Report on the investigation of

Young Lady

Dragging anchor 5 miles east of Teesport and

snagging the CATS gas pipeline,

resulting in material damage to the pipe

25 June 2007

Marine Accident Investigation Branch
Carlton House
Carlton Place
Southampton
United Kingdom
SO15 2DZ

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Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 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

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AIS	-	Automatic Identification System
Bar g	-	Gauge pressure (above atmospheric pressure)
BA	-	British Admiralty
BP	-	British Petroleum
BPA	-	British Ports Association
BST	-	British Summer Time
CAST	-	Coastguard Agreement for Salvage and Towage
CATS	-	Central Area Transmission System
CPSO	-	Counter Pollution and Salvage Officer
DAHM	-	Duty Assistant Harbour Master
DBERR	-	Department for Business Enterprise and Regulatory Reform (formerly the Department for Trade and Industry – DTI)
DfT	-	Department for Transport
DGPS	-	Differential Global Positioning System
DNV	-	Det Norske Veritas
DPA	-	Designated Person Ashore
DSOSREP	-	Deputy to the SOSREP
DTI	-	Department for Trade and Industry (now DBERR as above)
EOP	-	End Of Passage
ETA	-	Estimated Time of Arrival
HSE	-	Health and Safety Executive
IMT	-	Incident Management Team
Kgf	-	Kilogram force
kN	-	A force equal to a kilonewton
Kts	-	Knots
kW	-	Kilowatt
LR	-	Lloyd’s Register
m	-	metres
MAPD	-	Major Accident Prevention Document

m/mn	-	metres per minute
mmscfd	-	Million standard cubic feet per day
MRCC	-	Maritime Rescue and Co-ordination Centre
nm	-	Nautical mile
OIM	-	Offshore Installation Manager
OOW	-	Officer of the Watch
PIMS	-	Pipeline Integrity Management Scheme
PMS	-	Planned Maintenance System
RCC	-	Rescue Coordination Centre
ROV	-	Remotely Operated Vehicle
SBE	-	Stand By Engines
SOSREP	-	Secretary of State's Representative, (Maritime Salvage and Intervention)
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency
UKMPG	-	UK Major Ports Group
VTS	-	Vessel Traffic Services
VTSO	-	Vessel Traffic Services Officer

Aframax	-	Tanker with a cargo capacity of between 80,000 and 120,000 tonnes dwt. Term is derived from the Average Freight Rate Assessment (AFRA) tanker rate system
Bitter end	-	The end of the anchor cable secured in the vicinity of the chain locker
Cable	-	0.1 nautical mile
Navtex	-	Narrow band, direct printing system for transmission and reception of navigational and meteorological warnings
Shackle	-	Ninety feet or 27.5 m of anchor cable
Teesports Control	-	Includes the VTS centre

All times in this report are UTC +1 unless noted otherwise

SYNOPSIS

A large vessel, dragging her anchor in heavy weather, dislodged a strategic pipeline carrying gas into the United Kingdom. Although, in this case, the risk of pollution was avoided, the pipeline was out of action for over 2 months.

At 2200 on 25 June 2007, the tanker *Young Lady* started to drag her anchor in Tees Bay; the wind speed was in excess of 40 kts and there was a heavy northerly swell. The master decided to weigh anchor and depart, but during the operation the windlass hydraulic motor exploded and the cable ran out to the bitter end. The vessel continued to drag her anchor until 2300 when, passing over the CATS gas pipeline, the anchor flukes snagged the pipe.

The vessel was caught on the pipeline for about 10 minutes before a wide yaw caused the flukes to free themselves. *Young Lady* continued dragging until the anchor finally held as it rode over a shoal patch, 2.5 miles off a lee shore. There were no injuries sustained or damage caused by pollution.

A subsequent survey of the pipeline showed that *Young Lady'* s anchor had lifted the pipeline out of its trench and dragged it about 6m laterally. The pipeline suffered damage to the concrete coating and impact damage to the steel surface.

The MAIB investigation found that:

- The master was aware that the anchorage was not recommended in the forecast conditions, and the decision to remain at anchor was inappropriate.
- There was no statutory requirement for anyone to monitor the area adjacent to the CATS pipeline, or to identify vessels anchoring too close.
- A number of strategic oil and gas pipelines run close to large vessel anchorages. A breach of these pipelines could have significant implications for the United Kingdom's energy supply.
- The risks associated with large vessels anchoring or dragging over pipelines had not been fully assessed. Consequently, some strategic pipelines could be vulnerable to snagging by large anchors.

Recommendations have been issued to:

- The manager of *Young Lady,* designed to improve the information available to its masters when anchoring large vessels.
- The MCA, BPA and UKMPG, to review the criteria and procedures used by port administrations to ensure HM Coastguard receives early notification of developing situations.
- The DfT, DBERR and HSE to conduct a review of the risk assessment process for the protection of pipelines from surface vessel interaction.

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Young Lady

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *YOUNG LADY* AND ACCIDENT

Vessel details

Registered owner	:	Blenheim Shipping UK Limited
Manager	:	Scinicariello Ship Management, Italy
Port of registry	:	Douglas, Isle of Man
Flag	:	Isle of Man
Type	:	Crude oil aframax product carrier
Built	:	2000 Yokosuka, Japan
Classification society	:	Lloyd's Register
Construction	:	Higher tensile steel, double hull oil tanker
Length overall	:	239 m
Gross tonnage	:	56,204 tons
Deadweight tonnage	:	105,528 tonnes
Engine power and type	:	12000kW. Sulzer 6 cylinder two stroke
Service speed	:	15.2 kts
Manoeuvrability	:	Single screw, fixed pitch right handed propeller.

Accident details

Time and date	:	2200 BST on 25 June 2007
Location of incident	:	Latitude 54º 40.5' N Longitude 001º 00.5' W
Persons on board	:	24
Injuries/fatalities	:	None
Damage	:	To the vessel - loss of the port anchor and cable and failure of the port windlass hydraulic motor To the pipeline - contact damage from the vessel's anchor.

1.2 BACKGROUND

Young Lady is one of four similar aframax crude oil tankers owned and operated by Blenheim Shipping UK Limited and managed by Scinicariello Ship Management of Italy.

Since its maiden voyage in June 2000, the vessel had been predominantly employed carrying crude oil between European ports, occasionally interspersed with visits to North America. The proposed loading at Teesport would have been the 55th port visited during the master's 8 months on board the vessel.

The accident was reported to the MAIB by the MCA's counter pollution and salvage officer (CPSO) at 1500 on 26 June 2007.

1.3 MANNING

Young Lady had a minimum safe manning certificate which required 16 crew. The complement at the time of the incident was 24.

Two third officers and a second officer were the designated bridge watchkeeping officers, which allowed the chief officer and master to work days, or as required. Two deck cadets provided additional support. The navigational watch was supplemented by day and night with a dedicated lookout at sea and at anchor.

A similar manning scale in the engineering department allowed continuous 4 hour watches to be maintained. The chief and second engineer worked days, or as required. The manning scale was sufficient to provide an engine room rating for each of the three watches.

1.4 ENVIRONMENTAL

1.4.1 Forecast weather

A 993mb low pressure system, originally centred over Scotland, had moved south and was later centred over the English Channel. An associated east-west occluded front was moving south-easterly in the vicinity of Teesport. Weather forecasts had been received on board *Young Lady* via Navtex, and by a listening watch on VHF channel 14 receiving the local VTS weather information.

The Navtex message received by the vessel, and issued by the United Kingdom Meteorological Office on 24 June at 0900 UTC, forecast:

'gales warnings - none'

'Tyne, Dogger South 3 or 4 backing North-east 5 or 6, occasionally 7. Sea state slight, increasing moderate later. Showers then rain. Visibility moderate or good, occasionally poor later'

'Outlook for the following 24 hours…..strong winds all areas with gales for a time'

Later, at 2142 UTC, a gale warning was broadcast by Cullercoats Radio forecasting a north-easterly gale force 8, expected soon in Humber; the sea area just to the south of the vessel's anchorage.

By 2100 UTC on the following day, 25 June, the forecast from the United Kingdom meteorological office was:

'Gale warnings: Viking, Forties, Cromarty, Forth, Tyne, Dogger, Humber, Thames'.

'Tyne, Dogger, North or North-east backing North-west 6 to gale 8, occasionally severe gale 9, decreasing 5 or 6 in Tyne later. Sea state rough or very rough, occasionally high in East Dogger later, rain or showers. Visibility moderate or good, occasionally poor'.

'Outlook for the following 24 hours….. strong to gale force North or North-west winds with severe gales possible …… winds gradually moderating'.

1.4.2 Recorded weather

Harbour authority data of the actual weather and tidal conditions over the period of the incident is shown in Table 1.

Date (June) /Time (UTC)	Height of Tide (m)	Tidal Surge (m)	Wind Direction (degrees true)	Wind Speed (kts)	Maximum Gust[1](kts)
24/1205	4.10	0.07	073	13.0	15.0
24/1805	2.05	0.06	023	8.0	9.5
25/0005	4.19	0.10	037	19.5	22.5
25/0605	2.45	0.19	008	24.0	29.0
25/1205	4.60	0.30	345	33.5	41.0
25/1805	2.17	0.32	325	31.0	39.0
25/2105	3.40	0.41	316	37.5	46.5
25/2205	3.98	0.41	313	38.5	46.5
25/2305	4.45	0.41	311	35.5	43.5
26/0005	4.68	0.43	306	32.0	41.0
26/0605	2.50	0.41	287	27.5	33.0
26/1205	4.69	0.37	303	30.0	38.0

Table 1 – Extract from Tees Ports Control recorded weather data.

1.4.3 Tidal stream

At the time of the incident the neap tidal stream was setting south-easterly at 0.6 kts.

[1] Period between previous and current reading.

1.5 NARRATIVE

1.5.1 Planned voyage

At midnight on 23 June, *Young Lady* sailed from Rotterdam. The sailing condition comprised 34,544 tonnes of ballast, a displacement of 53,160 tonnes and a maximum draught aft of 8.0 m. In the ballast condition, *Young Lady* had a longitudinal cross sectional area of approximately 3000m². The vessel was clear of the environs of Rotterdam by 0100 on 24 June and had commenced passage for Teesport, with the intention of loading a cargo of crude oil.

Once on passage, clocks on the vessel were retarded 1 hour to time British Summer Time (UTC+1). The anticipated ETA at Teesport was 2200 on 24 June.

