London Offshore
Consultants Pte. Ltd.
6 Shenton Way OUE Downtown 2
#19-09
Singapore 068809

T (+65) 6224 9200
F (+65) 6224 2416
E singapore@loc-group.com
www.loc-group.com

REPORT ON THE

THREE RECREATIONAL DIVING ASSESSMENTS

MV "RENA", WRECKED ON ASTROLABE REEF

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report has been commissioned by MNZ to provide expert advice in respect to issues raised in the Resource Management Act (RMA) application report undertaken by Beca Carter Hollings & Ferner Ltd (BECA) on behalf of the owner of the M.V. “RENA”. Specifically, LOC has been asked to comment on the three recreational diving assessments that have been provided.

Resource consent is being sought for the preferred alternative of leaving the wreck, as it is in May 2014, in situ apart from further reduction of the debris field. This reduction of the debris field is intended to remove diving entanglements and other hazards. However, it is not clear to what extent this reduction will be. This is important as the recent passage of tropical storm LUSI has shown how the debris field has been churned up, effectively re-setting the diver hazards.

The two parties, Gorman & Mitchell, and Wasik, have prepared three reports assessing recreational diver safety at the wreck site. They have both recognised that this dive site will be of particular interest once there is public access; it was a popular dive site before RENA, and I consider that the infamy of RENA will attract increased interest in this location to recreational divers. Whilst the stern section has recently slipped into deeper water, effectively removing it from the reach of recreational divers, there are substantial areas still remaining in the debris field and wreck site which are easily accessible to such divers. Both parties have recognised the hazards that still exist, including the entanglements in the debris field and a section of the bow which has a tempting tunnel but is hazardous due to surge, and believe that the removal of these entanglements, cutting windows in the tunnel and promulgating warnings and guides to recreational divers will mitigate the hazards of this dive site. However, it is not clear who will police this location and who will provide the necessary updates and amendments on the status of the wreck site over time, given the changes that occur to it after every weather event. In particular, the re-setting of the debris field and the movements of the bow sections. Leaving these areas in situ, which is certain in respect of the bow section, but unclear in respect of the debris field, will generate a changing dive site where hazards thought to have been removed may re-appear. It is not clear who will then monitor and address the location.

1. INTRODUCTION

1.1 Instructions Received

1.1.1 We are instructed by Sid Wellik, Manager Legal services, Maritime New Zealand (MNZ) to review and provide expert opinion on three reports covering the assessments on recreational diving, as follows:-

- "Recreational diving on MV RENA" by D.Gorman & S. Mitchell (undated)
- "Supplementary Report. MV RENA: IMPLICATIONS FOR RECREATIONAL DIVING AFTER CYCLONE LUSI" by D.Gorman & S.Mitchell (dated 25th May 2014)
- "Recreational Diving Safety Assessment of the Wreck of the MV RENA, Bay of Plenty, NZ" by S.Wasik (dated 9th March 2014)

1.1.2 In particular we have been asked to specifically consider and comment on the following aspects of the reports:-

1. *A general assessment about the safety of recreational diving in the current environment;*
2. *Whether the likely or possible changes to the environment have been adequately addressed;*
3. *Any assessment of the likely future safety for recreational diving;*
4. *Any comments about proposed wreck access plan;*
5. *Any comments on the likely conditions to an RMA consent (if granted).*

1.2 Background

1.2.1 The “RENA” ran aground, at a speed of 17 knots, on the Astrolabe Reef at approximately 02:20 hours on 5th October 2011. On 11th October a period of bad weather and large seas caused the vessel to move from the original grounded condition with a change of heading of approximately 20°. It is thought that the bow of the vessel remained pinned to the reef during this period with the more buoyant aft section being moved by the heavy swell and rotating about the bow. This resulted in significant damage to the bulbous bow. The list of the vessel also changed from port to approximately 22° to starboard.

1.2.2 During the period of heavy weather a crack developed in way of No. 3 Hold in both the port and starboard side shells. The stern of the vessel rotated an additional 1-2° meaning that the crack on the starboard side opened to approximately 1.7 metres at its widest point. On the port side the crack was overlapping above the waterline and then opened to around 0.15 metres below the waterline.

1.2.3 On 21st October 2011 the vessel was officially declared a constructive total loss and became a wreck, which term is used hereafter.

1.2.4 The wreck was located at a position of 37º 32'.4S, 176º 25.7E with a heading of 276° True. (The position was provided by Discovery Marine Ltd (DML) who had undertaken single and multi-beam surveys of the reef in the area surrounding the wreck.)

