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WUNMA BOARD OF INQUIRY

CHAPTER 5: THE SHIP'S OPERATIONS

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WUNMA BOARD OF INQUIRY

CHAPTER 5 THE SHIP'S OPERATIONS

5.1 INTRODUCTION

[1] The operation of the ship at the time of the marine incident was governed by agreements, laws, systems, procedures and practices. These included:

- **The Vessel Operations Management Agreement**

  This agreement governed the relationship between Zinifex and Inco in relation to the operation and management of the ship. It conferred contractual rights and imposed contractual obligations on those parties.

- **Legislation**

  The *Transport Operations (Marine Safety) Act* 1994 ("the *TOMS Act*"), the *Transport Operations (Marine Safety) Regulation* 2004 ("the *TOMS Regulation*") and other legislation regulate marine safety and related marine operational issues. This legislative framework is derived from international conventions developed within the International Maritime Organisation;

- **The Ship's Safety & Quality System**

  The Ship's Safety & Quality System ("SQS") created a system for the safe operation of the ship and allocated responsibility to various individuals. Some parts of the SQS, including its cyclone procedure, have a special relevance to the marine incident. Many parts of the SQS are relevant to the ship's daily operations. The SQS imposed responsibilities on the Managing Director of Inco, the Operations Manager/Designated Person, the Operations Superintendent – Karumba, the Master, the Chief Engineer and other members of the crew. The SQS outlined precautions, including a review of the latest weather reports and synopses, and inspection and securing of the ship's seaworthiness in each department.

- **Practices that govern the ship's operations**

  These include operational issues such as when the ship is loaded, when she sails, the conditions in which she is able to discharge her load into export vessels, the operation of the ship's water management system, maintenance and cleaning.

- **Seafaring Practices**

  Underpinning safety quality systems and legal requirements are well-established seafaring practices, including how to avoid cyclones.[1] Cyclone avoidance rules also appear in the ship's SQS. In short, they require the possible path of the cyclone to be plotted and the implementation of avoidance rules having regard to the dangerous and navigable semi-circle within a tropical cyclone.

- **Port of Karumba Cyclone Contingency Plan**

  This plan is activated once the threat of a cyclone exists. Its objective is to organise the orderly removal of vessels from their normal moorings to more sheltered locations or, in the case of large vessels, to sea. Its objective is to have the Port evacuated at least six hours before destructive winds commence. The plan includes requirements of what is to be done when destructive winds are forecast within 24 hours (Yellow Alert), within 16 hours (Blue Alert) and within 6 hours (Red Alert) whereupon the Port is closed. One of the requirements upon a Yellow Alert is to suspend the loading of all ships. Upon a Blue Alert all ships are to sail. The stated objective of the plan is that all large ships will have left the Port before winds reach 30 knots. The Cyclone Contingency Plan states that the anchoring of large vessels upstream is not recommended due to tidal surges that could inundate the area, which, with high winds, may strand vessels inland of the river system, making any salvage extremely difficult.

- **The Zinifex Century Mine Port Site Cyclone Procedure**

  This procedure defines the procedures developed by Zinifex in the event of a possible cyclone at its port facility and extends to aspects of the ship's operation.

5.2 AN OVERVIEW OF THE SHIP'S OPERATIONS

[2] Before addressing these systems, procedures and practices in greater detail, it is appropriate to give an overview of the ship's normal operation prior to the incident as well as the management and command structures that applied at the relevant time.

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[1] See, for instance, *Australian Seafarers Handbook*, Australian Hydrographic Service, 2004, pp.49-51; *Small Ships: Training and Operational Manual* 5th Ed; Maritime Safety Queensland (2007) pp.190-195.

[3] The ship forms an essential part of Zinifex's process for the distribution of concentrate, requiring coordination and interaction between Zinifex personnel and the ship's manager on a daily basis. The ship's daily operation is largely under the control of the ship's manager. At the time of the incident this was Inco.

[4] Zinifex operates a dewatering facility at Karumba. A slurry of mineral concentrate and water is pumped to it from the Century Mine by a 306 kilometre underground pipeline. The dewatering facility at Karumba implements a process that reduces the moisture content of the concentrate to about 12%. This is the maximum transportable moisture limit to avoid the concentrate acting as a liquid and thus adversely affecting the stability of the ship in which it is carried.[2] The concentrate is then stored in a concentrate shed for reclaiming and loading onto the *Wunma*. Inco was responsible under the Vessel Operations Management Agreement to reclaim the concentrate and to load the ship. Thus there were two connected command structures at the time of the incident. The first involved the operation by Zinifex of the dewatering and production facility, which is headed by Zinifex's Port Operations Manager at Karumba. The second was Inco's conduct of the reclaiming, loading and shipping operation. Inco's personnel included an Operations Superintendent based at the facility and the Master of the ship.

[5] When it is not at sea or in the channel, the *Wunma* is berthed at the Zinifex wharf at Karumba. The ship's cargo capacity is approximately 5,000 dead weight tonnes ("dwt"). Generally she takes a full load to an export vessel. The export vessels to which she unloads are generally called "handimax" and "handisize" ships, and their cargo capacities vary between 30,000 and 45,000 dwt. The actual load carried on individual voyages of the *Wunma* may vary depending upon tides and the salinity of the water in the Gulf, which in turn affects her buoyancy and her load line.

5.3 LOADING THE *WUNMA*

[6] Loading takes between five and eight hours. It takes about four hours to sail to the export vessel at the Roadstead, although times can vary significantly due to weather and tidal conditions and the position of the export ship within the Roadstead. If the ship is not carrying a full load the time taken can be considerably less than four hours. Generally, the time taken to sail to the export vessel is between three and five

[2] IMO Resolution MSC.193(79) *Code of Safe Practice for Bulk Cargoes, 2004* adopted 3 December 2004.

hours. Discharging from the ship to the export vessel takes about three to four hours. Thus, once the *Wunma* has been loaded, she takes on average approximately twelve hours to sail to the export vessel, discharge and return to port.

[7] The duration of the voyage to and from the export vessel depends on weather and the tide. There is only one tide per day in the Gulf of Carpentaria. The maximum draft for *Wunma* to sail is 3.95 metres. There is only sufficient depth during a narrow window at high tide in which the ship can leave or enter the port when loaded.

[8] Because the ship's departure is dependent upon the diurnal tides at Karumba, the ship usually takes one load per day to an export vessel. If there are export vessels waiting to load their cargo, it is possible for the ship to complete a loading every day, seven days a week. The crewing of the ship is based on a continuous operation.

[9] The ship sometimes may be unable to sail due to weather conditions or maintenance requirements. The narrow channel and the large canopy above the ship's hold affect her ability to safely navigate the river channel. Typically, she is unable to safely do so if winds exceed 25 knots. Wind and sea conditions affect her ability to safely discharge into export vessels.

[10] Zinifex's plan is to export one million tonnes per year. With the ship's cargo capacity of about 5,000 dwt this approximates 200 loads per annum. Due to the varying capacities of the export vessels, there are occasions where only a part load can be transported, so generally the vessel needs to operate approximately 240 days in the year to reach the planned export levels.

[11] The timing and number of loads depends upon the arrival and scheduling of export vessels. Zinifex is responsible for negotiating the sale of its product, and the terms of charterparties that determine the voyage of export vessels and the amount that is to be shipped by each of them. The scheduling and arrival of an export vessel leads to the development of a load plan in conjunction with the ship's manager.

[12] Whilst the reclaiming of concentrate and loading was the responsibility of Inco and the decision about when to sail that of the Master, coordination between Zinifex and Inco was essential. This was facilitated on a daily basis by a morning Port Operations Review Meeting that was attended by key operating personnel from

Zinifex's port facility and Inco's Operations Superintendent. The Operations Review Meeting reviewed the previous day's operations, addressed production, safety, health and environmental issues and agreed a plan for that day. The outcome of the meeting was recorded in a form headed "Port Daily Coms meeting".[3] The form recorded whether or not there was compliance with the plan from the previous day. If, for instance, the ship did not sail the previous day or was not sailing that day and an export vessel was waiting to be loaded, Zinifex would raise the issue at an Operations Review Meeting.

[13] The Master of the ship did not usually attend the Operations Review Meeting. Instead, information from the ship and its Master was typically received via Inco's Operations Superintendent who spoke to the Master prior to the Operations Review Meeting or received documents from the ship such as the minutes of the Positive Action Safety System ("PASS") meeting that was held by the ship's crew each morning.

[14] In summary, the presence of an export vessel at the Roadstead prompted the activation of an anticipated load plan. The load plan included details about anticipated loading times, departure times, amounts to be discharged on each voyage and discharge times. These plans were issued by the Master and circulated to Inco and Zinifex, and could be amended. If and when a load was discharged into the export vessel, this was detailed into a report in the form of a shipping summary.[4]

[15] Loading practices at the time of the incident generally were governed by these procedures, namely:

(a) the scheduling of an export vessel;

(b) planning processes leading to the development of an anticipated load plan that would be the subject of consideration by Zinifex and Inco at a daily Operations Review Meeting;

(c) the implementation of that plan by the activation of the re-claiming and loading plant by Inco unless the Master decided it was inappropriate to load.

In some respects it may be difficult to pinpoint by whom and when a decision to load was made under such a process. The Master of the ship issued an anticipated

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3 The date appearing at the top of this document is the day prior to the meeting so as to record matters such as production levels that day, and what is planned for the day upon which the meeting occurs appears in the lower part of the form.

4 See, for example, Exhibit 26.

load plan for review by Zinifex and Inco personnel, and it was the Master who could decide that a planned load not be taken on board.[5] As a result, it can be said that the Master decided whether and when the ship would be loaded. Expressed differently, once a loading plan had been circulated and adopted, the Master could decide to not load in accordance with that plan.

[16] The provisions of the Cyclone Procedure in the SQS and the Port of Karumba Cyclone Contingency Plan (to be discussed in further detail below) contained provisions whereby once a certain alert status was reached loading operations would cease. Notably, neither procedure prevented the ship from being loaded on 3 February 2007.

[17] Unless such an alert status was triggered, there was nothing specific in the SQS or any other written procedure governing the ship's operation that prevented loading when a low pressure system was in the Gulf. No written procedure existed prior to or at the time of the incident that incorporated the practice described in Captain Heath Daniel's email to Captain Boath of 22 September 2005 which stated:

> "Over the upcoming cyclone season Inco will manage any approaching cyclone as per the previous two seasons. Using current procedures the Wunma will cease all cargo operations well in advance of any approaching low pressure system and be on standby to exit the Port if required."[6]

[18] The existence of such a practice was addressed by a former Master of the *Wunma*, Captain Thomson, in his evidence:

> "28. I understood that the *MV Wunma* was not designed to go out in cyclonic conditions. My understanding was that *MV Wunma* was to operate in the Gulf of Carpentaria in sheltered waters, not to try and withstand the rigours of a cyclone.
>
> 29. From my association with those involved in the construction at the time it was constructed, I believed that the strength of the ship would be okay. But the concern about going to sea in cyclonic conditions was whether we would get pooped or not. There was probably less chance of getting pooped in an unloaded state than when loaded, but you could not be sure. (Pooped is when you are in a following sea and the wave catches up to the vessel and breaks over the stern.)

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5 Captain Dunnett; T.339.

6 Exhibit 49; CB112.

30. Because we had these reservations about whether the ship was able to operate in a loaded state in a cyclone, if there were any cyclones threatening, we did not load. We would stay at the wharf waiting to see which way the weather system went.

31. If there a tropical low down low in the Gulf, we would not load. If it was a cyclone forming on the east coast or up off the tip of Cape York or Gove, we would probably keep working and closely monitor the movement of the system. Those systems were not going to affect us unless they started to move into the Gulf. But if there was something moving into the Gulf, then we did not load."[7]

[19] Evidence to like effect was given by Captain Thomson in his oral evidence[8] and also by Captain Gordon Dunnett, who was a Master and Relief Master on the *Wunma* between July 2003 and November 2006.[9]

[20] The practice of not loading the ship if there was a tropical low in or moving into the Gulf was not passed on to new Masters, including Captain Seal, as part of their training. However, evidence was given by Captain Dunnett of an occasion in early 2006, when Captain Seal was Master, of a low pressure system coming from the East coast when it was decided that there would be no point in loading the ship and she was tied to the berth with extra mooring lines.[10]

[21] In short, although the practice of not loading when there is a low pressure system in the Gulf may have been adopted over the years, it did not form part of the ship's operating procedures.

[22] The absence of such an operating procedure in the ship's SQS or other written operating procedures had the potential to leave the ship in a loaded condition in the event of the low pressure system developing into a cyclone. This is because there is no discharging facility in the port and deteriorating sea and wind conditions may make it impossible to discharge into an export vessel. Unloading the ship in port by using earthmoving equipment is not a practical option since it would take literally days to unload it.[11]

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7 Exhibit 9; paras 28-31.
8 Captain Thomson; T.33–34; T.36.
9 Captain Dunnett; T.324–325; T.329; T.332; T.338.
10 Captain Dunnett; T.324–325; T.329.
11 Statement of Frank Thomson, Exhibit 9; para 33.

[23] The practice of not loading when there is a low pressure system in the Gulf during the cyclone season, as described in Captain Daniel's email of 22 September 2005 and in the evidence of Captain Thomson and Captain Dunnett, is an appropriate precaution.

[24] Its omission from the ship's SQS or other written operating procedure is largely unexplained. In the first years of the ship's operation the view may have been taken that the ship should be able to travel to the cyclone mooring buoy at Sweers Island even in a loaded condition, and that there was no need for an operating procedure to ensure that she was unloaded before going to the cyclone mooring.[12] If this view was taken, it did not conform with the views of the ship's Masters at the time, who were concerned about the ship's seakeeping properties in a loaded condition.[13]

[25] Emerging concerns in later years about the utility of the cyclone mooring at Sweers Island and the risks posed to the marine environment by the ship being at sea in cyclonic conditions when loaded, as identified by Dr Cowell and others, should have led to the practice of not loading the ship when a low pressure system was in the Gulf being incorporated into the ship's written operating procedures.

[26] Finally, the "decommissioning" of the cyclone mooring, the removal of the cyclone mooring as an option in the ship's SQS cyclone procedure and the inclusion of the option of the ship going to sea to "ride out" a cyclone necessitated a review of the ship's operating procedures to ensure that she was not caught in a loaded condition during a cyclone. The designer of the ship had not contemplated that she would go to sea in cyclonic conditions in a loaded condition,[14] and the Lloyd's Register review of her strength in cyclonic seas assumed that it was unlikely that the ship would be fully loaded during a cyclone.[15] Masters of the ship like Captain Thomson sensibly adopted the practice of not loading the ship if a low pressure system was in the Gulf.

[27] The omission of their practice from the ship's written operating procedures was a major shortcoming.

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12 For instance, Captain Diack considered in December 1999 that the ship should be able to use the mooring in any state of loading as cyclone can form very rapidly, and that a condition that the concentrate be removed from the ship before she proceeded to the mooring would delay and limit the ship's use of the mooring, and significantly interfere with marine safety: Exhibit 49; CB40. Captain Diack; T.911–912.

13 Captain Dunnett; T.333.

14 Statement of Mr Ballantyne, Exhibit 97; paras 36, 37 and 50. Mr Ballantyne; T.801.

15 Exhibit 49; CB99.

[28] The first draft of the new cyclone procedures appeared in December 2003.[16] At that stage it was in three parts. The first part had as its objective to ensure that, where reasonably possible, the ship "will have nil cargo on board in the event of a cyclone occurring in the Gulf of Carpentaria".

[29] This draft procedure did not, in terms, prohibit loading whenever a low pressure system was in the Gulf of Carpentaria during the cyclone season. But it did provide for the ship to not be loaded if the weather was likely to deteriorate, and it applied even if no cyclone alerts were in force. Paragraph 4.1.2(e) of the draft procedure applied when the ship was at sea. It stated:

> "If the medium to long-term assessment indicates that the weather is likely to deteriorate and thus, in the opinion of the Master it would not be feasible to undertake another discharge voyage, return to Karumba. **Do not** attempt to load another cargo."

Paragraph 4.1.3 of the draft procedure applied when the vessel was in port. It stated in paragraph 4.1.3(d):

> "**Do not** load the vessel if it is believed the weather is likely to deteriorate (see 4.1.2(d) above)."

[30] Paragraph 4.1.2(d) defined "worsening weather" to mean that conditions alongside the export vessel posed a danger of the loading chute striking some part of the export vessel or sea swell and wind patterns would make it dangerous for the *Wunma* to traverse the shipping channel, or a combination of both. If the reference in paragraph 4.1.3(d) to "weather is likely to deteriorate" was intended to include the kind of weather assessment in 4.1.2(e), then the draft procedure had a significant potential operation. This is because a low pressure system that develops in the Gulf will often make it not feasible for the ship to discharge into the export vessel. Captain Thomson explained:

> "…if there is a system developing, normally it will bring up 20, 25 knot, 30 knot winds in the lower part of the gulf. Normally from the north-west. It is very hard to go alongside of an export ship and discharge. So you are better off sitting…at the wharf unloaded because once you load you can't unload."[17]

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16 Exhibit 49; CB69.

17 Captain Thomson; T.36.

[31] Evidence was given that a low pressure system in the South Western part of the Gulf will produce sea conditions from the North West that will take two to three days for seas to settle even if a cyclone does not develop, making it impossible to discharge to the export ship, and inappropriate to load.[18]

[32] The draft procedures of December 2003 were still the subject of discussion between representatives of the Inco, Zinifex, MSQ and the EPA in late 2004 and early 2005.[19] A further draft was circulated in September 2005. It was in two parts, and did not have the stated objective of ensuring that the ship had nil cargo when cyclones were in the Gulf.[20] Unlike the December 2003 draft, it did not provide that the ship should not be loaded in deteriorating weather conditions prior to any cyclone alert coming into force. The new draft generally reflects the procedures that existed at the time of the incident, namely having actions based upon different alerts. For reasons to be discussed, the requirement in those procedures to not load if a "Blue Alert" was declared comes too late to prevent the ship being caught in a loaded condition during a cyclone.

[33] The introduction and implementation of a procedure to prevent loading at an earlier time and well before a "Blue Alert", for instance, when a low pressure system was in the Gulf (the practice adopted by Captain Thomson and other Masters) or when such a system was in the Southern part of the Gulf, would have prevented the cargo being loaded on 3 February 2007.

5.4 COMMERCIAL PRESSURE

[34] A substantial body of evidence supported the existence of a commitment by Zinifex to a culture of safety in the operation of its port facility that extended insofar as Zinifex influenced the operation of the ship. One indicator of this is the weighting given in the calculation of the bonus component in Inco's management fee. For instance, in calculating Inco's bonus for 2005/06 various areas were weighted as 60% safety, 30% environmental and 10% operational.[21]

[35] The issue of commercial pressure inevitably arises for consideration in circumstances in which each voyage by the *Wunma* to an export vessel involves the

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18 Captain Thomson; T.88.
19 Exhibit 49; CB90, CB100.
20 Exhibit 49; CB112.
21 Statement of Mal Mewett; Exhibit 47; paras 35 and 36.

carriage of millions of dollars worth of concentrate, and the ship is expected to take loads to the export vessels on about 240 days per year to reach planned export levels,.

[36] Captain Thomson's evidence was that the level of cargo activity for the *Wunma* was much higher than he experienced as Master of the *Aburri* where there was "a lot more time and a lot more flexibility".[22] A former Master, Captain Hadley, who was employed as Chief Mate and Relief Master on the *Wunma* in 2004 and 2005, gave the following evidence:

> "20. Whilst I was always well aware of the commercial pressure to proceed as quickly and as efficiently as we could, such pressure was not usually unreasonable. However, I do believe that on a number of occasions an opportunity to allow the crew to rest was ignored by the company in favour of getting on with the job of backloading the *Wunma*.
>
> 21. If however I decided that the sailing conditions were not suitable to leave the Port, my decision in that regard was never questioned by the owners or operators of the vessel. It is the Master who makes the assessment of conditions at sea and decides whether the *Wunma* puts to sea and/or is unloaded onto export vessels.
>
> 22. Nonetheless, the Master would have to justify why cargo was not loaded on to the *Wunma*. This pressure would increase markedly when the storage shed at Karumba was nearly full.
>
> 23. If the shed was full, no product could be received from the Mine and the whole conveyance process would stop. …"

[37] There is other evidence that on occasions when the Master decided not to load and the ship did not sail to the export vessel the Master would be asked to explain.[23] But their evidence is that their explanations were accepted.

[38] Zinifex's Port Operations Manager, Mr Mewett, gave evidence that during an Operations Review Meeting if the relevant performance targets were not being met and the vessel was not sailing that day whilst an export vessel was waiting to be loaded, Zinifex would query the situation. But if Inco could provide a satisfactory reason why she was not intended to sail that day, he would not press them to sail. Reasons for not sailing that he would not contest included any danger of the crew and vessel because of weather conditions, the risk of not being able to discharge

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22 Captain Thomson; T.52.

because of the swell or urgent maintenance requirements.[24] Mr Mewett's evidence was that if a decision was made not to sail, he would usually discuss the decision with the Master or other Inco personnel but he would never tell the Master that he had to sail. Mr Mewett's understanding, and those of other witnesses, was that the Master had the authority to decide whether and when the *Wunma* was to leave port and this authority was respected.

[39] Perceptions can differ from reality, and some Masters may have different perceptions to others concerning the commercial pressure to load in accordance with an existing load plan. The practice of the Master being called over to the office to explain why the Master decided to not load may exert a subtle pressure. Mr Mewett's evidence was that he had never rejected an explanation that was given to Zinifex on safety grounds and that, on the contrary, when a decision had been made to not load for safety reasons Zinifex had given "positive reinforcement" because it did not want people to think that they were under too much pressure.[25] The practice of going to the Master for an explanation as to why he has not loaded or left the wharf,[26] rather than relying on the advice given by Inco's Operations Superintendent, may be well-intentioned to better understand why a decision was made. But such a practice has the potential to influence the perceptions of a Master and apply subtle pressure to comply with a pre-arranged loading plan. That said, there is no acceptable evidence that the practice of Zinifex asking a Master why a ship had not been loaded in fact placed inappropriate pressure upon Masters in general or upon any particular Master.

[40] The commercial and operational environment in which the ship operates inevitably imposes a pressure upon those responsible for the operation of the ship to load and discharge into waiting export ships, if possible. This kind of commercial pressure is understandable and not unreasonable provided it does not affect the safe operation of the ship and the safety and welfare of her crew. There is no reliable evidence that it did. There was no claim by a present or former Master of the ship that he was required to load as a result of dictation or pressure from Zinifex to do so or that he was concerned that if he did not do so, there would be unpleasant or adverse consequences. The evidence indicates that although decisions to not load were

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23 Captain Dunnett; T.329–330.
24 Exhibit 47; paras 51 and 52.
25 Mr Mewett; T.385.
26 Mr Mewett; T.423.

sometimes queried, provided there was a satisfactory explanation, those decisions were never challenged.

[41] Despite Zinifex's obvious commercial interest in ensuring as many loads as possible were transferred to export vessels anchored or expected at the Roadstead, there is no reliable evidence that it adopted the practice of pressuring Masters to load and to undertake voyages when it was unsafe to do so. The evidence is that it did not adopt such a practice.

5.5 MAINTENANCE

[42] Maintenance on the ship was planned under a computer system known by its proprietary name, AMOS. The system was based on a schedule of planned maintenance.[27] Some items of maintenance could only be undertaken when the ship was "laid up", and that would occur probably two and no more than three times per year.[28]

[43] The planned maintenance program that is generated by AMOS could be changed. An AMSA Auditor in August 2006 observed that amendments to the AMOS maintenance system appeared "uncontrolled",[29] which was taken by Inco's Operations Manager to mean that access rights were not restricted to certain individuals to change areas of planned maintenance, with the Chief Engineer having certain access rights, the First Engineer having different access rights, and so on.[30] The underlying issues in this context concern who should have access rights to change planned maintenance and the recording and reporting of changes to the system, including who made the changes and when they were made.

[44] Actual maintenance records were on computer. But unlike the majority of ships in Inco's fleet, access by Inco's head office to these records was limited because of a Zinifex computer "firewall". Inco's head office had to rely on the Chief Engineer and the Master to administer the system. It would be reviewed by the Fleet Technical Manager, or superintendents on visits to the ship and when an audit was being done.[31]

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27 Mr McDonald; T.441–442.
28 Mr McDonald; T.443.
29 Exhibit 32.
30 Captain Ives; T.474–474.
31 Mr McDonald; T.442.

[45] Captain Thomson's evidence was that, at times during his period as Master, due to a change in shipping schedules or "lack of manpower" the general maintenance program would be put on hold.[32] But any maintenance that was concerned with the safety of the ship or the crew was not put on hold.[33] Another former Master, Captain Hadley, gave evidence that the major problem with effecting repairs was Karumba's remote location and the short turnaround times between voyages. For a tradesman to attend the ship could cost thousands of dollars for the time spent travelling. Repairs were difficult to organise if they were not deemed an emergency or could not be attended to locally.[34] Some replacement parts were in short supply and maintenance jobs were cancelled on occasions.[35]

[46] In its 2006 Operational Review commissioned by Zinifex, Thompson Clarke Shipping was critical of the absence of scheduled maintenance downtime, with cargo transfer taking precedence and maintenance being "fitted in around cargo requirements".[36] This system with scheduled maintenance periods being displaced, was said by Thompson Clarke Shipping to have apparently grown up by default. Zinifex recognised that scheduled maintenance was "haphazard".[37] Insufficient resources were allocated to planned shutdowns and planned maintenance.[38] Improved planning of maintenance was said to require a "bipartisan effort" by Zinifex and Inco.[39]

5.6 SURVEYS

[47] Maritime safety legislation requires annual surveys of the ship. The fact that the ship is partially classed through Lloyd's Register (for hull and machinery) leads to a division of survey functions, with Lloyd's Register surveyors being responsible for surveys of hull and machinery. Records indicate that a Lloyd's Register survey of hull and machinery was certified on 16 August 2005 with a certificate due to expire on 31 August 2009, and an interim survey due August 2007.[40] That interim survey was overtaken by the surveys that occurred shortly after the incident and new certificates by Lloyd's Surveyors to which later reference will be made.

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32 Exhibit 9; para 54.
33 Captain Thomson; T.87.
34 Exhibit 75; para 36.
35 Exhibit 75; para 38.
36 See Chapter 6, para 12; Thompson Clarke Operational Review, Exhibit 49; CB137, para 9.1.2.
37 Mr Mewett; T.412.
38 Mr Mewett; T.412.
39 Mr Mewett; T.412.
40 Exhibit 31.

