ACCIDENT REPORT

Report on the investigation of

the man overboard from the dredger

Cherry Sand

resulting in one fatality

in the non-tidal basin at Port Babcock Rosyth,

Scotland on 28 February 2019

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 9/2020 MAY 2020

Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AB	-	Able-bodied seaman
ABP	-	Associated British Ports
Bitts	-	A pair of posts on the deck of a ship used for fastening mooring lines
Bulwark	-	The extension of a ship's sides above the level of the deck, which creates a solid barrier around the deck
CCTV	-	Closed-circuit television
CoC	-	Certificate of Competency
COSWP	-	Code of Safe Working Practices for Seafarers
Debris	-	Large items and materials gathered during the dredging process that cannot be redeposited within the non-tidal basin as they are not organic
DPA	-	Designated Person Ashore
HMS	-	Her Majesty's Ship
IMS	-	Integrated Management System
ISM	-	International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention 1998
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
Safe System of Work	-	An evolution that was included in UK Dredging's integrated management system, which provided instruction and guidance as to how a task is to be completed.
SIP	-	Safety in Port
STCW	-	The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, as amended
UKD	-	UK Dredging
VHF	-	Very High Frequency

TIMES: all times used in this report are UTC unless otherwise stated

SYNOPSIS

On 28 February 2019, the master of *Cherry Sand* was crushed between the dredger and the jetty after he fell while attempting to step ashore to assist berthing the vessel alongside 'M' Berth, Port Babcock Rosyth.

The master had climbed over *Cherry Sand*'s bulwark[1] and on to the rubbing band in readiness to step ashore as part of a self-mooring operation. The chief officer was still manoeuvring the dredger towards the berth when the master took a single step towards the quayside. *Cherry Sand* was too far away from its berth, with the result that the master's foot missed the quay, and his upper body struck the chains and quayside with force before he fell between the quay wall and the vessel. He was crushed by the moving dredger before slipping into the water.

The master was wearing a lifejacket and the ship's crew were able to recover him from the water in about 10 minutes. The master was declared life extinct on the quayside. The postmortem examination report recorded that the master had sustained extensive injuries consistent with crushing.

The MAIB investigation concluded that the system of work employed for self-mooring *Cherry Sand* was inherently hazardous, and that:

- Linesmen were not used, but no measures had been taken to avoid having to place a crew member ashore while the vessel was unmoored.

- The crew routinely employed the practice of stepping ashore/on board when the vessel was not tight alongside.

- The master misjudged the distance between the vessel and the berth and attempted to step across too early.

- UK Dredging's safety management system audits had not identified that *Cherry Sand*'s operational practices, and the general safety culture on board, were below the expected level.

Following the accident UK Dredging has stopped its crews stepping ashore to self-moor and has reviewed its procedures for mooring and toolbox talks. In addition, the vessel inspection guidance has been revised to provide greater focus on compliance with procedures.

A recommendation has been made to the Maritime and Coastguard Agency to amend the Code of Safe Working Practices for Seafarers to provide guidance on mooring and unmooring operations, and when it is permissible for vessels to self-moor. A recommendation has also been made to Associated British Ports aimed at ensuring a common approach to safety and the application of company procedures across the UK Dredging fleet.

[1] Bulwark - The extension of a ship's sides above the level of the deck, which creates a solid barrier around the deck.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *CHERRY SAND* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Cherry Sand*
Flag	United Kingdom
Classification society	Not applicable
IMO number/fishing numbers	6811059
Type	Grab hopper dredger
Registered owner	Associated British Ports plc
Manager(s)	UK Dredging
Construction	Steel
Year of build	1968
Length overall	62.84m
Registered length	59.44m
Gross tonnage	1081t
Minimum safe manning	6
Authorised cargo	Dredge soil

VOYAGE PARTICULARS	
Port of departure	Port Babcock Rosyth
Port of arrival	Port Babcock Rosyth
Type of voyage	Port area
Cargo information	Dredge soil
Manning	6

MARINE CASUALTY INFORMATION	
Date and time	28 February 2019
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	Port Babcock Rosyth
Place on board	Bow
Injuries/fatalities	1 fatality
Damage/environmental impact	None
Ship operation	Manoeuvring
Voyage segment	Arrival
External & internal environment	Good, Force 2 winds, rippled seas
Persons on board	7

Cherry Sand

1.2 BACKGROUND

At 1000 on Sunday 24 February 2019, Brian Smith joined the UK registered grab hopper dredger *Cherry Sand* at Port Babcock Rosyth as temporary master (hereafter referred to as 'master'). The dredger had arrived in the port the day before to complete a dredge campaign in the non-tidal basin, **(Figure 1)** in preparation for the arrival of the UK aircraft carrier Her Majesty's Ship (HMS) *Queen Elizabeth*. The master took over command of the vessel at 1200 following a handover from the permanent master and a new joiner induction conducted by the chief officer, who was also a temporary appointee.

Later that day, the UK Dredging (UKD) operations manager also joined *Cherry Sand*. The operations manager was a former master with UKD and, with two agency staff in senior positions on board, he was there to provide additional support, guidance and coaching.

Dredging commenced at 0800 the next day following a brief on the campaign, which included a representative from the port. Over the following few days the operations manager observed the master's handling and manoeuvring of *Cherry Sand*. He concluded that the master was struggling to control the dredger in the confines of the non-tidal basin, and decided to remain on board pending the arrival of the permanent chief officer. The permanent chief officer was due to arrive on Wednesday 27 February and had considerable experience manoeuvring *Cherry Sand*.

On the morning of 27 February, *Cherry Sand* dredged area T3 before returning to C berth **(Figure 1)** at 1006. The dredger then remained alongside until 1600. During this time, *Cherry Sand*'s 'B' watch crew joined the vessel at various times relieving all of 'A' watch, except for the master, who remained on board with the operations manager. After the crew change had been completed, *Cherry Sand* was moved to M berth **(Figure 1)** to discharge debris[2] ashore, before continuing to dredge in area T3 and returning to C berth for the night.

1.3 NARRATIVE

At 0700 on 28 February, the operations manager gathered all the crew for a safety briefing that covered a previous mooring incident with *Cherry Sand*'s 'A' watch crew. The operations manager explained the outcome of the subsequent disciplinary action and reminded the crew of the need to follow the Safe System of Work[3]. A logbook entry was made, as shown in **Figure 2**. The master was not present during the safety briefing.

Following the briefing, and before dredging could begin, the master, chief engineer and able-bodied seaman (AB)/cook proceeded to the main deck to complete the routine task of greasing the grab bucket. The operations manager and chief officer remained on the bridge and discussed the plan for the day. Before he left the vessel, the operations manager wanted to assess the chief officer to ensure that he was capable of manoeuvring *Cherry Sand* safely on to M berth in the tight confines of the non-tidal basin. Once the greasing of the grab bucket had been completed, the master returned to the bridge as the operations manager was explaining his plan to the chief officer. To facilitate the assessment, the master volunteered to take the chief officer's role of letting go and receiving the lines for mooring. The operations manager agreed that he could do so, and instructed the master not to 'hop ashore' during mooring operations.

By 0748, the master was on the quayside to release *Cherry Sand*'s mooring lines. After releasing the last line, and with the vessel starting to move slowly away from the berth, he stepped up on to the vessel's rubbing band and climbed over the bulwark on to the main deck. *Cherry Sand* departed C berth and headed towards dredge area T3 within the tidal basin. The plan for the day was to dredge areas T3 and T4. The operations manager remained on the bridge with the chief officer throughout the dredging operation.

Over the course of the day, *Cherry Sand* dredged areas T3 and T4, depositing the spoil at locations within the basin after each dredge. After the final deposit, the dredger headed towards M berth to land the debris. Before the master went to the forward station, the chief officer reminded him not to go outside the bulwark until instructed, and the operations manager subsequently made an entry in the deck logbook that a toolbox talk had been completed with the master **(Figure 3)**. The bridge team comprised the operations manager and chief officer. Both had a hand-held VHF radio in order to communicate with an AB and the master, who were sited on the port side of the main deck and were relaying distances to the berth back to the bridge team. On the bridge, the chief officer was at the port side manoeuvring

[2] Debris – large items and materials gathered during the dredging process that cannot be redeposited within the non-tidal basin as they are not organic.

[3] Safe System of Work – a prescribed evolution included in UKD's IMS, which provided instruction and guidance as to how a task was to be completed.

