Nō te rere moana Aotearoa
MARITIME NEW ZEALAND

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Level 11,1 Grey Street, PO Box 25620, Wellington 6140
New Zealand

13 September 2021

[redacted]

Our ref: F29789
By email

Dear [redacted]

**Official Information Act request – Niagara**

I refer to your request, dated 16 August 202, in which you requested information regarding the Niagara wreck as follows:

*"I'm looking at a story on oil leaking from the Niagara wreck.*
*In 2005 the Dominion Post reported the oil was almost gone, and MNZ were saying there was little or no risk of polluting the Gulf, according to Nick Quinn, general manager of Maritime New Zealand's pollution response service in Auckland, the report said.*
*Quinn was reported saying the thick viscous oil would have solidified in the cold temperature 120m below.*
*Since then there have been reports from divers saying there is still 1600tonne left in the hull which is slowly disintegrating, and could burst apart at any time.*

*-What is MNZ current policy on the wreck?*
*-Should the remaining oil be taken out?"*

We have considered your request under the Official Information Act 1982 (the Act). Please find attached the following documents:

- *Management of the report of the Niagara – report back*, dated 28 September 2018. The document includes the following attachments:
    - Maritime NZ briefing, *Management of the wreck of the Niagara*, dated 2 March 2018;
    - Navigatus report, *Consequences of Oil Release from* ***Niagara***, dated 17 August 2018;
    - London Offshore Consulting report, ***Niagara*** *Wreck Survey Report*, dated 11 July 2018;
    - Centre for Environment, Fisheries and Aquaculture Science (CEFAS) report, *Management of the wreck of* ***RMS Niagara*** *and the Surrounding Environment*, dated 30 August 2018; and
    - Maritime NZ report, *Management of the wreck of the* ***Niagara****: Business Case*, dated 4 September 2018 (note that we have replaced this with the updated report dated 4 November 2019).

These documents address the first part of your request: *"What is MNZ current policy on the wreck?"*. We have withheld some information within the attached documents under the following sections of the Act:

- Section 9(2)(a) of the Act to protect the privacy of natural persons (the mobile number of the author of the briefing on page 1; and
- Section 9(2)(f)(iv) of the Act to maintain the constitutional conventions for the time being which protect the confidentiality of advice tendered by officials.

We do not consider that the withholding of this information is outweighed by other considerations which render it desirable, in the public interest, to make the information available (section 9(1) of the Act refers).

With regards to the second part of your request: *"Should the remaining oil be taken out?"* – the Government has advised that given the constrained economic climate as a result of COVID-19, we have had to consider the allocation of funding for various initiatives even more carefully than usual. As a result, funding for inspecting the wreck, such as an underwater survey and associated environmental risk assessment of the Niagara, is not being considered at this time.

You have the right to seek an investigation and review by the Ombudsman of this decision. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

If you have any additional queries regarding the management of the wreck of the ***Niagara***, please feel free to telephone Nigel Clifford, Deputy Director, Safety and Response Systems, on (027) 538 5093, nigel.clifford@maritimenz.govt.nz.

Yours sincerely

**Anna Dwen**
Senior Advisor, Government Services

Nō te rere moana Aotearoa
MARITIME NEW ZEALAND

## Management of the wreck of the *Niagara* – report back

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|---|---|
| **Reason for this briefing** | Following a report from officials on the management of the wreck of the *Niagara,* Ministers Genter and Sage requested officials provide further advice on the options contained in that report.<br>This report back details work undertaken since then, provides options and attaches a business case identifying funding requirements if Ministers wish to commission a survey and risk assessment (Option 2) |
| **Action required** | Direct officials as to next steps |
| **Deadline** | N/A |
| **Reason for deadline** | N/A |

**Contact for telephone discussion (if required)**

| Name | Position | Telephone | First contact |
|---|---|---|---|
| **Maritime New Zealand** | | | |
| Nigel Clifford | Deputy Director Safety and Response Systems, Maritime New Zealand | 9(2)(a) | √ |

***ASSOCIATE MINISTER'S COMMENTS***

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|---|---|---|---|
| **Date:** | 28 September 2018 | **Briefing number:** | |
| **Attention:** | James Shaw | **Security level:** | |

**Associate Minister of Transport's office actions**

☐ *Noted* ☐ *Seen* ☐ *Approved*

☐ *Needs change* ☐ *Referred to*

☐ *Withdrawn* ☐ *Not seen by Minister* ☐ *Overtaken by events*

## Background

1. The ***RMS Niagara*** (a United Kingdom-flagged trans-Pacific passenger steamer) hit a sea mine and sank in the Hauraki Gulf, approximately 40 kilometres to the southeast of Whangarei, in 1940. Over the intervening years, there have been infrequent reports to authorities of oil surfacing in the vicinity, apparently from the wreck (the most recent of these was in 2016). In recent times, various parties have raised the profile of the wreck and concerns that it poses a major environmental risk.

2. It is not possible to quantify how much oil was in the vessel when it sailed (maximum capacity was over 4,000 tonnes), how much was lost when it sank, how much leaked during a salvage operation to recover a cargo of gold bullion or how much has seeped out over the years. Substantial amounts (many tonnes) may well remain within the vessel.

3. What is certain is that over time wrecks such as the ***Niagara*** deteriorate, corrode and degrade, thereby increasing the likelihood that any oil within them may escape. Globally there is increasing focus in managing the risks of oil spills from historic wrecks. Given the potential risks posed by the ***Niagara***, Maritime NZ has reviewed the options regarding management of the wreck.

4. Following a request from Ministers Maritime NZ provided initial advice in March 2018 (Attachment 1) outlining three possible wreck management options:

   - Option 1 – Status Quo. The status quo of monitoring via reports received and maintaining a contingency plan for use in the event of a significant[1] release of oil from the wreck;

   - Option 2 – Survey and Risk Assessment. Undertaking an underwater survey and an independent risk assessment to consider the likelihood and consequences of a release, and (if then considered appropriate);

   - Option 3 - Oil Recovery Operation. An oil recovery operation to remove oil remaining in the wreck.

5. At a meeting in May 2018 Ministers Genter and Sage indicated a preference for Option 2 – Survey and Risk Assessment and requested that officials develop a business case to support a possible Cabinet paper on options for the management of the wreck. The business case should:

   - Provide additional information about the preferred option of Survey and Risk Assessment (Option Two);

   - Outline options and costs for funding the survey and risk assessment, including funding via the Oil Pollution Fund;

   - Investigate the opportunities for reducing the cost of the exercise, including by engaging the Royal New Zealand Navy; and

[1] A "Significant" release in terms of this report back is considered to be one where there is the risk of environmental damage and the need for an oil spill response (as opposed to natural dispersion).

- Consider the costs of alternative options including potential clean-up/response costs and the ecological costs of a significant spill.

## Work in support of the Business Case

6. Maritime NZ consulted a number of expert parties in developing the business case. An outline of the work undertaken is provided below. Full reports are attached.

## Modelling of the Costs of a spill from the wreck

7. Navigatus Consulting Limited (Navigatus) is a New Zealand based risk consultancy with extensive experience in risk modelling for the movement of oil in the marine environment and modelling of the economic costs of marine oil spills.

8. Navigatus modelled the consequences of an oil release from the ***Niagara***. Four release quantities were considered; 20, 100, 500 and 1,600 tonnes. These amounts were chosen to reflect the wide range of uncertainty over what oil may remain in the wreck.

9. Navigatus used drift data supplied by Maritime NZ along with a cost model developed for work previously undertaken for Government on the financial liabilities that could arise from an oil spill.

10. Navigatus calculated that the direct costs of a marine oil spill from the wreck might range from $12 million to $108 million. These costs cover only the direct response costs and any direct damage to fishing, aquaculture and tourism. No indirect costs could be estimated nor could any estimate be derived for impacts on Natural Capital[2]. The Navigatus report is at Attachment 2.

## Technical requirements (vessel and equipment) for a survey

11. London Offshore Consultants Limited (LOC) is an international marine consultancy with extensive experience in salvage matters, including wreck management and survey, with experience of working for Government in New Zealand on the ***Rena*** response.

12. LOC provided technical details and costings for the vessel and equipment requirements to undertake a wreck integrity survey. The data is based on its experience in both undertaking and over-sighting similar operations and on the latest hire rates from the international market.

13. [redacted] 9(2)(f)(iv)

14.

[2] Treasury were consulted on the current work to value aspects of natural capital but indicated that at this time the work is still at an early stage so no figures were available.

15. 9(2)(f)(iv) [redacted]

## Wreck integrity and environmental survey requirements

16. The Centre for Environment, Fisheries and Aquaculture Science (Cefas) is a United Kingdom scientific environmental agency with extensive wreck integrity survey and marine environmental survey experience. Cefas work closely with the United Kingdom Ministry of Defence (UK MOD) on a joint risk management programme for some 5,000 wrecks which the UK MOD is responsible for worldwide. Cefas have prepared a technical report (to complement the LOC report) on the wreck integrity survey and environmental survey requirements needed to support a detailed desk-based risk assessment.

17. The requirements detailed in the Cefas report would be used to further scope and define the wreck and environment survey work costed by LOC should the survey option be taken forward. 9(2)(f)(iv) [redacted]

## Business Case

18. As directed by Ministers a business case has been developed to consider the three options, undertake detailed analysis, examine funding options and develop recommendations. Maritime NZ was supported in this work by Price Waterhouse Coopers and the business case follows Treasury guidelines and the standard "five case" format. The full business case is at Attachment 5

19. 9(2)(f)(iv) [redacted]

9(2)(f)(iv) [redacted]

- Highlights that the direct costs of dealing with a significant release of oil from the wreck could be significant (up to $108 million);
- Highlights that indirect costs, the damage to Natural Capital and the reputational damage to New Zealand arising from a significant release of oil from the wreck would be substantial additions to the direct clean-up costs although it has not been possible to quantify these costs;
- Concludes that Option 2 – Survey and Risk Assessment – is essential in order to reduce uncertainty and to allow for appropriate planning as to the way forward. Option 2 is recommended;
- 9(2)(f)(iv)
- Notes that support from the Royal New Zealand Navy is most likely not available until 2020 due to the lack currently of a suitable vessel;
- 9(2)(f)(iv)

[redacted]

## Summary

20. Maritime NZ with support from the Department of Conservation and the Ministry of Transport has completed additional work on options for the management of the wreck of the ***Niagara***. This work includes developing detailed requirements for a survey and risk assessment programme covering both technical and environmental matters, and an economic analysis of the direct costs of a significant oil spill from the ***Niagara***.

21. The direct costs of a significant oil spill from the wreck as modelled could be up to $108 million, excluding indirect costs and the damage to natural capital and to New Zealand's reputation.

22. The costs for a survey and risk assessment programme using commercial vessels are estimated to fall in the range [redacted]; the variation depending mainly on whether a suitable vessel can be sourced from within New Zealand or needs to come from overseas.

23. Vessel support from the Royal New Zealand Navy is unlikely before late 2019/early 2020 (when the newly announced support vessel is forecast to enter service); this vessel offers the potential for significant cost savings should it prove to be suitable and available.

24. [redacted]

[5] The Minister of Transport has responsibility for Transport funding matters.

9(2)(f)(iv)

[redacted]

## Recommendations

25. It is recommended that you:

a. **Note** the work undertaken to support the development of a business case on options for the management of the wreck of the ***Niagara***;

b. 9(2)(f)(iv)

c. [redacted]

d. [redacted]

e. [redacted]

f. **Forward** a copy of this briefing and attachments to the Minister of Conservation, Hon Eugenie Sage, and the Deputy Prime Minister, Rt Hon Winston Peters.

Keith Manch
Director Maritime New Zealand

Minister's Signature

Associate Minister's Signature

Hon Phil Twyford
**Minister of Transport**

Hon James Shaw
**Associate Minister of Transport**

Attachments

1. Maritime NZ – Management of the Wreck of the ***Niagara*** 02 March 2018.
2. Navigatus Report – Consequences of Oil Release from ***Niagara*** Rev 0 17 August 2018.
3. London Offshore Consulting – ***Niagara*** Wreck Survey Report 11 July 2018.
4. Centre for Environment, Fisheries and Aquaculture Science – Management of the wreck of ***RMS Niagara*** and the surrounding environment V1.0 30 August 2018
5. Maritime NZ – Management of the wreck of the ***Niagara:*** Business Case V.1.0 14 September 2018.

# Report

IN-CONFIDENCE

MARITIME NEW ZEALAND

| | |
|---|---|
| AGENDA ITEM NO. | TBD |
| DATE OF REPORT | 2 March 2018 |
| SUBJECT | **Management of the Wreck of the Niagara** |

## Purpose

1. To provide an update to the Associate Minister of Transport and the Minister of Conservation on matters related to the management of the wreck of the ***Niagara***.

## Executive Summary

2. The wreck of the ***Niagara*** located in the Hauraki Gulf has been the source of a number of minor marine oil spills in the years since it sank. There is public concern over the environmental risk posed by the wreck.

3. Internationally, the management of historical wrecks due to the environmental risks they pose is a significant and growing challenge. Technology permits oil recovery operations to be carried out on wrecks and at depths that were previously not considered feasible although at significant cost and with operational risks.

4. The UK authorities operate a comprehensive wreck management regime that uses desk-top risk assessment, survey and inspection of wrecks and, on rare occasions, oil recovery operations.

5. In the case of the ***Niagara*** considerations include uncertainty over the amount of oil in the wreck, the environmentally sensitive nature of the area around the wreck, the potential costs of any activity, funding for the activity, cost recovery considerations, third party interests and the operational risks of any intrusive activity.

6. It may be possible to use the services of the Royal New Zealand Navy to support any survey work process that might take place.

7. Any action relating to the ***Niagara*** raises the question of setting a precedent for possible future historic wreck management activities.

8. Three basic options exist:

   a) The status quo of monitoring via reports received and maintaining a contingency plan for use in the event of a release;

   b) Undertaking an underwater survey and an independent risk assessment to consider the likelihood and consequences of a release, and (if then considered appropriate);

   c) An oil recovery operation to remove oil remaining in the wreck.

9. Costs for an independent risk assessment, informed by an underwater survey are likely to be significant (possibly in the range of [redacted] costs for any oil recovery operation would be very significant (potentially tens of millions).

10. [redacted]

11. Maritime NZ is considering how best to proceed, with the preferred course of action likely to be a formal risk assessment of the wreck, including an underwater survey, in order to determine the level of risk and whether or not an oil recovery operation is appropriate.

## Background

12. The Royal Mail Ship ***Niagara*** (***Niagara***) was built in 1913 in Scotland. The vessel was 524 feet long with a gross tonnage of 13,415, a passenger and crew capacity of 904 and a fuel capacity of 4,324 tons. In 1940 the vessel was owned and operated by the Canadian Australasian Line Ltd and was sailing out of the port of Auckland when it hit a sea mine laid by an undetected German auxiliary cruiser.

13. Amongst the cargo was a secret consignment of UK Government owned gold bullion (590 ingots) being taken to the USA as payment for war munitions. The vessel sank rapidly although all crew and passengers were saved. There was a considerable but un-quantified release of oil from the damage caused by the mine. The sinking occurred approximately 20 miles offshore and 7 miles east of the Hen and Chicken Islands and the wreck lies in 120 metres of water. The position is close to the boundary between Northland and Auckland Regions' Coastal Marine Waters. See map at Appendix 1.

14. In 1941 a salvage operation was conducted to recover the gold bullion. Using a viewing/diving chamber, radio, and a grab lowered from the surface the operation blasted a hole in the hull and successfully recovered 555 gold bars. The remaining boxes were inaccessible to the grab. There was a further substantial but un-quantified release of oil as a result of the blasting activity. In 1953 a further 30 gold ingots were recovered, leaving five bars still unrecovered in the wreck as of today.

15. Over the years since the vessel sank a number of minor oil releases have been observed and reported to authorities. In addition there have been a number of underwater surveys by dive enthusiasts and also using Remote Operated Vehicles (ROVs). In 2000 Maritime NZ and the Northland Regional Council conducted a joint assessment of the pollution risk posed by the wreck. In 2008 an oil sample was recovered after another minor release and sent for sampling at a specialist laboratory. The laboratory reported that the oil was "sticky and semi-solid" and was consistent with being a marine fuel oil.

16. The most recent report of an oil leak from the wreck was received by Maritime NZ in February 2016, from Mr Keith Gordon[1], who operates SeaROV Technologies Ltd and who uses ROVs to conduct underwater services including shipwreck search and survey, and salvage and marine insurance investigation. The leak was seen in photographs provided to Maritime NZ from the wreck site showing very small 'wisps' of oil drifting from the wreck

## Current Situation

17. In recent months interest has been growing in the condition of the wreck and in the potential risk for damage to the environment from a release of oil. Interested parties have written on more than one occasion to the Minister of Transport, the Minister for the Environment, the Minister of Conservation, the Parliamentary Commissioner for the Environment and the Auckland Council. Media reports have been raising the matter for some time.

18. To date, responses have confirmed that agencies are aware of the matter and noted that Maritime NZ has a lead role in the management of any releases of oil from the wreck. Based on previous work dating back many years it is considered unlikely that all remaining oil would be released at one time and that the more likely scenario is that which we are continuing to see – occasional reports of small amounts of oil apparently coming from the ***Niagara*** wreck as it slowly degrades. Monitoring these very small releases has shown that the oil naturally disperses and breaks up and

[1]. Mr Gordon is the author also of "Deep Water Gold", originally published in 2005, which is the story of ***Niagara*** – see http://www.deepquest.co.nz

has not caused any significant environmental impact. In 2016 Maritime NZ prepared a Niagara Contingency Plan to address any oil that emerged from the vessel. That Plan remains in place.

19. Key parties involved in raising the profile of the wreck include the Auckland Conservation Board, Councillor Mike Lee from the Auckland Council, Mr Keith Gordon and Mr Clive Sharp (a salvage expert and owner of the salvage company Subsee Limited). In February 2018 there was an exhibition on the history of the ***Niagara*** and the threat posed by the wreck at the Mangawhai Artists Gallery including a public meeting.

## Wreck Management Practice

20. Internationally there are many thousands of wrecks that pose some degree of risk to the environment. The historical practice was to resolve any hazards to navigation posed by wrecks but not necessarily to deal with any pollution risks. This practice has evolved and changed over time due to the growing awareness of the environmental pollution risks coupled with the availability of technology that did not exist previously to address those pollution risks.

21. If a vessel sinks today then the immediate priority will be the safety of life of those involved but the next priority is the risk to the environment. Complex, and expensive, pollution prevention or mitigation operations are now common when a vessel sinks.

22. However, historical wrecks are posing significant environmental challenges to jurisdictions across the globe; in particular wrecks dating from after approximately 1870 when engine driven (and hence hydro-carbon fuelled) vessels came into widespread use. Jurisdictions are grappling with how to assess the risks from historical wrecks and how to determine what, if any, preventative action could or should be undertaken. Technology will now allow hydro-carbon recovery operations to be undertaken at almost any depth, albeit with the risk of unintended releases and at significant cost.

23. Maritime NZ has been engaged with authorities in the United Kingdom (UK) to understand the current best practice on the management of historical wrecks. The UK Ministry of Defence (MoD) in partnership with the Centre for Environment, Fisheries and Aquaculture Science (Cefas – the UK national operational marine science agency) operate a comprehensive Wreck Management Programme to oversee the more than 5,000 historical wrecks that are the responsibility of the MoD.

24. The UK Programme is based on a three stage approach – stages one and two involve a desk-based environmental risk assessment and a site-based wreck integrity and environmental survey. The desk-based survey uses a formal risk assessment process to consider the likelihood of the release of oil combined with the impacts on the affected environment to produce an overall risk assessment.

25. The site survey using high-resolution multi-beam sonar and ROV or diver sourced imagery supports a detailed analysis of the condition of the wreck. It may be undertaken after the desk-based risk assessment or before; in which case the results inform the risk assessment. Based on the scientific and technical assessment of the results from stages one and two a view can be reached on the overall level of risk (the combination of the likelihood of release given the state of the wreck, and the consequences of an oil release should one occur given the nature of the surrounding environment, the amount of oil etc.). If this overall risk level is judged to be unacceptable then stage three – an oil recovery operation – can be initiated.

26. Maritime NZ is of the view that the UK approach represents best practice for managing the pollution risk from wrecks.

## Considerations Specific to the *Niagara*

### The oil remaining in the wreck

27. It is impossible to determine at present the volume of oil remaining in the wreck. What is known is that the vessel had a capacity of 4,324 tons contained in eleven designated fuel tanks and three ballast tanks and that there were significant but un-quantified releases of oil at the time of the sinking and during the first salvage operation. In addition the vessel has undoubtedly been leaking oil at low or very low rates in the subsequent years – this also may be a substantial amount in total given the elapsed time.

28. Interested parties have speculated that approximately 1,600 tons remains in the wreck. This figure cannot be confirmed at present. Modern technology (e.g. neutron back-scatter) may allow for a non-intrusive assessment of how much oil remains in the wreck during an underwater survey operation but techniques are complex and expensive and results cannot be guaranteed.

29. Speculation has suggested that a rise in sea temperature in the vicinity of the wreck would allow any oil present to flow more easily and so increase the risk of oil escaping from the vessel. In general, heavy fuel oil (of the type understood to have been on-board the ***Niagara***) is a thick, heavy oil. At low temperatures such oils are typically in a semi-solid state – as such it is common for these fuels to be heated to enable easier flowing prior to them being burned in a ship's engines.

30. Maritime NZ sought advice from NIWA as to the possible rise in sea temperature at the wreck site (approximately 120m deep) given the warm weather this summer and higher than usual surface temperatures. The advice indicated that temperature profile over depth in the sea is a complex matter where local conditions – currents, topography etc. can have a significant impact. Nevertheless the deeper the water the more stable the temperature is likely to be. Below 100m variations in surface temperature will have only a limited effect. Maritime NZ considers it most likely that the oil is in a semi-solid or thick liquid form generally and resistant to easy flowing and that surface temperature variation will have little effect on the water temperature at the depth of the wreck.