1.5.2 Sequence of events: before anchoring

On passage, the master contacted his agent in Teesport and was advised that the cargo had not yet been fixed. As a consequence, *Young Lady* would be required to anchor on arrival, and await further orders.

At 1832, *Young Lady* established VHF contact with Tees Ports Control, the designated VTS authority, and was asked to provide the vessel's call sign and its maximum draught. On completion of the conversation, Tees Ports Control gave instructions that the vessel was to anchor on arrival, and in response to a request for a designated anchorage, the vessel was informed that there was no designated anchorage in Tees Bay, but that ships of similar size to *Young Lady* would normally anchor in the vicinity of the two spoil ground areas. The master was advised to find a safe place and call VTS 10 minutes before anchoring. Specifically, VTS then advised the master to keep well clear of the pipelines, which were in the area adjacent to the likely anchorage position.

At 2145, the master called Tees Ports Control and informed them that he was swinging the vessel around and intended to anchor about 4 cables south of his present position. He requested confirmation that the position was acceptable, to which Tees Ports Control replied that the position *'was fine'*, and that the master should call them again when anchored.

At 2154, the main engine was tested astern, and at 2200 the port anchor was let go in position 54º 40.51'N 001º 00.5'W. The position of the anchor and its location with reference to harbour limits, spoil ground areas and pipelines can be seen in **Figure 1**.

At 2201, the master contacted Tees Ports Control on VHF channel 14 and reported the time of anchoring. The call was acknowledged, and the master was informed by Tees Ports Control that there were no berthing instructions for him at that time, but that by 1000 the following day more information might be available. The master acknowledged the message and confirmed that the vessel would be keeping a listening watch on VHF channels 14 and 16.

By 2212, the cable was brought up with the seventh joining shackle on deck. The brake was applied, the windlass was taken out of gear, and the manual compressor bar left over the cable but not secured in position. The main engine readiness was reported to have been placed on short notice, although this was not recorded in the bell book until 1300 on 25 June.

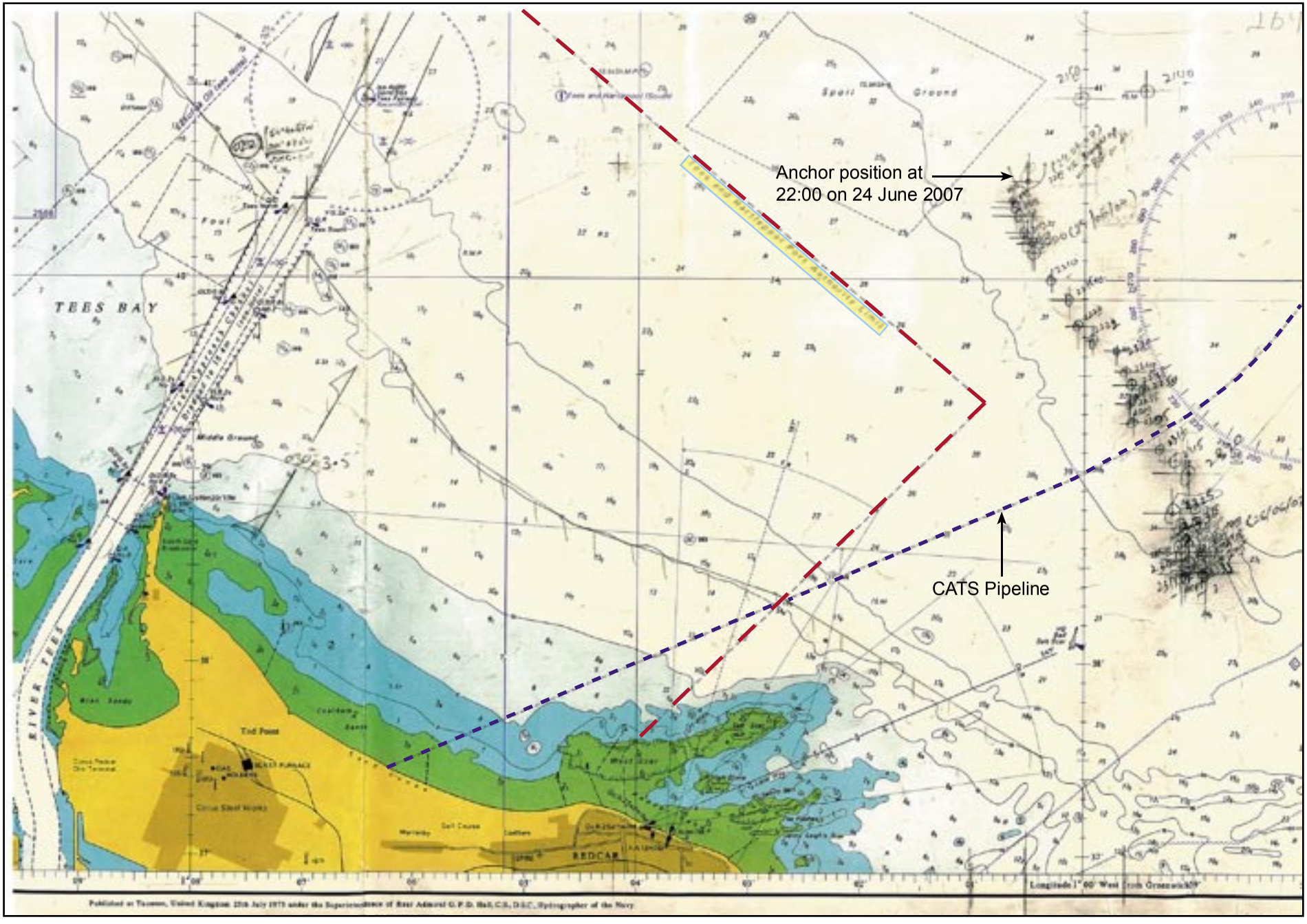

Figure 1

Position of anchor and its location with reference to harbour limits, spoilt ground areas and pipelines

1.5.3 Sequence of events: post-anchoring

Bridge anchor watches were commenced on completion of anchoring and comprised an OOW and a lookout. Rounds were conducted hourly by the lookout, which included an inspection of the anchor cable and windlass.

Weather conditions overnight on 24 June were moderate with winds averaging about 20 kts from the north-east.

The master's night orders instructed the OOW to comply with standing orders, company instructions and statutory regulations. A constant VHF watch was to be maintained on VHF channels 14 and 16 and,

> *'if the weather deteriorates, B/F (*beaufort*) scale 7 or more, keep the engines ready and watch the anchor position and traffic movements'*.

The night orders also required that the master was to be called if the OOW was in doubt about the anchor position, or if in any doubt at any time.

The wind speed gradually increased throughout the following morning, and by mid-day was in excess of 30 kts. The master was concerned about the prevailing conditions and ordered the chief officer, after lunch, to go forward and veer a further shackle of cable.

At 1300 on 25 June, *Young Lady*'s logbook recorded that, '*due to the gale the anchor cable slacked 1 shackle, now 8 shackles on deck'*.

No further information concerning the vessel's loading programme had been received, and the master of *Young Lady* concluded she would be required to remain at the anchorage for another night. Records show that during the afternoon period the wind speed remained fairly constant at around 30 kts, backing throughout the day from north-east to north-west. Shortly after 2000, the wind speed increased to between 35 and 40 kts, at times gusting to 48 kts.

The third officer, responsible for the 2000 to 2400 watch, had been monitoring the vessel's position within a 2 to 3 cable swinging circle using:

- DGPS drag alarm function
- Radar range and bearing of prominent features
- Visual bearings of landmarks and the Tees fairway buoy.

A position was placed on the chart each hour, on the hour, to provide a record and confirmation that the vessel was not dragging.

By 2000, the vessel had started to roll and pitch heavily in a northerly swell estimated to be in excess of 5m. The course recorder confirmed the vessel was yawing in excess of 70º from the north-east through north toward north-west. The 2100 position placed the vessel within its predicted swinging circle.

1.5.4 Sequence of events: dragging anchor

At 2200, the OOW placed a DGPS position on the chart, which showed the vessel lying outside of the swinging circle. He had concerns that the vessel was dragging anchor and called the master at around 2203 **(Figure 2)**. The master ordered the third officer to contact the duty engineer to make ready the main engine, and the chief officer to stand by forward. When the master arrived on the bridge he fixed the vessel's position on the chart, and confirmed that *Young Lady* was dragging anchor[2].

At 2215, the main engine was successfully tested, and at 2216 the engine room was then placed on stand by. Between the times of identifying that the vessel was dragging anchor at 2200, and the main engine being made ready for use at 2216, the vessel had dragged a distance of 0.8 nm at a rate of 3 kts **(Figure 3)**.

At the same time that the engine room was placed on stand by, the anchor party, consisting of the chief officer and two seamen, was ordered to commence heaving in the port cable. The chief officer informed the bridge team, via a hand-held VHF radio, that there was a lot of weight on the cable which, on average, was taking nearly 9 minutes to recover 1 shackle (under normal operating conditions to recover 1 shackle of cable would take about 3 minutes).

At 2221, the master contacted Tees Ports Control on VHF channel 14 and reported that *Young Lady* was dragging anchor. The operator acknowledged the call and asked the master to report when the vessel was underway.

The first engine order was a kick of 'dead slow ahead' recorded at 2223 **(Figure 4)**. The chief officer continued to report the direction of the cable which, with the vessel swinging wildly, was leading at very long stay from between starboard 90º to port 180º. The ship's head was recorded as swinging between 068º and 320º over the same period.

The vessel continued to drag in a southerly direction. The next recorded engine movement occurred between 2228 and 2235, during which slow ahead was maintained for 5.5 minutes in an attempt to reduce the rate of drift and the amount of weight on the cable. The master, concerned about the position of the cable, was averse to using substantial engine power, afraid that the vessel might run over it. At 2233, the rate of drift had been reduced and *Young Lady* started moving over the ground in a north-westerly direction.

At 2235, the engine was stopped and the rate of drift increased markedly. The next period of engine movements, between 2238 and 2245, succeeded in arresting the drift, and at about 2240 **(Figure 5)** *Young Lady* was stopped over the ground. The vessel had now dragged a total distance of 1.3 nm, and lay only 2 cables north of the charted CATS (Everest) gas pipeline. The wind was steady at about 45 kts from the north-west, and the ship's head was yawing between 310º and 070º. Seas were breaking over the forecastle in the 5m to 6m swell.

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[2] This was the master's second experience of dragging anchor in *Young Lady*, and he consequently elected to immediately start his engine and recover his anchor, as he had done previously.