Image courtesy of Babcock

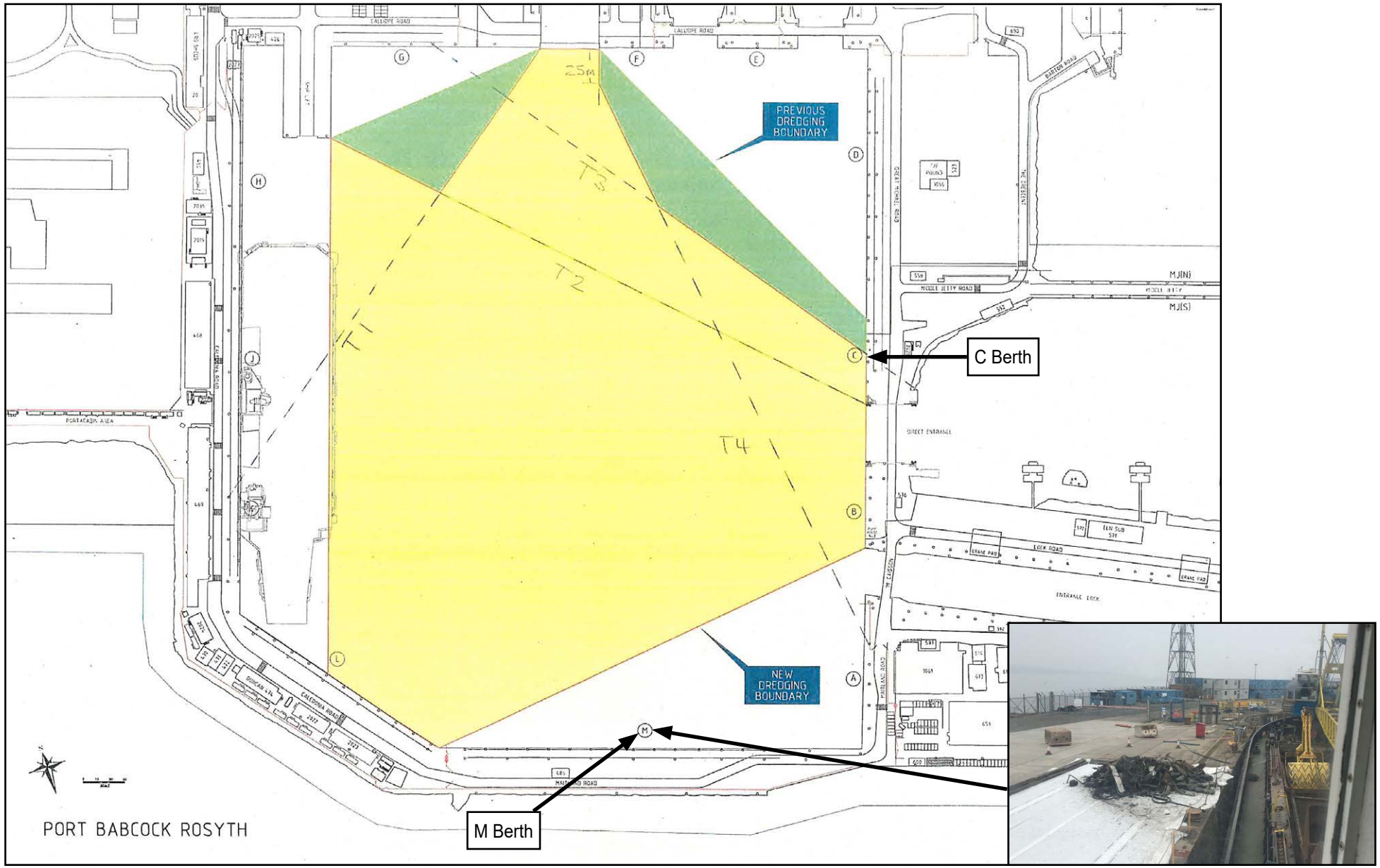
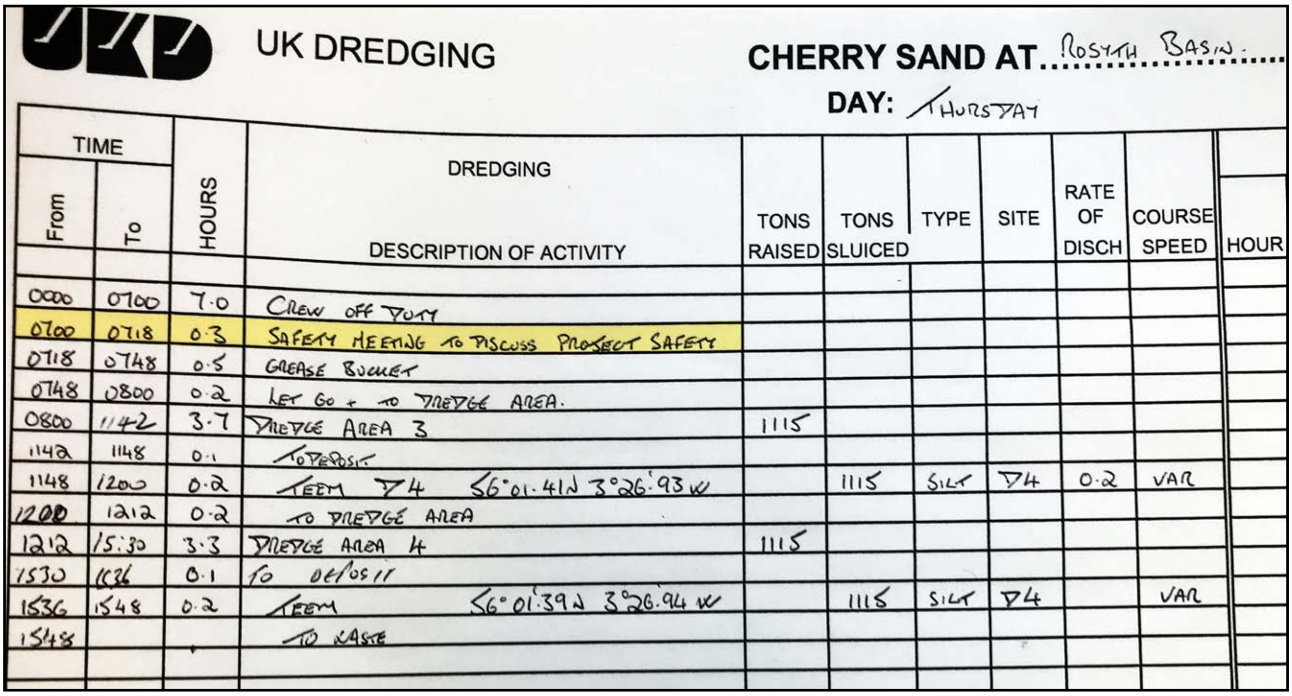


Figure 1: Plan of the non-tidal basin at Port Babcock Rosyth



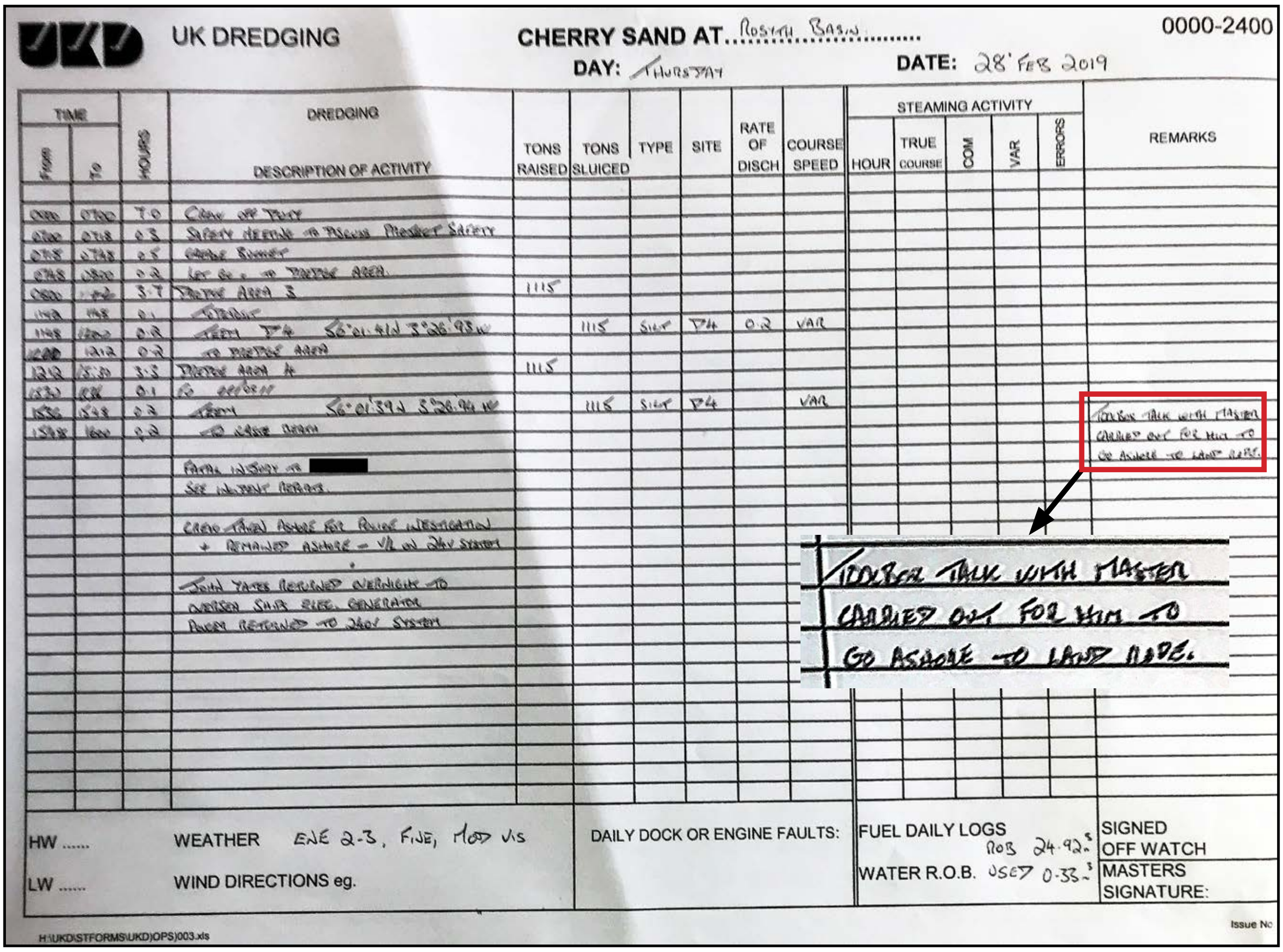
UK DREDGING

CHERRY SAND AT ROSYTH BASIN

DAY: THURSDAY

TIME From	TIME To	HOURS	DREDGING DESCRIPTION OF ACTIVITY	TONS RAISED	TONS SLUICED	TYPE	SITE	RATE OF DISCH	COURSE SPEED	HOUR
0000	0700	7.0	CREW OFF DUTY							
0700	0718	0.3	SAFETY MEETING TO DISCUSS PROJECT SAFETY							
0718	0748	0.5	GREASE BUCKET							
0748	0800	0.2	LET GO + TO DREDGE AREA.							
0800	1142	3.7	DREDGE AREA 3	1115						
1142	1148	0.1	TO DEPOSIT							
1148	1200	0.2	TEEM D4 56°01.41N 3°26.93W		1115	SILT	D4	0.2	VAR	
1200	1212	0.2	TO DREDGE AREA							
1212	15:30	3.3	DREDGE AREA 4	1115						
1530	1536	0.1	TO DEPOSIT							
1536	1548	0.2	TEEM 56°01.39N 3°26.94W		1115	SILT	D4		VAR	
1548			TO BASE							

Figure 2: Deck logbook entry at 0700 on 28 February 2019



UK DREDGING

CHERRY SAND AT ROSYTH BASIN

0000-2400

DAY: THURSDAY

DATE: 28' FEB 2019

TIME From	TIME To	HOURS	DREDGING DESCRIPTION OF ACTIVITY	TONS RAISED	TONS SLUICED	TYPE	SITE	RATE OF DISCH	COURSE SPEED	STEAMING ACTIVITY HOUR	TRUE COURSE	COM	VAR	ERRORS	REMARKS
0000	0700	7.0	CREW OFF DUTY												
0700	0718	0.3	SAFETY MEETING TO DISCUSS PROJECT SAFETY												
0718	0748	0.5	GREASE BUCKET												
0748	0800	0.2	LET GO + TO DREDGE AREA.												
0800	1142	3.7	DREDGE AREA 3	1115											
1142	1148	0.1	TO DEPOSIT												
1148	1200	0.2	TEEM D4 56°01.41N 3°26.93W		1115	SILT	D4	0.2	VAR						
1200	1212	0.2	TO DREDGE AREA												
1212	15:30	3.3	DREDGE AREA 4	1115											
1530	1536	0.1	TO DEPOSIT												
1536	1548	0.2	TEEM 56°01.39N 3°26.94W		1115	SILT	D4		VAR						TOOLBOX TALK WITH MASTER CARRIED OUT FOR HIM TO GO ASHORE TO LAND ROPE.
1548	1600	0.2	TO BASE BERTH												
			FATAL INJURY TO [redacted]												
			SEE INCIDENT REPORT.												
			CREW TAKEN ASHORE FOR POLICE INVESTIGATION												
			+ REMAINED ASHORE – V/L ON 24V SYSTEM												
			JOHN YATES RETURNED OVERNIGHT TO												
			OVERSEE SHIP ELEC. GENERATOR												
			POWER RETURNED TO 240V SYSTEM												

HW ...... WEATHER ENE 2-3, FINE, MOD VIS

LW ...... WIND DIRECTIONS eg.

DAILY DOCK OR ENGINE FAULTS:

FUEL DAILY LOGS ROB 24.92 ^{3}

WATER R.O.B. USED 0.33 ^{3}

SIGNED OFF WATCH

MASTERS SIGNATURE:

H:\UKD\STFORMS\UKD)OPS)003.xls

Issue No

TOOLBOX TALK WITH MASTER CARRIED OUT FOR HIM TO GO ASHORE TO LAND ROPE.