31. An additional factor to consider is the age of the oil in the wreck. It is now more than 70 years old and will have weathered and aged to some degree depending on how it is contained and how much it is exposed to seawater. As oil ages the more volatile, lighter components degrade quite quickly – giving the hydrocarbon smell typically associated with spilled oil – and the remaining oil 'thickens' and begins to break down. If oil leaks out from containment its behaviour will vary widely depending on its condition in terms of how much it moves within the water column[2]; it may spread across the sea-floor, be dispersed within the water column, rise to the surface or a combination of all three.

32. In a similar way to having no certainty as to the volume remaining, it is not possible to be certain of the current condition of the fuel oil from the ***Niagara*** or exactly how it might behave should it be released from the wreck. The most likely scenario is that it will be buoyant to some degree, consist mainly of the heavy components and that its behaviour will vary depending on the extent of any weathering. The extant contingency plan to respond to a release of oil is based on this scenario. As a heavy fuel oil the oil will be challenging to clean up, resistant to dispersant and slow to break down.

### Environmental Risk

33. The area in the vicinity of the wreck includes the Hauraki Gulf Marine Park, a number of marine reserves and significant coastlines with important ecology. The Hauraki Gulf Marine Spatial Plan (SeaChange) recommends an assessment of the risk posed by the wreck. A large scale release of oil would spread widely in the area and potentially severely impact marine wildlife including important sea bird species. The coastlines likely to be impacted include estuaries, rocky shorelines and islands. It is very challenging to protect these shorelines; the effectiveness of

[2] From the seabed to the surface.

booms may be very limited in some areas due to wind, tides and the size of the areas. In addition some of the shorelines would be challenging to clear up without causing significant damage in the process.

34. There are potential impacts on benthic assemblages – research indicates that contamination of flocculated marine sediments can transport significant amounts of released oil to the seafloor with significant adverse effects on pelagic organisms and infauna. The extent of the impact of spill from the ***Niagara*** on benthic and pelagic ecosystems in the Gulf would depend upon local hydrographic conditions, time of the year (influences the amount of suspended particulate material in the water column) and what proportions and components of the oil entered the water column and what stayed on the seafloor

35. Maritime NZ and the Regional Councils have a good understanding of the sensitive areas, sites and species in the area; this is a standard part of developing the general regional oil spill response plans. In addition Maritime NZ has expert advice and support available through its partnerships with Massey University (recognised worldwide for their work around oiled wildlife) and the Department of Conservation (DOC).

36. A formal assessment specifically focused on the potential environmental impacts of any significant oil spill from the wreck forms a key part of the Wreck Management best practice risk assessment. If this is undertaken for the ***Niagara*** Maritime NZ considers that Cefas would be well placed to undertake the work, supported by New Zealand agencies as appropriate.

## Ownership of the Wreck

37. The legal frameworks around the ownership of wrecks are complex; over time international systems have evolved and changed and New Zealand has changed domestic arrangements. Maritime NZ has received a comprehensive legal opinion on this matter due to its importance to the issue of identifying a responsible party or owner who might be held accountable for the costs of any assessment and oil recovery operations.

38. Given the passage of time and the demise of the company that was operating the vessel in 1940 we have concluded that it is almost certain that a private or commercial owner for the wreck itself no longer exists. Maritime NZ is of the view that ownership is most likely to have vested, in effect, in the Crown.

## Other Party Interests

39. Maritime NZ has undertaken research in the UK to determine what, if any, interests exist in the wreck. Vessel ownership can be complex due to considerations around the hull and machinery components as well as multiple cargo interests. In the case of the Niagara what has been established is that the UK Treasury retains ownership of (and hence an interest in) the remaining gold bullion. As such they would need to be advised of any intrusive activity in regards to the wreck.

40. The wreck lies in Protected Area 2 as defined under the Submarine Cables and Pipelines Protection Order 2009. This area exists to protect the Southern Cross cable and the Pakam East Cable. The Southern Cross cable network is of major structural significance for New Zealand and Australia. As such any activity in the area of the wreck that poses a potential hazard to the cables needs to be coordinated with relevant commercial and Government parties.

41. There are also multiple other parties with an interest in the wreck and/or in the likelihood and consequences of any potential oil release and so with an interest in any potential risk assessment and subsequent oil recovery operations. Government parties would likely include Environment and Conservation plus others, and regional and local authorities. External parties might include Iwi and the local Conservation Boards and the Hauraki Gulf Forum. To date consultation has only occurred with the Ministry of Transport and the Department of Conservation.

## Operational Risks

42. Non-intrusive survey activity poses very little risk of disturbing the wreck. Any intrusive activity that might be recommended as part of the survey would need to be very carefully considered due to the risks of causing a release of oil. Examples might include taking metal samples of plates and panels or attempting to physically investigate the tanks to measure their contents.

43. If the risk assessment led in due course to an oil recovery operation it must be recognised that there is a risk of causing a release of oil while attempting to recover the oil. The vessel is now 105 years old and has been underwater for over 77 years; the metal will be significantly corroded. In such cases experience shows that oil 'migrates' around the vessel if it escapes from the tanks; as such it may be encountered in unexpected places.

44. Should an oil recovery operation result at some time there is a very real risk of an uncontained oil release. Precautionary response measures would need to be mobilised to mitigate this risk.

## Operational Support

45. Informal discussions with the Royal New Zealand Navy have indicated that there may be the technical capability to support the site survey work using ROVs and side-scan sonar. This potential support needs to be requested formally and then confirmed but offers the possibility of reducing direct costs for the wreck survey activity. The Royal New Zealand Navy has no capability to undertake any oil recovery operation.

## Precedent

46. Undertaking an active wreck management programme for the ***Niagara*** may establish a precedent for future activity. While the approach may be appropriate in the individual case under consideration there are potential implications for costs in the future if the same approach were to be taken by default with other wrecks, although there are only a handful of wrecks that might have some degree of environmental risk attached to them.

## Options

47. Broadly speaking there are three options:

    d) Status Quo. Continue monitoring of the situation based on reports received, supported by the contingency plan that is in place;

    e) Survey and Risk Assessment. Undertake an underwater survey and use the information to conduct a revised risk assessment, and (if then considered appropriate);

    f) Undertake an Oil Recovery Operation. A decision to do this would follow a survey and risk assessment [redacted 9(2)(f)(iv)]

48. Status Quo. [redacted 9(2)(f)(iv)]

49. Survey and Risk Assessment. [redacted 9(2)(f)(iv)]

50. Oil Recovery Operation. [redacted 9(2)(f)(iv)]

9(2)(f)(iv)

## Costs

51. 9(2)(f)(iv)

52. The UK authorities indicated that an oil recovery operation mounted for the wreck of the ***Darkdale***[3] cost some nine million pounds sterling (over $16M) to recover 2,000 tonnes of oil.

## Funding for Any Activity related to the *Niagara*

53. Maritime NZ administers the Oil Pollution Fund (OPF) to fund the costs associated with preparing for and responding to marine oil spills. Legally, the money in the OPF could be applied to the costs associated with assessing the risk of continued or future discharge of oil from a wreck, and any consequent oil recovery operation may be considered as part of a 'marine oil spill response'.

54. However, industry contributes to the OPF via the Oil Pollution Levy (OPL) and would likely have major objections to funding any of the possible activities required in regard to the ***Niagara***. These objections would be reasonable given that the underpinnings of the oil pollution response regime and fund are related to 'who creates the risk' and the 'polluter pays' principle and cost recovery being sought from the responsible party/owner.

55. Having said this, the OPF does hold an operational reserve of $2M to pay for immediate response activity prior to an appropriation from Government being made available (typically after a few days), with cost recovery action following on within relevant convention limitations. 9(2)(f)(iv)

56. 9(2)(f)(iv)

57.

58. Finally, if an oil recovery operation was required then the significant potential costs are well beyond the means of the OPF generally, and its operational reserve in particular. Maritime NZ funding could not be used legitimately for the task; in any case sufficient funds are not available. Funding would need to be provided from the Crown.

[3] **RFA *Darkdale*** was a tanker in World War II. She was sunk in 1941 by a German submarine. Her wreck off Jamestown, Saint Helena continued to leak oil, posing a potential environmental threat until MoD divers drained the ship's tanks in 2015.

## Proposed Way Forward

59. Maritime NZ is considering how best to proceed at this time. Based on a view that the current level of uncertainty is unacceptable then, subject to being able to pay for it, the preferred course of action is likely to be to initiate and manage a formal risk assessment of the threat of oil discharging from the wreck of the ***Niagara*** based on the best practice wreck management model as developed and used by UK authorities, including:

    a) An ROV photographic and video survey augmented by a side-scan sonar survey in accordance with UK developed protocols – possibly delivered by a commercial entity or through the New Zealand Navy;
    b) The potential use of neutron back-scatter technology or other similar technologies to attempt to quantify the amount and locations of any oil in the wreck;
    c) A desk top risk assessment undertaken by Cefas using the results of the survey work;
    d) An independent report from Cefas detailing the results of the survey and the results of the risk assessment.

60. If the results of the formal risk assessment indicate a level of risk greater than if no action were to be taken (status quo), then the report delivered may indicate that it is advisable to proceed with an oil recovery operation. However, based on discussions with UK MOD and Cefas it must be noted that it is quite possible that the risk assessment will be inconclusive. This is a challenging and technically difficult area to work in and the results of the survey and risk assessment are likely to be caveated, particularly in regard to the likelihood of a release.

61. Maritime NZ would follow Government guidelines and processes for the procurement of any services required under the proposed way forward.

## Recommendations

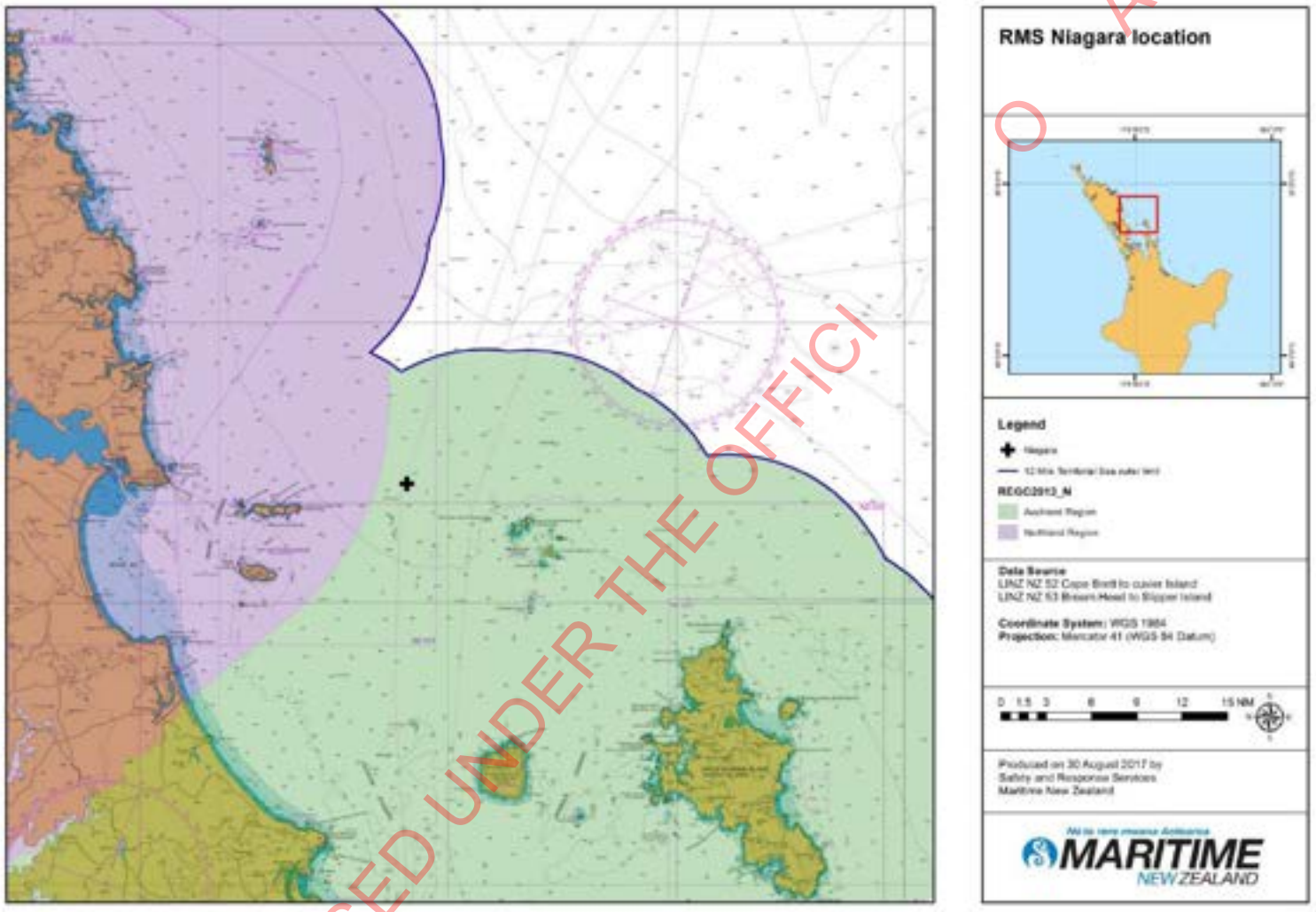
62. It is recommended that you:

    g) **Note** the information provided on the management of the wreck of the ***Niagara***
    h) **Note** the course of action (wreck survey to inform independent formal risk assessment) under consideration by Maritime NZ;
    i) **Note** the potential costs for the course of action under consideration and the potential costs for any consequent oil recovery operation;
    j) [redacted]
    k) **Advise** whether you wish to meet with officials for further discussion

N Clifford

**Nigel Clifford**
General Manager Safety and Response

## Appendix 1: Map showing location of the *Niagara* and relevant boundaries



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# REPORT

## NIAGARA Wreck Survey

## Maritime New Zealand

**Date: 11 July 2018**

**Our Ref: 016357/NEH/R01/LOCL.rev1**

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[redacted]

# 1 INTRODUCTION

## 1.1 Background

1.1.1 The NIAGARA was a trans-Pacific passenger steamer built in 1913 in Scotland with capacity to carry 667 passengers, 237 crew members and 8,216 tons of cargo. The principal particulars of the vessel are below.

| | |
|---|---|
| Length | 159.3m |
| Breadth | 19.3m |
| Depth | 10.5m |
| Gross Tonnage | 13,415 |
| Maximum Speed | 17 knots |
| Crew | 237 |
| Passengers | 667 |
| Fuel Storage Capacity | 4,324 tons |

1.1.2 In June 1940, the NIAGARA struck two contact mines among the 228 laid by the ORION, a German raider disguised as a merchant ship, as it left Auckland on its regular route to Vancouver.[1] It sank at a depth of 120m, 40km Southeast of Whangarei, the northern most city of New Zealand.

1.1.3 It is estimated that from the total of 4,324 tons of fuel oil onboard at the time of sinking, 1,958 tons were lost when the vessel sank. Additional fuel has also since been lost and as such it is assumed that 1,643 tons remains onboard.

1.1.4 Leakage of oil suggests that the steel structure of the ship could be degrading due to corrosion and as such MNZ have an interest to investigate the wreck to determine the threat posed by the remaining oil within the vessel.



[1] SS Niagara (+1940). Available at: https://www.wrecksite.eu/wreck.aspx?58561

1.2 Instructions Received

1.2.1 LOC were instructed by Renny Vandervelde of Maritime New Zealand (MNZ) on 20 June 2018 to provide a report outlining the costs required to undertake an underwater survey to determine the aspects listed below.

- The overall condition of the vessel (significant structural components, etc.)
- Condition / integrity of the fuel tanks
- Quantity of fuel in the vessel
- General survey of the ecosystem

1.2.2 9(2)(f)(iv) [redacted]

1.3 Scope of Report

1.3.1 This report initially outlines the known information regarding the wreck including location, environmental conditions and vessel condition. 9(2)(f)(iv) [redacted] 9(2)(f)(iv) [redacted]

## 2 LOCATION OF VESSEL & ENVIRONMENTAL CONDITIONS

### 2.1 Location

2.1.1 The NIAGARA wreck is located at approximately 35°51'50" S, 174°56'38" E, 40km Southeast of Whangarei. The nearest port is Northport, which is 37km away, as seen in Figure 1. Auckland is 117km to the south of the wreck.

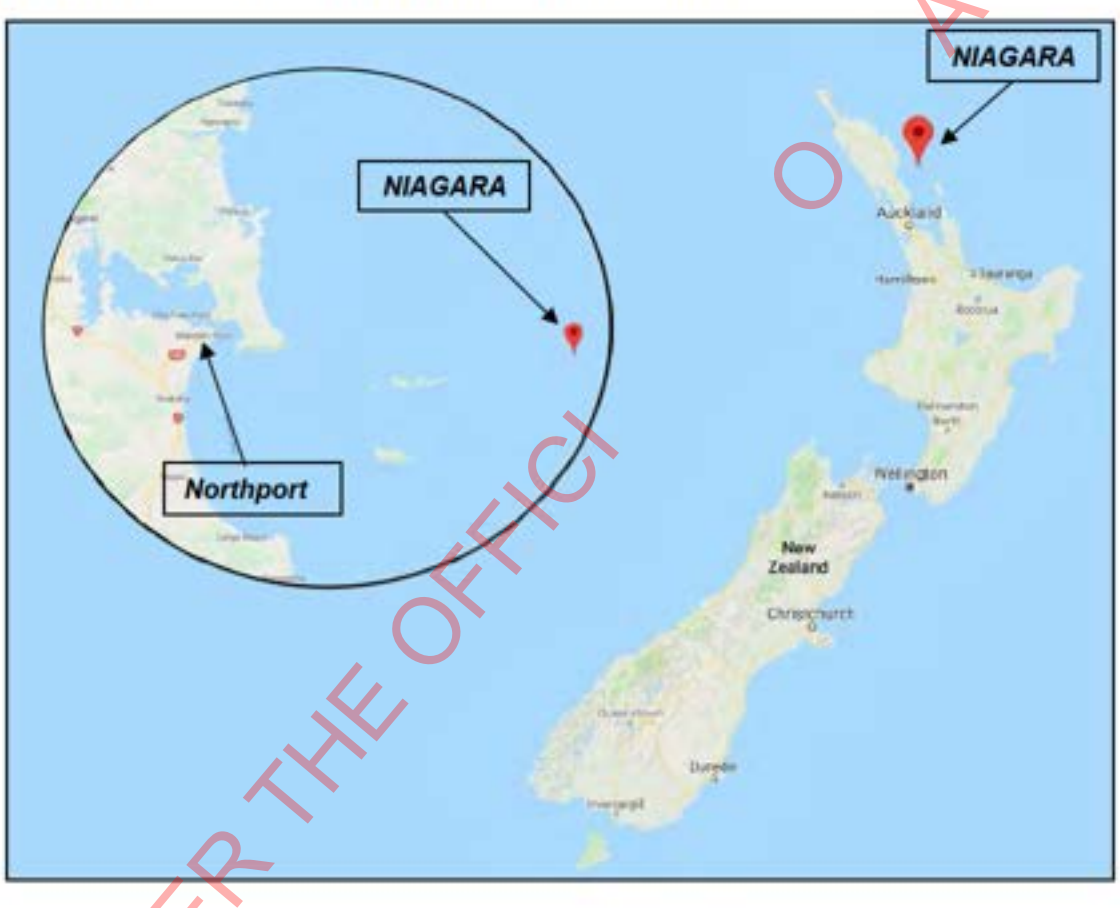



**Figure 1:** Location of NIAGARA wreck.

2.1.2 The wreck is located approximately 1 nautical mile from subsea cables within a protected area. Approval is required for anchoring in this location and as such this should be considered when selecting vessels and developing the methodology for the survey.

2.1.3 We are advised by MNZ that approval may be granted to anchor within the vicinity of the wreck subject to approval of the mooring arrangement being granted by MNZ.

## 2.2 Environmental Conditions

2.2.1 Preliminary environmental data has been obtained for the wreck site, illustrated in Figure 2 and

2.2.2 Figure 3 for wind and wave data respectively. More benign weather conditions occur in the spring and summer months between September and February. If possible, it is recommended that any site works are carried out within this period to reduce weather downtime and therefore minimise risk of cost escalation.

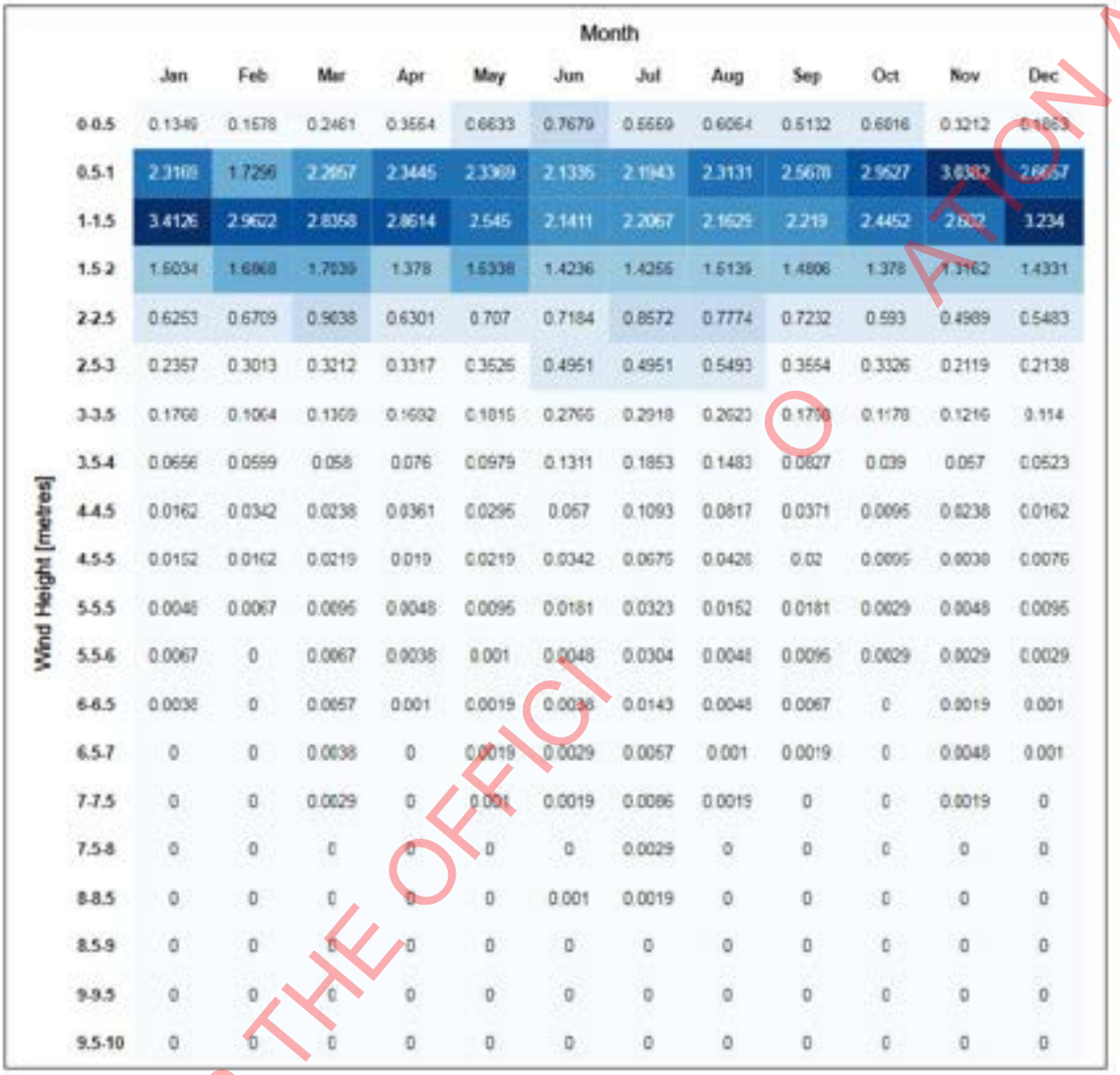
2.2.3 A more detailed environmental assessment should be completed once the vessel to be used for the survey and its associated operating limits are known.