Figure 2

VTS screenshot at 22:03

Figure 3

VTS screenshot at 22:16

Figure 4

VTS screen shot at 22:23

Figure 5

VTS screen shot at 22:40

Figure 6

VTS screen shot at 22:50

Following a succession of engine movements up to 'half ahead', the vessel started to make slight headway toward the north-west. At 2250 **(Figure 6)**, with the main engine set at 'half ahead' and the third joining shackle visible between the sea and the hawse pipe, the chief officer reported that the cable was leading nearly astern along the port side. The same report advised the bridge that there was too much weight on the cable, and it was the intention to apply the brake and hold on. As the brake was being applied and the crew made the final adjustment, the port windlass, which was still in gear with the control lever in the neutral position, suffered a catastrophic failure of the hydraulic motor unit **(Figure 7)**. The cable ran out immediately, the brake lining started to smoke, and sparks from the brake shoe were observed as the lining disintegrated. Hydraulic oil from the windlass motor was spraying over the forecastle at a pressure of 220 bar.

1.5.5 Events in the vicinity of the CATS pipeline

At 2252.5 the main engine was set to 'slow ahead'; at 2253 reduced to 'dead slow', and stopped at 2255. As the port cable payed out to the bitter end, a total of 12 shackles, the vessel drifted quickly to the south, passing over the CATS gas pipeline at 2301. The drift was arrested at 2306 when *Young Lady* was lying 460 m south of the pipeline, a position which corresponded with the port anchor being in the vicinity of the pipeline, some 1.75 nm south-south-east of the original anchor position **(Figures 8 and 9)**.

The master, suffering from the effects of shock, was concerned about the dangers faced by the crew working on the forecastle. He was now aware that the vessel had passed over the gas pipeline. The master made a telephone call to the DPA to apprise him of the situation. Between 2301 and 2306.5 engine movements of 'dead slow', and 'slow ahead' were made in an attempt to reduce the weight on the cable, and to control the yawing which was in excess of 100 degrees. At about 2311, when the vessel was at the extremity of a yaw to the north-west, the anchor freed itself from the pipeline and *Young Lady* re-commenced dragging anchor toward the south **(Figure 10)**.

1.5.6 Dragging toward a lee shore

At 2324, the master contacted Tees Ports Control and informed them that the windlass was inoperative and that the cable was now only holding on by the bitter end. Although the master believed that the vessel was no longer dragging, he was conscious of the close proximity of the Salt Scar cardinal buoy. Aware that the vessel was still in the vicinity of the pipeline, it was the master's intention to steam to the north and slip the cable. The main engine was not used throughout this period but, coincidentally as the vessel dragged over a shoaling sea bed, the anchor held and the vessel settled in position 54º 38.55' N 000º 58.9'W at about 2328 **(Figure 11 and 12)**.

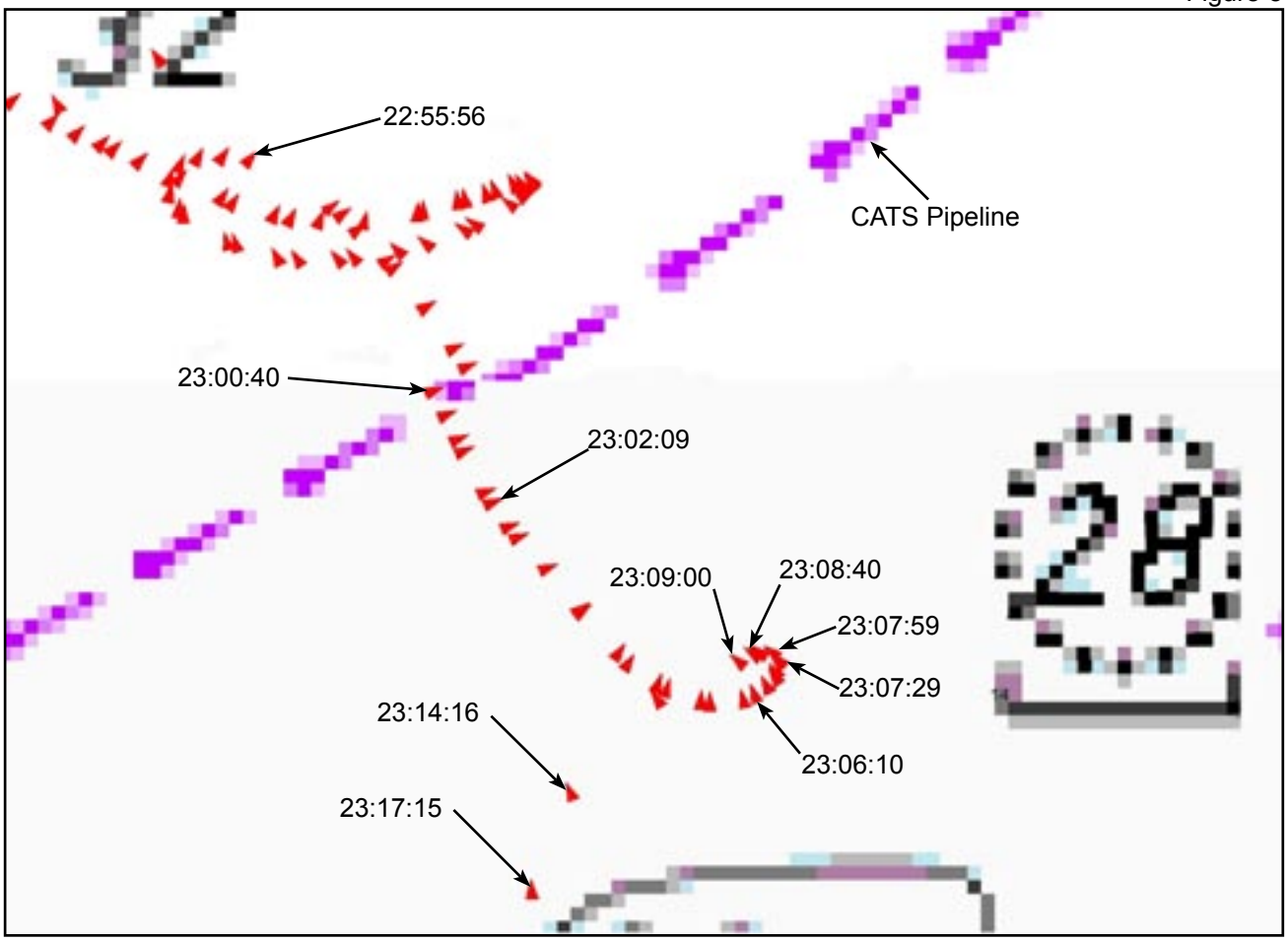
The next recorded engine movement was at 2329 when the engine was used to try and take the weight off the cable. At the same time, Tees Ports Control called *Young Lady* on VHF and asked for a situation report. The master was noticeably more agitated, but declared it was still his intention to steam to the north before slipping the cable.

At 2338, the master informed Tees Ports Control that it was now his intention to slip the cable in his present position, afraid that by steaming to the north the anchor might damage the pipeline. Tees Ports Control instructed the master to wait before proceeding to slip, and, at 2339, checked to see if *Young Lady*'s main engine was still fully operational. The next communication was at 2348, when Tees Ports Control requested that the vessel attempt to buoy the cable before slipping; the master's voice was noticeably calmer at this stage.

Figure 7

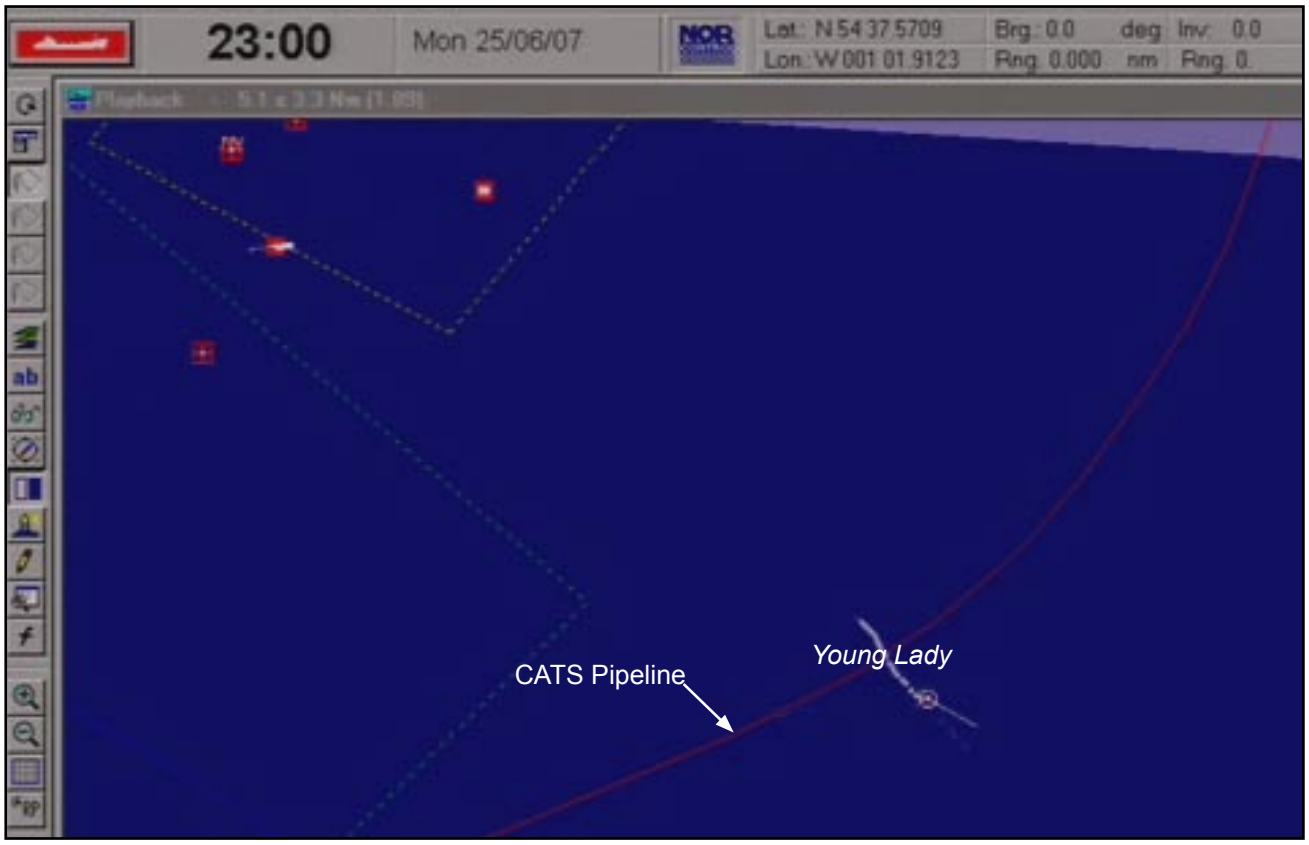
Damage to the port windlass hydraulic motor unit