1.2.5 During the salvage operation containers were removed from both above deck and partially below deck. However, during the early hours of 8th January 2012 during a period of bad weather, the hull severed in way of the damage in Hold 3. Over the next two days the stern section commenced listing further to starboard until eventually the stern section sank on 10th January 2012.

1.2.6 Subsequent to the bad weather it was established that the stern section had sunk on the reef and slid downwards to starboard and aft until coming to rest on the stern at a depth of 74 metres. The section was lying on its starboard side against the reef. The forward end of the aft section was 3.5 metres below the surface. The port bridge wing was some 10 metres below the surface. The fore section remained in place on the Astrolabe Reef.

1.2.7 Removal of containers from the forward section continued under the existing Lloyds' Open Form contract until 8th June 2012 when owners terminated the contract. The contractors Smit & Svitzer departed the site on 13th June 2012.

1.2.8 Owners prepared an invitation to tender for the partial removal of the bow section and on 8th August 2012 Resolve Salvage and Fire (RSF) commenced work on the wreck reduction of the forward section. The contract was for the removal of the forward section to -1 metre LAT.

1.2.9 Surveys undertaken by owners' contractors revealed that the wreck itself was beginning to disintegrate. An ROV survey undertaken in August 2012 showed that the port side of the upper accommodation area (in way of the chief engineer's cabin) on the stern section had begun to collapse.

1.2.10 RSF were subsequently contracted to remove part of the debris from around the wreck and to recover specific cargo that had dispersed around and remained within the wreck itself. In addition, the owners and their P&I Club also contracted RSF to remove the accommodation block from the wreck.

1.2.11 The bow section of the wreck is said to have been reduced to LAT- 1m. RSF' work ceased on this area in July 2013 leaving two sections of the bow on the Reef. These have since separated into 7 sections and are now spread around the shallow part of the Reef.

1.2.12 The upper decks of the accommodation block, down to Deck D, were removed in March 2014. Before the lower decks of the accommodation block could be removed, during the passage of tropical storm LUSI, the stern section sank further, sliding down the reef into deeper water increasing the depth of the accommodation block from -11m to -24m.

1.2.13 As of the 25th May 2014, the structure and cargo remnants of RENA on the Astrolabe Reef are now wholly below the sea surface in three main areas; 7 sections of the bow said to be located at depths ranging from -2m LAT to -15m LAT, a debris field of cargo and detached ships structure of at least 10,000 m² in depths ranging from about -2m LAT to -50m LAT, and the stern section where the shallowest depth is now said to be -24m LAT and deepest depth about -56m LAT.

1.2.14 As part of the resource consent application, which identifies the preferred proposal of effectively leaving these three main areas of the RENA, the owners commissioned three reports, from two parties, which have assessed its impact on the safety aspects for recreational diving on the wreck.

1.3 Scope of Report

1.3.1 Review and comment where appropriate on the recreational diving assessments by D.Gorman & S.Mitchell and S.Wasik and answer the specific questions included in paragraph 1.1.2 above.

1.4 Author

Whilst I have been a Salvage Master for 7 years I have been a qualified and practising salvage Naval Architect since 1995, which includes overseeing numerous diving operations, I am also a recreational diver having qualified as a PADI[1] Open Water diver in 1991 and having dived UK, North & South American and Asian waters over the last 23 years with over 50 dives logged in the last 5 years. Consequently, I believed I am qualified to answer the questions asked.

1.5 Disclaimer

This report is based on our understanding of the documents itemised in *para* 1.1.4 and the weekly salvage updates issued by MNZ; such evidence is contemporaneous in its nature. However, our opinions are based on the information available from these documents and not through our own

[1] PADI - Professional Association of Dive Instructors

attendances on site. Potential inaccuracies in any of the reports provided may as a result be reflected in this report.

2. GENERAL PARTICULARS

2.1 The Vessel “RENA”

2.1.1 Motor Vessel “RENA” (ex- “ANDAMAN SEA”, ex – “ZIM AMERICA”) was a fully cellular 7-hold, gearless container carrier which was owned at the material time by Daina Shipping Co of Liberia and operated and managed by Ciel Shipmanagement SA of Greece. The vessel’s keel was laid in October 1989 and she was completed in January 1990. The vessel was built at Howaldtswerke-Deutsche Werft AG (HDW) of Kiel. She was registered in Liberia and classed by the American Bureau of Shipping (ABS) with the following Hull Notation, AB*A1.