Month

| Wind Speed [knots] | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-5 | 0.7184 | 0.7127 | 0.7023 | 0.5911 | 0.5236 | 0.4067 | 0.3716 | 0.4267 | 0.4676 | 0.5369 | 0.5493 | 0.6947 |
| 5-10 | 2.2285 | 2.0061 | 1.9648 | 1.9909 | 1.7058 | 1.5215 | 1.4911 | 1.6488 | 1.5234 | 1.6441 | 1.7505 | 2.1762 |
| 10-15 | 2.659 | 2.4442 | 2.66 | 2.564 | 2.3473 | 2.0674 | 2.3131 | 2.2665 | 2.3064 | 2.448 | 2.4699 | 2.8044 |
| 15-20 | 1.8988 | 1.7286 | 2.0242 | 1.9102 | 2.1164 | 2.1202 | 2.0926 | 2.1743 | 2.1297 | 2.1126 | 2.1563 | 1.8227 |
| 20-25 | 0.726 | 0.6025 | 0.8154 | 0.8377 | 1.2639 | 1.3333 | 1.2345 | 1.2269 | 1.1927 | 1.2155 | 0.9104 | 0.7337 |
| 25-30 | 0.2186 | 0.1777 | 0.2499 | 0.2594 | 0.4286 | 0.5132 | 0.6462 | 0.5464 | 0.4105 | 0.4248 | 0.2832 | 0.1958 |
| 30-35 | 0.0551 | 0.0561 | 0.0608 | 0.0437 | 0.0827 | 0.1749 | 0.2433 | 0.153 | 0.1444 | 0.0827 | 0.0656 | 0.0466 |
| 35-40 | 0.0106 | 0.0038 | 0.0114 | 0.0143 | 0.0133 | 0.0371 | 0.0599 | 0.0342 | 0.0342 | 0.0171 | 0.0181 | 0.0095 |
| 40-45 | 0.0029 | 0 | 0.0038 | 0 | 0.0029 | 0.0067 | 0.0257 | 0.0076 | 0.0019 | 0.0029 | 0.0076 | 0.001 |
| 45-50 | 0 | 0 | 0.0019 | 0 | 0 | 0.001 | 0.0057 | 0 | 0 | 0 | 0 | 0 |
| 50-55 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 |
| 55-60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60-65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Figure 2:** Wind speed percentage probability at wreck site[2].

[2] Sourced from MetOceanView - https://app.metoceanview.com/hindcast/sites/hrki/-35.86/174.941



| Wind Height [metres] | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 0-0.5 | 0.1349 | 0.1678 | 0.2461 | 0.3564 | 0.6833 | 0.7679 | 0.6659 | 0.6064 | 0.5132 | 0.6816 | 0.3212 | 0.1853 |
| 0.5-1 | 2.3169 | 1.7296 | 2.2657 | 2.3445 | 2.3369 | 2.1335 | 2.1943 | 2.3131 | 2.5678 | 2.9527 | 3.0382 | 2.6657 |
| 1-1.5 | 3.4126 | 2.9622 | 2.8358 | 2.8614 | 2.545 | 2.1411 | 2.2067 | 2.1629 | 2.219 | 2.4452 | 2.602 | 3.234 |
| 1.5-2 | 1.5034 | 1.6868 | 1.7039 | 1.378 | 1.5338 | 1.4236 | 1.4255 | 1.5139 | 1.4806 | 1.378 | 1.3162 | 1.4331 |
| 2-2.5 | 0.6253 | 0.6709 | 0.9038 | 0.6301 | 0.707 | 0.7184 | 0.8572 | 0.7774 | 0.7232 | 0.593 | 0.4989 | 0.5483 |
| 2.5-3 | 0.2357 | 0.3013 | 0.3212 | 0.3317 | 0.3526 | 0.4951 | 0.4951 | 0.5493 | 0.3554 | 0.3326 | 0.2119 | 0.2138 |
| 3-3.5 | 0.1768 | 0.1064 | 0.1369 | 0.1632 | 0.1815 | 0.2765 | 0.2918 | 0.2623 | 0.1758 | 0.1178 | 0.1216 | 0.114 |
| 3.5-4 | 0.0656 | 0.0599 | 0.058 | 0.076 | 0.0979 | 0.1311 | 0.1853 | 0.1483 | 0.0827 | 0.039 | 0.057 | 0.0523 |
| 4-4.5 | 0.0162 | 0.0342 | 0.0238 | 0.0361 | 0.0295 | 0.057 | 0.1093 | 0.0817 | 0.0371 | 0.0095 | 0.0238 | 0.0162 |
| 4.5-5 | 0.0152 | 0.0162 | 0.0219 | 0.019 | 0.0219 | 0.0342 | 0.0675 | 0.0428 | 0.02 | 0.0095 | 0.0038 | 0.0076 |
| 5-5.5 | 0.0048 | 0.0067 | 0.0095 | 0.0048 | 0.0095 | 0.0181 | 0.0323 | 0.0152 | 0.0181 | 0.0029 | 0.0048 | 0.0095 |
| 5.5-6 | 0.0067 | 0 | 0.0067 | 0.0038 | 0.001 | 0.0048 | 0.0304 | 0.0048 | 0.0095 | 0.0029 | 0.0029 | 0.0029 |
| 6-6.5 | 0.0038 | 0 | 0.0057 | 0.001 | 0.0019 | 0.0038 | 0.0143 | 0.0048 | 0.0067 | 0 | 0.0019 | 0.001 |
| 6.5-7 | 0 | 0 | 0.0038 | 0 | 0.0019 | 0.0029 | 0.0057 | 0.001 | 0.0019 | 0 | 0.0048 | 0.001 |
| 7-7.5 | 0 | 0 | 0.0029 | 0 | 0.001 | 0.0019 | 0.0086 | 0.0019 | 0 | 0 | 0.0019 | 0 |
| 7.5-8 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0029 | 0 | 0 | 0 | 0 | 0 |
| 8-8.5 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.0019 | 0 | 0 | 0 | 0 | 0 |
| 8.5-9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9-9.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9.5-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Figure 3:** Wave height percentage probability at wreck site[3].



[3]Sourced from MetOceanView - https://app.metoceanview.com/hindcast/sites/hrkl/-35.86/174.941

## 3 WRECK CONDITION

### 3.1 Oil Remaining Onboard

3.1.1 It is estimated that there was a total of 4,324 tons of fuel onboard at the time of sinking and an estimated 1,958 tons were lost during the event since six tanks were destroyed. The remaining tanks with fuel contained within at the time of departure on the voyage are listed below.

| | | |
|---|---|---|
| Mid Cross (Port) | - | 273 tons |
| Mid Cross (Starboard)* | - | 285 tons* |
| Side Boiler Room (Aft Port) | - | 236 tons |
| Side Boiler Room (Aft Starboard) | - | 236 tons |
| Aft Cross (Port) | - | 411 tons |
| Aft Cross (Starboard) | - | 389 tons |
| Water Ballast 4 & 5 | - | 536 tons |

3.1.2 *It should be noted that the condition of the Mid Cross (Starboard) tank has not been confirmed and it is considered that all oil from this tank could have been lost.

3.1.3 It is also assumed that approximately 400 tons of oil was used in the final voyage from Sydney. Finally, it has been advised that 0.5 tons of oil has been leaking from the vessel per annum for 75 years, resulting in an additional loss of approximately 38 tons. It has been assumed that this is speculative and as such the actual rate of leakage could be notably different.

| | | |
|---|---|---|
| Intact tanks less Mid Cross (Starboard) | - | 2,081 tons |
| Less oil used in final voyage | - | 400 tons |
| Less 75 years of oil leakage (0.5 tons P.A) | - | 38 tons |
| **TOTAL ESTIMATED OIL REMAINING** | - | **1,643 tons** |

3.2 Wreck Condition, Orientation & Tank Access

3.2.1 The exact orientation of the wreck is not known and as such it is not known whether all tanks containing oil can be accessed by ROV from the outside of the hull structure. If the vessel is laying on its side then any tanks in way of the seabed will be difficult to access to take measurements and potentially remove oil at a later stage.

3.2.2 It is also noted that previous salvage operations have been carried out to recover gold bars from within the wreck. Explosives were used during this operation to give access to the hull but it is not known how much damage was caused during this process.

3.2.3 From historical dive reports it is also considered likely that the wreck remains covered in numerous fishing nets which could further impede access.

3.2.4 The points above need to be investigated further in order to make a thorough assessment of the general condition and integrity of the wreck which would influence any operations carried out.

3.3 Marine Growth

3.3.1 Although the wreck has been submerged since 1940, marine growth is not expected to be extensive due to the water depth at which it is laying. Any hull cleaning required to access tanks containing oil is therefore expected to be feasible with commercially available tools that can be fitted to a work class ROV. The extent of marine growth will however need to be investigated at the initial inspections to confirm this.

3.4 Hull Degradation

3.4.1 It is anticipated that significant degradation could have occurred to the steel structure of the vessel, which could in part be causing loss of oil from some of the tanks. High corrosion rates occur in higher temperature waters and in the proximity of the sea surface where oxygen concentration is higher. Although the wreck is in relatively deep water, it is still considered likely that notable hull degradation will have occurred due to the time the vessel has been submerged. If it is assumed that corrosion occurs at 0.1mm per annum, it is estimated that steel plating could have reduced in thickness by 8mm.

3.4.2 It is recommended that hull thickness gauging is carried out during the survey to verify the residual hull plating thickness, since this information could be required for any future oil removal operations.

This Report is based on the information provided and is prepared in good faith and without prejudice to any or all parties concerned.

For and on behalf of
LONDON OFFSHORE CONSULTANTS LIMITED

Nick Haslam

Master Mariner

James Whitlam

Naval Architect

NAVIGATUS
CONSULTING

# Consequences of Oil Release from Niagara

Prepared for Maritime New Zealand
by
Navigatus Consulting

17 August 2018

NAVIGATUS CONSULTING

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Prepared by Navigatus Consulting Ltd on behalf of:

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**Reviewed by:** Kevin Oldham, Director (Navigatus Consulting)

| Revision | Date | Authorised By | |
|---|---|---|---|
| | | Name | Signature |
| Rev 0 | 17 Aug 2018 | K. Oldham | |
| | | | |
| | | | |

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# 1. Executive Summary

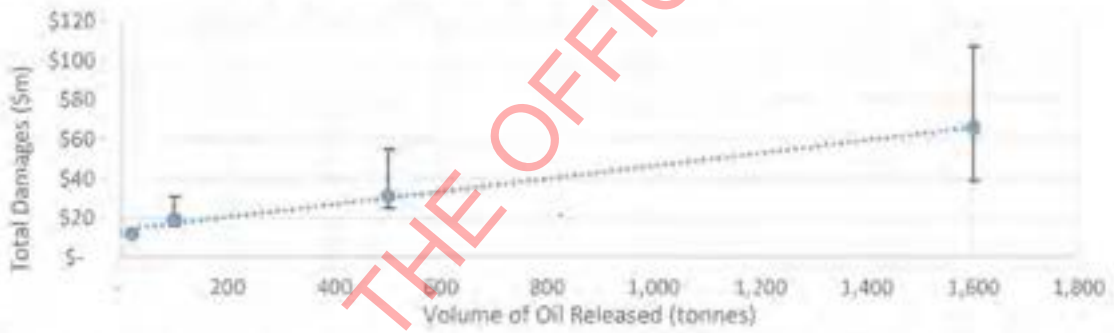
Maritime New Zealand contracted Navigatus Consulting to quantify the direct damages that could arise from an oil release from the RMS Niagara. The ship struck a mine and sank in the shipping channels between the Hen and Chicken and Mokohinau Islands in June 1940.

In 2015, Navigatus developed an oil spill damages model to estimate the financial liabilities that could arise from oil exploration, development and production (Financial Assurance Review). The estimates were intended to help inform decision-making by MBIE and MoT in quantifying financial assurance amounts in their review of the financial security regime for offshore installations. The model was calibrated against the Rena spill and replicated the costs breakdown well.

In 2016, RPS APASA was commissioned by Maritime New Zealand to carry out an oil spill modelling assessment for potential releases of oil from the Niagara wreck.

For this study, the direct damages model was run using the results from the RPS APASA study[1] to estimate the direct economic costs of these scenarios[2].

The estimated median direct damages are $12, $20, $31 and $66 million respectively for 20 tonne, 100 tonne, 500 tonne and 1,600 tonne oil releases.




There is variability in the estimates due to geographic differences in shores being oiled and whether the thresholds for various effects are met, both being weather dependent. There is no set level of direct damages, but rather a range of consequences which may occur.

Primarily the spills are comprised of clean-up costs, with maximum damages of $1.2m of fisheries.

In the 1,600 tonne spill there are some runs which have large tourism effects giving rise to substantial tourism related damages (over $50m). Whether such tourism effects arise depends on oil movement after the release, so is a matter of chance, depending on factors such as wind and current directions.

While there are limitations to the modelling, which are discussed in this report and in the FAR reports, the results of modelling are considered suitable to inform decision makers on the potential scale of direct damages.

---

[1] as well as scaling the data for additional oil spill volumes 20 tonnes, 500 tonnes and 1,600 tonnes.
[2] clean-up costs, direct damages to wild fisheries, direct damages to aquaculture, direct damages to tourism.

Two other factors should also be considered;

1. For simplicity the modelling has considered an instantaneous release, over the course of 24 hours. A more gradual, or episodic set of releases, could be more costly to attend to.
2. Potential effects on the critically endangered Fairy Tern should also be considered. We have not attempted to put a value on non-market damages such as effects on the Fairy Tern, but these should also be considered in decision making.

# 2. Introduction

## 2.1. Project Background and Aim

The RMS Niagara struck a mine and sank in the shipping channels between the Hen and Chicken and Mokohinau Islands in June 1940. Although not a hazard to shipping, the wreck potentially poses an environmental risk in terms of oil release.

The actual risk posed (scale and likelihood) is, however, unknown. Accordingly, consideration is being given to undertaking an under-water survey the aim of which is to try and better estimate the risk of oil spill occurring and the quantities of oil involved. In addition, the survey would provide data on the environment in the immediate vicinity of the wreck, so allowing for a detailed assessment of the consequences to the environment should an oil spill occur. Information gleaned from the under-water survey would then help to inform a decision about whether and when to take steps to recover the oil, the cost of which could be many millions of dollars.

This work builds on oil spill modelling undertaken by RPS APASA for Maritime NZ. Navigatus has been commissioned to estimate direct damages arising from these scenarios (i.e. clean-up costs, direct damages to wild fisheries, direct damages to aquaculture, direct damages to tourism)[3].

Qualitative comment is also provided on indirect damages (non-market and eco-system).

**Figure 2.1 Modelled location of the RMS Niagara Wreck** – (RPS APASA, 2016)

[3] Using the Financial Assurance Review model methodology as developed in 2015 by Navigatus for MBIE (Navigatus Consulting, 2015c, 2015a, 2015b).

# 3. Background

## 3.1. Damages Model

In 2015, the Ministry of Business, Innovation and Employment (MBIE) and the Ministry of Transport (MoT) contracted Navigatus Consulting to estimate the financial liabilities that could arise from oil exploration, development and production (Financial Assurance Review). The estimates were intended to help inform decision-making by MBIE and MoT in quantifying financial assurance amounts in their review of the financial security regime for offshore installations.

For the Financial Assurance Review (FAR) project, Navigatus developed a model of direct damages arising from an oil spill. The model was calibrated against the Rena spill and replicated the Rena costs breakdown well.

The Navigatus model seeks to simulate a spill as it happens, modelling the likely course of decision-making as the spill unfolds. The model then assesses the consequences in terms of clean-up costs, costs of fisheries closures, cost of contamination of aquaculture operations and lost value of tourism.

A necessary precondition for using the model is that the amounts of oil coming ashore are available as a geospatial time series (e.g. at a certain location, 5 $m^3$ of oil arrived onshore on day 3).

Photo: Maritime NZ

**Figure 3.1 Penguin Treatment During Rena Spill**

For the FAR project, the brief was to quantify direct damages. Indirect damages such as effects on suppliers to affected businesses were excluded. In addition, no attempt was made to quantify or assign values to less tangible damages such as cultural effects.

Figure 3.2 below shows how direct damages relate to other forms of damage that may arise in an oil spill. The direct damages listed under the heading "Scope of Brief" are estimated in this report, along with qualitative comments on other damages.

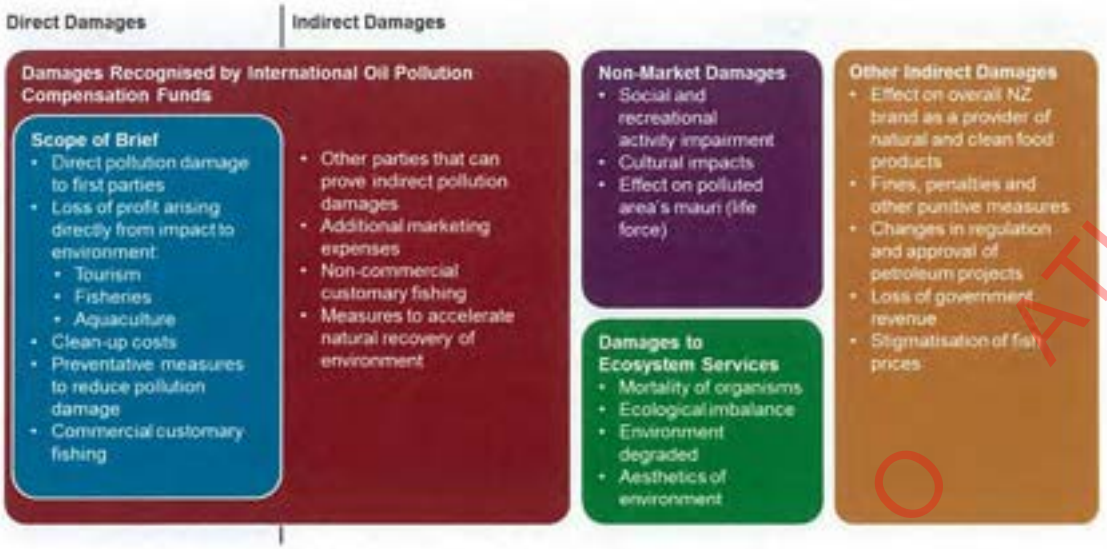



**Figure 3.2 Damages inside and outside scope of project brief** (Navigatus Consulting, 2015d)

The costs are largely dependent on how the response unfolds, when developing the model, clean-up costs were based on implementing the National Oil Spill Contingency Plan (Maritime New Zealand, 2013), and guided by industry best practice. The clean-up model applied the cone of response approach adopted by Maritime New Zealand (Figure 3.3).

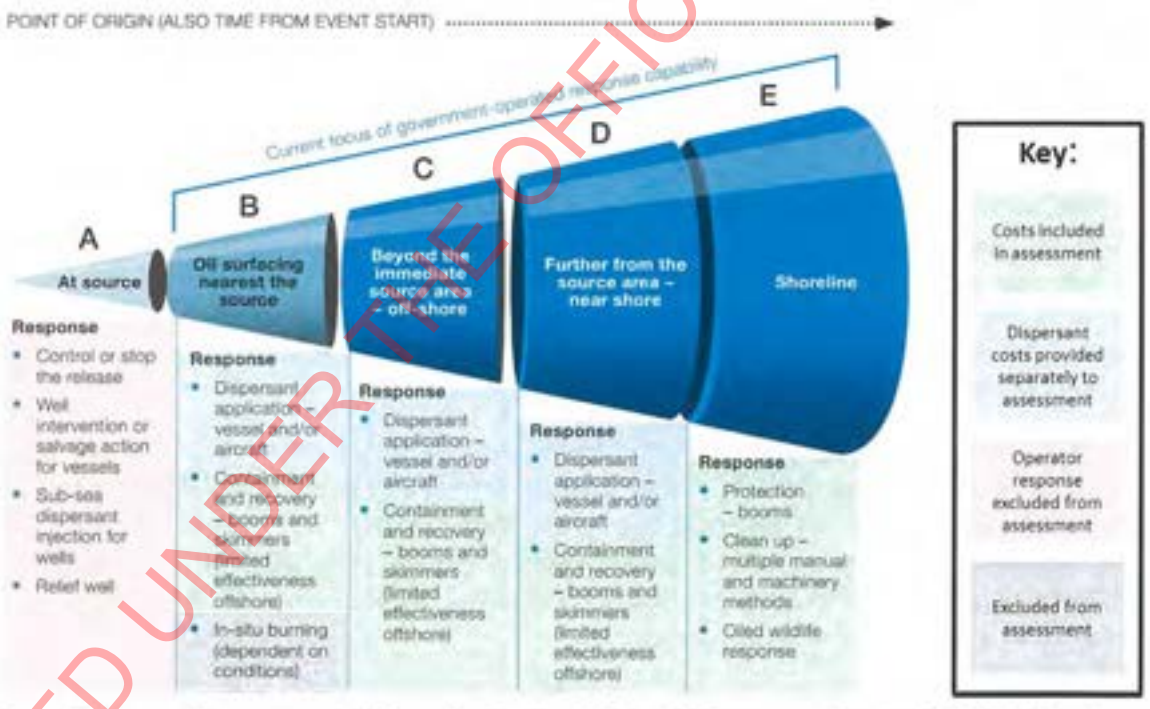



**Figure 3.3 Cone of response model from New Zealand Marine Oil Response Strategy 2015-2019** (Maritime New Zealand, 2014). **Key added by Navigatus to show relationship to damages in assessment.**

## 3.2. Model Validation

During the development of the model, Navigatus produced a number of oil spill case studies which were used to inform development of the model. The case studies were also used for comparison to help validate the findings. A graph comparing total damages vs volume ashore for the FAR simulations and some historic spills is shown in the figure below.