Figure 8



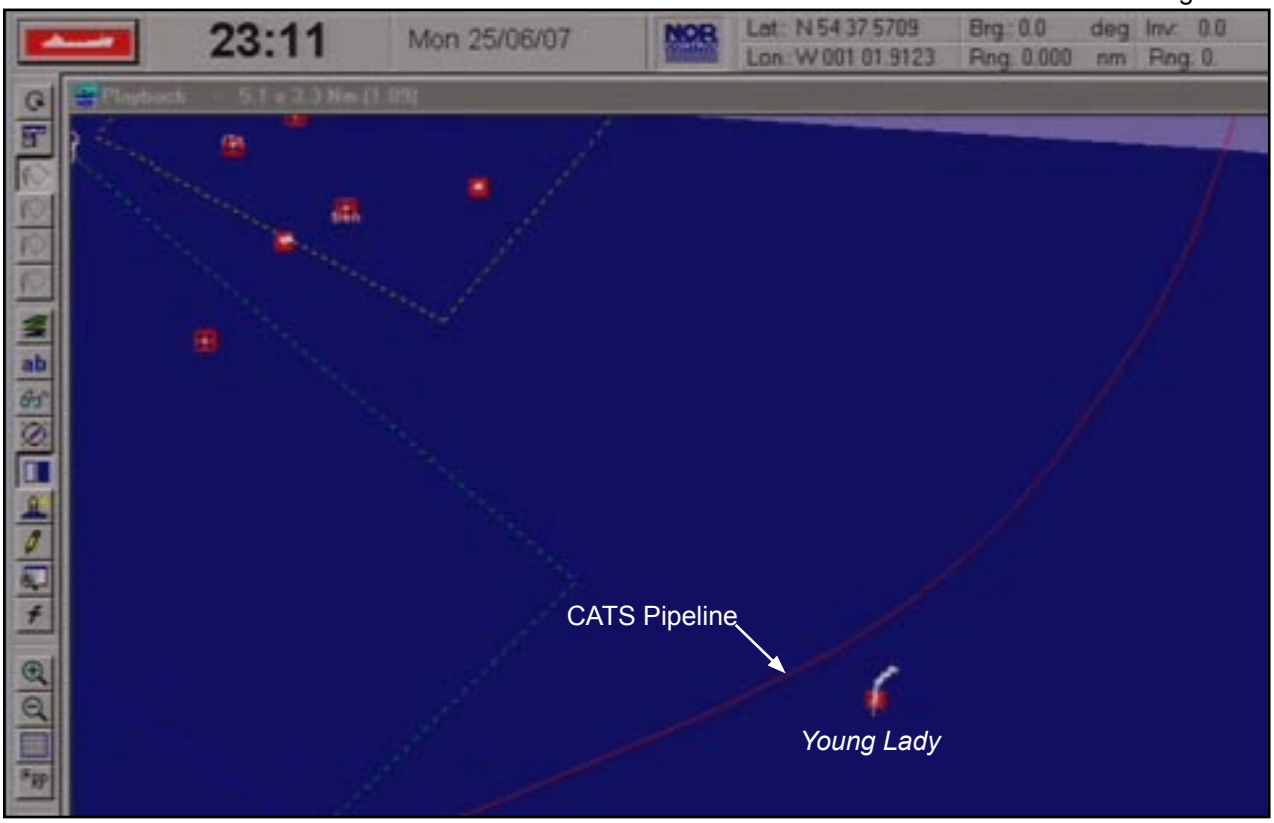
Timings of *Young Lady*'s movement over the CATS Pipeline