2.1.2 The vessel had the following principal dimensions:

Length Overall	:	236 metres
Breadth Moulded	:	32.2 metres
Depth Moulded	:	18.8 metres
Summer Loaded Draft	:	12.001 metres
GT	:	37,209
NT	:	16,454
Summer Deadweight	:	47,230 tonnes

2.1.3 The vessel’s propulsion was provided by a Zaklady Przemyslu Metalowego 'H Cegielski' SA - Poznan SULZER 8RTA76 Diesel Engine, developing 29,476 BHP at 98 RPM, driving a fixed pitch propeller. The vessel had a service speed of 21 knots.

2.1.4 The vessel was fitted with seven cargo holds. The vessel had a total capacity of 3,352 twenty foot equivalent units (TEU), split as 1,384 TEU within the holds and 1,968 on deck. In addition, the vessel was originally designed to carry 121 refrigerated units.

2.1.5 Prior to grounding the vessel had onboard 1,368 containers loaded as mixed TEU and FEU (forty-foot equivalent units). Of the containers said to have been onboard, 821 were loaded below deck and 547 were stowed on deck.

2.2 Astrolabe Reef

2.2.1 A brief reference to Astrolabe Reef is made in the New Zealand Pilot (NP51 – 2010 Edition)[2]. The reference is given below:

"***9.95*** *From a position ENE of "A" Light Beacon (E Cardinal) (37° 36.1'S 176° 10.7'E), at the seaward end of No.1 Reach to Tauranga Harbour, the coastal route leads initially ENE passing clear of Pudney Rock (37° 31'S 176° 19'E), depending on draught. Thence the track either continues ENE to pass N of Volkner Rocks (37° 29'S 177° 08'E) and thence to a position N of Cape Runaway, 41 miles E, or it leads E. The E track passes (with positions from Motiti Island Light (white metal column, 4m in height) (37° 36.4'S 176° 25.1'E)):*

N of Okaparu Reef (3 miles WNW), where the sea breaks in all swell conditions and particularly during NE or N gales, and:

N of Brewis Shoal ($2^3/_4$ miles NW), which breaks in a moderate to heavy swell from the NE, thence:

Either side of Astrolabe Reef (4 miles N), which breaks in all swell conditions and in fair weather appears like a boat, thence:……."

This reef structure just breaks the surface at low tide, roughly halfway between Motiti and Mayor Islands. It is renowned for pristine water, spectacular drop-offs to 37m and shallow plateaus alive with fish and the occasional seal. The reef is described as being a stellar scenic experience with visibility from 6-30m.[3]

[2] New Zealand Pilot NP51 Eighteenth Edition 2010, para 9.95.2, page 264
[3] http://www.newzealand.com/sg/article/diving-in-the-bay-of-plenty/

3. CONSIDERATIONS

3.1 *A General Assessment About the Safety of Recreational Diving in the Current Environment.*

3.1.1 With Astrolabe Reef already being a site of interest for sport divers, leaving the remnants of "RENA" will only increase the interest in the area. Those that came before will still come to the location to see the … "*gullies, plunging walls, shelves, caverns and caves"* … as described by Wasik[4]. The new group to the location will be the wreck divers, which as a side note to the statement made by Wasik[5], is that cave diving like more advanced wreck diving, is closely related to penetration of shipwrecks and Astrolabe Reef already offers divers the opportunity to explore … "*gullies, plunging walls, shelves, caverns and caves*[6]*" ….* Many of these new divers will have a pioneering spirit, both to explore and log a new location, some, like Wasik, may even be writing guides or magazine articles to be published for others to see, but also some will want to see if there is anything material left for them. These concepts have been covered in the reports.

3.1.2 It is clear that the dive location at Astrolabe Reef is already considered advanced[7] but the standard of the divers that have dived there is not available. Clearly though, mainly through its exposed location providing weather effects to the diving environment, the site has the potential to be treacherous. Wasik states that the weather at Astrolabe Reef is only suitable for diving approximately two thirds of the time.[8]

[4] Wasik Report, 2. Executive Summary, paragraph 3
[5] Wasik Report, 2. Executive Summary, paragraph 3
[6] Wasik Report, 6. Hazards for Recreational Divers, paragraph 2.
[7] Wasik Report, 2. Executive Summary, paragraph 3
[8] Wasik Report, 6. Hazards for Recreational Divers, paragraph 3.

3.1.3 Having reviewed the first Gorman & Mitchell Report[9], the statistics put forward appear to be what I would expect. Diving in its infancy was a pioneering activity, today much more is known about diving hazards, and equipment specification and reliability has increased to make the statistics what they are now – a relatively safe sport. Like most sports, sport diving has risks but these are well documented and not relevant to this report. As such the issues associated with the "RENA" are more to do with the risks posed by this particular wreck and its extended debris field rather than the hazards of diving or indeed wreck diving in general.