Figure 3: Deck logbook entry for master's toolbox talk on 28 February 2019

control station and the operations manager was outboard of him. At 1550.59, as recorded by the closed-circuit television (CCTV) on the berth, *Cherry Sand* was on its approach to M berth.

Shortly afterwards, at 1551.25, the master, who was stationed at the port shoulder with an AB, stood on the mooring bitts[4] **(Figure 4)** and looked towards the quay. After 7 seconds he stood back down. The chief officer had misjudged the approach, and at 1552 he brought the vessel to a stop in the water. The operations manager then took the con and started to give helm orders to the chief officer. Five seconds later the master briefly looked over the side, once again standing on the mooring bitts before stepping back down to the deck almost immediately. Using the VHF radio, the AB then reported to the bridge that the bow was 3 metres off the berth. The master was standing slightly forward of him but behind the mooring bitts on the port side. At 1552.08 *Cherry Sand* began to move astern as the chief officer realigned the vessel to make another approach. By 1552.30, *Cherry Sand* was again approaching the berth, and the master once again stood on the mooring bitts.

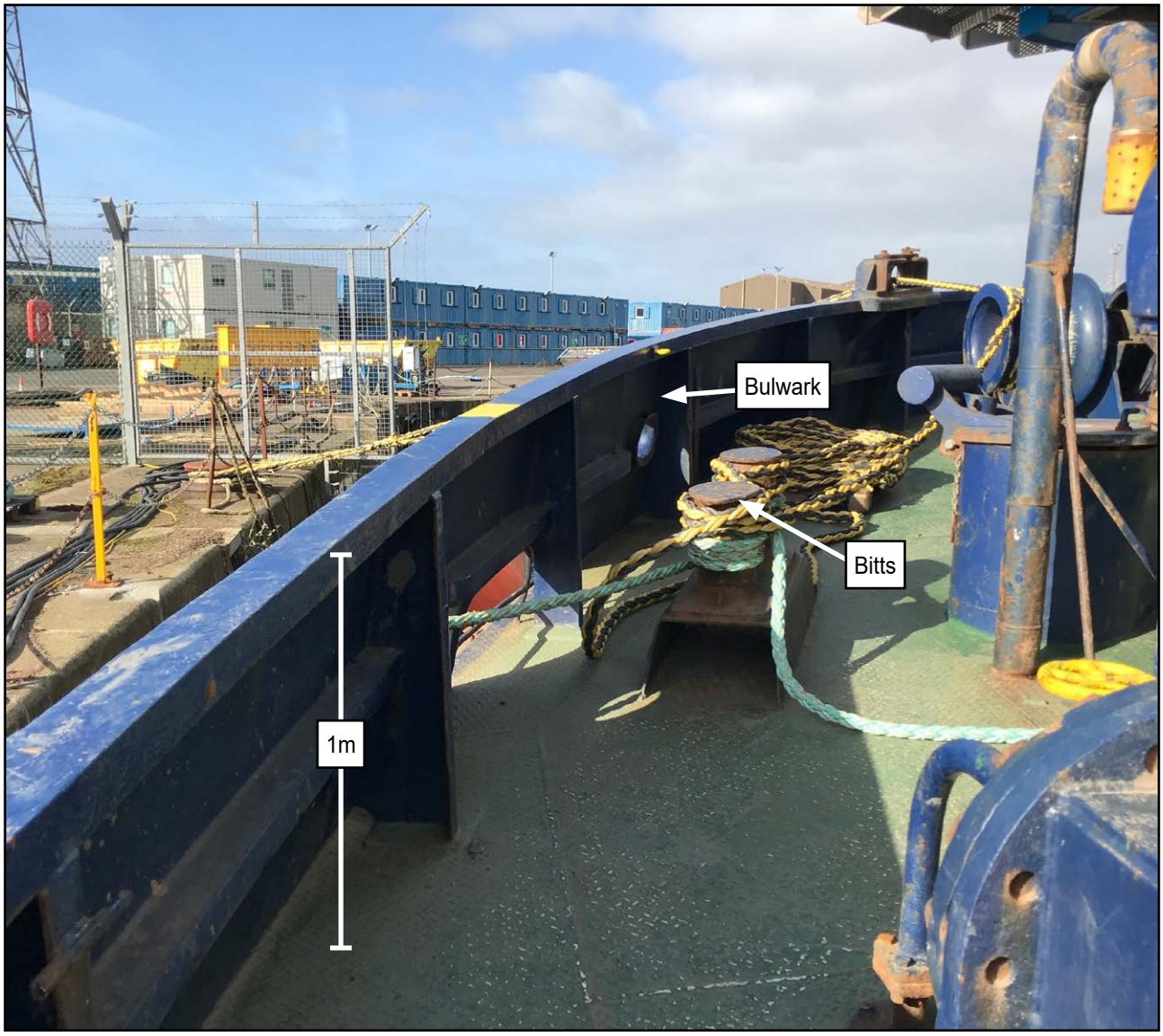


Figure 4: *Cherry Sand* fore deck bulwark and mooring bitts

[4] Bitts - A pair of posts on the deck of a ship used for fastening mooring lines.

At 1553.02, the master stepped down from the bitts. Twenty three seconds later he stepped up on to the bitts, and at 1553.34 he climbed over the bulwark to stand on the vessel's rubbing band **(Figure 5)**. He then stood with his back to the bulwark, facing the direction of travel, with his hands holding on to the bulwark.

Image from video courtesy of Babcock

Figure 5: Master's location at the break of the forecastle

The operations manager attempted to call the master back in board using the VHF. The AB also advised him that it was too early to step outboard, but the master assured him that he would wait until the vessel was alongside before stepping ashore. By that time *Cherry Sand* was closer to the quay and closing the berth at a slow but steady pace. At 1554.08, some 33 seconds after he had climbed on to the rubbing band, the master held on to the bulwark with his right hand and extended his left leg towards the quay. One second later, as the master moved towards the quay, he fell. The master's foot missed the quay, and his torso hit the chains and quay edge **(Figure 6)** before he bounced between the dredger and the quayside and disappeared from sight.

Figure 6: Quayside where the master was attempting to step ashore

1.4 THE EMERGENCY RESPONSE

With *Cherry Sand* still moving forward, the AB shouted urgently over the VHF for the bridge team to put the dredger's engine astern. The chief officer complied and then sounded the general alarm. *Cherry Sand* continued to swing to starboard as the AB threw a lifebuoy to the master, who by that time was in the water. The AB reported that the master's lifejacket had inflated; he also stated that the master appeared to be very badly injured.

Leaving the operations manager in control of the vessel, the chief officer and crew readied and launched *Cherry Sand*'s rescue boat within minutes of the accident. At the same time, the operations manager notified the port authority of the accident

and requested all available assistance. As the AB helmed the rescue boat towards the dredger's bow, the chief officer saw the port authority's rescue boat being launched and shouted to them to assist.

Cherry Sand's rescue boat reached the master first. He appeared unconscious, with extensive crush injuries. The AB checked for a pulse and, not finding one, the chief officer used his VHF radio to report to the operations manager that the master was deceased.

The port authority's rescue boat arrived on scene shortly afterwards and, as it had a low stern and bow ramp, this boat was used to recover the master and take him to M berth. The port medical team attended the master before the arrival of the ambulance crew, who declared life extinct.

1.5 ENVIRONMENTAL CONDITIONS

At the time of the accident, it was daylight, the weather conditions were good with a rippled sea state and force 2 winds.

1.6 PREVIOUS ACCIDENT

On 23 January 2019, *Cherry Sand*'s 'A' watch chief officer submitted an internal accident report to UKD about an accident that had occurred that day. The report stated that while the chief officer had been making his way forward he had fallen down some stairs, fracturing his left wrist. The report named 'A' watch's master as a witness to the accident.

In accordance with its integrated management system (IMS), UKD informed the MAIB of the accident and launched an internal investigation. The report of the investigation was being finalised when a whistle-blower came forward, claiming that the report of the accident was a fabrication. Further investigation by UKD revealed that the 67 year old chief officer had been injured as he attempted to cross from *Cherry Sand* to shore to receive the vessel's lines during a self-mooring operation. He had stepped on to a Yokohama fender from the unmoored vessel and had either tripped or fallen, landing heavily on his wrist.

UKD immediately suspended the master and chief officer involved pending the outcome of an internal investigation. UKD informed the MAIB that the initial accident report had been false when MAIB inspectors were on site investigating this accident.

1.7 *CHERRY SAND*

1.7.1 Vessel background

Cherry Sand was a grab hopper dredger managed and operated by UKD and owned by Associated British Ports (ABP). The vessel had been constructed by Appledore Shipbuilders, UK in 1968 and was the only vessel of its type in UKD's fleet. *Cherry Sand* was certified by the Maritime and Coastguard Agency (MCA) as a hopper/dredger.

Cherry Sand had a hopper capacity of 765m³. The hopper well was fitted with a grid to separate debris from spoil to be deposited at sea. Spoil was discharged by operating hydraulically controlled doors in the bottom of the hopper; debris was discharged ashore using the grab. A Pulleman grab crane was located on the

forepart of the main deck to enable the dredging of a wide scope of materials to a maximum depth of 21m. The crane could be used with either a 3m³ or 5m³ bucket for heavy or soft material respectively.

Cherry Sand had a 1 metre high solid steel bulwark **(Figure 7)**, which encircled the freeboard deck. There were openings for the running of mooring lines and to allow water to run off the deck. There were no bulwark gates or identified boarding station.

Figure 7: *Cherry Sand*'s bulwark

1.7.2 Bridge layout

Cherry Sand had a traditional bridge layout in keeping with a 50 year old vessel, though much of the original equipment had been supplemented by newer technology.

The ship's wheel was located on the centre line of the bridge. The main helm control for the autopilot was located on the forward bulkhead amidships. From this station all dredging and navigation tasks could be undertaken by the officer of the watch as all the necessary instrumentation and controls were easily visible and accessible. In addition to the central control station, there were control stations located on either side of the bridge with good visibility along the vessel's sides.

1.7.3 Propulsion and steering

Cherry Sand's propulsion comprised two Ruston Hornsby six cylinder diesel engines driving two fixed pitch propellers. Two synchronised rudders were fitted; there was no bow thruster. With the engines set to dead slow ahead, *Cherry Sand*'s expected speed was 2-3 knots. Astern power was 60% of the ahead power.

1.7.4 Rescue boat

Cherry Sand's lifesaving equipment included a rescue boat that was stowed aft of the accommodation **(Figure 8)**. The boat had its own davit and was capable of being launched quickly. The rescue boat was usually crewed by the chief officer and an AB.

Figure 8: Stowage position of rescue boat

1.8 MANNING

1.8.1 General

At the time of the accident, *Cherry Sand* was operating with a crew of six, as required by its safe manning certificate. Although the operations manager was also on board at the time of the accident, he was not part of the crew nor listed as a supernumerary on the crew list.

When engaged in dredging operations the crew worked a day work schedule that usually commenced at 0700. The day's work was typically completed by 1800, after which the crew were stood down. At sea, the bridge watch was split into four 6-hour watches with the master and chief officer alternating as watchkeeper.

Cherry Sand was normally manned by one of two permanent crews: 'A' and 'B'. These crews worked 2 weeks on board, followed by 2 weeks off. The majority of crew were permanent UKD employees, although agency staff were regularly used to fill manning gaps.