Figure 9



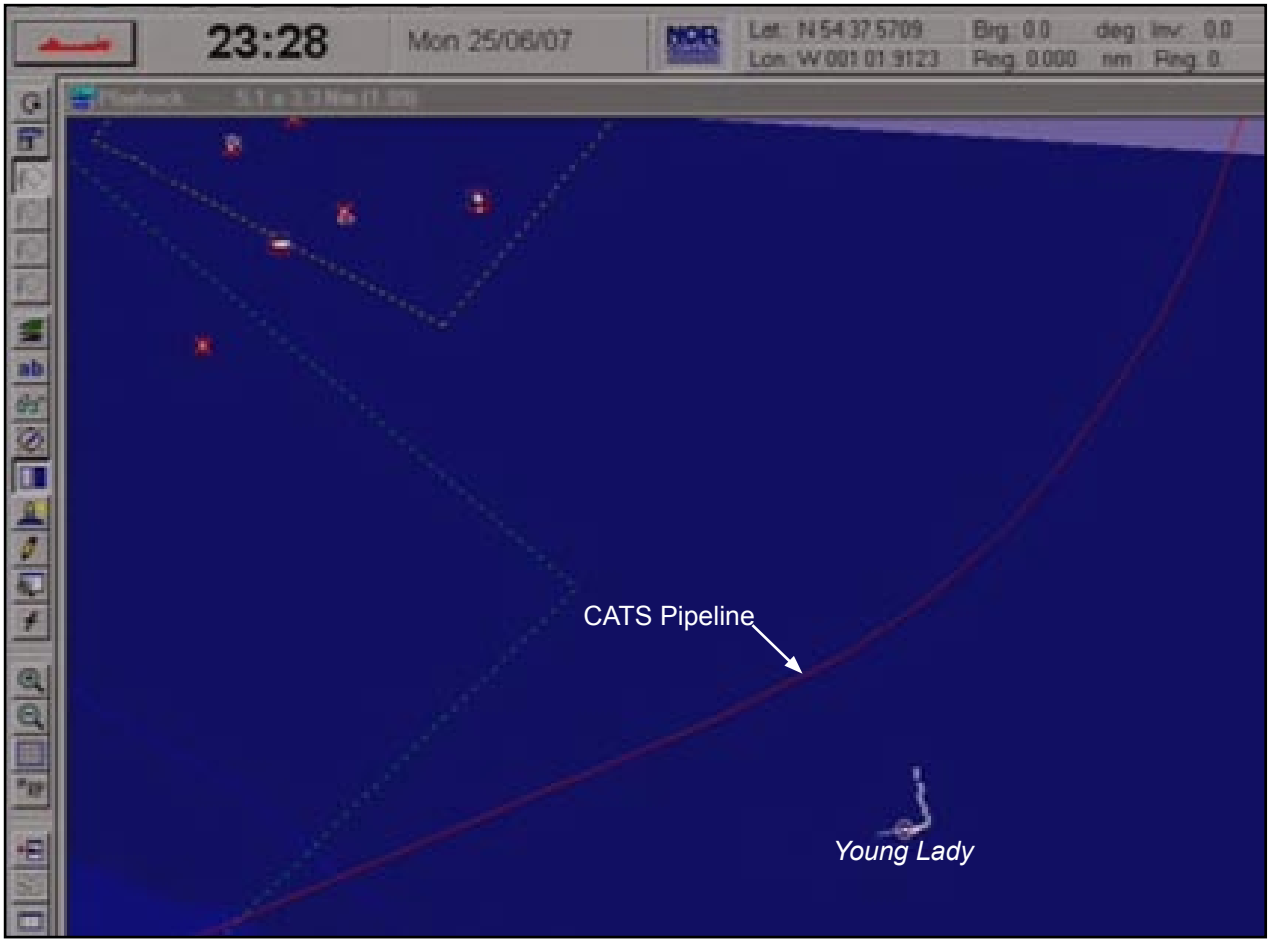
VTS screen shot at 23:00

Figure 10



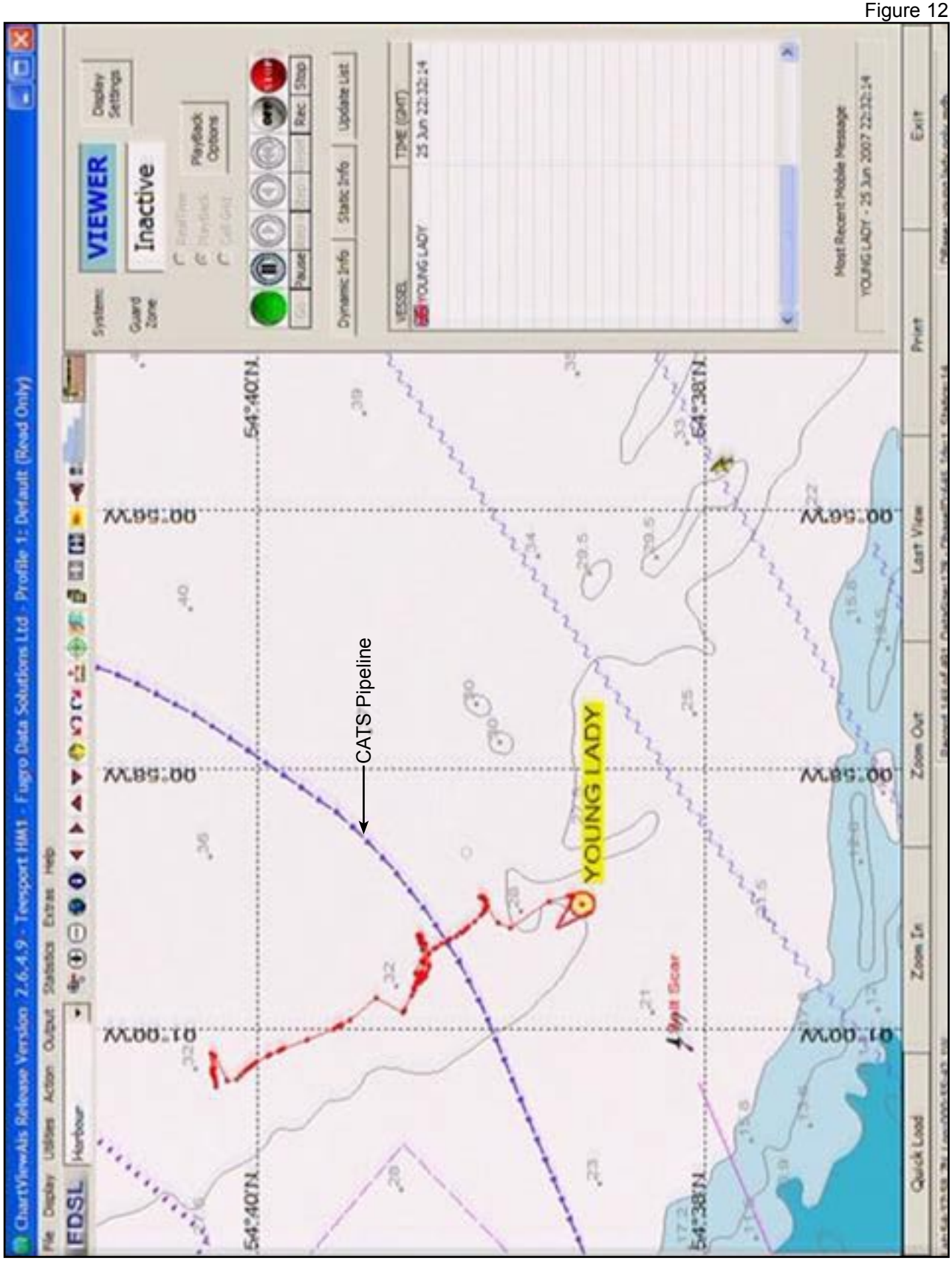
VTS screen shot at 23:11

Figure 11



VTS screen shot at 23:28

Figure 12



AIS Screen shot, showing *Young Lady*'s movement from 22:00 to 23:32 BST

At 0101 on 26 June, Tees Ports Control requested an update on the situation, and the master reported that the crew were facing problems releasing the bitter end securing pin due to the amount of weight on the cable.

At 0440, the master reported to Tees Ports Control that it had still not been possible to release the bitter end, and that the main engine was being used to help maintain position.

It was not until 1330, when the crew had replaced the port windlass hydraulic motor, that it was possible to take the weight off the bitter end, remove the pin and finally slip the cable. *Young Lady* made ground to the north-east and awaited further instructions.

1.6 EVENTS ASHORE

1.6.1 Tees Ports Control

On 25 June, the VTS watch changeover commenced at 1930. The 12 hour watch consisted of a VTSO and a Duty Assistant Harbour Master (DAHM) in overall charge of the watch. As he commenced his watch, the VTSO checked the previous meteorological office forecast for area Tyne, issued at 1725, which forecast:

> '*North or North-east backing North-west 6 to gale 8, occasionally severe gale 9, decreasing 5 or 6 later. Rough or very rough. Rain or showers. Moderate or good.*'

The VTSO checked with the DAHM to ensure he was aware of the forecast.

The DAHM acknowledged that he was aware of the forecast and continued with his watch, on what was described as a fairly quiet evening; two ships at anchor, and four or five other vessels further to seaward which had heeded the earlier weather warning. After accepting the watch, the DAHM was content that all equipment was operational.

At 2208, a red flashing alarm indication over *Young Lady*'s anchor symbol activated on the DAHM's radar display **(Figure 13)**. The alarm indicated that the vessel was underway. At around 2215, the DAHM left the control room for a comfort break, leaving the VTSO in charge. The alarm had not been identified visually, nor was it audible. At 2221, when *Young Lady* called to inform VTS that the vessel was dragging anchor, the VTSO acknowledged the call, and requested *Young Lady* call again, once underway. That a vessel was dragging anchor in the anchorage was not considered an uncommon event.

The DAHM returned to his console at approximately 2225, and the VTSO briefed him about the VHF call from *Young Lady*. The VTSO recalled some form of acknowledgement from the DAHM, although the DAHM did not recall the briefing. Nonetheless, as *Young Lady* continued dragging anchor towards the CATS pipeline, the DAHM failed to appreciate the events that were unfolding on the VTS display in front of him.

At 2324, *Young Lady*'s master called Tees Ports Control to update them on the problems with the windlass, and spoke to the DAHM. Unaware that *Young Lady* was dragging anchor and was now south of the CATS pipeline, the DAHM acknowledged the update.

Figure 13

VTS screen shot at 22:08

At 2325, an on-duty pilot who had overheard the previous VHF conversations, and had an AIS picture available, called the harbour office. The conversation highlighted that the DAHM was unclear as to exactly what had happened to *Young Lady,* in particular that the vessel had already dragged its anchor over the pipeline.

At 2328, the DAHM contacted *Young Lady* to ascertain whether the anchor had already dragged over the pipeline.

In conversation with the Conoco Phillips terminal at 2333, the DAHM referred to *Young Lady*'s master initially wanting to recover his anchor to move out into clear water, and that the vessel had dragged anchor over the pipeline. The conversation continued, referring to 'the pipeline' but the identity of the pipeline was never established.

At 2340, the DAHM contacted the harbourmaster and briefed him on the evening's events. The harbourmaster was advised that *Young Lady* had wanted to initially heave up the anchor to proceed to sea but, because of a windlass defect, had dragged over the pipeline and was now lying about 0.5 mile to the south. The conversation referred to Conoco Phillips, operators of the Ekofisk pipeline 5 miles to the north-west. The harbourmaster requested that the vessel try and mark the position of the anchor, to assist in its recovery at a later date.

At 2349, during a further conversation between the DAHM and the Conoco Phillips terminal it was discussed that the vessel had originally anchored '*in between the pipelines'* and had dragged to the south.

At 0020 on 26 June, the DAHM again called the Conoco Phillips terminal to keep them updated on developments. It was during this conversation that the DAHM checked whether Conoco Phillips maintained both the Ekofisk oil pipeline and the CATS (Everest) gas pipeline. The response confirmed Conoco Phillips only operated the northerly Ekofisk pipeline. Clearly shocked, the DAHM realized that the wrong operator had been contacted and that the status of the CATS (Everest) line was unknown.

At 0024, the DAHM contacted the CATS (Everest) pipeline operator, BP, and reported the incident. The terminal operator acknowledged the report and confirmed that he would contact the production platform to try and establish whether the effects from any damage to the pipeline could be recognised. A further call, made at 0029, to the operations room confirmed that there were no pressure fluctuations in the gas pipeline. At 0044, BP CATS terminal informed the DAHM that an ROV survey would probably have to be carried out, and the relevant positions of the incident were passed. In the latter part of the call, the operator confirmed that the pressure reading on the line had not fluctuated, the alarm had not activated, and he was therefore sure that the line was still intact.

At 0124, the BP CATS terminal called the harbour office and explained that the North Everest platform was concerned about the incident and thought it advisable to inform the MRCC. As nobody needed rescuing, the DAHM did not feel that it was necessary to inform the coastguard.

1.6.2 BP CATS

At 0030, the CATS terminal commenced monitoring pipeline integrity, and the Offshore Installation Managers (OIM) on the North Everest platform was informed of the incident. Between 0150 and 0230 BP's emergency response building at Aberdeen was informed of the developments by both the terminal and the platform. As part of the reporting procedure the Incident Management Team (IMT) manager was advised, and he made the decision that no immediate action was required based on the information provided and the fact that a breach in the pipeline had not been confirmed.

At 0715, the operations and maintenance superintendent called Tees Ports Control and was informed *Young Lady* had still not slipped her anchor cable and was holding position south of the CATS pipeline.

At approximately 0945, after establishing all of the facts, the onsite CATS IMT was mobilised. It was after the onsite CATS IMT had requested assistance with pipeline specialists, logistics, and communications and external affairs that (at 1130) the Dyce (Aberdeen) IMT was mobilised and a joint response with the CATS IMT was commenced. Response procedures were managed in accordance with the *Dyce Emergency Plan*, and the *CATS Pipeline Emergency Procedures* document.

At 1220, both DTI (now DBERR) and HSE were advised of the incident. At 1330, 1 hour after the business support team was mobilised, the decision was made to conduct an ROV inspection of the pipeline.

Between 1350 and 1520, the Dyce IMT liaised with Humber MRCC and Tees Ports Control to try and implement a traffic exclusion zone around the area where the anchor of *Young Lady* had dragged across the CATS pipeline. The exclusion zone was not sanctioned because the request had not been passed by the MRCC to the duty

CPSO. But, by 29 June, a BP guard vessel had been placed on station. On 1 July, SOSREP was made aware of the request for a temporary exclusion zone and, following discussions with BP, the exclusion zone was finally approved and implemented on 6 July 2007.

1.6.3 HM Coastguard

At 0140 on 26 June, Aberdeen MRCC was informed of the incident by the OIM of the North Everest platform. The information provided by the OIM, originally supplied via Tees Ports Control and then the CATS terminal, advised Aberdeen MRCC that *Young Lady* had dropped an anchor close to the pipeline, and that it was possible that it had snagged on the line. The OIM believed that the anchor had been dumped, and provided the position to the MRCC.

The Aberdeen MRCC operator confirmed that he held the vessel on AIS which was showing *Young Lady* at anchor in the same position as that passed by the OIM. The OIM, aware that his information had been passed through several people, wanted an assurance that the situation was under control.

At 0153, Aberdeen MRCC passed a situation report to Humber MRCC, the MRCC in whose area the incident had occurred. The report finished with a request for Humber MRCC to:

> *'call the vessel to see if all okay and then call the OIM (by telephone), we have northerly force 9 gales imminent so find out why anchored there'.*

At 0202, Humber MRCC called Tees Ports Control by telephone and was briefed on the situation by the DAHM. On completion of the brief, and content with the information received, Humber MRCC called the OIM and passed on the information. The OIM replied that at the present time the platform did not require coastguard assistance.

On completion of the telephone call with the OIM, the Humber MRCC watch manager was content that there had been no apparent damage to the pipeline, that the vessel still had main engine power available and, that the platform appeared satisfied with events. The watch manager then made the decision that there was no requirement to call the duty CPSO.

Before closing the incident at 0228, Humber MRCC called Aberdeen MRCC and provided a final update.

Later that morning, Aberdeen MRCC received a call from the BP IMT at Dyce, informing them that the response centre was manning up and that the situation was being assessed. There was still no evidence of actual damage to the pipeline. Aberdeen MRCC immediately informed Humber MRCC of developments. The incident was reopened, and Aberdeen MRCC asked Humber MRCC whether they intended to inform the CPSO. Humber MRCC, busy dealing with local flooding incidents, requested that Aberdeen MRCC inform the CPSO.

1.6.4 CPSO and DTI

BP staff made advisory calls, reporting the incident to the DTI and HSE at 1220. The DTI duty officer was called initially, followed by the duty environmental inspector.

