as precious as the FMA. Given the degree to which the FMA is revered, it is fitting that this is the first proposal for a Pathway Management Plan in the country.

4. The formal proposer of the Plan is Environment Southland. However, the proposal was developed by a Steering Group consisting of representatives from Environment Southland (ES), the Fiordland Marine Guardians (Guardians), Kai Tahu Oraka/ Aparima Runaka, the Ministry for Primary Industries (MPI) and Department of Conservation (DOC) – an indication of the wide support for keeping marine pests out of Fiordland.

2. The outstanding nature of the Fiordland Marine Area

5. The FMA supports unique marine habitats and communities within a magnificent fiord landscape. This exceptional combination is considered to be unique on a global scale.

6. The special nature of the inner fiords is driven by tannin stained freshwater that flows from the forests into the fiords to float on the ocean water. This reduces light penetration allowing deep-water animal wall communities to flourish at much shallower depths. For instance, the world's largest population of black coral is found at diving depths within the fiords. Some trees reach 5 metres tall and can be over 300 years old. Red coral, sponges, anemones, bryozoans, sea pens, brachiopods and a wide range of other spectacular species, including fish, also inhabit these low productivity wall communities.

7. In 1995, the Fiordland community came together to ensure the special values of their iconic marine area were safeguarded. The result was the development of the Fiordland Marine Conservation Strategy by an integrated Guardians/agencies group and presented to the Government in 2003. The Fiordland (Te Moana o Atawhenua) Marine Management Act was passed in 2005 bringing into law measures to protect the exceptional features such as the most special wall communities (china shops) and eight sizable representative marine reserves. The management of fisheries was also a major component of the initiative, as were threats to the marine environment.

8. Marine pests were identified as one of the major threats facing the FMA during the development of the strategy.

9. This background highlights how special the Fiordland marine environment is to locals, the wider community and the government. As a key agency, ES participated wholeheartedly in the process of developing the strategy. The publication and circulation of the strategy was a noteworthy ES contribution. The creation of a strategy and special legislation to safeguard the outstanding features of the FMA is testament to the national and international importance of this unique area.

3. The risk of marine pest incursions

10. As mentioned, the Fiordland Marine Guardians/agency group identified marine pests as one of the major risks to the Fiordland marine environment as early as 2003.

11. Then in 2010 a single *Undaria pinnatifida (Undaria)* sporophyte was discovered in Sunday Cove, Breaksea Sound. An immediate joint-agency response between ES, MPI and DOC was initiated in an attempt to eliminate the pest and since August 2010 monthly diving surveys and control treatments have taken place. Despite this effort, occasional young *Undaria* specimens are still being found. Five years and the expenditure of more than $1 million have not entirely eliminated this pest from the site and regular treatment continues with the objective of eliminating *Undaria* in Fiordland.

12. Like other designated marine pests, *Undaria* tends to be fast growing, robust and highly fertile. These features result in marine plant pests expanding rapidly, blanketing and displacing existing communities and dominating the seaweed assemblages. For these reasons, the agencies involved in the elimination effort are committed to preventing the potential loss of exceptional Fiordland habitats and communities and associated ecosystem values that may be adversely impacted.

13. Other named marine pest species such as the sea squirt *Styela clava* and Mediterranean fanworm *Sabella spallanzanii* have also become well established in some areas of New Zealand. They can cause a detrimental impact on fragile ecosystems by competing directly for food and space with indigenous species such as mussels, oysters, brachiopods and corals.

14. Pest species that are already in other parts of New Zealand and those that might arrive from overseas have the potential to dominate the native flora and fauna. Apart from radically modifying their new environment, they can disrupt the associated values. For instance, major negative biological change such as out-competing native species and the collapse of fisheries has been linked to a range of alien species in temperate regions including the Northern Pacific Seastar *Asterias amurensis,* the seaweed *Caulerpa taxifolia*, the comb jelly *Mnemiopsis leidyi*, the Asian clam *Potamocorbula amurensis*, and the invasive crab *Carcinus maenas* (Bax et al. 2003).

15. Clearly the detrimental impacts of alien species warrant major efforts to prevent them from being transported into Fiordland.

4. Pest pathways into Fiordland

16. Given the isolation of Fiordland, vessels are almost the only means of entering and residing in the FMA. But vessels of all types and sizes are potentially capable of carrying marine pests into this special area.

17. The variety of vessels identified within the FMA is a consequence of the array of attractions in this isolated place. Cruise ships and super yachts, yachts, motor sailors, tourist cruise vessels, charter vessels, syndicate vessels, fishing vessels, tenders, trailer boats, research vessels and agency vessels all spend time within the FMA. The degree of risk associated with this wide range of vessels varies depending on a number of factors including the type of vessel and gear, pattern of use, homeport, and operational decisions of the owners/operators.

18. Irrespective of vessel type there are specific locations on vessels such as hulls, niche areas, gear, residual seawater and bilge water that are vulnerable to marine pest attachment or infection. Ballast water was identified as a risk some time ago and is subject to controls nationally by MPI.

***Note**: Vessels and other items associated with aquaculture have not been considered in this proposal because aquaculture is not currently permitted in the FMA. Should this change and any new risks be identified, the Pathway Plan would be reviewed, as the legislation allows, to incorporate these into the Plan.*

4.1 Vessel transport of marine pests

19. Recently a super yacht from Wellington on its way to Fiordland was reported to have Mediterranean fan worms *Sabella spallanzanii (Sabella)* attached to the hull. This highlights how easily another pest incursion could take place. Indeed, Fiordland's status and special values are no protection against vessel-borne pests.

20. Mapping the spread of marine pests around New Zealand reveals a number of patterns. First, pests tend to appear in the most highly used ports. These ports also generally harbour more established marine pest species. The spread of pests to other locations is associated with vessel anchoring and mooring facilities such as in harbours and marinas. *Sabella,* sea squirt (*Styela clava)* and *Undaria* have become widespread throughout many parts of New Zealand. Apart from ballast water (which is regulated by MPI), the main mechanism for these marine pests entering New Zealand has been the biofouling on vessel hulls and niche areas. For instance, *Undaria* colonised the remote Sub Antarctic Islands, where it was first detected in popular anchoring sites. The FMA is vulnerable to invasions of marine pest species from ports and marinas around the country being carried into Fiordland by visiting vessels. Irrespective of the distance between an established pest and Fiordland, vessels are capable of transporting undesirable pests from any part of the country into the FMA in a single trip.

21. Locally established marine pest populations present an even greater risk. *Undaria* is now well established in Bluff Harbour, the main service port for Fiordland. It has also spread to Stewart Island (Rakiura) where it is now established in Halfmoon Bay and Horseshoe Bay.

22. To define the pattern of local vessel movement into and out of the FMA, trip behaviour of owners/operators was noted. A number of vessels were found to undertake trips between

infested locations and Fiordland without cleaning or hull checking. These vessels pose a very high risk of causing further incursions of *Undaria* within the FMA.

5. The pathway concept

23. The concept underpinning the pathway approach is preventing marine pests from reaching Fiordland in the first place rather than responding after a pest has arrived, become established and been discovered.

24. Translating this concept into reality is relatively straightforward. Indeed, ensuring vessel hulls, niche areas, gear and associated water is clean and/or appropriately treated prior to entering the FMA is much more effective than expending significant resources treating an incursion with no certainty of success. Furthermore, methods of treating vessels and associated equipment are well known and part of best practice for responsible vessel owners/operators. There is no pathway for marine pests on vessels with clean hulls, niche areas and gear and treated residual seawater and bilge water.

25. The simple fact is that clean vessels and their associated equipment are the key to preventing pests from reaching the FMA.

5.1 From concept to Pathway Management Plan

26. In 2012 an amendment to the Biosecurity Act introduced national and regional pathway management plans. These plans are based on the pathway concept and provide government recognition of the need for a statutory mechanism to prevent pests and harmful organisms being transported into new areas. In other words, they are a comprehensive mechanism specifically designed for the purpose.

27. Regional pathway management plans may apply to areas other than entire regions. Justification for tailoring a pathway plan proposal to the FMA rather than the whole of Southland is twofold. First, the iconic nature of the FMA, the special values, uses and vulnerabilities are distinct from those of the wider Southland region. And second, the FMA is a legal entity under the Fiordland (Te Moana o Atawhenua) Marine Management Act 2005. Since then management has been the responsibility of an integrated community/agency combination - the first of its kind in the country. Furthermore, the flexibility inherent in this statute can accommodate the isolation, low population, limited road access and challenging environment of the FMA.

28. A Fiordland Marine Pathway Management Plan would provide a statutory basis for minimising the risk of vessels transporting marine pests into the FMA. Without the ability to enforce this solution, keeping vessels clean would remain voluntary.

29. Prior to the discovery of *Undaria* in Sunday Cove, Breaksea Sound in 2010 and since, an intensive education and awareness programme has been carried out about cleaning vessels to prevent the attachment and transport of pests. Advice and encouragement has been provided to vessel owners/operators about cleaning methods and the use of cleaning facilities. MPI has also supported an ongoing hull-checking programme in Bluff Harbour and Stewart Island.

30. Despite this effort, it is apparent that voluntary measures alone are unlikely to be effective. It only takes one vessel owner/operator to either not be aware of, or disregard advice about, best practice to increase the risk of an incursion. In addition to providing a regulatory tool, the adoption of a pathway approach would also enhance awareness about the need to keep vessels and gear clean. Accordingly, a Fiordland Marine Pathway

Management Plan would provide more effective protection from marine pest incursions by both increased education/understanding and statutory measures.

5.2 Proposal for a Fiordland Marine Pathway Management Plan

31. In 2014, Environment Southland approved the development of a formal proposal for a Regional Pathway Management Plan for Fiordland. Pathway management plans are a new and, as yet, untried statutory mechanism. Accordingly, there are no precedents to guide the development of a Fiordland Marine Pathway Management Plan. The following process was adopted to develop the proposal.

5.3 Development of the Proposal

5.3.1 Guardians/agency/advisors approach

32. The Steering Group that developed the proposal is comprised of representatives from organisations with statutory responsibilities for biosecurity in Fiordland, namely Environment Southland (ES), Ministry for Primary Industries (MPI), Department of Conservation (DOC), Kai Tahu, Te Runaka o Oraka/Aparima and the Fiordland Marine Guardians. This was an extension of the successful community/agency management approach that has operated in Fiordland since the Fiordland (Te Moana o Atawhenua) Marine Management Act 2005 was passed. Advisors with expertise in marine biosecurity and locals with extensive practical knowledge of operations taking place within the FMA also worked with the Group.

5.3.2 Designing a workable solution

33. Designing a mechanism to prevent marine pests from being transported into Fiordland by a wide range of vessel types has been a challenge. The mechanism had to be effective in one of the most isolated marine areas in the country, be readily adopted and easily administered. To develop such a solution required input from those who have first-hand experience of the FMA and know what will work there. This level of detail has been dictated by the need to create a sensible, practical and acceptable solution that can be successfully implemented.

6. What is proposed

34. It is proposed that a regional pathway management plan is made that consists of an Exclusion Programme for marine pests entering the Fiordland Marine Area.

6.1 The objective

35. To exclude marine pests and other harmful marine organisms from the iconic FMA over the duration of the plan by addressing the threat of them being transported into the area by vessels. This will prevent significant adverse effects on the unique marine ecosystems in Fiordland and the associated impacts on economic wellbeing, the environment, enjoyment of the natural environment, and the relationship between Maori, their culture, and their traditions and their ancestral lands, waters, wahi tapu, and taonga. A map of the FMA is included in Appendix 1.

36. The key known organisms to be excluded are *Undaria*, the sea squirt *Styela clava*, Mediterranean fanworm *Sabella spallanzanii*, the Asian paddle crab *Charybdis japonica*, the shallow water tunicate *Pyrura praeputialis*, the droplet tunicate *Eudistoma elongatum*, and the sea squirt *Didemnum vexillum*.

6.2 Principal measures to achieve the objective

37. The following principal measures are required.

6.2.1 Implementing Clean Vessel, Gear and Residual Seawater Standards and Bilge Water Procedures

38. Vessel hulls, associated niche areas, gear, residual seawater and bilge water have been identified as aspects of vessels that are susceptible to marine pest attachment and infestation. Science-based standards for cleanliness have been developed that effectively minimise the risk of pest attachment.

39. Responsible vessel owners/operators routinely maintain their vessels at the defined standards but vessel owners who fail to do this are fostering biofouling on their vessel and providing an ideal habitat for the settlement of pest species. Given the nature of the FMA all vessel owner/operators need to be encouraged to adopt the clean vessel standards and codes of practice. The Plan would require that these standards be met every time a vessel enters the FMA.

- **Clean Vessel Standard**

40. Applies to hulls and associated niche areas such as recesses around rudders, propellers, stabilisers, boarding platforms, zinc blocks and sea chests (water intake/outlets) on larger vessels.

Standard: No more than a slime layer and goose barnacles

41. This standard has been adopted by the International Marine Organisation (IMO) and incorporated into its Guidelines as a standard that will not facilitate pest attachment. The same standard has been adopted by MPI for the Craft Risk Management Standard (CRMS) applying to long stay vessels entering New Zealand and those entering places not classed

as Places of First Arrival and without inspection facilities, such as Milford Sound. The CRMS is to assume statutory status in 2018.

- **Clean Gear Standard**

42. Applies to anchors, ropes, mooring lines, floats, fishing gear (lines and pots), diving gear, tenders and research equipment.

Standard: Visibly clean, free of fouling and sediment and preferably dry (accepting Fiordland conditions)

- **Clean Residual Seawater Standard**

43. Applies to areas that do not drain completely and can be left with a few litres of seawater while in port. Such residual seawater could become contaminated with spores and other infestations. Treatment of seawater in this category is straightforward as outlined in Appendix 2. Live wells and seawater toilet heads are examples that fall into this category.

Standard: Residual seawater has been treated and/or is visibly clean and free of sediment

- **Bilge Water**

44. Applies to seawater that seeps into the engine room/sump where it can become contaminated with diesel, detergents, marine debris, dirt and even terrestrial vegetation. Once a certain amount of bilge water has collected it is pumped out into the ocean. Recent studies show a wide range of organisms present in bilge water and investigations are being conducted to identify whether they present a marine pest risk to the receiving water (Cawthron Institute Report No. 2775 2015). Results of laboratory experiments including several biofouling species indicate that some species can survive being retained in the bilge and remain in a viable form after passing through a bilge pump.

45. At this point, the risks are not well enough understood and possible bilge water disposal methods are not sufficiently well developed to propose a bilge water standard. But the scientific findings to date justify a precautionary approach. Options for discharging bilge water in source regions or low risk areas, collecting and disposing bilge water and treating bilge water are discussed in the Cawthron Institute Report No. 2775 2015.

46. Rather than a standard, the following procedures/code of practice is suggested to encompass discharge, collection, disposal and treatment of bilge water:

Prior to entering the FMA bilge water must either be pumped into purpose-built collection tanks for disposal on land or discharged overboard in accordance with current marine pollution regulations.