1.8.2 Operations manager

The operations manager was responsible for the day-to-day operation of the UKD fleet and line management of the company's masters. He had joined UKD in 2001 as a master serving on many of UKD's vessels, including *Cherry Sand*, and had joined UKD shore-based staff as a superintendent in 2011. The operations manager had held an STCW II/2 (Unlimited) Certificate of Competency (CoC), but this had expired in 2013. During his career at sea, the operations manager had served on tankers, passenger vessels and container vessels, and he had spent 6 years as a pilot, working in a large UK port.

1.8.3 Permanent master

The 'B' watch permanent master held an STCW II/2 CoC as master for vessels under 3000gt, unlimited area. He had joined UKD as master in June 2018.

1.8.4 Chief officer

The 'B' watch chief officer held an STCW II/2 CoC as chief officer for vessels under 5000gt, unlimited area. He had initially worked for UKD for a period of 5 weeks in 2010 before joining as a permanent crew member in 2014, and had worked on board *Cherry Sand* for 4 years.

The chief officer had previously worked in the towage and ferry sectors. He had previously served with Brian Smith in 2013 on board a tug for a repositioning passage from Ukraine to the Netherlands. The chief officer considered the master to be safety conscious and a cautious ship-handler in bad weather, and the two men had worked well together.

1.9 THE MASTER

The temporary master, Brian Smith, was 72 years old and held an STCW II/2 CoC as master for vessels less than 15000gt, unlimited area. This was his first contract with UKD and consequently his first time on board *Cherry Sand*.

The master operated his own company carrying out inspections and audits of small vessels. He occasionally supplemented his income with temporary contracts such as that on board *Cherry Sand*. He had been engaged by UKD for a short contract as master from 22 February 2019 to 2 March 2019, to cover the absence of the permanent master from 'B' watch, who had been required to attend a mandatory medical training course. The master's details and copies of his qualifications and ENG1[5] had been forwarded by the manning agency, Clyde Marine Recruitment Ltd, to UKD for review. This review led to him being engaged on *Cherry Sand* as master.

On the day of the accident the master was wearing a high visibility vest, safety helmet, overalls, safety boots, gloves and an automatic inflation lifejacket. The lifejacket had an integrated safety harness, a crotch strap, and it provided 275 newtons of buoyancy. In addition, the master was wearing jeans and a shirt, and was carrying a portable VHF radio, his spectacles and an empty contact lens case.

[5] Certificate of medical fitness for UK seafarers.

1.9.1 Master's fitness

The master was 185cm tall and weighed 98kg. He was described as a heavily built man who was active and enjoyed recreational walking when not at sea.

In 2018, the master had undergone surgery to rectify a detached retina in his right eye, and he had a cataract removed from his left eye around the same time. Following this surgery, the master was effectively monocular when not wearing a prosthetic lens in his right eye. Without this lens, the eye could only see blurred movement and lacked depth perception. In addition to the prosthetic lens, the master wore glasses to improve his overall vision.

The master had used a prosthetic lens for over 3 months prior to the accident, but had reported experiencing discomfort when wearing it. This discomfort was sufficiently severe for him to avoid wearing the lens until 10 days before joining *Cherry Sand*, when he had received a new prosthetic lens from his optician.

Guidance on the standards required for ENG1 and ML5[6] certification was provided by Merchant Shipping Notice 1886 (M+F) *Maritime Labour Convention, 2006 Work in Fishing Convention, 2007 (ILO No. 188), Medical Examination System: Appointment of Approved Doctors and Medical and Eyesight Standards* **(Annex A)**. This stated that the statutory standards for medical fitness allowed sufficient flexibility for the normal duties of each candidate to be considered. In practice, neither the ENG1 nor the ML5 assessment comprise any active fitness assessment involving physical exercise. A current seafarer reapplying for an ENG1 medical assessment was permitted to be monocular, providing they had enough time for their senses to adjust to the situation. No such allowance was made for new seafarers.

The master had been awarded his ENG1 certificate **(Figure 9)**, having attended a medical centre for assessment on 4 December 2018. He wore the prosthetic lens for this examination and his eyesight was checked with and without his spectacles.

1.9.2 Postmortem examination findings

The postmortem examination report stated that the master's death was the result of significant head, neck and chest injuries in keeping with crush injuries. Although the pathologist noted that there was evidence of heart disease, which might have led to sudden cardiac arrest at any time, this was not considered to have contributed to the master's death. The pathologist also noted that there was marked pupillary dilation of the right eye.

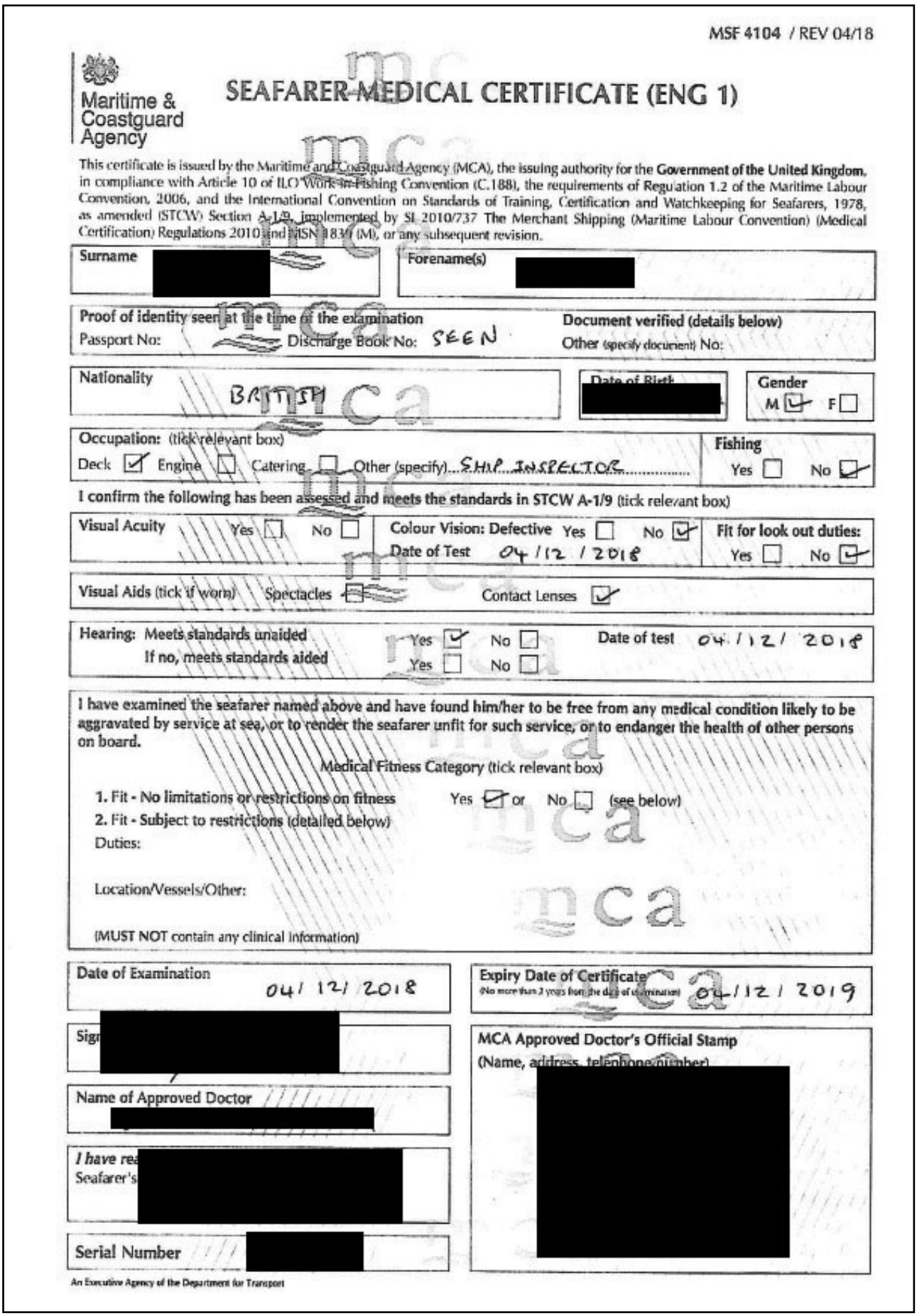
The toxicology report was negative for alcohol and drugs.

1.10 UK DREDGING

1.10.1 Structure

UKD was a UK registered company established in 1996 and was a division of ABP. UKD's fleet comprised six vessels: three trailing suction hopper dredgers, two support multicats and the grab hopper dredger, *Cherry Sand*. The UKD website stated that "*UKD is backed by the financial strength of ABP, the UK's largest and leading ports group, handling about a quarter of the country's seaborne trade*".

[6] The ML5 certificate follows the same criteria as the ENG1, but is for service on non-seagoing vessels.



MSF 4104 / REV 04/18

Maritime & Coastguard Agency

SEAFARER MEDICAL CERTIFICATE (ENG 1)

This certificate is issued by the Maritime and Coastguard Agency (MCA), the issuing authority for the **Government of the United Kingdom**, in compliance with Article 10 of ILO Work in Fishing Convention (C.188), the requirements of Regulation 1.2 of the Maritime Labour Convention, 2006, and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended (STCW) Section A-I/9, implemented by SI 2010/737 The Merchant Shipping (Maritime Labour Convention) (Medical Certification) Regulations 2010 and MSN 1837 (M), or any subsequent revision.

Surname [redacted] **Forename(s)** [redacted]

Proof of identity seen at the time of the examination — Passport No: ~~~ Discharge Book No: SEEN — **Document verified (details below)** Other (specify document) No:

Nationality BRITISH **Date of Birth** [redacted] **Gender** M ☑ F ☐

Occupation: (tick relevant box) Deck ☑ Engine ☐ Catering ☐ Other (specify) SHIP INSPECTOR — **Fishing** Yes ☐ No ☑

I confirm the following has been assessed and meets the standards in STCW A-1/9 (tick relevant box)

Visual Acuity Yes ☐ No ☐ — **Colour Vision: Defective** Yes ☐ No ☑ Date of Test 04/12/2018 — **Fit for look out duties:** Yes ☐ No ☑

Visual Aids (tick if worn) Spectacles ☐ Contact Lenses ☑

Hearing: Meets standards unaided Yes ☑ No ☐ — **If no, meets standards aided** Yes ☐ No ☐ — **Date of test** 04/12/2018

I have examined the seafarer named above and have found him/her to be free from any medical condition likely to be aggravated by service at sea, or to render the seafarer unfit for such service, or to endanger the health of other persons on board.

Medical Fitness Category (tick relevant box)

1. Fit - No limitations or restrictions on fitness — Yes ☑ or No ☐ (see below)
2. Fit - Subject to restrictions (detailed below)

Duties:

Location/Vessels/Other:

(MUST NOT contain any clinical information)

Date of Examination 04/12/2018 — **Expiry Date of Certificate** (No more than 2 years from the date of examination) 04/12/2019

Sign [redacted]

Name of Approved Doctor [redacted]

I have rea [redacted]
Seafarer's

Serial Number [redacted]

MCA Approved Doctor's Official Stamp
(Name, address, telephone number) [redacted]

An Executive Agency of the Department for Transport

Figure 9: Master's ENG1 certificate

1.10.2 Quality and safety compliance

UKD's IMS complied with the requirements of the International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code). A document of compliance was issued by the MCA on 21 June 2016.