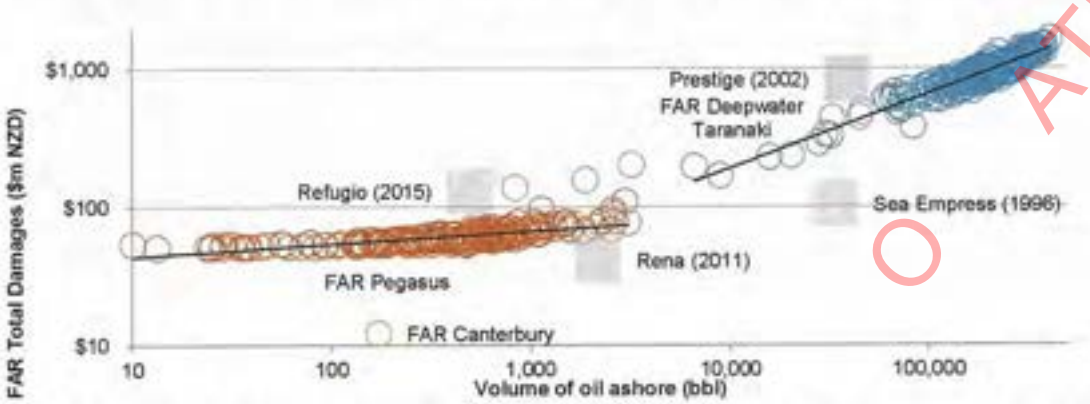



**Figure 3.4 Financial Assurance Review total damages versus oil ashore** (Navigatus Consulting, 2015a)[4]

An additional check undertaken on the FAR model was to compare to a breakdown of costs as incurred during the MV Rena spill clean-up. This data was categorised into the clean-up categories adopted for the model (e.g. Command, Shoreline Clean-up, Wildlife). The overall quantum and breakdown of clean-up costs in the FAR model was found to be similar.

## 3.3. RPS Fate and Transport Modelling

In 2016, RPS APASA was commissioned by Maritime New Zealand to carry out an oil spill modelling assessment for the Niagara wreck. The modelling examined a hypothetical discharge of 100 $m^3$ of furnace oil[5] from the wreck, released over 24 hours and tracked for 30 days. The modelling was undertaken for a total of 200 runs using historical weather data with random start dates between 2011 and 2015 inclusive, 100 runs over the summer (Nov – April) and 100 over the winter (May – Oct) seasons.

Navigatus received a summary from RPS APASA, outlining the location of first contact to shore and amount ashore (bbl) for all runs undertaken. To limit the time and expense to abstract the model runs from archived data, we elected to choose a sample of runs and model those only. To ensure that our analysis covered a diverse range of geographies and wind directions, we first ranked the runs by amount of oil ashore, then selected 10 runs which arrived at different areas of shore.

[4] Financial Assurance Review total damages includes tourism and fisheries damage estimates for Financial Assurance Review scope.
[5] Heavy Fuel Oil used as a proxy.

Figure 3.5 All runs first impact location

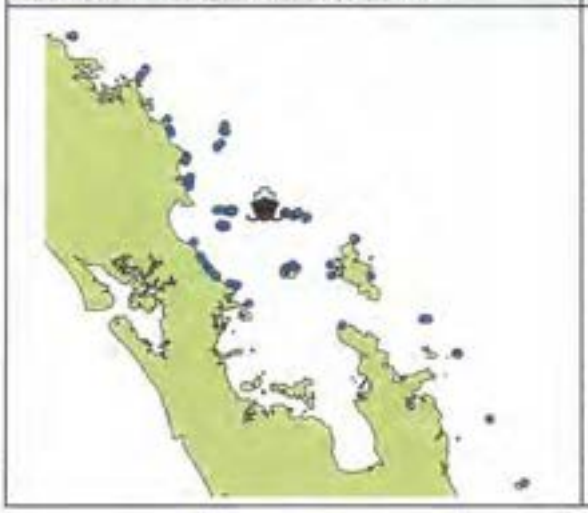
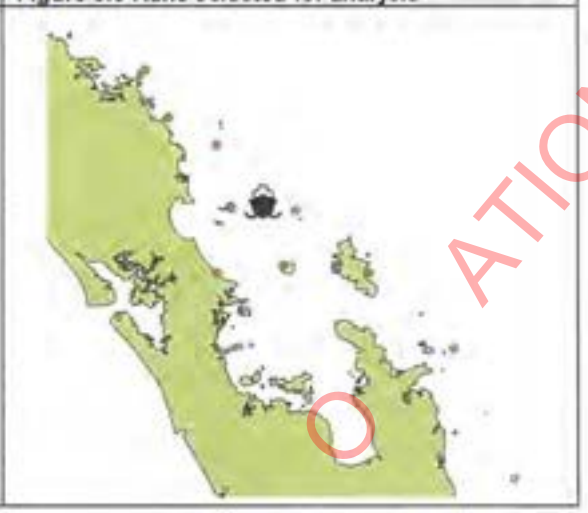


Figure 3.6 Runs selected for analysis



A large number of runs had a similar amount of oil ashore[6], therefore when selecting runs emphasis was put into obtaining a geographic representation and the maximum spread. Runs were selected where more than 90 tonnes of oil arrived onshore and ensuring at least one run first impacting each geographic area was selected. If there were multiple runs with more than 90 tonnes in a similar geographic area we selected the run which took the longest to reach shore, as was thought likely to represent spills with larger areas of oiling. In addition, the run with the maximum amount of oil ashore was selected.

The shapefiles for 10 runs selected using the above criteria were requested and provided from RPS APASA. Each shapefile showed the position over time of "spillets" and gave, at hourly intervals, position, mass (in metric tonnes)[7], and status.

# 4. Method

The intention of this study was to use the FAR damages model and the existing RPS APASA fate and transport modelling to estimate the direct economic costs that might arise from such a release.

In the previous FAR analysis, RPS APASA provided three special summary files:

1. the cumulative amount of oil in each shore cell per day,
2. the km of shoreline oiled[8]
3. Area of sea swept by spilled oil by Fisheries Management Area (FMA) with first and last day of oil contact

Due to the fate and transport modelling incurring before Navigatus was commissioned for the Niagara, we post-processed the shapefiles from RPS APASA into a format which enabled us to to run the FAR direct damages model. The processing method is outlined below.

[6] Almost half of all runs had over 90 tonnes ashore, with a maximum of 95 tonnes, being 90-95% of oil released.
[7] Data also had several other fields not used in this study.
[8] Split by shore type: Sandy Beach, Rocky Shoreline, Pebble/Gravel/Boulder Beach, Tidal Flats.

## 4.1. Pre-processing Data

### 4.1.1. Oil Ashore each day by Cell

To calculate the amount of oil in each shore cell per day we undertook the following steps:

1. For each run, find spillets[9] where status = 0 (spillets which have impacted the shoreline).
2. Assess the maximum amount of oil onshore for each spillet co-ordinate for each day.
3. Sum oil ashore by cell for each day, multiply by 6.3[10] to convert from tonnes to bbl.
4. Find difference between days to assess amount arriving per day[11].

The RPS modelling showed low levels of oil degradation the simulation period. This observation enabled an approximation to be made whereby we assessed the three different scenarios of volume released by simply scaling the RPS outputs by a fixed ratio of scenario release volume to the 100 cubic metre release.

### 4.1.2. Length of Shoreline Oiled

To calculate the length of shoreline oiled split by shore cell and shore type we undertook the following steps:

1. Create 1km square grid, finding the length of shoreline in each grid cell, in QGIS[12].
2. For each run, find spillets where status = 0 (shoreline).
3. Combine unique co-ordinates for all runs.
4. Assign each set of co-ordinates the nearest shoreline type and coast cell using the nearest neighbor analysis in QGIS. Export to CSV.
5. For each run, grid cell, coast cell and shoreline type combination, count the number of unique co-ordinates which contained oil.
6. If the number of co-ordinates containing oil within a grid cell is more than one, then apportion the grid cell shoreline length to each shoreline type.
7. Summarise km affected by shore cell and shore type

It is assumed that the oiled area for different release scenarios would be similar, but with a larger volume of oil over the same extent. These greater volumes then give rise to different clean-up costs.

### 4.1.3. Wild Fisheries Closures

To estimate the fisheries closure areas, all spillet points were loaded in QGIS. We then visually traced the extent of the swept area. This traced area was overlaid with the Fisheries Management Areas (FMA) and QGIS was used to calculate the swept area[13] within each FMA.

---

[9] Point file which represents a small proportion of the spill.
[10] 1 tonne = 1m$^3$ (assumes specific gravity of nearly 1.0 for furnace oil) 1m$^3$ = 1,000l and 1bbl oil= 159l therefore 1m$^3$ = 6.3 bbl.
[11] Add 0.38% of previous days oil to remove degradation. As per FAR model.
[12] Using QGIS Version 2.18.22.
[13] Maximum area of oil exposure on the sea surface (km$^2$).

Similarly, the time stamps on the spillets were reviewed to find the first and last day spillets were present within each FMA area[14].

It is assumed that the oiled area for different release scenarios would be similar, but with a larger volume of oil on the water surface[15] (i.e. a thicker layer of oil).

## 4.2. Adjustments to existing FAR direct damages model

Primarily we used the direct damages model as developed during the Financial Assurance Review without change. There were some minor changes to the level of command and control and reconnaissance to account for this being a spill of a known oil types source and maximum volume, rather than spill of initially unknown duration and flow rate in the FAR analysis. The response structure as adopted in the Financial Assurance Review is shown in Figure 4.1 for reference.

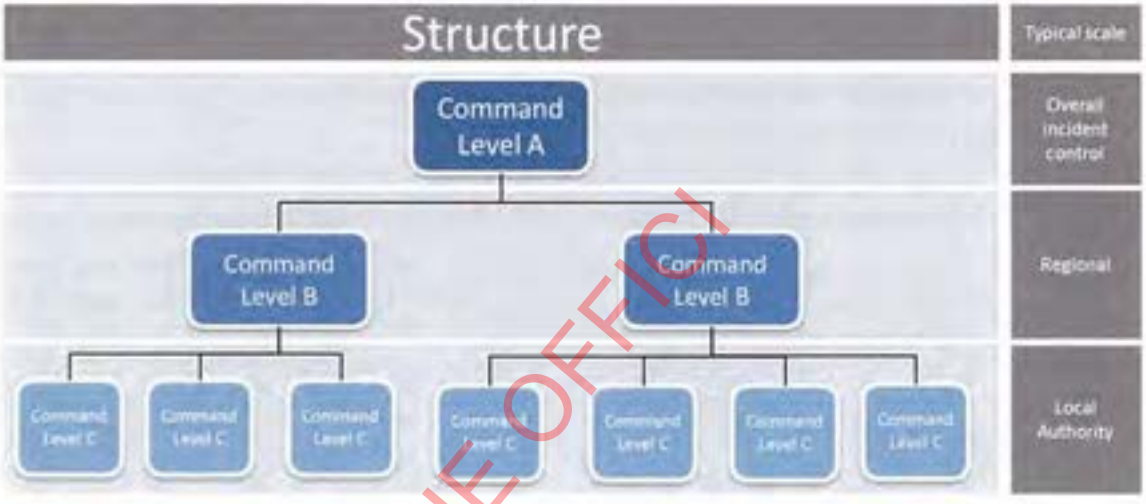



**Figure 4.1 Response structure used in the clean-up cost model**

We made the following changes from the FAR methodology or adopted parameters:

- Shoreline Cleanup Assessment Teams (SCAT) were changed to be implemented when the arrival rate is >10bbl per day in a notional 20km shoreline cell (formerly 100 bbl/day). The effect of reducing this parameter is to lower the threshold at which beach clean-up is initiated. The FAR model attempts to estimate the most likely real-world clean-up costs. In moderate-sized oil spills such as the Niagara scenario we expect that clean-up crews will be mobilised to attend to smaller volumes of oil ashore than will occur in larger spills.
- Command and Control
    - Level A command duration was set at 45 days (20 tonne release), 90 days (100 tonne release), 150 days (500 tonne release), and 180 days (1,600 tonne release). These increasing durations with volume reflect our observations and analysis from spill case hisotries. The response duration for

[14] only FMA1 Auckland (East) and FMA2 Central (East) were affected and FMA1 was affected for the full 30 days run in each scenario.
[15] For this reason, the swept area adopted is the same in all four release scenarios.

larger spills is typically longer than for smaller spills. This may reflect in part, a need to prioritise resource allocation in large spills, then coming back to those areas later.

  - The extent of the spill in this case is more known due to forewarning of the location and likely volume. As such, we expect that the top level command will not need to be as big as adopted for the Financial Assurance Review. For this reason, we have adopted half of the set up and per day cost for the Level A command centre.
  - One baseline Level C centre (in Whangarei) operates for 127 days.
  - There are no baseline Level B centres built into the model, at the outset. They automatically open in the model based on the criteria set out in the FAR technical report.
- Marine Reconnaissance
  - Cost per day of $12,000 (same as adopted in the Canterbury spill simulation in the FAR).
  - Adopted to run for the duration of Level A command.
- On-water Containment and Recovery
  - setup and daily costs set to the same as adopted in the Canterbury spill simulation in the FAR (a quarter of the Deepwater Taranaki simulation).
  - Adopted to run for the duration of Level A command. This was extended from the FAR modelling to allow for ferrying of staff to and from the many islands in this locality for clean-up operations.

## 5. Limitations

Limitations of the FAR models are outlined in the Financial Assurance Review Main Report and supplementary technical reports (Navigatus Consulting, 2015c, 2015a, 2015b, 2015d). The results of modelling were considered suitable to inform the MBIE and MoT Financial Assurance Review and are similarly considered suitable to inform MNZ in this case.

In addition to the limitations mentioned in the Financial Assurance Review reports, the following limitations apply to this study:

- Unit costs of staff and equipment have not been updated fromn the 2016 FAR study.
- Only a limited number of scenarios were run, due to the cost of abstracting and handling. While we have selected a range of runs with different impact locations and amounts in an attempt to best cover different scenarios. We may not have identified the true median or true worst case modelled.
- Each spill volume is not individually modelled, but rather scaled from the 100m$^3$ spill modelled by RPS APASA, which is an approximation.
- For simplicity, in all cases the release is assumed to occur more or less instantaneously – that is over a period of 24 hours or less. An episodic release of oil over a much longer period would likely be a worse case from a damages perspective. Accordingly the direct damages estimate given in this report may be exceeded.

As the outcomes are weather dependent there is no set level of direct damages, but rather a range of consequences which may occur.

# 6. Model Results and Discussion

Estimated direct damages for the four oil spill release scenarios are shown in Table 6.1 and Figure 6.1.

**Table 6.1 Assessed Direct Damages**

| Release Scenario (tonnes) | Median Direct Damages ($m) | Range of Direct Damages ($m) |
|---|---|---|
| 20 | $12m | $11m - $13m |
| 100 | $20m | $16m - $31m |
| 500 | $31m | $25m - $55m |
| 1,600 | $66m | $39m - $108m |


**Figure 6.1 Volume of Oil Released vs Total Damages**

As shown in the figure above, the larger the release the more variable the spill cost. With a larger amount of oil, the clean-up thresholds have more potential to be met, implementing additional response mechanisms. For example, additional geographic spread of clean-up operations which requires more staff and additional Level C response centres (required to cover the extended range of affected shorelines).

### Cost Breakdown

A breakdown of costs for the four scenarios is shown below in Figure 6.2.

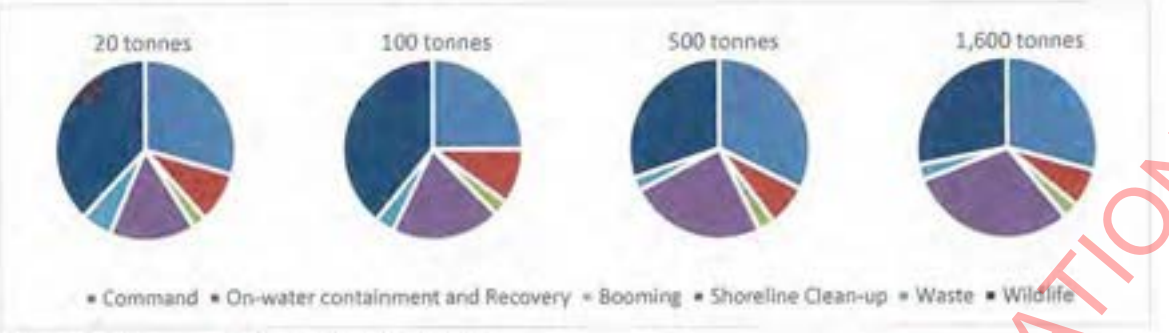



**Figure 6.2 Clean-up costs activity breakdown**

The cost breakdown is broadly similar between the four scenarios. This reflects adaptive features of the clean-up cost model: as the quantity of oil ashore expands so does the clean-up duration and complexity of command and control and wildlife response. Conversely for smaller releases a more simple and shorter response is automatically developed.

### Tourism

Tourism is often cited as a potential casualty of oil spills, but the evidence from spill case histories suggests that the effects are modest and only appear at relatively high thresholds. In the Niagara modelling, tourism effects appeared only in the highest release scenarios. In 3 out of 9 runs there were significant tourism effects in Whangarei District, 1 in the Far North District and 3 in Auckland. Because the Auckland tourism market is much larger, these latter 3 cases gave rise to substantial tourism related damages (over $50m). Whether such tourism effects arise depends on oil movement after the release, so is a matter of chance, depending on wind and current directions.

Tourism comprises the largest estimated costs, but is also the least certain. The tourism model draws heavily on case studies to estimate likely tourism impacts. This approach has three limitations. Firstly, there are very few instances of spills of similar scale in comparable situations. Secondly, definitive studies on tourism effects are rare in the literature. Thirdly, confounding effects are often present in tourism market data – such as method changes, currency movements, pandemics, financial crises, and natural disasters (Navigatus Consulting, 2015d).

Although the exact effect is difficult to ascertain, the Auckland tourism revenue numbers are so large that even a small effect on tourism translates into a big number. The model adopts an initial impact of 8% for International Visitors and 5.5% for Domestic (Auckland has half the effect of other areas due to having two coastlines) which reduces each year for the duration of effects. The duration for international visitors is taken to be one year for low oiling, or two for high oiling, with an extra year of effects for Asian visitors. Domestic visitors' effects are only observed in high oiling, with a duration of two years.

### Comparison to Rena

In the MV Rena spill in 2011, approximately 350m$^3$ (~333 tonnes) of oil was assessed to have come ashore (Navigatus Consulting, 2015a). The clean-up cost was approximately $47m (Murdoch, 2013). This falls within the range of assessed clean-up costs using the model. The median of the Niagara estimate is slightly lower than the costs incurred in the Rena spill for the similar 500m$^3$ spill for Niagara. The FAR model assumes some increased efficiencies, building on learnings from the Rena spill response. In addition, a significant proportion of the shorelines affected by the Niagara spill are rocky, which are cheaper to clean that the sandy beaches mainly contacted by Rena and produce less waste.

Photo: Maritime NZ

**Figure 6.3 Cleaning of Rocky Headland - Rena Spill**

Similar to the Rena spill, the model assesses a large proportion of costs associated with command and control and wildlife related costs.

### Comparison to Jody F Millennium

The Jody F Millennium ran aground on the beach in poor weather while heading out to sea after breaking free from several moorings in the Gisborne Harbour.

A Tier 3 oil spill response was declared soon after the grounding, a day before the first oil was spilled (Maritime Safety Authority of New Zealand, 2002). The Tier 3 response continued for approximately one month (Murdoch, 2013).

At the conclusion of the spill, a total of 25 tonnes of fuel oil was estimated to have spilled (Maritime New Zealand, n.d.). It affected approximately 8km of coastline between Tuahine Point to 300 metres along the coast, roughly opposite Gisborne Airport.

At the conclusion of clean-up operations, the cost was estimated to have been $3-$4m (Renny VanderVelde, pers. comm), however this was in 2002. Using the same escalation method outlined in (cite appropriate FAR technical report) to the Jody Millennium clean-up costs are estimated to be approximately $5m in the 2015-dollar costs that are reported by the FAR clean-up cost model.

In the modelled scenario of a similar sized spill of 20 tonnes, the clean-up estimate was significantly higher, at $12m. At face value this seems high and may be towards the high end of expected clean-up costs for a spill of this size but it also reflects some special features of the context of an oil release from the Niagara:

- Modelling by RPS-APASA indicates that oil released from the Niagara wreck will likely cover a greater extent of coastline. In the Jody F Millennium grounding, oil washed ashore fairly quickly and covered only 8km of beach. In the Niagara modelled scenarios, a significantly larger extent was oiled above the threshold requiring clean-up.
- The area is dotted with small islands, many of which are protected nature reserves which are likely to be oiled. Approximately 10% of the clean-up costs is for extended on-water containment and recovery including costs for on-water transport to ferry clean-up crews, equipment and waste to and from the islands.