[48] Annual surveys are required of safety equipment, load line and matters such as structural fire protection. This requires an inspection of the ship's safety equipment including EPIRB's static safety releases, life rafts and fire fighting equipment. Fire fighting equipment may be certified by an independent, accredited testing body that certifies that the fire fighting equipment is serviceable.

[49] Surveys of load line rely upon the load line that is calculated and certified by a naval architect. The certificate of load line identifies in the form of a diagram the dimensions and location of the load line. The surveyor ensures that the load line is at the right height and has the right dimensions. The surveyor inspects the ship to assess "down flooding" to guard against the risk of water being retained on the vessel and immersing the load line. This, in effect, involves an audit of closing devices on watertight doors and hatches.[41]

[50] Annual surveys of the ship were undertaken. The last of these prior to the incident was on 31 August 2006. It included a safety equipment survey. The surveyor also conducted a "superficial hull and machinery survey" that day, notwithstanding that hull and machinery were surveyed by Lloyd's Register.[42] The 2006 survey did not involve a re-measuring of pipes or an inspection of scuppers. According to the surveyor, these would be inspected during the load line renewal survey that was required every five years.[43]

[51] The survey on 31 August 2006 included an audit of the ship's load line and stability documents. This revealed that Sea Transport Solutions had undertaken work that resulted in the load line mark being raised by 100 mm. The inspector inspected the plimsoll marks from a dinghy and confirmed their location.[44]

[52] The principal of Sea Transport Solutions, Mr Ballantyne, gave evidence that its 2006 load line review was to allow for the carriage of more cargo. Approximately 100 tonnes of cargo was not being collected on each voyage and, as a result, shipments were not reaching the required average 5,000 tonnes. As a result, Sea Transport Solutions was asked to review matters to see if the ship could have slightly deeper drafts.[45]

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41 Exhibit 111, Part 1, paras 4 and 5.
42 Exhibit 111, Part 1, para 10.
43 Exhibit 111; para 6.
44 Exhibit 111, Part 2, para 4.
45 Mr Ballantyne; T.854.

5.7 CREWING

5.7.1 Crew Structure, Command and Responsibilities under the SQS

[53] The ship's command structure places the Master in overall command. The shipboard organisation consists of a "deck department" and an "engineering department".

[54] The Crew Manual section of the SQS details the responsibilities of the Master and others. It records that the Master is fully responsible for the implementation of the SQS on board. This is confirmed by the Fleet Operating Manual section of the SQS which states:

> "The Master has overriding authority, and responsibility to make decisions with respect to safety and pollution prevention, and to request the Company's assistance as may be necessary."[46]

This Manual also imposes a responsibility on the Master to report to the Company without delay, such defects and other matters which could affect the safe operation of the ship or present a risk of pollution.[47]

[55] The Crew Manual section of the SQS is largely a generic document that generally describes shipboard organisation, reporting lines and responsibilities. Many of its provisions are equally applicable to other ships in the Inco fleet with larger crews than the *Wunma*. The Manual refers in some places to officers of the Deck Department as "First Officer", "Second Officer", "Third Officer", etc. Rather than adopt these terms in describing the responsibilities, it is appropriate to refer to the positions by the name that was commonly used on the *Wunma*. In the case of the Deck Department, this consisted of a Chief Mate and a Second Mate.

[56] The reporting lines under the SQS are for the Chief Mate to report to the Master at all times. The Chief Engineer reports to the Master at all times. Deck officers report to the Master at sea at all times when not under the direct supervision of the Chief Mate. The First Engineer reports to the Chief Engineer at all times.

[57] Relevantly, under the SQS the Chief Mate is responsible for preparing a loading and discharge plan which is then discussed with the Master. The Chief Mate, under the direction of the Master, is responsible for all matters pertaining to cargo.

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46 Fleet Operating Manual, p.33, para 8.1.2.

47 *Ibid*, para 8.1.1.

[58] The Crew Manual of the SQS states that the Second Mate is responsible to the Master at all times, but indirectly when under the direct supervision of the Chief Mate in the course of performing cargo duties, and deck maintenance. The SQS describes the Second Mate's primary task as that of "navigation, watch keeper at sea, and as a Duty Cargo Officer when in port". The Second Mate is responsible for the maintenance of charts and publications, passage planning, providing, prior to departure, a plan for the Master's verification, and the maintenance of radio publications.

[59] The Crew Manual provides that every Master and seaman has a personal duty to be properly rested when commencing duty, particularly before watch at sea and in port, and to obtain adequate rest during allocated rest periods. Normal hours of duty for day workers are 0800 to 1630 hours seven days a week. The hours for watchkeepers under the SQS are the Chief Mate 0400 to 0800 hours and 1600 to 2000 hours and the Second Mate 1200 to 1600 hours and 0000 to 0400 hours. Although the SQS anticipates a "Third Officer" having watch keeping duties from 0800 to 1200 hours and from 2000 to 2400 hours, in the events that transpired leading up to the incident, this watch was undertaken by the Master.

[60] Section 5.1.5 of the Crew Manual deals with personnel in port and requires a minimum of five crew members to be on board at all times to enable the vessel to depart in an emergency. The Fleet Operating Manual specifies the duties of the Officer on Watch in Port. These include being responsible for entries in the deck logbook that include weather information.[48]

[61] One section of the SQS Crew Manual which is specific to the *Wunma* concerns a lead monitoring program to ensure that each crew member's blood lead level is below the recommended level.

[62] The Fleet Operating Manual part of the SQS contains extensive provisions in relation to shipboard management and shipboard meetings including a Committee of Management which is to meet monthly and consists of the Master, the Chief Engineer, the Chief Mate, the First Engineer and the Bosun/CIR. Section 12.7 of the Fleet Operating Manual provides that ship inspections are to be conducted by the Master, accompanied by appropriate officers, at least once a week. Section 12.8

[48] Fleet Operating Manual, p.50, para 12.9.4.

contains inspection guidelines and stresses the importance of weekly rounds. Section 12.6 requires the submission of a ship's monthly report (no longer than two to three pages) at the end of each month that is jointly submitted by the Master and Chief Engineer.

5.7.2 Changes in Crewing Arrangements

[63] The ship's original Master was Frank Thomson who became its Master in December 1999 after gaining a Restricted Master Class 3 qualification and a Pilots Exemption for the Port of Karumba. Prior to his arrival in Karumba Captain Thomson had been the Master on the *Aburri* for approximately four years. The *Aburri* is a self-discharging ore carrier which transfers zinc and lead concentrate from the Port of Bing Bong in the Northern Territory to export ships anchored offshore. In September 2003 Captain Thomson acquired his National Standard of Commercial Vessel Certificate of Competency Master Class 3. He remained a Master on the *Wunma* until early 2006 when he took three months leave. Subsequently he became employed by MSQ but maintained an association with the ship and, on occasions, was consulted by Inco in respect of aspects of her operation.

[64] In late 2005 a decision was taken by the then Zinifex Port Operations Manager to upgrade the qualification required of the Master of *Wunma* from a Master Class 3 to a Master Class 1.[49] Prior to this decision some Master Class 1s had been employed as Masters on the *Wunma*.[50] The decision, with which Inco agreed after discussions, to replace Master Class 3s with Master Class 1s was taken to "up-skill" the level of leadership and to have "more focus on the quality assurance systems".[51] Zinifex wanted to become "more system oriented" and to bring Inco into its culture and way of doing things, and felt that having a Master Class 1 was appropriate.[52] After the decision Captain Thomson trained about six or seven new Masters.

5.7.3 The "Swing" System

[65] The Master of the ship is placed on a rotation roster with equal time on and off. The term "swing" is used to refer to this practice. Typically, a Master will be on a rotation of three weeks on the vessel, and three weeks on leave off the vessel.

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49 Exhibit 9; para 22, Mr Mewett; T.422.

50 See for example Captain George Hadley, Exhibit 25, who was employed as Chief Mate and Relief Master of the *Wunma* in 2004 and 2005. Captain Seal was employed as Master of the *Wunma* after March 2006.

51 Exhibit 53; para 17, statement of Andrew Dally.

52 Mr Mewett; T.422.

[66] Other members of the crew operate on a swing. The period of each "swing" depends upon the relevant position. For example, a member of the deck crew may have a swing of four weeks on, and three weeks off. The system operates so that there are overlaps between the "swing" period of members of the crew in the interests of ensuring continuity. In other words, the swing system operates so that one crew does not hand over to another crew at the same time.

5.7.4 The Crew at the Time of the Incident

[67] At the time of the incident, the crew consisted of ten persons: the Master, the Chief Mate, the Second Mate, the Chief Engineer, the First Engineer, four other general crew and the ship's cook. The names and a short summary of the qualifications of the first five individuals at the time of the incident is as follows:

Position	Name	Qualifications
Master	Dean Seal	Master Class 1 (AMSA) GMDSS General Radio Operator qualification Pilotage Exemption Licence for the Karumba pilotage area
Chief Mate	Paul Davis	Chief Mate Certificate (AMSA) GMDSS General Radio Operator qualification Master Class 3 Certificate (MNSW)
Second Mate	Kelly Osmand	Mate Class 4 Certificate (MSQ) Master Class 5 Certificate (MSQ)
Chief Engineer	Geoffrey Fisher	Engineer Class 1 (Motor) Certificate (AMSA)
First Engineer	Andrew Leeson	Marine Engine Driver Grade 1 Certificate (MSQ) Master Class 5 Certificate (MSQ)

These crew members held additional qualifications which are not presently relevant. By way of preliminary observation it can be said that the Class 1 qualification held by the Master and by the Chief Engineer "over qualify" them for the daily routine of the ship in her normal area of operation.

[68] The other crew at the time of the incident were:

(a) Phillip White who held a position of Leading Hand on the deck crew. Mr White is a trainee integrated rating.[53]

[53] Exhibit 79.

(b) Troy Shepherd who performed general duties as part of the deck crew. Mr Shepherd is a trainee integrated rating who has held a Coxswain Certificate since 1992 from MSQ.

(c) Jamie Roll: Mr Roll worked as an integrated rating having qualified through an integrated rating course. He also holds qualifications as a fitter and turner.

(d) Ross Caletti: Mr Caletti's qualifications and experience consisted of trade qualifications as a fitter and turner and as a self-unloading ship fitter. He completed his basic shipboard induction for the *Wunma* on 26 September 2006.

(e) Matthew Rohrsheim: Mr Rohrsheim was the ship's cook.

[69] Captain Seal has had extensive experience at sea, having joined the Royal Australian Navy in 1987. He acquired various qualifications in the Navy and at the Australian Maritime College. His experience at sea included cadetships and various ranks on bulk carriers, tankers and container vessels. These included positions as Third Mate and Second Mate. During 20 years at sea he experienced two cyclones off the North West coast of Australia.[54] Prior to February 2007 he had not experienced cyclones in the Gulf. But he had been on board the *Wunma* in March 2006 when Tropical Cyclone Larry crossed the Queensland coast near Innisfail and headed west.[55] It tracked over land south of Karumba.

[70] Commencing in January 2004 Captain Seal became the Master of various A and B Class tugs in Sydney Harbour and Botany Bay. He held these positions until February 2006 when he became Master on the *Wunma*. Captain Seal's experience in charge of tugs gave him ship handling experience which made him a suitable candidate for appointment to the *Wunma*. Prior to the incident he had approximately 200 days on board the *Wunma*. Mr Fisher said that he found Captain Seal to be "very professional particularly with regard to pilotage and bridge resource management type issues".[56] In short, Captain Seal held the requisite qualifications, having been awarded a Master Class 1 Certificate of Competency in June 2002. He had seagoing experience including positions as Third Mate and Second Mate on large vessels.

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54 Captain Seal; T.136-137.

55 For a description of the track and intensity of Tropical Cyclone Larry: http://www.bom.gov.au/weather/qld/cyclone/tc_larry

[71] Chief Mate Davis undertook four weeks induction as Chief Mate of the *Wunma* between mid-December and 15 January 2007. He rejoined the ship at about 1430 hours on 5 February 2007, a few hours prior to its departure. Before being appointed to the position of Chief Mate on the *Wunma*, Mr Davis had worked on the self-discharging bulk carrier *MV Alcem Calaca* between March 2006 and December 2006 in the positions of Second Mate and Third Mate.[57] Between November 2000 and February 2006 he was out of the industry taking care of a disabled child, following which he undertook a "revalidation" course at the Australian Maritime College. Mr Davis's seagoing experience commenced in 1976, after which he worked as a deckhand and coxswain on ferries, tugs and launches, as well as on foreign-going vessels. He rose through the ranks, acquired additional qualifications and served in roles, including Second Mate and Third Mate on trading vessels, principally in Australian waters. But his crossings include the American East Coast, Canada, Germany, Singapore, Thailand, Japan and Hong Kong. He estimates having travelled approximately 200,000 nautical miles during his seagoing career.

[72] During his period of induction on the *Wunma*, Mr Davis's priorities were on learning the paperwork which he described as "vast" and learning the pilotage.[58] He learned what he could about the ship. During this time the usual form of communications used by the ship was VHF.

[73] The Second Mate, Kelly Osmand, first went to sea in 1999 working on prawn trawlers out of Cairns and also on charter vessels and tourist boats. Her experience on fishing vessels out of Karumba included working as a crew member on the deck of trawlers and also on board a "mother ship" serving a fleet of trawlers. She joined the *Wunma* in December 2004 after obtaining her Master Class 5 qualification and worked as a leading hand on the ship until the end of January 2006. She then attended the Hunter Maritime College where she completed a diploma in Maritime Transport and Distribution. She rejoined the *Wunma* as Officer of the Watch in order to gain experience towards a Second Mate's qualification.

[74] Ms Osmand has had experience with cyclones in the Gulf of Carpentaria but had never been caught in one at sea because she worked on small ships that could moor

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56 Statement of Mr Fisher – 15 February 2007; para 23.
57 Mr Davis; T.670.
58 Mr Davis; T.678.

up the river for refuge. During her time on fishing boats between 1999 and 2003 she had been to Sweers Island on a number of occasions.

[75] The Chief Engineer, Geoffrey Fisher, has lengthy experience in a wide variety of vessels. His qualifications and experience proved to be invaluable in the circumstances of the incident in being able to restore power to the ship after a total black-out on the night of 6 February 2007. Mr Fisher joined the *Wunma* in August 2006. He commenced his fourth swing (of four weeks) as Chief Engineer on 22 January 2007.[59]

[76] The First Engineer, Mr Leeson, worked on the *Wunma* for about six months prior to the incident. Before that he worked for Quicksilver Connections for approximately seven years.

[77] It is unnecessary to detail or dwell on the qualifications and experience of other members of the crew who were not navigation officers. Some had a reasonable amount of experience at sea. For instance, Mr Shepherd's experience includes approximately 15 years of crewing on vessels including a research boat, tugs and tourist boats.[60] Others had less. This is not reflection on them. It is important to record the commendation that Mr Davis gave of them at the conclusion of his evidence. Mr Davis remarked upon their limited sea experience but said they were "very well trained and very good on this vessel".[61] He said that throughout the incident, and during a period when he did not think they would be able to get off the ship, everybody acted in a calm and competent manner. Mr Davis remarked that the "young people" on the ship, with limited experience, needed to be commended, along with everyone else, for the way they conducted themselves.

5.7.5 Overview of the Crewing of the Ship

[78] Before the ship went into operation, its managers in March 1999 described its expected daily operation as "undertaking an identical passage and schedule". This description in connection with crewing certificates supported a submission that the job of Master was suited to persons with ship handling knowledge and restricted inshore navigational skills that might be found in holders of lower classification certificates. The job of Master in 1999 was a demanding one. It remains so. It

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59 Exhibit 40.
60 Exhibit 83.
61 Mr Davis; T.690.

entails management of a ship that plays a critical role in the Century Mine's export of lead and zinc concentrate. The Master must plan loading and departure to coincide with the "tidal window" and the discharge of loads in order to meet, if possible, the "load plan" for export ships. It is a job that requires the Master to attend to a volume of paperwork and to organise a relatively small crew to maintain, if required, a continuous operation.

[79] Masters require skill in handling and manoeuvring the ship due to the intricate nature of the discharge operation that requires the ship to berth alongside export vessels at the Roadstead. Pilotage skills are required to navigate the Norman River and the channel and to understand the run of the tide across the channel. Captain Thomson found that Masters who had experience in command and hands-on experience in the offshore or tug industry were the easiest to train. But very few new Masters or Mates have experience in the Gulf or the weather conditions that they were likely to experience in that area of operation.[62]

[80] The induction and training of new Masters inevitably focused upon the daily operations of the ship and there was much for any new Master or new Chief Mate to learn during the training period. Captain Seal made no complaint about the training that was provided to him by Captain Thomson and others. But this training could not impart all the knowledge that Captain Thomson had acquired through several years' experience as Master.

[81] The *Wunma* provides an opportunity for Masters to gain command experience before moving on to other positions. Captain Thomson's evidence was that since it commenced operation the *Wunma* has had "an unusually high turnover of Masters as they normally take up the position to get command experience before trying for positions as marine pilots".[63] The *Wunma* was not designated as a training vessel and a training program was not formally implemented as part of her procedures. But Captain Thomson observed that since 2004/2005 she had been a training vessel for Inco with engineers who wanted to advance, and for deck crew wanting to become integrated ratings, deck cadets or engineers. By contrast, the *Aburri* was not considered a training vessel for crew by its parent company, P&O.

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62 Captain Thomson, Exhibit 9; para 24.

63 Exhibit 9; para 25.

[82] Just as the constant routine of the ship's normal, daily operations places substantial demands upon the Master, they place demands upon other crew. The Chief Engineer and those who assist him in the engineering department are required to undertake the daily operations of the vessel and to attend to maintenance and repairs in the course of these operations. But programmed maintenance may be displaced. During the ordinary operation of the vessel when she is required to go to and from an export vessel each day, there is limited time to undertake major maintenance. The schedule might include a period for maintenance. But on occasions this programmed maintenance had to be deferred. Evidence was given of occasions when there was a week of jobs to do but the crew would only get a few days into them before being told "there is a ship coming, we have to go".[64]

[83] Various members of the crew are required to undertake general ship duties including maintenance and cleanliness of the ship. Tasks include the maintenance of conveyor belts and other equipment and keeping decks and drains as clear as possible of concentrate. Deck crew have to shovel quantities of zinc concentrate that collects under the C1 conveyor belt on the port side deck. One member of the crew observed that they seemed "to be stretched pretty thin".[65] Overall, the impression that emerged from the evidence was of a hard-working crew with many demands on their time.

[84] The review undertaken by Thompson Clarke Shipping in the latter half of 2006 on behalf of Zinifex identified a number of issues in connection with crew employment and operational arrangements. These included:

(a) crew churn rates with a high turnover of crew which led to the question of whether the conditions and challenges of the work were being properly communicated to new entrants;[66]

(b) the responsibility imposed upon the Master/Assistant Master/Chief Engineer and Second Engineer to train new or inexperienced crew in circumstances where those officers had full time jobs and often worked long hours on rosters determined by commercial charters and tides;[67]

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64 Statement of Troy Shepherd; Exhibit 83; para 7.

65 Statement of Matthew Rohrsheim; Exhibit 48; para 6.

66 Exhibit 49; CB137; para 5.1.4.

67 *Ibid*; para 5.1.5.

(c) the difficulty of retaining senior officers: the vessel being virtually always "under pilotage" and thus by default, a good platform for a career path development leading to pilotage;[68]

(d) fatigue: Thompson Clarke noted that the extent of fatigue depends on shipping programs, that on occasions there are various slack periods, that only officer (not crew) fatigue is monitored, that during the visit of Thompson Clarke some extremely long (and probably excessive) hours were being worked by the engineers and that rest periods may have been inadequate. Thompson Clarke observed that fatigue "is a very difficult issue to address, measure/control and counter" but that the ship's staff were well aware of the issues and dangers involved and made every endeavour to minimise fatigue while maintaining optimal operations for Inco and Zinifex;

(e) personnel holding Class 1 Masters or Class 1 Engineering certificates are overqualified for the limited and repetitive work involved;[69]

(f) some of the crew may not have the ability, knowledge and experience to handle cyclones at sea.[70] This was posed as a question in the Thompson Clarke Operational Review relation to Cyclone Preparedness. The author of the Report, Mr Clarke, explained that it was not a question necessarily directed at all of the crew, and was not directed at the Masters. It was prompted by observations made in the course of the review about the experience and training of some members of the crew.

[85] Someone with a Master Class 1 may not have had experience of cyclones at sea. Whether they do depends on the area in which they train and their experience, and "the actual chance of getting practical experience is probably fairly small".[71] The incidence of cyclones is such that persons with experience in the Gulf may not have experience of operating a ship in a cyclone. For instance, Captain Thomson was on board the *Wunma* on a few occasions when there was the threat of a cyclone, but had not been in cyclonic conditions on the ship.[72] But the formal training of a Master Class 1, which includes study of meteorology and cyclone avoidance techniques,

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68 *Ibid*; para 5.1.6.
69 *Ibid*; para 5.2, p.12.
70 *Ibid*, Attachment C, p.4.
71 Mr Clarke; T.868.
72 Captain Thomson; T.33; T.109.

coupled with their command experience should equip them to take appropriate cyclone avoidance action.[73]

[86] The Terms of Reference of the Inquiry ask the Board to have special reference to whether "relevant persons" were appropriately qualified and experienced in their roles on the ship, with special reference to tropical revolving storms. The Board considers that the "relevant persons" are principally the ship's navigation officers. The Board considers that in general, those persons were appropriately qualified and experienced. Even experienced seafarers may have limited experience of tropical revolving storms/cyclones. But the holder of a Master Class 1 is appropriately qualified to undertake cyclone avoidance action.

[87] The qualifications and experience of the crew have been outlined above. Mr Davis, through no fault of his own, had limited experience in the use of the ship's communication systems, and limited experience of the ship in general, consisting of a four week period of induction between mid-December 2006 and 15 January 2007. He re-joined the ship on 5 February 2007. During his induction period the ship was not outside the range of VHF communications, and he did not gain experience in the operation of all aspects of the ship's communication equipment. He was suitably qualified, being the holder of a GMDSS General Radio Operator qualification, and experienced in the use of communications systems. But he was not familiar with the operating procedures of all of the communications systems on board the ship. During his period of induction he concentrated on matters of more immediate importance in becoming acquainted with the ship's normal, daily operations. Unfortunately, this lack of familiarity with the ship's communication systems proved to be a problem on the evening of 6 February 2007 when he was on watch. These matters are appropriately addressed in the context of the narrative of events on that voyage. Mr Davis's lack of familiarity with the communications systems should have been addressed before he was required to undertake a voyage in open seas or before taking over the watch on 6 February 2007.

5.7.6 Crewing – Statutory Requirements, Minimum Crewing and Adequate Crewing

[88] The evidence before the Inquiry discloses some confusion about crewing requirements. For instance, the Thompson Clarke Shipping Operational Review in

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[73] Mr Clarke; T.868. Captain Dally; T.539.

December 2006 reported that Queensland Transport required the ship to be manned with a total of seven persons being:

[89]

Rank	Certificate
Master	Master Class 4
Mate	Master Class 4
Chief Engineer	Marine Engine Driver II
Second Engineer	Marine Engine Driver III
GPs (3 in number)	Coxswains Certificates

The same view was expressed in a report prepared on behalf of Zinifex for the Inquiry.[74]

[90] The Managing Director of Inco gave evidence that:

> "The mandatory requirement for operating the *MV Wunma* is a Master Class 3 Restricted."[75]

His witness statement of 1 August 2007 also stated:

> "Currently, and in February 2007, the number of crew of the *MV Wunma* is not mandated under a Safe Manning Certificate."

[91] It appears that for many years, the normal operation of the ship between the Port of Karumba and export ships at the Karumba Roadstead was conducted on the basis that an exemption had been obtained from Queensland Transport to permit the ship to have as her Master a Master Class 3 in that area of operation. It was on this basis that holders of Master Class 3 qualifications, such as Captain Thomson and Captain Dunnett, acted as Master or Relief Master. It will be recalled from Chapter 4 on the history of the ship that the issue of exemptions arose as a topic for discussion within the Maritime Services Branch in 1999. In a Memorandum dated 12 October 1999 the then Director (Maritime Services), Captain Diack, expressed his opinions concerning a proposal to grant exemption to operate the ship with a Master and officers holding qualifications less than required in the regulation. Captain Diack's view was that a reduction in qualification of the Master from Master Class 2 to

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74 Report of Captain White; Exhibit 114; para 5.1.3.

75 Exhibit 53, Part 1; para 17.

Master Class 3 was considered reasonable with the contingent upgrade of the Mate to Master Class 3. The proposed reduction in the engineering qualifications was not supported by Captain Diack as a result of advice that the ship had complicated engineering systems that could easily present a safety issue.

[92] Draft notices of exemption were prepared in two different forms. The first option granted an exemption subject to the following conditions:

(a) The Master holds at least a Master Class 3 open certificate of competence; and

(b) the Chief Mate holds at least a Master Class 3 open certificate of competence; and

(c) the Chief Engineer holds at least an Engineer Class 3 open certificate of competence; and

(d) the Second Engineer holds at least a Marine Engine Driver Grade 1 open certificate of competence; and

(e) the ship operates as an ore transfer vessel within the Karumba port limits and in the most direct route to the designated ore transfer anchorage between the positions:

Latitude 17º 09.0 S Longitude 140º 30.0 E;
Latitude 17º 19.5 S Longitude 140º 39.0 E;
Latitude 17º 20.5 S Longitude 140º 38.0 E;
Latitude 17º 10.0 S Longitude 140º 29.0 E; and
the ship's cyclone mooring at –
Latitude 17º 07.5 S Longitude 139º 34.7 E.

[93] The second option was subject to conditions (a), (b) and (e). In other words, it included no conditions in relation to the qualifications of the Chief Engineer or Second Engineer.

[94] An application for exemption to reduce the Master Class 2 requirement to a Master Class 3 restricted to the ship's limited area of operation was supported by certain officers within MSQ. But the application for exemption was not finally determined and no exemption was ever gazetted. Remarkably, the matter was allowed to drift for years without the exemption to allow use of a Master Class 3 in the ship's limited area of operation being officially granted. From time to time individuals such as

Captain Thomson were granted an "interim certificate" of three months duration by the Regional Harbour Master which granted "Restricted Master Class 3" licences restricted to the *Wunma's* Karumba operations. A file note from February 2003 records a direction from the Acting Principal Advisor to not issue such certificates until the Master's exemption in respect of the ship had been finalised. Despite this, a further interim certificate was granted to Captain Thomson in March 2003. More importantly, the granting of an exemption to permit the ship to operate in her limited area of operation under the command of the holder of a Master Class 3 was never finalised and officially granted. The owners and operators may have assumed that it was.