The most recent ISM Code audit was completed by the MCA while *Cherry Sand* was in Hull on 20 October 2016. An observation made during the audit was that the document control and record keeping on board was "*found to be inconsistent*".

1.10.3 Internal investigation

In accordance with ABP's accident and incident recording and investigation procedures, this accident was designated as a level 5 major accident requiring a full internal investigation to be completed by ABP at group level.

ABP's internal investigation report included the following findings:

- The immediate cause of the accident was that *Cherry Sand*'s master made three critical deviations from the prescribed Safe System of Work. These were:
    - The master had climbed outboard of the bulwark without permission from the bridge
    - The master had climbed over the bulwark before the vessel was tight alongside
    - The master was in a position on the rubbing band that was "*forward of the best optimal position and therefore was not level with the quay edge*".
- Linesmen had not been made available, resulting in the requirement to step ashore.
- There was no positive record to confirm that the risk assessment and Safe System of Work had been fully understood by all crew.
- The generic mooring risk assessment and Safe System of Work had not been reviewed within a 12-month period.
- There was no specific risk assessment for mooring practices at Port Babcock Rosyth.

The internal investigation report also noted the following:

- The Safe System of Work provided three options for mooring.
- The CCTV provided by Port Babcock Rosyth showed that the self-mooring practices prior to this accident had been completed in accordance with the Safe System of Work, specifically that there was "*nothing to suggest that the crewman making this step had to step up or down any significant amount when carrying out the step ashore*."

1.11 VESSEL SAFETY MANAGEMENT, RISK ASSESSMENTS AND AUDITS

1.11.1 General

The ISM Code, Section 7, Shipboard Operations states:

> *The Company should establish procedures, plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel.*

UKD was responsible for safety management and compliance with the ISM Code within the company and on board its managed vessels. The safety and compliance manager held the role of Designated Person Ashore (DPA) for ISM purposes.

The UKD IMS was computer-based, and crew could access electronic copies on the bridge and in the chief engineer's office. The IMS was separated into six sections:

1. Policy documents
2. Management system manual
3. Fleet procedures manual
4. Emergency response manual
5. Management local process
6. ISM forms database

The IMS fleet procedures (operational procedures) in Section 3 consisted of a task-based risk assessment that was supplemented by a Safe System of Work procedure.

1.11.2 UKD risk assessment

Section 3.1.5 of UKD's IMS fleet procedures (operational procedures) stated the procedures to be followed when mooring, unmooring and anchoring. It included the following:

> *The Master is responsible for ensuring that an adequate number of crew is made available in order to accomplish the task safely. Crew are to be trained in mooring operations as demonstrated by an AB's certificate, an efficient deck hand certificate or having followed an on-board training programme detailed on form UKD/ISM/022. The Master should ensure that all persons involved with the mooring operation are familiar with the operation of mooring equipment on that ship and has had a tool box talk within the last 12 months. All persons taking part in the mooring task are to wear hard hat, safety footwear, safety eyewear, and waterproof safety gloves. Where there is a need for a crew member to step ashore before a safe access has been provided, s/he shall also wear a lifejacket and high vis PPE.* [sic]

Section 3.1.6 specifically covered embarking/disembarking and safe access. It stated:

> *Due to the nature of vessels' operation, it may be necessary to embark or disembark whilst the vessel is in a lock or alongside when unmoored. This practice is acceptable as long as mooring the vessel is not impracticable or unsafe in the circumstances and all safety precautions have been carried out in accordance with the risk assessment and safe system of work.*
>
> *Embarking and disembarking when vessel not moored (UKD/002) Risk Assessment and safe system of work,* **Annex B**.

UKD/002 was last assessed by UKD's DPA on 30 April 2018 and was due for review on 29 April 2019. Identified risks included falling from a vessel into the water and jumping from height on to a quay. The control measures listed were to leave the "gate" closed until the vessel was alongside; the master/officer of the watch to approve the transfer; ensure minimal height difference; and ballast to achieve a safe height.

1.11.3 Shipboard risk assessment

In addition to the UKD risk assessments and safe systems of work drawn up by the DPA, UKD required ships' staff to produce their own local risk assessments and safe systems of work following the same format as UKD but specific to each vessel. These risk assessments were generated by the master, who was also responsible for reviewing them at intervals not greater than 12 months. On board *Cherry Sand*, Safe System of Work No.5 **(Annex C)** contained the general instructions for mooring and included the following instructions:

> *7. Linesmen should be used when possible*
>
> *13. When stepping ashore from the vessel to the quay the crewmember should wait until the vessel is tight alongside and step from a position as close to the height of the quay as is possible when given permission from the Bridge, and always have another crewmember in attendance to see him safely ashore. Do not climb over the coaming, or stand on the rubbing band, while the vessel is away from the quay.*[7]

Safe System of Work No.5 had last been reviewed on 31 July 2017.

1.11.4 Toolbox talks

Section 3.2.6 of the IMS included the following instruction on the completion of toolbox talks:

> *When carrying out a tool box talk, it is important to actively involve those carrying out the work and others that may be at risk, such as sub-contractors affected by the work. Full and active participation should be encouraged and any questions or concerns should be taken into consideration. Once finished, each person should confirm they fully understand the job and the precautions put in place to ensure everyones safety. This should then be recorded on the form,* **(Figure 10)***, and retained for reference.* [sic]

[7] UKD emphasis to indicate latest update.

A tool box talk should be carried out before undertaking a task for the first time and at intervals not exceeding 12 months. [sic]

At the time of this accident, the most recent toolbox talk form was dated 8 February 2019. This had been completed by 'B' watch for the fitting of grab closing wires.

Courtesy of UK Dredging

HEALTH & SAFETY AT SEA

BEYOND ZERO

UKD/ISM/009
May 2017

Toolbox Talk (TBT)

Job being done:		
Date:		Time:

What did the Toolbox Talk (TBT) cover? *(indicate below)*

☐	TBT covered particulars from a SSOW Ref: _____ Details spoken about:	
☐	TBT covered Observed Working Practices Details spoken about:	
☐	TBT Covered details from a Safety Code, SC No. _____ Details spoken about:	
☐	TBT covered details about an Accident/Near Miss Details spoken about:	
☐	TBT covered details about a Safety/Alert Notice Details spoken about:	
☐	TBT covered details about a Procedure/Policy Details spoken about:	
☐	TBT gave a General Safety Update Details spoken about:	

Questions asked and responses given

Staff present at the TBT

Name:	Signature:	Name:	Signature:

Toolbox Talk was given by:			
Signature:		Job title:	

TBT continuation sheet used: ☐

Figure 10: Blank UK Dredging tool box talk record form

1.11.5 Safety management audits

The last internal ISM audit had been completed on 13 February 2019 by the safety and compliance manager/DPA, when *Cherry Sand* was in Hull. Three observations were noted and six non-conformities raised, and it was noted that several risk assessments had passed their review dates.

Following the accident investigated in this report, the MCA carried out an inspection of *Cherry Sand* on 11 April 2019 after an incident that resulted in water ingress into a void space. This inspection resulted in 13 deficiencies being noted by the attending surveyor. These included the lack of passage plan or plotted positions for the previous voyage, the most recent compass error check had been made in April 2016 and several certification and paperwork errors. The surveyor made the following comment:

> *Number and nature of many above deficiencies suggest lack of full implementation of SMS on board.*

At the time of this accident, ABP had not completed any internal audits of UKD operations.

1.12 PORT BABCOCK ROSYTH

1.12.1 Background

Formerly a Royal Navy Dockyard, the independent dockyard of Rosyth was purchased by Babcock International Ltd (Babcock) in 1997. Babcock was involved in the defence, energy, telecommunications, transport and education sectors within the UK.

Like many Royal Navy dockyards, the quayside at the non-tidal basin in Port Babcock Rosyth was equipped with chain barriers to prevent personnel from falling into the dock **(Figure 6)**. The chains could be removed to allow access to mooring bitts or to facilitate the rigging of a gangway. The chains at M berth had not been removed at the time of the accident.

1.12.2 Dredging of the non-tidal basin

In 2016, Babcock identified that the non-tidal basin at Rosyth needed to be levelled to the charted depth of 6.1m to enable the aircraft carrier, HMS *Queen Elizabeth*, to depart the port on completion of its construction. Following invitations to tender to several dredging operators, UKD was awarded the contract. *Cherry Sand* was one of the vessels used to complete the operation. UKD subsequently became established as Port Babcock Rosyth's preferred contractor for dredging operations. During the dredging campaign, linesmen were not used for mooring *Cherry Sand* and the chains on the berths were not removed to facilitate berthing operations.

In February 2019, Port Babcock Rosyth was awarded the contract to dry dock HMS *Queen Elizabeth*. In order to facilitate berthing the vessel in the dock, the non-tidal basin's bed required re-levelling to 6.1m. Accordingly, Babcock and UKD entered into discussions regarding the project schedule and *Cherry Sand*'s availability. It was agreed that linesmen would be made available for *Cherry Sand*'s initial arrival

at C berth. However, once *Cherry Sand* was operational all mooring operations would be completed by ship's crew, as arranging linesmen was considered to be too troublesome in the event that port workers were not on site.

1.12.3 Closed-circuit television

Port Babcock Rosyth had several CCTV cameras as part of its safety and security system.

The MAIB reviewed the CCTV footage of the 14 mooring operations completed by *Cherry Sand* at Port Babcock Rosyth prior to the accident. The observations made regarding the ten notable mooring operations are at **Table 1**.

Date	Berth	Operation	Observation
23/2/2019	Middle jetty	Berthing	Vessel is moving forward as one person crosses gap from ship to ladder
25/2/2019	C berth	Berthing	Bow on only, vessel not tight alongside one person steps off
25/2/2019	C berth	Unberthing	Bow on only, vessel moving, one person steps across to board
26/02/2019	C berth	Unberthing	Vessel moving off as one person steps across gap
26/2/2019	C berth	Berthing	Person steps across before bow fully on, vessel not tight alongside
26/2/2019	M berth	Berthing	Vessel not tight alongside, one person steps across from same position on fendering that temporary master used
27/2/2019	C berth	Berthing	Bow on only, vessel not tight alongside one person steps off
27/2/2019	C berth	Unberthing	Bow on only, vessel moving, one person steps across to board
27/2/2019	M berth	Berthing	Vessel not tight alongside, one person climbs up on to quay
28/2/2019	C berth	Unberthing	Vessel moving off as one person steps across

Table 1: MAIB observations on closed-circuit television footage of notable mooring operations by *Cherry Sand* at Port Babcock Rosyth

1.13 REGULATION AND GUIDANCE

1.13.1 The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997[8]

The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 required that a safe working environment was maintained on board vessels. Regulation 5 required "*the adoption of work patterns and procedures that take account of the capacity of the individual, especially in respect of the design of the workplace and the choice of work equipment, with a view in particular to alleviating monotonous work and to reducing any consequent adverse effect on workers' health and safety.*"

1.13.2 Merchant Shipping and Fishing Vessels (Health and Safety at Work) (Working at Height) Regulations 2010, Statutory Instrument 2010 No.332

Statutory Instrument 2010 No.332 required the employer to take into account the risks associated with working at height when carrying out health and risk assessments. The requirement applied to all work where a person could fall a distance liable to result in them sustaining an injury.