3.1.4 The report by Wasik, frequently mentions "*recreational divers of average experience*" defining this as a diver diving within a depth constraint of 30 metres, a no decompression dive profile and not conducting penetration dives[10], later in the report refining this is enhanced with …"*diving safely with a buddy, using appropriate equipment and diving within the limits of their qualification, fitness, experience, and of the site conditions"*…[11] furthering this with … "*divers who choose do so assume their own responsibility for diving beyond the limits of their certification"*… . However, many of those exploring the majority of the wreck will be diving beyond the 30 metre recommendation. This is also recognised in the supplementary report by Professors Gorman & Mitchel[12] … "*It is germane to point out the vast majority of recreational divers are not certified to depths beyond 18m and divers who visit the aft section of the Rena without appropriate certification must assume responsibility for diving beyond the limits of their training."* These statements would appear to be disclaimers, entered into both reports, in an attempt to place the responsibilities of an unsafe site on the divers rather than "RENA" interests. Similarly, the Gorman & Mitchel report also highlights the fact that … "*As long as there is a target, no matter how trivial, some divers will try to reach it and the depths involved in such dives would be substantial"*[13] There will always be some divers that will want to find the deepest point or the last remaining

[9] Recreational Diving on MV RENA – Gorman and Mitchell (March 2014)
[10] Wasik Report, 2. Executive Summary, paragraph 5
[11] Wasik Report, 5. Hazard Identification Methodology, paragraph 1
[12] MV RENA: Implications For Recreational Diving After Cyclone Lusi – Gorman and Mitchell (May 2014), page 5, paragraph 2
[13] MV RENA: Implications For Recreational Diving After Cyclone Lusi – Gorman and Mitchell (May 2014), page 5, paragraph 1

fragment, much in the same light as Cousteau’s desire to explore underwater, or Hillary’s drive towards other extremes, but man tackling nature through technology is different than the same adventurer being thwarted or indeed injured by remains left by others.

3.1.5 Notwithstanding this, people generally have some form of self-preservation instinct even though this will vary significantly according to individual’s risk tolerance. Those diving deeper, an activity which has often been regarded as beyond the certification schemes, and hence leaving little learning material available, are often more conversant with the risks and are more technically aware of the risks as they explore within their limits. This has been the necessity behind the growth of one of the training providers founded in the early nineties. This may partially explain why the statistics for deeper diving and wreck diving do not necessarily reflect the increased risk inherent of the more hazardous activity.

3.1.6 Between the various training providers there are training and logged experience based certification bands that permit diving to various depth limits with further specialties that cover different diving conditions and equipment. Certification supporting training is not to my knowledge mandatory in New Zealand or anywhere else in the world, although the diving industry makes attempts to police this requirement partially as a means to generate training revenue and evident in the increased number of courses available within the various corporate training providers over the last two decades.

3.1.7 In the documents provided much is made about the culpability of those diving beyond the level of their certification although this only has relevance to incidents where it can be shown that there is culpability or a failing in knowledge. Similarly the statistics, which show diving as safe, are a reflection of the status quo rather than something that is unusual and new.

3.1.8 “RENA” although regarded in some documents as being no different to any other accidental shipwreck should be regarded as very different. Most wrecks that are considered dive sites are relatively static in their environment, often below wave action, and although often deteriorating over time rarely close enough to the impact and break of the seas to be moved and torn apart by passing weather systems. Waves although appearing as a static profile travelling across the surface of the sea have circulatory water currents within the wave extending many times the visible wave height beneath the visible wave, creating surges in the water beneath the passing wave and exerting huge forces on anything that is there. Here with “RENA”, the shallow sections will be subject to massive wave action and surge which during changing conditions could leave people caught out amongst moving debris, or being flushed between wreckage. Indeed currents flowing within the debris could make some areas accessible with other adjacent areas being beyond the capability of the same diver leading to the separation of dive buddies if one were not able to negotiate a route back to a safer place.

3.1.9 The wreck of “MIKHAIL LERMONTOV” may be more hazardous in offering extensive wreck penetration opportunities, and is the site of the three diving fatalities noted by Gorman & Mitchel[14], confirming the risks associated with penetrating the structure during wreck dives.

3.1.10 In the case of “RENA” the effects of wave and current have since the first days of operation caused extensive damage to the structure of “RENA” and made the work of professional salvors, including their divers, difficult to say the least. So, to walk away and leave what is left has to expose the recreational diver to significantly greater risk than before. The risks posed by the weather being shallow water effects will ironically affect the lesser qualified and experienced divers more than those taking the greater challenge of diving deeper.