Later, at 1301, the CPSO was apprised of the incident by Aberdeen MRCC. The report triggered a dialogue between the CPSO and DSOSREP at 1313, 15 hours after *Young Lady* started dragging. However, the vessel was finally underway some 17 minutes later. The CPSO also informed the DTI through the duty environmental inspector, and was advised that an ROV survey vessel was en-route to the scene.

After *Young Lady* had departed the scene, government departments were able to monitor and assess the implications of the incident with information provided by the BP IMT at Dyce.

When DSOSREP was informed of the incident, his main concerns were:

- The integrity of the pipeline
- The action being taken to check whether the pipeline was damaged
- The integrity of *Young Lady* and the need to conduct a port state control inspection of the vessel.
- To ensure that the pipeline operator was acting responsibly and taking effective action.
- To liaise with the DTI inspectors.

1.7 THE TEES BAY ANCHORAGE

1.7.1 Choice of anchorage

Admiralty Sailing Direction, NP 57, provides advice for mariners anchoring in the vicinity of Tees Bay:

> '*There is an anchorage in Tees Bay to seaward of the prohibited areas listed below and to the E of the Fairway Light-buoy, but anchoring in N or E gales is not recommended*'

The publication also informs mariners that it is prohibited to anchor vessels within 2.5 cables of the Ekofisk and Everest pipelines, a message re-iterated on BA chart 2567, the chart in use by the master of *Young Lady* at the time of the incident.

Aware that there were no dedicated anchorages in Tees Bay, the master, heeding advice provided by Tees Ports Control, chose to anchor approximately 3 cables south-east of the western-most area of spoil ground. The anchorage was clear from other anchored vessels, and 1.5 nm from the CATS (Everest) pipeline.

1.7.2 Nature of the anchorage

The anchorage had a charted depth of 32 m. The expected height of tide was up to 4.5m over the period *Young Lady* expected to remain at anchor. The holding ground in the vicinity of the anchorage was predominantly of fine sand with some mud. Initially, 7 shackles of cable (the seventh joining shackle on deck), were used to hold the vessel.

1.8 WINDLASS OPERATING SYSTEM

1.8.1 Anchor and cable

Young Lady was fitted with port and starboard KHAC-14 stockless bower anchors, each weighing 8.775 tonnes. Twelve and a half shackles (344 m) of 84mm diameter U3a cable were connected to each anchor. The AC-14 anchor is a high holding power anchor, with 2.5 to 3 times the holding power of a standard stockless anchor of equal weight.

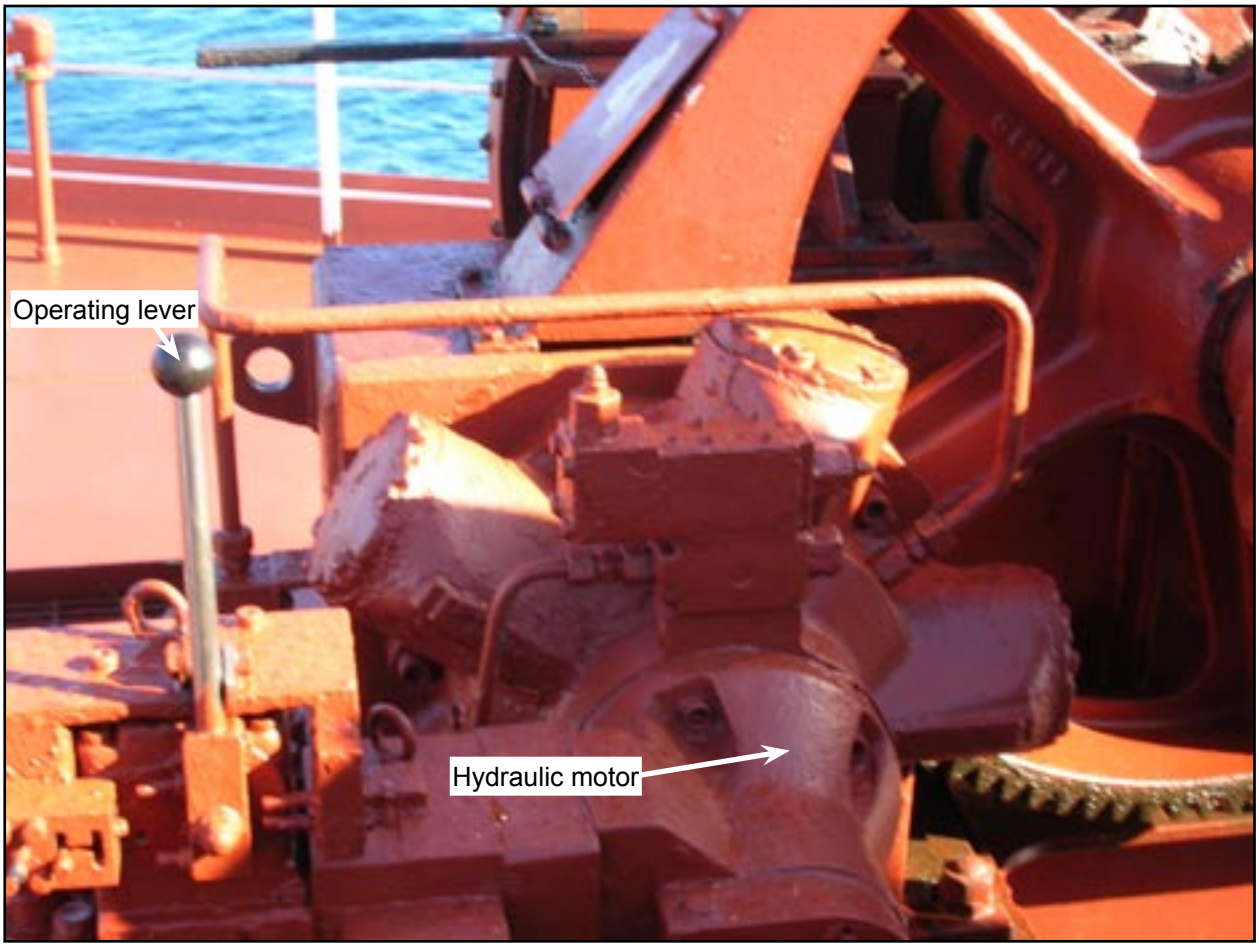
1.8.2 Windlass

The anchor cable was led around a dedicated Nippon Pusnes electro-hydraulically powered windlass. Each windlass was rated 34.5/15 338/147 t/kN 9/12 m/mn (windlass 34.5 tonnes at 9m per minute and its associated mooring winch 15 tonnes at 12m per minute). In the overload condition, the windlass was rated at 1.5 times the standard specification, and was designed with two independent mooring winch drums, one either side of the cable gypsy.

Power was supplied by a Kawasaki hydraulic motor, operating at a pressure of 220 Kgf. A selection lever provided the operator with a choice of mooring or windlass operation. Once selected, the operator had a choice of two speed operation for lowering or heaving, and a mid-point neutral position **(Figure 14)**.

The hydraulic system was fitted with two in-line relief valves designed to operate when a hydraulic pressure of 240 Kgf was reached. One relief valve was fitted to guard against shock loads, and the other relief valve was fitted to guard against a gradual increase in hydraulic pressure encountered during the heaving operation. There was no relief valve fitted within the hydraulic motor itself.

Figure 14



Port Windlass Hydraulic motor

1.8.3 Securing arrangement at anchor

The windlass was fitted with a friction brake band, applied through a series of linkages and tightened onto a steel brake drum by means of a screw thread, operated by a hand wheel arrangement. The 220mm wide and 15mm thick fibre brake lining was described by the chief officer as being in good condition prior to the incident.

A simple compressor or guillotine bar was fitted between the windlass and hawse pipe, complete with a securing mechanism to prevent the bar from riding over the cable in the event of the cable paying out. It was common practice on board *Young Lady* for the unsecured compressor bar to remain over the cable while heaving in, and this was confirmed by visible wear on the bottom side of the bar.

The bitter end of the cable was secured outside the chain locker. The end link was placed between two steel plates, and a securing pin was fitted through the plates and link. The location was well lit and provided suitable access and space for the crew to work while attempting to release the cable.

1.8.4 Operating instructions

The manufacturers' operating instructions for the windlass can be found at **Annex A**. The instructions provide guidance for:

- Making the anchor ready for dropping.
- Stowing the anchor.
- Operating the windlass in rough weather.

1.8.5 Maintenance

Planned maintenance records confirmed that monthly inspections of the forward mooring winches had been carried out in May and June of 2007.

In April 2007, a defective hydraulic seal on the port windlass hydraulic motor led to a new motor being ordered and fitted. To facilitate the motor replacement, the crew designed and manufactured a tripod arrangement to hold the motor in position while replacement was carried out. The defective motor was later repaired on board by the crew, and became an unofficial spare. Fortunately, the availability of the spare motor and the tripod arrangement allowed the failed windlass motor to be replaced on the morning of 26 June 2007.

1.9 CLASSIFICATION REQUIREMENTS

Anchoring and windlass equipment are required to be surveyed by the classification society every 5 years. The standards required for such equipment are common between IACS members, and are best summarised by assumption A300 laid down in the DNV class rules:

'*301 The anchoring equipment required is the minimum considered necessary for temporary mooring of a vessel in moderate sea conditions when the vessel is awaiting a berth, tide, etc. The equipment is therefore not designed to hold a vessel off fully exposed coasts in rough weather or for frequent anchoring operations in open sea. In such conditions the loads on the anchoring equipment will increase to such a degree that its components may be damaged or lost owing to the high energy forces generated.*

Guidance note:

If the intended service of the vessel is such that frequent anchoring in open seas is expected, it is advised that the size of anchors and chains is increased above the rule requirements, taking into account the dynamic forces imposed by the vessel moving in heavy seas. The equipment number (EN) formula for required anchoring equipment is based on an assumed current speed of 2.5 m/s, wind speed of 25m/s and a scope of chain between 6 and 10, the scope being the ratio between length of chain paid out and water depth.

302 The anchoring equipment required by the rules is designed to hold a vessel in good holding ground in conditions such as to avoid dragging of the anchor. In poor holding ground the holding power of the anchors will be significantly reduced.

303 It is assumed that under normal circumstances the vessel will use only one bower anchor and chain cable at a time.'

LR requires that the windlass is to have sufficient power to exert a continuous duty pull over a period of 30 minutes of $0.0475d^2$ (kN), which for a vessel of *Young Lady'*s size equated to 335 kN (33.5 tonnes). *Young Lady'*s windlass was rated at 34.5 tonnes, slightly more than the classification society's minimum requirement. The windlass should also be capable of exerting a short term pull over a period of at least 2 minutes equal to 1.5 times the continuous pull. For a vessel of *Young Lady'*s size, this was 503 kN (50.3 tonnes).