1.13.3 MGN 533 (M) - Means of Access, Amendment 1

MGN 533 replaced the statutory duties from the Merchant Shipping (Means of Access) Regulations 1988 and stated that safe access to a vessel was considered by the MCA to be a vital part in ensuring a safe working environment on board vessels under the Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997.

1.13.4 MGN 591 (M+F) - Provision of Safe Means of Access to Fishing Vessels and Small Vessels in Ports

MGN 591 provided guidance on means of access to fishing vessels and other small vessels in port, including a hierarchy of means of access. The MGN referred to SIP021 (see Section 1.13.6) and suggested that guardrail gates be provided to discourage both the climbing of guardrails and crossing between vessels where they taper and a gap may be formed.

1.13.5 The Code of Safe Working Practices for Merchant Seafarers – 2015 Edition, Amendment 4, October 2019

The MCA's Code of Safe Working Practices for Merchant Seafarers (COSWP) made no reference to moving between an unmoored vessel and quay or other shore structure. However, Chapter 26 provided guidance on anchoring, mooring and towing operations and 26.3.6 stated that:

> *Decks should have anti-slip surfaces provided by fixed tread or anti-slip paint coating…*

[8] Statutory Instrument 1997 No. 2962.

1.13.6 The Port Skills and Safety Group

The Port Skills and Safety Group is the industry health and safety group for UK ports. The group's purpose is the promotion of continuous improvement to encourage a skilled workforce and to share best practice, which is issued in its Safety in Port (SIP) publications.

SIP005- Guidance on mooring provides:

> *7.2. Access to some quays, jetties, berths and terminals may give rise to additional risk, for example working at height, water safety, restricted working areas, unguarded edges and access via boat or vertical ladders. It is important that the risk assessments cover suitable and sufficient controls for these additional aspects. See also **SiP014 Safe Access and Egress**.*

SIP014- Guidance on safe access and egress provides:

> *8.7 Access by means of quay wall or pier ladders: Stepping from ship to shore or shore ladder should be avoided where practicable.*

SIP021- Guidance on safe access to fishing boats and small craft in port

Section 5 of SIP021 detailed the factors to be taken into consideration when assessing the means of access between ship and shore, specifically:

- *capability: whether the means of access will be within the capability of the expected users, whether they are workers or members of the public, for example taking account of any tasks they may be performing when using the means of access, and their likely footwear and clothing*

- *tread/handhold surface: whether for the prevailing covering/uncovering by water and/or exposure to weather, the means of access can retain a climbing surface with suitable hand or footholds, with or without mechanical cleaning*

1.14 SIMILAR ACCIDENTS

1.14.1 MAIB report 3/2016[9] – Fatality of shore worker while disembarking passenger vessel *Oldenburg* when alongside

On 3 August 2015, a 58 year old shore worker was fatally injured when he became trapped between the passenger vessel *Oldenburg* and a quayside vertical fender as he attempted to disembark from the vessel. The casualty was employed as a shore rope-handler and had gone on board to socialise with the crew before its departure. Shortly after he had boarded the vessel, its gangway had been withdrawn due to the vessel's movement in the prevailing swell. The accident occurred as the casualty used an unguarded external shell door to exit the vessel and then attempted to make his way back to shore by moving along the vessel's external belting to a platform and steps.

[9] https://www.gov.uk/maib-reports/accident-to-shore-worker-while-disembarking-passenger-vessel-oldenburg-with-1-fatality

The MAIB investigation identified that the crew had not expected the casualty to use that route as it had not been used before. Consequently, the risk in leaving an open shell door unguarded had not been identified and no control measures were in place.

1.14.2 MAIB report 19/2016[10] – Fatal accident while manoeuvring *Svitzer Moira* alongside an unmanned tug

On 29 December 2015, the chief engineer of the 29m tug *Svitzer Moira* suffered fatal crush injuries at Royal Portbury Dock, Bristol, when he fell between *Svitzer Moira* and *Svitzer Ellerby*, which was unmanned, as *Svitzer Moira* was attempting to berth. The 61 year old chief engineer had been attempting to cross from *Svitzer Moira* to the unmanned tug before the mooring lines between the two vessels were in place.

The MAIB investigation concluded that although the company's Safe System of Work for 'mooring' and 'barge handling' were adequate for the task, the control measures had not been applied. In addition, the relocation of tugs within the port had been a frequent activity, but the activity had not been formally risk assessed and therefore specific instructions for the task were not available.

1.14.3 MAIB report 15/2019[11] – Fatal fall while boarding the tug *Millgarth*

On 27 January 2019, the chief engineer of the tug *Millgarth* died after falling into the river from the north oil stage at Tranmere Oil Terminal, Birkenhead. The 62 year old chief engineer had been on the jetty to release the tug's mooring lines, and after doing so had fallen through a gap between the fender and the oil stage while attempting to board the unmoored tug.

The tug's crew were unable to recover the chief engineer from the water and he was eventually recovered by a shore rescue boat crew 22 minutes later. Although the chief engineer was wearing a lifejacket, he suffered cold water shock followed by cardiac arrest.

[10] https://www.gov.uk/maib-reports/fall-from-tug-svitzer-moira-with-loss-of-1-life

[11] https://www.gov.uk/maib-reports/fall-while-boarding-tug-millgarth-with-loss-of-1-life

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 FATIGUE

There is no evidence that any of *Cherry Sand*'s crew were suffering from fatigue and, therefore, it is not considered a contributing factor to this accident.

2.3 THE ACCIDENT

Cherry Sand's master died as a result of crush injuries sustained when he became trapped between the moving dredger and the quayside. The 72 year old master fell while attempting to step ashore from an unsuitable platform, the rubbing band, which had an uneven, slippery surface. *Cherry Sand* was not tight alongside when the master stepped out, and was still moving towards the jetty because the vessel had no means of holding itself alongside without mooring lines, and a tug was not being used.

This section of the report will discuss the method of self-mooring adopted on board *Cherry Sand*, the safety culture evident on board and within UKD, and the relevant regulations and guidance.

2.4 SAFETY SHORTCOMINGS EVIDENT DURING THE ACCIDENT

2.4.1 Climbing over the bulwark

UKD Risk Assessment UKD/002 **(Annex B)** referred to crew opening a [bulwark] gate to embark/disembark the vessel. *Cherry Sand* was not fitted with any bulwark gates, so the only way the crew could move outboard before a gangway was in place was to climb over the bulwark. The bulwark ladder was not used to facilitate crossing the bulwark from the deck, nor was there any means to facilitate crew stepping down on the outboard side. The Safe System of Work for mooring acknowledged that, in certain circumstances, the crew would need to cross over the bulwark, but no means had been established for them to achieve this safely.

2.4.2 Standing on the rubbing band

The rubbing band was not a safe place for crew to stand, nor was it a safe place from which to step ashore. The deck edge was narrow; the bolts holding the rubber banding to the securing flanges on the hull created an uneven surface and in some areas a trip hazard; the paint had no non-slip properties; and the entire rubbing band, including the rubber, was too narrow and uneven to create a safe platform on which to stand **(Figure 11)**. Once on the rubbing band, there was no barrier to prevent a fall from height, and the task of stepping ashore precluded the crew from wearing either a fall restraint or fall arrest equipment.

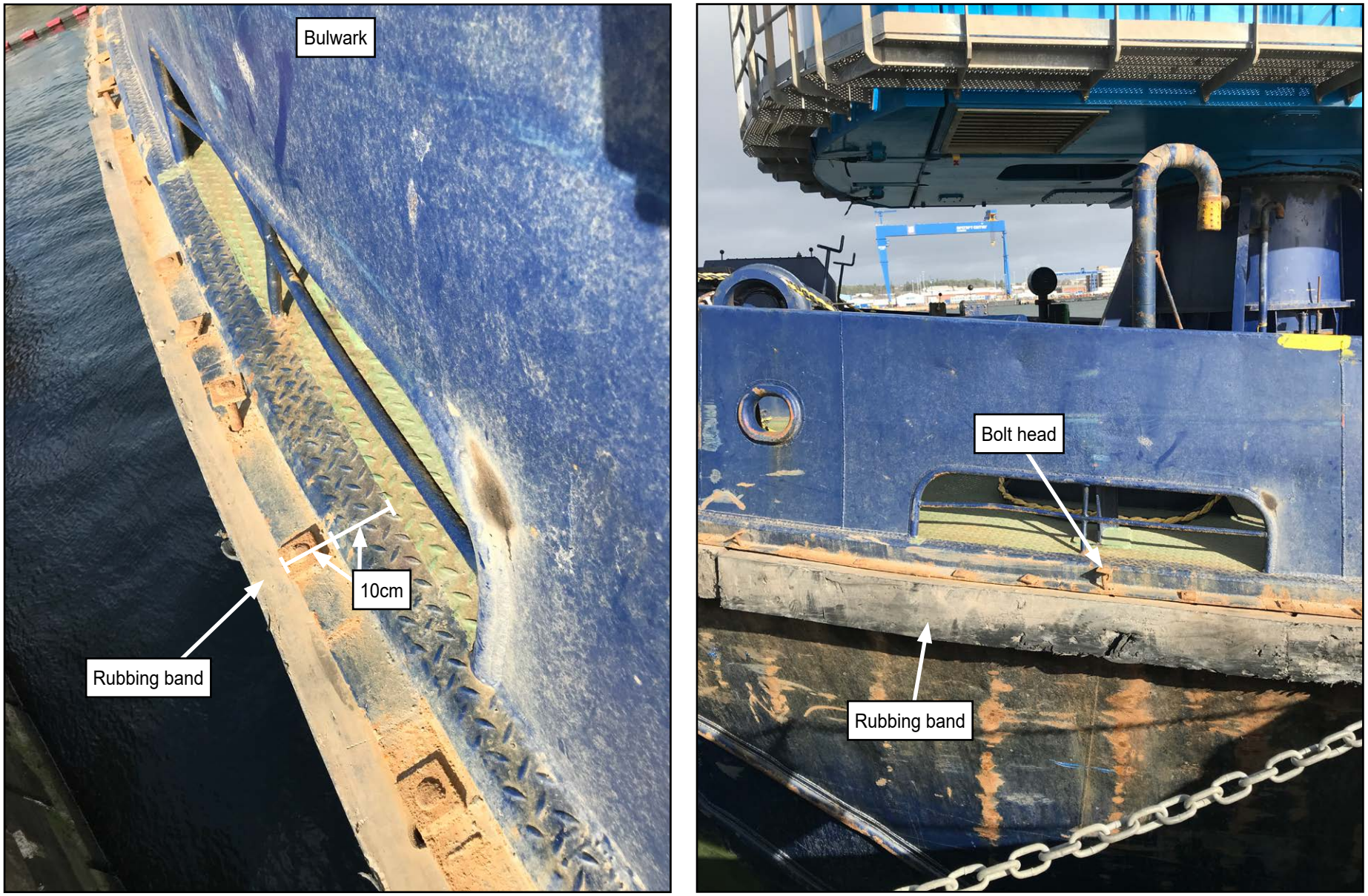


Figure 11: *Cherry Sand* fore deck bulwark and rubbing band

2.4.3 Stepping across between ship and shore

Cherry Sand was still moving towards the quay when the master attempted to step ashore. The dredger's approach to the jetty had been quite slow, and it had stopped a number of times as the chief officer attempted to improve the line of approach. While this was going on, the master stepped up on to a set of mooring bitts no fewer than four times, presumably to assess when he needed to climb outboard. When he then climbed over the bulwark, the master was told a number of times that it was too early for him to step outboard. However, that he stepped up a number of times, crossed outboard of the bulwark, and then attempted to step ashore indicate that he was acting on his own initiative and was not reacting to instructions from the bridge.