[14] Recreational Diving on MV RENA – Gorman and Mitchell (March 2014), page 16 - Fatalities

3.1.11 The shallow debris is quite well covered in the Wasik report, but fails to point out that container remains are that of thin plate, which when torn can offer treacherously sharp edges. It is also of note that for most of the obstructions the mitigating solution suggested is to remove the debris, except for the chemicals where the suggestion is only to advise divers! Nonetheless the risks posed by the current debris is a significant risk requiring significant removal or remediation, in part because the debris is shallow and where those exploring the reef may venture "for a quick look" as an aside from their main purpose of visiting the more benign conditions of the reef, where they may find themselves ill equipped to handle surge between potentially harmful obstructions.

3.1.12 Although the primary breakdown of the structure will occur in weather conditions that are beyond any divers capability or interest to be there, there will be movement of sections on other days which could significantly endanger sport divers investigating what would be perceived as the easily accessible shallower areas of the wreck. Thus posing risks to divers of entrapment, crushing and possibly shearing by moving plates.

3.1.13 Both the Gorman & Mitchell reports[15] and the Wasik report[16] highlight the risks posed by the 30 metre tunnel, which would make for an interesting dive, although as an overhead obstruction, this is a significant and tempting risk to adventurous but less experienced divers, as this is by definition in the realms of advanced wreck diving. At such a shallow depth (6m) this should be removed, as merely opening windows only makes it a less daunting challenge and still offers the risk of severe injury if the diver were affected by surge and buffeted along the tunnel, possibly with minimal protection to their body and in particularly their head. Something that more experienced divers would be aware of with cave divers and more advanced wreck divers wearing head protection to mitigate such risks. Mitigating the dangers of this tunnel by cutting windows still exposes divers to temptation and risk that is unnecessary, and the section may be better removed than a part solution found.

[15] Appendix One, Risk analysis of the bow and debris fields, paragraph 2
[16] Wasik report, 7.1 Wreck Penetration Opportunities, paragraph 2

3.1.14 The deeper aft parts of the wreck in reality are marginal for most divers, with most recognising their limitations and although they offer some severe risks and challenges most divers will not explore the aft portion of the wreck. However, some will go a little further and others will set up an expedition to explore it fully. Those that do explore the after portions will be more likely to understand the risks of penetrating the hull and those of the deeper water, however they may not be aware of the likelihood of potential movement or be prepared to handle the razor sharp edges left from the chain cutting of the superstructure, which could cause not only injury, but also sever the guidelines so essential for the diver exploring the internals of the wreck.

3.2 *Whether the likely or Possible Changes to the Environment have been Adequately Addressed*

3.2.1 The upper sections (bow) of the wreck will continue to degrade over time, however the rock structure will trap debris retaining sharp, or relatively sharp, projections as the debris breaks up and disperses over time. Weather events will continue to weaken and break up the structures with the likes of cyclone Lusi eventually clearing much of the shallow remains until only intermittent hazardous debris remains – this will however take time, even multiple decades.

3.2.2 Although the lower sections have recently moved extensively, the movement at this depth will be less than the when the bow section was closer to the surface, so further degradation of the lower sections will be slower.

3.2.3 Much of the initial Gorman & Mitchell report, dealt with comparisons between "RENA" and other popular wreck dive sites in New Zealand, dealing with such topics as *Characteristics, Fatalities, Accessibility and diving activity, Summary and comparison with MV RENA.* No specific mention has been made to the degradation of these wrecks due to weather conditions, other than the "WELLINGTON" … *"Any southerly swells … can create significant underwater surge conditions. The wreck has broken in two just forward of the bridge"*[17] …, while it has not been stated, I assume this has been caused by the surge conditions. Degradation of "RENA", as a result of surge conditions has not been considered and is not dealt with in their section *Recommendations and risk mitigation strategies.*3.2.5 Wasik, in his report[18], recognises that … *"Certain sections of the wreck will break down quicker than others. This is the same for all wrecks and even all of the artificially scuttled wrecks in New Zealand have degraded to some extent. The process of degradation is accelerated when wrecks lie in exposed positions. The environmental conditions at the reef, it is likely that certain sections of the wreck will be more susceptible to accelerated changes. … Particular areas of Rena … will be subject to the most stress from environments conditions due to being located in a dynamic environment. … Accelerated changes have the potential to occur during infrequent large storm events … there is a potential hazard present when divers return to the site" …*

[17] Gorman & Mitchell (March2014), HMNZS WELLINGTON, Characteristics
[18] Wasik Report, 7.6 Wreck Condition