- Due to the environmental sensitivity of the area and the rare species that inhabit it, we would expect a higher level of response than for the Jody F Millennium, possibly including pre-emptive capture in some instances. We would also expect a larger number of oiled wildlife[16] due to the wider spread of oil on the water. This accounts for approximately 40% of the overall response costs for wildlife (and is similar in similar dollar terms to the observed wildlife costs for the larger Rena spill).

Even allowing for the above it may appear that the FAR modelled oil response seems heavy for a 20 cubic metre oil release. However, that is only valid if one knows at the outset that the ultimate size of the oil release from the Niagara wreck will be not be more than 20 cubic metres. The ultimate size of release is only bounded by the amount thought to be remaining on board, which is understood to be around 1,600 tonnes. When oil starts leaking in significant quantities from the wreck we expect that further (and possibly larger) leaks will be judged to be likely and that a prudent spill response will cater for the risk of subsequent oil releases in fairly quick succession. Mobilisation of such response resources is costly, whether or not they are subsequently employed on actual clean-up operations.



[16] In the Jody F Millennium grounding, only two birds were brought in for cleaning, both died (NZ Herald, 2002).

# 7. Indirect Damages

Indirect damages can take several forms as indicated in Figure 3.2.

In this case indirect monetary damages are likely to be low as the expected effects on fishing and tourism are likely to modest and offset by other effects. Indirect damages to parties such as accommodation providers arising from loss of tourism income may be partly or wholly offset by increased accommodation demand from oil spill responders. However, the winners and losers are not necessarily the same people, or in the same industry, so while the net effects may be low there would still be winners and losers.

A spill from the Niagara is comparable in size to the Rena. Monitoring by the University of Waikato after the Rena spill found biological communities on Bay of Plenty open coast beaches did not appear to have been catastrophically effected by the Rena oil spill (University of Waikato, 2013). As such we would not expect to find lasting damages to ecosystem services in general.

Analysis of oil spill case histories, including the Rena spill indicate that recreational activity impairment will be modest. However cultural impacts and effects on the mauri of an area can be significant and should be considered.

### Fairy Tern

Mangawhai Heads is home to the critically endangered Fairy Tern (Box 1).

**Box 1 - New Zealand Fairy Tern[17]**

With a population of around 45 individuals that includes approximately 12 breeding pairs, the New Zealand fairy tern is probably our most endangered indigenous breeding bird.

It is ranked as an endangered species, and carries a 'Category A' priority for conservation action. A Department of Conservation Recovery Plan is currently in action.

Records from the 19th century suggest that NZ fairy terns used to be widespread around the coast of the North Island and eastern South Island, but were not abundant in any one area.

New Zealand fairy terns are now confined to the lower half of the Northland Peninsula. Breeding is limited to four regular sites: Waipu, Mangawhai, Pakiri and the South Kaipara Head.

Three of the four known breeding areas are in areas at risk from a Niagara oil release.

If a spill occurred during the breeding season it is conceivable it would prompt the pre-emptive capture of these terns.

If survival in captivity is poor then there is a risk that the remaining genetic diversity of the population may be too low for survival of the species. Such a loss would not only be of ecological importance but would also be of profound cultural importance to both tangata whenua and pakeha alike.

The potential for such outcomes should be weighed in decision-making alongside monetary considerations.

[17] Source: https://www.doc.govt.nz/nature/native-animals/birds/birds-a-z/nz-fairy-tern-tara-iti/ Accessed 10 August 2018

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# Management of the wreck of *RMS Niagara* and the surrounding environment

Paul Whomersley, Paul McIlwaine and Freya Goodsir

August 2018

# Cefas Document Control

| | |
|---|---|
| Submitted to: | Maritime New Zealand |
| Date submitted: | 30th August 2018 |
| Project Manager: | Aaron Blowers |
| Report compiled by: | Paul Whomersley |
| Quality control by: | Jemma Lonsdale |
| Approved by and date: | Chris Jenkins, 30th August 2018 |
| Version: | V1.0 |

| Version Control History | | | |
|---|---|---|---|
| Author | Date | Comment | Version |
| Paul Whomersley | 28/08/2018 | First Draft | V0.1 |
| Jemma Lonsdale | 29/08/2018 | QC Comments | V0.2 |
| Paul Whomersley | 29/08/18 | Addressed QC Comments | V1.0 |
| | | | |
| | | | |
| | | | |

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## 3.1 *RMS Niagara*

*RMS Niagara* was an ocean liner launched on 17 August 1912 and owned by the Union Steam Ship Company intended for the Australia-Vancouver, Canada service. On 19 June 1940 she was under the command of Captain William Martin and had just left Auckland when, off Bream Head, Whangarei, she struck a mine laid by the German auxiliary cruiser *Orion* and sank in 121 meters of water. A secret and large consignment of gold from the Bank of England was in *RMS Niagara*'s strong room and went down with the ship. There were 295 boxes, each containing two ingots of gold (590 ingots total), valued at £2,500,000.

On 2 February 1941 the wreck of the *RMS Niagara* was found and the task of retrieving the gold began. A hole was blasted in Niagara's hull and 555 gold bars; more than 8 tonnes and 94% of the total of the gold was retrieved using a grab. A further 30 gold ingots were recovered, leaving five bars still unrecovered in the wreck.

There is current anecdotal evidence that oil is leaking from the wreck and there is > 2000 tonnes of heavy bunker oil remaining still onboard (Northland Conservation Board 2017).

## 3.2 Historic accounts of the sinking of the *RMS Niagara*

Due to the violent nature of the sinking of *RMS Niagara* and the use of explosives during subsequent salvage operations, it will be vital to assess any written accounts that may detail any oil loss. This information will inform the amount of oil that was potentially lost during the sinking and subsequent salvage operations and therefore the potential amount of oil that remains on the vessel. Photographs that were taken may also show where the hull was impacted by the mine and therefore indicate the likelihood of damage occurring to the fuel tanks. The fact that the vessel had just departed from Auckland may indicate that she was fully fuelled. Accessing the ships manifesto could provide information on the type and quantities of fuel oil being carried.

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# *Management of the wreck of the* Niagara*: Business Case*

*V2.0*

*4 November 2019*

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# 1. Executive summary

## 1.1 Introduction

The RMS *Niagara* (a United Kingdom-flagged trans-Pacific passenger steamer) hit a mine and sank in the Hauraki Gulf, approximately 40 kilometres to the southeast of Whangarei, in 1940. There was a significant release of heavy fuel oil. Salvage operations were undertaken to recover a cargo of gold bullion causing further damage to the wreck and further releases of oil. Over the intervening years, there have been infrequent further reports to the authorities of oil surfacing in the vicinity, apparently from the wreck (the most recent of these was in May 2019). To date, however, there has been no significant leakage and no observable environmental damage. The wreck presents no risk to navigation (it is approximately 120 metres under water).

In recent times, various parties have raised the profile of the wreck and concerns that it poses a major environmental risk. Accordingly, there have been calls for something to be done about the *Niagara*.

This business case has been prepared in support of commissioning a site-based survey and subsequent desk-based risk assessment of the wreck. The objectives are to provide information regarding the estimated volume of oil still contained within the wreck and the state of the vessel in terms of the extent of corrosion and other damage. From this information, the risk of any remaining oil leaking out and causing environmental damage can be assessed.

Information obtained from the survey and risk assessment will be used to inform subsequent decisions about whether to take steps to recover remaining oil (assuming there is some) and the degree of urgency involved. Any decision regarding recovery would be the subject of a subsequent business case. At this stage, this business case is focused solely on whether to undertake a survey and risk assessment.

## 1.2 Strategic case for intervention

In 2016, Maritime New Zealand (Maritime NZ) updated its Niagara Contingency Plan that addresses the response that might be required if any significant quantity of oil is released from the wreck. Maritime NZ continues to monitor the situation and respond to the (infrequent) reports of oil spill.

One option is to continue with this approach (the Status Quo option) and to defer any further intervention until there is a significant oil spill. This is, however, a risky option because of the uncertainty regarding the amount of oil that remains within the wreck, the state of the oil (which influences the likelihood of causing environmental damage), and the lack of knowledge about the state of the wreck. There is a risk, the level of which is unknown, that significant amounts of oil remain (one estimate is in the order of 1600 tonnes[1]) and that the condition of the wreck is such that significant release of oil is possible, or probable.

Worldwide there are many thousands of wrecks (including those from two World Wars) that pose some degree of risk to the environment. Historically, not much has been done about these unless there was also a risk to navigation. There is, however, growing awareness of the environmental pollution risks associated with wrecks and a number of recent, high-profile oil recovery operations have been undertaken.

Although the status quo is one option, the strategic case for intervention, beyond on-going monitoring and maintaining a contingency plan, rests on the following points.

- Because little is known about the condition of the *Niagara* and the volume and state of any remaining oil, the risks to the environment posed by the Niagara are not well understood. Because the risks are ill-defined (probability and consequence) it is not possible to determine how best to manage those risks. Gaining more information about the wreck and quantities of remaining oil will help to better understand the risks and determine how to manage them (including how urgently any action needs to be undertaken). Even if more information indicates no near term need for action, it will help to inform the design of contingency plans and serve to allay public comment that nothing is being done.

[1] The parties raising concerns over the environmental risks arising from the wreck estimate that in the order of 1,600 tonnes of Heavy Fuel Oil may remain in the vessel. To put this into context, in the period shortly after its grounding, the Rena discharged around 350 tonnes of oil.

- The status quo option runs the risk that there are significant quantities of oil and that there is a large scale and uncontrolled release of oil. Such a scenario would lead to significant environmental damage and, hence, associated environmental, economic and social costs (including the costs of clean-up). Work undertaken for Maritime NZ concludes the direct costs (response and immediate impact on aquaculture fishing and tourism) could be in the order of $100 million. There would also likely be significant adverse indirect impacts in relation to natural capital and New Zealand's reputation and image. In short, the status quo could turn out to be a very expensive option.
- Under its legislation, Maritime NZ has statutory responsibility for dealing with the risk of, and incidents involving, marine oil spills and, more generally, for protecting the marine environment. Consistent with its overall regulatory approach, Maritime NZ's preference is to take reasonable and practicable steps to avoid the risk of harm turning into actual harm.
- Maritime NZ has powers to require responsible parties to deal with a wreck and any associated threat of pollution or risk to navigation. The long period since the *Niagara* sank means, however, it is almost certain that a private or commercial owner for the wreck no longer exists. Maritime NZ is of the view that ownership is most likely to have vested with the Crown. By implication, the onus is on the Crown to determine what to do with the wreck.

## 1.3 *Intervention options*

There are two main intervention options. One of these is to undertake an underwater survey and risk assessment (Survey and Risk Assessment option), the aims of which are to find out more about the likelihood of oil spill occurring and the size of any spill. This information would then be used to assess the likelihood and consequence of environmental damage. A decision can then be taken as to whether to mount an oil recovery operation.

The alternative option is to proceed directly to an oil recovery operation (Oil Recovery option).

The preferred option is to undertake the underwater survey and risk assessment. This is consistent with international best practice which involves a three-phase approach. Phases one and two involve site-based (underwater) wreck integrity and environmental survey and a desk-based environmental risk assessment. It needs to be noted, however, that there is no guarantee that the survey will provide the information sought (for example, the way in which the wreck lies on the seabed may impede the ability to gather information regarding the quantity of oil remaining). The third phase is an oil recovery operation (if environmental risks are judged to be high enough).

The alternative of proceeding directly to an oil recovery operation is not recommended for several reasons.

- A recovery operation would, in any event, still require a comprehensive survey to help determine the scale of, and approach to, recovery
- There is a risk that without the advantage of more information, the recovery operation is either over, or under-engineered relative to the size of the problem. In a worst case scenario, a recovery operation is mounted only to discover no material quantities of oil or, alternatively, the operation is seriously under-scoped and serves to trigger an uncontrolled and significant discharge of oil.
- Recovery is likely to cost several tens of millions of dollars. Accordingly, it does not make sense to incur this level of expenditure if it is not needed (i.e. if the state of the wreck is such that recovery is not needed in the near-term, or if the state of the wreck is such that a planned and controlled recovery would have little chance of success).

In short, the best strategy is to find out more about the situation of the *Niagara* and then decide whether to maintain a watching brief and contingency plan, or to mount an oil recovery operation.

## 1.4 *Approach to survey and risk assessment*

There are choices in terms of how best to proceed with the underwater survey and desk-based risk assessment, and there are also choices in terms of who to involve in the underwater survey.

When this initiative was first considered, as part of Budget 2019, the estimated costs for an assessment and survey, conducted in two phases, were 9(2)(f)(iv). Since that time, it has become apparent that it is possible to source a vessel

and core survey equipment in New Zealand which will substantially reduce the mobilisation and demobilisation costs. The current estimated cost for undertaking a single-phase survey approach (discussed further below) is 9(2)(f)(iv). There is also potential to use a Royal New Zealand Navy vessel, which would reduce, potentially, the financial cost to 9(2)(f)(iv). Updated specialist technical advice[2] notes that the availability of a suitable local vessel influences the previously advised two-phase approach. The previous advice was to:

- first, carry out a visual inspection to establish the general condition of the wreck, to inform an oil survey plan and to allow a detailed computer model of the wreck to be built
- secondly, use a larger, more capable, vessel and more expensive equipment, to enable hull measurements and oil level readings to be taken and a comprehensive environmental survey to be completed.

Given the availability of local vessels and equipment, the technical advice notes that it may now be better and more cost-effective to use the same vessel and remotely operated underwater vehicle (ROV) for both stages, including the initial visual and 3D inspections, thickness gauging and tank inspection.

It is proposed to undertake an underwater survey in one part to cover both phases outlined above in the previously advised two-phase approach, with the desk-based risk assessment undertaken as soon as possible following its completion. The results of the survey and the risk assessment would allow decision makers to confirm what the next steps should be – continue monitoring or initiate an oil recovery operation.

9(2)(f)(iv)

Maritime NZ has engaged with the Royal NZ Navy around their capabilities and availability to support the survey work. Based on discussions with them, they would be able, potentially, to support the survey activity with a newly commissioned support vessel, which is expected to enter service imminently. However, this vessel does not have the right type of ROV capability and so if this vessel were to be used, Maritime NZ would need to contract with a third party to provide the ROV capability.

Given the additional project complexity and transaction costs of engaging multiple parties and ensuring mechanical, electrical and software integration between a Navy vessel and survey equipment, and that there is no guarantee that a Navy vessel would be available, it may also be necessary to engage commercial parties to provide the vessel. Maritime NZ will pursue its procurement options in accordance with its normal procurement policies and practices. As part of the procurement process, Maritime NZ will consult with relevant stakeholders including local iwi, the two Regional Councils in the area as well as a range of other stakeholders listed in the management case.

## 1.5 *Funding the work*

Maritime NZ is funded from several sources; the maritime levy, the oil pollution levy (OPL), fees and charges, a portion of fuel excise duty and Crown revenue. Of these, Crown revenue is the most appropriate source of funding.

The purposes for which the maritime levy can be used are set out in the Maritime Transport Act and generally these are for the provision of services relating to maritime safety. Given the main intent of the maritime levy, and the existence of the OPL, it follows that there are significant doubts as to whether the maritime levy could be used to fund activity in relation to the *Niagara*.

The OPL clearly is intended to fund oil pollution prevention and recovery activities. However, the context within which the OPL sits is one of cost recovery and the polluter-pays principle. In short, the OPL is used to fund the cost of response but then steps are taken to recover those costs from the person responsible for the spill. In the case of the *Niagara*, it is very unlikely the original owners and/or person responsible still exist in which case the Crown is, almost certainly, in a situation of being the owner by default.

Fees and charges are recovered to fund the specific services to which they relate. This is not relevant to the *Niagara*.

The portion of fuel excise levy that is provided to Maritime NZ is for the purposes of activities in relation to recreational boating (this is set out in the Land Transport Management Act). This is not relevant to the *Niagara*.

[2] Maritime NZ has engaged London Offshore Consultants Limited, a global maritime consultancy with recognised expertise in these matters.

Crown funding is the only other funding option and, by default, is the source for funding the costs of undertaking the site-based survey and risk assessment.

The cost of the site-based survey and desk-based risk assessment is estimated to be in the range of 9(2)(f)(iv) to 9(2)(f)(iv). The range reflects uncertainty about the availability of provision of a vessel on a non-commercial basis.

Funding approval for up to 9(2)(f)(iv) is sought; it is proposed that the survey and risk assessment are undertaken, at a cost estimated to be around 9(2)(f)(iv) (including project management costs) if a vessel and ROV equipment are sourced from a commercial provider. If a vessel can be sourced from the Navy, and ROV equipment can be provided and operated by a commercial provider, financial costs would be significantly lower (estimated at 9(2)(f)(iv)) but a formal tender process will be required to confirm availability and actual costs.

## 1.6 *Managing the project*

The work on, and findings of, the survey and risk assessment will be of interest to a range of central and local government agencies as well as iwi, community groups, environmental groups and private firms (e.g. Southern Cross Cables who have a major cable linking NZ with the USA and Australia in the vicinity of the *Niagara*). A stakeholder management plan will be developed accordingly.

The project will have a dedicated project manager and support – resourced from the funding sought - with oversight from the Maritime NZ Deputy Director Safety and Response Systems.

The aim is to undertake the survey and, shortly thereafter, the desk-based risk assessment in the calendar year 2020, with the actual timing dependent on availability of a vessel and technical specialists. Once work is completed, an assessment will be made as to what to do with the *Niagara*. Any decision to mount a recovery operation would be the subject of a separate business case.

## 1.7 *Recommendation*

It is recommended that up to 9(2)(f)(iv) operating expenditure be made available for Maritime NZ to fund the costs of undertaking a site-based survey and risk assessment, including project management and associated activities, in respect of the wreck of the *Niagara*.

# 2. Introduction and background

## Purpose

The purpose of this business case is to support a bid for funding a site-based survey and subsequent desk-based risk assessment of the wreck of the *Niagara*. The objectives of the survey and risk assessment are to provide information regarding the volume of oil, if any, that is left in the wreck, the condition of the wreck, and to inform an assessment of the environmental risk posed. Once the information has been obtained and analysed, an assessment will be made as to what, if anything, should be done regarding the wreck including the option of mounting an operation to recover some or all of any remaining oil. Any decision in this regard will be the subject of a subsequent business case.

## 2.1 *History of the* Niagara

The *RMS Niagara* was a United Kingdom-flagged trans-Pacific passenger steamer built in 1913 in Scotland. It had capacity to carry:

- 667 passengers
- 237 crew
- 8,216 tonnes of cargo
- 4,324 tonnes of oil.

On 19 June 1940, as the *Niagara* left Auckland on its route to Vancouver, it struck two contact mines among the 228 laid by the Orion, a German raider disguised as a merchant ship. The *Niagara* sunk at a depth of 120 metres, off Bream Head, 40 kilometres southeast of Whangarei.

Amongst the cargo was a consignment of UK Government-owned gold bullion (590 ingots) being transported to the USA as payment for war munitions. In 1941, a salvage operation successfully recovered 555 gold ingots, although it caused further damage to the hull. In 1953, a further 30 gold ingots were recovered, leaving five ingots unaccounted for and thought to still be in the wreck.

Ownership of the gold remains with the UK Treasury who, accordingly, have an interest in the wreck and any decisions to intervene in respect of it. Maritime NZ has been in initial contact with the UK Treasury to apprise them of the situation and establish lines of communication to ensure relevant interests are taken into account in any decision-making process.

## 2.2 *Risks posed by the* Niagara

Reflecting the depth at which the wreck sits, it is not a risk to navigation. However, there is a potential environmental risk.

In particular, it is likely that oil remains within the hull of the wreck but how much is left, and the state of the oil, is unknown. Moreover, the state of the hull, and hence, the risk of oil leakage is unknown. It is these uncertainties that lie at the heart of the business case and the proposal to undertake a survey and risk assessment to find out more about the current situation and the risks posed to the environment.

***Volume of oil***

It is impossible to determine with any degree of certainty the volume of oil remaining in the wreck because it is not known:

- how full the *Niagara's* fuel tanks were when it sank (the vessel had sailed from Sydney to Auckland, and it is not known if the tanks were full upon departing Sydney, and/or whether they were replenished in Auckland)
- how much oil was released when the vessel sank and during the subsequent cargo salvage operations when explosives were used to breach the strong-room
- what the rate of oil leakage has been in subsequent years.

One of the parties raising the potential environmental risks around an oil leak has estimated that there might be 1,600 tonnes of heavy fuel oil remaining on board. This estimate assumes that:

- 4,324 tonnes of fuel oil were on board when the vessel sailed from Auckland (full capacity)
- 1,958 tonnes were lost when the *Niagara* sank
- additional fuel has leaked subsequently, including during cargo salvage operations when explosives were used to breach parts of the hull.

Given the considerable uncertainties as set out above, the estimate of remaining oil is essentially an informed guess. Notwithstanding this, Maritime NZ has used the figure of 1,600 tonnes as an upper figure for potential oil release quantities to inform the modelling of possible costs arising from an oil spill.

The survey is aimed at trying to get a much more accurate picture.

***Condition of oil***

Little is known about the condition of the oil in the *Niagara* or how it will behave in the event of a significant leak from the wreck. Reports of small amounts of oil apparently coming from the wreck of the vessel have been received over many years by Maritime NZ. Monitoring of those small releases has shown that the released oil naturally disperses and breaks up without causing any observable environmental impact. However, for several reasons, this may not be a good guide to the situation in the event of a large-scale oil leak.

The age and weathering of the oil can affect its behaviour. The oil in the *Niagara* is now more than 70 years old and it will have weathered to some degree depending on how it is contained and how much it has been exposed to seawater. As oil ages, the more volatile and lighter components degrade quite quickly, and the remaining oil 'thickens' and begins to break down. If oil leaks, its behaviour will vary widely depending on its condition. For example, the oil may spread across the sea-floor, be dispersed within the water column, rise to the surface, or a combination of all three may occur. Each type of behaviour has different implications for the risk of environmental damage.

The most likely scenario is the oil will be buoyant to some degree and consist mainly of the heavy components. If this is correct, the oil from the wreck will be challenging to clean up, resistant to dispersal, and slow to break down.