In respect of hydraulic systems, LR rules require that:

'*Over-pressure protection is to be provided on the discharge side of all pumps. Where relief valves are fitted for this purpose they are to be fitted in closed circuit, i.e. arranged to discharge back to the system oil tank'*.

In the case of *Young Lady,* two relief valves were fitted within the system; one was designed to counter increases in pressure due to short shock loads, and steady loads encountered when heaving in. The second relief valve was fitted to protect the hydraulic system when the windlass was being used to veer the anchor and cable under load.

1.10 CATS PIPELINE

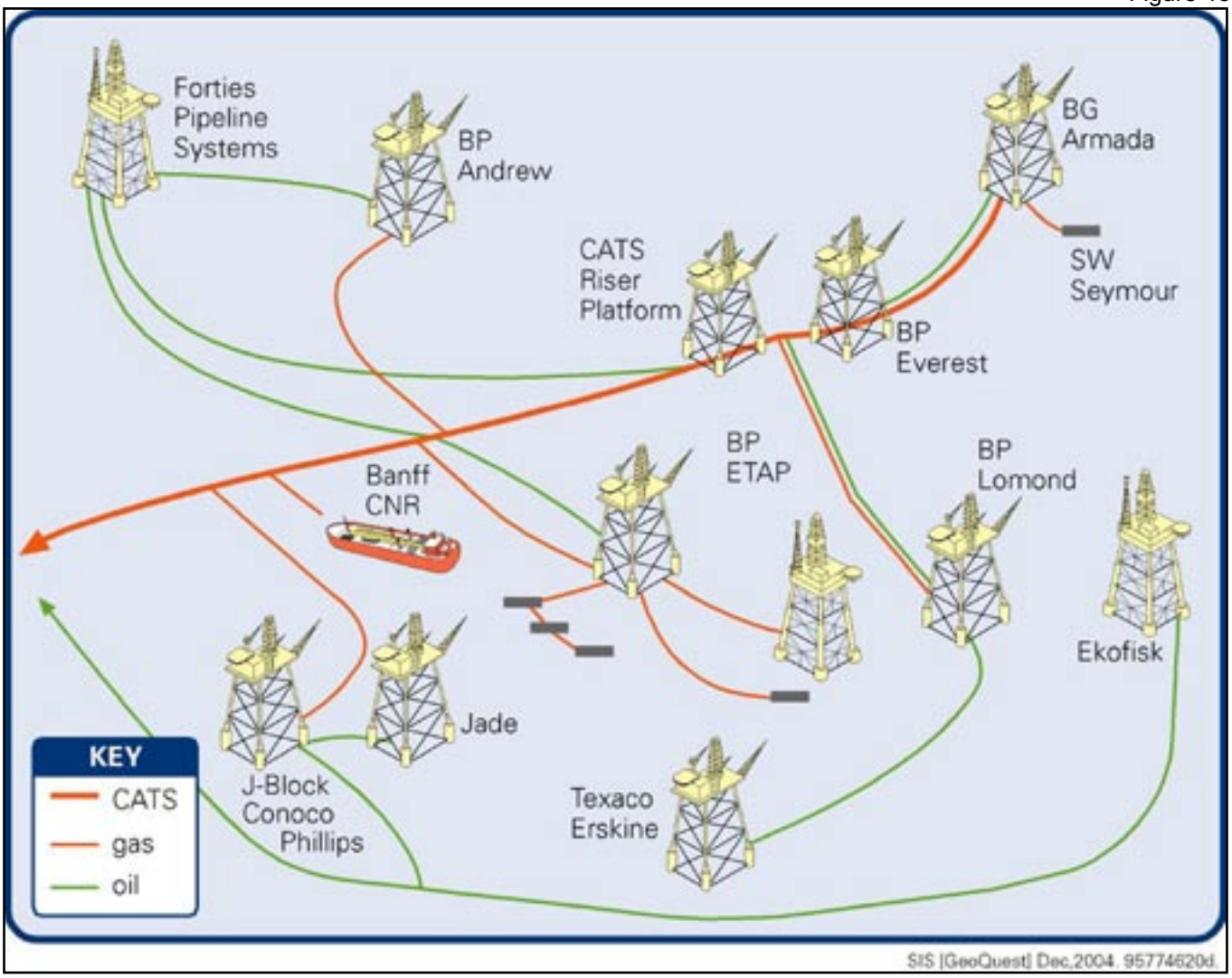
1.10.1 Description

The CATS pipeline **(Figure 15)** was commissioned in 1993. The pipeline has a 36 inch (0.914m) outside diameter, with a maximum allowable operating pressure for dry gas of 179 bar g. With a total length of 251nm from the riser platform to the terminal, the line is capable of supplying a throughput of gas in the region of 1000 mmscfd; potentially, 20 percent of the United Kingdom peak gas requirement. There are no isolation valves between those at the riser platform and one positioned at the Beach Valve Station, about 3 miles from the terminal.

1.10.2 Routing

When the CATS pipeline was proposed, the Teesport harbour authorities initially hoped that it would be allowed to run parallel to the Ekofisk oil pipeline, thus keeping the pipelines closely grouped. However, for public safety reasons, the CATS pipeline had

Figure 15



North Sea Platforms supplying the CATS Pipeline

to come ashore further to the south. Following consultation, the decision was made for the pipeline to approach the shoreline in an arc to the south-east, in order to run clear of the main harbour approaches.

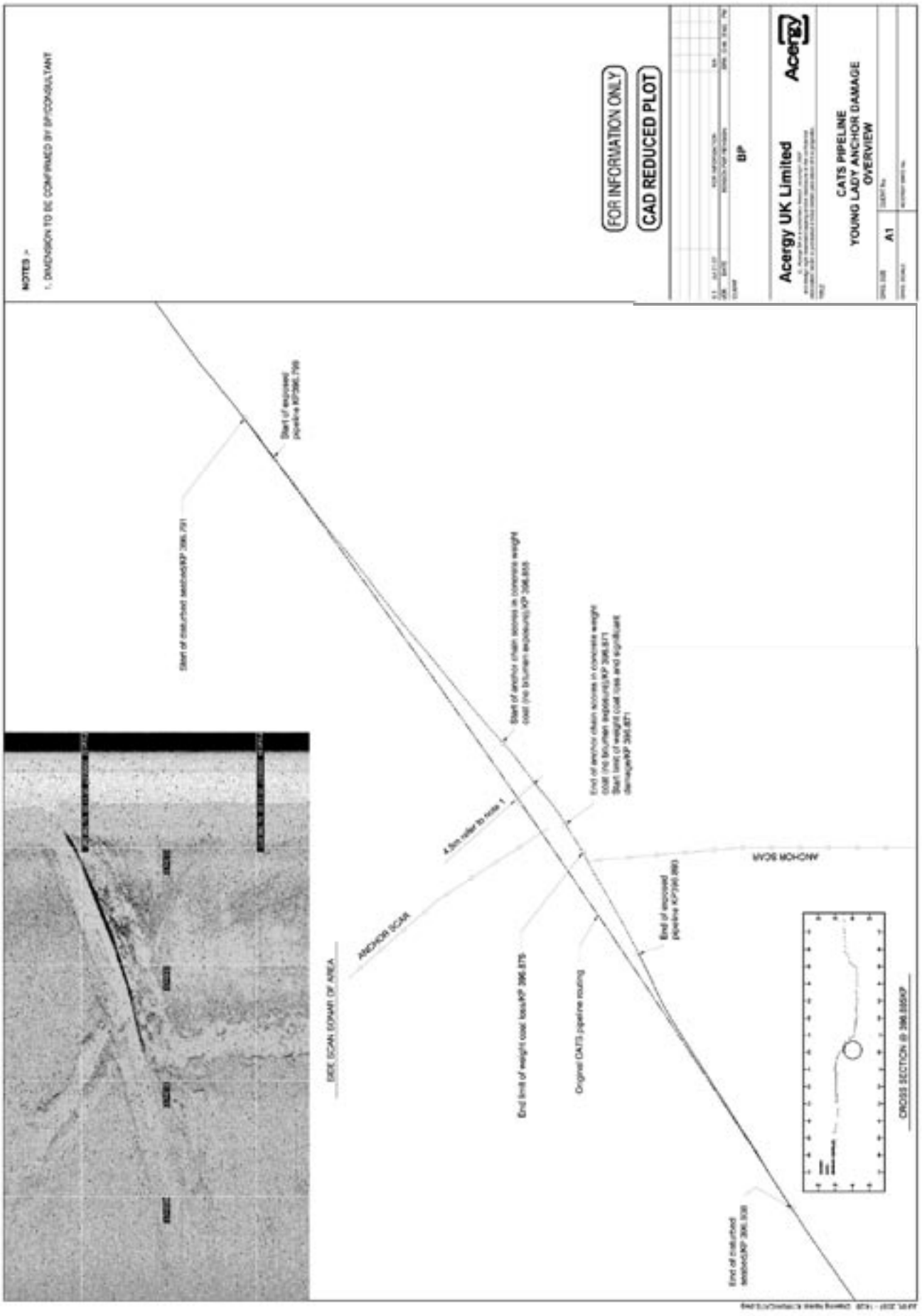
To ensure the pipeline was negatively buoyant, it was clad in concrete. To ensure the pipeline was stable as it reached the shore and crossed the shore line it was trenched (surface of the pipe level with the sea bed) from 20km offshore to 5km, and buried (surface of the pipe 2m below the sea bed) from 5km offshore until inland.

1.10.3 Damage sustained

By 1 July, the ROV survey conducted by BP was able to provide an assessment of the damage suffered by the CATS pipeline as a result of the snagging caused by *Young Lady*'s anchor.

Importantly, the inspection showed that there was no loss of containment.

A side scan sonar image was able to identify a trench in the sea bed north of the pipeline running in a south-easterly direction, and a second trench south of the pipeline, running in a south-south-easterly direction **(Figure 16)**. The trenches were consistent with the approach of *Young Lady*'s anchor, and its track once she broke free of the pipeline.



Profile of CATS Pipeline in relation to sea bed

Once the extent of the damage to the CATS pipeline had been identified, BP contacted the SOSREP and an exclusion zone was established in the vicinity of the damaged section of pipeline.