From the CCTV footage showing the mooring operations at the port, it was apparent that crew habitually stepped over the bulwark and stepped ashore while the vessel was not tight alongside, despite this being a requirement identified in both the Safe System of Work and risk assessment. When the master climbed over the bulwark, *Cherry Sand* was still approaching the berth and there was ample time available for either the operations manager or the chief officer to abort the manoeuvre. That they did not do so, together with the CCTV evidence of previous mooring operations, are strong indicators that crew climbing over the bulwark before the vessel was tight alongside was not uncommon.

2.4.4 The step ashore

The master took the step towards the quay when *Cherry Sand*'s bow was about 1.5 metres away from the berth. The CCTV footage showed that he stepped out in a deliberate manner, apparently confident that he would be able to reach the quay. As he did not inform anyone why he thought it appropriate to step when he did, it cannot be known with any degree of certainty why he stepped off the vessel at that specific time.

It is possible that the master misjudged the distance to the quay. He required a prosthetic lens for his right eye, without which his depth/distance perception would have been negatively affected. The postmortem report makes no reference to the presence of the prosthetic lens in his right eye, but as the master's lens case was empty when found, and he might have lost the lens during the accident, there can be no certainty that he was not wearing it when he attempted to step ashore.

Equally, the master might have stepped out intentionally in the belief he could step across the gap. CCTV footage shows that his trailing leg did not move from the rubbing band as he stepped out, possibly indicating that his foot had become snagged. This would have halted his momentum and prevented his outstretched foot from reaching the quay as intended.

2.5 SYSTEM OF WORK

2.5.1 Work as imagined

UKD's generic risk assessment UKD/002 **(Annex B)** provided that crew could embark or disembark a vessel when it was not moored, providing that all safety precautions had been completed in accordance with the Safe System of Work. The risk of falling into the water had been identified, with the possible consequence of death from drowning or being crushed; and, the generic Safe System of Work

required the [bulwark] ‘gate’ to be closed until the vessel was thrusting alongside and the master had approved the transfer. There were elements of the generic risk assessment and Safe System of Work that could not be applied on board *Cherry Sand*, as the vessel had neither bulwark gates nor bow thrusters. However, the company required its ships’ masters to produce local risk assessments and safe systems of work, based on the generic format.

Cherry Sand’s Safe System of Work No.5 and General Risk Assessment for mooring the vessel **(Annex C)** were intended to build on the company’s generic risk assessment, so they were specifically relevant to the vessel. The risk assessment recommended that linesmen should be “*more readily available*” to mitigate against a fall into the water or a fall from height on the quay, and the Safe System of Work No.5 stated that linesmen should be used when possible. The document went on to state that “*Whenever possible, the forward spring should be thrown to a bollard and made fast, and the vessel steamed gently ahead on it to maintain a steady position alongside*”. However, Safe System of Work No.5 did not include any procedures for the circumstances when linesmen were not in attendance and it was not possible to lasso a bollard. Further, while it required the vessel to be tight alongside and permission given by the bridge before crew stepped ashore, it acknowledged that mooring operations required them to climb over the bulwark and to stand on the rubbing band, which was not in compliance with UKD’s generic procedures.

2.5.2 Work as carried out

CCTV footage from Port Babcock Rosyth indicated that *Cherry Sand*’s crew had adopted the practice of crew crossing from ship and quay, and vice versa, when the vessel was not tight alongside in order to moor and unmoor the vessel **(Table 1)**. It had been agreed between Babcock and UKD that linesmen were not required, so none were in attendance, no attempts were made to lasso shore-side bollards to pass spring lines, and tugs were not used to hold the vessel tight alongside while mooring lines were passed. In short, there was a marked difference between how the company imagined mooring operations were being conducted and actual practices on board. Such differences would have been abundantly clear to senior company staff had they been observing *Cherry Sand*’s mooring operations with safety in mind.

2.6 SAFE SYSTEMS OF WORK

Development of a safety management system requires that operations are risk assessed, and that safe systems of work are put in place to ensure prevention of human injury or loss of life, and avoidance of damage to the environment. A safe system of work is underpinned by the provision of appropriate equipment, suitably qualified personnel who have received relevant training (induction), and a process for tailoring the Safe System of Work to the circumstances on the day (dynamic risk assessment, leading to a toolbox talk). Deficiencies in all the above were evident in this accident.

2.6.1 Equipment

UKD’s generic risk assessment referred to the [bulwark] ‘gate’, but *Cherry Sand* did not have any gates in the bulwarks nor any mechanism for safely crossing the bulwark when stepping ashore to receive a mooring line. Once outboard, there

were no suitable footplates that crew could stand on safely prior to stepping ashore. These were significant material deficiencies that should have been identified during risk assessment.

2.6.2 Suitably qualified personnel

When UKD realised a temporary master was required for *Cherry Sand*, there was very little time to source one. Last minute requirements for crew are not unusual in the marine industry, and the manning agency was able to nominate the master for *Cherry Sand* within 24 hours of the request. His documentation was sent to UKD prior to his appointment, which included his ENG1 certificate **(Figure 7)**.

Examination of the master's ENG1 certificate identified notable errors and omissions that should have raised concerns with either UKD or the manning agency about the master's fitness for duty. Specifically:

- Visual acuity was not indicated, as neither the 'yes' or 'no' boxes had been checked; and

- The certificate showed that the master was not fit for lookout duties, though no explanation for this was given.

The investigation has established that the doctor had checked the master's eyesight and that he had passed the required standard with just the prosthetic lens and when wearing both prosthetic lens and spectacles. The 'fit for lookout duties' had erroneously been ticked 'no' when 'yes' should have been indicated, and visual acuity should have indicated 'yes'.

That the master's ENG1 certificate indicating he was not fit for lookout duty was not identified by either UKD or its manning agency, is of concern. An ENG1 certificate can be issued that indicates an individual's fitness or employability is limited, and for this reason it should be checked. In this instance, the master was fit for duty and it was his certification that was incorrect. Nonetheless, the master's ENG1 certification should have been clarified before he joined *Cherry Sand*.

2.6.3 Training/induction

UKD's new joiner induction procedure consisted of 17 items that were largely safety focused **(Annex D)**. Item 11 on the list required new joiners to "*Locate the ISM manuals, risk assessments and other manuals and identify the DPA*". It did not include any specific instruction in the ship-specific tasks the new joiner was required to undertake.

In practice, the new joining checklist for the master was completed in under an hour, and the instructor was the 'A' watch chief officer, who was himself an agency employee on his first contract with UKD. Consequently, while the induction procedure would have given the 72 year old master an awareness of safety procedures, emergency drills and company policies, it provided no assurance that he was able to function safely and effectively on deck.

2.6.4 Toolbox talks

Section 3.2.6 of UKD's IMS required that, "*A tool box talk should be carried out before undertaking a task for the first time and at intervals not exceeding 12 months*". It is generally accepted that toolbox talks are held prior to the start of work to ensure that generic risk assessments and procedures are tailored to reflect the circumstances prevailing at the time the work is to be carried out[12]. They are a dynamic activity, not a time-based requirement. By including in its IMS a statement that toolbox talks should be carried out annually, UKD was signalling to its staff that pre-work toolbox talks, with everything that entailed, were not required.

There are a number of reasons why a local risk assessment for mooring/unmooring would have been appropriate prior to *Cherry Sand* commencing dredging operations at Port Babcock Rosyth's non-tidal basin. The line of approach to M berth was steep, there were decommissioned nuclear submarines on the adjacent berth and in close proximity to the line of approach, the dockside area was cluttered, and there were chains along the quay edge that created potential obstructions to mooring lines and personnel. Further, while *Cherry Sand* had not used linesmen during the previous dredging campaign, the vessel had a new master who was not on board at that time. Mooring and unmooring is a daily occurrence for many dredgers, but reviewing new berths and the implications of changed circumstances, such as new crew or adverse weather conditions, is good practice that helps identify, and therefore mitigate risks.

There is reason to doubt the authenticity of the log entry recording that the master had received a toolbox talk before the accident. The entry appeared in the remarks column of the log, unlike the entry recording the operations manager's safety briefing to the crew on 28 February 2019; it was untimed, unlike the safety briefing record that was entered when it occurred; and it was not supported by a toolbox record form **(Figure 10)**. The most recent toolbox talk record form available to the investigation recorded the talk given on 8 February 2019. Even had the toolbox talk actually taken place as recorded, it was too late as the master had helped unberth the vessel at 0748 that morning, and CCTV shows he stepped on board as *Cherry Sand* was moving clear of the berth.

2.7 SAFETY CULTURE

2.7.1 Onboard safety culture

While *Cherry Sand*'s crew routinely wore the appropriate PPE, there were a number of indications that the onboard safety culture was weak. Specifically:

- As borne out by CCTV coverage, there was a ready acceptance of a sub-optimal mooring method that put crew at risk as they stepped ashore to take lines before the dredger was tight alongside.

[12] A **Toolbox Talk** is an informal safety meeting that focuses on safety topics related to the specific job, such as workplace hazards and safe work practices. Meetings are normally short in duration and are generally conducted at the job site prior to the commencement of a job or work shift. It is one of the very effective methods to refresh workers' knowledge, cover last minute safety checks, and exchange information with the experienced workers. **Toolbox Talks** are also intended to facilitate health and safety discussions on the job site and promote your organisation's safety culture. Toolbox talks/meetings are sometimes referred to as tailgate meetings or safety briefings.

- Record keeping was poor. Despite there being numerous crew on board who were new both to the company and the vessel, no evidence could be found that the required toolbox talks had been completed prior to them undertaking tasks for the first time.

- There was a willingness, at least among some senior crew, to cover up accidents.

2.7.2 Actions following the previous accident

The previous accident on board *Cherry Sand*, which occurred on 23 January 2019, was a clear indication of a safety culture problem on the dredger. The operation had not been subject to a thorough risk assessment; the Safe System of Work procedure had not been followed, an injury had resulted, and an attempt had been made to cover up the nature of the accident.

When the operations manager joined the ship he briefed the crew on the incident and the resulting disciplinary action. While he reminded them to follow procedures, he did not take the opportunity to remind them what the mooring procedure entailed. Consequently, a chance was missed to remind all concerned of the ship-specific mooring and unmooring procedures to be followed. Had the operations manager referred to Safe System of Work No.5, it might have prompted him to revisit the decision to dispense with linesmen. Reviewing the Safe System of Work would likely have highlighted the inconsistencies between the safety documentation and local practices, such as the absence of bulwark gates, the inadequacy of the rubbing band as a safe platform to stand on, and the practice of crew stepping ashore before the vessel was tight alongside.

By treating the misreporting of the accident on 23 January as a disciplinary matter, the opportunity was lost to learn safety lessons and make improvements that could have helped prevent the accident 5 weeks later that led to the death of the master.