Within the FMA bilge water must either be discharged into the same water body (fiord), as it originated from or be subjected to chemical treatment options[1] and discharged in accordance with health and safety and marine pollution regulations.

[1] Chemical treatment options were identified by Cawthron Institute (2013). Its current position is that "chlorine provides a cost effective and efficient biocide option, however constraints with regard to the contaminant discharge regulations and health and safety considerations exist". It is clear that chlorine presents the most promising bilge water treatment for the FMA.

47. Whereas vessel owners/operators are likely to be made aware of the standards for hulls, gear and residual water, a code of practice for bilge water may require a greater communication effort for effective uptake. The Plan would not require vessel owners/operators to follow the bilge water procedures, although they would be encouraged to do so.

6.2.2 Creating a Fiordland Clean Vessel Pass

48. There would be very little risk of marine pest incursions if all vessel owners/operators entering or residing in the FMA adopted the clean vessel standards voluntarily. But observations indicate a provision is needed to both draw attention to the risks of biofouled vessels and promote the uptake of the clean vessel standards.

49. The proposal is that vessel operators/owners entering or residing in the FMA would be strongly encouraged to acquire a Fiordland Clean Vessel Pass. To do so the applicant would only need to declare he/she has read and understands the clean vessel standards and will meet the standards on every entry into the FMA.

50. A Fiordland Clean Vessel Pass would be a strongly recommended requirement for all vessel owners/operators entering or residing in the FMA. It would demonstrate that the operator understood the marine biosecurity risks and was aware all practical steps that needed to be taken to ensure that these risks were minimised. The Clean Vessel Pass was chosen because it would require ***minimum effort*** on the part of vessel owners/operators, ***involve no cost*** (to the applicant), be ***easily acquired,*** easily administered and ***be effective*** in the isolated Fiordland environment. Any vessel that did not have a valid Clean Vessel Pass would immediately classed as **high risk**. As such all statutory inspection and other regulatory work on the vessel to achieve compliance with the plan's rules would be done on a cost recovery basis.

51. The Clean Vessel Pass would also provide ES will valuable information about vessels operating in Fiordland, their movements and activities and the levels of risks they pose over time. This will be essential for assessing the effectiveness of the Plan by allowing it to be effectively reviewed and improved.

Features of the Pass

A. The pass would be specific to a vessel and would be carried on that vessel at all times.

Note: *Charter vessel owner/operators would be responsible for the pass and for advising clients about the clean gear standards for private gear, such as diving and fishing gear. Vessel owners/operators would also be responsible for craft associated with their vessel such as tenders and kayaks, which would need to meet the clean vessel and gear standards.*

B. Applications for a pass could be made by way of a website, e-mail, fax or letter.

Note: *The applicant would be guided through a simple application process. This would include a user-friendly guide about vessel cleaning methods, antifouling, local cleaning facilities and hull inspections (see Appendix 2).*

C. A pass would be issued after the applicant has provided all required information (which may be subject to a check), and declared that he/she understands the standards and that the vessel will meet the clean vessel, gear and residual seawater standards and conform to the bilge water code on each entry into the FMA. The pass would be issued electronically for the applicant to print.

D. The duration of a pass would be one year. That means a vessel could leave and re-enter the FMA over the course of the year without applying for a new pass but the vessel must meet the Clean Vessel Pass requirements on every re-entry. An annual pass is considered appropriate for most situations (whether one-off trips or frequent trips).

E. Vessel owners/operators would be reminded when the pass needs to be renewed.

Pass requirements for specific situations

Vessels residing in the FMA for extended periods

52. Vessels that remain in the FMA for extended periods can become fouled and no longer meet the clean vessel standards. Specifically, most of the tourist vessel fleet only leaves the FMA once every two years for survey, maintenance and cleaning. Within the FMA vessel hulls are subject to fouling from local pest-free waters but cannot be cleaned as there are no cleaning facilities available. Vessels in this situation do not present a risk of transporting marine pests while remaining in the FMA. These vessels would be issued with a two year pass at the time of survey and vessel cleaning. This would be on the condition that the vessel operates solely within the FMA for the intervening period. But the clean vessel standards would need to be met on re-entry into the FMA.

The Cruise ship clean vessel mechanism

53. Cruise ships were widely identified as a source of concern during the informal consultation exercise. Increasing numbers of ships together with those that stay for several days within the FMA present a significant marine pest threat. For instance, accounts of a cruise ship anchored in Pickersgill Harbour with a film of weed and very little antifoul paint serve to illustrate this point.

54. Cruise ship companies must sign a Deed of Agreement with ES to visit Fiordland, or seek resource consent. It is proposed that the Deed of Agreement is amended to require cruise ships to meet the clean vessel standards. This could be done by requiring the cruise ship owner/ operator to hold a Biofouling Management Plan based on International Marine Organisation Guidelines (the equivalent of the clean vessel standards). Cruise ships that are operating under the Deed of Agreement would not be expected to hold a Clean Vessel Pass.

Emergency provisions

55. Emergency provisions for vessels that experience adverse weather, vessel malfunctions or health emergencies at sea outside of the FMA have been considered. Emergencies at sea outweigh all other provisions so a Clean Vessel Pass would not be required for vessels that enter the FMA under these circumstances. But information about where and for how long

a vessel remained in a fiord would need to be reported to ES. That way the condition of the vessel and area within the fiord could be checked.

6.2.3 Information required on application for a Fiordland Clean Vessel Pass

56. Descriptive information about the applicant and the vessel (to appear on the pass):

- name (owner/operator);
- address/e-mail/phone;
- vessel name/identification number/description;
- vessel type;
- vessel length;
- home base/port/harbour/marina;
- nature of trip(s) (commercial, recreational, other).

57. Information from Environment Southland (to appear on the pass):

- date of issue;
- date of expiry;
- number of pass;
- signature of authority.

58. Vessel/operator information of marine biosecurity relevance (not to appear on the pass):

- origin of trip(s), trip description(s) and intended dates;
- intended date of entering the FMA and expected duration in the FMA;
- where and when was the vessel last cleaned;
- where and when was the vessel last antifouled; or what is your regular scheduled hull maintenance programme i.e. antifoul cleaning/replacement (current surveying plan);
- has gear associated with the vessel been in seawater, used in seawater or stored in seawater outside the FMA?
- has the gear been cleaned since? how and when?
- does your vessel have any compartments that retain residual seawater/ live wells?
- have these compartments/residual seawater been treated?

59. The pass will ensure monitoring and surveillance can be effective despite the extent and isolation of the FMA.

6.3 Rules to implement the principal measures

60. Rules are the statutory provisions associated with pathway management plans. The purposes for which rules can be created are listed in the Biosecurity Act. The proposed rules for the Plan and their purposes are:

Proposed rule 1

The owner or person in charge of a craft entering the Fiordland Marine Area must ensure the craft complies with the following clean vessel, gear and residual seawater standards:

Clean vessel standard: The hull and niche areas have no more than a slime layer and goose barnacles, defined as the Biofouling Threshold for Long-Stay Vessels in the Ministry of Primary Industry's Craft Risk Management Standard: Biofouling on Vessels Arriving to New Zealand dated 15 May 2014.

Clean gear standard: All marine gear and equipment on the craft is visibly clean, free of fouling, free of sediment, and preferably dry.

Residual seawater standard: All on board residual seawater has been treated or is visibly clean and free of sediment.

Contravention of this rule creates an offence under section 154N(19) of the Biosecurity Act.

Reason for the rule: This rule is to ensure that marine organisms are not transferred into the Fiordland Marine Area on craft, gear or in residual seawater. This rule will be the key mechanism for minimising the risk of harmful organisms being conveyed in the area.

Proposed rule 2

The owner or person in charge of a craft in the Fiordland Marine Area must keep records of the actions taken to meet the clean vessel, clean gear and residual water standards in rule 1 of this plan, and must provide those records to an authorised person on request.

Contravention of this rule creates an offence under section 154N(19) of the Biosecurity Act.

Reason for the rule: This rule is to ensure that clean vessel standards are met before craft enter the Fiordland Marine Area.

61. It is necessary for an operator to fully understand the risks posed by the transport of marine pests into the FMA and to have taken all reasonable measures to ensure the craft does not carry any marine pests. This could be demonstrated by the owner or person in charge of the craft having a current Fiordland Clean Vessel Pass. If the owner or person in charge cannot provide a valid Clean Vessel Pass then the vessel would be treated as high risk and automatically inspected. The owner or person in charge would be charged the costs of undertaking that inspection.

Proposed rule 3

Rules 1 and 2 do not apply to craft entering the Fiordland Marine Area in an emergency. For the purposes of this rule an emergency arises when the craft enters the Fiordland Marine Area because of an emergency relating to:

- the safety of the craft; and/or
- the health or safety of any person on the craft.

Reason for the rule: This rule acknowledges that in some circumstances it may be impracticable without endangering the craft or persons on the craft to comply with Rules 1 and 2. (See paragraph 55)

6.4 Alternative options considered for managing the risks

62. A range of different management options were considered for excluding marine pests from Fiordland. These included:

    1. **No action/do nothing** – rely on voluntary actions by vessel operators.
    2. **Status quo** – rely on the current Regional Pest Management Strategy and ad hoc surveillance and reactive compliance.
    3. **Rely on the implementation of a national marine pathways plan at some undetermined time in the future**.
    4. **Regional Pathways Plan** – to promote proactive behaviour change targeting hull/gear fouling with regulatory provisions targeting vessels. (Costs estimated @ $120KPa)

63. In the Economic Analysis Fiordland Marine Area Pathways Plan (Appendix 3) options 2 and 4 were considered. The others were rejected because the risks of potentially high economic and environmental costs arising from inaction and/or delay.

7. Fostering commitment to the Fiordland Pathway Management Plan

64. To successfully implement the Fiordland Pathway Management Plan, all vessel owners/ operators entering and residing in the FMA must recognise and accept the need for the Plan, adopt the clean vessel standards and acquire a Fiordland Clean Vessel Pass.

65. Informing and encouraging vessel owners/operators to take up the Plan provisions requires identifying and making contact. This was the issue of most concern to those who took part in discussions about the Plan. Identifying and contacting local vessel owners/operators was not thought to be difficult whereas identifying vessel owners originating from elsewhere in New Zealand before they arrived in the FMA certainly was. And making contact with vessels coming from overseas was considered to be a significant challenge.

7.1 A Communications Plan

66. Many vessel owners have already been informed about the proposal from regular updates sent to more than 600 contacts over the past 18 months (Section 9). Furthermore, informal consultation during the process of developing this proposal (Section 10) offered a more detailed account. However, during the implementation phase a more far-reaching approach would be necessary given the wider target group. Conveying the need to comply with the clean vessel standards and bilge water procedures as well as a Fiordland Clean Vessel Pass to vessels from throughout New Zealand and overseas would need to be the subject of a comprehensive Communications Plan.

67. The initial focus of the Communications Plan would be two-fold:

Conveying the message to vessel owners/operators within New Zealand who plan to visit Fiordland

68. For vessels based within New Zealand the message could be conveyed most effectively by a publicity campaign. During informal consultation, views were frequently expressed about the need for a combined national (MPI) and regional (regional councils) approach to Fiordland. For this reason, a Fiordland focused promotion coordinated by Environment Southland and involving national and regional marine biosecurity managers is most likely to reach the widest target group.

Conveying the message to vessel owners/operators from overseas who plan to visit Fiordland

69. These vessels raised as much concern as those from other regions of New Zealand, but the difficulty of informing them about the rules in Fiordland would be much higher. As a first step, the following suggestions about ways of contacting these different vessel types were made:

- any vessels that berth at MPI "Ports of first arrival" could be identified and informed of requirements;
- cruise ships would be covered by incorporating biosecurity measures into the Environment Southland Deed of Agreement;

- mega yachts (more than 1 000 t) are subject to the Deed of Agreement with Environment Southland;
- super yachts (more than 500 t) require a pilot to berth and could be identified by contact with agents or the Marine Transport Association.

70. The approach to inform the owner/operators of each of these vessel types needs to be developed as part of the Communications Plan.

71. Once the Plan provisions are bedded in, communication would likely focus on operational matters and the results of monitoring. A Communications Plan would evolve to meet the ongoing needs of the Plan.

8. Implementing the Pathway Plan provisions

72. Much effort has been directed to the issues associated with implementing the proposed Plan. Remoteness and minimal support services have played a major part in determining how to implement workable solutions for the FMA. A commitment from vessel owners/operators is fundamental to keeping pests out, so the provisions must be practical and easily incorporated into vessel operations. To ensure that they are, vessel owners/operators have been involved in working out how best to implement the provisions.

8.1 Implementing the clean vessel, gear and residual seawater standards and bilge water code of practice

73. The following advice and information about cleaning methods and facilities is available to assist vessel owners/operators in meeting the standards.

8.1.1 Advice about cleaning and treatment methods

74. The most important advice for vessel owners/operators tasked with meeting the clean vessel standards is information about cleaning methods and procedures. There is a wealth of information about vessel cleaning methods but much of it is scattered in substantial reports and not easily accessible to vessel owners/operators.

75. To make this available, information about the most effective cleaning procedures has been extracted from the wider material and compiled into a Vessel Cleaning Guide. This guide includes advice about how to clean hulls and an exhaustive list of niche areas for different vessel types, the different types of gear associated with each vessel type, and how to treat residual seawater and bilge water. It is concise, easily accessible and user friendly. This will provide a simple but effective guide to vessel owners and will be accessible on an ES website created for the purpose, as well as being integrated into the application for a Fiordland Clean Vessel Pass.

76. Information provided to pass applicants and holders will be tailored to their vessel and gear types and will also provide specific information about cleaning facilities and resources in their home port. For instance, providing a detailed list of niche areas that are vulnerable to biofouling and pest attachment will enable vessel operators to include specific checks into plans for vessel slipping in Bluff/Dunedin. Furthermore, information about such operations as where tanks/ areas holding water from a 'risk' port must be flushed/exchanged will be included.

77. The Vessel Cleaning and Treatment Methods Guide is included as Appendix 2.

8.1.2 Advice about antifouling

78. Effective antifouling and vessel maintenance is also a critical component of keeping vessel hulls pest free. A range of antifouling materials is available and research is aimed at improving the efficacy of new antifouling products. While the appropriate type of antifouling is necessary for particular vessel types, effective application is also essential. And to lengthen its effectiveness, antifouling can be kept fresh by carefully cleaning off a build-up of slime, something that is easily forgotten.

79. As with cleaning methods, information about the critical role antifouling plays and advice about its use will be made available to vessel owners.

8.1.3 Information about cleaning facilities in Southland

80. Vessels larger than those able to be trailered require facilities for lifting the vessel out of the water for cleaning and antifouling. If facilities are not available when required there is a real risk that vessels will enter Fiordland carrying pests. This may be considered the responsibility of the vessel owner but insufficient cleaning facilities could be seen as a valid reason for not meeting the clean vessel standards.