[95] As matters transpired, at the time of the incident the ship was under the command of a Master Class 1 and its Chief Engineer held a Class 1 certificate. However, due to a failure by MSQ to resolve the exemption issue, the ship was permitted to be operated for a substantial period in breach of statutory requirements concerning the qualifications of her Masters. The operation of the ship during this period under the command of the holders of "Restricted Master Class 3" certificates exposed them, the operators of the ship and the ship's owners to the risk of adverse legal consequences and may have had insurance implications. The Board notes that an advertisement by the incoming ship manager on 8 September 2007 assumed that the position of Master could be held by the holder of a Master Class 3. However, a later advertisement published in the *Weekend Australian* of 22 September 2007 readvertised the positions for the holder of a Master Class 2.

[96] These matters were brought to the attention of MSQ by Counsel Assisting, and were also raised in the written submissions of Counsel Assisting. Those submissions made clear that at the time of the incident the *Wunma* was under the command of a Master Class 1 and, as a consequence, deficiencies in MSQ's processing of the application for an exemption were not a cause of the incident. MSQ submitted that these matters were outside the scope of the Board's term of reference. But under section 132 of the *TOMS Act* a Board of Inquiry's report may contain reference to relevant matters. The shortcomings in MSQ's failure to process the application for exemption, although not causative of the incident, are relevant matters about which the Board should report.

[97] Captain Boath was satisfied that the crew to whom he issued a Restricted Master Class 3 licence to operate the *Wunma* in her normal area of operation were competent to operate the ship. There is no evidence to the contrary and, in fact, individuals such as Captain Thomson were, and are, highly regarded mariners. But that is not the present point. The point is that an application to grant an exemption to permit a Master Class 3 to operate the ship in her normal area of operation was never processed. Captain Boath was unable to advise why the exemption was not processed and gazetted.[76] Mr Bundschuh could not explain why the exemption was not processed and gazetted.[77] Overall, the fact that the application for exemption was not processed to finality and gazetted is a matter that reflects adversely on MSQ's administration.

[98] The current statutory requirements and possible future requirements in the event that the provisions of the *USL Code* are replaced by provisions based upon the *National Standard for Commercial Vessels* are matters for the owners and operators to consider. In essence, section 88 of the *TOMS Regulation* 2004 requires a person to hold an appropriate licence to operate a commercial ship as her Master or act as a crew member. The appropriate licence is at least the class of certificate stated for the area in the *USL Code*, section 2, part 4, clause 37.[78] This USL provision is in the form of a table that specifies the required class of certification by reference to vessel size and operational area. For instance, a vessel over 80 metres and less than 120 metres operating in an offshore area requires a Master holding a Master Class 2. If a Chief Mate is required the Chief Mate must hold a Chief Mate Class 2 certificate. If a Deck Watchkeeper is required they must hold a certificate as a Second Mate Class 2 or a Master Class 3. The licenses required by engineers depends on a ship's propulsion power and operational area. In short, the minimum qualifications depend, in part, upon the operational area of the ship. It may be possible to apply for an exemption pursuant to section 18A of the *TOMS Act* 1994. But that exemption may be subject to conditions including the area in which the ship is to operate.

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76 Statement of Captain Boath dated 26 October 2007, Exhibit 134.

77 Statement of Mr Bundschuh dated 25 August 2007, Exhibit 134.

78 *TOMS Regulation* 88(2).

5.7.7 Minimum Crewing and Adequate Crewing

[99] It is important to distinguish between:

(a) the qualifications required of a Master and other crew to operate the ship;

(b) the minimum number of crew;

(c) the adequacy of crewing in terms of both number and competence.

[100] The qualifications required of the Master and other crew under the relevant provisions of the *USL Code* which are picked up by section 88(2) of the *TOMS Regulation* do not dictate the minimum number of crew required to safely operate a ship, let alone to operate her as a commercial enterprise.

[101] The qualifications referred to in the Thompson Clarke Operational Review and the White Report reflect the contents of a letter from ISM which sought a "Safe Manning Certificate" in terms of those qualifications. No "Safe Manning Certificate" was issued. As Captain Dally stated, the number of crew of the *Wunma* at the time of the incident was not mandated under a "Safe Manning Certificate". The general safety obligations imposed by sections 41 and 43 of the *TOMS Act* may, in general terms, require a certain number of crew to safely operate a ship. Minimum crewing requirements essentially are concerned with the number of crew required to take the ship from one place to another and to be able to operate the ship, including her safety equipment. They assume that the crew will be in a good state of health, rested and free from fatigue. Crewing numbers should take proper account of the in-port workload of the crew and the intensity of the ship's "trade".

[102] Operation of a ship in accordance with an actual or perceived "minimum safe manning requirement" limits the scope for on-the-job training and supervision. It does not provide redundancy and a protection against overwork and fatigue. Minimum manning requirements do not address whether, in particular circumstances, a crew member is overworked or fatigued. For instance, the Thompson Clarke Operational Review in late 2006 apprehended, on the basis of its inspection of the ship, that some extremely long, and probably excessive, hours were being worked by the engineers and that rest periods may have been inadequate. As will appear from the account of events later given concerning the voyage prior to the incident, the Chief Mate re-joined the vessel at 1630 hours on 5 February 2007. He had been up since 0430 hours that day to catch a plane and did not rest until about 2300 hours.

[103] A *National Standard for Commercial Vessels* has been drafted to replace the *USL Code*. In relation to crewing it contains the following provisions:

> "*National Standard for Commercial Vessels Part D*
>
> CHAPTER 2 CREWING OF VESSELS
>
> **2.3 OBJECTIVE**
> To provide Authorities, owners and masters with requirements for determining both the minimum crew (in terms of number and certification levels), and the adequate crew required onboard a vessel for the safe operation of that vessel.
>
> **…**
>
> **2.5 MINIMUM CREW**
> A vessel must at all times when under way or operating carry sufficient competent and trained crew so that:
> a) The vessel can safely navigate, berth and unberth.
> b) The essential vessel systems can be operated and monitored safely.
> c) Immediate and appropriate emergency action can be taken when there is a failure of an essential system.
> d) Immediate and measured response can be provided in an emergency situation.
> e) The crew can safely abandon the vessel if required.
> NOTE: The minimum crew is not tailored to the nature of trade or particular activities, functions, or business carried out on the vessel.
>
> **2.6 ADEQUATE CREW**
> In addition to the minimum crew, a vessel must at all times when underway or operating, carry sufficient crew in terms of both number and competence to:
> a) Eliminate or control to acceptable levels risk associated with the nature of the activity conducted by the vessel.
> b) Provide a measured response to emergencies or risks that may threaten the vessel or persons onboard during normal or abnormal conditions when considering all facets of the vessel's operation.
> c) Facilitate the rapid and safe evacuation of all persons onboard the vessel.
>
> **…**
>
> **2.8 DETERMINATION OF ADEQUATE CREW**
> In determining the adequate crew required, the risks to the vessel and to the persons onboard (crew and passengers) shall be evaluated.
>
> The evaluation shall take into account, but it is not necessarily limited to, the following factors:

a) Task or employment (i.e. passenger carrying, fishing, etc.) of the vessel and any particular demands on the crew that the task imposes on the vessel in addition to its safe navigation.
b) Number of persons carried on the vessel.
c) Design characteristics of the vessel including its machinery and equipment.
d) Expected conditions including weather, climate and water temperatures.
e) Length of voyage.
f) Fatigue.
g) Foreseeable emergencies.
h) State and repair of the vessel and its machinery and equipment.
i) Safe and timely evacuation of all people from the vessel in an emergency.
j) Risks to the environment, and other persons.
k) Skills and experience of crew.
l) Support available to the vessel and its crew.
m) Any factors identified by an Authority as relevant to safe operation.
n) Any other identified factors, operational practices or known risks.

NOTES

1. The adequate crew for a vessel may change from day to day depending on operating conditions and other circumstances. For example the number of passengers on a particular voyage.
2. Part E of this Standard specifies requirements for emergency preparedness and safety management systems that will need to be taken into account when determining crewing.
3. Legislation may specify specific requirements for the determination of adequate crew.
4. Legislation may require an owner to identify the basis on which the adequate crew was determined. It may also require any owner to prove the effectiveness of the adequate crew and their training by conducting a drill simulating as closely as practicable to situations considered in the determination of the adequate crew." (Emphasis added)

[104] In *Marine Information Bulletin* dated 27 September 2007 MSQ stated "Under Queensland's current performance based legislation adequate manning levels to satisfy the General Safety Obligations is the responsibility of the Master and Owner". This contrasts to what is described by MSQ in the *Bulletin* as the "more prescriptive approach" where manning levels specified in NSCV Part D. The matter is the subject of ongoing discussion within the marine industry.

[105] At the time of the incident there were ten crew on board. By August 2007 it had increased so that at times there were up to fourteen crew on board. The manning of

the ship from her inception was about nine or ten crew. The crew are accommodated on board.[79]

[106] The intensity of the "trade" undertaken by the ship during her normal operations, combined with the system of "swings" warrants a review by MSQ, in conjunction with the owners and operators of the ship, to ensure that the ship has sufficient crew in terms of both number and competence to undertake her normal daily operations and, when required, to respond to other situations, including the threat of a cyclone.

[107] The intensity of the ship's "trade" whereby she may be scheduled to operate continuously from the Port to the Roadstead each day, depending on the scheduling of export ships, has already been mentioned. It raises issues of crew fatigue and the adequacy of crew numbers to undertake routine tasks such as shovelling of ore concentrate from the portside deck, cleaning and maintenance.

[108] The "swing" system presents a number of obvious advantages including a structure to permit crew to return from a remote location to their normal place of residence at the end of each "swing". It is understandable that employers and employees in remote locations favour such a system which allows employees to have a block of time away from work. But such an arrangement, which has the potential to have a crew member work on 28 consecutive days (assuming a "swing" of four weeks on) has implications in relation to fatigue, even allowing for normal rest periods each day and suitable accommodation on board to rest.

[109] The owners and operators of the ship are subject to a variety of statutory and common law obligations concerning the safety of the ship and the occupational health and safety of her crew, and can be expected to be conscious of these obligations. Still, it is appropriate that MSQ review the qualifications, competence and number of crew. A new operator took over the management of the ship as from 1 November 2007.[80] This provides a suitable occasion for MSQ to consider more than simply the qualifications of the crew and any application for an exemption relating to the appropriate licence for a person to hold in order to operate the ship. It provides the occasion for MSQ to consider the minimum crew required and that adequate crew are on the ship. The number of crew should take account of fatigue

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79 Statement of Andrew Dally; Exhibit 53; para 20.

80 Exhibit 120; para 9.

issues that arise from the intensity of the ship's "trade" and the operation of a "swing" system.

5.8 MANAGEMENT STRUCTURES AND PROCEDURES

5.8.1 Inco's Management Structure in 2007

[110] Inco Ships Pty Limited is part of the Intercontinental Group. Prior to 23 September 2004 it was named Intercontinental Ships Management Pty Limited. It manages and operates the group's vessels and manages vessels for third parties. Management of the fleet does not distinguish between group-owned and third party vessels.[81]

[111] The ship management services provided by Inco for third party owners includes crew management, quality assurance systems, safety management systems, technical management and consolidation of accounts for owners. Full management consists of crew management, safety, quality, technical and accounts. Crew management involves placing appropriately certified and qualified individuals into positions. Inco also offers commercial services such as chartering.

[112] The Inco fleet initially numbered five ships. By early 2007 Inco managed eleven ships under full management and three ships under crew management and technical consultancy.[82]

[113] The management structure in February 2007 consisted of Captain Andrew Dally as Managing Director; Captain Ian Ives as Operations Manager with responsibility for employment and nautical matters; Mr Peter Iuliano as Quality and Technical Manager with responsibility for quality assurance procedures, safety, security systems and the provision of technical support for two vessels; Mr Dick McDonald, the Fleet Technical Manager with general responsibility for the fleet including the *Wunma*, and two other Technical Managers.[83] In addition to its main office at St Leonard's in Sydney, Inco had an office in Adelaide, an office in Whyalla associated with managing a Floating Offshore Transfer Barge and an office in Karumba. A manager was located in each of these offices. Captain Dally described these offices as "the coal face" of Inco's management and the main liaison with the vessel's owner.[84] The office in Karumba was run by Inco's Operations Superintendent.

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81 SQS 05, Inco Ships Management Manual, p.1.
82 Exhibit 53, Part 1; para 8.
83 Exhibit 53, Part 1; para 9.
84 Exhibit 53, Part1; para 10.

5.8.2 Operations Superintendent - Karumba

[114] Under the SQS, the Operations Superintendent-Karumba is said to have "Operational Responsibility for *Wunma*" and also is responsible to:

- ensure good cooperation with ZCML management and staff;
- ensure that *Wunma* and Inco ship staff meet contractual agreements with ZCML.[85]

[115] The reference in the SQS to "Operational Responsibility for *Wunma*" is too broad a description since under the Crew Manual section of the SQS states:

> "The Master has overriding authority and is fully responsible for the conduct of the vessel"

[116] Nevertheless, the Inco Ships Management Manual section of the SQS places considerable responsibility on the Operations Superintendent. In terms of organisational relationships defined in the SQS, the Operations Superintendent reports to the Managing Director, liaises with the Operations Manager, the Engineer Manager and the Financial Controller and provides "supervision" to the Master and the Crew. In terms of cargo operations and vessel scheduling, the Operations Superintendent is required by the Management Manual to work closely with ZCML and the Master/Chief Engineer. The stated qualifications for the position was said to "ideally" be a current Master Class 1 or Engineer Class 1 Certificate with technical knowledge of self-discharging barge operations, shipping rules, regulations and technical factors.

[117] The holder of the position at the time of the incident was Mr Mark Tonkin. Mr Tonkin served in the Australian Navy Reserves for 12 years between 1973 and 1985 where he performed engine room duties. Before joining the Reserves he had completed an apprenticeship as a fitter and turner. After 1979 he worked in the cement industry as a maintenance foreman in charge of a plant. In 1985 he became the Operations Superintendent for a new cement plant. He commenced work with Inco as a Maintenance Supervisor in February 2006 at Karumba. It was Mr Tonkin's experience in maintaining plant and equipment, including maintenance on Inco's river ship's loading gear that led to him being approached by Inco to take up the position in Karumba. Although Mr Tonkin had experience in the Australian Naval Reserves, he did not claim to be an experienced mariner.

[118] Prior to May 2006 the position of Operations Superintendent had been held by Captain Heath Daniel, a former Master of the *Wunma* who was qualified as a Master Class 1. As appears from the previous account of the history of the ship, Captain Heath Daniel was involved in communications concerning cyclone procedures. Mr Tonkin's experience was principally in the maintenance and operation of plant. As Inco's Maintenance Supervisor he had experience in the management and maintenance of the Material Handling Plant onshore at the Zinifex port facility and the Self-Unloading Systems on board the *Wunma*. This made him suitably qualified and experienced in managing and maintaining the material handling side of the operation. It is understandable, given his relative lack of maritime experience, that he would defer to decisions made by the Master of the *Wunma* concerning decisions to load and to sail.

5.8.2 Inco's Operations Manager

[119] Under the SQS, the purpose of this position was the maintenance of high safety and environmental standards in an efficient and operational manner throughout all managed vessels.[86] The holder of this position reports to the Managing Director and acts as Deputy to the Managing Director.

[120] Between 2002 and June 2007 the position of Operations Manager was held by Captain Ian Ives, who had extensive maritime experience, including 18 years at sea during which time he mastered bulk carriers and container ships. Captain Ives is the holder of a Master Class 1. As Operations Manager Captain Ives' duties included managing safety audits of the *Wunma*. He was not involved with the technical management of the ship.[87]

[121] The Inco fleet initially numbered five ships. It grew to 14 ships. Even with an additional crew coordinator Captain Ives was not able to devote sufficient time to each vessel he was required to manage.[88] As a result, on 29 January 2007 there was a change in Inco's office structure and Mr Peter Iuliano became the Designated Person for Inco Ships Pty Ltd and had responsibility to attend to correspondence and other matters relating to SQS systems.[89]

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85 SQS 05, Inco Ships Management Manual, p.9.
86 SQS 05, Inco Ships Management Manual, p.6.
87 Exhibit 51; para 2.
88 Captain Ives; T.492.
89 Exhibit 37.

5.8.3 Designated Person Ashore

[122] Under the SQS, the role of the Designated Person (also referred to as the Designated Person Ashore) is to ensure the safe operation of the company's ships and to provide a link between the company and those on board.[90]

[123] The Designated Person's responsibilities include monitoring the safety and environmental aspects of vessels, ensuring that adequate resources and shore based support are applied. Although the SQS described the Operations Manager as the Designated Person/Designated Person Ashore,[91] as already noted Mr Peter Iuliano, Inco's Safety Quality and Technical Manager, assumed the role of Designated Person on 29 January 2007.

5.8.5 Fleet Technical Manager

[124] Under the SQS, the Fleet Technical Manager has responsibility to ensure that nominated vessels are maintained to standards that provide reliability and efficiency for the vessel's principals. The position reports to the Managing Director and liaises with Masters and Chief Engineers, external supplies, classification societies and customers. The position provides supervision to Masters and Chief Engineers. Under Inco's organisational structure at the time of the incident, the Fleet Technical Manager provided technical support for the *Wunma*.

[125] At all relevant times the Fleet Technical Manager was Mr Richard McDonald who has worked in the shipping industry since 1962.[92] His work as Fleet Technical Manager includes supervising the operation, maintenance and building of ships, work in dry docks and conversions.[93] When Mr McDonald became Fleet Technical Manager in March 1999 he understood that the *Wunma* was intended to operate in sheltered waters and that a cyclone mooring was intended to be an element in the ship's operations. But he did not play a significant role in those discussions at the time.[94] He had no direct input into the later change in the ship's registration from Class 2C to Class 2B because he was in Singapore from about November 2004 until October 2006 on a ship reconstruction project.[95]

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90 SQS 05, Inco Ships Management Manual, p.3.
91 SQS 05, Inco Ships Management Manual, pp.3 and 6.
92 Exhibit 50; para 2.
93 Exhibit 50; para 2.
94 Exhibit 50, Part 2; paras 2 and 3.
95 Exhibit 50, Part 2; para 4.

5.8.6 Managing Director

[126] This position carries a number of responsibilities in relation to the company's business. The Managing Director reports to the directors of the Intercontinental Group. Under the SQS, the position involves supervision of all management level office staff and the management of a team of 15 office staff in Sydney, the Operations Superintendent – Karumba and Project Managers, as required.[96] Naturally, the position involves the management responsibilities that would be expected of a Managing Director of any organisation including ensuring that the company remains profitable and grows. Responsibilities include operating vessels in accordance with company policies. The Designated Person is responsible to the Managing Director for Occupational Health & Safety, Quality and Environmental Issues. However, under the SQS the Managing Director is in charge of the emergency response team.[97]

[127] At all relevant times the Managing Director of Inco was Captain Andrew Dally. Captain Dally held a number of positions at sea after completing a four year officer cadetship in 1989. He became the holder of a Master Class 1 in about 1994.[98] In about 1996 he transferred to Intercontinental Ship Management ("ISM") where he served as a Master until 1998. In 1998 he became ISM's Operations Superintendent and in 2000 was promoted to Deputy Managing Director. He became Managing Director in about 2001. Captain Dally's seagoing experience included service on a number of tankers, being a relief Master on a 34,000 dwt bulk carrier and two years as Master of a 5,500 dwt general cargo ship.

5.8.7 Overview of Onshore Management of the Ship

[128] Inco is certified under the ISM Code as a management company. It has to meet certain criteria and its systems are audited by AMSA annually.[99] Its management at all relevant times included persons with extensive maritime experience and qualifications, including Captain Dally, Captain Ives, Mr Iuliano and Mr McDonald. Its SQS for the ship was audited, and found to comply with the requirements of the International Management Code for the Safe Operation of Ships and for Pollution Prevention.

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96 SQS 05, Inco Ships Management Manual, p.4.
97 SQS 05, Inco Ships Management Manual, p.4.
98 Exhibit 6, Part 1; para 3.
99 Exhibit 53, Part 1; para 15.

[129] The operation of the ship involved an interaction between, on the one hand, Zinifex's production process and its Karumba-based management and, on the other hand, Inco's materials handling and shipping operations. Inco's Karumba Operations Superintendent was the point of contact between these two systems. The ship is a critical element in Zinifex's business. Without it, Zinifex's exports halt. Delays in transporting ore to scheduled export vessels come at a substantial cost and may jeopardise Zinifex's production and export program. Unsurprisingly, Zinifex, as owner of the ship and the wharf facility, has a vital interest in the ship's operations, and Inco's Operations Superintendent at Karumba had a significant responsibility in ensuring that Inco met its contractual obligations with Zinifex and was attentive to Zinifex's operational requirements. The Operations Superintendent at Karumba had a substantial responsibility for the operation of the *Wunma* and for the efficient operation and maintenance of critical plant and equipment. This included the reclaiming plant at the port and the on-board plant which is used to load and discharge concentrate. In short, substantial responsibilities were imposed upon the Operations Superintendent at Karumba.

[130] The remoteness of Karumba, and daily interaction between Inco's Operations Superintendent and Zinifex employees, meant that, in some respects, the relationship between Inco and Zinifex was not conducted strictly in accordance with the terms of the Vessel Operations Management Agreement ("VOMA"). For instance, the VOMA provided for monthly meetings of a coordination committee. Instead, there was no coordination committee. Its function was replaced by a quarterly review. In the eight years since it was written, operational experience and interaction on a daily basis at an operational level meant that the VOMA "morphed into a different beast".[100]

[131] The remoteness of Karumba meant that senior management and technical personnel from Inco's head office did not attend meetings with the client or visit the ship as often as they might if it were located in a larger city.

[132] The expansion of Inco's business meant that its Operations Manager, Captain Ives, was not able to give the operations of the *Wunma* the attention that he might otherwise have given. Nevertheless, if Captain Ives was unable to attend to matters, Inco was not short of persons with maritime experience. Captain Dally was

personally involved in the development of revised cyclone procedures and the upgrading of the ship's registration from Class 2C to Class 2B. For a substantial period, the Operations Superintendent at Karumba was Captain Heath Daniel, a former Master of the ship. However, as the 2006 review undertaken at Zinifex's request by Thompson Clarke Shipping indicated, significant operational issues needed to be addressed, including:

(a) crewing issues:

(b) the scheduling of maintenance on the ship;

(c) design issues;

(d) the cleanliness of the ship and the need to identify the root causes for the transmission of concentrate around the vessel and to improve cleaning processes;

(e) the operation of cargo handling arrangements.

[133] Mr Tonkin's background in materials handling made him a suitably qualified person to address cargo handling and maintenance issues.

[134] Inco agreed to a proposal to replace the position of Master Class 3 on the ship with a Master Class 1 to provide "more focus on the quality assurance systems".[101] This was despite the fact that a Master Class 1 was arguably "overqualified" for the ship's routine daily operations to and from export vessels at the Roadstead.

[135] The consequence of replacing Master Class 3s, such as Captain Thomson, who had extensive experience on the ship was the loss of their knowledge. Captain Thomson and other masters who trained new masters passed on the benefit of their experience and, even after he left Inco's employment, Captain Thomson continued to be available to give on advice. But with the "changing of the guard" practices known to individuals such as Captain Daniel and Captain Thomson, such as the practice of not loading the ship when there was a low in the Gulf, did not find their way into written operating procedures and did not become standard operating procedures.

[136] The demands placed upon Inco to ensure that the ship met Zinifex's contractual requirements and Zinifex's plan to export one million tonnes of concentrate annually meant that Inco management and head office and its Operations Superintendent at Karumba had to do their best to work with the existing system and equipment. The

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100 Mr Mewett; T.393.

101 Exhibit 53, Part 1; para 17.

objective of meeting planned exports meant that Inco and Zinifex worked cooperatively with the equipment and systems that they had, rather than undertake a major overhaul of those systems. There was limited time for major maintenance programs or overhauls of the ship or the materials handling plant.

[137] With the Operations Superintendent undertaking a demanding job, the Operations Manager busy with an expanding fleet of ships and the Fleet Technical Manager absent in Singapore for a period of approximately two years between 2004 and 2006, Inco staff probably did not have the personnel resources to undertake a major review of the ship's operations and her equipment. Nor was it requested by Zinifex to undertake such a fundamental review. Operational issues later identified in December 2006 by the Thompson Clarke Operational Review were not comprehensively addressed. The focus was on maintaining daily operations, implementing a system that had been developed over a seven year period and doing the best to "live with" the materials handling plant and the ship they had been given.

5.9 VESSEL OPERATIONS MANAGEMENT AGREEMENT

[138] Pasminco Century Mine Limited ("PCML") and Intercontinental Ship Management Pty Limited ("ISM") entered into a Vessel Operations Management Agreement ("VOMA") on 3 May 1999. It was varied by a Deed of Variation around February 2000. PCML later changed its name to Zinifex Century Limited. ISM later changed its name to Inco Ships Pty Limited.

[139] VOMA governed the contractual rights and obligations of Zinifex and Inco in relation to the operation and management of *Wunma* and the reclaiming system. It does not specifically address issues such as drills, emergency response procedures, compliance and documentation.

[140] Clause 4.1(a)(7) provided that Inco shall provide all labour, equipment, materials and supplies necessary to manage and operate *Wunma* and the reclaimer system. Clause 4.2(a) provided that Inco as principal shall engage and employ the Master, officers and crew of *Wunma* and ensure that the Master, all officers and crew of *Wunma* are in possession of all necessary endorsements for service in accordance with the requirements of the Queensland Department of Transport.

[141] Clause 4.1(b) obliged Inco to ensure that its work was carried out in accordance with applicable laws and directives, the Operating Procedures specified in clause 4.5 and good operating and maintenance practice.

[142] Clause 4.5(a) provided, amongst others, that Inco shall develop and keep current operating procedures in relation to:

- loading *Wunma* with concentrates;
- manoeuvring *Wunma* as required;
- transporting the concentrates to the offshore anchorage;
- manoeuvring the vessel alongside ocean going bulk ships;
- returning *Wunma* to the port; and
- cyclone management.

[143] Clause 4.9(a) provided that Inco shall:

- ensure all parts of *Wunma* are kept in good repair, efficient operating condition and are seaworthy in all respects except where otherwise agreement in writing by the parties;
- schedule all maintenance, overhauls, replacements and repairs necessary to *Wunma* and reclaimer system so as to minimise disruption to Zinifex's operations;
- carry out all maintenance, overhauls, replacements and repairs necessary to *Wunma* and reclaimer system in accordance with good operating and maintenance practice;
- keep *Wunma* with unexpired classification certificates, including all safety, radio, load line and such other certificates prescribed by applicable laws and directives.