2.7.3 The role of the master during the berthing operation

The master had been employed on a temporary basis, and the operations manager was on board *Cherry Sand*, in part, to assess his performance. When it became clear that the master was having difficulty manoeuvring the dredger in the confines of the non-tidal basin, the operations manager decided to remain on board pending the arrival of the ‘B’ watch permanent chief officer. Once the chief officer had joined, on the morning of 27 February, the operations manager focused on assessing his ship-handling. With the chief officer fully employed ship-handling, and with the operations manager alongside him, the master ceased to have a meaningful role. He had to remain on board, as *Cherry Sand*’s safe manning certification required it to have an STCW II/2 qualified deck officer as master, but he had no function to fulfil.

The master’s motivation for becoming involved in mooring and unmooring cannot be known. What is certain, is that the operations manager was content for him to become part of the mooring party, and that the crew were content for a 72 year old man, who had been on board 5 days, to take on the physically demanding role of ‘first man ashore’ as *Cherry Sand* made its angled approach to the quay.

A common factor between this accident, the 23 January accident involving the 'A' watch chief officer, and the accidents listed at Section 1.14 is that all the injured/ deceased crew were older workers. The Health and Safety Executive provides the following guidance on older workers: "…*while older workers are generally less likely than younger workers to have occupational accidents, accidents involving them are likely to result in more serious injuries, permanent disabilities or death, than for younger workers. Older workers may experience more slips, trips and falls than younger workers, and recovery following an injury may take longer*[13]".

Climbing over safety barriers, or any obstacles, and stepping across gaps, are inherently hazardous activities that increase the risk of slips, trips and falls. Such activities should be avoided. In circumstances when they cannot be avoided, strict controls should be put in place. These include; appropriate PPE, good lighting, level and clean surfaces, and competent and sufficiently fit and agile crew. It is evident that a more thorough assessment of the master's physical abilities was required before he was allowed to work as a member of the deck crew and, specifically, to take on the role of stepping ashore.

2.7.4 Actions taken by UKD

As highlighted above, there were a number of indicators to suggest that the safety culture on *Cherry Sand* was not as it should be. However, the previous accident in January 2019 involving *Cherry Sand*'s chief officer was a direct warning to UKD that access procedures were not being followed and the process of landing crew before the vessel was moored was inherently unsafe.

When a whistle-blower brought the facts of the January accident to UKD's attention, the company focused on the misreporting and the disciplinary action rather than the operational practices that had led to the accident in the first instance. UKD did not review *Cherry Sand*'s self-mooring practices and procedures until after the accident reported in this report. The focus on the cover up resulted in a missed opportunity to take practical steps to prevent a similar accident.

The company was aware that it was relying heavily on agency staff to crew *Cherry Sand* at the commencement of the dredging campaign in Rosyth, and the operations manager attended to monitor the senior officers' performance. However, once on board, the operations manager appeared focused solely on achieving the dredging campaign. Consequently, he became complicit in the unsafe mooring practices instead of stepping back and reviewing them objectively.

UKD's pre-accident audit of *Cherry Sand* on 13 February 2019 had identified that one watch was operating better than the other. However, despite several non-conformances being identified, the company did not attempt to identify why one watch was performing to a very different standard on one vessel.

In addition, the comments made by the MCA surveyor during the inspection after the accident in April 2019 are particularly concerning as they indicate that in the 6 weeks following this accident UKD had not taken steps immediately to improve the implementation of the SMS on board.

[13] https://www.hse.gov.uk/vulnerable-workers/older-workers.htm

In summary, UKD's monitoring of safety on board *Cherry Sand* was ineffective. In particular, the opportunity to learn from the previous accident was missed, internal audit and attendance on board by the operations manager did not prompt action, and following the death of the master the company was slow to initiate safety improvements.

2.7.5 ABP oversight of UKD

At the time of this accident, ABP did not carry out audits of UKD, but the fatal nature of this accident crossed the threshold at which ABP's internal procedures required it to carry out an investigation.

The ABP investigation report indicated that the root cause of this accident was that the master had made '*three critical deviations*' from the prescribed Safe System of Work. ABP's analysis of the CCTV footage from Rosyth did not raise any concerns about the mooring practices employed, which differs greatly from the MAIB's own examination of the evidence. The CCTV footage is far from clear at times, but it can be seen that *Cherry Sand* was not tight alongside the berth on many occasions, with the success of the operation entirely dependent on the crewman's ability to cross the gap between ship and shore.

While the report made additional observations, it did not question the decision not to use linesmen. Nor did it identify the practices of climbing over the bulwark and standing on the rubbing band as unsafe; explain the lack of records; or review the effectiveness of the local risk assessment. Had the investigation also covered the previous accident, the similarities between the two would have been self-evident, possibly resulting in a report that focused less on one individual and more on systemic shortcomings.

ABP's arms-length approach to UKD's operations allowed a number of sub-optimal practices to go unnoticed, and more proactive engagement might have identified earlier that aspects of UKD's operations required review. Although UKD's operations are specialist in nature, as the parent company with a breadth of maritime expertise, ABP could have provided the dredging firm with advice, assistance and oversight that would have helped ensure a safe standard of operations was maintained.

2.8 REGULATIONS AND GUIDANCE

The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 set out the responsibilities of owners, and there is ample guidance in the form of MGNs and SIPs. However, none of it provides specific best guidance on mooring operations. The evidence from previous accidents (see Section 1.14) indicates that operators are choosing to self-moor/unmoor significant sized vessels. In all cases, the crew involved were attempting to step from or to an unmoored vessel; the route the crew were using to make their transfer was either unsafe or had shortcomings; and in two of the cases the vessels were still moving towards the berth. SIP021 provides guidance on level-transfer between vessels, but in two of the cases the transfer heights involved did not meet this criterion. Every berthing/unberthing operation will be different, and must be risk assessed accordingly. However, clearer guidance is needed on the circumstances when self-mooring/unmooring is acceptable, and the considerations that should be taken into account before deciding that it is safe to dispense with linesmen ashore or on the adjacent vessel.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. *Cherry Sand*'s master died as a result of crush injuries sustained when he became trapped between the moving dredger and the quayside. The 72 year old master fell while attempting to step ashore from an unsuitable platform, the rubbing band, which had an uneven, slippery surface. [2.3]

2. The Safe System of Work for mooring acknowledged that, in certain circumstances, the crew would need to cross over the bulwark, but no means had been established for them to achieve this safely. [2.4.1]

3. The dredger's rubbing band was not a safe place for crew to stand, nor from which to step ashore. [2.4.2]

4. Evidence indicates that *Cherry Sand*'s crew habitually stepped over the bulwark and stepped ashore while the vessel was not tight alongside, despite this being a requirement identified in both the Safe System of Work and risk assessment. [2.4.3]

5. It cannot be known with any degree of certainty why the master stepped off *Cherry Sand* when the dredger's bow was about 1.5 metres away from the berth. CCTV footage shows that he stepped out in a deliberate manner, and it is possible that he either misjudged the distance to the quay, or his trailing foot became snagged as he attempted to step ashore. [2.4.4]

6. *Cherry Sand* did not have any gates in the bulwarks nor any mechanism for safely crossing the bulwark. Once outboard, there were no suitable footplates that crew could stand on safely prior to stepping ashore. These were significant material deficiencies that should have been identified during risk assessment. [2.6.1]

7. While the induction procedure would have given the 72 year old master an awareness of safety procedures, emergency drills and company policies, it provided no assurance that he was able to function safely and effectively on deck. [2.6.3]

8. By including in its IMS a statement that toolbox talks should be carried out annually, UKD was signalling to its staff that pre-work toolbox talks, with everything that entailed, were not required. [2.6.4]

9. It is evident that a more thorough assessment of the 72 year old master's physical abilities was required before he was allowed to work as a member of the deck crew and, specifically, to take on the role of stepping ashore to moor the vessel. [2.7.3]

3.2 OTHER SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. *Cherry Sand*'s Safe System of Work No.5 acknowledged that mooring operations required the crew to climb over the bulwark and to stand on the rubbing band, which was not in compliance with UKD's generic procedures. [2.5.1]

2. There was a marked difference between how the company imagined mooring operations were being conducted and actual practices on board. Such differences would have been abundantly clear to senior company staff had they been observing *Cherry Sand*'s mooring operations with safety in mind. [2.5.2]

3. While the master's ENG1 certificate had been completed incorrectly, it contained notable errors and omissions that should have raised concerns with either UKD or the manning agency about his fitness for duty. [2.6.2]

4. There were a number of indications of a weak safety culture on board *Cherry Sand*. Specifically: a ready acceptance of a sub-optimal mooring method that put crew at risk as they stepped ashore; record keeping was poor, no evidence could be found that new joiners had received the required toolbox talks prior to them undertaking tasks for the first time; and there was a willingness, at least among some senior crew, to cover up an accident. [2.7.1]

5. By treating the misreporting of the accident on 23 January as a disciplinary matter, the opportunity was lost to learn safety lessons and make improvements that could have helped prevent the accident 5 weeks later that led to the death of the master. [2.7.2]

6. UKD's monitoring of safety on board *Cherry Sand* was ineffective. In particular, the opportunity to learn from the previous accident was missed, internal audit and attendance on board by the operations manager did not prompt action, and following the death of the master the company was slow to initiate safety improvements. [2.7.4]

7. ABP's arms-length approach to UKD's operations allowed a number of sub-optimal practices to go unnoticed, and more proactive engagement might have identified earlier that aspects of UKD's operations required review. [2.7.5]

3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. Clearer guidance is needed on the circumstances when self-mooring/unmooring by allowing crew to step ashore is acceptable, and the considerations that should be taken into account before deciding that it is safe to dispense with linesmen ashore or on the adjacent vessel. [2.8]

SECTION 4 - ACTION TAKEN

4.1 MAIB ACTIONS

The **MAIB** has:

Written to the British Ports Association and the UK Major Ports Group to highlight the lessons learned from this accident and other similar accidents to ensure that the lessons learned with regard to correct berth allocation for vessels is shared among their membership.

4.2 ACTIONS TAKEN BY OTHER ORGANISATIONS

UK Dredging has:

- Ceased the practice of crew stepping ashore from *Cherry Sand* when the dredger is not securely moored.

- Amended its safety management system to ensure crew do not step ashore until the dredger is secured with two lines fore and aft.

- Amended its mooring procedure to ensure stepping ashore is not permitted without a gangway. If linesmen are not attending and lassoing a bollard is not possible, a crewman is to be placed ashore using the sea boat.

- Amended the toolbox talk template to include confirmation that the risk assessment and Safe System of Work have been fully understood.

- Appointed a fleet 'roving master', thereby removing the need to employ short-term agency masters.

- Established a new position of 'crewing co-ordinator'.

- Updated its guidance on vessel inspections to ensure greater focus on compliance with procedures when completing tasks and the associated administration.

Associated British Ports has introduced a system for greater oversight of UKD operations, including an audit programme.

Clyde Marine Recruitment Ltd has:

- Implemented a new recruitment procedure to provide the verification of certification for its placed sea staff.

SECTION 5 - RECOMMENDATIONS

The **Maritime and Coastguard Agency** is recommended to:

2020/118 Amend the Code of Safe Working Practices for Seafarers to include guidance for the safe completion of mooring operations including, specifically, the circumstances when it is permissible for crew to carry out self-mooring operations.

Associated British Ports is recommended to:

2020/119 Review its audit programme to ensure a common approach to safety and adherence to operational procedures across the UK Dredging fleet.

Safety recommendations shall in no case create a presumption of blame or liability

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