81. Currently, vessel-cleaning facilities for larger vessels are located at South Port, Bluff Harbour. Vessels are lifted out of the water by the Syncrolift to be cleaned on the hard ground. At times there is a queue for the Syncrolift that can lead to vessel owners choosing not to wait. This may be resolved by an improved formal booking system. Additionally, due to its size, the harbour tug must remain on the Syncrolift for up to two weeks to be cleaned. During that time other vessels cannot access the facilities.

82. A solution needs to be put in place if vessel owners/operators are to commit to meeting the clean vessel standards. Potential solutions such as the use of the port container crane or upgrading facilities in nearby areas have been considered. So too has the latest development in in-water cleaning, that involves the delivery of water under high pressure together with a powerful suction apparatus that collects all material and deposits it in a container to be disposed of on land. Currently, the Southland Regional Coastal Plan does not allow in-water cleaning beyond hand removal of marine pests. However, some flexibility may be provided by the possibility of an exemption to the blanket statement *"In-water cleaning must be in accordance with local authority requirements"*. Given the need for flexibility when vessels are unable to be lifted out of the water, an arrangement with professionally trained and qualified operators could provide a much-needed back up.

8.1.4 The Vessel Quarantine Facility (Fabdock)

83. ES and MPI purchased a Vessel Quarantine Facility (VQF) in 2015 to provide an on-water capability for vessels that might need to be treated for biofouling. This is an inflatable dock that vessels of less than 20 m can enter to isolate them from the surrounding seawater so they can be inspected and possibly treated. Furthermore, the VQF is portable and can be transported by helicopter - an absolute necessity in Fiordland. Vessels that are found in contravention of the clean vessel, gear or residual seawater standards and are therefore a risk can be effectively separated from surrounding water and inspected so a decision about how to treat the vessel can be made. Any use of the VQF for this purpose would be done on a full cost recovery basis. In exceptional circumstances the VQF may also provide a backup for vessels less than 20m when the facilities at Bluff (i.e. Syncrolift) is not available.

8.1.5 Information about hull inspections

84. To consider the role of hull inspections in the Pathway Management Plan provisions it is important first to understand the current situation regarding hull inspections in Bluff and Stewart Island.

85. The primary purpose of the current MPI programme is to inspect moored vessels (Fiordland bound) in Stewart Island and Bluff for marine pests and secondarily to raise the

profile of the importance of marine biosecurity. The overall marine growth and antifoul paint condition on vessels is also assessed in these inspections.

86. Routine inspections take place at approximately the same time each month and involve the vessels in port at that time known to travel to the FMA. There is also an option for on-request inspections whereby conscientious vessel owners can request an inspection at any time but which most often happens close to their next trip to Fiordland. In-water inspections take place by diving. Divers remove undesirable organisms by hand and these are disposed of on land.

87. If hulls or niche areas are found to be carrying marine pests that are named in statute vessel owners are informed. Initially they are informed of the results and recommendations prior to the vessel's next trip to the FMA. Owners may also be contacted directly to determine what their plans are regarding travelling to Fiordland. Slipping and anti-fouling is usually advised to take place before the next trip to Fiordland.

88. The continuation of this hull inspection programme is strongly supported. Vessels that pose a risk to Fiordland are identified as above and action is taken. Trends in hull conditions of vessels in close proximity to the FMA are also monitored. A focus on trends in hull conditions will be an important indicator of how well the Fiordland Pathway Management Plan provisions are being adopted and may justify an adjustment to the current programme.

89. Cleaning can be voluntary or required by a Notice of Direction from ES. There is also a rule under the Regional Pest Management Plan that prevents the possession, sale or offer of sale, propagation, transport or release of *Undaria* within the Southland region but this is not specific to the FMA.

90. Making hull inspections a statutory requirement of the Fiordland Pathway Management Plan is not favoured due to practical difficulties of implementation and enforcement. Rather, hull inspections will be strongly advised and included in the vessel owner package together with information about the availability and location of suitably qualified divers. The need to strengthen the status of hull inspections can be considered on the basis of results once the plan is operative.

8.2 Implementing the Fiordland Clean Vessel Pass

8.2.1 Designing and issuing a Fiordland Clean Vessel Pass

91. ES will design and administer the Fiordland Clean Vessel Pass. Using the IRIS system, applications for a pass can be made directly from an ES website to be created or by e-mail, fax or letter. Essentially, the applicant will be guided through a straightforward application process and fill in the information required. This information will be automatically entered onto the database and may be checked by an ES administrator. If no issues are identified, the required information is provided and a declaration made that the vessel meets the clean vessel and gear standards a Clean Vessel Pass will be issued.

92. Tasks involved in issuing Clean Vessel Passes, checking some applications and managing the database are estimated to require 0.2 FTE. It is anticipated that cleaning, checking and analysing the data would be carried out annually.

8.2.2 Data analysis and use of the database

93. For the first time a comprehensive record of vessels entering or residing in the FMA will be possible. Fiordland Clean Vessel Passes will obviously be a key component of the database but so too will the current contact list of more than 600 individuals and groups. Together these contacts will provide an excellent way of making information, news and updates available to those directly involved or interested in the FMA.

94. Checking the database and analysing the data will reveal patterns of use and trends in vessel operations that may identify specific issues. For instance, information about where vessels come from, what cleaning has been carried out and the intention of when vessels will enter the FMA will allow an assessment of risk that may prove critical. So too could information about where gear has been stored and if it has been cleaned before being used in the FMA. Furthermore, patterns and trends of vessel use are important for identifying possible longer-term improvements to provisions of the Fiordland Pathway Management Plan.

9. Compliance with the Fiordland Pathway Management Plan

95. Essentially there are only two provisions in the Pathway Plan Proposal that are subject to enforcement activities:

- whether a vessel meets the clean vessel, gear and residual seawater standards; and
- whether a vessel operator can demonstrate they have met the standards, by providing the necessary documentation as proof.

96. Of the agencies operating within the FMA, the MPI Fishery Officers' approach to compliance is well documented and proven. This approach was also adopted by the original Guardians (*Marine Conservation Strategy, 2003)*. It is based on increasing compliance intervention from:

➢ ***Voluntary to Assisted to Directed to Enforced (VADE)***

97. Within MPI, voluntary compliance with the rules is encouraged by providing information to increase fishers' awareness and understanding of the rules. Assisted and directed compliance can involve field inspections where fishers are reminded of their obligations and warned about minor breaches. Enforced compliance is appropriate for more serious breaches where officers can issue infringement notices and, for the most serious offences, initiate Court prosecutions.

98. When the Fiordland Marine Guardians was established in 2005, one of its responsibilities was to foster an integrated management approach within the FMA for major areas such as communication, biosecurity, monitoring and compliance. At the outset MFish (now MPI), together with ES and DOC developed an Integrated Compliance Plan for the FMA. This has encouraged the agencies to co-operate, sharing information and conducting joint agency patrols on an annual basis.

99. The Integrated Compliance Plan is currently under review providing an ideal opportunity to integrate proposed Fiordland Pathway Management Plan compliance goals, objectives and actions with the compliance activities of other agencies. This also presents an opportunity for ES to benefit from advice and support offered by MPI compliance staff, who have much experience in the Fiordland marine environment.

100. For the Pathway Management Plan rules to be successfully implemented it is vital that the ***VADE*** compliance approach be adopted by all officers carrying out current and future biosecurity activities in the FMA.

9.1 Voluntary compliance

Information and education

101. Informing and educating vessel owners/operators about the risks of marine pests and how to avoid them fosters voluntary compliance and helps to keep pests out of Fiordland. Informing the local community, regular fiord users and visitors about Fiordland's underwater values and lesser-known vulnerabilities has been a top priority ever since the original Fiordland Marine Guardians formed in 1995. Since *Undaria* was found during a joint-agency compliance patrol in 2010, and a response initiated, information about marine biosecurity and the recommended cleaning measures has been widely distributed by MPI, ES, DOC and the Guardians. The development of this proposal has further reinforced

targeted marine biosecurity messages. Raising awareness about the reason for rules and providing clear advice about the measures to take will enhance voluntary compliance. This message will underpin ES compliance initiatives and also fit seamlessly into the Integrated Compliance Plan for the FMA.

9.2 Assisted and directed compliance

Monitoring and surveillance

102. Monitoring and surveillance patrol activities normally involve vessel inspections. Contact with vessel owners/operators may take place at landing points, fiord anchorage and mooring sites and on the water. On-water vessel inspections are undertaken by divers to detect hull fouling and identify biosecurity risks. Surveillance checks are essential to gauge compliance of local and visiting vessels with the rules. Monitoring and surveillance checks also allow ES officers to provide marine biosecurity information and give advice or directions about the best ways to minimise the risk of spreading unwanted pests.

103. Biosecurity compliance in the FMA suffers from three major issues:

1. a current lack of trained and warranted Biosecurity Act officers with marine pest identification expertise;
2. a need to develop effective vessel boarding protocols and a standard operating procedure (SOP) for undertaking diving inspections of vessel hulls;
3. a need to strengthen the current on-the-water compliance presence.

104. Any one of these issues will compromise marine biosecurity effectiveness in the FMA. To resolve these issues the following needs have been identified.

9.2.1 An increase in the number of Authorised Persons

105. To conduct an effective marine pest compliance programme within the FMA, warranted Biosecurity Act officers with marine pest identification expertise and experience with pest legislation are critical. Environment Southland intends to increase the number of its Compliance and Biosecurity Officers to act as authorised persons under the Fiordland Pathways Management Plan. The same will be promoted within other agencies that are involved in biosecurity related activities within the FMA.

9.2.2 An approved Standard Operating Procedure (SOP)

106. An inspection protocol exists for MPI led joint-agency waterborne patrols in Fiordland. This is based on Fishery Officer powers to initiate vessel inspections. The vessel boarding protocol takes into consideration health and safety, compliance with relevant inspections provisions and enforcement agency legal obligations under the Search and Surveillance Act 2012.

107. ES's Compliance Division will need to tailor a SOP for ES staff involved in their patrol inspections. For instance, an ES Compliance Officer needs to remain above water to initiate contact with the vessel skipper and explain the inspection is being conducted under the provisions of the Biosecurity Act. The vessel operator also needs to know when ES Biosecurity Officers are underwater checking the hull. Environment Southland is intending to develop such procedures with the assistance of other agencies such as MPI. In

particular, MPI officers can assist with training of ES staff involved in surveillance and compliance activities on the water.

9.2.3 An increase in on-water compliance capability

108. The present ES on-water biosecurity compliance capability must be strengthened to conduct the work required for bedding in and enforcing new Pathway Management Plan rules. The current constraints allow only one multi-agency compliance biosecurity trip annually.

109. An estimate of 3-4 biosecurity compliance patrols each year together with an increase in biosecurity trained and warranted officers is considered to be a more realistic level for the needs of the FMA. The regular presence of warranted and non-warranted ES, MPI and DOC biosecurity divers in Doubtful and Breaksea Sounds (as part of the monthly *Undaria* pest monitoring programme) is helpful for checking vessels but not for compliance activities. Experienced owners/ operators of the local fleet are also confident about detecting at risk vessels within the FMA. The ability to have these vessels checked will provide another means of protecting Fiordland from marine pest incursions.

110. Including the three identified issues and their possible resolution in the Pathway Plan will promote an increase in ES marine biosecurity compliance capability. Measures could also be usefully documented in the Draft Integrated Compliance Plan.

9.3 Enforcement

9.3.1 Enforcement of the rules

111. Enforcement activities associated with the proposed Fiordland Pathway Management Plan are provided for under the Regional Pathway Management Plan provisions of the Biosecurity Act.

112. Any owner/operator of a vessel found in the Fiordland Marine Area in contravention of the clean vessel standard rules will be committing an offence under section 154N (19) of the Biosecurity Act. The penalty for such an offence is a fine of $5,000 for an individual and $15,000 for a corporation.

9.3.2 Enforcement actions

113. Given the isolation of Fiordland and the risk of marine pests to the vulnerable marine environment, the following practical enforcement response to fouled vessels encountered on the water has been suggested:

- any owner/operator of a vessel who enters the FMA and is found to be in breach of the plan rules will be served a legal notice of direction by an authorised person requiring them to take the vessel out of the FMA immediately, or as soon as is reasonably practical. The urgency is necessary to minimise the risk of any possible escape of unwanted marine organisms from the vessel and their establishment in the Fiordland ecosystem;
- if a vessel does not have a Clean Vessel Pass it will be treated as high risk and will be inspected automatically. Inspection and any other associated work required to achieve compliance with the Plan rules will be done on a cost recovery basis.

- the vessel may not return to Fiordland waters until it meets the clean vessel standards;
- if the vessel is under 20 m in length and poses a particularly high risk and/or is unable to be safely removed from the FMA provision could be made for hull cleaning in situ using approved methods at the vessel owner/operator's expense.

114. The iconic status of the FMA and responsibility for preventing further marine pest incursions was reflected in the view that vessels in breach of the rules should be treated firmly to encourage other vessels to meet the standards.

9.4 Powers to implement the Plan

115. The following powers may be used to implement the Plan:

Administrative Power	***Biosecurity Act reference***	***Level of Delegation***
The appointment of authorised and accredited persons.	Section 103(3) & (7)	Principal Officer of Environment Southland
Instructions to authorised persons.	Section 104	
Delegation to authorised persons	Section 105	
Power to require assistance	Section 106	Authorised person
Power of inspection & Duties on exercising power of entry	Section 109 & 112	
Entry in respect of offences	Section 111	
Power to record information	Section 113	
General Powers	Section 114	
Power to seize evidence	Section 118	
Power to seize abandoned goods	Section 119	
Power to intercept baggage etc	Section 120	
Power to examine organisms	Section 121	
Power to apply article or substance to place.	Section 121A	
Power to give directions	Section 122	
Power to administer vaccinations	Section 123	
Declaration of restricted area	Section 130	
Power to act on default	Section 128	Management Agency
Liens	Section 129	
Declaration of controlled area	Section 131	
Options for cost recovery	Section 135	
Failure to Pay	Section 136	
Offences	Section 154	Prosecutions Sub-Committee, Environment Southland

10. Costs and effects of the proposed Plan

10.1 Costs of the Plan

116. The estimated costs of implementing and maintaining a work programme to deliver the objectives of the Plan are presented in Appendix 5. The estimated cost to set up the work programme in the first year would be $141,750 and thereafter $120,000 per annum. The costs would be shared between the ES, DOC and MPI with a possible contribution in kind from other sources such as the Royal NZ Navy.

117. Since 2009, ES, DOC and MPI have been sharing the costs of maintaining marine biosecurity in Fiordland including delivering the *Undaria* Incursion Response Programme in Sunday Cove. The parties have indicated a willingness to continue to apply the same principles to the pathways Plan. It is planned to formalise this under a Memorandum of Understanding. There are no unusual administrative problems or costs expected in recovering the costs allocated to any of the persons required to pay the costs.