[144] Clause 4.10 provided that Inco shall replace with reasonable promptness all parts which may from time to time become inoperative, damaged beyond repair or otherwise unusable for any reason for use by Inco with *Wunma*. Clause 4.12 provides that Inco shall ensure that proper books of record and accounts of Inco are maintained.

[145] Clause 5.10 provided that Inco shall:

- keep deck and engine room logbooks, maintenance and other records in relation to *Wunma*; and

- keep those logbooks, maintenance and other records current.

[146] Clause 6 set out the obligations of Zinifex. Clause 6.2 provided that Zinifex shall provide, amongst others, a safe wharf suitable for mooring with the Autodock System with *Wunma* always afloat. Clause 6.3 stated that Zinifex shall provide:

- a navigable dredged channel; and
- cyclone moorings.

[147] Under clause 8, Zinifex was responsible for reimbursing Inco its estimated outlays and expenses for the coming months as determined by the approved annual budget. Schedule 1 to the VOMA sets out an indicative annual budget and the types of expenses Zinifex pays for. These include wages and on costs of crew and other staff, crew expenses, insurance, stores, repairs and maintenance, fuel and oil, owner sundries and port facility costs.

[148] Zinifex also paid Inco a management fee calculated in accordance with clauses 8.2 and 8.3. This management fee included a bonus amount. The bonus amount was calculated taking into account a number of factors as follows:

(a) safety;
(b) satisfactory performance with respect to the operating procedures and the operator's Gulf communities agreement obligations management plan;
(c) environmental;
(d) availability and utilisation
(e) complaints;
(f) demurrage.

[149] Clause 12.3 required Inco to comply with, amongst other things:

- Inco's Safety and Quality System;
- the Karumba Safety Plan to be jointly prepared and agreed by Zinifex and Inco;
- the Karumba Environmental Management Plan to be jointly prepared and agreed by Zinifex and Inco.

Although Inco was required by clause 12.3(c) to maintain and furnish to Zinifex with a copy of its SQS, together with each subsequent amendment to it, at the time of the incident Zinifex did not hold a current version of the SQS.[102]

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[102] Exhibit 47, Part 1; para 44.

5.10 THE REGULATORY ENVIRONMENT

[150] The ship's operation is governed by laws, including Queensland marine safety laws. It is also governed by systems that apply a quality assurance approach to ship management. The ship's Safety & Quality System ("SQS") reflects the International Safety Management Code or *ISM Code*. This section briefly describes the main provisions of Queensland marine safety laws that govern the ship's operation. There follows an outline of the regime that gave rise to the *ISM Code*. The development of written safety management systems, based on the *ISM Code*, should be viewed in its historical context, and as part of a broader process by which written quality assurance systems increasingly govern the operation of organisations. That background provides a context in which to consider the ship's SQS.

5.10.1 Legislation

[151] Shipping law Australia is regulated partly by Commonwealth law and partly by State law. The Commonwealth Parliament has extensive, but limited, powers to legislate with respect to shipping.[103] The Offshore Constitutional Settlement reached in 1979 agreed to give the States a general legislative power in respect of their territorial sea and sought to rationalize the allocation of legislative powers by reference to the type of voyage the ship was undertaking. As a consequence, the *Navigation Act* 1912 (Cth) does not apply in relation to certain voyages. For example, it does not apply in relation to "a trading ship proceeding on a voyage other than an overseas voyage or an inter-State voyage".[104]

[152] The principal piece of Queensland legislation is the *TOMS Act*. It regulates the maritime industry to ensure maritime safety and to enable the effectiveness and efficiency of the Queensland maritime industry to be further developed. The Act is primarily about marine safety but seeks to establish a system to achieve an appropriate balance between safety and cost.[105] The Act's objective of marine safety is advanced by imposing general safety obligations to ensure seaworthiness and other aspects of marine safety. A general safety obligation under the Act might be discharged by complying with a relevant standard or in some other appropriate way. General safety obligations are imposed on:

- ship designers;

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103 Davies and Dickey, *Shipping Law* (3rd Edition), Chapter 2.

104 The expressions "trading ship", "inter-State voyage" and "proceeding on a voyage" are defined in various provisions of the *Navigation Act*.

- ship builders;
- marine surveyors;
- ship owners (including operators);
- ship masters and crew;
- pilots.

[153] Section 41 imposes a general safety obligation on ship owners and masters about the condition of ships. It provides:

> "The owner and master of a ship must not operate the ship unless the ship is safe."

[154] Section 43 imposes a general obligation on persons involved with the operation of a ship to operate it safely. Subsections 43(1) an (2) provide:

> "(1) A person involved with a ship's operation (including the owner, master, pilot and crew members) must not cause the ship to be operated unsafely.
>
> …
>
> (2) Without limiting subsection (1), a person causes a ship to be operated unsafely if the person causes the ship to be operated in a way that -
>
> (a) causes a marine incident; or
>
> (b) contravenes -
>
> (i) conditions of the ship's registration about safety; or
>
> (ii) a provision of a regulation that is declared by a regulation to be a provision to which this section applies."

[155] The *TOMS Act* includes extensive provisions about the registration of ships, licensing, permits and accreditation. It confers powers upon Harbour Masters to give directions about the operation of a ship in a pilotage area if the Harbour Master considers it necessary to give the direction to ensure safety. The Act confers extensive powers upon shipping inspectors to board ships, to inspect ships, to require the production of documents and in certain circumstances to demand information.

[156] The *TOMS Regulation* deals with matters such as safety equipment, accreditation of ship designers, ship builders and marine surveyors, the building and registration of

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105 *TOMS Act* s.29.

ships, licences to operate ships and ship operations. In relation to ship operations, Part 5 of the *TOMS Regulation* defines the operational area of a commercial ship by reference to its class. Section 111 of the *TOMS Regulation* provides that the Master of a registerable commercial ship must comply with Parts 1 and 2 of the *USL Code*, s.15 (emergency procedures and safety of navigation) when operating the ship. The Emergency Procedures in Part 2 of s.15 of the *USL Code* include emergency procedures, crew emergency practice procedures, crew fire drills and crew collision drills. Division 5 of Part 5 of the *TOMS Regulation* concerns load line certificates and, in essence, provides for the assignment of freeboard according to s.7 of the *USL Code*.

[157] Division 11 of Part 5 of the *TOMS Regulation* requires the person who is the owner or master of a particular ship to keep documents for the ship. Section 133 applies to a registrable commercial ship like the *Wunma* and requires the following documents to be kept on board:

(a) the operational manual for the ship;

(b) the technical manual for the ship;

(c) the maintenance and service manual for the ship;

(d) the marine occupational health and safety manual for the ship;

(e) the safety management plan for the ship for onboard emergencies;

(f) the manual of procedures for verification of passenger numbers.

The owner or master must also ensure that these manuals and plans are available to the ship's crew and that every person in the ship's crew has a working knowledge of those parts of the manuals and plan that are relevant to the person's role on the ship.[106]

[158] The view may be taken that the requirement to keep on board a "safety management plan for the ship for onboard emergencies" extends to a safety management plan that includes a planned response to the threat of a cyclone.[107]

[159] Other Queensland legislation, including laws governing occupational health and safety, applied to the *Wunma* at the time of the incident. This is because a commercial ship is a "workplace" and the provisions of the *Workplace Health and Safety Act* 1995 apply to it. In general terms, the obligations imposed by workplace

106 *TOMS Regulation*, s.133(3).

health and safety legislation reinforce safety obligations imposed under the *TOMS Act*.

5.10.2 The International Regime

[160] Internationally, maritime safety and environmental standards are set by the International Maritime Organization ("IMO") through a tiered framework of mandatory and non-mandatory instruments, ranging from conventions, resolutions, codes, circulars of information and guidance material.

[161] The Conventions are multilateral treaties that facilitate international trade, through mutual acceptance of and compliance with internationally agreed safety and environmental standards. Conventions that are relevant to inquiry include:

- The International Convention on Safety of Life at Sea, 1974, as amended (SOLAS'74)
- The International Convention on Load Lines, 1966 as amended by the 1988 Protocol (ILLC'66)
- The International Convention on Standards for Training Certification and Watchkeeping, 1978/1995 (STCW'95)
- The International Convention on Prevention of Pollution by Ships, 1973, as amended, including by the Protocol of 1978 (MARPOL'73/78)

[162] Each of these Conventions provides for amendment, generally by resolution of the relevant committee of IMO. For example, reference was made in the evidence to Resolution MSC.143(77) which amends the ILLC'66 by replacing its entire technical content with new text. Resolutions of IMO Committees may also contain standards or Codes comprising subordinate requirements that may be made mandatory by reference in the relevant Convention. A relevant example is Resolution A.741(18), the International Management Code for the Safe Operation of Ships and for the Safe Operation of Ships and for Pollution Prevention which is known as the International Safety Management or *ISM Code*, that is given mandatory effect through SOLAS Chapter XI. A further example is the Code of Safe Practice for Solid Bulk Cargoes, most recently adopted in 2004 through Resolution MSC.193(79), but which has not yet been given mandatory effect through SOLAS.

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[107] This was the view taken by Captain Diack; Exhibit 49; CB34; para 11, and is also referred to by Mr Bundschuh in Exhibit 94, Part 1; para 74.

[163] MARPOL'73/78 is relevant because its Annex V deals with the discharge of garbage, which is defined to include cargo residues such as the concentrates carried by the *Wunma*.

[164] Another tier of IMO instruments are circulars which, amongst other things, provide guidelines on the interpretation and implementation of IMO mandatory instruments. One such guideline, which is used to overcome Convention impediments to the international acceptance of a new type of ship, is MSC/Circ.608/Rev.1, the Interim Guidelines for Open-Top Containerships. These requirements provide, among other things, for the probable maximum rate of water ingress from rain or in a seaway to be determined by model tests and, after application of a safety factor to the predicted rate, for redundant pumping systems to be fitted to the vessel for the overboard discharge of that water. Although non-mandatory and "interim", these guidelines have been used and accepted for about 15 years to facilitate the international operation of open-top containerships.

[165] The international maritime safety regime also gives explicit recognition to the standards that are set by classification societies.[108] For example, ILLC'66 deems that a ship complying with the requirements of a recognized classification society meets the load line provisions for structural strength. SOLAS'74 has similar provisions. The rules of the major international classification societies are consistent with the requirements of the conventions, while not necessarily embodying all of their requirements.

[166] In order to achieve the desired mutual recognition of ships and their safety standards, the relevant IMO instruments are generally of a prescriptive nature rather than performance-based, and provide limited scope for an authority to make a subjective judgment about whether the relevant standards have been met.

5.10.3 The ISM Code

[167] This Code originated during the 1980s as a set of guidelines to apply a quality assurance approach to ship management, and in particular to assure that a ship complies with classification society and statutory requirements and that appropriate procedures exist to deal with anticipated operational and emergency situations. The

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[108] Resolution A.647(16) *IMO Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention*, adopted October 1989.

guidelines were sufficiently successful in this regard to warrant their refinement and adoption as a Code that is given mandatory effect by SOLAS, Chapter IX.

[168] At the heart of the Code are Safety Management Systems ("SMS") to be applied in relation to both the "Company" managing the ship and the ship itself. Organisationally, two essential elements are that the master has over-riding responsibility for matters relating to the safety of the ship, and is required to have immediate access to a suitably qualified "designated person ashore" in the Company who, in turn, will have direct access to the highest levels of management ashore. Implementation of the Code is required to be audited, firstly through a master's review, then an internal audit by the Company and finally by the Administration or its delegated authority.

[169] Although subject to on-going refinement, the Code has been implemented using a set of guidelines for Administrations.[109] The International Chamber of Shipping in conjunction with the International Shipping Federation has from time to time produced a document comprising an updated compilation of the Code and Administration guidelines together with their unofficial interpretations for the information of interested parties.

[170] Notwithstanding attempts by some parties to have specific issues introduced into the Code, it has remained general in its content to enable the ship's Safety Management System to be tailored to meet the needs of the ship, her operators and trade.

5.10.4 The Development of Safety Management Systems

[171] The development of written safety management systems of the kind found in the *Wunma's* SQS should be viewed in its historical context.

[172] The *ISM Code* came into being because the world of merchant shipping changed after WWII. For many years up to the 1960's the fleets of the traditional maritime countries of Northern Europe dominated the shipping world. Generations of seafarers sailed in those famous fleets. It was not uncommon for both officers and seamen to sail in the same company all their seagoing career, as indeed their fathers did before them. In this environment, although each company had its own written

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[109] Resolution A.647(16) *Guidelines on implementation of the International Safety Management (ISM) Code by Administrations*, adopted 1995.

rules and regulations, seafarers knew "the company way" of doing things largely by a process of oral learning.

[173] By the 1960's the international shipping industry had changed and the traditional maritime countries came under pressure from the fleets of new emerging countries who set up their own merchant fleets and actively competed in the international shipping market. This included the provision of crews. Generally these ships had lower cost structures than the ships of their Northern European and American competitors and so had an advantage in the market place. The traditional shipowners, many with great reluctance, realised they had to lower their cost structures to survive. American shipowners, who had the highest cost regime of all, were amongst the first to adopt the strategy of registering ships in a country with a low cost regime. The "open registry" or "flag of convenience" was born. The old national influence was lost. A new type of company, the ship management company, began to emerge.

[174] Ships were still operated under the traditional flag state laws with regard to safety equipment and classification societies set class rules. However the safety standards on board the world's merchant fleets began to decline. The issue arose as to why this should be the case since qualified people were operating the ships. One answer was that, although crew were properly qualified, the missing element was the structure previously provided in the old "company" framework. The matter was raised in the IMO. The result was the *ISM Code* that became mandatory for cargo ships from 1 July 2002.

[175] The "Code" was not well received amongst many ship's officers. The traditional "oral" system was replaced by a written system of ensuring compliance to a safety management system. It meant an increase in paperwork and meetings. Instead of concentrating on the actual operational aspects of the ship, more time had to be spent in the ship's office. Arguably, such a system does not encourage innovation, since changes in procedures require a re-writing of manuals. Many ship officers perceive manuals as a means by which the company can demonstrate its commitment to safety, whilst seeking to avoid responsibility should something go wrong. In that event, responsibility can be cast on a ship officer for failing to follow "the manual".

[176] The advantages of a safety management system are many. In an era in which the largely, unwritten "company way" of doing things no longer prevails, there is a need for a structured system to ensure the safety and quality of shipping operations.

[177] The development of quality assurance systems are not confined to maritime activity. Quality assurance systems are a common feature of government and business organisations. Their operation has the potential to improve safety and reduce human error. But to be most effective, the system has to be accessible and "user-friendly".

5.10.5 The Australian System

[178] International maritime requirements have generally been translated into Australian national requirements through the *Uniform Shipping Laws Code* ("*USL Code*"). It takes account of the fact that the international requirements are not designed for the smaller vessels and local operations. An exception to this is MARPOL'73/78, concerning pollution of the marine environment.

[179] Provisions of the *USL Code* have been given effect through federal, state and territory legislation. In Queensland, this is through the *TOMS Act* and the *TOMS Regulation*.

[180] In conformity with international practice under SOLAS, maintenance of the ship in Lloyd's Register class (covering hull and machinery) has been deemed to meet the corresponding requirements statutory requirements. However, additional regulations exist in relation to load line, safety equipment, pollution prevention, qualifications/manning and operations as these are not covered by the classification society's rules and associated certification. For instance, section 7 (Load Lines) of the *USL Code* is given effect by sections 118 and 119 of the *TOMS Regulation*.

[181] The *USL Code* was adopted in 1979 and has generally not been updated with amended IMO requirements over the intervening period. It is currently undergoing a complete review by the National Marine Safety Committee with a view to reducing prescriptiveness. The revised technical standards are to be performance-based and named the National Standard for Commercial Vessels ("NSCV"). Survey and certification requirements are to be contained in the National Standard for the Administration of Maritime Safety ("NSAMS").

[182] Although SOLAS Chapter IX gave international effect to the *ISM Code* from 1 July 1996, there is no corresponding provision under the *USL Code*. The relevant national standard reflecting the *ISM Code* in general terms has been finalized as Part E of NSCV but, as far as the Board is aware, has yet to be given legislative effect in any State or Territory.

[183] As the *Wunma's* normal operations are short voyages in Queensland, the ship is not subject to the *ISM Code* for those operations. However, *ISM Code* compliance was required by AMSA for the vessel's 2004 voyage to Singapore for drydocking and audits of the ship's SQS were conducted against the *ISM Code* for this purpose. Inco have subsequently maintained the ship's *ISM Code* audits and certification by AMSA, the most recent of these external audits being conducted on 28th August 2006.

5.11 THE SHIP'S SAFETY AND QUALITY SYSTEM

[184] Although not required as a matter of law to have a system that conforms with the *ISM Code* in order to operate in Queensland waters, at the time of the incident the ship had an SQS that is based on the *ISM Code*. The SQS was one that has been developed by Inco as part of its operating systems, with certain modifications and inclusions that were specific to the *Wunma*.

[185] An AMSA *ISM Code* audit was conducted in August 2006. The SQS was found to conform with the requirements of the *ISM Code*. The auditor included eight observations, none of which were regarded by Inco as being of a major kind.[110]

[186] The SQS manuals are voluminous. They exceed 700 pages. Much of their content is generic in the sense that they are applicable to Inco's fleet. Some parts have specific application to the *Wunma*, for instance, the cyclone procedure. A review by Thompson Clarke Shipping in late 2006 found that the ship's SQS procedure manuals were excessive for the nature of the operation and should be simplified. Thompson Clarke Shipping were told that they were in the process of being simplified.

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[110] Exhibit 32. Captain Ives; T.474; see also *Thompson Clarke Operational Review Report*, December 2006 (Exhibit 49; CB137), p.20 which stated that most of the observations related to minor matters which, while not strictly complying with the code, were handled in a different manner given the *Wunma's* unique operations.

[187] The ship operates a computer-based maintenance system named AMOS. The ship's operating procedures presumably include many other manuals and documents in relation to the operation of its systems, including her loading and discharging operations. Given the purpose of an SQS and the need to limit its volume in the interests of being "user friendly", one would not expect the ship's SQS to be expanded to include procedure manuals for the operation of the materials handling plant onboard the ship. These might be in a "stand alone" operating manual for the material handling plant. But the SQS should address matters that impact upon its safe operation at sea.

[188] Two matters that are not contained in the SQS should be noted. First, the SQS does not contain a procedure reflecting the practice adopted over the years to not load the ship when a low pressure system is in the Gulf. Instead the Cyclone Procedure of the SQS (to be discussed below) provides that the ship will cease loading if a "Blue Alert" is effective (when the Bureau of Meteorology has advised the vessel that a Watch Alert is effective with gale force winds greater than 40 knots expected within 48 hours).

[189] Second, the SQS does not address the operation of the ship's water management system and the circumstances in which deck drains to sea should be opened. The operation of the ship's water management system is discussed in Chapter 6. The present issue is that her operation, which has significant implications for the safety of the ship and the environment, is not addressed in the SQS.

[190] One would expect the ship's SQS to include matters that are unique to the ship and that have the potential to impact upon the safety of her operations, such as the operation of her unique water management system. Alternatively, the operation of the ship's unique water management system should have been the subject of a procedure manual. The evidence indicates that it was not. This constitutes a significant deficiency in the ship's procedures.

[191] Because the SQS is so voluminous, necessarily only a brief summary can be given of those parts of it that are directly relevant to the incident.

[192] Section 13 of the Fleet Operating Manual part of the SQS concerns navigation and provides that the ship is to be navigated with caution, good seamanship and in

accordance with applicable laws. It requires "regular position checks" to be made when the ship is under way using all appropriate equipment.

[193] Under this section "the Master is to satisfy himself before taking the vessel to sea that it is in all respects ready for sea".

[194] The Master's Night Order Book is normally completed nightly at sea and is intended to assist Watchkeeping Officers with guidance about the action to be taken through the hours of darkness and when to seek assistance from the Master.[111]

[195] Section 13.10.1, page 55, confirms that the Second Officer is responsible for preparing the passage plan and has the task of preparing the detailed passage plan to the Master's requirements prior to departure.

[196] Section 16 of the Fleet Operating Manual of the SQS is concerned with "Navigation in Extreme Weather Conditions". It requires the following precautions in the event of rapidly falling barometer readings, threatening sky formations and other signs of abnormal meteorological conditions:

- review latest weather report and synopsis, and compare with actual conditions;
- if the actual conditions depart greatly from the weather reports, determine the direction of the low pressure area on the basis of wind direction, and consider if rules for cyclone navigation should be followed;
- make attempts to contact other ships or shore radio stations in the vicinity to obtain weather report;
- establish radio watch to receive possible security messages.

This section of the SQS details safety actions to be taken to secure the ship's seaworthiness, including inspection and battening down.

[197] SQS 06 consists of "Shipboard Checklists and Work Instructions". These include detailed checklists for preparation for arrival in port, arrival at the export vessel, departure from the export vessel and departure from port. The general requirements for departure from port[112] include taking account of latest weather reports, testing of navigational and communication equipment, ensuring hatches are closed and dogged

111 Fleet Operating Manual; para 13.3.

112 SQS 06, p.A6.

and that the bobcat is secured. Preparation for sea[113] includes weather tight doors, vents and other openings on weather deck secured and ready for sea. Bridge preparation[114] includes checking radios. It anticipates a voyage plan. Likewise there are Engine Room checklists that include checking bilges and pumps. The Safety and Environmental Manual section of the SQS[115] confirms the importance of weather reports and navigation warnings. It provides:

> "**1.19 Weather Reports and Navigations Warnings**
>
> Weather reports are to be regularly obtained and, when practicable, sea areas most affected by severe storms are to be avoided. Suitable shipboard precautions are to be taken whenever the ship may be expected to enter, or unexpectedly enters, an area affected by adverse weather conditions.
>
> Navigation and other warnings received are to be noted immediately by the Master and OOW and appropriate action taken to avoid any hazards to which they refer."

[198] Emergency procedures are addressed in a number of parts of the SQS. SQS 06 Shipboard Checklist and Work Instructions,[116] has emergency notification procedures. Major incidents require reporting by the Master to Operations Superintendent, Karumba, Operations Manager Sydney, Engineering Superintendent, Chartering and Administrator Manager. The person contacted becomes the Duty Manager. There is an identical reference to the responsibilities of the Duty Manager in Section 2 Safety and Environmental Manual.[117] This confirms that the Duty Manager is the person first contacted in the event of an emergency and is responsible for the activation of the Emergency Management Plan in accordance with the procedures in the Appendix Manual. Lloyds Ships Emergency Response System is used for advice on designated vessels. This ship makes initial contact with the office through Initial Report (SOPEP). The office will then contact SERS in London. All forms sent to SERS will go through the Emergency Response System at Sydney office.

[199] The Safety and Environmental Manual section of the SQS deals with abandoning ship.[118] It provides:

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113 SQS 06, p.A7.
114 SQS 06, pp.A8-A9.
115 Page 22, 1.19.
116 SQS 06, p.D1.
117 SQS 06, p.4, section 1.3.
118 Pages 5-6, section 1.5.2.

"1.5.2 Abandoning Ship

The decision to abandon ship must be based on an evaluation of

- the current situation
- how the situation is expected to develop
- what are the possibilities of influencing the development in a positive manner
- what are the consequences if one does not manage to influence the development to a sufficient extent
- buoyancy characteristics and damage stability

The evaluation will be a probability calculation in which all known factors that may influence the development of the situation are taken into account. Actions must be concentrated on those aspects upon which it is possible to influence, and which are of utmost importance of the desired result – safety of lives."

5.12 THE SQS CYCLONE PROCEDURE

[200] Prior to the revision of the SQS to introduce new cyclone procedures, the SQS provided for the ship to go to the cyclone mooring at Sweers Island.[119] Under that procedure the required action to depart for the designated cyclone mooring at Sweers Island only arose upon a "Red Alert" which became effective when the Bureau of Meteorology had advised that a "Warning Cat 2 Alert" (Destructive winds greater than 70 knots were expected within 24 hours).

[201] The cyclone procedure that replaced it was introduced by a revision to the ship's SQS manuals in or about January 2006. A memorandum notifying the revision was sent to the Master of the *Wunma* under a Memorandum dated 12 January 2006. Their receipt was acknowledged by Master Simon McEvoy.

[202] The relevant procedure[120] appears as an Appendix to this report. Following the incident a copy of the cyclone procedure in a slightly different format was taken into the possession of Captain Thomson.[121]

[203] The procedure that was introduced into the SQS in January 2006 and that was in force at the time of the incident[122] states the following in respect of responsibilities:

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119 Exhibit 53, Part 2, annexure AD3.

120 Exhibit 6; also attachment AD1 to the supplementary statement of Andrew Dally, Exhibit 53, Part 2.

121 Exhibit 10. This document is ten pages in length and apart from inconsequential formatting changes appears to consist of a duplication of the relevant pages of the cyclone procedure.

122 Exhibit 6.

> "The Managing Director is ultimately responsible for this procedure. The operation of the vessel is the responsibility of the Operations Manager in Karumba, and the operation of the vessel at sea is the responsibility of the Master."

[204] The procedure anticipates the receipt of cyclone watches, cyclone warnings and gale, storm and cyclone warnings for shipping from the Tropical Cyclone Warning Centre when a cyclone is expected. It also contemplates that the vessel will receive daily weather information by Satcom 'C', facsimile, VHF or MF/HF radio. It provides:

> "The Operations Superintendent will communicate on a regular basis with the Port Manager and will relay cyclone warnings received by the vessel.
>
> The Operations Superintendent will communicate with Head Office on a regular basis to keep them advised of cyclone activity in the region."

[205] The SQS Cyclone Procedure provides that the Operations Superintendent and the Master will monitor cyclone alerts and make a preliminary choice of action in the event a cyclone is imminent. Their choice of action is to take the form of one of the following:

- Anchor off Karumba "if the cyclone is not intended to intensify and is expected to pass over (50 kms??) of the Port".
- Proceed to Weipa if there is sufficient time to make the journey and the Port Authority of Weipa allocates a berth in an anchorage position.
- Head for the open sea and remain in open waters until the cyclone has passed. This action is to be undertaken if either there is no time to steam to Weipa, or permission to enter Weipa has been declined because of the prevailing conditions at that port.

The Master is said to have the final responsibility of choice of action taking into account prevailing weather conditions and any changes in forecast conditions that may occur, with choice of action relayed to the Port Authority and the Operations Superintendent.