***Local environment***

The area surrounding the *Niagara* includes the Hauraki Gulf Marine Park, a number of marine reserves, and significant expanse of coastlines with important ecology. Any large scale release of oil from the wreck would likely spread widely in the area and potentially severely impact marine wildlife, including endangered seabird species (the NZ Storm Petrel, Black Petrel, Fairy Tern, Bullers Shearwater, Australasian Gannets, Pycroft's Petrel).

Given the features of the coastlines in the area (estuaries, rocky shorelines, and islands), it is difficult to protect them. Booms may only have limited effectiveness in some areas due to wind, tides, and size of the areas. Some areas would be challenging to clean-up without causing significant damage in the process.

An oil leak could have potential impacts on local ecosystems, depending on hydrographic conditions, the time of year (related to the amount of suspended particulate material in the water column), and what proportions and components of the oil entered the water column or remained on the seafloor.

## 2.3 *Public interest*

There is significant public interest in Government taking action to investigate the wreck in order to determine the risk posed by the remaining oil within the vessel.

Interested parties have written on more than one occasion to the Minister of Transport, the Minister for the Environment, the Minister of Conservation, the Associate Minister of Transport, the Parliamentary Commissioner for the Environment, and the Auckland Council.

The *Niagara* continues to be the subject of intermittent news reports, most recently in July 2019. These reports highlight a perceived risk of an oil spill "four times worse than the Rena" with suggestions that the *Niagara* still has about 1500 tonnes of heavy oil on board and is subject to corrosion and risk of eventual implosion.[3]

Key parties involved in raising the profile of the wreck include the Auckland Conservation Board, local and national media, Mike Lee (previously an Auckland Council member), Mr Keith Gordon (an author and underwater explorer who once had salvage rights relating to the *Niagara*), and Mr Clive Sharp (a salvage expert and owner of the salvage company Subsee Limited).

Given the public interest in the potential risk, and the ability to better determine that risk, there is potential for public criticism if the calls to investigate the *Niagara* are rejected and a significant release of oil occurs that causes substantial environmental, social, and economic damage.

## 2.4 *Regulatory and legal situation*

The *Niagara* is located within the territorial limits of New Zealand, and within the coastal marine area of the Northland Regional Council.

***Maritime NZ's statutory mandate***

Maritime NZ is the national regulatory, compliance, and response agency for the safety  security, and environmental protection of maritime waters.

Maritime NZ has a variety of statutory functions in relation to the safety and security of the marine environment. Those functions are set out in section 431 of the Maritime Transport Act 1994 (MTA) and include to:

- promote the protection of the marine environment
- ensure New Zealand's preparedness for, and ability to respond to, marine oil pollution spills
- provide information and advice with respect to marine protection.

***Maritime NZ's strategic objectives***

Maritime NZ's vision is for *a maritime community that works and plays safely and securely on clean waters*. The organisation's mission is to be a professional, evidence-based, intelligence-led, risk-focused, regulatory, compliance, and response agency.

Maritime NZ is responsible for promoting a safe, secure, and clean maritime environment, and leading responses to major maritime incidents. "Safe, secure, and clean" means that, among other things, the maritime environment is clean and protected.

Maritime NZ seeks to address risks in the maritime domain before they result in poor outcomes. Maritime NZ does this through three key roles: regulation, compliance, and response.

The response function includes:

- leading responses to significant and major maritime incidents and emergencies (for example, the response to the Rena grounding and oil spill)
- overseeing the maritime industry and Regional Council marine pollution readiness and response capabilities and delivering national level capability.

Maritime NZ has international and domestic obligations to maintain an oil pollution preparedness and response capability. This capability includes personnel, training, equipment, and strategic planning, and is funded through the New Zealand Oil Pollution Fund (the Fund). The Fund is generated through an Oil Pollution Levy (OPL).

A contingency plan to address an oil leak from the *Niagara* was updated by Maritime NZ in 2016, and remains in place.

[3] For example: "Is Northland's sunken treasure a ticking time bomb", Stuff, 30 August 2017, https://www.stuff.co.nz/national/96328161/is-northlands-sunken-treasure-ship-a-ticking-time-bomb; " Leaking ocean liner wreck a ticking time bomb" 30 August 2017, NZ Herald http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11914206; also article by Mike Lee, councillor for Auckland Council' Waitemata ward in Gulf New, 5 October 2017 indicating the Auckland  Conservation Board chair had written to the Minister of Conservation and Minster of Transport recommending funding be allocated to remove the oil now.

***Powers to deal with the wreck***

The *Niagara* is not subject to any heritage protection that would prevent the wreck being dealt with under the MTA or the Resource Management Act 1991 (RMA).

If the *Niagara* is discharging oil, or is considered likely to discharge oil, the most appropriate powers available to the Director would be the powers of intervention under Part 20 of the MTA. These powers would enable the Director to take any measures necessary to deal with the pollution or significant risk of pollution. What is necessary will involve technical assessment of the actual risk of harm to the marine environment. The measures could range from doing nothing or simply monitoring, through to operations to deal with the wreck and/or remove the oil. The Minister could also give directions to the Director in the exercise of such powers.

***Ownership of the wreck and identification of the 'person who caused the oil spill'***

The long period since the *Niagara* sunk means there is a question as to who is the legal owner of the wreck.

Where there is an identifiable owner, there are options to require the owner to take direct action to deal with the wreck or any threat of pollution. Where the person who caused the oil spill can be identified there is an obligation on Maritime NZ to seek to recover costs incurred through taking action under statutory powers.

Establishing ownership or identifying an owner and/or the person who caused the spill is not a precondition to the exercise of statutory powers to deal with the *Niagara*. Establishing responsibility, however, matters in terms of paying the costs of dealing with the wreck or any threat of pollution.

The passage of time means that, in all probability, the original owner for the wreck no longer exists. It is considered likely that ownership of the *Niagara* (as distinct from its cargo) has either passed to the Crown as an unclaimed wreck, or to a relevant insurer based in London and/or its successors. Although further enquiries could be made in an attempt to identify the owner, this is considered likely to be inconclusive  Maritime NZ considers that ownership of the wreck is most likely to have vested in the Crown by operation of law or way of bona vacantia.[5]  Therefore, the onus is on the Crown to determine what to do with the wreck (with Maritime NZ taking the lead agency role).

Given the history of the wreck (its sinking as an act of war) it is unclear if it would be possible to identify the 'person who caused the spill' in any practical way that could lead to a recovery of the costs of any intervention.



[4] See Maritime Transport Act 1994 s.331 (2) ,

[5] Ownerless property.

# 3. Strategic case

## 3.1 Overview

This section sets out the strategic case for taking action in respect of the *Niagara*, over and above the status quo of maintaining a watching brief and a contingency plan. The case for undertaking further activity rests on the following.

- Very little is known about the wreck in terms of the environmental risk it poses. The volume of oil remaining (if any) is unknown and the state of the wreck and hence the risk of significant oil pollution is not known. The uncertainty means risks are not well understood. As a result, it is very hard to know whether those risks are being managed in the best way.
- Reducing uncertainty will enable a better understanding of the risks posed by the *Niagara* and how to manage those risks.
- Ultimately, better risk management will help to minimise the risks of a major oil spill, the direct costs of which could be $100 million or more. A better understanding of the risks will also help to inform decisions regarding the need for, and timing of, any future planned recovery operation (i.e. enabling the most effective response that is proportional to the risks involved).
- Taking further action over and above the status quo is consistent with Maritime NZ's statutory responsibilities and its overall approach of seeking to reduce the risk of harm (i.e. environmental damage) turning into actual harm.

Notwithstanding these points, maintaining the status quo is an option and it is considered first before then discussing the benefits of further intervention.

## 3.2 Maintaining the status quo

**No observable environmental risk has occurred to date**

Maintaining the status quo with respect to the *Niagara* is a realistic option. The status quo involves Maritime NZ maintaining the contingency plan that is in place to respond to any release of oil from the *Niagara*, and continuing to monitor reports of oil apparently leaking from the wreck.

The wreck has been in situ for 79 years. Although there have been reports of oil surfacing in the vicinity of the wreck, these reports have been infrequent. Moreover, the quantities of oil have been small and have not caused any observable environmental damage.

The most recent report of oil surfacing apparently in the vicinity of the wreck was received on 3 May 2019. In the three days immediately following receipt of the report, aerial reconnaissance by sea plane, helicopter and drone, and on-water reconnaissance by vessel was carried out. Oil spill trajectory modelling was also undertaken to ascertain potential drift patterns and pathways of any oil.

The results of the response to the May 2019 report are consistent with the historical monitoring: that no observable environmental damage has been caused. The recent reconnaissance reported a relatively long (300m – 1500m) and narrow (20m -30m) "slick" of barely detectable oil that appeared to be completely and naturally dispersing and evaporating. The very small release rate and rapid and effective natural dispersion and evaporation resulted in the assessment that there would be minimal impacts to the environment and that the best response was to allow natural dispersion to continue.

Maintaining the status quo avoids the large cost of a recovery operation (until any intervention is needed). The need to undertake a response may never arise if, for example, there is little oil left within the wreck and/or because the wreck's condition means the risk of significant oil leak is small. Alternatively, the need for an unplanned response might not arise until some years into the future. In either case, there is benefit to avoiding an immediate cost if it does not need to be incurred, or can be incurred at a later date. Although the costs of a recovery option are uncertain, it is likely that they would be several tens of millions of dollars.

**It is not unusual for wrecks to be left "as is", but practices are changing**

The situation posed by the *Niagara* is far from unique. According to the Centre for Environment Fisheries and Aquaculture Science (Cefas) in the United Kingdom, internationally, there are approximately 8,500 identified wrecks containing an estimated quantity of between 2.5 and 20.4 million metric tonnes of oil. Many potentially polluting wrecks are situated in sensitive areas and are considered to be reaching a point of degradation where releases can be expected. Historically, wreck management practice was to address navigation hazards posed by wrecks, but not necessarily respond to environmental risks. Wreck management practice has evolved over time due to growing awareness of environmental risks combined with advances in technology that permits oil recovery operations to be carried out on wrecks and at depths that were previously not considered feasible, although at significant cost and with operational risks.

**Maintaining the status quo is, potentially, a risky strategy**

Continuing with the status quo is a potentially risky option because of the uncertain nature of the current situation. The risks posed by the wreck[6] are not well understood which means authorities are not well-placed to manage those risks in the best way possible. In a worst case scenario, an unplanned and uncontrolled spill of circa 1600 tonnes of oil could give rise to direct environmental, social and economic costs that total $100 million or more (discussed further below) as well as significant indirect costs.[7] It is not possible to quantify in dollar terms the impact of a major oil release on the natural capital in the area or the 'value' that might be placed on reputational damage arising from such a release.

There is public interest in the risk posed by the wreck, with various parties raising the profile of the *Niagara*, and calls being made for something to be done about the potential risk. Maintaining the status quo does nothing to allay concerns and the concerns are difficult to mitigate because of the uncertainty surrounding the wreck.

In short, rather than maintaining the status quo, the case for further intervention rests on the benefits that stem from obtaining more information about the volume of any remaining oil, and the condition of the wreck and surrounding environment. More information would enable decision-makers to gain a better understanding of the likelihood, and consequences, of a release of oil and, moreover, determine the best course of action to take in response to the risk posed by the *Niagara*.

Before turning to the benefits of further intervention, it should be noted that intervention of itself could create some risk. Active intervention whereby the wreck is disturbed in some way could lead to a release of oil. This risk would need to be carefully managed during any activity but especially should an oil recovery operation be deemed necessary in future. In addition, undertaking an active wreck management programme for the *Niagara* may establish a precedent with respect to other wrecks. Creating an expectation that all wrecks will be proactively managed could be costly. In reality, however, precedent risk is not considered to be material. Maritime NZ is aware of only a small number of wrecks that might have some degree of environmental risk associated with them and none of anywhere near the magnitude of the *Niagara*.

## 3.3 *The benefits of reducing uncertainty*

There is a potential risk of a release of oil from the *Niagara*. However, the likelihood and extent of the consequences of that risk are very uncertain because it is not known how much oil, if any, remains in the wreck, or what condition the wreck is in (and, hence the risk of leakage occurring). At the heart of this business case is an investment designed to reduce that uncertainty.

Authorities are not currently in a position to make a well-informed decision about whether or not to undertake any activity (and, if so, to know what that activity should be and how urgently it should be undertaken) in respect of the potential risk posed by the wreck of the *Niagara*.

Better information would inform what decision-makers should do in response to the risk posed by a potential release of oil from the *Niagara* and result in better decision-making. That is the primary purpose of this business case.

Further intervention (over and above the status quo) that is aimed at reducing uncertainty will confer benefits in terms of enabling decision makers to:

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[6] The probability and consequences of a release of oil from the wreck that could give rise to significant environmental, social, and economic costs.

[7] Estimate for possible direct costs based on analysis performed for Maritime NZ by Navigatus Consulting.

- better understand the risk posed by the wreck
- make a more effective response to managing the actual risk posed (i.e. tailor the plan to the situation so it is not over- or under-engineered)
- choose the most cost-effective option for managing the risk.

Even if better information indicates there is no pressing need for further action to be undertaken, it will help to provide assurance regarding the suitability of the existing contingency plans (and identify the need for any changes to those plans).

## 3.4 *The impact of an oil spill (under the status quo)*

Continuing with the status quo carries the risk that there are significant quantities of oil remaining in the wreck, and that the condition of the wreck (and/or rate of deterioration) is such that a major oil spill will occur at some point in the future. Although the level of risk is not known, if the risk materialises, there will be several consequences:

- the area affected by the oil spill could be large
- the ability to effectively contain a large oil spill is uncertain
- the costs stemming from the direct costs in terms of the required response and impact on fishing, aquaculture and tourism could be very large
- the indirect costs in terms of environmental damage could be very large
- significant reputational damage for government given the public awareness of the issue and demands for action.

Rather than take the risk of these impacts occurring, a better option is to intervene to reduce uncertainty and better understand and manage the risks involved.

**Affected area**

An oil spill assessment for the *Niagara was* prepared in 2016 for Maritime NZ by RPS APASA. The following two images from RPS APASA show zones of potential oil exposure on the sea surface, following a hypothetical loss of furnace oil from the *Niagara*. The modelling assumed a 100 $m^3$ discharge of heavy fuel oil over 24 hours, tracked for 30 days.

Figure 1 shows the results calculated from 100 spill trajectories during summer conditions. Figure 2 shows the results calculated from 100 spill trajectories during winter conditions.

**Figure 1: Oil spill trajectory - summer**

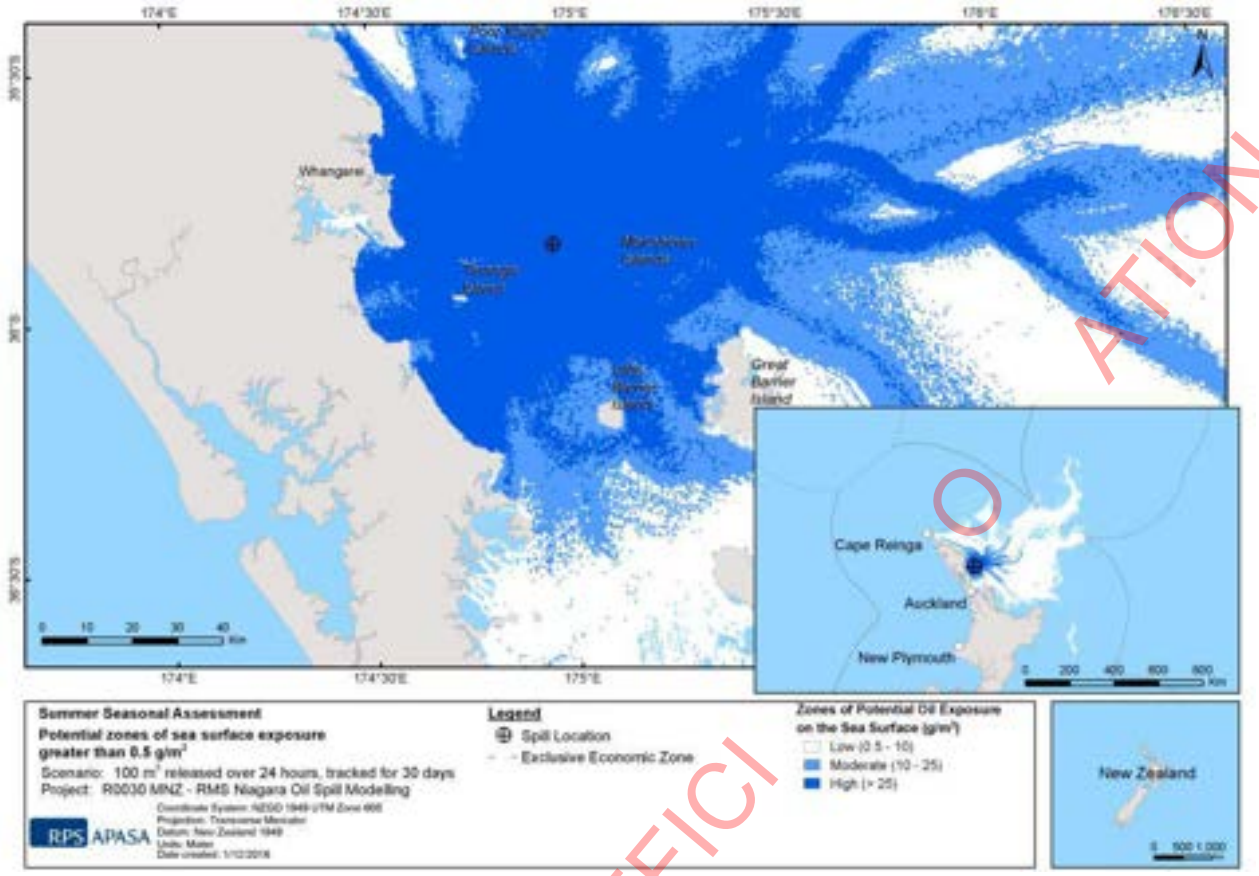
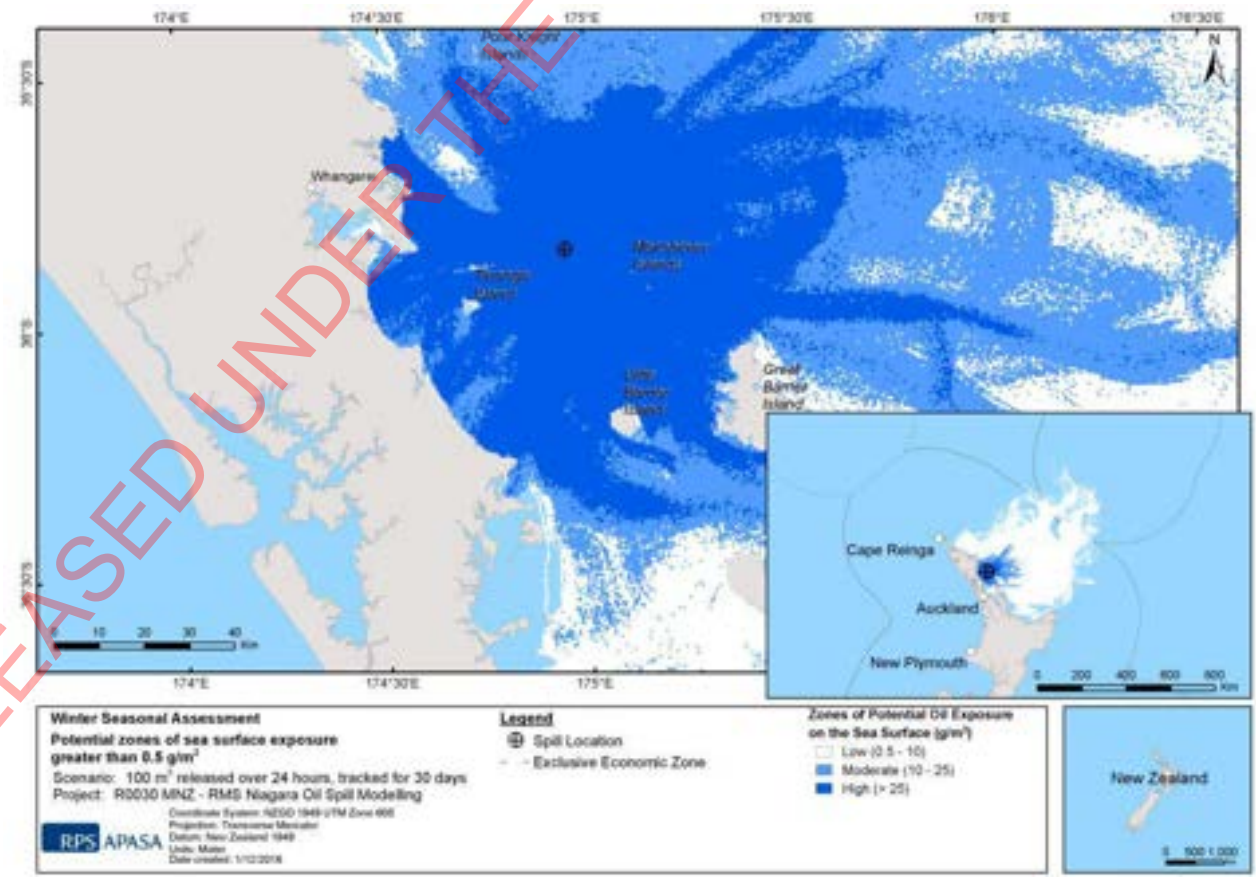



**Figure 2: Oil spill trajectory - winter**



Irrespective of the season, the geographic impact of the oil spill is highly significant (but worse in summer). Moreover, the illustrations above are for 100 $m^3$ of oil. Potentially, the discharge from the *Niagara* could be much larger than this.

**Effectiveness of responding to unplanned release of oil**

Were a release of oil to occur through an unplanned event, the effectiveness of any response would depend on the circumstances at the time, including weather patterns and the volume and nature of the release of oil. If a significant unplanned release of oil occurs, a response needs to be assembled which takes time and may arise when weather conditions are not conducive to undertaking response activity. Such a situation could delay the response and/or make it less effective, which could lead to worse outcomes/greater consequences.

The experience of the Deepwater Horizon oil spill in the Gulf of Mexico highlights that the effectiveness of on-water containment depends on a variety of factors, including:

- the quantity and type of oil
- weather and sea conditions
- availability of on-water recovery assets.