118. In addition it is estimated in the Cost Benefit Analysis (Appendix 3) that costs of spot cleaning vessels travelling to Fiordland may amount to $496,000/annum. However this would be spread over at least 186 vessels and may be offset by fuel savings from having a clean/antifouled hull.

10.2 Effects of the implementation of the Plan

119. The Biosecurity Act requires that the effects of the implementation of the Plan on economic wellbeing, the environment, human health, enjoyment of the natural environment, and the relationship between Maori, their culture, and their traditions and their ancestral lands, waters, sites, wahi tapu, and taonga, and on the marketing overseas of New Zealand products be considered.

120. The successful implementation of the Plan is expected to provide significant benefits in a range of areas.

Economic Wellbeing

121. The Cost Benefit Analysis (Appendix 3) suggests the major economic benefits would be the saved costs of not having to undertake incursion responses and reduced losses for commercial fishers and marine tourism.

Environment

122. Although the full impacts of marine pests on Fiordland's pristine marine and globally unique ecosystems are not known it can be assumed they would be considerable if not catastrophic. On this basis excluding marine pests from Fiordland and protecting the marine values there represents the largest non-economic benefit of the programme.

Enjoyment of the Natural Environment

123. Fiordland is increasingly recognised as a site of international interest and importance for its unique marine environment. It is likely it will need to cater for increasing numbers of people who wish to visit Fiordland to experience this.

Cultural Values

124. Maori have had a long historical association with Fiordland and its marine values. Iwi representatives have confirmed this through their support of the pathways plan process which they see as a critical means to prevent the adverse impacts of marine pests.

Marketing overseas of New Zealand products

125. Pristine marine environments free of introduced invasive pests in Fiordland could be used to strengthen New Zealand's reputation as a clean, green producer of quality seafood products. Similarly this achievement can be used to help market Fiordland as a premium tourism destination.

10.3 Cost Benefit Analysis and Cost Allocation

126. Assessing the benefits and costs of implementing a Pathway Management Plan for the FMA is a requirement under the Biosecurity Act. The method to be used is the subject of a guidance document released in 2015 to accompany the National Policy Direction for Pest Management Plans and Programmes (2015). There are two relevant components:
    - the cost benefit analysis "Economic Analysis Fiordland Marine Area Pathways Management Plan", presented in Appendix 3; and
    - an assessment of the costs of implementing and managing the Pathway Management Plan together with the proposed allocation of those costs, presented in Appendix 4.

127. The analysis required information about the costs to vessel owners/operators of meeting the standards, the benefit of avoiding further incursion responses, the benefit of a pest free environment to tourist and fishing interests and to indigenous biodiversity.

128. Fiordland presents an unusual situation being isolated and therefore subject to relatively low use. This combination has resulted in limited Fiordland based information and has required assumptions about the costs and benefits of the programme being adopted for the analysis. But the most significant limitation is the evaluation of risks and benefits for Fiordland's marine biodiversity. Indeed, the author states "...the major unknown and unquantifiable variables are the value from protection of biodiversity in the FMA, and the reduction in risk that results from the introduction of the Pathway Management Plan". A similar view was expressed in a cost benefit analysis conducted by Cawthron Institute in 2010 as part of a wider risk assessment for marine biodiversity in Fiordland.

129. While it is clear the current cost and benefit analysis meets the requirements of the Biosecurity Act, the exercise appears to have been understandably compromised by the lack of Fiordland based information despite efforts to locate this.

130. In summary, the economic cost and benefit analysis undertaken only partially reflects the total benefits over costs of the proposed Pathway Management Plan. The ratio would be much greater if the difficult to quantify non-economic values could be factored in. That the FMA and outstanding biodiversity is held in such high esteem locally, nationally and internationally indicates that a very significant effort to keep marine pests out is not only justified but an absolute necessity.

131. The economic analysis in Appendix 3 meets the process requirements in clause 6 of the NPD: Directions on Analysing Benefits and Costs. The cost allocation analysis in Appendix 4 meets the process requirements in clause 7 of the NPD: Directions on Proposed Allocation of Costs for Pest and Pathway Management Plans.

11. Information provided prior to and during the development of this Proposal

132. Providing information is regarded as the most important activity to keep pests out of Fiordland. Information has already been widely disseminated for more than five years, initially as part of the 2009 Fiordland Marine Biosecurity Strategic Plan and Operational Recommendations released in the same year. The task of raising awareness to keep marine pests out of Fiordland is ongoing and forms a major component of implementing the Pathway Management Plan (refer to Section 7.1).

11.1 2010-2014

133. The discovery of *Undaria* during a multi-agency survey in 2010 resulted in MPI, ES, DOC and the Guardians adopting a new Communications Strategy to spread the word about the risk of marine pests and how vessel owners could combat the risk. Information was circulated widely including practical guides for use on the water. The results of monthly *Undaria* surveys continue to be reported.

11.2 2014-2015

134. During the development of this proposal emphasis has remained on communicating with vessel owners/operators, marine biosecurity interests and the wider community. The message continues to focus on the threat of marine pests being transported into the FMA and how vessel owners/operators can prevent this from happening.

135. To ensure the widest distribution of information a list of contacts was compiled numbering more than 600 individuals, groups and organisations. Information has been circulated to commercial tourist charter, recreational fishing, diving and hunting operators and all commercial fishers operating within the FMA since July 2014. Private recreational users are the most difficult group to identify but those using Wilmot Pass, the Deep Cove Hostel and Milford Sound launching facilities have been included as well as a number of fishing, diving and yachting clubs and organisations. A number of science providers, universities and environmental organisations are keenly interested in the outcome of this initiative. Furthermore, harbourmasters, port authorities and marina operators are being kept informed, as are regional councils and agencies other than those actively progressing the initiative.

136. These contacts have all received a series of five updates that track the need for, and development of this proposal. The updates also posed questions and requested feedback from the recipients.

137. Other ways the message has been promoted include dedicated website pages on ES and the Guardians' websites, articles in the Guardians' newsletters and Annual report, interviews with media, presentations at seminars and conferences and attending displays at boat shows.

12. The informal consultation programme (2015)

138. Providing adequate information about this proposal is the first component of meaningful consultation. The effort already invested in making information available is detailed above.

139. A very considerable effort has also been expended on informal consultation over the pathway concept and practical provisions developed in the proposal. Vessel owners/operators and others involved in the FMA with direct experience and knowledge have provided feedback about the Clean Vessel Pass, clean vessel standards and other aspects of the proposal.

140. Given the pivotal role of local and visiting vessel owners/operators they have been given every chance to respond to the draft proposal. Their feedback is also fundamental to ensuring workable solutions as they have the practical knowledge of how provisions might work in the FMA.

141. Informal consultation on the draft Proposal has taken the form of both written feedback and discussions. The Guardians and agencies participated in a number of meetings. The Guardians organised and fronted the meetings and members of the Group supported the Guardians during discussions and also recorded feedback.

142. The following actions have taken place as part of the informal consultation programme:

- regular updates have been presented at Guardians' meetings since November 2013. The Guardians represent all interests in the FMA and updates are the subject of public record;
- presentation to the NZ Marine Sciences Society at University of Otago in July 2014;
- five updates sent to 600+ contacts on the mailing list in July, August, September and November 2014 and March 2015 posed questions and encouraged feedback;
- in November 2014 a presentation and discussion took place at the CRA8 AGM;
- as Kaitiaki of Te Moana o Atawhenua, the Oraka/Aparima runaka, together with the other three southern Kai Tahu runaka, met with ES in April 2015 to share views about the proposal;
- in May 2015 a discussion about a draft proposal took place with some members of commercial fishing companies and small operators who fish for BCO within the FMA;
- the Chair of PAU 5A Management Advisory Committee provided a written response to the draft Proposal in May;
- cruise ship issues were progressed by ES, MPI and Cruise NZ in May 2015;
- in May 2015 questions and clarification sought by tourist operators were discussed informally;
- in May 2015 recreational fishers, divers and hunters met in Gore to discuss the draft proposal.

12.1 Results of informal consultation

143. Feedback received could generally be summarised as:

- informed and thoughtful;
- the initiative was justified for Fiordland;
- the Fiordland clean vessel standards and Clean Vessel Pass were accepted;
- many constructive suggestions were made to improve details of the proposal;
- there were questions about how aspects of the proposal would work;
- the most frequently raised concern was the need to communicate with owners / operators of vessels from other ports/marinas within New Zealand and from overseas before they visited Fiordland;
- a Fiordland Pathways Management Plan for a national icon threatened by vessels from throughout the country deserved strong national support.

144. The issues raised during informal consultation have been considered by the Group as well as others with experience of the Fiordland situation. Possible solutions have been integrated into the appropriate sections of the proposal.

13. Monitoring the performance of the Plan

145. Monitoring the performance of the plan is fundamental for assessing whether it is achieving the objective of keeping pests out of Fiordland. Collecting information about key indicators over time will reveal patterns and trends that are likely to be critical for informed management. For instance, some provisions may require adjustment and indicators may identify what that adjustment should be. Alternatively, if the plan is performing well reviews might be all that are needed.

146. The indicators would include:

- number of pest incursions reported or discovered;
- proportion of vessel owners/operators intercepted not in possession of a current pass;
- proportion of vessels intercepted that do not meet the clean vessel, gear and/or residual seawater standards;
- proportion of hull inspections that do not meet the clean vessel standards.

14. Administrative Provisions

14.1 Duration of the Plan

147. The need for a Fiordland Pathway Management Plan is not likely to decline in the foreseeable future. However, the provisions and requirements may need to be tailored to reflect the dynamic marine biosecurity situation in New Zealand. Therefore, the Fiordland Pathway Management Plan should be reviewed after five years.

14.2 Management agency

148. It is proposed that Environment Southland is the management agency for the Fiordland Pathway Management Plan.

14.3 Compensation

149. It is proposed that no compensation is payable for losses incurred as a direct result of the implementation of the Plan.

14.4 Recovery of costs incurred

In accordance with section 135 of the Biosecurity Act, Environment Southland will, at its discretion, recover actual and reasonable costs.

15. Marine Pest Pathway Policy - Prevention and Collaboration

150. Marine pests have increasingly being reported over the past few years from formerly pest free ports, harbours and marinas around the country. This resulted in the Pathway Management Plan Amendment and more recently pathway initiatives at both the national policy and regional biosecurity management levels.

151. Policy development for marine biosecurity is focused on preventing pests from being transported into new and different areas.

152. Similarly the need for a collaborative approach between central and local government and stakeholders is being recommended by MPI *"For marine pathway management to be effective MPI and regional councils need to work in collaboration with all parts of the system to jointly develop aligned national and regional approaches"*.

153. The respective MPI and regional council roles were recorded in the Pest Management National Plan of Action. Currently, the national and regional roles of direct relevance to the Fiordland situation include:

- ***MPI*** - will lead interventions for:
  - management of risks associated with inter-regional vector movement.

- ***Regional Councils*** - will lead interventions for:
  - management of risks associated with intra-regional vector movement;
  - protection of places recognised by formal regional policy as being of special value to regional communities.

15.1 The Fiordland Proposal - prevention and collaboration in action

154. The proposal for a Fiordland Pathway Management Plan is the first to be based on the Regional Pathway Plan legislation. It has been a collaborative effort over the past 18 months between MPI, ES, DOC, Kai Tahu Oraka/Aparima Runaka and the Guardians, and has been developed according to the statutory requirements.

155. Fiordland is a national icon with values not replicated elsewhere. Accordingly, the proposal has been tailored to the special features of the FMA. The importance of Fiordland is further highlighted by the collaborative national (MPI and DOC) and regional (ES) effort to eliminate *Undaria* from Sunday Cove, Breaksea Sound. Given the threat of further pest incursions into the FMA, the community and agencies are anxious to see the Pathway Management Plan implemented.

156. During the development of the proposal the national and regional roles of MPI and ES have been consistent with those defined above. For instance, ES is responsible for intra-regional matters and MPI takes the lead on inter-regional issues. Therefore the responsibility for informing all vessel owners/operators visiting the FMA about the Pathway Management Plan provisions will be a matter for MPI and ES to resolve collaboratively (Section 7.1). MPI also holds schedules of marine biosecurity management contacts within New Zealand and listings of harbours, ports and marinas throughout New Zealand with identified marine pests. This information will play an important part in implementing the Pathway Management Plan.

157. Given a well-developed proposal and the need to make progress ES will rely on the continued support of MPI together with the other regions to advance the protection of the FMA - an icon for all New Zealanders.

15.2 Timing issues - current national led/regional marine pest initiatives and the Fiordland proposal

158. Initiatives such as MPI's Domestic Marine Pathway Management Project "will provide a framework for prioritising short term and long term actions that can be taken regionally and nationally to improve pathway management and reduce risk across all of the relevant sectors". An associated exercise to identify Immediate Options for Marine Pathway Management is being conducted to provide much needed advice to regional councils about a range of possible interventions. These are not restricted to the Biosecurity Act and include provisions from Coastal Plans and also voluntary provisions.

159. There is no doubt that these initiatives are urgently needed and will provide a wider framework for the Fiordland situation in the longer term. But the Biosecurity Act's Pathway Management Plans have been designed specifically for situations such as the FMA. And delays in making the Fiordland Pathway Management Plan could increase the risk of further incursions - an outcome to be avoided.

16. The alignment of marine biosecurity statutory provisions for Southland and the FMA

160. Whereas pathway management may be the key to keeping pests out of the FMA, related aspects of managing marine pests are catered for by other legislation. For instance, the Southland Regional Pest Management Strategy includes provisions for responding to named marine pests (such as *Undaria*) before an incursion has taken place and after pests have become established.

161. A review of the Southland Coastal Plan scheduled in two years could be an opportunity to promote consistency of provisions and ensure alignment between the Coastal Plan and the Pathway Management Plan for the benefit of the FMA.

16.1 A package of regional biosecurity measures for the FMA

162. The Southland Coastal Plan, Environment Southland Regional Pest Management Strategy and now, Regional Pathway Management Plans contain provisions that respectively address aspects such as unwanted organisms, named marine pests and named marine pest pathways. The alignment of these provisions is likely to deliver a more effective regional defence against marine pests than if these provisions are not coordinated:

- RMA, Southland Coastal Plan (***unwanted organisms***);
- Biosecurity Act, Regional Pest Management Plan (***named marine pests***);
- Biosecurity Act, Pathway Management Plan (***pest pathways)***.

163. In the longer term, an integrated package of measures from relevant statutes could ensure the FMA has increased protection from marine pests. But in the short term the provisions of the Pathway Management Plan can apply specifically to marine pest risk situations such as those facing Fiordland.

Glossary

Terms with a ***** are defined in the Biosecurity Act 1993.

Act means the Biosecurity Act 1993

Authorised Person* means a person for the time being appointed as an authorised person under section 103 of the Act

Costs and benefits* means costs and benefits of any kind whether monetary or non-monetary

Craft* means an aircraft, ship, boat, or other machine or vessel used or able to be used fro the transport of people or goods, or both, by air or sea; and includes an oil rig; and a structure or installation that is imported by being towed through the sea.