[206] The SQS provides for various kinds of action to be taken when the Bureau of Meteorology issues Cyclone Watch Alerts and Warning Alerts. A "Blue Alert" is effective when the Bureau of Meteorology has advised the vessel that a "Watch

Alert" is effective, ie Gale Force Winds greater than 40 knots are expected within 48 hours, but not less then 24 hours. The required action in the event of a Blue Alert is:

- Recall crew and ensure everything is firmly lashed and secure. Specific attention is to be given to any material that may become airborne in extreme wind conditions.
- Ensure vessel has sufficient bunkers to be able to proceed to sea and steam for a minimum of four (4) days. This may require returning to Karumba if the vessel is at the transfer anchorage.
- Cease loading or discharging operations.
- Ensure sufficient ballast water is on board to maintain good stability in the event vessel proceeds to sea. Ensure that the vessel is not at a draft, which may prevent her from leaving Karumba, taking into account weather and tidal conditions.

Under the SQS a "Yellow Alert" is effective when the Bureau of Meteorology has advised the vessel that a "Warning Cat 1 Alert" is effective, ie Gale Force Winds greater than 40 knots are expected. The required action in the event of a Yellow Alert is:

- If berthed, run extra mooring lines and make appropriate preparations to depart the wharf and proceed to sea if the wind is expected to intensify further.
- Place engine room on stand by and maintain the vessel at an alert status for the passing of the cyclone.
- If alongside overseas ship, let go and remain in vicinity but be prepared to head either to open sea or to the anchorage point closer to Karumba if the wind is expected to intensify further.

Under the SQS a "Red Alert" is effective when the Bureau of Meteorology has advised that a "Warning Cat 2 Alert" is effective, ie Destructive Winds are expected greater than 70 knots within 24 hours. The required action is:

- If in port, depart the wharf and proceed to sea. Make preparations for navigating in heavy weather as per procedure safety actions.
- If at sea, either proceed to anchor off Karumba or proceed into deep water keeping in mind procedures to be followed in the event of encountering a cyclone.

- If the vessel is unable to proceed to sea for whatever reason, ensure sufficient mooring lines have been run, rig extra fenders if this is possible, and lay out the starboard anchor only if this is possible due to possible weather conditions and time constraints.

5.13 AVOIDING CYCLONES AT SEA

[207] The SQS Cyclone Procedure states what might be thought otherwise to be obvious: it is "imperative that the Master maintains a good track of the eye of the cyclone".

[208] It also states:

> "The Bureau of Meteorology will give information on a regular basis … however it is the responsibility of the Master to maintain a plot so as to determine if the vessel has sufficient speed to outrun the cyclone or it is more prudent to "heave-to" to allow the cyclone to pass."[123]

[209] The Master and other navigation officers are provided with instructions in the SQS as to how to plot the cyclone and as to how to take avoiding action. To plot the cyclone, the following is advised:

> "1. Plot cyclone centre on the chart.
>
> 2. Construct a circle to equal the cyclone radius.
>
> 3. Construct tangential lines to the cyclone circle at approximately 40º from the forecast path.
>
> 4. Construct the quadrant from the cyclone centre to equal one day's movement of the cyclone. This is known as the imminent danger area.
>
> 5. By projecting the cyclone's movement for an additional 24 hour period the "probable danger area" can be chartered."[124]

[210] The advice for "Taking Avoiding Action" is as follows:

> "1. Determine the semi-circle in which the vessel is situated.
>
> 2. If the wind is backing the vessels in the dangerous semi-circle, the Master should make the best speed keeping the wind on the port bow between 10º to 40º. Alter course to port to keep the wind on the port bow as the wind continues to back.

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123 Exhibit 6.

124 *Ibid*. Captain Thomson; T.80.

3. If the wind is observed to veer, the vessel is in the 'navigable semi-circle'. The Master should make all possible speed with the wind on the port quarter. Alter course to starboard to keep the wind on the quarter as it continues to veer.

4. If the wind is remaining steady, or nearly steady, the Master should alter course to obtain the wind well on the port quarter and proceed towards the navigable semi-circle. Once within this semi-circle alter course to starboard to maintain the wind on the quarter."[125]

[211] Captain Thomson explained that to follow this procedure the Master plots the Latitude and Longitude on the chart and then constructs a circle equal to the cyclone radius based on the information provided to the Bureau of Meteorology.[126] Then the position of the ship is plotted and, in that way, the Master can determine whether he is in the dangerous semi-circle of the navigable semi-circle.[127]

[212] Guidance is given in the form of a schematic as well as two tables of advice. Because of its importance, the SQS Cyclone Procedure, including the schematic and advice tables, is reproduced in an Appendix to this report.

[213] There are several publications available which detail the actions that mariners ought to take to evade a Tropical Revolving Storm ("TRS"), and which reflect the advice and rules contained in the SQS.[128] They include the MSQ's *Small Ships: Training and Operational Manual*, a copy of which was on board the *Wunma*. It contains useful instruction on tropical revolving storms, warning signs, action to avoid cyclones and schematics of TRS quadrants and TRS evasion.

[214] Another publication which the evidence indicates is commonly kept on board vessels is *The Mariner's Handbook* which is published by the UK Hydrographic Office.[129] It includes the following instruction:

"**Avoiding Tropical Storms**

In whatever situation a ship may find herself the matter of vital importance is to avoid passing within 80 miles or so of the centre of a storm. It is preferable but not always possible to keep outside a distance of 250 miles.

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125 *Ibid*.
126 Captain Thomson; T.81.
127 Captain Thomson; T.82.
128 Some of them.
129 Report of Captain White - 5 September 2007; Exhibit 114; para 5.5.1.

…

If a vessel is in an area where the presence or development of a storm is likely, frequent barometer readings should be made and corrected. If the barometer should fall five hPa below normal or if the wind should increase to Force 6 when the barometer has fallen at least 3 hPa, there is little doubt there are storms in the vicinity. If and when either of these criteria is reached the vessel should act as recommended in the following paragraphs until the barometer has risen above the limit just given and the wind has decreased below Force 6. Should it be certain, however, that the vessel was behind the storm or even in the navigable semicircle it will evidently be sufficient to alter course away from the centre keeping in mind the tendency of tropical storms to re-curve towards North and North East in the Northern Hemisphere and South and South East in the Southern Hemisphere:

In the Southern Hemisphere

(a) If the wind is backing the ship must be in the dangerous semicircle. The ship should proceed with all available speed with the wind 10º to 45º, depending on speed, on the port bow. As the wind backs the ship should alter course to port thereby tracing a course relative to the storm as shown in diagram 5.32.

(b) If the wind remains steady in direction or nearly steady so that the vessel should be in the path of the storm or very nearly in its path, she should bring the wind well onto the port quarter and proceed with all available speed. When in the navigable semicircle act as at (c) below.

(c) If the wind veers the ship is in the navigable semicircle. The ship should bring the wind onto the port quarter and proceed with all available speed turning to starboard as the wind veers to follow a track as shown in the diagram. If there is insufficient room to run when in the navigable semicircle and it is not practicable to seek shelter, the ship should heave-to with the wind on her starboard bow in the Northern Hemisphere or on her port bow in the Southern Hemisphere."

[215] *The Mariner's Handbook* also contains the following advice:

However, it is sometimes difficult to identify the precise position of a storm centre, even with modern tracking facilities; and in view of the uncertain movement of storms, prediction of the future path of a storm maybe liable to appreciable error particularly when forecasting several days ahead. Appropriate allowances are therefore prudent when considering what action is necessary to avoid a storm. …

Ships should pay particular attention to their own observations when in the vicinity of a storm and act in accordance with advice given below.…

> Because of the importance of pressure readings it is wise to take hourly barometric readings in areas affected by tropical storms. …
>
> If a vessel is in an area where the presence or development of a storm is likely, frequent barometer readings should be made."[130]

5.14 WEATHER INFORMATION AVAILABLE TO THE *WUNMA*

[216] The Global Maritime Distress and Safety System ("GMDSS") provides for safety communications. It uses modern technology, including satellite and digital selective calling techniques. These systems enable a distress alert to be transmitted and received automatically over either short or long distances. The GMDSS also facilitates the dissemination of Maritime Safety Information ("MSI") such as navigational and meteorological information to ships.

[217] The Bureau of Meteorology provides meteorological forecasts, warnings and observations to mariners by various means including HF voice and facsimile, VHF voice, telephone voice and facsimile, Inmarsat C and through media outlets.[131]

[218] The communications systems on board the Wunma at the time of the incident are the subject of two statements to the Inquiry from Mr Peter Green[132] and Mr David Thomas.[133] At the time of the incident, the *Wunma* was fitted with:

- Two complete VHF installations;
- Two Inmarsat C systems;
- One HF/MF radio system.

[219] The *Wunma* complied with the minimum GMDSS requirements. In fact, it had one Inmarsat C system in excess of those requirements. The *Wunma* also was fitted with a Thrane and Thrane Sailor 33 satellite phone that is not required by the regulations.

[220] The *Wunma* could receive emails while at sea. This facility was available through AMOS system which was routed through an Inmarsat M unit. The Inmarsat M provides automatic low quality voice and medium speed data in real time mode.[134]

[221] AWA Marine held the Shore Base Maintenance Agreement for the vessel. Under that agreement, AWA Marine carried out six monthly inspections of the GMDSS

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130 Chapter 5, Exhibit 16.

131 *Australian Seafarers Handbook* – Chapter Nine

132 Exhibit 82. AWA Marine held the Shore Based Maintenance Agreement for the vessel and carried out six monthly inspections. Mr Green conducted the last such inspection – in August 2006.

133 Exhibit 107. Mr Thomas attended on the Wunma on evening of 7 February 2007.

134 See: Statement of Captain White dated 5 September 2007; Exhibit 114; Para 5.7.3.

installation to ensure that compliance is maintained. The last such inspection was carried out on 14 and 15 August 2006 and the Service Reports of those dates[135] noted a number of deficiencies of which the following were critical:

- No receive signal was picked up on SatComm C 2. The technician suspected that a short circuit caused the fault in the transceiver and he concluded that a new transceiver or SatComm receiver was required.
- Fuses in the MF/HF DSC needed to be replaced.
- All ITU manuals were found to be out of date.

[222] Captain Seal gave evidence that the *Wunma* was fitted with:

- HF radio;
- 2 x VHF radios;
- 2 x SatComm C systems, one of which was not working;
- 3 x portable VH radios with backup lithium batteries;
- a satellite phone with connection for emails only;
- a CDMA phone;
- 2 x SART's;
- 1 x 406 MHz EPIRB. [136]

[223] The Sat Comms, the VHF radios and the HF radio were all powered by the ship's emergency circuit with a backup to a battery bank.[137] The satellite phone was similarly powered.[138]

[224] After the incident, Zinifex sent their communications technician, Mr Thomas, to the Wunma on the evening of 7 February 2007. On boarding, he noted that there was no power to the GMDSS equipment due to the fact that the batteries were run down.

[225] The battery charger was then rewired to the main power and the power supply to the GMDSS equipment was restored. Once that occurred, he noted that the two VH radios and SatComm C 1 were operational. SatComm C 2 was, of course, found to be inoperative. On examining the MF/HF radio, Mr Thomas found that an internal fuse in the main power supply module had blown, most likely due to a power spike

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135 There are two dated 14 August 2006 and 15 August 2006, respectively. And see: Appendix J to the report of Captain White dated 5 September 2007; Exhibit 114.

136 Statement of Captain Seal dated 2 August 2007; Exhibit 18; p. 18.

137 *Ibid*.

138 *Ibid*.

which resulted from the submersion and ultimate failure of the emergency generator and switchboard.[139] Mr Thomas was also able to restore power to the Thrane and Thrane Sailor 33 satellite telephone.

[226] Mr Thomas also expressed the opinion that a changeover switch, which allows power to the GMDSS equipment to be switched from the 24 volt system to the ship's main power, was not something which the Master or crew was familiar with. Mr Thomas stated that had the Master and crew been aware of this switch, power could have been maintained on the VH radios and on the SatComm C 1 unit.[140]

[227] The *Wunma* had the capacity to receive weather forecasts and warnings in text format over the SatComm C Unit. Forecasts and warnings also were available over the MF/HF radio. Emails of weather information could be sent by email via the AMOS system through an Inmarsat M unit. But Mr Tonkin, the Operations Superintendent at Karumba, explained that he could not be send an email directly to the ship due to AMOS connection difficulties If he had to send an email to the ship in February 2007, he would have been required to contact Inco's Sydney office or the communications section at Zinifex Century Mine to arrange for the email to be sent.[141] These difficulties apart, e-mails could be sent to the ship at sea via the AMOS system, as was shown on the voyage when Captain Seal's wife emailed him certain weather information.

[228] When moored alongside the Zinifex Wharf, the *Wunma* had the capacity to network into the Zinifex communication system and, thereby, gaining full access to the internet. By these means, the *Wunma* was in a position to receive up to date weather information from the Bureau of Meteorology website as well as email bulletins from Zinifex with respect to the weather.

[229] An employee of Zinifex would disseminate information concerning "any lows or any whether predictions" via email and then these would "come to the ship".[142] That information would then be discussed at PASS meetings[143] either on the ship or ashore.

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139 Statement of Mr Thomas, Exhibit 107; para 16.

140 Statement of Mr Thomas, Exhibit 107; para 27

141 Mr Tonkin; T.605

142 Captain Dunnett; T.325.

143 Statement of Mr Gurr dated 10 August 2007; Exhibit 55 and the Annexures to that statement. Mr Gurr; T.586-589. Tonkin; T.597-598.

[230] Onboard the *Wunma* at the time of the incident was a publication entitled "Admiralty List of Radio Signals".[144] This was the primary reference work for the Master and crew of the *Wunma* so far as weather reports and information are concerned. It details the full weather services provided by the Bureau of Meteorology, including broadcast times, frequencies on which they can be received and faxback contact details and telephone numbers for the Bureau of Meteorology from which additional information can be received.

5.15 PORT OF KARUMBA CYCLONE CONTINGENCY PLAN

[231] This plan is activated once the threat of a cyclone exists. Its objective is to organise the orderly removal of vessels from their normal moorings to more sheltered locations or, in the case of large vessels, to sea. Its objective is to have the Port evacuated at least six hours before destructive winds commence. The plan includes requirements of what is to be done when destructive winds are forecast within 24 hours (Yellow Alert), within 16 hours (Blue Alert) and within 6 hours (Red Alert) whereupon the Port is closed. One of the requirements upon a Yellow Alert is to suspend the loading of all ships. Upon a Blue Alert all ships are to sail. The stated objective of the plan is that all large ships will have left the port before winds reach 30 knots. The Cyclone Contingency Plan states that the anchoring of large vessels upstream is not recommended due to tidal surges that could inundate the area, which, with high winds, may strand vessels inland of the river system, making any salvage extremely difficult.

[232] Some observations are appropriate in relation to the Port of Karumba CCP. First, the plan and the policies that underpin it are not new. Similar plans and advisory messages were issued and circulated to the general public in previous years. Second, such a cyclone contingency plan is not peculiar to Karumba. A similar plan exists for Weipa and other ports.[145] Third, the Port of Karumba CCP and similar plans appear to be based on a widely-accepted principle that in the absence of an appropriate cyclone mooring or safe haven[146] it is appropriate and safer for a "large ship" to go to sea in the event of a cyclone. This was the opinion of Captain Cole in

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144 Appendix L to the statement of Captain White dated 5 September 2007; Exhibit 114.

145 See Weipa plan Exhibit 92. Plans are accessible at: www.msq.qld.gov.au/Home/Waterways/Cyclone_contingency_plans

146 Defined in "The Mariner's Handbook" (1989) as a harbour or place of refuge for vessels from the violence of wind and sea. In the strict sense it should be accessible at all states of the tide and conditions of weather.

his advice to the EPA and was his evidence to the Inquiry.[147] Captain Cole's opinions were based, in part, upon his observations and experiences. This included being ashore in Hong Kong in August 1971 when a typhoon caused maritime havoc when its eye passed over the colony. Captain Cole also witnessed the damage caused to larger vessels that sought shelter in some of the bayous of the Mississippi River when a hurricane passed over the lower reaches of the Mississippi Delta in August 1969. Captain Cole observed "a number of vessels high and dry miles away from the Mississippi River".[148] Based on his observations and experience in the maritime industry, Captain Cole said he had a natural inclination to support any cyclone avoidance strategy that recommends a reasonably sized vessel sheltering in a restricted anchorage. However, in the case of a large ship such as the *Wunma* and the prospect of some environmental damage given its type of cargo, he considered that a proper risk assessment favoured it going to sea. It should be noted that Captain Cole acknowledged the risks in the vessel going to sea, but concluded that those risks were less than the risks posed by her going to the cyclone mooring at Sweers Island.

[233] Another view of the comparative risks of the *Wunma* being required to go to sea in the event of a cyclone was articulated by the ship's designer, Mr Stuart Ballantyne. Mr Ballantyne's preference is for the ship to stay alongside with her large fenders on the wharf side to avoid or minimise damage to the wharf and with the port anchor out to hold the ship a small way off the wharf.[149] Mr Ballantyne said that when the ship was designed he made recommendations to Pasminco and Inco regarding cyclone contingency plans. The recommendation was to stay in port or to go up the Norman River with full ballast so that if the ship was aground, she could always pump out the ballast and float off. Mr Ballantyne acknowledged the risks associated with going up the river, that in a bad flood the ship might find herself stranded inland.[150] Mr Ballantyne's evidence was as follows:

> "It does not matter if you are on a 40 foot catamaran or a 2000 tonne ship or a 5,000 tonne ship. You go up the creek. Don't go out to sea, especially in a marine cul-de-sac like the Gulf of Carpentaria."[151]

147 Exhibit 88; paras 12 and 13. Captain Cole; T.705.
148 Captain Cole; T.705.
149 Exhibit 97; para 41.
150 Exhibit 97; para 40.
151 Exhibit 97; para 43.

[234] The Queensland Transport policy of requiring large ships to go to sea in the event of a threatened cyclone rather than remain in port does not reflect this approach. It reflects the approach and philosophy expressed by Captain Cole in his opinions to the EPA and in his evidence to the Inquiry. The policy of requiring a "large ship" to go to sea, rather than remain in port, in the event of a cyclone is intended to avoid damage to the ship, port infrastructure and other vessels and to enhance the safety of the ship's crew and other mariners.

[235] The policy is not so easily applied in the case of a ship like the *Wunma* (whose class restricts it to coastal service) in the geography of Karumba. Cyclone avoidance at sea requires sufficient sailing time and sufficient sea room to effect cyclone avoidance action, ideally in surveyed waters. It also requires a ship with sea-keeping properties and a design that will enable it to remain in open waters in cyclonic conditions.

[236] As events transpired during the incident, the ship left the Port of Karumba *before* it was required to do so under the Port of Karumba CCP. Had she used all three engines and not altered course, she may have been able to steam a substantial distance north of the path of Tropical Cyclone Nelson. However, if she had delayed leaving the port until she may have been required to do so under the Port of Karumba CCP then sufficient time may not have existed for her to steam north and avoid the cyclone.

[237] In any event, in circumstances in which cyclones behave unpredictably, it is questionable whether a ship such as the *Wunma* departing Karumba has sufficient searoom to avoid a cyclone that in, or heading in the direction of the South East part of the Gulf.

[238] The *Australian Seafarers Handbook* advises:

> "Ensure **plenty of sea room** in order to avoid being blown aground. This is particularly important, and will require early decision making if the ship is in coastal waters that have no tropical cyclone havens."[152]

[239] Captain Thomson, who travelled to China when the *Wunma* was being built there and who had dealings with those involved with the project at the time, understood that a cyclone mooring was intended as an essential element for the operation of the

ship.[153] Captain Thomson's evidence was that the ship was not designed to try and evade a cyclone in the Gulf and there "is not much searoom to do so". Captain Thomson pointed out that the way the Gulf is formed makes it hard to evade a cyclone. By contrast, in Western Australia you can go south and then west and then north outside of the cyclone. You cannot do that in the Gulf.[154]

[240] In a letter to the Board a Karumba resident, Mr Bill Rutherford, who is an experienced mariner and Secretary of the Karumba Volunteer Marine Rescue Unit, was critical of the practice of vessels vacating the port if and when a cyclone event is declared. As he said:

> "Because of the geography of the Southern Gulf it is certain that in the event of a cyclone being in the Eastern Gulf, there is no escaping it. …"

[241] The same essential point is made by critics of the Port of Karumba CCP in respect of a cyclone that is heading in the direction of Karumba or a cyclone, like Tropical Cyclone Nelson, which takes an easterly path and affects the waters of the Eastern Gulf. The point is that there is insufficient searoom to avoid such a cyclone. In a colourful phrase it is a "marine cul-de-sac". The ship cannot go South. Going North-West of Karumba in the direction of Sweers Island risks heading in the direction of a cyclone such as Tropical Cyclone Nelson. The only remaining direction is North and the risk exists of having insufficient time or searoom to avoid the cyclone. The fact that Tropical Cyclone Nelson was a category 1/category 2 and easier to avoid than a Category 3 or higher cyclone does not detract from the general hazard posed to large vessels leaving Karumba in the face of a cyclone affecting the South-East part of the Gulf. The point was well-made by Mr Campbell Smith in his affidavit in the Federal Court proceedings in 1999 when he stated that going to sea was not a viable option.

> "The option of sending the *MV Wunma* to sea is not viable due to:
>
> (i) the shallow waters in the Gulf and the substantial unsurveyed areas in the southern part of the Gulf;

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152 Exhibit 16(b), p.51.
153 Exhibit 9; para 27.
154 Exhibit 9; para 35.

(ii) the inherent risks such as running aground or colliding with another vessel, associated with the vessel being subjected to cyclonic winds and high seas in open water."[155]

[242] The Port of Karumba CCP is not clear in its definition of what is a "large vessel". However, it contemplates that smaller vessels will leave the port and go upstream and seek protection amongst mangroves.

[243] The direction or recommendation in relation to large vessels is informed by the risk of a storm surge leaving large vessels stranded. Evidence was given of a large vessel being stranded during a cyclone event in the mid-1970s. A storm surge is an increase (or decrease) in water level associated with a significant meteorological event such as a tropical cyclone. Typically it raises the level of the tide above the predicted level. But in some situations the actual tide level can be lower than that predicted, for instance when winds blow offshore. The storm surge height depends on a range of factors including:

(a) the intensity and size of the tropical cyclone;

(b) the shape of the seafloor – the more gentle the slope the greater the surge, and

(c) the speed and angle of approach of the cyclone to the coast.

The surge can be worsened by the funnelling effects of bays and estuaries – and river and local flooding caused by torrential rain.[156]

[244] The EPA operates a storm tide system comprising tide gauges along the Queensland coastline that allows real-time access to tide data during events to monitor the effects of coastal flooding from tidal surge. For Tropical Cyclone Nelson data was obtained from the Weipa and Karumba gauges. The EPA reports that the maximum surge value recorded at Karumba was 0.8 metres at 1210 hours on 5 February 2007. This did not exceed the Highest Astronomical Tide ("HAT") which is the highest water level which can be predicted to occur at a particular site under average weather conditions. But as the EPA observes, had the maximum surge recorded at Karumba occurred on the spring tide four days earlier (at 1730 hours on 1 February), the actual storm tide would have been 0.6 metres above HAT and this may have resulted in substantial flooding around Karumba.[157]

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155 Campbell Smith affidavit; para 29; Exhibit 49; CB33.

156 EPA Fact Sheet: Tropical Cyclone Nelson.

157 EPA Fact Sheet: Tropical Cyclone Nelson.

[245] The storm surge experienced at Karumba as a result of Tropical Cyclone Norman is informative. But the extent of that surge does not dictate the extent of the surge that might be experienced during a different, more severe, cyclonic event.

[246] Evidence from an experienced mariner, Mr Bevis Hayward, accords with evidence given by meteorologists that cyclones in the Gulf are fickle by nature and their tracks uncertain. As was said:

> "Once formed into cyclones their tracks can be erratic and their progression speed is also virtually impossible to predict."[158]

[247] Mr Hayward has been at sea for all of his working life, beginning in September 1967 at the age of 16. His experience includes operating the 69 metre cargo ship, *Gulf Cloud*, during two wet seasons and he has spent another six wet seasons as the Manager Remote Area Service in Karumba for MSQ. He has studied tropical revolving storms (cyclones) in the Gulf region. His evidence was:

> "32. … I have witnessed storm systems lingering in the Gulf region for days on end and travelling in one direction before then changing direction and crossing the coast to form rain depressions. These are normally low category 1 & 2 storms. I also witnessed Cyclone Craig in March 2003, a cyclone that travelled from Cape Arnhem in the Northern Territory to the southwest of Cape York Peninsular near the Gilbert River in less than 15 hours. At one stage this system covered 240 nautical miles in 9 hours at a speed of 26 knots.
>
> 33. In my experience, the geographical position of Karumba works in favour of the town missing the full impact of tropical storms. This is because a storm, approaching from quadrants in the Northeast through to the West, produce mainly offshore winds as opposed to onshore winds which subsequently lessens the probability of substantial tidal surges in the Norman River. However, history tells us, a direct hit with a severe category 5 storm spares no-one.
>
> 34. In my experience, the fact that a tropical low or cyclone has crossed over from water to land does not mean it will not re-form and change track back to sea, and vice versa. An example in this regard was "Cyclone Ingrid" in March 2005."[159]

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158 Statement of Bevis Hayward; Exhibit 74; para 31.

159 Statement of Bevis Hayward; Exhibit 74; paras 32-34.

5.16 COMPLIANCE WITH PORT CYCLONE CONTINGENCY PLANS

[248] Compliance with Port Cyclone Contingency Plans such as the Port of Karumba Cyclone Contingency Plan is an issue of contention amongst mariners. A similar issue of contention arose in respect of the *MV Warrender* which was unable to enter Weipa during a cyclone event.[160]

[249] Twice when Mr Hayward was Master of the *Gulf Cloud* he had a disagreement with the then Harbour Master in Cairns about being directed to go to sea. The port was closed and he was directed to sail but he declined to do so. He subsequently discussed the matter with the Harbour Master and explained his reasons for not taking the *Gulf Cloud t*o sea.[161]

[250] The cargo ship the *MV Warrender* remained in the Port of Karumba during Tropical Cyclone Nelson. The Board's inquiries indicate that she was not required to proceed to sea under the Port of Karumba Cyclone Contingency Plan or pursuant to a direction from the Regional Harbour Master. The *MV Warrender* proceeded up the Norman River without cargo and dropped anchor. She was in contact with the Cairns VTS during this period, and was not directed to go to sea by the Regional Harbour Master or any other MSQ officer.

[251] The history of compliance or non-compliance by the *Wunma* with the Harbour Master's requirements for clearing the port of large vessels was the subject of some evidence.