3.2.4 In mitigation, Wasik proposes … *"a monitoring regime to record the visual condition of the wreck and any significant changes.*" … However, this monitoring will only be considered in areas … *"most prone to degradation and areas where divers are most likely to regularly visit"*[19] … Wasik further explains that monitoring of the wreck will provide an assessment of the wreck's condition over a period of 10 years, including if necessary following a significant storm event and that on-going information on how the wreck is degrading has been kept since the initial grounding. He concludes by saying …*"when considered with the additional 10 years of monitoring proposed following grant of consent, there will actually be around 13 years of information on how the wreck has degraded."*

3.2.5 However Wasik has not explained who, or which one body will be responsible for monitoring the changing conditions on the wreck, or who or which body will be responsible for declaring the wreck or sections of the wreck as being dangerous and not suitable for diving let alone any system for policing any recommendation. Wasik also states that in New Zealand, there is very little governmental or regulatory control over recreational diving on accidental wreck sites.[20] However, Wasik confirms that professional dive centres, dive clubs and professional trip leaders are currently required by health and safety legislation to provide safety measures during their excursions.[21] Although Wasik also states that prior to "RENA" excursions to the reef were conducted by private individuals, local and visiting scuba diving clubs, commercially organised excursions, independent charter boats, fishermen and wildlife watching operators[22], many of which would fall outside of the health and safety requirements imposed on the commercial outfits.

[19] Wasik Report, 7.6 Mitigation Proposed
[20] Wasik Report, 6.2 New Zealand Wreck diving
[21] Wasik Report, 7.5 Wreck Profile & Size
[22] Wasik Report, 6.1 Recreational Diving on Astrolabe Reef

3.2.6 Wasik states that a Wreck Access Plan is proposed, which will outline education materials to be prepared on potential risks and safety considerations for recreational divers who wish to explore the site. These plans will include a code of conduct for site users and interim surface management procedures to mitigate hazards in the first 2 dive seasons once the exclusion zone is lifted when visitation is expected to be high.[23]Given that there is very little governmental or regulatory control over recreational diving on accidental wreck sites, Wasik does not provide details of who will be responsible for preparing the proposed plans and procedures or how they will be policed.

3.2.7 The supplementary report issued by Gorman & Mitchell in May 2014, recognises the fact that the huge seas associated with tropical storm LUSI, caused significant changes in the condition of the wreck. The stern section is reported to have settled about 10m deeper, which now means that the shallowest part of the stern has gone from ~-12m to ~-30m. The very shallow section at the bow, the long corridor Gorman & Mitchell commented on in their first report, has actually moved up the reef to about -6m making it a … *"greater surge hazard, or perhaps more correctly, further limiting the range of conditions in which it can be safely dived*[24]*."* …

3.2.8 The records show that the wreck and debris field have been adversely affected by the weather conditions in general, even prior to the passing of tropical storm LUSI. Tropical storms are not an abnormal event or occurrence for this location and are like to continue to add to the degradation and continued movement of the wreck and debris field.

3.2.9 Both the Gorman & Mitchell reports, only make brief reference to the wire cabling both coiled and uncoiled, with a recommendation that this hazard be removed. No mention is made to any other items of debris that might be hazardous to recreational divers although it is unlikely that only one cargo presents a problem.

[23] Wasik Report, 8. Conclusion
[24] Gorman & Mitchell Supplementary report The MV RENA after Tropical Storm Lusi

3.2.10 Wasik deals with potential hazards within the debris field in more detail. At Section 7.1, he too identifies the numerous wire coils as being a hazard to recreational divers and recommends the removal as far as practicable, although the limits of practicality do not remove the probability of coils being left behind and later becoming a hazard after the next or later weather event. Gorman & Mitchell, in their Supplementary Report, state that, after the passage of tropical storm LUSI, ***"In the shallower reaches of the wreck, the wire hazard in the debris field has become worse, with partial uncoiling of many of the previous coils. We remain of the opinion that these need to be removed"*** Clearly, after a weather event, the debris field is churned up.

3.2.11 At Section 7.3, Wasik addresses *Amateur Salving and Removal of Artefacts* and recognises that recreational divers might be tempted to search for remains of valuable cargo or be enticed into the interior of the wreck in search for fixtures and fittings. Wasik has identified the hazard as divers becoming fixated on the task of working the wreck and not concentrating on their gas contents, decompression profile or exit route. With regards to the recovery of items such as the aluminium ingots, Wasik does say that due to the weight of these ingots, divers would struggle to lift them under their own buoyancy. In mitigation he suggests that as far as practicable, the aluminium ingots should be removed from accessible parts of the wreck. He also advises that there are declaration responsibilities for anyone recovering items from a wreck site in New Zealand.