Environment Southland means the Southland Regional Council

Operator means the owner or person in charge of a vessel

Vessel means a sea craft

References

Bax, N., Williamson, A., Aguero, M., Gonzalez, E. and Geeves, W. 2003. Marine invasive alien species: a threat to global biodiversity. Marine Policy 27 (4), 313-323.

Cawthron Institute 2013. Biosecurity guidelines for managing seawater discharges from vessels operating in the Fiordland (Te Moana o Atawhenua) Marine Area. Advice document prepared by the Cawthron Institute on behalf of the Ministry for Primary Industries. Version 1.0 (final) 15 p.

Fletcher L M 2015. Bilge water risk to the Fiordland Marine Area. Prepared for Environment Southland via Envirolink Advice Grant 1608-ESRC160. Cawthron Report No. 2775. 24 p. plus appendices.

Appendix 1: Map of Fiordland Marine Area

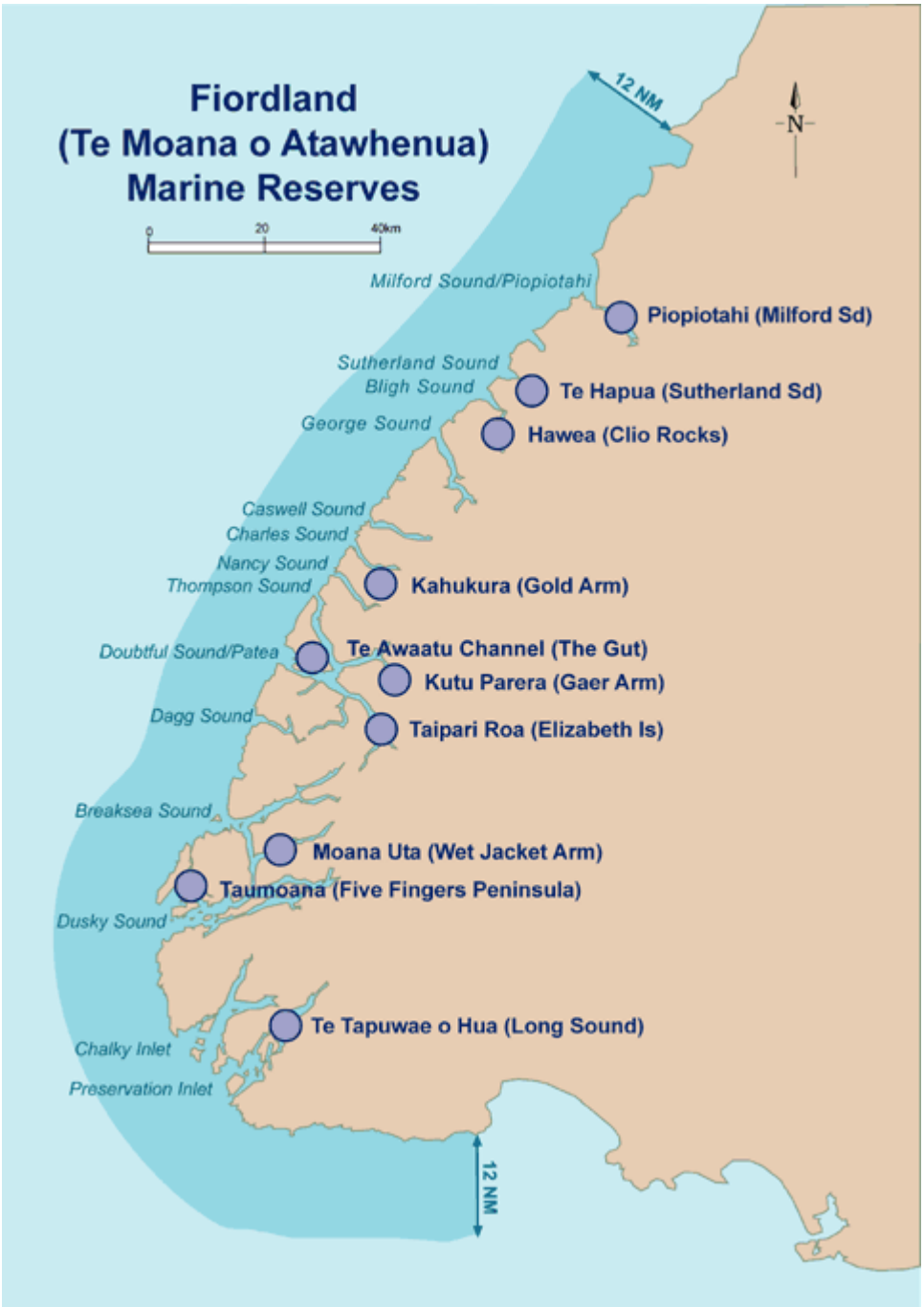

Figure 1: Location map showing the Fiordland Marine Area (FMA). Map courtesy of Department of Conservation.

Appendix 2: Vessel Cleaning and Treatment Methods Guide

Vessel standard - *"Hull and niche areas are to have no more than a slime layer and goose barnacles only"*

All vessels used and moored in seawater (yachts, launches, fishing/aquaculture boats, ferries, barges) can collect marine pests in the growth that accumulates on the vessel bottom. These can then drop off and establish in new locations. See guidelines below for more information on how to ensure your vessel is meeting the Fiordland Privilege Pass Vessel hull standard.

Definitions

The Hull

The immersed (including occasionally immersed) surfaces of a vessel include the following three parts. The definition of hull includes pontoons and has three areas:

- ***hull area*** - the immersed surfaces of a vessel excluding niche areas and wind/water line;
- ***niche areas*** - areas on a vessel hull that are more susceptible to biofouling due to different hydrodynamic forces, susceptibility to coating system wear or damage, or being inadequately, or not, painted, e.g. sea chests, bow thrusters, propeller shafts, inlet gratings, dry-dock support strips, etc. Includes appendages;
- ***wind and water line*** - the area of the hull that is subject to alternating immersion due to a vessel's movement or loading conditions (also known in shipping as the Boot-top).

A Slime Layer

A layer of microscopic organisms, such as bacteria and diatoms, and the slimy substances that they produce.

Goose barnacles

Also called stalked barnacles or gooseneck barnacles, goose barnacles are ubiquitous foulers of tropical, subtropical and temperate seas, with a wide oceanic distribution that includes attachment to drift wood, floating plant debris and vessel hulls, as well as turtles and whales.

Guidelines for moored vessels

In order to be a biosecurity-safe mariner, it is ideal to give your hull regular in-water attention, removing slime before it builds up to more serious growths. Your boat should also have a regular out-of-water clean and a liberal coating of antifouling paint.

As well as making cleaning easier when you do dry dock, slip or haul out your boat, a clean boat (or one with a light slime coating) poses little biosecurity danger.

In-water cleaning guidelines:

Light in-water cleaning should only be undertaken at your usual mooring, berth or marina. It pays to check with your local council or marina about rules and bylaws as some regions do not allow in-water cleaning because of the risk of releasing contaminants in paint.

Do not clean your hull in the water if it has more than a slime layer on it.

Out-of-water cleaning guidelines:

Haul out
The only way to ensure a good thorough clean is to slip or haul out your boat. You should always haul out your vessel for cleaning if it is carrying any more than a slime layer. Regularly cleaning out of the water and replacing your antifouling paint should be a fact of life for boat ownership. And that is not just for biosecurity. As most boaties know, keeping the hull clean improves performance, reduces running costs and prolongs the life of your vessel.

The following are guidelines for cleaning your hull if you are doing it yourself.

When out-of-water cleaning, where possible, arrange to haul your boat out at a facility where waste hull-wash water is contained and treated before going back into the sea or is discharged to a municipal sewerage system. Once again, your local city or regional council or marina will be able to guide you on the best facilities for your needs.

For out of water cleaning, dispose of all debris removed to a rubbish bin that will go to a land-based refuse dump. Some pests are very tough and can survive being out of water for a long time, and some are encouraged to reproduce after being out of the water for some time. So do not dump debris where it might end up back in the ocean.

When cleaning, hose and brush down surface to remove all fouling. Waterblast where required. Pay particular attention to what are known as "**niche areas**" on your boat – areas that stick out or contain water where marine organisms could attach or hide. These include keel and stabilisers; intakes and outlets; propellers and shafts; rudders and casings; earth plates, transducers and areas where antifoul has not been applied such as where the hull has rested during the last painting; anchors and anchor wells (diagram to be inserted)

Antifouling guidelines:

The best way to avoid fouling build-up is to have your hull coated with an appropriate antifoul paint.

Your anti-foul should be replaced at the interval recommended by the manufacturer or retailer, or when the paint has been scraped or damaged.

The antifouling paint used should be suitable for the material of the hull, the type of boat and the use it is put to. Factors considered in this are the speed of travel, time kept at mooring or berth, and the water conditions around your boat. Be sure to strictly follow the manufacturer's and/or retailer's instructions.

If you are unsure on what antifouling paint to use, get advice from your local marine chandlery or marina slip-yard.

This information was obtained from http://www.biosecurity.govt.nz/files/pests/surv-mgmt/marine-fiordland-resource-cards.pdf

Guidelines for trailered vessels

Trailer boats can also relocate marine pests when moved from location to location. In order to be a biosecurity-safe mariner, it is important to ensure you have good decontamination protocol in place.

Before moving your boat and trailer:

- remove any debris such as weeds, crabs, barnacles and check the anchor well, as weeds and other organisms are often brought up on the anchor and chain;
- rinse down boat, trailers and all gear thoroughly with fresh water. At the same time, drain, or thoroughly rinse, areas where seawater might pool, including within the trailer frame; and
- where possible, allow to air dry for several days before using in the new location.

Gear standard: "*All marine gear and equipment is to be visibly clean, dry, free of fouling and sediment*"

Marine gear and equipment has the potential to introduce unwanted marine pests to pristine environments such as Fiordland and has the potential to cause irreparable harm to the biodiversity and beauty of these regions.

See the guidelines below for more information on how to ensure you are meeting the Fiordland Clean Gear standard when taking marine gear and equipment into Fiordland.

What kind of gear and equipment should I be aware of?

All gear and equipment that has been in contact with seawater must meet the Gear standard. See below for specific gear types associated with different vessel types.

Vessel type	Associated equipment
Cruise ships (anchoring)	Anchor, mooring line, dock line, tenders
Superyacht (>1000 tonnes)	Anchor, mooring line, dock line, dive gear, fishing gear, tenders, floats, fenders
Private yachts, motor sailers	Anchor, mooring line, dock line, dive gear, fishing gear, tenders, floats, fenders
Commercial Tourist Cruise vessels , commercial charter vessels	Anchor, mooring line, dock line, dive gear, fishing gear, tenders, floats, fenders
Recreational vessels - syndicate and non-syndicate	Anchor, mooring line, dock line, dive gear, fishing gear, tenders, floats, fenders
Commercial fishing	Anchor, mooring line, dock line, dive gear, fishing gear, tenders, floats, fenders
Research vessels	Anchor, mooring line, dock line, dive gear, fishing gear, tenders, deployable scientific equipment, floats, fenders
Recreational and commercial trailer boats	Anchor, mooring line, dock line, dive gear, fishing gear, tenders, floats, fenders

Guidelines for gear and equipment

Check

- Check for and remove any living or dead marine growth from equipment prior to arriving in Fiordland. Dispose all removed material appropriately on land.

Clean

- Clean **all** equipment in accordance with the guidance on treatment methods prior to arriving in Fiordland.

  Cleaning is required for all equipment, even if there are no visible marine organisms present - microscopic life stages can be on equipment, in seawater (trapped inside kayaks etc) or within ropes, nets or dive equipment.

Where possible, completely **dry** equipment following cleaning. Some marine organisms can survive days exposed to air, so the longer equipment is dried the more effective any cleaning measures will be.

Guidance about treatment methods

Provided below are a range of cleaning options to minimise the risk of transferring marine pests associated with canoes/kayaks, snorkelling/diving gear and fishing/boat equipment (e.g. nets, pots, anchors, ropes).

Choose the best treatment option for your item/s, taking into consideration:

1. time available (e.g. air exposure can take up to one month);
2. access to treatment chemicals;
3. size and amenability of the item/s to the treatment methods (e.g. a kayak may be too big to soak so spraying or air exposure is likely to be a better approach);
4. sensitivity of equipment.

Note: *Follow correct handling precautions when diluting cleaning chemicals from concentrated solutions. Ensure there is adequate ventilation and, where possible, use protective gloves and appropriate eye wear.*

Where possible, use hot water (>40°C) to make up a treatment solution, as this dramatically increases its effectiveness. A good rule of thumb is to use water that is hot enough to submerge your hand in without significant discomfort. Dispose of cleaning solutions well above the high tide mark and away from streams and rivers.

Soak

Soak the item/s as per one of the methods below:

- **Freshwater** for at least 72 hours. If soaking ropes, freshwater should be replaced after 12 hours.

- **Hot water** (> 40°C) for 20 minutes. Temperatures exceeding 48 °C should not be used on dive equipment as certain temperature-sensitive gear may be damaged.

- **5% Palmolive dishwashing detergent/freshwater solution** for 60 minutes. (5% solution = 500 mls of detergent into 10 litres of freshwater).

- **1% Dettol antiseptic/freshwater solution** for 60 minutes. (1% solution = 100 mls of dettol into 10 litres of freshwater).

- **2% bleach/freshwater solution** for 30 minutes *(2% solution = 200 mls of bleach into 10 litres of freshwater).

- **2% Decon 90TM/freshwater solution** for 30 minutes.

- **5% acetic acid/freshwater solution OR undiluted household vinegar** for 10 minutes *(5% solution = 500 mls of acetic acid into 10 litres of freshwater).

Palmolive dishwashing detergent, Dettol, bleach and vinegar can be readily purchased from most supermarkets and service stations.

*Not recommended for dive gear as it may compromise the integrity of some plastics.

Spray/Wash

For items too large or difficult to soak, spray the item/s as per one of the methods below:

- **1% Dettol antiseptic/freshwater** solution and leave for 60 minutes.
- **5% acetic acid/ freshwater solution OR undiluted household vinegar** and leave for 10 minutes.

When spraying an item, ensure you generously cover all surfaces.

Handheld sprayers can be readily purchased at a hardware store, or in the gardening department of supermarkets and other department stores.

Dry

For an item where chemical/ freshwater treatment is not feasible, remove from water and thoroughly air dry for 1 month.

Care is needed to ensure that the item is laid out in a manner that ensures all surfaces are completely dried.

Prolonged air exposure is also an ideal complementary treatment for any item/s that have been soaked or sprayed

This information was obtained from http://www.biosecurity.govt.nz/files/pests/surv-mgmt/protect-fiordland-marine-biodiversity.pdf

Residual Seawater standard – "*All seawater is to be visibly clean, and free of sediment*"

Residual seawater applies to areas that do not drain completely and can be left with a few litres of seawater while in port. Seawater can also be associated with other compartments on vessels such as **ballast, bilge water, holding tanks and live wells**. The type of seawater compartments associated with different vessel types is shown in the following table.