[252] One matter that arises in connection with the *Wunma* is that winds have to be below about 25 knots and tidal conditions suitable for the *Wunma* to negotiate the channel and go to sea. The Port of Karumba CCP has as its objective that large vessels will generally have cleared the port before winds reached 30 knots. But depending upon the circumstances, winds may reach 25 knots before a "Blue Alert" is declared under the Port of Karumba CCP requiring a vessel to leave port. This is because a "Blue Alert" requiring all ships to sail only becomes operative when destructive winds are forecast within 16 hours. The term "destructive winds" refers to wind gusts in excess of 125 kilometres per hour. Destructive winds are Category Number 2 winds. The Bureau of Meteorology defines them as consisting of sustained winds of

160 Statement of Frank Thomson; Exhibit 9; para 58.

161 Exhibit 74; para 25.

between 89 and 117 kilometres per hour with strongest gusts between 125 and 169 kilometres per hour. One kilometre per hour is approximately 0.54 knots.

[253] In short, although the Port of Karumba Cyclone Contingency Plan has as its objective that large vessels will clear the port before wind speeds have reached 30 knots, the system of alerts does not require ships to sail until a "Blue Alert" when destructive winds are forecast within 16 hours. This situation may permit a Master of the *Wunma* to remain alongside the wharf, notwithstanding the terms of the Port of Karumba CCP, and to explain that course of conduct because winds and tidal conditions did not allow the ship to safely negotiate the channel and go to sea. Such an explanation could be based upon past experience when the ship once was nearly caught in the channel when a cyclone threatened.[162]

[254] Any Master of the *Wunma* who takes the decision to remain alongside the wharf on the basis that it is a safer option than going to sea may be vindicated by events or, at least, able to justify that decision if, as matters transpire, the ship and the wharf infrastructure are not damaged. But if the cyclone intensifies and affects Karumba, with or without a tidal surge, such that the ship and the wharf are damaged, the Master is placed in a very different position.

[255] First, the Master and the Master's employer might be required to explain to the ship's owner why procedures to leave the port in the SQS and in the Port of Karumba CCP were not followed and there may be legal liability to the owner of the ship and the wharf infrastructure in respect of physical damage and substantial, consequential losses during the period that concentrate cannot be exported.

[256] Second, there is the risk of prosecution notified in the Regional Harbour Masters Advisory Message and the risk of being held accountable for damage caused to other vessels or other property. Although the Port of Karumba CCP does not have statutory force, non-compliance with a Harbour Master's directions to leave port would expose a Master to possible prosecution.

[257] In short, and as Captain Thomson agreed, a Master who decides to stay alongside may be taking a fair bit upon himself or herself if, in the course of events, damage is done to the vessel and the wharf.[163]

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162 Statement of Frank Thomson; Exhibit 9.

163 Captain Thomson; T.107.

5.17 THE ZINIFEX PORT SITE CYCLONE PROCEDURE

[258] This procedure[164] defines the responsibility of the Zinifex Port facility, the mine site and the "Wunma Teams" in the event of a possible cyclone. So far as it is relevant to the operation of the *Wunma* it is based on a system of alert conditions:

- Blue Alert — The Bureau of Meteorology has issued a Cyclone Watch for the area of Karumba. A cyclone has developed and may affect the area within 48 hours.
- Yellow Alert — The Bureau of Meteorology has issued a Cyclone Warning for the area of Karumba. The cyclone is moving towards the area, impact within a 200km radius is probable within 12 hours.
- Red Alert — Cyclone impact is imminent within a 50km radius.

[259] To ensure the management and implementation of the procedures there are five teams. Team A is responsible for cyclone coordination and is led by the Port Manager, the Emergency Services Incident Controller and the Site Administrator. Its areas of responsibility include maintaining communications with the *Wunma* and monitoring cyclone intensity.

[260] Team D is described as "Wunma Personnel". It includes Inco's Operations Superintendent in Karumba. The areas of responsibility of Team D are described as:

> "• Prepare vessel for departure for sea. Call in crew if necessary
> • Check fuel, water and sufficient food for two weeks at sea
> • Secure vessel inline with ISM Cyclone Procedures
> • Alert AMSA/Department of Transport Qld of situation
> • Ensure the vessel proceeds to sea or action is taken after communication with Ports Cooperation (sic) & Operations Manager."

[261] When a Blue Alert is raised the Team D (*Wunma* personnel) are required to:

> "• Prepare vessel for depart for sea. Call in crew if necessary.
> • Check fuel, water and sufficient food for 2 weeks at sea
> • Carry out checks on communications equipment
> • Review Cyclone Procedure – MV Wunma."

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[164] Statement of Malcolm Mewett, Exhibit 47, Annexure 5.

[262] If a Yellow Alert is raised (the Bureau of Meteorology has issued a Cyclone Warning for the area of Karumba. The cyclone is moving towards the area, impact within a 200 kilometre radius is probable within 12 hours), the following action is stated:

> "• Wunma to proceed to sea if possible, if not possible because of strong wind or tidal flows the vessel will take action after communication with Ports Cooperation (sic) & Operations Manager.
>
> • The Starboard anchor will be put underfoot and the vessel ballasted to the maximum extent.
>
> • The Master will determine the number of crew to remain onboard, consistent with the INCO Cyclone Procedures.
>
> • The Master may make arrangements to repatriate other crew to a safe area away from Karumba.
>
> • Determine with Team A at what intervals communications is to be made to give status report. Ensure communications schedule is met."

[263] If a Red Alert is raised, Team D is required to maintain regular communication with Team A.

[264] Importantly, for present purposes, the March 2006 Zinifex Port Site Cyclone Procedures anticipate that when a Blue Alert is raised, the ship will be prepared for departure to sea, that fuel is checked, that the vessel is secured in line with ISM cyclone procedures, and that when a Yellow Alert is raised the ship proceeds to sea or other action is taken after communication with the Ports Corporation and the Operations Manager.

[265] An earlier edition of the Zinifex Cyclone Procedure was on the vessel at the time of the incident. It consists of a separate and detailed Cyclone Procedure issued in May 2004 in respect of the *Wunma*.[165] It is based on a similar system of alert conditions. In the event of a Blue Alert, the vessel is to "Finish off current loading or cease any further loading such that the *Wunma* is empty of any zinc or lead concentrate". It also includes provision for preparation for departure to sea and checking fuel and water. It contains a section on navigation action in the event that the Regional

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165 Exhibit 11.

Harbour Master directs the ship to vacate port. In this event, the procedure advises there are two alternatives:

- heading to sea; or
- heading to the cyclone mooring, depending on the position and direction of the TRS.

It includes a section in relation to the Cyclone Mooring at Sweers Island, with detailed instructions in relation to connection to the cyclone mooring.

5.18 MULTIPLE CYCLONE PROCEDURES GOVERNING THE SHIP

[266] As can be seen, at the time of the incident, the ship was subject to three different cyclone procedures:

(a) the Cyclone Procedure in its SQS;

(b) the Zinifex Cyclone Procedure (and in that regard, the ship had an outdated version on board that contemplated use of the cyclone mooring at Sweers Island, rather than the March 2006 edition which made no reference to it);

(c) the Port of Karumba Cyclone Contingency Plan.

[267] Each procedure is based upon a system of alert conditions which are not identical. Although in general terms, the system of alerts have similar objectives in preparing the vessel to depart port and then proceed to sea, there is no consistency between the different alert conditions. For instance, the SQS has as the first stage alert a "Blue Alert" which is effective when the Bureau of Meteorology has advised the vessel that a "Watch Alert" is effective, i.e. gale force winds greater than 40 knots are expected within 48 hours, but not less than 24 hours. The action required upon such a Blue Alert includes "cease loading or discharging operations". The Zinifex Cyclone Procedure has a similar, but not identical, Blue Alert condition where the Bureau of Meteorology has issued a "Cyclone Watch" for the area of Karumba. The Blue Alert goes on to say "a cyclone has developed and may affect the area within 48 hours". This definition is open to the interpretation that it applies only once a cyclone has developed in respect of which a "Cyclone Watch" has been issued for the area of Karumba. In any case, the definition of "Blue Alert" under the SQS and under the Zinifex procedure is not the same. The definitions of Yellow Alert and Red Alert are not the same.

[268] More significantly, the Port of Karumba Cyclone Contingency Plan has as its first stage alert a "Yellow Alert" when "destructive winds" are forecast within 24 hours,

upon which, ships are to suspend loading. The "Yellow Alert" definition does not coincide with any cyclone alert condition in the SQS or Zinifex Port Cyclone Procedure. Under the Port of Karumba CCP a "Blue Alert" occurs when destructive winds are forecast within 16 hours, whereupon all ships are to sail.

[269] The existence of three overlapping cyclone procedures with different alert conditions is a potential source for confusion.

[270] As matters transpired, the ship departed the Port of Karumba without being required to by an alert condition under any of these procedures. As matters transpired, she departed the Port of Karumba too late to be well-clear of the cyclone's path.

[271] The copy of the SQS that was on board at the time of the incident, by mistake, retained two pages about connection and disconnection procedures to the cyclone mooring at Sweers Island. The Inco SQS memorandum that was circulated on 12 January 2006 should have contained a direction to remove these pages and through an oversight this did not occur.[166]

[272] The inadvertent retention in the SQS of pages in relation to the cyclone mooring at Sweers Island was a potential source of confusion, even though proceeding to the cyclone mooring was not included as one of the options in the Cyclone Procedure section of the SQS. The presence on board of an outdated copy of the Zinifex Cyclone Procedure for the ship that also referred to the cyclone mooring at Sweers Island was a potential source of confusion.

[273] The mistaken retention of pages in connection with the cyclone mooring at Sweers Island in the SQS and the existence of an outdated version of the Zinifex Cyclone Plan for the vessel that contemplated the vessel going to the cyclone mooring at Sweers Island, did not affect the course of events in February 2007 leading up to the incident. Going to the cyclone mooring at Sweers Island was never a realistic possibility on 5 February 2007. It would have required the ship to steam in the general direction of the low pressure system, not away from it. Experience showed that it was difficult to connect to the cyclone mooring in high winds. Captain Seal had never been to the cyclone mooring and there had been no training drills in respect of it for some years. The authority to use it had expired on 16 December 2005. It apparently had not been maintained. An inspection of the cyclone mooring

on 31 May 2007 indicated that the mooring buoy was not in readiness for the *Wunma* to moor up to it and there was no mooring line or mooring hook in place.[167]

[274] But in different circumstances, the existence of documents on the ship's bridge that referred to the cyclone mooring had the potential for confusion. That this is so is demonstrated by a voyage plan prepared after the incident when the ship proceeded under a Restricted Use Flag after unloading to an export vessel near Weipa to Karumba. The voyage plan prepared by the Second Mate included the following:

> "During the voyage from the Export vessel to Karumba should a TRS evolve, we will depart from the passage plan and set course to the designated cyclone anchorage at Sweers Island. The vessel will make fast to the cyclone mooring."[168]

5.19 THE CHOICE OF ACTION PRESCRIBED BY THE SQS

[275] It should be recalled that the Cyclone Procedure that was introduced into the ship's SQS in January 2006 had its origin in draft procedures that had been prepared in previous years.

[276] The procedure that was introduced into the SQS in January 2006 and that was in force at the time of the incident[169] stated the following in respect of responsibilities:

> "The Managing Director is ultimately responsible for this procedure. The operation of the vessel is the responsibility of the Operations Manager in Karumba, and the operation of the vessel at sea is the responsibility of the Master."

[277] The procedure anticipated the receipt of cyclone watches, cyclone warnings and gale, storm and cyclone warnings for shipping from the Tropical Cyclone Warning Centre when a cyclone was expected. It also contemplated that the vessel would receive daily weather information by SatComm C, facsimile, VHF or MF/HF radio. It provided:

> "The Operations Superintendent will communicate on a regular basis with the Port Manager and will relay cyclone warnings received by the vessel.
>
> The Operations Superintendent will communicate with Head Office on a regular basis to keep them advised of cyclone activity in the region."

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166 Supplementary statement of Andrew Dally; Exhibit 53, Part 2; para 6.
167 Statement of Bevis Hayward; Exhibit 74; para 37.
168 Exhibit 49; CB204.
169 Exhibit 6; see also Exhibit 10.

[278] It provided:

> "The Operations Superintendent and the Master will monitor the cyclone alerts and will make a preliminary choice of action in the event a cyclone is imminent. Their choice of action is to take the form of one of the following:
>
> - Anchor off Karumba in position (Lat. Long). This action to be undertaken if the cyclone is not intended to intensify and is expected to pass over (50 kms??) of the Port. Have both anchors down at maximum scope of cable and engines should be employed to ease the weight on the anchors. The vessel will remain on full alert at the anchorage during the duration of the cyclone.
>
> - Proceed to Weipa. This action to be undertaken if there is sufficient time to make the journey (nautical miles??, /hours). Permission must be obtained from the Port Authority of Weipa who will allocate a berth of an anchorage position.
>
> - Head for the open sea and remain in open waters until the cyclone has passed. This action is to be undertaken if either there is no time to steam to Weipa, or permission to enter Weipa has been declined because of the prevailing conditions at the Port at that time.
>
> The Master will have the final responsibility of choice of action taking into account prevailing weather conditions and any changes in forecast conditions that may occur. Choice of action will be relayed to the Port Authority and to the Operations Superintendent."

[279] The content of this document suggests that it remained, to some extent, a work in progress at the time of the incident. The first option of anchoring of Karumba "in position" did not supply a location for that position. It might be said, with justification, that the selection of an appropriate location to anchor should be a matter for the choice of the Master in the prevailing conditions, since it depends upon an assessment of tide, swell, sea and weather conditions. If that was so, then words to that effect might have been included. The reference "in position (Lat. Long)" was incomplete.

[280] The entry "(50 kms??)" might suggest some uncertainty about the selected distance, or it simply could indicate that the distance was necessarily an approximate one. An earlier draft of the procedure had selected a distance of 75 kms.

[281] The impression that the newly-introduced cyclone procedure was not in a final form is supported by the inclusion in the option of proceeding to Weipa "(nautical

miles??, /hours)". There is no reason why the number of nautical miles between Karumba and Weipa could not have been included. The number of hours, of course, is dependent upon the speed of the vessel. When asked about these matters, the Managing Director of Inco, Captain Dally, initially said it was "very difficult to be prescriptive", but acknowledged that that the "gaps" in relation to distance were to be further dealt with.[170] Otherwise, the plan was fully completed, and was said to be the product of a lot of work between Mr Campbell Smith and him.

[282] Leaving aside the form in which these options are written, matters of substance immediately arise. The option of anchoring off Karumba is to be undertaken "if the cyclone is not intended to intensify and is expected to pass over (50 kms??) of the Port". The unpredictable nature of cyclones in the Gulf is well-recognised. Evidence was given to the Inquiry by a number of witnesses, including an internationally-recognised expert, Mr Jeffrey Callaghan who has been employed by the Bureau of Meteorology since 1965 and has been the Head of Severe Weather Section since 1996. His evidence included the following general description of tropical cyclones in the Gulf:

> "5. Tropical cyclones in the Gulf of Carpentaria mainly form in the monsoon trough. The monsoon trough is an area where the NW monsoon winds meet the SE trade winds and these colliding air masses provide an area of convergence necessary for the formation of thunderstorms. To cause heating of the atmosphere which can lead to surface pressure falls, the thunderstorms should remain nearly vertically upright. To do this the wind speed and direction around the circulation must not change too dramatically with height. This places a severe limitation on the number of tropical cyclones which can form and only about 80 form globally each year.
>
> 6. Tropical cyclones in the Gulf are similar to other areas of the globe except that they can develop very fast. Warm waters aid the development of tropical cyclones and the water in the Gulf is very warm and mostly over 30 degrees Celsius in summer. Tropical cyclones in the Gulf rapidly can reach category 3 intensity or higher under the right conditions."[171]

[283] By reference to the cyclone tracks over an 81 year period from season 1924/1925 to 2004/2005, Mr Callaghan observed:

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170 Captain Dally; T.515

171 Exhibit 77; paras 5 and 6.

> "… the tracks of tropical cyclones in the Gulf have no favoured direction of movement and can move in any direction being steered by prevailing weather systems at the time of its formation"

[284] Mr Callaghan's expert opinion reflects the evidence of a number of other witnesses. The track of the low pressure system that became Tropical Cyclone Nelson itself demonstrates the unpredictable path of tropical cyclones in the Gulf.

[285] In those circumstances, the first option in the ship's SQS cyclone procedure comes with its obvious limitations. In some cases it may be possible to say that the cyclone "is not intended to intensify", for instance, if it is over land. But even that prediction can be falsified. The fact that a tropical low or cyclone has crossed over from water to land does not mean that it will not re-form and change track back to sea.

[286] Next, given the unpredictable direction of tropical cyclones, a cyclone that, at one stage, might be "expected to pass over (50 kms??)" of the Port of Karumba may take a different direction and head for the Port. In that event, a Master who has taken the option of anchoring off Karumba faces the difficult choice of either remaining at anchor or pursuing some other option. The other options are few and unattractive, especially if the cyclone intensifies to Category 3 or higher.

[287] Despite these obvious limitations on the option of anchoring off Karumba, in the absence of a suitable cyclone mooring in the Norman River or some other location, the option of anchoring off Karumba has certain attractions. Local experience, reflected in the evidence of Mr Hayward is that, although history tells us that Karumba is exposed to "a direct hit" from a cyclone, the geographical position of Karumba tends to work in favour of the town missing the full impact of tropical storms.[172] The option of anchoring off Karumba rather than heading for the open sea and remaining in open waters enables VHF ship to shore communications to remain intact during severe tropical revolving storms. In a worst case scenario, the ship and her crew are in reasonably close proximity to Karumba if a rescue is required.

[288] The procedure of anchoring off Karumba in a designated position was incorporated in an Interim Cyclone Contingency Plan for the ship that was produced by MSQ at the request of Inco after the incident. In essence, in the event of a "yellow alert" the ship was required to steam to a designated cyclone anchorage about three nautical

miles to the North-West of the Fairway Beacon, drop her anchor and run twelve shackles of cable.

[289] The March 2007 Interim Cyclone Contingency Plan was drafted by Mr Hayward, the Manager Remote Area Services (Karumba) of MSQ, in consultation with Captain Thomson, a former Master of the *Wunma* and current MSQ employee. It was drafted at the request of the Regional Harbour Master (Cairns), Captain Alan Boath following an approach to Captain Boath by Inco. But Captain Boath's request to Mr Hayward did not include the option of the ship remaining in the Norman River. Captain Boath requested Mr Hayward not to make any allowance in the draft Interim Cyclone Contingency Plan for the Norman River and requested that the Interim Plan be based on the safest option or options for operating in the Gulf from the Port of Karumba. Accordingly, the development of the Interim Plan did not consider the option of the ship remaining alongside the Zinifex wharf or other options for remaining in the Norman River.

[290] On 2 March 2007 Captain Boath sent an email to various persons in MSQ concerning the reinstatement of registration of the ship and noted that there were two major issues that needed to be addressed:

(a) the condition of the ship including its classification, load line and survey; and

(b) the operating parameters/procedures specifically relating to cyclone contingency planning.

He recorded in that email his understanding of the position of MSQ shortly after the *Wunma* was disabled:

> "1. The ship in a lightship condition is susceptible to dangerous pounding;
>
> 2. The ship in a loaded condition is susceptible to swamping;
>
> 3. The Zinifex decision not to continue to renew the Buoy Mooring Authority at Investigator Roads off Sweers Island, leaves no safe cyclone contingency arrangements for the vessel;
>
> 4. The only viable solution would be to make arrangements for a cyclone mooring in the Norman River."[173]

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172 Exhibit 74; para 33.

173 Exhibit 41; CB205.

[291] In his oral evidence to the Inquiry, Captain Boath confirmed that his first preference was for a mooring facility in the Norman River.[174] He explained that the Interim Plan to anchor off Karumba was "not much of a plan at all" but was the only effective plan that could be developed based on the facts of the incident in circumstances where MSQ had yet to be satisfied that the ship could proceed to sea in the event of a cyclone.[175] If the ship was able to go to sea, then Captain Boath's second preference after having a facility in the Norman River would be for the vessel to try to outrun the cyclone and head North, subject to the vessel being able to withstand that type of voyage. Captain Boath noted that such a course of action depends on timing issues and, amongst other things, "an effective water management plan".[176] The third option was to anchor outside the channel in sufficient water.[177]

[292] Under the SQS Cyclone Procedure that applied at the time of the incident, the second option to be considered by the Operations Superintendent and the Master was to proceed to Weipa. The limitations on that course of action include many of the factors that pose risks in the ship heading into cyclonic winds and high seas in open water. In addition, the option depends upon permission being obtained to enter Weipa. The same cyclonic conditions that may trigger the closure of the Port of Karumba under its Cyclone Contingency Plan may lead to the Port of Weipa being closed under its comparable Cyclone Contingency Plan, depending upon conditions. The weather system may head away from Weipa. However, there can be no assurance that the Port of Weipa will remain open during the period in excess of 30 hours that it would take for the ship to reach it from Karumba.

[293] The final option under the SQS Cyclone Procedure at the time of the incident was to "head for the open sea and remain in open waters until the cyclone has passed". It is well to recall Mr Campbell Smith's evidence to the Federal Court in November 1999 that the option of sending the ship to sea is not viable due to:

(a) the shallow waters in the Gulf and the substantial unsurveyed areas in the southern part of the Gulf;

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174 Captain Boath; T.733.
175 Captain Boath; T.732–T.733.
176 Captain Boath; T.733.
177 Captain Boath; T.734.

(b) the inherent risk, such as running aground or colliding with another vessel, associated with the vessel being subjected to cyclonic winds and high seas in open water".

[294] Reference has already been made to the geographic limitations and limited searoom in which any vessel has to undertake cyclone avoidance procedures in the southern parts of the Gulf. But more fundamental issues arise in the case of the *Wunma*, namely:

(a) whether the ship was designed to head into open waters during a cyclonic event, especially when in a loaded condition;

(b) whether the operation of its water management system made it safe to do so.

[295] As to the former, the evidence indicates that the ship was not designed to proceed to sea and remain in open waters in cyclonic conditions. In summary:

(a) the designer of the ship, Mr Ballantyne, gave evidence that the ship was not designed to proceed to sea and remain in open waters in cyclonic conditions;[178]

(b) the ship's conditions of class were limited to "Coastal Service within the Gulf of Carpentaria" meaning not more than 21 nautical miles from the coast;

(c) a cyclone mooring was intended as an essential part of the ship's operation;

(d) despite her stability in the event that her cargo hold filling with water and the Lloyd's Register review of her global and local strength in cyclonic conditions, no expert or anyone else contended that the ship would be seaworthy or safe in a condition in which large quantities of water entered and remained in her aft well deck and cargo hold;

(e) in fact, as Mr Bundschuh explained in his evidence:

> "In a full load condition if you have a water management system that relies on keeping water on board, you are then in serious danger of actually overloading the vessel. That is the context in which the water management system has to come into play to make sure that when operating in full load you are not going to keep on water that immerses the load line."[179]

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178 Exhibit 97; para 36. Mr Ballantyne; T.801; T.804; T.807.

179 Mr Bundschuh; T.767; T.770.

(f) at no time was a risk assessment undertaken which evaluated the risk that the ship's water management system would operate so as to result in large quantities of water remaining on board during a cyclonic event with the risk of the ship being immersed below the load line and becoming unseaworthy.

[296] As to the latter issue, given its importance, it is appropriate to separately consider the design and operation of the ship's water management system.

WUNMA BOARD OF INQUIRY

CHAPTER 6: THE SHIP'S WATER MANAGEMENT SYSTEM

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CHAPTER 6 THE SHIP'S WATER MANAGEMENT SYSTEM

6.1 INTRODUCTION

[1] The operation of the ship's water management system is central to the Board's Inquiry. The retention of large quantities of water on board the ship on 6 February 2007 contributed to the incident.

[2] This chapter will address the design of the ship's water management system, and the operation of that system in the years prior to 1 February 2007. It is appropriate to discuss the operation of the system in February 2007 as part of the narrative of events in Chapters 11 and 13.

[3] The following issues emerge in relation to the design of the ship's water management system and her operation prior to 1 February 2007:

1. The design intent was that the waste water system operate, in effect, as a "first flush" system, with waste water from rain run off from the canopy and deck waste water being collected in "dirty water tanks", following which deck drains would be directed to the sea.
2. The system did not in fact operate as a "first flush" system: rarely was water discharged to the sea during the ship's normal operations.
3. An issue exists about whether the water management system is capable of operating as a "first flush" system since:
    (a) side deck drains, especially drains on the port deck and below the C1 conveyor belt, are prone to being blocked with concentrate;
    (b) valves which might be operated to direct water in these drains overboard are prone to being blocked with concentrate, and they are below deck such that they cannot be quickly and easily serviced;
    (c) it is questionable whether the side deck drains (if clear of concentrate and with valves to sea being operational) are capable of collecting and discharging to sea the large volume of water that falls during a tropical storm onto the side decks through several large downpipes from the canopy;
    (d) a small drain from the sump in the aft well deck, if opened to the sea, will discharge "dirty water" and is not part of the "first flush" system.

4. The operators and owners of the ship seemingly were aware of the fact that the system did not operate as a "first flush" system, necessitating return of the ship to port when her "dirty water tanks" became full during voyages.

5. There is a significant difference between:

   (a) the collection and retention of rainwater during the ship's normal daily operations, whereupon the ship is *able to return to port*, and empty her dirty water tanks; and

   (b) the collection and retention of rainwater (and seawater) during a voyage in open seas in cyclonic conditions in circumstances where the ship is *unable to return to port*.

6. The operation of the ship's water management system during a lengthy voyage in cyclonic conditions, when tropical downpours might be expected, does not appear to have been adequately considered by parties who promoted or sanctioned the option of the ship heading for the open sea and remaining in open waters during cyclonic conditions.

[4] Different witnesses used different terms to describe certain features. For instance, some used the term "scuppers" whilst others used "deck drains" to describe the drains that are flush with the side decks and which, if operational, drain water from the deck to the sea. "Scupper" is defined[1] as "one of the drains set in decks to carry off accumulation of rain and sea water". The term "freeing port" is used to describe any opening in a vertical plate structure for the drainage of water, whether or not fitted with means of closure such as a shutter.

6.2 THE DESIGN INTENT

[5] Mr Stuart Ballantyne, a naval architect, was approached in or about January 1996 by Pasminco to design the transfer vessel. Mr Ballantyne is and was the Managing Director of a marine consulting, naval architecture and vessel survey business conducted by ADSMAR Pty Ltd that traded at the time under the name Sea Transport Solutions, and now trades under the name Sea Transport Corporation. He described the owner's design intent as follows:

> "22. One of the owner's design requirements included that there was to be no ore run-off from the vessel. To achieve that,

[1] De Kerchove R, *International Maritime Dictionary*, Van Nostrand, New York, Second Edition, 1961, p.693.

water tanks were included to collect the dust and then, once the tank filled up, the water was to trickle away. Once it does fill up, the water does spill over.