3.2.12 Proposed mitigation is to provide educational materials as part of the Wreck Access Plan. Again, given that there is very little governmental or regulatory control over recreational diving on accidental wreck sites, how will the enthusiasm of recreational divers, for amateur salving, actually be curtailed to prevent accidents.

3.2.13 Wasik, at Section 7.8 has identified that there is a potential hazard to recreational divers, from potentially hazardous cargo remaining in the vicinity of the wreck, and proposes to mitigate this hazard with educational material. The Cawthron report[25], at section 4.3 – Summary, details contaminants which may need to be monitored for the RMA proposal. Given that monitoring of certain contaminants is recommended by the Cawthorn Institute, this might suggest that there is a potential for these contaminants to enter the food chain, which in turn could pose a hazard for recreational divers. This hazard has not been identified by Grman & Mitchell or Wasik.

3.3 *Any Assessments of the Likely Future Safety for Recreational Diving*

3.3.1 The risks will be greatest in the first few seasons when the initial divers will be coming to explore, not only through numbers but also though a lack of familiarity with this wreck, which may continue to change. It is noted that the internal panelling has largely collapsed, and this is often a significant risk that becomes more problematic over time until completely collapsed and degraded. With the panelling already collapsed, the risk of entrapment is significantly reduced and this will not deteriorate much over time, until major structural deterioration occurs sometime in the future and will probably be related to a significant weather event such as tropical storm LUSI.

3.3.2 The mitigation measures being proposed appear on the whole to comprise monitoring the condition of the wreck, and in particular after a significant weather event, provide a Wreck Access Plan, a code of conduct, and educational material to mitigate hazards in the first two dive seasons. However, the remains of "RENA" and the debris field have from day one, and continue to be, affected by weather events, with continued changes to the condition of the wreck and the debris field.

[25] Cawthorn Institute, Report No. 2407 – Water Quality and Ecotoxicity Assessment: Proposal to Leave the Remains of the MV Rena on Astrolabe Reef

3.3.3 Notwithstanding this, these measures will mitigate potential hazards for recreational divers that receive them, however the system for the dissemination of the information is not identified and as stated previously, in New Zealand, there is very little governmental or regulatory control over recreational diving on accidental wreck sites although professional dive centres, dive clubs and trip leaders are currently required by health and safety legislation to provide safety measures during excursions it is not known if this extends beyond due diligence matters to providing “educational material”.

3.3.4 Neither Gorman & Mitchell or Wasik, have addressed the problem as to who, or which party, will be responsible for monitoring the wreck and debris field and have the authority to advise or prevent recreational divers access should it be deemed that new hazards exist that have made the wreck site dangerous for recreational divers. Furthermore if a hazard were identified would this be capable of triggering further remediation or only a warning.

3.3.5 The parties who do have some control over the safety of recreational divers, such as professional dive centres, dive clubs and trip leaders, are also reliant on the revenue that is generated in taking divers to the site.

3.4 *Any Comments about the Proposed Wreck Access Plan*

3.4.1 With the exception of scuttled recreational sites, guide materials for most wrecks are developed over time, with most relying on contributions to third party published dive books, or notes provided in part, as advertisements on dive trip facilitator’s websites. To provide any information in advance of this would be a significant improvement, although a wreck access plan is not an excuse for leaving hazards, and will not be read by all. However, highlighting the significant dangers of the shallower areas, which may appear benign, may significantly deter those that would otherwise stray.

3.4.2 The reports do not cover how the plan will be implemented, whether it is limited to website and hand-out type material or whether it extends to having rangers policing and informing people onsite during suitable diving periods. Certainly there will have to be systems in place for having knowledgeable people inspect the wreckage to devise the plan and maintain the current status of the plan as the wreckage decays.

3.4.3 Monitoring any situation is only the act of watching a known problem and in no way will it resolve the problem itself, it is also unlikely that it would trigger anything more in response than awareness of any issues arising in the future.

3.5 *Any Comments on the Likely Conditions to an RMA Consent (If Granted)*

3.5.1 It goes without saying that the wreck site is in no way fit for recreational divers at this time with considerable remediation required before the site could have any restrictions lifted.

3.5.2 The extent of debris considered is limited to that covered in the reports and may not be a complete representation of the hazards present, including those trapped or damaged within the cargo hold, and those in or from containers that have been dispersed beyond the initial wreck location.

3.5.3 Starting with the shallower areas, the potential wave action and surge across the top of the site will leave all debris hazardous in all but the calmest weather. Even though the weather will ultimately destroy and remove the majority of the debris in the shallows, the mere presence of the debris will leave this area a significant hazard until either such time that it is removed either by intervention or over time. With Astrolabe Reef being a popular dive location, and one which is already considered to be advanced, further restriction by being left with debris will reduce the potential availability of the site for diving. As such the debris in the shallows should be removed to an extent where only isolated trapped debris remains.