Vessel type	Associated water and compartments
Cruise ships, Navy vessels (non-anchoring)	Ballast water
Cruise ships (anchoring)	Ballast and bilge water
Superyacht (>1000 tonnes)	Bilge water, other compartments
Private yachts, motor sailers	Bilge water, other compartments
Commercial Tourist Cruise vessels, commercial charter vessels	Bilge water, other compartments
Recreational vessels - syndicate and non-syndicate	Bilge water, other compartments
Commercial fishing	Bilge water, live wells/holding tanks, other compartments
Research vessels	Bilge water, other compartments
Recreational and commercial trailer boats	Bilge water, other compartments

In 2013, Cawthron Institute produced Biosecurity Guidelines for Managing Seawater Discharges from Vessels Operating in the Fiordland (Te Moana o Atawhenua) Marine Area for MPI.

All types of seawater discharges were considered and a useful overview about managing such discharges was produced as follows.

Overview of biosecurity guidelines for managing seawater discharges from vessels in Fiordland Marine Area

Ballast water

Discharge prohibited in FMA except emergency

AND

Notify Environment Southland immediately of any emergency discharge

Water in bilge areas

***Prior to entering FMA:**

Pump bilge water into collection tanks[1]
OR
Discharge bilge water overboard[2]
OR
Treat bilge areas with bleach[2]

***Within FMA:**

Pump bilge water into collection tanks[1]
OR
Discharge bilge water[2] overboard in the same fiord where seawater entered the vessel
OR
Treat with bleach before leaving the fiord[2]

Seawater holding tanks & containers

Prior to entering FMA, with empty tanks:

Flush with freshwater

Within FMA, containers filled with seawater from outside FMA:

No discharge within FMA
OR
Treat with bleach prior to discharge[2]

Within FMA, containers filled with seawater from within FMA:

Discharge in the fiord where water was taken on-board[2]
OR
Discharge at least 1km away from a fiord's entrance or outside the FMA[2]
OR
Treat with bleach prior to discharge[2]

Other compartments where seawater may accumulate

Prior to entering FMA, check compartments and IF seawater is present:

Flush with freshwater
OR
Treat with bleach[2]

Within FMA, check compartments and IF seawater is present:

Empty the compartment as much as practical prior to leaving the fiord[2]
OR
Flush with freshwater prior to leaving the fiord[2]
OR
Treat with bleach prior to leaving the fiord[2]

Prior to entering

Within FMA

* *Also applies to tender boats and dinghies towed behind larger vessels.*

[1] *Collection tanks should be emptied at a suitable land-based facility outside of FMA.*

[2] *Must comply with current health & safety and marine pollution regulations, including the Regional Coastal Plan for Southland.*

Instructions for the use of bleach to treat seawater

In the Cawthron Institute report the use of household bleach (approximately 5% sodium hypochlorite) was recommended for situations where more straight-forward approaches to managing risk are not feasible. Bleach was chosen for several reasons:

1. it is used globally as a disinfection agent, including for applications to kill marine organisms for biosecurity purposes;
2. it quickly breaks down in seawater (i.e. biodegradable) and becomes benign rapidly with dilution;
3. it is commonly found on fishing vessels, as it is used to treat ropes for fouling;
4. it is readily available at supermarkets, dairies and service stations;
5. it is relatively safe to handle; however, ensure protective equipment is used for the eyes, hands and skin.

The recommended <u>dosage is 1 part of bleach to 100 parts of seawater</u> which should be left <u>for 1 hour</u> prior to discharge for the treatment to be effective (i.e. 1 L of bleach into approximately 100 L of seawater)

Thus, the amount of bleach to be added will depend on the amount of seawater already present in the container, tank or other area where the seawater has accumulated.

Volume of seawater to treat		Volume of bleach* to add	Example of container
Litres	Cubic metres		
20	0.020	0.20 L (<1 cup)	Standard chilly bin
50	0.050	0.50 L (2 cups)	Standard fish bin
100	0.100	1 L	Drum holding samples collected in the FMA
200	0.200	2 L	

*(~ 5% sodium hypochlorite)

Appendix 3: Economic Analysis Fiordland Marine Area Pathway Management Plan

Report prepared for Environment Southland by Simon Harris 2015

Background

The Fiordland Marine Area is an area that spans from Big Bay in the north to Te Waewae point in the South and 12 nautical miles offshore. Fiordland is well understood for its scenic uniqueness, but there are also significantly unique ecological communities associated with the low light environments caused by the tannin enriched freshwater floating on top of the sea water in the fiords. These marine communities are threatened by the potential introduction of exotic pest species, most immediate of which is invasive marine seaweed *Undaria pinnatifida* (*Undaria*) which is established in Bluff Harbour and Stewart Island, and is the subject of an eradication programme currently underway in Sunday Cove in Breaksea Sound.

Environment Southland (ES) has developed a marine pest Pathway Management Plan for the Fiordland Marine Area (FMA) under the Biosecurity Act 1993. This plan was developed in a partnership with DOC, MPI and the Fiordland Marine Guardians, and is intended to reduce the spread of marine pests into the FMA. The plan has a number of components including education, surveillance, and the requirement for vessels entering the FMA to comply with clean vessel, gear and residual seawater standards and to obtain a Clean Vessel Pass.

This report describes an analysis of the benefits and costs of the FMA. It follows the requirements of the recently released National Policy Direction for Pest Management (2015) (NPD) based on the Guidance Document (V 1.0, September 2015).

Under this guidance the requirement for analysis is required to be ranked. The following assessment criteria outcomes are identified:

- there is potential for moderate interest from vessel operators, with both support and opposition from within this group;
- the relationship between costs and benefits is unknown; and
- there is medium uncertainty, with reasonably high certainty about the impacts and spread risk of marine pests in Fiordland, but high uncertainty about the effectiveness of the measures in preventing their spread into the FMA; and
- there is only a low – medium amount of information available as to the costs and impacts of the proposed Pathways Management Plan.

Under the flow chart in Figure 1 of the Guidance, the Pathways Management Plan would be on the boundary between a low and medium level of analysis. For this reason a medium level of analysis has been adopted. Medium analysis requires that:

- describe the costs (including effects on values) of each option and quantify / value as many as practicable;
- describe the benefits of each option and quantify / value as many as practicable;
- apply cost/benefit analysis techniques for each option;
- take into account the risks to being successful - as required by clause 6(2)(g) of the NPD; and

- conclude by choosing the most appropriate option.

The analysis incorporates risk by calculating a break even probability of success

Scenarios

The analysis adopts two scenarios of action associated with managing the incursion of pests into Fiordland:

1. voluntary action or "Do Nothing" scenario, in which no action is undertaken to manage the entry of pests into the FMA other than the current voluntary removal of weeds from hulls and gear.

2. Pathway Management Plan, which includes a number of actions:
   (a) public awareness and education;
   (b) vessel operators to hold a Clean Vessel Pass when entering the FMA;
   (c) surveillance;
   (d) enforcement.

Impacts for a range of costs (administration, education, surveillance, enforcement and clean vessel costs) and potential benefits (reduced impacts for commercial fishing, recreation, tourism, and biodiversity) are assessed. The results are incorporated into a discounted cashflow analysis over 50 years. The Guidance document suggests 30 years as an appropriate period for analysis, however the completion of spread under the approach assumed here is not completed until year 43, so a 50 year time horizon is more appropriate.

The discount rate of 8% is adopted, based on Treasury rate in the Guidance document, which is appropriate for a public sector policy intervention.

The Net Present Value (NPV) results for each cost and benefit are provided, and an estimate of the potential impact of different levels of success in preventing pests reaching the FMA is calculated. The results are presented as the value which would need to be attributed to biodiversity in order for the Pathways Management Plan to be more worthwhile than doing nothing.

Costs of Pathway Management Plan

Administration

There are a number of agencies involved in management of the Pathways Management Plan. Costs were provided by Environment Southland, based on estimate by the different agencies involved. The costs are incurred for public awareness and education, the development and management of the Clean Vessel Pass, and surveillance and enforcement. These costs are shown in Table 1 below.

The voluntary action programme is assumed to have no specific costs for administration.

Table 1: Estimated administration costs (Environment Southland, pers.comm.)

Item	Year 1	Year 2 onward
Public Awareness/education	$7,000	
Clean Vessel Pass	$17,000	$7,500
Surveillance and enforcement	$117,750	$112,500
Total	$141,750	$120,000

Clean Vessel management

Under the voluntary action scenario vessels are expected to maintain their vessels in a state that maximises for them the fuel and vessel management benefits associated with a clean hull. Gear is expected to be kept clean to the extent that it reduces maintenance and fouling/tangles, and residual water is maintained to the extent that it fits with standard vessel hygiene and maintenance requirements.

For the Pathways Management Plan scenario the Clean Vessel Pass is likely to include additional costs which are discussed below.

The requirements for clean vessels include gaining a Clean Vessel Pass – this is not onerous and can be filled out online and is only required annually. While the pass itself is self-regulating, in order to meet the standards for clean vessel, gear and residual seawater (bilge and ballast) the following requirements must be met:

- ***Vessel*** - only slime and gooseneck barnacles.
- ***Gear*** – visibly clean and free of fouling and sediment
- ***Residual water*** – treated and/or is clear and free of sediment.

There are a varieties of ways in which the requirement for clean vessels will manifest itself. These include increased antifouling, inspection, spot cleaning, and gear cleaning, and residual water cleaning or treatment. Branson (2012) and Sinner et al (2009) both describe a variety of costs associated with attaining clean vessel standards. Sinner et al largely identify more frequent antifouling and hull treatment as the main options, while Branson draws on NIWA work for MPI to describe costs for a range of vessels and sizes. This analysis relies on the Branson work, but assumes that vessel operators maintain a largely fouling free vessel for fuel reasons, and only inspection and spot cleaning is required above the voluntary action scenario to maintain clean vessel status. It is also worth noting that with the Craft Risk Management Standards for biofouling (CRMS), vessels arriving in New Zealand will have reduced incidence of fouling. Once the CRMS provisions are compulsory (from 2018), this is likely to reduce the amount of fouling on contract deep sea vessels, cruise ships and any other overseas sourced vessels arriving in Fiordland. In general these costs should be conservative, but information from a deep sea vessel operator which is occasionally in the FMA indicates that costs for these operators could be very significant if specific trips were required to undertake antifouling.

Costs in this respect would include[2]:

- Steaming to dry dock – up to $50,000/day
- Pilot hire - $5,000
- Pre-treatment - $10,000
- Dry dock hire - $25,000
- Lost fishing time - $50,000 - $100,000 per day.

However, visits to the FMA for these vessels are infrequent, with this operator indicating only 1-2 fishing trips and up to 10 transits depending on the start point, with potential to avoid the area. It seems appropriate therefore that the costings approach adopted below is used for the analysis, noting the potential for significantly greater costs for some operators depending on the circumstances.

The costs for vessels spot cleaning are based on average figures from Branson[3] for all vessel types excepting commercial fishing, for which the 25m vessel figures are used. The commercial fisher vessel is likely to be an overestimate for the typical fishing vessel in Fiordland, but is an adequate and conservative assumption for the purpose of this analysis. Only one spot cleaning per year is assumed, but again this could be exceeded depending on the circumstances. However the assuming an average cost based on a 25m vessel contains some leeway for more frequent cleaning for smaller vessels, which are the more frequent (in terms of number of trips) visitors to the FMA[4].

Costs for cruise vessels are included as per Branson 2012. However it should be noted that these vessels will be covered by the CRMS when they enter the country, and furthermore may be managed by mechanisms outside of the Pathways Management Plan. The costs for these vessels are included but noted as potentially lower.

The clean vessel costs are shown for each category of likely cost (hull cleaning, inspection, gear cleaning, and residual water treatment) in Tables 2, 3, 4 and 5.

Costs for inspection are based on discussions with a dive operator in Bluff[5] with costs for inspecting a 25m vessel estimated at $390, and $190 for a 14 m vessel. The $500/inspection allows for some leeway in the estimates. Gear cleaning and residual water treatment are nominal assumptions and could be significant underestimates for very large trawlers. Table 6 shows the estimated number of vessels travelling to Fiordland (Sinner, Forrest, O'Brien, Piola, & Roberts, 2009).

[2] Bill Healey, Sealord, pers.comm.

[3] Updated to 2015 using Reserve Bank CPI index

[4] The smaller vessels are used for the fresh market, with less need to accommodate the large catches because they return frequently to base to unload for the fresh market.

[5] Mike Haines, pers.comm.

Table 2: Estimated costs for spot cleaning of vessels travelling to Fiordland, additional to voluntary action ($/annum, from Branson 2012)

Vessels	Cost for spot clean/out of water	Opportunity cost	Frequency /year	Proportion requiring treatment	Total (including CPI update)
Commercial fishing	$3,500	$2,944	1	35%	$112,770
Recreational (yachts and launches)	$420	0	1	80%	$33,600
Commercial charters and tourism	$3,500	0	1	35%	$17,150
Research and agency	$3,500	0	1	35%	$4,900
Cruise	$13,750	7000	1	63%	$235,305
Total/annum	**$24,670**				**$403,725**

Table 3: Estimated costs for inspection of vessels travelling to Fiordland, additional to voluntary action (from Branson 2012)

Vessels	Inspection cost	Proportion requiring inspection per annum	Frequency (per annum)	Total (per annum)
Commercial fishing	$500	50%	2	25,000
Recreational (yachts and launches)	0	0	0	-
Commercial charters and tourism	$500	50%	2	7,000
Research and agency	$500	50%	1	1,000
Cruise	0	0%	-	-
Total				**$33,000**

Table 4: Estimated costs for gear cleaning on vessels travelling to Fiordland, additional to voluntary action (from Branson 2012)

Vessels	Costs for inspection and cleaning	Proportion requiring gear cleaning/annum	Total/annum
Commercial fishing	$500	10%	$30,000
Recreational (yachts and launches)	0		
Commercial charters and tourism	0		
Research and agency	0		
Cruise	0		
Total			**$30,000**

Table 5: Estimated costs for treatment of residual water for vessels travelling to Fiordland, additional to voluntary action (from Branson 2012)

Vessels	Costs for inspection and cleaning	Proportion requiring gear cleaning/annum	Total/annum
Commercial fishing	$100	50%	$30,000
Recreational (yachts and launches)	$100	80%	$12,000
Commercial charters and tourism	$100	80%	$3,360
Research and agency	$100	80%	$1,280
Cruise	0		
Total			**$30,000**

Table 6: Vessel movement assumptions, additional to voluntary action (from Sinner, Forrest, O'Brien, Piola, & Roberts, (2009)

Vessels	Number of vessels visiting FMA	Number of vessels Bluff resident	Trips into FMA /year (average)	Average days/trip
Commercial fishing	50	25	12	10
Recreational (yachts and launches)	100	10	1.5	5
Commercial charters and tourism	14	4	3	60
Research and agency	4	0	4	14
Cruise	18	0	4	1
Total	186	39		

Benefits of Pathway Management Plan

Under the voluntary action/Do Nothing scenario no measurable difference is expected from historic experience with marine pests, which has seen reasonably rapid spread of marine pests within New Zealand. The impacts described here are therefore the costs saved as a result of preventing spread into the FMA.