23. The dirty water tanks were of limited capacity. They were only intended to collect the dust that had settled on the vessel from either the load operation or the discharge operation. Once the dust had been collected, the idea was for the runoff from the shed in particular to be turned into the sea. Such runoff would be clean by that point in time. The design never envisaged that all water that fell on the vessel would be collected in the dirty water tanks; they simply did not have that sort of capacity and, in any event, there was no need to store clean water in them.

24. As such, during extreme weather conditions, all that was required was a five-minute or ten-minute flush and, thereafter the ship was designed to keep operating with the water flowing directly out. In other words, at the start of the operation you would leave the tanks open until it had rained sufficiently to collect all of the dust that had previously settled on her. At that point, you were meant to close the tanks. The idea was to collect the first couple minutes of rainfall because that is the part that would contain all of the dust. Then you would close it off so that the clean rainwater would discharge overboard. That was the intent of the design anyway."[2]

It is convenient to refer to this design intent as a "first flush" system, and that term was used by various witnesses during the Inquiry.

[6] The operation of the water management system was described as an aspect of PCML's Environmental Management in its submission to the "2000 Engineering Excellence Awards" of the Institution of Engineers Australia - Queensland Division:

> "**Water Collection:** Rain and wash down water is held in collection water tank and recycled to the port process plant."[3]

6.3 THE SYSTEM

[7] The *Dust Control Waste Water System*[4] collects and stores "dirty water", for instance water containing zinc or lead concentrate from the dust scrubbers located aft, cargo leachate or water from hold cleaning and wash down activities that may accumulate on the well deck. Water from the scrubbers is piped directly into the

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2 Statement of Stuart Ballantyne; Exhibit 97, paras 22-24.
3 Exhibit 49, CB47, p.50.
4 Exhibit 98; refer ASDMAR Drg No 4211-14/4A *Dust Control Waste Water System.*

"dirty water tanks". Other water drains to the well deck and drains aft when the vessel is trimmed by the stern. Scuppers on the aft decks also drain to the well deck. Water that enters the scuppers is piped directly into the "dirty water tanks", unless it is directed to sea through valves.

[8] Fitted into the well deck at the aft end, just forward of the stern ramp, is a small sump (0.45m^3) fitted with a removable metal grate.

[9] Water in this sump drains to a Washdown Water Transfer Tank[5] that has a volume of approximately 5m^3 located in the engine room. The contents of this tank can be pumped up into a larger Dirty Washdown Water Tank[6] that has a volume of approximately 20m^3 where the water can be stored until the vessel returns to port, where the contents can be pumped ashore for treatment or disposal.

[10] In an emergency, it should be possible to use the system that pumps out the dirty water tanks to shore to pump dirty water from the dirty water tanks to the sea. But it takes these pumps hours to empty the tanks. Therefore, this discharge system has a limited capacity to drain tanks which could fill in torrential rain in less than half an hour.

[11] It also is possible in an emergency to discharge water from the "dirty water tanks" through the ballast system into the sea.

[12] The "dirty water tanks" with an aggregate capacity of about 25m^3 are probably adequate to collect leachate from the cargo, or water from hold cleaning and wash down activities. But they do not have the capacity to also handle the run-off from the canopy fitted over the cargo hold and water from the aft deck scuppers that drains into the well deck.

[13] The catchment area of the canopy (83 metres long by 19.2 metres wide) is 1594m^2. An assumed rainfall of 125mm would result in approximately 200m^3 of run-off; about 8 times the aggregate capacity of the dirty water system tanks.

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5 Identified on the General Arrangement drawing as a "Wash-down water transfer tank" located beneath the well deck on the starboard side between frames 5 and 6.

6 Identified as a "Wash-down water tank" located beneath the well deck near the centreline between Frames 0 and 2.

[14] The canopy and associated arrangements were designed by WBM separately from the ship itself. Two WBM drawings[7] of the canopy show drains from the roof gutters serving the forward section of the canopy being connected to a long sloping 125mm diameter drains leading forward, while those from the aft section of the canopy are shown as being drained aft through a similar long sloped drain labelled as being connected to the dirty water storage tank. However, the "as built" arrangement is different with an external vertical pipe from each canopy gutter on the starboard side that terminates approximately 150mm above the side deck. Therefore all rainwater collected from the canopy roof on this side drops onto the side deck where it is prevented from flowing overboard by the 100mm upstand formed by the side shell plating of the vessel. Provided the rainfall is not great, the water will flow outboard, due to the deck camber, then along the deck to one of the four 50mm diameter scuppers positioned along the side of the vessel, then into a 100mm diameter collector pipe and be led aft to the small washdown water transfer tank in the engine room. Providing the ship is trimmed by stern, any excess water that does not escape overboard will flow to the stern and gravitate down to the well deck via the normal deck scuppers.

[15] The main difference between the arrangements on port and starboard sides is that on the port side the side deck is that on which the C1 conveyor is located within the space enclosed by the canopy, whereas on the starboard side the rain water spills onto the deck on the fore-and-aft walkway outboard of the canopy. On the port side the canopy side therefore presents an additional barrier to the overboard drainage of rain water.

[16] The low capacity of the four 50mm scuppers relative to the larger number of 100mm downpipes would tend to indicate that the scuppers system was not designed to take run-off from heavy rain.

[17] The capacity of the "dirty water tanks" to handle both waste water and the rainfall collected from the roof of the canopy is limited. It cannot be expected to handle the volume of rainwater that would collect on the canopy during cyclonic conditions and any seawater entering the openings in the transom bulkhead and around the stern

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[7] WBM Drg. No. CY-430-03026 *Canopy General Arrangement* & WBM Drg. No. CY-430-03035 *Canopy Miscellaneous Details.*

ramp. The water that would accumulate in the aft well deck would flow forward into the cargo hold.

[18] The ASDMAR drawing[8] shows that there is in the line from each side deck scupper a valve that can be opened to allow water on the side deck to be diverted overboard. Valves were fitted in conformity with this drawing. These valves are remotely operated gate valves provided with manual override in case of actuator failure. However, the evidence establishes that these scuppers, particularly on the port side where they are located inside the canopy, became blocked with concentrate and do not allow water on deck to flow either down into the "dirty water tanks" or overboard (assuming the valves are operational and opened to the sea).

[19] During periods of high rainfall, such as may occur during a cyclonic event, much of the rainwater from the starboard side of the canopy would, after spilling onto the open deck might be expected to pour over the upstand and overboard and that only a smaller amount would drain via the deck scuppers into the "dirty water tanks". [9] Some might escape overboard through the freeing ports at the stern of the upper deck.

[20] On the port side where the pipes from the canopy gutters empty onto the side deck inside the canopy some water would flow to the deck scuppers and, provided they are not blocked with concentrate, drain into the "dirty water tanks". On the port side an additional ten scuppers have been fitted along the length of the hold to allow dirty water from washing down this deck to drain into the cargo hold. Wooden plugs are used to block these ten scuppers when they are not required for washing down.

[21] In summary, water that enters side deck drains can be diverted overboard provided the drains are not blocked or the valves jammed by concentrate.

[22] The 100mm upstand is designed to prevent water mixed with or concentrate from spilling overboard.[10] This "lip arrangement" directs water that does not enter the side deck drains to deck drains/scuppers on the stern quarterdeck that flow through

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8 Exhibit 98; ASDMAR Drg. No. 4211-14/4A *Dust Control Waste Water System.*

9 Captain Thomson; T.25.

10 Captain Thomson; T.66; T.110-113.

to the well deck.[11] There are freeing ports on the stern quarterdeck that can be closed with a shutter.

[23] In short, drains on the foredeck or on the port and starboard side deck drain directly into the dirty water tanks.[12] Some water that is dumped onto the starboard deck might, if it was in sufficient quantities, go over the side or through freeing ports in the aft quarterdeck into the sea. But the design intent is for water that does not enter into deck drains to be kept on board where, depending upon the vessel's trim, it will drain through deck drains/ scuppers on the aft quarterdeck and into the well deck.

[24] By one means or other, unless deck drain valves are opened to the sea and are not blocked with concentrate, water that collects on the foredeck and port and starboard decks finds it way, either directly or indirectly into the dirty water tanks. Once these dirty water tanks are full, water "bubbles up" through the sump in the aft well deck and onto the well deck where, in the absence of freeing ports, it collects.

[25] A small drain from the sump leads directly overboard through a screw down non-return valve provided with remote actuation and manual override in case of actuator failure. Opening this valve would allow dirty water to directly flow overboard, however the size of this drain means it would not be able to quickly clear large quantities of water. The presence of concentrate in various parts of the ship, including the aft well deck, makes it unlikely that any water that is discharged through this drain will be clean. In practice, the small drain is unlikely to operate as part of the "first flush" system. In an emergency it might be opened to the sea. But its capacity to discharge large quantities of water is questionable, especially if the water contains a high level of concentrate.[13] The evidence supports the conclusion that even if free of concentrate this drain would not be able to quickly clear large quantities of water.[14]

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11 Captain Thomson; T.111.

12 Captain Thomson; T.111.

13 Captain Seal submitted a calculation in Exhibit 28 indicating that this drain, at 64mm nominal bore and under a head of 2.5m would (after verification of calculation) be able to drain 1200 m3 from the cargo and well decks in 888 minutes if it did not become blocked. Captain Thomson's evidence (T.31, ll6-20 and T.68, l30) indicated that the drain is of smaller diameter (for which a longer drainage time could be expected). The evidence variously described the pipe as being about 2.5 inches or 5 cm (Captain Seal; T.232) or 65mm (Mr McDonald; T.457).

14 Taylor Report, Exhibit 81, para 107

[26] The drain to sea could not operate as part of any "first flush" system. Any water going through it would not be clean. As Captain Thomson remarked:

> "Any water on the well deck is going to be highly contaminated. It doesn't matter if we had had gallons and gallons of water; because of the nature of the area down there it is very dirty. It is the dirtiest part in the ship and you are going to be just letting pure sludge go virtually …"[15]

[27] These concerns about permitting "highly contaminated" water to drain to sea through the sump drain might not apply in the event of an emergency when the drain might be opened to avoid water building up to an unacceptable level in the well deck. The potential for water to build up in the aft well deck during cyclonic conditions was realised during the incident when the absence of freeing ports in the aft well deck permitted water to build up to an unacceptable height. In the events that occurred, the sump drain was of no use because, unbeknownst to the Master and the Chief Engineer, it had been blocked from the outside. These aspects will be considered later in the course of describing the events in February 2007. For present purposes, the issue is that if the aft sump drain is operational, it has a limited capacity to discharge water to sea. That capacity is not enhanced by a pump. It depends upon gravity. Its capacity also depends on whether water or "sludge" (water mixed with a large amount of concentrate) is going through it. The aft sump drain lacks the capacity to discharge to sea more than a very small proportion of the water than is likely to accumulate on the aft well deck in a tropical downpour.

6.4 THE SYSTEM'S OPERATION IN PRACTICE

[28] The extent to which the water management system actually operated as a "first flush" system over the years was the subject of evidence. Practices appear to have varied between individual Masters and over time. Some Masters, like Captain Thomson, opened the deck drains when the water was "relatively clean". But this was the exception rather than the rule, and the practice of opening deck drains to sea caused discontent with some members of the crew.

[29] Other Masters adopted a different approach to opening the side deck drains. That approach is exemplified in the practice of Captain Seal who kept the deck drains closed because:

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15 Captain Thomson; T.79.

(a) the Zinifex pollution plan; and

(b) discharging concentrate would involve garbage disposal at sea under MARPOL Annex V unless the ship was in distress.[16]

As a result, prior to the incident there was no occasion when Captain Seal discharged dirty water over the side. The practice of not opening side deck drains was not confined to Captain Seal. It appears to have been a widespread practice in recent years. The practice adopted by Captain Thomson and others of opening the side deck drains when the water was "relatively clean" does not appear in any written operating procedure. The practice probably was not the subject of instruction to new Masters in recent years. In the end result, the water management system rarely operated as a "first flush" system.

[30] To better explain how the water management system operated prior to 1 February 2007 it is necessary to give an account of the evidence of a number of relevant witnesses.

[31] Captain Thomson's evidence was:

> In a tropical downpour I think it would take about 30 minutes to fill up its water tanks. Once the tanks are full the water goes up into the well deck, and then into the cargo hold because the swing doors are not watertight.[17]

[32] The possibility existed at sea to use the pumps that were used to discharge waste water from the "dirty water tanks" to the recycling plant onshore in order to pump dirty water directly overboard. But the circumstances to do so did not arise prior to 1 February 2007. In any case, this pump discharge system took about 12 hours to empty the dirty water tanks.[18] Captain Thomson explained:

> "I was never in extreme weather where I had to pump water directly overboard. We kept it on board and came back to port and discharged it at shore. But on occasions we had water up into the cargo hold by the time we had come back."[19]

[33] Captain Thomson described his practice of opening side deck drains if the ship was in a storm and the dirty water tanks were full:

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16 Captain Seal; T.156-157.
17 Exhibit 9, para 34.
18 Captain Thomson; T.69.
19 Exhibit 9, para 39.

> "When I was on board, it was standard procedure (so as not to accumulate excess water on board and thereby endanger the safety of the cargo and the ship) that if we were in a storm, once the deck was washed, and once the roof was washed and the 25 tonne tank was full (which meant we have had a fair quantity of water over the deck), I used to open the scuppers to sea. This action caused discontent with some members of the crew but you'd get about 80% of the water then going over the side into the sea and the other 20% would still go down in to the well deck and into the 5 tonne tank. The 80% going overboard I would class as reasonably clean. The scuppers were always closed before entering the entrance channel and never opened at all while the vessel was in the Norman River or Entrance channel. This procedure was not contained within the Wunma's SQS."[20]

The 80%:20% ratio given by Captain Thomson in that evidence is an area of contention, and in his oral evidence Captain Thomson accepted that the apportionment may be different.[21] It is impossible for Captain Thomson, for any other witness or for the Board to reach any precise figure for the percentage of water that would be able to go over the side if the side deck drains were open to the sea. There are significant issues concerning the capacity of scuppers to carry the large volume of water which may collect on side deck drains from the several downpipes that drop rainwater from the canopy onto the side decks.

[34] The present issue is the practice which Captain Thomson describes of opening side deck drains[22] to sea. This practice was not in the ship's SQS or any other written procedure. In his evidence the Managing Director of Inco expressed surprise at the existence of this practice.[23] The former Operations Manager of Inco also was not aware of the practice.[24]

[35] Captain Thomson's evidence does not suggest that the practice of opening side deck drains to sea was a frequent occurrence in the normal course of events:

> "40. In the years I was master, there were probably a number of times, but not that many, perhaps one or two per wet season on average, that the *MV Wunma* went out to load in rainy weather but had to come back to pump out. For instance, we might have gone out, got into a storm on the way out and had to turn around and come back because the water was up

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20 Exhibit 9, para 44.
21 Captain Thomson; T.69, T.89.
22 Referred to in many parts of the evidence as "scuppers".
23 Captain Dally; T.543.
24 Captain Ives; T.480.

to the base of the cargo. You cannot unload in that state due to the fact that when you get to the stage of having apx 1000 WMT of cargo left in the hold you go down by the head and, the water will run foreward into the cargo. (Down by the head is a position where the vessel is deeper in the water foreward than it is by the stern)

41. It is not that common to have this problem because if you know that storms are around, you try not to go out. But the problem happens when you commit yourself to go, you go to sea and you get caught in rain. If you get caught with most of the cargo you can trim the stern as much as you can, to keep the bow high and keep the water out of the cargo.

42. If it starts to rain the export ships close their hatches. So you would not aim to go out to the export ship in rain.

43. But if you are caught in rain, once the tanks are full, there is no way we can stop water coming into the well deck. …"[25]

[36] Captain Thomson gave oral evidence about his practice on occasions when the dirty water tanks were full in the event of storms:

> "If it happened at sea you – there is a couple of different scenarios there. It depended on the scenario. If it happened at sea and you could you just stored it in and came home and pumped it ashore. If you were close to finishing the discharge and I will use a figure of 1000 tonne, it may not be a 1000 tonne, it could have been a bit more or a bit less, and you could try to keep the vessel – keep it out of the cargo hold by opening the deck drains and putting them over the side you would do that."[26]

The objective of this practice was to stop water from running up into the cargo during the final stages of discharging operations. At that stage the ship will "go down by the head",[27] and water in the well deck might run up into it, meaning that the product could not be discharged. To avoid this Captain Thomson adopted the practice that he described of opening the valves.

[37] The valves to open the side deck drains to the sea were controlled by three control panels: one in the control room at the rear of the bridge, one in the engine room control room and one in the machinery control room, and they were linked together.[28]

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25 Exhibit 9, paras 40-43.
26 Captain Thomson; T.26.
27 Captain Thomson; T.26.
28 Captain Thomson; T.26-27; T.66.

[38] The control panels that could be used to direct water to the sea would not necessarily indicate whether the drains were operational. They would indicate whether the valves were open or closed.[29] The valve might be open but the adjacent pipe might be clogged, and whether it was or not required a physical check on the drains' operation.[30] But if the valve was not operating properly then the light on the control panel would flash yellow which would prompt a direction to one of the engineers to inspect it. Otherwise, the light would be red or green.[31] In short, the control panel would indicate whether or not the valves were open to the sea but it would not necessarily indicate whether the drains were working.

[39] Incidentally, on his inspection of the ship on 10 February 2007 after the incident Captain Thomson found the side deck drains were blocked full of concentrate. Only one deck drain on the portside and only one on the starboard side were operating. The deck drains around the bridge were open and working.[32] How and when the side deck drains became blocked will require further consideration in connection with events leading up to and after the incident. But during his inspection on 10 February 2007 Captain Thomson observed that the "mimic screen" that controls the side deck valves were directed to the dirty water tank, suggesting that there was no attempt to put any water to sea.[33]

[40] When Captain Thomson inspected the ship after the incident the valves were closed to sea and open to tanks and a couple of them were flashing yellow on the control panel meaning that they either had not opened or had not closed and that a problem existed.[34]

[41] Captain Thomson's evidence was that the practice he adopted during the time he was Master of opening side deck drains to the sea if the ship was in torrential rain arose because, in Captain Thomson's assessment, it would take between 20 minutes and a half an hour for both dirty water tanks to fill in torrential rain.[35] The practice of opening side deck drains in such a storm was based on the belief that the water

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29 Captain Thomson; T.67.
30 Captain Thomson; T.67.
31 Captain Thomson; T.67.
32 Captain Thomson; T.27.
33 Captain Thomson; T.30.
34 Captain Thomson; T.67.
35 Captain Thomson; T.53.

coming off the roof and the deck was "relatively clean".[36] This practice was worked out by the Masters in charge of the ship and the Operations Manager who first operated the vessel. The practice developed after they got caught a few times with a lot of water on board by keeping side drains closed and then having to come back to port to discharge dirty water. The procedure that they worked out allowed them to keep operating rather than having to return to port once the dirty water tanks were full.[37] The procedure did not find its way into any document.[38] Captain Thomson could not say that the practice was passed on to new Masters, including Masters he trained.[39]

[42] The practice adopted by Captain Thomson and other Masters was to discharge "relatively clean" water[40] in order to avoid cargo becoming wet, such that it could not be unloaded,[41] and, more generally, for the safe operation of the ship.[42] But his practice of discharging "relatively clean" water to sea caused discontent with some members of his crew who took a different view of how "relatively clean" the water was.[43] On the occasions when the deck drains were opened this would be entered in the logbook. This suggests, and Captain Thomson acknowledged, that the practice of opening deck drains to the sea was the exception rather than the rule. He explained:

> "… with the Zinifex's no spills policy, we tried to keep the deck drains closed. And it was only when let's say in storms and more severe storms that we did open them."[44]

[43] This evidence might be interpreted as suggesting that Captain Thomson and other Masters in effect, operated the system as a "first flush" system by opening deck drains during storms at about the time the dirty water tanks became full. Whether this practice accorded with the "first flush" system design intent is debateable. The presence of residue of concentrate on decks or in deck drains meant that, at best, the water being discharged was "relatively clean". It would be "relatively clean" if the

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36 Captain Thomson; T.53.
37 Captain Thomson; T.53.
38 Captain Thomson; T.54.
39 Captain Thomson; T.54.
40 Captain Thomson; T.53; T.70.
41 Captain Thomson; T.70.
42 Captain Thomson; T.70.
43 Captain Thomson; T.106-107.
44 Captain Thomson; T.107.

drains had been cleared of accumulated concentrate, either by a cleaning process or the flushing of the drains by large quantities of water in the event of a tropical downpour. The design intent may have been to discharge water which Captain Thomson and other Masters regarded as being "relatively clean". But the phrase "relatively clean" is one of indeterminate reference, and opinions might reasonably differ as to whether water was "relatively clean". Another view of the design intent would be that the water that Captain Thomson and others regarded as "relatively clean" would not be discharged to sea: only clean water was to be discharged to sea. Whether or not the practice described by Captain Thomson accorded with the design intent of the "first flush" system, neither the practice envisaged by the designer nor the practice adopted by Captain Thomson and other Masters was described in any written operating procedure.

[44] The evidence of a former Master of the ship, Captain Dunnett, served to highlight the need to maintain clear decks and drains in order to observe the practice described by Captain Thomson. Captain Dunnett described the practice with respect to "dirty water tanks" when he was on the *MV Wunma*, either as a Master or serving under another Master:

> "When I first started on the ship, when the new cyclone season was starting, Captain Thomson made sure that we always had clean decks as much as possible. So we either washed them off, hosed them off, but we kept them as clean as possible. Because you have a lot of showers going through, heavy showers, and tied up at the wharf was okay because you could discharge it once the tank was full, but once you were at sea you couldn't. What we would do because we knew the decks were clean and your first flush, they were then open to the sea.
>
> Can you just explain that in some greater detail, first flush?---First flush, because it had been raining, usually it had been raining, all the foredecks and that would be clean. The top of the canopy would be clean. Any water that had gone through and down to the aft well or to the first 5 tonne tank, the dirty water tank, would then be pumped in. If there is any more they just keep pumping until the aft well was free of water, and then the discharge pipes overboard were opened."[45]

The "discharge pipes overboard" to which Captain Dunnett refers were the side deck drains to enable water to be directed overboard. The "first flush" of run-off water from the canopy and the decks was collected or pumped into the dirty water tanks.

In other words, the "first flush" system was able to operate if the decks were clear of concentrate. This required the crew to ensure that concentrate, particularly on the port deck near the C1 conveyor belt was clear of material. If it was not, the water would not be clean. Sometimes the port deck drains would not be opened, but the starboard side would be.[46] If the deck drains were not opened, then the aft well deck could quickly collect water in a tropical downpour. Captain Dunnett described occasions when the ship was at the Zinifex wharf and "within 15 minutes the bobcat wheels would be under water on that aft well, it would come down so fast, so it would take four to six hours to pump it out".[47] He estimated that in a heavy downpour the aft well deck could have a metre and a half of water in it after 15 minutes.[48]

6.5 MAINTENANCE AND CLEANING

[45] Captain Dunnett gave evidence of side decks being hosed down on a regular basis.[49] But there were problems with hosing down the concentrate, at least if there were large quantities of it. When it dries it hardens into a different state. Sometimes air hoses were used to clean our scuppers. In about early 2006 "an eel" was acquired and kept on board the ship to help clean out scuppers.[50] The biggest problem area remained the portside deck inside the cargo space along the C1 conveyor. Another problem area was on the starboard deck "around the tower" (the discharge boom).[51] The practice was to use shovels and brooms to remove the bulk of the product from the deck and then "the light stuff would be washed down the drains".[52]

[46] Captain Dunnett said that the system that Captain Thomson had in place to keep the decks clean worked well and was not a particularly difficult system.[53] Captain Thomson's evidence was:

> "We would have to regularly check that the scuppers were not blocked. I cannot say how often it was done towards the end of my time on board. The crew would clean them out. It was up the crew to tell you when they were doing their wash down that you had a

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45 Captain Dunnett; T.336.
46 Captain Dunnett; T.336.
47 Captain Dunnett; T.336.
48 Captain Dunnett; T.337.
49 Captain Dunnett; T.336.
50 Captain Dunnett; T.337.
51 Captain Dunnett; T.337.
52 Captain Dunnett; T.337.
53 Captain Dunnett; T.342.

> blockage. The crew doing a wash down would know whether the scupper was working or not and they would normally let you know if there was a blockage."[54]

[47] Mr Richard McDonald, the Fleet Technical Manager for Inco, gave evidence concerning maintenance and cleaning. In general, the planned maintenance of the ship was based on a computer system with a proprietary name AMOS. Mr McDonald was unable to say how often scheduled maintenance of the deck drains was to occur, but he described the maintenance of deck drains as a continual problem area.[55] On visits to the ship he noticed that drains were blocked, with the port side being worse than the starboard side. When blockages were observed they would be reported and it would be left to the ship's personnel to take action to clear them. But that was difficult because it involved getting access to the void spaces. It was insufficient to check valves by reference to the control panel. Physically checking the operating valve required access to the void spaces and could not be done between cargoes because of the time that it takes to access the void spaces. It was an item of maintenance that Mr McDonald said could only be done when the ship was "laid up".[56] This would probably be only a few times per year. Even then, if it was addressed when the ship was laid up, it was more likely that the valve would become blocked again.

[48] Two related issues arise in this context. The first is the clearing of drains. The second is the testing, maintenance and rectification of valves. Mr McDonald explained:

> "They are essentially two separate things. But whilst it is necessary to gas prove (sic) [gas free ie fill with clean fresh air] the void space to do the valve, if the drainage system is flushed with water - air has proven previously to be ineffective totally and that was the original arrangement - if the piping system is washed out as soon as the piping system is clear in one area then the water takes the line of least resistance and the remaining part of the system is probably still blocked. So it is a bit inconclusive. The only effective way of doing it is to remove pipes which has been done on occasions to clear the pipes which requires not only access time to gas prove but also staging to get up to the pipes to remove them. It is not a simple straightforward exercise."

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54 Exhibit 9, para 46; see also T.69.
55 Mr McDonald; T.442.
56 Mr McDonald; T.443.