3.5.4 The presence of the 30 metre tunnel section is of particular concern and should be removed in its entirety. This should also prove a more manageable exercise for the salvage divers to only cut rigging holes rather than spending a considerably greater time cutting multiple windows in the wreckage.

3.5.5 The reports agree that the wire coils should be removed and this should be required, however the extent needs to ensure that not just the expanded coils are removed, but all coils as it is likely that they could become a significant hazard at any time.

3.5.6 Although possibly time consuming to execute, requiring “air-lifts”, venturi or other pumping equipment to recover, the removal of the dispersed chemical cargo should be considered as diving exposes the individual to not just limited point contact through touching, but full body contact (including eyes) and ingestion, particularly if adjustments were made to a mask or regulator in the vicinity.

3.5.7 The ingots and “treasures” than divers may seek do not appear to be a hazard in themselves, unless they have potential to move or are toxic, as such removing them is only to remove the potential for the divers curiosity becoming the hazard.

3.5.8 Moving to the deeper debris and remains of the stern section, there is little practical work, save for the complete removal that would remove the risks to the divers, however most of the risks are those of diving rather than the wreckage. The panelling present in the superstructure is already collapsed making the superstructure safer than some wrecks, however the Gorman Mitchel report mentions vent flaps which could move and endanger divers – obstructions such as these could be removed, however, I would expect that many of the advanced divers exploring at this depth would be aware of such things and prepared to handle such things making their removal less important.

3.5.9 With the wreck now relocated after cyclone Lusi the stability of the stern section wreckage should be considered with regard to unexpected movement. This level of consideration should be maintained as part of any consent to leave the wreckage as until inspected thoroughly it would not be known if the wreckage is securely positioned or sitting on a crumbling outcrop.

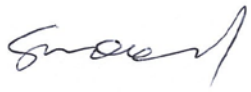
3.5.10 Approval of the mechanism for applying the wreck access plan should be part of any consent.

4. CONCLUSIONS

4.1 As of May 2014, the wreck of "RENA" now covers three areas; 7 sections of the bow section in shallow water on the reef said to be located in depths ranging from -2m LAT to -15m LAT, a field of debris of cargo and ships structure of at least 10,000m^2 in depth ranging from about -2m LAT to -50m LAT; and the stern section where the shallowest depth is now said to be -24m LAT, and deepest depth about -56m LAT.

4.2 The owners are continuing to remove debris, although not all, from the debris field but their preferred option is to leave the other sections of the wreck in situ. It is recorded that after the latest weather event, the passage of tropical storm LUSI in March 2014, caused significant movement with the stern section of the wreck; it is now deeper. The bow section; which was originally left in two pieces in July 2013, now, after similar weather events, has separated and is currently in 7 sections, dispersed around the shallow areas of the reef. The passage of tropical storm LUSI also churned up the debris field to such an extent that Gorman & Mitchell commented on how it had worsened ***"In the shallower reaches of the wreck, the wire hazard in the debris field has become worse, with partial uncoiling of many of the previous coils. We remain of the opinion that these need to be removed".***

4.3 Since October 2011, there has been an exclusion zone around the Reef which barred access to the public. It is intended in the preferred alternative of the resource consent application that the exclusion zone is removed. Consequently, recreational divers will visit Astrolabe Reef. This location, pre-RENA, was a popular dive location. Post-RENA, certainly initially, it is considered that there will be increased interest to recreational divers because of the presence of the RENA. Although there are areas of the wreck site below normal recreation diving depths, there are considerable sections in shallower depths, in particular the bow section pieces and debris field. Gorman & Mitchell and Wasik have recognised that these areas will be of interest and that they currently contain hazards to recreational divers; e.g. wire coil entanglement hazards and the surge within the 30m bow tunnel. Their response to these is to remove the hazards within the debris field, put windows in the tunnel to reduce the surge hazard and, in the main, promulgate notices on the dangers at the wreck site to recreational divers. It is not yet clear how the debris field will be addressed to remove entanglement and other hazards to divers, particularly in light of the effect of weather events, such as the recent passage of tropical storm LUSI causing the churning up of the debris field. Similarly, the movement of the, identified, hazardous section at the bow can only re-occur, resetting the extent of its hazard if it remains there. Further, there is no indication as to who will prepare the Wreck Access Plans and, if there are subsequent changes in the wreck site, who polices the location and makes the necessary amendments to the diver advice. Therefore, I believe that the approval of the mechanism for applying the Wreck Access Plan should form part of the consent.



Stephen Woods