Maritime NZ understands an estimated 3-5% of the oil from the Deepwater Horizon spill was recovered. This was despite the use of very large numbers of vessels with containment equipment.

On-water containment and recovery is of marginal value if there are large quantities of oil in unfavourable weather/sea conditions. Booms will not be effective in adverse weather, with the oil spill difficult to contain, meaning that the focus would likely be on an onshore clean-up.

The variable effectiveness of an unplanned recovery operation depending on a range of factors, increases the uncertainty of the potential risk posed by a spill from the *Niagara*. A small spill in favourable weather may be largely manageable, whereas a large spill in unfavourable weather may have starkly different outcomes.

**Estimated consequences of oil spill**

***Direct Costs***

By way of context, the 2011 oil spill from the *Rena* saw an estimated 355 - 365 tonnes of fuel oil released after the vessel hit the Astrolabe Reef.[8] The direct response costs to Government of the clean-up from the *Rena* oil spill were estimated to be in the order of $47 million.[9] The salvage costs for the vessel (including recovery of on-board oil and complex cargo and debris clean-up) borne by the owners/operators (their insurers) are estimated to have been in the order of $700 million.

Maritime NZ contracted Navigatus Consulting to quantify the direct damages that could arise from an oil release from the wreck of the *Niagara.* Navigatus used an oil spill damages model, calibrated against the *Rena* spill, to estimate the clean-up costs and direct damages to wild fisheries, aquaculture, and tourism based on four different scenarios (20 tonne, 100 tonne, 500 tonne, and 1,600 tonne oil releases).[10]

There is variability in the estimated range of damages due to geographic differences in shores being oiled and whether the thresholds for various effects are met – both being weather dependent. Primarily, the direct cost consequences of oil spills based on the four scenarios are comprised of clean-up costs, with maximum direct damages of $1.2m estimated to fisheries.

Spill case histories suggest direct tourism effects are modest and only appear at relatively high thresholds. In the *Niagara* modelling, tourism effects appeared only in the highest release scenarios. In the 1,600 tonne oil spill scenario, there are some scenarios that have large tourism effects giving rise to substantial damages (over $50m). Whether such tourism effects occur depends on oil movement following release, which is a matter of chance depending on factors such as wind and current directions.

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8 https://www.maritimenz.govt.nz/public/environment/responding-to-spills/spill-response-case-studies/rena.asp

9 https://www.maritimenz.govt.nz/public/environment/responding-to-spills/documents/Independent-Review-MNZ-response-to-Rena.pdf

10 Indirect damages, such as effects on suppliers to affected businesses, are not included. In addition, no attempt was made to quantify or assign values to less tangible damages such as social and cultural effects or natural capital.

The Navigatus modelling assumes that the oiled area for different release scenarios would be similar, but with a larger volume of oil on the water surface. The greater volumes of oil give rise to greater clean-up costs. As the outcomes are weather dependent, there is no set level of direct damages, but rather a range of consequences which may occur.

The estimated range of direct damages for the four oil spill release scenarios are shown in Table 1.

**Table 1: Estimated cost of oil spill**

| Release scenario (tonnes) | Median direct damages ($m)[11] | Range of direct damages ($m) |
|---|---|---|
| 20 | $12m | $11m - $13m |
| 100 | $20m | $16m - $31m |
| 500 | $31m | $25m - $55m |
| 1,600 | $66m | $39m - $108m |

Based on the economic modelling undertaken by Navigatus, the direct costs of a worst case scenario of a release of 1,600 tonnes of oil are estimated to be within a range of $39 million to $108 million, with a median cost of $66 million. The estimates include the direct costs of clean-up, fisheries closures and the contamination of aquaculture operations together with direct costs stemming from adverse impacts on tourism.

The limitations of the Navigatus modelling mean that the actual median or worst case direct costs could differ from the amounts estimated and the estimate of direct damages could be higher. It should be noted that:

- the staff and equipment costs are based on a 2016 study and have not been updated
- only a limited number of scenarios were run
- each spill volume was not individually modelled, but rather scaled from earlier modelling work, which is an approximation
- the spill was assumed to occur more or less instantaneously (over a period of 24 hours or less) and a release over a much longer period would likely cause greater environmental damage.

**Indirect Costs and Natural Capital[12]**

Maritime NZ considered whether it was possible to estimate indirect costs and natural capital costs arising from the impact of an oil spill. It is very challenging to monetise costs in these areas; accordingly no estimates are provided. However, there would undoubtedly be significant social, economic and cultural impacts from a major oil spill occurring from the *Niagara*.

## 3.5 *Alignment with statutory responsibilities and good practice*

Maritime NZ has statutory responsibilities under the MTA to protect the marine environment, and specifically to deal with the risk of, and incidents involving, oil spills. Further intervention, over and above the status quo, is consistent with Maritime NZ's roles in relation to protecting the marine environment. Further intervention is also consistent with being a risk-based and evidence-led regulator. In general, good regulatory practice involves intervening early to minimise later harm. Consistent with this, Maritime NZ's approach is to take reasonable and practicable steps to mitigate the risks of harm turning into actual harm. Further intervention with respect to the *Niagara* is consistent with this.

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[11] Therefore, based on the Navigatus modelling, there is a 50% chance of direct damages being above the median figure and a 50% chance of direct damages being less than the median figure.

[12] New Zealand's social, cultural and economic wellbeing is inextricably tied to the state of its environment. This dependency spawned the term 'natural capital', which in its simplest form compares natural resources and ecological processes to 'money in the bank'. Natural capital is the irreplaceable biotic and abiotic components and processes that underwrite our way of life, many of our cultural aspirations, and the key industries and services upon which our economy is based – W Parker "The Importance of Natural Capital".

Even though, for all of the reasons discussed above, there is a strong case for further intervention with respect to the *Niagara*, there is a question as to whether there is a need for intervention over and above exercising the regulatory powers that are available to Maritime NZ. Maritime NZ can require the owners/responsible persons of a wreck to deal with it and any associated risks posed to the environment and/or navigation. In the case of the *Niagara*, however, such powers are likely to be of no use. Given the long passage of time since the *Niagara* sank, it is almost certain that a private owner of the wreck or the responsible persons no longer exists.

Ownership is very likely to have vested, in effect, with the Crown. By implication, if something needs to be done, over and above the status quo, to deal with the risks posed by the *Niagara*, the responsibility sits with the Crown. In this regard, decision-makers do not want to be accused of failing to address the risks posed by the *Niagara*, especially in the event that there is a significant oil spill that causes widespread environmental damage and gives rise to substantial economic, environmental, and social costs.

## 3.6 *Investment benefits*

The benefits that stem from further intervention in respect of the *Niagara* include:

- reducing uncertainty in order to better understand the risks posed by the wreck
- reducing the risk of harm turning into an actual harm and avoiding the potentially large direct costs (circa $100 million) and un-quantified indirect costs that could stem from a large and uncontrolled oil spill
- enabling Maritime NZ to determine the most cost effective approach to managing the risks posed by the *Niagara* (which could be by maintaining the contingency plan, or initiating an oil recovery operation) and avoiding unnecessary expenditure.

## *Investment objectives*

The primary objective is getting the right balance between minimising harm to the environment (and consequential economic, environmental, and social costs) and the costs of reducing the risk of harm. To achieve this objective, there is a need to reduce the uncertainty posed by the *Niagara* by addressing information gaps to support decision-making.

# 4. Economic case

## 4.1 Overview of the options

The two main options for managing the potential risk of an oil spill from the *Niagara* are:

1 undertaking a site-based survey and a subsequent desk-based risk assessment of the wreck of the *Niagara* to gain more information about the likelihood, and consequences, of an unplanned release of oil (and which could inform the appropriateness of mounting an oil recovery operation)

2 initiating an oil recovery operation to remove the oil that remains in the wreck (assuming there is some).

A description of each option, the criteria against which the options are being assessed, and an assessment of each of these options is set out below.

## 4.2 Description of the intervention options

**Intervention Option 1: Undertake survey and risk assessment (two-phase approach)**

Undertaking a site-based survey and desk-based risk assessment is aimed at addressing the current level of uncertainty about the state of the wreck and surrounding environment, and the volume and location (within the wreck) of any remaining oil, and therefore the likelihood, scale, and consequences of a release of oil.

London Off-shore Consulting (LOC) – a global maritime consultancy with extensive salvage expertise - was commissioned by Maritime NZ in 2018 to prepare a technical report on the costs and methodology of undertaking a survey of the wreck of the *Niagara* in order to determine the integrity of the wreck and the quantity of oil remaining within the wreck.

LOC advised that the survey process should be split into two phases to reduce the risk of unnecessary expenditure; if phase one indicates factors that preclude any possibility of oil recovery, then the additional costs of mobilising expensive vessels and equipment from overseas needed for phase two of the survey work might be avoided.

The Centre for Environment, Fisheries and Aquaculture Science (Cefas) – a United Kingdom scientific agency with extensive wreck integrity survey and marine environmental survey experience - was also commissioned by Maritime NZ in 2018 to prepare a technical report (to complement the LOC report) on the wreck integrity survey and environmental survey requirements needed to support a detailed desk-based risk assessment. Their approach is in line with the model used in the UK for management of more than 5,000 wrecks worldwide.

The requirements detailed in the Cefas report will be used to further scope and define the wreck and environment survey work costed by LOC should the survey option be taken forward.

The two-phase survey would be undertaken along the following lines.

- Phase one involves surveying the wreck from a locally sourced vessel (in New Zealand) using an observation class Remote Operated Vehicle (ROV). This is a small remotely controlled submersible that carries cameras. The cameras are used to obtain video and still imagery of the vessel. Vessel-mounted multi-beam sonar is used also to scan the vessel to allow a detailed computer model to be built. In addition, this survey would undertake an initial environmental assessment using the same equipment. This work would establish the general condition of the wreck, inform an oil contents survey plan and an initial overall risk assessment. All of this work would then support making a decision to proceed to phase two of the survey programme. The cost of the survey elements of phase one is estimated to be in the region of 9(2)(b)(ii)
- Phase two is more complex and requires a larger and more sophisticated vessel (capable of automatic position keeping) or a vessel capable of mooring on site to provide a suitable platform for operating a work class ROV. This is a medium to large sized remotely controlled submersible that is capable of carrying sophisticated scanning equipment to detect oil in tanks and compartments and equipment to assess vessel hull plate thickness. It also carries hydraulic tools for cleaning the hull of the wreck and taking environmental samples. Hull cleaning will be undertaken using the ROV, hull thickness measurements taken using ultrasonic gauges, and oil level readings will be taken using specific scanning technology developed for this purpose. A wider area

and more detailed environmental sampling and base-lining programme will also be completed. Together this work allows for a comprehensive risk assessment to be completed and for a detailed plan to be developed for an oil recovery operation should one be required. 9(2)(f)(iv) [redacted]

9(2)(f)(iv) [redacted]

Subsequent to the LOC and Cefas reports, it is known that there is now a suitable vessel in New Zealand with the requisite capability, and a work class ROV, to undertake the survey activities. The domestic availability of this survey capability comes at a significantly reduced cost.

**Intervention Option 1a: Undertake survey and risk assessment (single phase approach)**

The LOC advice to undertake a two-phase approach was predicated on the assumption that a suitable vessel and equipment to support phase two of the survey work would need to be brought to New Zealand from offshore, entailing substantial mobilisation and de-mobilisation costs. The rationale for option 1 is it made economic sense to undertake the survey in two phases in order to potentially avoid the more significant costs of undertaking the complex and sophisticated activities of phase two if the comparatively straightforward and affordable phase one activity could provide sufficient certainty that there was either no oil or no risk of a significant spill (for example, either because the wreck is clearly structurally sound so as to securely contain any remaining oil, or the wreck is so significantly damaged that it could no longer hold any material quantity of oil).

Subsequent industry liaison by Maritime NZ has revealed that a suitable vessel and underwater survey equipment are now available in New Zealand with the capabilities required to undertake all necessary activities required for the wreck and environmental survey.

The presence of underwater survey capability in New Zealand significantly reduces the previous cost estimate and influences the previously advised two-phase approach. It is now possible to commission one vessel to undertake in a single phase the entire survey activities that were split in two phases in option 1 above.

There are two broad ways of carrying out option 1a:

- first, contracting a third-party commercial provider that is capable of providing both a vessel and a work-class ROV (such a provider operates in New Zealand and is known to Maritime NZ, and there are others internationally). This approach is now estimated to cost 9(2)(f)(iv) [redacted] (including other project costs) if using an NZ based vessel.

- secondly, contracting a third-party commercial provider for the provision and operation of a work-class ROV, and securing the services of a Government owned/operated vessel (Maritime NZ is aware of such sources in New Zealand, including the Royal New Zealand Navy, among others). This approach could further reduce the costs should a Government owned asset be available below commercial rates.

The former approach has the advantage of needing only to deal with the one provider. This approach has the benefit of being more administratively simple than the second approach, as only one other party would have to be engaged with, one contract entered into, one set of availability and timing coordinated, and one channel of communication maintained.

The latter approach has the disadvantage of the project complexity of entering into and managing a three-way contract (or some other arrangement), and ensuring integration of mechanical, electrical, and software systems between vessel and ROV. The advantage of the latter approach is that it may have a lower financial cost. The potential to reduce the financial cost of this approach to option 1a depends on the ability to use a vessel provided by the Navy.

The Navy has a potentially suitable vessel that is in its final stages of commissioning; it is expected to be available in the near future and initial discussions between Maritime NZ and the Navy indicated it could be made available for Maritime NZ's use. While there is no guarantee a Navy vessel could be used for supporting this survey activity, if it was available, the estimated financial cost of this approach to option 1a would reduce to 9(2)(f)(iv) (including other project costs).

Further potential advantages of the latter approach, if a Navy vessel is used, are:

- the opportunity to use this survey support work as a training and testing exercise for the Navy vessel and crew, but in a real, rather than simulated, situation
- it presents an opportunity for Maritime NZ and the Navy to work together, which has benefits given both parties are strategic and operational partners in various respects, including responding to major maritime incidents.

**Intervention Option 2: Initiate oil recovery operation**

Undertaking an oil recovery operation is aimed at removing the risk posed by the *Niagara* by recovering any remaining oil from the wreck before there is an unplanned discharge of oil.

It is inherently difficult to estimate the cost of recovery operations as they are influenced by a range of variables. The International Tanker Owners Pollution Federation (ITOPF) has prepared a paper on Sunken Oil and the Removal of Oil from Sunken Wrecks which notes the "enormous technical difficulties" that have to be overcome for sub-sea recovery of oil to be cost effective.[13] ITOPF notes a range of factors that influence the cost of oil recovery operations. These include:

- the extent or quantity of the oil and its location in a sunken wreck
- the quantities of water and sediment being recovered with the oil which, if substantial, can require a number of separation stages to remove excess water (which can be difficult even after transferring to an on-shore holding tank)
- adverse weather which can cause recovery operations to halt if conditions exceed the operational capability of the recovery systems
- weather conditions affect how oil is dispersed and this can lead to a need for a new survey to target the highest concentrations of oil, and re-deployment of recovery systems (in some circumstances, these factors may lead to abandonment of the operation to be reassessed in more favourable conditions/seasons).

The UK experience indicates that a recovery exercise could cost many millions of dollars. It cost over $16 million (NZD) to recover 2,000 tonnes of oil in 2015 from the wreck of the RFA Darkdale, which was sunk in 1941 by a German submarine in shallow water in James Bay to the north of the island of St Helena (a British overseas territory). The Canadian and United States Governments recently committed $17.5 million to an oil recovery operation from the wreck of a 1980's vessel in relatively shallow water.

Noting the inherent difficulty of estimating such costs, and based on previous experience in other jurisdictions, Maritime NZ considers the costs of an oil recovery operation are likely to be in the order of tens of millions of dollars.

## 4.3 *Criteria for assessing the options*

The main options have been assessed using the following criteria (and with reference to the status quo):

- strategic alignment with Maritime NZ's objectives and responsibilities and good regulatory practice
- the cost to undertake the option (in the short term)
- the potential to reduce the uncertainty surrounding the risk posed by the *Niagara* (i.e. address the information gap)

[13] http://www.itopf.org/knowledge-resources/documents-guides/document/sunken-oil-and-the-removal-of-oil-from-sunken-wrecks-2008/

- the potential to reduce, and manage risk (probability and consequence), in the most cost-effective way.

## 4.4 *Assessment of the options*

### *Status quo*

The status quo is the cheapest and easiest option to implement. However, it does not reduce uncertainty. The status quo does nothing to advance the state of knowledge regarding the extent of oil remaining and the condition of the hull which means that there is very little understanding of the risks posed by the *Niagara*. This makes it difficult to manage the potential risks.

The status quo is very unlikely to be the most cost-effective way of managing risk. This option would only be cost effective if there is already a very high level of certainty that either there is no, or little, oil left in the wreck and/or the condition of the hull is such that there is no (or very little) risk of oil spill. Clearly, this is not the case.

The status quo could potentially result in the greatest long-term costs if, at some point, there is a large scale oil spill. Modelling by Navigatus indicates that the direct costs of a release of 1,600 tonnes of oil could be in the range of $39 million to $108 million (as the actual outcomes are weather dependent, Navigatus has given a range rather than a set level of direct damages). Indirect costs stemming from damage to natural capital, as well as other social, economic and cultural costs impacts, would be substantial.

Given the size of potential consequence, a strategy that relies just on maintaining a watching brief and contingency plan is unlikely to be viewed as being fully aligned with the principle of addressing the risk of harm to avoid incurring actual harm.

### *Survey and risk assessment*

The current lack of information prevents accurate assessment of the potential likelihood and size of an oil discharge from the *Niagara* and what the consequent direct and indirect, environmental, social, and economic costs would be if that risk is realised.

Advances in technology mean it is now possible to undertake survey activity of wrecks at almost any depth to aid understanding of the likelihood and consequences of an oil spill.

Having a better understanding of the situation will help inform the contingency plan and the case for any subsequent intervention by way of an oil recovery operation. If a recovery operation is considered desirable, a comprehensive survey and risk assessment is an essential prerequisite.

***Strategic alignment***

Undertaking a survey and risk assessment accords with best practice for managing the pollution risks from wrecks and also accords with the Hauraki Gulf Marine Spatial Plan which recommends an assessment of the risk posed by the wreck.

Internationally, it is best practice to gather information to be better informed of the risks posed by wrecks and to be better able to make evidence-informed decisions regarding how best to manage those risks. The United Kingdom operates a comprehensive Wreck Management Programme to manage the pollution risk from more than 5,000 historical wrecks it has responsibility for. Maritime NZ considers the UK programme represents best practice for managing the environmental risks from wrecks. That programme is based on a three-phase approach.

- Phases one and two involve site-based wreck integrity and environmental survey and a desk-based environmental risk assessment.[14]
- Phase three is an oil recovery operation. This is initiated if the overall risk (probability and consequence) is judged to be unacceptable. The timing for, and approach to, a recovery operation is informed by phases one and two.

[14] See section 4.2 regarding LOC advice to split this stage into two parts.

***Cost to undertake***

Undertaking a comprehensive survey and risk assessment is significantly cheaper (worst case estimate approximately 9(2)(f)(iv) for intervention option 1a) and less risky to implement than the alternative of proceeding directly to an oil recovery operation (which is estimated to cost in the tens of millions of dollars, and could unintentionally cause a spill).

Undertaking a survey and risk assessment is more expensive in the short term than the status quo but, compared to the status quo, the survey/risk assessment option helps to reduce uncertainty and enable risks to be managed in the best way.

The revised cost estimates arising from domestic availability of a suitable vessel and equipment means the survey and risk assessment now has two variations: intervention option 1 and intervention option 1a.

Intervention Option 1 has the potential estimated cost of 9(2)(f)(iv) if phase one is determinative and there is, therefore, no need to proceed to phase two. This outcome would amount to a saving of 9(2)(f)(iv) over intervention option 1a. However, the more likely scenario is that phase one is inconclusive and, therefore, that phase two is needed to provide sufficient information about the nature of the risk posed.

In such an event, the total estimated cost for intervention option 1 would be 9(2)(f)(iv), which would be an additional expense of 9(2)(f)(iv) above intervention option 1a (estimated cost 9(2)(f)(iv)) for the same information. Therefore, intervention option 1a is considered likely to be the more cost-effective option.

***Reduces uncertainty***

Gaining better information about the situation through undertaking a survey and risk assessment has the potential to significantly reduce the uncertainty presented by a wreck. In particular this option aims to provide much better information than exists now regarding the quantity of remaining oil, the state of the hull and the consequences if an oil spill occurs.

Non-intrusive survey activity poses very little risk of disturbing the wreck and causing an unintended release of oil.

There is, however, a risk that the survey is inconclusive; that is, it does not provide the information sought. The way that the wreck is situated on the seabed, and its present condition or the presence of obstacles (e.g. fishing nets), may mean it is not possible to assess the volume and location of the remaining oil, with much degree of confidence. Intervention option 1 is designed to address this risk through undertaking the survey in two phases: phase one would provide guidance in this regard and whether or not it is worth proceeding to the more expensive phase two of the survey.

However, there is also a strong likelihood that phase one of intervention option 1 would be inconclusive. There is, therefore, the possibility that phase two would be required in any event to inform decision makers about what they are dealing with in terms of the likelihood and size of the risk of a release of oil from the *Niagara*. In that case, it would be more efficient to proceed with intervention option 1a.

***Reduce risk and enable cost-effective management of risk***

If the survey and risk assessment yield better information that reduces uncertainty, the level of risk can be more accurately assessed. Decision-makers will be better placed to choose the best response to minimise harm and costs. In particular, the information generated by the survey and risk assessment will deliver a range of benefits.

- The information gleaned from the survey and risk assessment will help to determine whether a recovery is needed or whether the better option is to maintain a watching brief and contingency plan (i.e. the status quo).
- If the status quo is deemed to be the best approach, it means that the cost of mounting a recovery operation is avoided (or at least deferred to a later time if and when risk levels rise). Moreover, the information from the survey and risk assessment will provide assurance regarding the existing contingency plan and the need for any changes to that plan. That is, the information will help to ensure that the contingency plan is well aligned with the risks involved. In so doing, if the contingency plan needs to be implemented at some stage, the consequences of an oil spill will be minimised.
- Alternatively, if the overall risk assessment is such that a recovery operation needs to be mounted, there will be more information available to determine the optimal timing for, and approach to, the recovery. In this respect, the survey and risk assessment option helps to avoid unnecessary expenditure in terms of a recovery operation that is over-engineered, or badly designed, relative to the risks involved, or in terms of being mounted too early (i.e. before risks reach an unacceptable level).