The estimates for a number of benefits were calculated either from specific information (marine tourism), or where specific information was not available by apportioning national level benefits from Branson (2012) to the FMA on an area basis.

Recreational fishing was excluded because no good figures are available on recreational fishing in the FMA – some good data (Davey & Hartill, 2011) is available on the breakdown of recreational fishing activity, but not in a format that allows extrapolation to total population of recreational fishers in the FMA, and recreational shellfish gathering and recreational use of beaches were excluded because they are not considered to be significant activities in the FMA. Aquaculture, which currently does not take place in the FMA, is also excluded.

Fuel benefits were calculated by Branson (2012), and it is likely that there will be some incidental benefits from more frequent antifouling. The limited discussion with the fishing industry has indicated that the preference of vessel operators is to maintain hull fouling at limited levels because of the high fuel penalties associated with fouling. The spot cleaning assumed in this

analysis as a result of these comments means there are not likely to be major impacts on the fuel costs, and so an associated benefit has not been included in this analysis.

Incursion response

Incursion response is estimated variously at $51,120 by Dustow (2010) based on the cost for the *Undaria* incursion response, or $380,000/year by Branson (2012) based on the average of six national incursion responses over the period from 2005/06 to 2010/11. The Branson costs were incurred at a national level for between two and four years, and the figure of three years was adopted. The Branson (2012) figures are considered more appropriate here because they are an average of a number of previous incursion responses while the Dustow (2010) figures are a projection of the costs. The Branson figures may overestimate costs because of the greater potential scale of national incursion responses, but conversely the difficulty of operating in a remote Fiordland environment is likely to increase the costs associated with a Fiordland response. In the absence of a reasonable means of adjusting the national estimates up or down, they are adopted directly.

The Branson (2012) analysis assumes that both incursion response and spread occurs. This appears appropriate because to date incursion responses do not appear to have been successful in halting spread. This has been adopted for the Fiordland situation, but it may be that the incursion responses either do not happen, or alternately are more successful at preventing spread. If either of these were to occur, the benefits of the Plan would be overestimated.

Commercial fishery

The commercial fishery impacts are calculated from the Branson 2012 estimates, with pro rating for the proportion of New Zealand marine area that occurs within the FMA. This proportion is 5.1%, and is derived from the total area of New Zealand territorial waters (182,000km^2) and the size of the FMA (9,280km^2).

Branson (2012) calculated the total loss for New Zealand commercial fishery at $1.1 million per year per species introduced at full spread, which when applied to the FMA on an area apportionment, which gives an estimate of $0.56 million per species per annum at full spread. The Sinner et al (2009) paper cites the value of quota in the FMA at $200 million. On an annualised basis at 9% as per Branson (2012), this gives an annual return of $18 million per annum. The impact suggested by the pro rating of the national estimates is approxiamtely 3% of the annual returns, which seems a reasonably conservative estimate of impact.

Marine tourism

Butcher (2006) estimated the number of visitors to Milford Sound and Doubtful Sound at 560,000 annually. Branson (2012) used GDP loss as a proxy for benefit from marine tourism, which is likely to overestimate the loss but is sufficient for the purposes here. She used an assumption of 1.4% reduction in marine tourism expenditure resulting from reduced visitor numbers associated with loss of amenity from pest incursion. Using these assumptions, and the Butcher (2006) estimate of the daily expenditure ($120) and ratio of GDP to expenditure (0.5775), updated using Reserve Bank inflation statistics between 2005 and 2015, gives an annual GDP reduction of $680,000 from pest incursions at full spread.

Indigenous biodiversity

The estimated loss for New Zealand indigenous biodiversity in Branson (2012) is $0.6 million per annum per species introduced, which converts to $0.03 million per annum per marine pest species for the FMA at full spread based on an area pro rate as for the commercial fishery. This seems a very low estimate for biodiversity impact in the FMA, given its unique flora and fauna, and relatively pristine nature. Sinner, Roberts, & Piola, (2009) assessed the impact introduced marine pests in Fiordland, and estimated the benefits of Fiordland's marine environment at $750 million ($1000/ha) based on an indicative multiplication of the $400/ha derived from Patterson & Cole (1999). This figure is also used in Dustow (2010) in her assessment of the impacts of undaria in Fiordland. This Patterson and Cole (1999) based figure involves some double counting however as it includes fisheries and marine tourism benefits.

The uncertainty around valuing biodiversity, and the disparity between the Branson (2012) and the Sinner, Roberts and Piola (2009) figures means a definite esitmate was not able to be made for the impact on biodiversity. Instead biodiversity is used as a balancing item – i.e. it is left to the decision maker to determine whether they will assign sufficient value to reduced impact on biodiversity to make the strategy worthwhile.

Assumption regarding frequency of arrival and spread

Branson (2012) modelled the arrival and spread of pests as a near certainty under a Do Nothing scenario, with one arriving each year from overseas. This is based on the historic rage of introduction of 34 new species over a nine year period from 2000 – 2008. Based on the 1226 unique vessel arrivals per annum into the FMA, it is expected that Fiordland's rates of introduction on a pro-rata basis would be 15% as great as national arrivals. There are various offsetting factors, with larger ships more prevalent as national arrivals than Fiordland arrivals potentially indicating a lower rate (less hull area for marine pests to hitchhike on), but conversely the shorter distance between ports for local arrivals may mean greater opportunity to spread. A straight pro rata basis is adopted as a main estimate giving an estimated 0.6 arrivals of marine pests annually in the absence of regulatory control.

Branson (2012) also estimated a variety of rates of spread around New Zealand, from which we have adopted the simple average of aquaculture spread rates (18 years). This assumes that a species will spread to occupy its potential habitat in a local area at approximately the same rate as it would spread at a national level. As for arrival rates this has offsetting factors – Fiordland is smaller than the national are over which the Branson spread was modelled, but conversely there are relatively few vessel movements within and between the fiords.

These two factors are used to give a proportion of maximum impact for each year in the absence of any control measures. The number of potential species identified as a risk in Branson (2012) is divided by the annual arrival rate (0.6) to give a period over which maximum arrival rate is achieved (23 years)[6]. The spread rate (17 years) is then added onto that, to give a time period (40 years) by which maximum impact is assumed to have been achieved. The impact between year 1 and maximum impact (year 40) is interpolated linearly.

The voluntary action scenario in the Branson (2012) analysis does allow for some reduction of risk, however this is associated with programmes of action in overseas jurisdictions, which are

[6] This is not strictly correct on a probabilistic basis, but is appropriate for a simplified analytical approach adopted here.

not relevant here. Therefore no difference in rates of arrival or spread between the voluntary action and Do Nothing scenarios are assumed in this analysis.

Assessment of Risks

This section assesses the extent to which the proposed option for the Pathways Management Plan is likely to be affected by risks. This assessment is taken in accordance with Section 6(3) of the NPD.

(a) ***The technical and operational risks of the programme***

The technical and operational risks are relatively minor. Hull cleaning is a well-established operation, both in a hauled out or in water situation. If no species are present on the hulls or gear, there is little risk of spread into the FMA. There are no particularly technical or operational issues in this regard.

(b) ***The extent to which the Pathways Management Plan will be implemented and complied with***

- The implementation and compliance risks are the major source of risk associated with the plan.
- The Plan requires self-policing by vessel owners and operators, with the Clean Vessel Pass a self-assessed process.
- There appears to be general recognition in the community of the value of protecting the FMA, although the extent to which the objectives of the Plan are supported by vessel owners is unknown.
- The costs of compliance are relatively significant, particularly for vessels that are not currently cleaned regularly. However it should also be noted that there are potentially some fuel benefits likely to be gained by cleaning heavily fouled vessels that are not currently cleaned regularly.
- In order to exclude spread of marine pests into the FMA 100% compliance with the Pathway Management Plan would be needed. However lower compliance rates that reduce the rate of spread into the FMA are still likely to produce some benefit.
- Monitoring of vessels will occur, but only a small sample of vessels visiting the FMA are able to be monitored with the level of resources proposed.

These ranges of factors mean that a significant risk of non-compliance does exist, but the extent to which the Clean Vessel Pass requirements will be adhered to is unknown. For that reason the risks are represented in the Results section as a range in risk of arrival into the FMA.

(c) ***Risks that compliance with other legislation will adversely affect implementation of the plan***

There are some risks from RMA and HSNO legislation associated with hull cleaning and antifouling, which will limit where and how these activities can take place and the extent to which cleaning can take place in the water. However these restrictions have been present for a number of years and are well understood. They have been taken into account in the development of the plan and its requirements. No other risks from legislation impacting on achievement of the Pathway Management Plan are known.

(d) ***Risks that public or political concerns will adversely affect implementation of the plan***

While risks of a public or political change always exist, there appears to be general public and political support for the Plan. Enforcing cleaning requirements on vessel operators is potentially politically unpopular, which does represent a risk from a political perspective.

(e) ***Other material risks***

No other material risks are known at this stage.

Mitigation of risks

The main risks are associated with non-compliance with the Clean Vessel requirements, for which the primary methods of mitigation are likely to be education of vessel operators, and surveillance and enforcement.

Education about the requirements of the Pathway Management Plan is allowed for in the operational costings already. Since there are a limited number of vessel operators regularly visiting the area, and because there are a limited number of departure/entry points, the likelihood is that the education plan will be reasonably effective. It is expected therefore that no further reduction in risk will be achieved by increasing the education effort and increased mitigation from this source is not included.

Surveillance and enforcement is also allowed for in the programme costings at ~$100,000 per annum. Additional surveillance and enforcement will reduce the risks, but in order to ensure 100% compliance every vessel would need to be inspected on every trip into the FMA. This would substantially increase costs and more importantly would increase the public and political risks associated with the Plan. We assume therefore that the current level of monitoring offers about the optimum level of risk reduction, and no further mitigation is allowed for from this source. This assumption could be tested during consultation on the proposed Plan.

The mitigation of public and political risk is best achieved by wide socialisation of the proposal prior to implementation, and by minimising the costs associated with the Plan. It appears that these have both been attempted by the proponents of the Plan, and it is likely therefore that risks from this source have been adequately mitigated. No further mitigation of this risk source is allowed for.

Results

There is little information on which to base an assessment of the risk of arrival with the Pathways Management Plan in place. This analysis therefore adopts the approach whereby a range of risks are assumed, with the breakeven assumption regarding the value of biodiversity and level of risk being the decision making criteria.

The results are presented in two forms which follow the format laid out in the NPD Guidance. Using Option 1 approach, a 50% risk of non-achievement of the plan objectives is assumed. This 50% risk is incorporated into the analysis, and an expected value of the costs and benefits estimated.

The second approach uses the Option 2 method in the NPD Guidance. This uses a range of failure risks, and estimates the breakeven value that would need to be assigned to biodiversity values in order for the Plan to be worthwhile.

NPD Option 1 Results

The results for the analysis are shown in Table 7 for the 50% reduction risk of arrival. The results show that there are potentially significant impacts associated with the Do Nothing Scenario, with impacts associated with incursion response forming a significant part (57%) of the $12.43 million NPV cost of that option. However the Pathway Management Plan potentially also has significant costs associated with administration and clean vessel requirements, at a total cost of $15.6 million.

The net benefit of the Pathways Management Plan is the difference between the outcomes under the Do nothing/voluntary scenario and those under the Pathways Management Plan. This difference in outcomes therefore at a 50% risk of arrival is NPV - $3.17 million – i.e. the Pathways Management Plan has costs NPV $3.17 million more than the Do Nothing scenario at a 50% risk of arrival. This represents the value that would have to be exceed from the prevention of damage to biodiversity and ecological health in the FMA in order for the Pathways Management Plan to be worthwhile.

It should be noted that a significant proportion (44%) of the costs are associated with the assumed cleaning of cruise vessels. As noted above, whether these costs would be incurred is not clear, and so the results should be seen as conservative in that respect.

Table 7: Results for key impact items with a 50% reduction in risk of arrival for Pathways Management Plan ($ million NPV (8%))

	Do nothing/ voluntary	**Pathways Management Plan**	**Net Do Nothing – Pathways**
Administration		$1.73	-$1.73
Clean Vessel Pass		$6.28	-$6.28
Incursion response	$7.09	$4.15	$2.94
Commercial fishing	$2.86	$1.84	$1.02
Marine tourism	$2.48	$1.59	$0.88
Total	**$12.43**	**$15.60**	**-$3.17**

NPD Option 2 method

Because the actual risk of non-compliance is unknown, this Option 2 approach estimates the breakeven value that would be required to be assigned to the biodiversity values for a range of risk. The results of this analysis are shown in Table 8. This shows that with an 80% risk of arrival associated with the Pathways Management Plan, biodiversity values protected would need to exceed $6.4 million NPV in order for the plan to be worthwhile. The plan would need to have a threshold risk of arrival of no more than 25% in order for there to be no value attributed to biodiversity protected and the plan still be worthwhile.

Table 8: Breakeven/exceedance value for biodiversity values in order for the Pathways Management Plan to be worthwhile under a range of different risk assumptions ($million NPV(8%))

Risk of non-compliance with Pathways Management Plan	100%	80%	60%	40%	20%	10%
Breakeven value of saved biodiversity	$8.01	$6.40	$4.34	$1.84	-$1.10	-$2.70

Discussion

The analysis shows that there are significant potential costs associated with the Pathways Management Plan. Most of these costs are from the Clean Vessel programme, and the majority of this is from inspection and cleaning of vessels. Some caution is warranted with these figures. They are abstracted from the Branson (2012) report, and the figures for fishing vessels are for 25m vessels, where the majority of the fleet visiting Fiordland is likely to be smaller than this. The larger deep sea vessels are reported (Talleys and Sealord) to only infrequently visit the area and could potentially transit further offshore to avoid the zone. These vessels have been included in the total costs, but may not actually incur significant costs. Similarly the two small vessel operators spoken to did not expect to incur any costs because:

- one operated a trailerable craft which was pulled from the water between trips;
- the other cleaned the hull annually and maintained it in a clean state for fuel reasons, and rarely experienced hull fouling due to speeds travelled.

Similarly as discussed above the costs for cruise vessels, which make up a large part of the overall costs, my not be incurred as part of the plan.

However on the other hand survey information indicates that hull fouling occurs more frequently than vessel operators expect, so costs have been included for a proportion of vessels (35% - 80%). Inspection, gear and residual seawater costs have also been included, but these should be regarded as indicative only, and are not based on any reliable data source.