[49] The practice of attempting to wash concentrate off the deck was problematic. A large amount of water was required to clear the deck of concentrate on a return voyage. With hoses it could be washed clear but in doing so the concentrate would probably block the scuppers.[57] Mr McDonald acknowledged that the "eel" had been used mainly in the long angled drains to aft, rather than in the vertical scupper pipes.[58] The use of compressed air was ineffective.[59] Compressed air might clear the lines, but, as soon as the first opening was clear and there was no back pressure, the crew using the compressed air system can deem it to be clear although the lines remain largely blocked.[60]

[50] Mr McDonald did not raise these problems directly with Zinifex.[61] The upshot of his evidence was that the problem of deck drains being blocked was a matter of concern but that it was something "that we have to live with because it is the environmental requirement that controls it".[62] If the deck drains were blocked the water ended up in the aft well deck where there is a sump through which the water enters the "dirty water tanks". If the deck drains were unblocked, the water went there directly. According to Mr McDonald, whether the deck drains were working or not, the water ended up in the same location, namely the dirty water tanks, with the same result, provided the sump drain was not blocked.[63]

[51] If the deck drains were blocked, entry of the water into the "dirty water tanks" depended upon its entry through a "3 inch line" from the sump to the 5 cubic metre tank and then pumped to the larger tank,[64] rather than through the various, ie 50mm, lines from the deck scuppers.

[52] In any case, Inco learned to live with the system over the years even though this required the ship to return to port on a number of occasions when the dirty water tanks were full.[65] Mr McDonald said that he was not happy with the stormwater retention system, but that it had not been an issue prior to the incident in February 2007. Environmental issues controlled the procedures. Environmental concerns

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57 Mr McDonald; T.447.
58 Mr McDonald; T.457.
59 Mr McDonald; T.458.
60 Mr McDonald; T.458.
61 Mr McDonald; T.444.
62 Mr McDonald; T.446.
63 Mr McDonald; T.444.
64 Mr McDonald; T.445.

were evident in the fact that the dust enclosure was constructed with overlapping sheeting arranged so that the water would run down the inside, rather than down the outside.[66] The by-product was that more water entered the ship.

[53] Practices in relation to the maintenance and cleaning of the drainage system were described by Mr Tonkin. He commenced employment with Inco in February 2006 as a Maintenance Supervisor to manage and maintain the Material Handling Plant on shore at the Zinifex port facility and the Self Unloading System on the *MV Wunma*. His primary job was in relation to material handling. In May 2006 the former Operations Superintendent, Heath Daniel, left employment with Inco and Mr Tonkin performed the duties of Operations Superintendent as well as Maintenance Supervisor. He was appointed Operations Superintendent in July 2006 and remained in this position until February 2007.

[54] In the course of his employment, Mr Tonkin, came to understand the problems in the operation of the water collection system that he was informed about by members of crew. He deferred to their knowledge about what needed to be done and how they attempted to manage the problem of drains being blocked.[67]

[55] This process was constrained by the amount of time that the crew could spend either in the hold or along side the C1 conveyor. The presence of lead concentrate meant that the crew could not work in the hold at all. In the case of zinc concentrate, heat was given off and crew could only spend about an hour there.[68] Within these constraints the crew attempted to clear concentrate and this included using water that would flow into the cargo hold and into the tanks, which would be pumped out each day.[69] Cleaning work by crew also was constrained by the fact that they had unloading and discharge duties to perform.

[56] The fact that drains would become blocked was the subject of regular reports from the Chief Engineer and would also be mentioned at PASS meetings. An on-shore contractor would be engaged on occasions to clear drains that had become blocked.[70] The problem of blocked drains was one of those things that would "never go away

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65 Mr McDonald; T.446.
66 Mr McDonald; T.446.
67 Mr Tonkin; T.608-609.
68 Mr Tonkin; T.609.
69 Mr Tonkin; T.609.
70 Mr Tonkin; T.609-610.

while the vessel was handling the product it did".[71] Inco acquired a plumber's "eel" that could be used to run down various pipes and clear as much concentrate as possible. The Chief Engineer, the First Engineer and other crew were able to use it if they had the time.[72] But it came with its limitations and if there was a deadlock the pipe would need to cut out and a new pipe installed.[73] The task of installing new pipe could only be undertaken when the ship was laid up. Time was needed to enter the void spaces, and check the drainage system. Procedures to gas-free void spaces with fresh air before jobs could be done meant that these tasks could not be undertaken during the ship's routine operations. If there was a gap of at least 36 hours then the Chief Engineer would vent the tanks so that the work could be done.

[57] Mr Tonkin's evidence was that a report of a blocked drain would happen "every second day" and this would be the trigger to engage the local on-shore contractor or a plumber.[74] Maintenance and repair of gate valves, such as the gate valve in the sump drain in the aft well deck required the attention of a member of the engineering crew.[75] In general, Mr Tonkin thought that the "ship's husbandry" improved dramatically with blockages and similar problems beginning to disappear. The officers, including Captain Seal and Captain Richardson, and relieving Master Captain Dunnett were ship-proud and efforts to establish "a regular crew" meant that maintenance efforts became more routine.[76]

[58] Even with regular cleaning practices, there was a perception that concentrate would find its way into the side deck drains such that Masters were not prepared to "put water over the side".[77] Even if they were prepared to do so, valves had to be operational. If there were problems with the valves, fixing them was a major and time-consuming exercise. As Captain Seal explained:

> "… to fix them is an extremely large job. The sides, the void space hatches have to be removed. For the majority of them scaffolding has to be set up and men have to go in it and the ship has to be allowed

71 Mr Tonkin; T.610.
72 Mr Tonkin; T.611.
73 Mr Tonkin; T.610.
74 Mr Tonkin; T.611.
75 Mr Tonkin; T.612.
76 Mr Tonkin; T.612.
77 Captain Seal; T.236.

the time to be able to do that sort of job when it hasn't got other work as well."[78]

[59] Captain Seal could not say how often the valves to the deck drains to sea to sea were tested, since it was not his responsibility. Inco did not supply maintenance records of how often they were checked and serviced prior to the incident. As Captain Seal stated the product would find its way to the bottom of the pipe, and he did not consider that he was able to "flush" the zinc concentrate in it over the side.[79]

[60] In summary, any hope of having the ship's water management system operate according to its "first flush" design intent depended on decks, drains and valves remaining free of concentrate. This was likely to prove a difficult, if not impossible, task. It required practices and equipment to clear side deck drains of concentrate and to service and replace blocked valves so that they could, if activated, direct water to sea. Clearing decks and drains of concentrate depended on having crew with the time to do these tasks and the crew being directed to do so.[80] It also required them to have the equipment to clear drains of concentrate. The port side deck had to be cleared of concentrate by shovel and broom. The use of compressed air to clean deck drains came with its limitations. The use of high pressure water hoses on the return voyage to clean decks and drains carried the risk of some concentrate remaining in the deck drains, hardening and blocking valves.

[61] The creation of ten additional drains below the conveyor directed into the main cargo well to facilitate cleaning[81] was a recognition that the deck drains were inadequate to carry water into the dirty water tank. Inspection by the Board in July 2007 showed that the concentrate appeared prone to become caked in the drains that went into the cargo hold. This was Captain Dunnett's evidence. He said that with moisture sitting on top of them, "it would become like cement".[82]

[62] In circumstance where:

(a) side deck drains are prone to be blocked with concentrate, and there are questions about the utility of crew cleaning them; and

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78 Captain Seal; T.236.

79 Captain Seal; T. 236

80 Captain Thomson's evidence was that the crew would normally clear the port deck near the conveyor belt twice a day: for a couple of hours after the cargo was loaded and a couple of hours after its discharge: T.106.

81 Captain Thomson; T.106. These were installed in about 2004 when the ship docked in Singapore; Exhibit 114, para 5.12.1.

(b) the ship was being operated on the basis of a "no spills" policy under which the practice developed of not opening side deck drains to sea,

there may not have been much of an incentive to routinely and regularly unblock the drains. The attitude may have developed: if the deck drains are blocked and the water does not run down those dedicated drains directly into the dirty water tanks, then it will get there indirectly (via the drains in the stern deck, onto the aft well deck, through the sump and into the dirty water tanks). But the evidence indicates that prior to February 2007 the crew and, when required, outside contractors attempted to unblock deck drains. Use of a plumber's "eel" assisted their task. They were fighting a constant battle, and perhaps a lost cause. Large amounts of concentrate collected on the port deck beneath the conveyor. Quantities of concentrate collected in the aft well deck through ordinary activities, including the use of the bobcat. Some dust inevitably would be transported on the boots of crew to the starboard deck. Some dust would collect on the starboard deck during discharge.

[63] Even if port and starboard decks and the drains beneath them could be cleaned of concentrate, they would be unlikely to remain clear and clean for long. The inevitable accumulation of concentrate on these decks and in these drains meant that, at best, rainwater directed to sea through the side deck drains would be only "relatively clean". Whereas some Masters had been prepared to discharge "relatively clean" water to sea, the standard practice was for rainwater to be collected on the ship and, when the dirty water tanks were full, for the ship to return to port. This practice was informed by an appreciation of what was described in the evidence as a "no spills" policy.

[64] Rather than call for the design of a new water management system, the ship's operator decided to "live with" the system that it had. The operator, with the owner's knowledge, adopted the practice of having the ship return to port once its dirty water tanks were full. Rather than devise and implement a new water management system, the owner and the operator worked with a system that did not operate as a "first flush" system. The cost of having the ship return to port on occasions in a loaded condition with her dirty water tanks full was a cost to be borne.

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[82] Captain Dunnett; T. 342.

6.6 THE CAPACITY OF THE SYSTEM

[65] It is questionable whether the side deck drains (if clear of concentrate and with valves to sea being operational) are capable of collecting and discharging to sea the large volume of water that falls during a tropical storm onto the side decks through the several large downpipes from the canopy.

[66] The *Dust Control Waste Water System* that was designed by Sea Transport Solutions in 1997[83] was described in evidence as a "schematic".[84] It did not specify the detail of the piping arrangements.[85]

[67] As constructed, a large number of downpipes was constructed that deliver rainwater onto each side deck. The number of downpipes vastly exceed the number of scuppers on the side deck. More importantly, each downpipe downpipes that drops rainwater onto each side deck is a 4inch/100mm pipe, whereas the deck drains or scuppers on these side decks are 2 inch/50mm and there are only four of them on each side deck.

[68] These deck drains do not have the capacity to carry the volume of water that would be deposited onto the side deck drains in a tropical downpour.

6.7 AN ALTERNATIVE DESIGN FOR A "FIRST FLUSH" SYSTEM

[69] In his evidence, Mr Ballantyne acknowledged that a better system than the one constructed on the ship would be to divert the clean water overboard before it hits the deck.[86] The waste water system that was designed in September 1997 depicted valves below the side decks and that is how it came to be constructed.[87] Mr Ballantyne and his company were not involved in the construction of the vessel or in her management. Although they continued to be consulted on occasions in relation to certain matters, including the upgrade of the vessel's registration from Class 2C to Class 2B and the provision of load line and other certificates, his company's involvement with the construction and operation of the ship was limited. Mr Ballantyne said that his company's involvement basically finished after the tender was given to the builder. The owner had other consultants working on the project. ISM became involved in the project and was appointed manager. Mr Ballantyne's evidence was that prior to April 2007 when he attended a workshop arranged by Zinifex he understood that there were freeing ports in the stern well deck and that the water management system operated as a "first flush" system.[88]

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83 Exhibit 98.
84 Mr Ballantyne: T.823.
85 Mr Ballantyne;T.821.
86 Mr Ballantyne; T.793; T.824.
87 Mr Ballantyne; T.855; Exhibit 98.
88 Mr Ballantyne; T.792.

6.8 THE OPERATOR'S KNOWLEDGE THAT THE SYSTEM DID NOT OPERATE AS A "FIRST FLUSH" SYSTEM

[70] The manager of the ship, Inco (formerly ISM), was aware that the ship's water management system was not operated as a "first flush" system.

[71] It is appropriate to quote a lengthy passage of the evidence of its Managing Director, Captain Andrew Dally:

> "Now, do I understand from your answers to some of my questions earlier about the water collection system on the Wunma that you understood it was designed to collect all water and not be discharged in any circumstance into the ocean, save for an emergency?---The design of the vessel?
>
> Yes?---No, I think the design of the vessel was that those tanks would fill up and then any remaining water would go over the side at that point.
>
> As a first flush system?---I'm not sure I would call it first flush, but the vessel wasn't designed to hold an infinite amount of water. It was fill those two tanks up and then all water would go directly to sea as per a conventional vessel.
>
> So assuming the proper working operation of the valves to achieve that and assume that the drains, the scuppers, are clear to allow that to function in that way, did the Wunma in your experience and in your time - was it ever operated in that way?---Never.
>
> Is that solely because of the environmental concerns?---That's correct.
>
> Was that an edict from Zinifex?---Yes.
>
> Where is that edict?---I haven't confirmed it. One of the places it might be is the environmental management plan. Zinifex did the environmental management plan, we did the vessel side with the environmental management plan. I can't confirm it's in there, but I suppose why I know that that's the way we do - were to conduct the operation, after the vessel was built and arrived in Karumba we had meetings with Zinifex and it was quite clear to us - it was laid out how they wanted to operate their ships.
>
> These are meetings you were at?---Yes, these were in Karumba. When the ship first arrived in Karumba after being built in China I was up there maybe for three or four days before it arrived and some time after it did arrive.
>
> Yes?---And in that time we had meetings and some of those meetings may have just been myself from the Inco Ships side. We were informed they wanted to operate their ship. An incredible emphasis on safety and likewise the environment. And the outcome of that was that they didn't want one drop of contaminated water to go over the

side. That came up down the track as well, and eventually we said do you realise this means the vessel will have to turn around if those tanks fill up. And they said if that is what that means that's what we want you to do.

Who is "they"? Who is saying that?---There were several changes up there so I really can't state who it was. But it would have been the manager in the port site or their 2IC. The first meetings I had, which was with Gary Sutherland, and I can't remember his 2IC, sorry.

This is in late '99 or early 2000?---'99 I'd say?

THE CHAIRPERSON: Just to clarify, in 1999 it wasn't Zinifex?---Pasminco.

So that's just an easy point of reference to refer to the owner of the ship. Back in 1999 it was Pasminco Century Mine Limited or its parent company?---That's correct.

MR BURNS: Was that reinforced by different personnel from the camp of the owner over succeeding years?---Absolutely. The fact that the vessel - wouldn't say frequently but regularly returned because the drain tanks were full - and that cost them - you know, it cost money to turn the ship around. It cost the fuel, delays to the export vessel. Bring it in, discharge the waste water and then go back out. The fact that practice still continues if need be and it's never been raised as what are you doing, why don't you just let it go at sea, gave us comfort that that's what they wanted.

Because that particular procedure doesn't appear anywhere in writing?---Not that I can find, no, other than the environmental management plan, which I have not been able to find.

I would be surprised if you find language in there any stronger than an obligation to minimise the risk of environmental harm. And I don't suggest I've seen the document, but I would be surprised if it is any more stringent than that. The VOMA is not any more stringent than that?---No, it definitely wasn't raised in the VOMA.

The VOMA talks of an obligation on the part of Inco to minimise the risk of impact on the environment?---Yes.

That's in fact a Zinifex policy, which is Exhibit 36 in these proceedings, which contains an undertaking to minimise its impact on the natural environment. To do the best you can is the effect of that?---Yes.

So far as a procedure for the Wunma, you are not able to point to anything in writing on that?---No, I have never needed to look. It was very clear to us the way we were to conduct it. It was their ship and it was that policy, so I didn't have any reason to question it. That was our goal, to deliver what the client wanted provided it was safe.

> I don't know whether you were here last week, but were you surprised to hear Mr Thomson, his practice?---Yes.
>
> And Mr Dunnett?---Yes.
>
> That's not something that you endorse?---Absolutely not.
>
> It's not difficult, though, to imagine circumstances where a master would choose to turn any further runoff to the ocean when the well deck is full or getting full when there is water on the well deck?---I see it as a safety issue. So in the event they did that and they rang up and said this is what we need to do, in all likelihood I would have raised it with Zinifex but would have endorsed it on the grounds of safety. But that never took place."[89]

[72] Some significant points emerge from this passage of evidence. First is that Captain Dally understood that the ship never operated a "first flush" system because of environmental concerns by her owner. Her owner was prepared to have the ship return to port, once her dirty water tanks were full rather than direct water overboard. Captain Dally's evidence was, and there is no reason to disbelieve it, that he was surprised to hear of the practice adopted by Masters such as Captain Thomson and Captain Dunnett, and this practice was not something that he would have endorsed, unless discharging the water to sea was necessary as a matter of safety. The occasion to endorse that practice on the grounds of safety never arose.

[73] Captain Dally's evidence to the effect that the water management system was not operated according to the design intent as a "first flush" system was confirmed by other evidence. Captain Ives, the Operations Manager of Inco between 2006 and June 2007, gave evidence that he was not aware of any practice to turn drains to sea once the dirty water tanks were full, and understood that the practice was for the ship to return to port.[90] Mr Fisher, who became Chief Engineer in August 2006, gave evidence that the possibility that the system could be used after a "first flush" with the deck drain being directed to sea was never raised with him. He stated:

> "As far as I'm aware, there was always the possibility of some sort of contamination can happen, even after allowing for first flush."[91]

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89 Captain Dally; T.541-543.
90 Captain Ives; T.480.
91 Mr Fisher; T.313.

[74] He said this was the procedure and policy that was adopted and that had been adopted when he joined the ship in August 2006. This prompted the following question from Mr Derrington SC:

> "Why have valves directing deck drains to the sea if you are never going to use them?"[92]

That question lies at the heart of the matter.

[75] Mr Fisher's evidence was:

> "Possibly the original design of the ship was for this first flush arrangement but environmental policy dictated that that first flush never be used. That's my understanding of it anyway."[93]

6.9 SUMMARY: THE SYSTEM DID NOT OPERATE AS A FIRST FLUSH SYSTEM

[76] The extent to which the ship operated as a "first flush" system depended on the practice of individual Masters and, more generally, depended on whether decks and drains were clear of concentrate, either by virtue of the "first flush" effect of rainwater cleaning the canopy, decks and drains of concentrate, or the implementation and results of cleaning activities by the crew. The perception that decks and drains inevitably had accumulated or residual concentrate led to the widespread practice of not opening deck drains to sea lest water mixed with concentrate be discharged to sea in contravention of a "no spills" policy.

[77] Some Masters, including Captain Thomson and Captain Dunnett, adopted the practice of opening deck drains to sea if the water to be discharged was "relatively clear" and only when storms meant that the dirty water tanks had become full. Under that practice, opening deck drains to the sea was the exception, rather than the rule, and only occurred when the ship encountered rain from storms. Other Masters adopted the practice of never opening deck drains to the sea. In this respect, the design intent of the system operating as a "first flush" was never achieved. But if the design intent was that only clear water, and not what Captain Thomson described as "relatively clear" water, be discharged overboard, it is questionable whether the design intent was ever achieved.

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92 Mr Fisher; T.313.
93 Mr Fisher; T.314.

[78] The practice adopted by Captain Thomson and others of opening the side deck drains when the water was "relatively clean" was not contained in any written operating procedure. It probably was not the subject of instruction to new Masters in recent years. In the end result, the water management system did not operate as a "first flush" system. As Mr Fisher stated, "environmental policy dictated that the first flush never be used".

[79] In theory, the ship was supposed to operate so that rain washed down dust from the canopy cover and any concentrate that was on the decks, with the "dirty water" going into the dirty water tank, following which "clean water" was diverted into the sea. In practice, this was not possible because:

- The port deck below the conveyor belt was particularly prone to accumulate concentrate which depended for its removal upon crew shovelling and sweeping concentrate and generally cleaning the decks and drains of concentrate.
- The starboard deck tended to accumulate concentrate, although in smaller quantities than the port deck.
- The side deck drains and the valves which, if opened, would divert water to the sea, regularly became blocked.
- Procedures to unblock them if, undertaken, were unlikely to be successful for very long.
- Even if the side deck drains were free of concentrate, it is questionable whether they had the capacity to capture the large volume of water that might drop onto the deck through several, large downpipes, with the result that water that could not go directly down the drains was redirected to the aft well deck, which typically had concentrate on it.

[80] The problems with the "first flush" system not operating as intended and deck drains being blocked with concentrate were long-standing problems. It raises the question why Inco as the ship's manager and Zinifex as the ship's owner did not alter the system, for instance, by devising a drainage system so that water coming off the roof did not continue to collect on board but, after a certain time, was directed straight overboard before it hit the deck. A probable reason is that the ship was only required to suspend a planned discharge to an export vessel and return to port a few times a year. She would not normally travel to the export vessel in a storm when it

would be impossible to discharge her cargo. The cost of suspending a small number of voyages each year once the "dirty water tanks" were full did not lead to changes to the design or operation of the water management system.

6.10 THE OPERATION OF THE SYSTEM IN CYCLONIC CONDITIONS

[81] Strict adherence to the "no spill" policy and the practice of retaining "dirty water" on board in torrential rain leads to the retention of large quantities of water on the ship, and its accumulation in the aft well deck, and possibly also in the cargo hold, once her dirty water tanks are full. Whatever justification may have existed to not adopt the "first flush" procedure during the usual operations of the ship in her normal area of operation because the ship was able to return to port once her dirty water tanks became full, did not apply to the retention of torrential rain in open seas during cyclonic conditions, as occurred on the voyage on 5 and 6 February 2007.

[82] There is a significant difference between:

(a) the collection and retention of rainwater during the ship's normal daily operations, whereupon the ship is *able to return to port* and empty her dirty water tanks; and

(b) the collection and retention of rainwater (and seawater) during a voyage in open seas in cyclonic conditions in circumstances where the ship is *unable to return to port*.

[83] The operation of the ship's water management system should have been reviewed when consideration was being given to the proposal for the ship to voyage into open waters in order to avoid cyclones. The existence of blocked drains and valves on side decks and the limited capacity of those side drains to direct large volumes of rainwater to sea inevitably would lead to the accumulation of large quantities of water in the aft well deck once the dirty water tanks were full. They could be expected to be full after a relatively short period of torrential rain.

[84] Parties considering the option of allowing the ship to voyage into open seas in cyclone conditions should not have assumed that deck drains would be clear of concentrate, not be blocked with concentrate and able to discharge water to sea. The operational experience of the ship was that side deck drains and valves became blocked with concentrate and could not be opened to the sea. The ship's manager

and others considering the risks association with the ship going into open waters in cyclonic conditions, should have known that:

(a) the system did not operate as a "first flush" system during her normal operations;

(b) the side deck drains and valves were prone to becoming blocked with concentrate.

[85] If the system had operated as a "first flush" system then it would not have been necessary for the ship to return to port on a number of occasions each year once her dirty water tanks were full. This practice was known to Inco and Zinifex. Inco understood that this practice accorded with the owner's environmental policy. The ship's operators and owners knew that the system did not operate as a "first flush" system.

6.11 THE ABSENCE OF A PROPER RISK ASSESSMENT

[86] The operation of the ship's water management system during a lengthy voyage in cyclonic conditions, when tropical downpours might be expected, does not appear to have been adequately considered by parties who promoted or sanctioned the option of the ship heading for the open sea and remaining in open waters during cyclonic conditions.

[87] Captain Ives, who was the Operations Manager of Inco Ships between 2002 and June 2007 was not directly involved in discussions about the upgrade of the ship to a Class 2B to allow her to avoid cyclones. His evidence was that the strength of the vessel would be one of a number of factors that would need to be looked at considering a proposal to take the ship to sea in cyclonic conditions.[94] He agreed that the factors would include the ship's watertight integrity because the ship in some respects operates on occasions as a receptacle for water.[95] Captain Ives thought that those and other issues about the performance of the ship in cyclonic conditions were appropriate for the designer. Issues of stability and free surface effect were said to be questions for a designer. But when the ship's water management was not able to be operated "as designed" so as to direct clean water overboard, her safe operation in cyclonic conditions presented a safety issue for her

94 Captain Ives; T.501.
95 Captain Ives; T.501.

operator. The question of overloading should have been considered by her manager, Inco, which knew of the problems with her water management system.

[88] But even if, as Captain Ives and other witnesses indicated in their evidence, the ship had sufficient stability and buoyancy because her design permitted water to go back over the stern when it reached a certain height, that gave rise to environmental issues that required consideration.[96] The performance of the ship in cyclonic conditions required consideration including her configuration and the effect of winds on her large canopy. In a review[97] consideration would be required of whether the ship's powering was sufficient to make headway in a cyclone and the behaviour of the ship if she had to "heave to". Captain Ives was not asked to consider these matters in the proposal to allow the ship to voyage into open seas in cyclonic conditions was under consideration. Captain Dally undertook the review, and in doing so had dealings with the ship's designer.

[89] The Technical Manager of Inco ships, Mr McDonald, was working in Singapore on a specific project during this period and was not consulted in relation to the matter.

[90] Captain Dally, who assumed principal responsibility on behalf of Inco for the conduct of the review and upgrade, did not adequately consider issues resulting from the retention of water, particularly when the ship was in a loaded condition.

[91] No proper risk assessment was undertaken by a consultant to the owner and operator of the ability of the ship to effectively discharge water to sea during cyclones. Mr Ballantyne was consulted and his company facilitated the provision of the Lloyd's Register global and local strength assessments for the purpose of the granting of a Class 2B certificate by MSQ. However, Mr Ballantyne assumed that the water management system operated as a "first flush" system.

[92] Captain Cole, who in 2004 conducted a risk assessment on behalf of the EPA in relation to the option of using the cyclone mooring buoy at Investigator Road and the option of going to sea, assumed that the ability of the ship to effectively discharge water to sea during cyclones would be looked at by a classification society or MSQ in the granting of a certificate:

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96 Captain Ives; T.502.

97 Captain Ives T.501.

> "… Did you consider things such as the capacity or the ability of the vessel to effectively discharge water to sea during cyclones? --- No, I didn't, simply because I looked – I look upon that as being part of what is a class – or the MSQ would look at in the granting of either a 2C or a 2B certificate.
>
> I see. So things like sea keeping, the power of the vessel, those sorts of things, you have assumed ---?--- Yes, my assumption was that those things were in order on the basis that the vessel would have a current survey certificate."[98]

[93] Captain Cole's assumption may have been based upon his experience in other jurisdictions and an understanding of what happens in "the big ship industry" rather than a knowledge of the practices of MSQ.[99] In fact, in granting the Class 2B certificate, MSQ did not adequately consider the operational performance of the ship's water management system and its capacity to discharge water to sea during cyclones. The involvement of Lloyd's Register in the upgrade was to provide a global strength and local strength assessment. It did not undertake a general review of the ship's seaworthiness in cyclonic conditions. The certificate from Lloyd's Register continued to contain a notation for "Coastal Service in the Gulf of Carpentaria" meaning not in excess of 21 nautical miles from the shore.

[94] In the end result, the ship was granted a Class 2B certificate in September 2005, and her cyclone procedure was revised, to enable her to head into the open waters in the Gulf in cyclonic conditions without any proper analysis of the risk of the ship becoming, in effect, a receptacle for the large volume of rainwater that her water management system would collect during a long voyage in cyclonic conditions.

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98 Captain Cole; T.699.

99 This was Captain Watkinson's assumption: T.921.