It follows from the points above that irrespective of whether the status quo, or the recovery operation, turns out to be the best way forward, undertaking the survey and the risk assessment in the first instance helps to avoid unnecessary expenditure and tailor the response to the risks posed. In short, the survey and risk assessment is a classic example of spend an amount today in order to potentially save a much larger amount in the future.

## *Oil recovery operation*

The option to undertake an immediate oil recovery operation leaps ahead of addressing the uncertainty of the situation to completely remove the potential risk posed by the *Niagara* (once successfully completed). Once any remaining oil is recovered from the wreck, there is no risk of an oil spill causing environmental damage and, hence, no risk of incurring the associated economic, environmental and social costs. It is, however, far from certain that the actual risk warrants an immediate recovery operation. Therefore, this option carries a high risk of incurring unnecessary expenditure.

***Strategic alignment***

Committing to undertake an oil recovery operation (before having completed a survey and risk assessment) could be characterised as representing an overly hasty and impulsive approach that is not informed by evidence and does not adequately balance other responsibilities (such as fiscal prudence and being risk-focused). It therefore addresses some of Maritime NZ's strategic objectives and responsibilities (such as dealing with the threat of pollution), but not others.

***Cost to undertake***

The recovery operation is the most expensive in the immediate term and most difficult option to implement. While cost is dependent on a variety of factors, an oil recovery operation in respect of the *Niagara* is estimated at some tens of millions of dollars (as discussed in section 4.2).

***Reduces uncertainty***

Immediate recovery does not directly address the uncertainty of the situation. Rather, this option treats the current situation as though it is already confirmed there is an immediate and high risk of an oil leak that will cause significant environmental damage and give rise to substantial environmental, social, and economic costs.

In reality, however, the situation regarding the wreck is far from certain. A recovery operation may not be needed immediately, or at all.

***Reduce risk and enable cost-effective management of risk***

While immediate recovery removes the risk of environmental damage posed by the wreck, there is some risk of environmental damage arising from the operation causing an unintentional release of oil. Physical intervention is inherently problematic with old, unstable wrecks in an uncertain situation. Given the wreck has been underwater for 79 years, the structure is likely to have suffered significant corrosion. Moreover, experience shows that oil can escape from the tanks but nevertheless still be contained within the overall hull. In such situations, oil may be encountered in unexpected places which increases the risk of a recovery operation unintentionally causing a spill (and, hence, environmental damage and associated costs).

If it transpires that the current situation poses little or no risk of an oil leak (because either there is not much oil left and/or the oil is securely contained), this option carries the risk of incurring significant cost (estimated at some tens of millions of dollars) when such costs do not need to be incurred.

Alternatively, if there is substantial oil remaining in the wreck and a real risk of it leaking, the recovery option is a lower cost and lower risk option than the status quo. A planned recovery operation is likely to cost in the order of tens of millions of dollars compared to the possibility of direct costs of $100 million and unquantified indirect costs and impacts on natural capital if there is an unplanned and substantial oil spill. A planned recovery option involves much lower risk of an oil spill because the timing and design of the recovery can be chosen to best suit seasonal and weather conditions. In contrast, an unplanned spill involves many more complexities and uncertainties.

However, initiating a recovery operation without first undertaking a survey and risk assessment is not the least cost or most cost effective way of proceeding. An immediate oil recovery operation may be disproportionate to the actual risk posed by the *Niagara*, given the uncertain condition of the wreck and volume and location of any remaining oil. Obtaining more information before initiating a recovery operation will help to ensure the operation is proportional to the risks posed.

## 4.5 *Comparison of options*

The table below sets out a comparison of the costs of the options given two possible scenarios of there being no/little oil left remaining in the wreck, and there being a substantial volume of oil remaining.

| Option | Costs if no/little oil remaining | Costs if substantial volume of oil remaining |
|---|---|---|
| **Status Quo** | Least cost (i.e. zero) | Most cost (direct costs potentially in the order of $100 million plus indirect costs and costs to natural capital) |
| **Survey and risk assessment: option 1** | [redacted] s9(2)(f)(iv) | |
| **Survey and risk assessment: option 1a** | | |
| **Oil recovery operation** | High cost (approximately tens of millions) | High cost (approximately tens of millions) and may not be right sized |

At this stage, the risk of an oil spill from the wreck has not been assessed based on actual data.

Although unlikely, if it turns out there is no oil, or no material risk of oil spill, undertaking the survey and risk assessment has the advantage of confirming that no more cost needs to be incurred (i.e. there would be no need to maintain the contingency plan).

It is more likely that there is oil and a risk of material oil spill. In which case, the survey and assessment option is likely to be the least cost option (even allowing for the subsequent cost of mounting a recovery operation) because the information obtained from the survey and risk assessment can be used to:

- tailor the recovery operation to match the quantities and risks involved (it avoids over-engineering the recovery operation)
- determine the optimal timing for the recovery thereby avoiding spending money until the risks are unacceptable.

In addition to the cost implications, Table 2 below presents a summary of the assessment of the two intervention options, and the status quo.

**Table 2: Summary assessment of the options**

| | Strategic alignment | Cost to undertake | Reduces uncertainty | Reduce risk and manage it in a cost effective way |
|---|---|---|---|---|
| ***Status quo*** | Low alignment with Maritime NZ objectives and responsibilities because conflicts with principles of being risk led and evidence based | Very low immediate and on-going costs (maintain contingency plan and monitor reports) | Does not reduce uncertainty and, hence, does not enable a better understanding of risks and how to manage them | Risk remains of oil spill giving rise to environmental damage and associated environmental, economic and social costs (estimated at potentially in the order of $100m of direct costs in worst case)<br><br>Direct cost of damage caused by uncontrolled oil spill (possibly $100 million) is almost certainly more than the estimated cost of a controlled recovery operation (low tens of millions of dollars)<br><br>Small risk of unnecessary expenditure on contingency plan if there is no oil or no risk of spill. This is, however, an unlikely situation |
| ***Survey and risk assessment: option 1*** | High alignment with Maritime NZ objectives and responsibilities as evidence-based and risk-informed approach that balances risk and financial responsibility | Relatively small immediate costs ( 9(2)(f)(iv) ) | Better information reduces uncertainty and helps to understand the level of risk posed by the wreck.<br><br>There is a small risk that uncertainty remains because the survey results are inconclusive (or the survey cannot be undertaken) | Better information regarding the risks enables risk to be better managed<br><br>If the results of the survey and assessment point to the need to mount a recovery option, the risk and costs of an uncontrolled oil spill are minimised. Moreover, the recovery operation is tailored to the risks (scale, approach and timing). However, small risk remains that the recovery triggers an unintentional spill<br><br>If results point to no oil or risk of spill, then small saving from not having to maintain the contingency plan<br><br>Risk of unnecessary expenditure from undertaking phase one, only to have to undertake phase two<br><br>Some risk of (minor) unnecessary expenditure if survey is inconclusive |
| ***Survey and risk assessment: option 1a*** | High alignment with Maritime NZ objectives and responsibilities as evidence-based and risk-informed approach that balances risk and financial responsibility | Relatively smaller immediate costs ( 9(2)(f)(iv) ) | Better information reduces uncertainty and helps to understand the level of risk posed by the wreck.<br><br>There is a small risk that uncertainty remains because the survey results are inconclusive (or the survey cannot be undertaken) | Better information regarding the risks enables risk to be better managed<br><br>If the results of the survey and assessment point to the need to mount a recovery option, the risk and costs of an uncontrolled oil spill are minimised. Moreover, the recovery operation is tailored to the risks (scale, approach and timing). However, small risk remains that the recovery triggers an unintentional spill<br><br>If results point to no oil or risk of spill, then small saving from not |

| | | | | |
|---|---|---|---|---|
| | | | | having to maintain the contingency plan<br><br>Some risk of (minor) unnecessary expenditure if survey is inconclusive |
| ***Oil recovery operation*** | Moderate alignment with Maritime NZ objectives and responsibilities because of risk of incurring more cost than necessary | Most expensive immediate costs (tens of millions of dollars) | Leaps ahead of addressing uncertainty, and treats situation as posing a certain and immediate high risk of environmental damage | Removes risk of environmental damage as much as possible<br><br>Some risk of environmental damage by causing unintentional spill<br><br>Cost of recovery operation (scale, approach and timing) not optimised because of gaps in knowledge regarding the current situation and the risks it poses<br><br>Small risk of needlessly incurring tens of millions of dollars of expenditure because survey and assessment indicates no/very low risk of spill (this outcome is very unlikely) |

## 4.6 *Conclusion*

The option to undertake a survey and risk assessment in a single phase (intervention option 1a) in respect of the *Niagara* represents the best balance of the identified options across the identified criteria. In short, this option offers the best balance between risks and the costs of managing those risks. It is, therefore, the preferred option.

Maintaining the status quo is a possible option but it is a risky strategy. The consequence could be a large uncontrolled oil spill that costs New Zealand in the order of $100 million in direct costs and un-quantified, but substantial, indirect costs including costs to natural capital. This outcome can be avoided by investing in the survey and risk assessment. Accordingly, the status quo is not recommended.

The option to immediately initiate an oil recovery operation is not preferred until more is known about the risks. Until more is known, this option risks spending more money than is needed because either:

- there is no oil or no risk of spill (unlikely), or
- the recovery is not well tailored to the situation presented by the *Niagara* (a risk the recovery is over-engineered), or
- the recovery is undertaken sooner than is needed.

Undertaking a survey and risk assessment to inform the merits and method of any recovery operation would mitigate the risks of undertaking an unnecessary recovery operation and its associated operational risks. Given that a recovery operation logically follows after a survey and risk assessment, there is a natural hierarchy between these two options while the current situation holds. This also means that if the preference was to proceed directly to a recovery operation, a survey and risk assessment would be needed in any event.

If the results of the risk assessment and survey indicate an unacceptable level of risk, then Maritime NZ will take steps to prepare a subsequent business case that focuses on initiating an oil recovery operation and the nature and scope of options in that regard.

# 5. Commercial case

## 5.1 Potential procurement approach

Maritime NZ does not have the in-house capability to undertake a survey and risk assessment in respect of the *Niagara*. Accordingly, Maritime NZ will invite potential suppliers to provide a response to a request for quotation to provide these services. Any procurement will be informed by consultation with local iwi, the two Regional Councils, and other stakeholders as listed in the management case, below.

As noted in section 4.2, the intention is to undertake the underwater survey in a single phase (involving a visual survey, scanning and modelling of the wreck, taking of hull measurements and oil level readings, environmental survey and overall risk assessment). By using a domestically sourced vessel, the expense of mobilising and demobilising a vessel from offshore can be avoided. This approach provides greater assurance that money is being spent wisely.

Once selected, Maritime NZ and the supplier(s) will enter into a contract(s) for services which details the nature of the work to be done, the methodology, equipment to be used, timeframe for undertaking the work, and the cost required to deliver the services.

Assumptions, constraints, dependencies, risks and strategies for mitigation will be considered and documented, with roles and responsibilities clearly defined between Maritime NZ and the supplier.

As survey vessels are expensive, especially if mobilisation to the survey site involves a voyage of a substantial distance, the potential to combine undertaking any survey with other work should be explored. The cost of the survey may be able to be reduced if the survey vessel is going to be in the area for other business (because the mobilisation cost may be smaller if the costs of the voyage can be shared across more than one job).

## 5.2 Likely attractiveness of the investment proposal to potential market suppliers

Underwater surveys and formal risk assessments of wrecks are highly specialised undertakings. However, there are providers in New Zealand and internationally capable of supplying such services. Based on engagement undertaken to date, there is market interest and capability to deliver the services required for the preferred option.

LOC has been engaged to provide a report outlining the costs required to undertake an underwater survey to determine the condition of the vessel, integrity of the fuel tanks, quantity of fuel remaining, and a general survey of the ecosystem. Cefas has been engaged to provide advice on wreck integrity and environmental survey requirements.

ROVCO, a United Kingdom based global provider of ROV services, including modelling, underwater survey, and all aspects of ROV operations, have provided cost estimates for multiple aspects of the ROV activities required for the survey.

Maritime NZ has also engaged with the New Zealand based industry to gauge domestic capability to support survey activity. There is now available in New Zealand a vessel with Dynamic Positioning capability[15] and the capabilities required to operate a work-class ROV. Further, a work-class ROV is available in New Zealand with the capability required to operate all necessary tools and undertake the necessary actions for the wreck and environmental survey.

The Royal New Zealand Navy has also been approached previously to consider potential support. Discussions indicated there is capability to support, potentially, the survey, with a suitable vessel expected to be in commission in the near future. However, there is no guarantee this Navy vessel will be available for this activity.

A potential provider has followed media reports relating to the *Niagara* and contacted Maritime NZ to express interest in undertaking survey work (and potential subsequent oil recovery operations). More generally, Maritime NZ is aware of privately owned vessels in New Zealand, of the moored type (assessed by LOC as the lower cost option), that could potentially be used to undertake the survey work. In addition NIWA may have capabilities available at

[15] Dynamic Positioning – the ability for a vessel to hold its position without any anchoring systems – typically with computer controlled thrusters.

commercial rates to support the activity. All options need to be further explored to get the right capability and right balance of availability (timeliness) and cost.

The UK Centre for Environment, Fisheries and Aquaculture Science (Cefas) is Maritime NZ's preferred provider to undertake the desk-top risk assessment using the results of the survey and providing an independent report because of their expertise in undertaking such engagements and their adherence to international best practice wreck management.

# 6 Financial case

## 6.1 Funding for any formal risk assessment

Five different potential funding sources for undertaking the survey and risk assessment are considered below: maritime levies, the oil pollution fund, fees and charges, fuel excise duty, and Crown revenue. These options reflect Maritime NZ's existing sources of funding.

### Maritime levies

The purposes for which maritime levies can be used are set out in section 191 of the Maritime Transport Act 1994. Generally these levies are for the provision of services relating to maritime safety (such as to enable the provision of navigational aids, distress and safety radio services, marine safety information, and other services related to the safety of shipping). Although the maritime levies can be used to fund any of Maritime NZ's powers under the Act, it is questionable, given the apparent intent of the levy and the existence of the Oil Pollution Levy as to whether this extends to pollution.

### Oil Pollution Fund

Maritime NZ administers the Oil Pollution Fund (the fund). The fund is established under section 330 of the Maritime Transport Act 1994 and is used to pay the costs associated with preparation for, and responses to, oil spills.

9(2)(f)(iv)

[redacted]

### Fees and charges

Fees and charges are recovered to fund the specific services to which they relate, such as seafarer licenses, ship registration, operator audits, inspections, and exemptions from rules. This funding source is not relevant in the case of the *Niagara*.

## *Fuel Excise Duty*

A small amount of fuel excise duty is provided to Maritime NZ for the purposes of activities in relation to recreational boating. Under section 9(1) of the Land Transport Management Act 2003, the Fuel Excise Duty is an available funding source that allows the responsible Minister to incur expenses up to the equivalent estimated excise duty paid by users of pleasure craft for the following purposes:

- search and rescue activities
- recreational boating and safety awareness
- maritime safety services that benefit users of pleasure craft
- administration of the above three purposes.

The purposes listed above do not include the situation presented by the *Niagara*.

9(2)(f)(iv)

[redacted]

## *Funding sought*

9(2)(f)(iv)

[redacted]

The costs provided are estimates. Final costs will be known with certainty pending the outcome of the procurement process. Final costs are also dependent on vessel availability and type. Using a vessel that is already in the vicinity of the wreck for other purposes, or using the Navy (if it has availability and the right capabilities) may assist in further reducing financial costs.

No additional ongoing capital or operating expenditure is expected to be incurred under the preferred option. The initiative cannot be funded from within existing Crown-funded budgets.

# 7 Management case

## 7.1 Project governance and management

Maritime NZ anticipates a simple governance and management structure to implement the preferred option. This structure involves assigning a responsible project manager (from within the Maritime NZ if possible). The project manager will have oversight from the Deputy Director Safety and Response Systems, and will be the lead point of contact for the supplier to receive reports, provide updates to the project governance, and mitigate risks.

## 7.2 Indicative milestones

The key milestones for this project are:

- Maritime NZ tendering for, and selecting, a preferred supplier(s)
- procuring and contracting a supplier(s)
- the supplier(s) undertaking the survey and risk assessment exercises
- the supplier(s) delivering a report on the results of the survey and risk assessment.

The timing of undertaking the survey and risk assessment will depend on the availability of providers to perform that work, which is a matter that can be canvassed during the procurement process. One domestic provider has indicated their interest in undertaking this work and advised they have a suitable vessel available now. The Royal NZ Navy has also indicated its potential ability to support a survey of the *Niagara* with a soon-to-be commissioned vessel. Maritime NZ will be exploring the possibility of whether there are other vessels which may be here from overseas for other purposes.

Ideally, Maritime NZ is aiming to undertake the survey and then the desk-based risk assessment shortly thereafter with both tasks completed during the 2020/2021 financial year (subject to aligning with suitable seasonal conditions). Once ready to proceed, the duration of the survey will depend on weather conditions.

Information obtained from the survey will, if going to plan, provide Maritime NZ with a good understanding of the risks posed by the *Niagara.* At that point, work can be undertaken to determine what (if anything) should be done to address those risks and the urgency of action that is required.

## 7.3 Stakeholder engagement

### Project stakeholders

The following stakeholders have an interest in any intervention in the wreck of the *Niagara*:

- UK Treasury
- NZ Treasury
- Department of Conservation
- Ministry for the Environment
- Heritage New Zealand
- Ministry of Transport
- NIWA
- Regional Councils
- Local iwi

- Organisations with interests in the undersea telecommunications cables in the vicinity of the *Niagara* (for example, the Southern Cross Cable)[16]
- Environmental groups.

### *Stakeholder engagement strategy*

Maritime NZ has engaged with UK authorities, Treasury, the Department of Conservation, the Ministry of Transport, and NIWA.

As part of the project a comprehensive engagement strategy will be produced with a strong focus on engagement with local Iwi, local communities and locally based interested parties.

## *7.4 Project risks*

The risks of this project include those set out in the table below.

| Risk | Probability | Consequence | Mitigation |
|---|---|---|---|
| Providers are unavailable to undertake the services in a timely fashion | Low (already had some expressions of interest) | Moderate impact | Begin procurement process sufficiently in advance of identified window(s) for undertaking the activity |
| Suitable vessels are not available in New Zealand | Low (Maritime NZ is aware of suitable vessels in NZ, and of foreign vessels that can be brought to NZ) | Significant impact to costs. Moderate impact to timescales | Allow for transport time in procurement process. Vessels are available in Southeast Asia and Australia |
| Adverse weather conditions cause delays, which increase cost through the survey vessel being on hold until conditions improve or necessitating additional time to complete the work | Medium | Potentially high impact (both in terms of cost and success of the activity) | Plan the activity to be undertaken during periods of historically favourable weather conditions, and build in contingency for delays |
| Restrictions on anchoring and the presence of subsea cables (e.g. the Southern Cross Cable) | Low | Moderate impact (require different and potentially more expensive type of vessel if mooring not available) | Utilise vessel capable of maintaining position without anchoring systems |
| The oil tanks are not accessible from outside the hull (for example, if the vessel is on its side, tanks by the seabed will be diff cult to access) | Unknown | Moderate to high impact (if information cannot be obtained, the uncertainty remains, which would have a high impact) | Using a work-class ROV with technical oversight from international consultants to provide the best chance of obtaining useful information to provide certainty. Conducting initial visual and 3D inspections and terminating the survey if it |

[16] The Southern Cross Cable is the main line to the United States for New Zealand and Australia, and between New Zealand and Australia. It is part of the Southern Cross network. The cable is located approximately 2.5 nautical miles from the site of the wreck.

| Risk | Probability | Consequence | Mitigation |
|---|---|---|---|
| | | | becomes apparent that further survey work is not needed or would not be beneficial |
| Mobilising expensive equipment only to find that the wreck was significantly damaged by the explosions and significantly degraded over time | Medium | Low impact | Using a domestically-based vessel will save significant mobilisation and demobilisation costs. Conducting initial visual and 3D inspections and terminating the survey if it becomes apparent that further survey work is not needed or would not be beneficial. If the wreck is significantly damaged, the oil will likely be depleted. If this is the case, the survey can terminate with low impact (i.e. little risk of further oil leak) |
| The vessel is covered in fishing nets and/or marine growth which could impede access | Medium | Moderate impact | Using a domestically-based vessel will save significant mobilisation and demobilisation costs. Conducting initial visual and 3D inspections and terminating the survey if it becomes apparent that further survey work is not needed or would not be beneficial. |
| The results of the survey are inconclusive and/or heavily caveated | Unknown | Moderate/high impact | Select provider with expertise and suitable equipment. Consider risk and mitigation strategies in procurement and planning processes |

## *7.5 Benefits realisation*

The preferred option is expected to deliver benefits in the form of providing additional and more certain knowledge about the location and volume of any remaining oil and the condition of the wreck of the *Niagara.* This will provide a better understanding of the risks surrounding the *Niagara* (probability and size of oil spill and its consequences).

The benefits of undertaking the site-based survey and desk-based risk assessment will start to be realised once the survey and the desk-based risk assessment has been completed.

At the conclusion of the desk-based and all site-based survey work, information will be gathered and analysed. At that point the issue of whether to mount a recovery option, or continue with existing arrangements, needs to be revisited. The information obtained can be used to inform the contingency plan and/or any subsequent decision-making about if, when, and how to undertake an intervention to salvage any remaining oil, thus avoiding the risk of a potential spill.

The direct benefits of the proposed intervention is more and better information (less uncertainty) and, hence, better understanding of the risks posed by the *Niagara* and how to manage those risks. The flow-on benefits are, ultimately, ensuring that risks are managed in the most cost effective way possible.

If the need for recovery looks likely, a separate business case will be prepared accordingly (as recovery will need a substantial injection of funds).