The major items of benefit have been adapted from a national study, and the degree to which these apply to the Fiordland situation are unproven. However they provide an indicative point of comparison for the vessel and administrative costs of the programme, and suggest that overall the known benefits and costs are of a similar order of magnitude if not of value.

The analysis also assumes that incursion response will be undertaken for all pest incursions in the absence of the Pathways Management Plan, and that these responses are not effective in preventing the establishment and spread of the pests. It may be that incursion responses either do not occur, or when they do occur they reduce or prevent the spread of marine pests. To date incursion responses to marine pests do not appear to have been successful in halting spread, but it may be that they have reduced spread. The extent to which this may occur, and the associated reduction in benefit associated with the Plan, is unknown.

However the major unknown and unquantifiable variables are the value from protection of biodiversity in the FMA, and the reduction in risk that results from the introduction of the Pathway Management Plan. Therefore the results are most appropriately viewed as what combination of risk and biodiversity value is required to be accepted in order for the plan to still be worthwhile. The results of this analysis in Table 8 suggest that at high risk of arrival (>=80%)

even with the plan, values of $6 - $8 million NPV would need to be attributed to biodiversity protected. At smaller risks of arrival (<25%) with the Pathway Management Plan, the strategy would be worthwhile even without any protection of biodiversity.

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Appendix A: Cashflow results year 1 – 10, 49 and 50. 50% reduction in risk of arrival

Year			1	2	3	4	5	6	7	8	9	10	49	50
Costs - additional costs under Pathways Management Plan														
		NPV												
Administration		*$1,734,096*	$141,750	$141,750	$141,750	$141,750	$141,750	$141,750	$141,750	$141,750	$141,750	$141,750	$141,750	$141,750
Clean Vessel Pass - cleaning, inspection etc	*Commercial fishing vessels*	*$2,419,418*	$197,770	$197,770	$197,770	$197,770	$197,770	$197,770	$197,770	$197,770	$197,770	$197,770	$197,770	$197,770
	Recreational (yachts and launches)	*$557,847*	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600	$45,600
	Commercial charters and tourism	*$336,543*	$27,510	$27,510	$27,510	$27,510	$27,510	$27,510	$27,510	$27,510	$27,510	$27,510	$27,510	$27,510
	Research and agency vessels	*$87,836*	$7,180	$7,180	$7,180	$7,180	$7,180	$7,180	$7,180	$7,180	$7,180	$7,180	$7,180	$7,180
	Cruise ships	*$2,878,600*	$235,305	$235,305	$235,305	$235,305	$235,305	$235,305	$235,305	$235,305	$235,305	$235,305	$235,305	$235,305
Total		**$8,014,342**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**	**$655,115**
Impacts - Do Nothing/Voluntary Action scenario														
		NPV												
Probabilistic spread (% maximum species number and site occupancy)			2%	5%	7%	10%	12%	15%	17%	19%	22%	24%	100%	100%
Incursion response		*$7,093,804*	$684,000	$684,000	$684,000	$684,000	$684,000	$684,000	$684,000	$684,000	$684,000	$684,000	$0	$0
Commercial fishing		*$2,864,158*	$19,006	$38,012	$57,018	$76,024	$95,030	$114,036	$133,042	$152,048	$171,055	$190,061	$784,000	$784,000
Marine tourism		*$2,475,919*	$16,430	$32,860	$49,289	$65,719	$82,149	$98,579	$115,008	$131,438	$147,868	$164,298	$677,728	$677,728
Total		**$12,433,881**	**$719,436**	**$754,872**	**$790,307**	**$825,743**	**$861,179**	**$896,615**	**$932,051**	**$967,487**	**$1,002,922**	**$1,038,358**	**$1,461,728**	**$1,461,728**
Impacts - Pathways Management Plan scenario														
		NPV												
Probabilistic spread (% maximum species number and site occupancy)			2%	3%	5%	6%	8%	9%	11%	12%	14%	15%	76%	77%
Incursion response		*$4,150,994*	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$0	$0
Commercial fishing		*$1,843,073*	$12,139	$24,279	$36,418	$48,557	$60,697	$72,836	$84,975	$97,115	$109,254	$121,394	$594,828	$606,968
Marine tourism		*$1,593,243*	$10,494	$20,988	$31,482	$41,975	$52,469	$62,963	$73,457	$83,951	$94,445	$104,939	$514,199	$524,693
Total		**$7,587,310**	**$364,633**	**$387,266**	**$409,900**	**$432,533**	**$455,166**	**$477,799**	**$500,432**	**$523,066**	**$545,699**	**$568,332**	**$1,109,027**	**$1,131,660**
Benefits (Do Nothing - Pathways Management Plan scenario)														

Year			1	2	3	4	5	6	7	8	9	10	49	50
		NPV												
Incursion response		*$2,942,811*	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$342,000	$0	$0
Commercial fishing		*$1,021,085*	$6,867	$13,733	$20,600	$27,467	$34,334	$41,200	$48,067	$54,934	$61,800	$68,667	$189,172	$177,032
Marine tourism		*$882,676*	$5,936	$11,872	$17,808	$23,744	$29,680	$35,616	$41,551	$47,487	$53,423	$59,359	$163,529	$153,035
Total		**$4,846,572**	**$354,803**	**$367,605**	**$380,408**	**$393,210**	**$406,013**	**$418,816**	**$431,618**	**$444,421**	**$457,224**	**$470,026**	**$352,701**	**$330,068**

Appendix 4: Cost Allocation for Fiordland Pathway Management Plan

Measures taken to comply with clause 7 of the National Policy Direction for Pest Management 2015

NPD requirement for cost allocation	Application to Fiordland Pathway Plan
(1) If a proposer of a pest or pathway management plan is determining an appropriate grouping of subjects, or organisms being spread by the subject, for cost allocation analysis, the proposer must consider: (a) whether the subjects, or organisms being spread by the subject, have similar groups of beneficiaries and exacerbators; and (b) whether the exacerbators have similar existing legislative responsibilities and rights; and (c) if applicable, whether the organisms in a proposed pest management plan are at a similar stage of infestation and whether the proposer has similar management objectives for the organisms.	Not applicable as single pathway being considered – movement of vessels and risk goods into Fiordland coastal marine area.
(2) When determining the appropriate cost allocation to be proposed for a pest management plan or pathway management plan, a proposer must:	
(a) identify and estimate the direct costs of the plan and identify the indirect costs of the plan; and	*Programme Administration Costs:* Year 1 $141,750 Year 2 onwards $120,000 *Vessel owners:* Hull cleaning/antifouling, etc. $496,000/annum Indirect costs are minimal. Public access to the Fiordland Marine Area would be restricted for those who do not have a Clean Vessel Pass.
(b) where possible, identify the beneficiaries of the plan; and	Public of NZ (national and regional) – protection of unique biodiversity values in Fiordland CMA, savings in incursion response costs Commercial fishing industry – protection of economic resource Tourism – protection of Fiordland brand Recreational boaters/ fishers – protection of recreational resource
(c) where possible, identify the active and passive exacerbators; and	Active exacerbators: All vessels operating in the Fiordland CMA – fishing fleet, tourism, Cruise liners, recreational craft, DOC, Navy, etc Divers – recreational and commercial Passive exacerbators: Owners/operators of structures in Fiordland CMA
(d) determine whether the best cost allocation method is to have beneficiaries or exacerbators or a mixture of both bearing the costs of the plan and determine the appropriate cost allocation by considering all of the following matters:	Covered at the end of the analysis.
(i) the legislative responsibilities and rights of beneficiaries and	Currently there are no legislative controls on vessels specifically to prevent the spread of

NPD requirement for cost allocation		Application to Fiordland Pathway Plan
	exacerbators;	marine pests/harmful organisms. Coastal plan provisions have some effect, e.g., consent conditions on the state of structures where the owners/operators are required to conduct activities to mitigate marine pest risk. Rules in the RPMS for 9 identified marine pests enable enforcement action to be taken with regard to the discovery these designated species. Currently no specific legal requirement to control hull fouling or the risk of contaminated equipment or water on a vessel. Hull and gear cleaning is done on a voluntary/commercial basis.
(ii)	the management objectives of the plan and the stage of infestation;	The exclusion of marine pests/harmful organisms which may be carried on/in vessels entering/operating in the Fiordland CMA.
(iii)	the most effective agents to undertake the control to meet the objectives of the plan;	The vessel owners are best placed to ensure that their vessels are kept clear of fouling, and ensure that they do not carry risk goods into Fiordland CMA.
(iv)	if proposing that beneficiaries bear any of the costs of the plan, how much each group of beneficiaries will benefit from the plan and whether each group of beneficiaries will benefit more than the amount of costs that it is proposed that it bear;	NZ public – between \$51K- 380K pa – by avoiding the need for an incursion response. Commercial fishers receive - \$560K pa for each commercial species protected from marine pest impacts Marine Tourism - \$680,000 pa
(v)	if proposing that exacerbators bear any of the costs of the plan, how much each group of exacerbators is contributing to the problem addressed by the plan;	Vessel operators with fouled hulls coming into Fiordland CMA from other parts of NZ are the main pathway for harmful organisms to enter Fiordland CMA. Total costs for each category of vessel per annum: Commercial vessels \$167,000 Recreational vessels \$34,000 Commercial Charters/Tourism vessels \$24,000 Research and agency vessels \$6,000 Cruise ships \$235,000
(vi)	the degree of urgency to make the plan;	Urgent – to prevent further marine pest incursions – risk is moderate to high based on presence of marine pests in many NZ ports and the frequency of visits by risk vessels.
(vii)	efficiency and effectiveness of the cost allocation method and proposed cost allocation;	The work programme involving – awareness raising, administration of the clean vessel pass, surveillance and regulatory compliance – will be funded primarily by ES with contributions in cash and kind from MPI and DOC. Most direct costs will be funded from marine fees generated from the Fiordland CMA (consent holders fees and levies on the marine Cruise ship industry) with a taxpayer contribution of \$80,000 pa for ongoing MPI monthly Bluff and Stewart Island vessel hull surveys and inputs from DOC and the Navy. Vessel owners must pay the costs of maintaining the clean vessel standard for Fiordland. Compliance activity – enforcing rules will be funded through cost recovery from non-compliers and/or by prosecution.
(viii)	practicality of the cost allocation method and proposed cost allocation;	This simple allocation formula in general allows costs to lie where they fall and relate directly to the roles and responsibilities of both beneficiaries and exacerbators.

NPD requirement for cost allocation	Application to Fiordland Pathway Plan
(ix) administrative efficiency of the cost allocation method and proposed cost allocation;	The costs of collecting funding and enforcing the rules would be low..
(x) security of funding of the cost allocation method and proposed cost allocation;	Funding from marine fees will depend to a degree on the continued use of Fiordland CMA by the Cruise ship industry. Contributions from central Government will depend on future budget constraints of MPI and DOC.
(xi) fairness of the cost allocation method and proposed cost allocation;	Beneficiaries are contributing in proportion to the benefit from the plan and exacerbators are contributing in proportion to the risks they create.
(xii) whether the proposed cost allocation is reasonable;	The person bearing the costs (the vessel owner/operator) is the owner or person in charge of the goods (the vessel), therefore the cost allocation is reasonable.
(xiii) the parties who will bear the indirect costs of the plan;	Indirect costs are minimal.
(xiv) the need for any transitional cost allocation arrangements;	No
(xv) the mechanisms available to impose the cost allocation; and	General taxation or rates, targeted rates, charges, rules imposing requirements or prohibitions, levies, and voluntary payments are all possible mechanisms..
(e) consider what is the best mechanism(s) to impose the cost allocation, taking into account the cost allocation method chosen, the most effective control tools and agents to undertake the control to meet the objectives of the plan, practicality, administrative efficiency, security of funding and any statutory requirements; and	The mechanisms to be used are marine fees for Cruise ships (voluntary payments), cost recovery from enforcement activities, general taxation and rates, and rules imposing requirements on vessel operators.
(f) document the steps and assessments carried out under sub clause (a) to (e) and the rationale for the proposed allocation of costs, and make them publicly available with the proposal for a pest or pathway management plan.	Given the analysis above, it is proposed that the majority of costs (approx. 75%) are to be borne by exacerbators via rules imposing requirements on vessel operators, marine fees and cost recovery from enforcement activities. Beneficiaries will bear the remainder of the costs (25%) via general taxation and rates.

Cost Allocation for Fiordland Pathways Plan

Fiordland Marine Pathways Plan - Work Programme - Costing		Direct costs ES	Direct costs MPI	Direct costs DOC	Direct Costs Navy	
Total Annual operating cost by Agency		$25,000	$85,000	$5,000	$5,000	
Total Annual operating cost by all Agencies						$120,000
Breakdown of funding						
Beneficiaries						
NZ public - taxpayers			$85,000	$5,000	$5,000	
ES ratepayers		$5,000				
Fishing industry						
Tourism industry						
Recreationalists						
Exacerbators						
Fishing Industry						
Tourism industry						
Recreationalists						
Cruise ship Industry						
Total Industry hull maintenance	$496,000					
Structure owners/consent holders fees		$20,000				

Appendix 5: Estimated costs of the proposed Plan

Proposed Fiordland Marine Pathways Plan - Work Programme - Cost Estimates										
		Who	How much	Unit rates	Cost	Direct costs	Direct costs	Direct costs	Direct Costs	
			Hours	$/hr		ES	MPI	DOC	Navy	
Implementation (Year 1)										
Public Awareness/Communication										
	Compile Data base of vessels/operators	ES	70	50	$3,500					
	Prepare information for CVP etc	ES	35	50	$1,750					
	Publicity/distribute information	ES	35	50	$1,750					
Develop Clean Vessel Pass										
	Design pro forma etc	ES	15	50	$750					
	Design-create CVP website/interface	ES	70	50	$3,500					
	User Acceptance Testing	ES	70	50	$3,500					
	Launch	ES	35	50	$1,750					
	Operate/administer (0.1 FTE)	ES	150	50	$7,500					
						$24,000				
Surveillance/compliance/enforcement										
	Create SOPs	ES	35	50	$1,750					
	Train/authorise staff		70	50	$3,500					
	Undertake Surveys X 4/ann		280	50	$14,000					
	DOC support							$5,000		
	Fisheries support						$5,000			
	Navy support								$5,000	
	Bluff Vessel Survey (MPI)						$80,000			
	Reporting	ES	70	50	$3,500					
						$22,750				
Total Set up and operating Cost by Agency						$46,750	$85,000	$5,000	$5,000	
Total Set up and operating Cost by all Agencies										**$141,750**
Maintenance - Year 2 onward	Undertake Surveys X 4/ann		280	50	$14,000					
	Operate/administer CVP (0.1 FTE)	ES	150	50	$7,500					
	DOC support							$5,000		
	Fisheries support						$5,000			
	Navy support								$5,000	
	Bluff Vessel Survey (MPI)	MPI					$80,000			
	Reporting	ES	70	50	$3,500					
Total Annual operating cost by Agency						**$25,000**	**$85,000**	**$5,000**	**$5,000**	
Total Annual operating cost by all Agencies										**$120,000**