The full damage assessment, conducted by ROV and diver survey, indicated that the pipeline had been lifted 1.5m, moved laterally at the point of contact by 6m in a south-easterly direction, and had been partially exposed over a length of about 170m. The concrete protection had been removed at the point of contact, and impact damage was identified on the steel pipe.

1.10.4 Damage consequences

Because of the damage sustained by the pipeline, there was an initial pressure reduction from 112 bar g to 105 - 107 bar g. On 29 June, CATS was carrying 220mmscf. These rates continued until 1 July when the pipeline was closed. During the shut down period, pressure was stable at between 108 and 106 bar g.

On 7 July, flow via CATS was re-commenced to reduce the operating pressure to 90 bar g and, by 9 July, the use of the riser flare had reduced the pressure further, to 55 bar g. The reduced pressure allowed a diver inspection to take place and repair to commence. Supply fields which were inactive due to maintenance were unable to return to production until the damage had been fully assessed.

By the end of July 2007, BP had completed the repair assessment. Primary damage was to the concrete coating, but there was sufficient concern about the damage to the pipeline itself to require the installation of a repair sleeve, which was carried out in August. The pipeline was covered and protected where it lay, and production was restarted in September 2007.

1.10.5 Risk Assessment responsibilities

The Pipeline Safety Regulations (SI 1996 No 825) require the pipeline operator to produce a Major Accident Prevention Document (MAPD) for the pipeline. The MAPD is required to:

- Identify all of the hazards associated with the design and operation of the pipeline.
- Evaluate the risks arising from the hazards.
- Ensure the safety management system is adequate to ensure that the risks identified are as low as reasonably practicable.
- Provide adequate arrangements for audits and reporting.

The administration of the legislation is undertaken by the HSE.

Initially the operator was guided on the contents and production of the MAPD through instructions drawn from BS 8010 Part 3 - Code of Practice for Pipelines. This document was superseded in 2004 by ISO/BS/EN 14161 - Standards for Pipelines On and Off-shore. However, the document was deemed less user-friendly than the original, and it was quickly overtaken by Published Document (PD) 8010-2: 2004 as the

main source of guidance to the industry. Another highly regarded source of guidance to pipeline operators is PS-F101 - Submarine Pipeline Systems, published by DNV, which was used for the design and construction of the Langaled pipeline MAPD.

Typically, the MAPD would contain a description of the operation, the organisation, safety management aspects, risk management and mitigation. Importantly, as part of the CATS MAPD, a pipeline integrity management scheme (PIMS) was developed to manage the ongoing integrity of the CATS pipeline and the conduct of risk assessments.

The production and consideration of the MAPD provides an important link between the CATS Pipeline operator, the HSE and DBERR.

1.10.6 CATS MAPD – Shipping Hazards

Relevant to this incident, the CATS MAPD had identified two significant hazards:

1. Impact by shipping (collisions and grounding).

   The associated consequences for impact by shipping, identified excessive strain, partial failure and, in the case of severe impact, a full bore rupture of the line.

   The key mitigation measures adopted to manage the hazard were:

   - From the shore out to 5km offshore, the pipeline was buried to a depth of 2m
   - From 5km offshore to 20km offshore the pipeline was 'trenched' (the top of the pipeline level with the sea bed)
   - From 20km onwards the line ran above the sea bed.
   - In areas of crossing pipelines, one of the lines was trenched below the other.

2. Anchor / fishing damage.

   The key mitigation measures adopted to manage the hazard were:

   - A 5-cable exclusion zone either side of the pipeline out to the limits of the Teesport harbour limit.
   - Monitoring of shipping movements and anchoring in the vicinity of the pipeline by Tees Ports Control.
   - A 50mm concrete coating around the line.
   - An exclusion zone around the riser platform.
   - Isolation valve within the platform exclusion zone.
   - Concrete protection placed over valves.

1.11 SAFETY MANAGEMENT

1.11.1 Scinicariello ship management

A comprehensive safety management manual provided instructions for when the vessel was at anchor, specifically:

- Section OPS. 13 – Precaution when the ship is at anchor.
- Section OPS. 14 – Anchor position and use.

Both sections can be found at **Annex B**.

1.11.2 Master's standing orders

The master's standing orders also contained seven instructions for the OOW to follow when the vessel was at anchor. The master's instructions were straightforward and appropriate, and had been acknowledged by signature, confirming that all four deck officers had read and understood them.

1.11.3 Tees Ports Control

The port had a comprehensive integrated management system. Four procedures were particularly relevant to this incident:

- 761-101 Anchored ship

  The DAHM is to be aware of the current position of anchored ships. In the case of a vessel anchored outside the port jurisdiction the DAHM is to verify that the ship is aware of a gale warning when, in his opinion, the direction of the forecast wind is such that dragging of a ship's anchor could result and, the ship or an undersea pipeline could be placed at risk.

  During the period at anchor, the vessel's position should be monitored frequently to ensure that any movement, e.g. dragging, is noticed and brought to the vessel's attention.

  After a vessel has weighed anchor, details should be recorded on the Anchor/ Steaming program of the computer.

- 761-102 Oil and gas pipelines in Tees Bay

  Whenever the alarm equipment is known not to be operating correctly, the DAHM should monitor the pipeline areas frequently for any shipping close to either of the areas.

  If, for any reason, a vessel requires tug assistance to avoid posing a threat to the Ekofisk or CATS pipeline (e.g. anchor dragging and unable to use main engines), the DAHM is to arrange assistance accordingly (in the case of the CATS pipeline, see Amoco's letter of 02 May 1995 **Annex C**).

- 772-102 Tees harbour radar

  The DAHM is to ensure that when any fault occurs in the radar system it is appropriately recorded in accordance with standard 781-103. Details of any 'untoward' happenings (lost or swapped targets and fault alarms) should be recorded in the radar recording log.

- 781-103 Port operations centre equipment failure

  All items of port operations centre equipment are to be monitored regularly to ensure that they are functioning at maximum efficiency. Any item not functioning correctly is to be recorded on an appropriate form.

All of the above procedures can be found at **Annex D**.

1.11.4 MCA CPSO

Coastguard publication CG3 (volume 7 chapter 3) provides guidance for watch managers, including when to notify the duty CPSO of actual or potential pollution incidents and salvage incidents.

Section 1.3 lays down the information required for the watch manager to make a full assessment of the case, and, in the first instance, whether the vessel is anchored, anchoring or drifting. Specifically, the information required should be obtained from the vessel, and before making a risk assessment the watch manager should establish:

- Position relative to the shoreline.
- Forecast weather.
- Tidal conditions.
- Type of bottom for anchor holding.
- Availability of tugs.

If the watch manager is satisfied that the incident is of a minor nature then he might decide not to alert the CPSO. If in doubt, the duty area officer should be informed, and a further assessment made.

There are, however, occasions when the CPSO must be contacted for a 'broken down' vessel:

- Which is anchored, anchoring, or drifting within 2 miles of land.
- Which is anchored outside port limits without means of support (i.e. tug on stand by).
- Which requires more than 6 hours to effect repair.
- When the weather forecast is greater than force 6 on a lee shore.
- When the weather forecast is greater than force 8.
- When the vessel is greater than 30,000 tonnes deadweight.
- When the vessel's cargo has shifted.
- When the vessel has sustained damage or fire.
- If the vessel is drifting into danger in less than 3 hours.
- When a tug or emergency towing vessel has been deployed.

In respect of incidents involving the offshore industry, if the watch manager is satisfied that the incident is of a minor nature and is being effectively controlled he might decide not to alert the duty CPSO. However, the duty CPSO should be notified in respect of any damage sustained to any part of a pipeline.

1.12 SIMILAR ACCIDENTS

1.12.1 Interaction with gas pipelines

There have been two previous incidents involving tankers snagging a gas pipeline.

In 1996, *Kandilousa* was fully loaded with 47,000 tonnes of heavy fuel oil and dragged anchor in bad weather off the Humber estuary. The crew failed to note the charted Amethyst gas pipeline. While dragging, the windlass failed and the cable ran out to the bitter end. The anchor snagged the Amethyst pipeline, parted an ethylene feeder line and a power cable. The gas pipeline remained intact. The accident necessitated the shut down of the supply platforms for several weeks.

In 1997, *Capella,* deadweight 32,936 tonnes, also dragged anchor in bad weather off the Humber estuary. As the anchor was being recovered, the clutch disintegrated, but the cable was snubbed using the brake. The cable was observed to be leading aft, and it was assessed that the anchor had snagged on the Amethyst gas pipeline. Although the pipeline was not breached, a power cable was parted and production halted.

The two accidents led to the introduction of the Humber estuary deep water anchorage, designed to increase the distance between large anchored vessels and the gas pipelines in the vicinity **(Figure 17)**.

1.12.2 Interaction with an oil pipeline

On 14 March 1977, the Liberian registered tanker *Marion,* deadweight 47,779 tonnes, was approximately 4nm from the Tees fairway buoy when the master contacted the pilot station by VHF radio to confirm that the proposed anchorage position of 1nm north of the fairway buoy was suitable. The position was confirmed as satisfactory. Over the next 3 days, the vessel communicated with both the harbour office and the pilot station, and there was no indication given that the anchor position was unsuitable.

In preparation for entering port, the vessel was unable to weigh anchor. It became evident that the anchor was fouled on the Phillips (Ekofisk) pipeline and the anchor plus two shackles of cable had to be slipped. Damage to the line resulted in mainly deep scratches, and repairs were completed in 1978.

The chart on board the vessel had not been fully corrected and as a consequence the master was unaware of the Phillips (Ekofisk) pipeline.

At the time, the harbour office had a Kelvin Hughes photoplot radar, which was used only in times of reduced visibility. The accident resulted in Teesport procuring a radar with a guard zone facility, and 10 years later an extension to the limit of jurisdiction was approved.

1.12.3 Vessels dragging anchor

The MAIB database shows that since 1992 there have been 20 accidents in United Kingdom territorial waters that involved merchant vessels of over 500 gross tons dragging their anchor and subsequently grounding. Key factors to the groundings were: the chosen anchoring position, the length of cable veered, weather conditions, and the main machinery's notice of readiness.

Two recorded incidents, in 1997 and 2006, occurred in the Tees Ports Control anchorage. Both vessels were unable to heave in on their cable in wind strengths of force 7 to 9.

1.12.4 Uncontrolled release of cable

A further eight incidents were recorded on the MAIB database which involved an anchor cable running free. The incidents were due to a combination of brake reliability, human error, and windlass power failure.

Figure 17

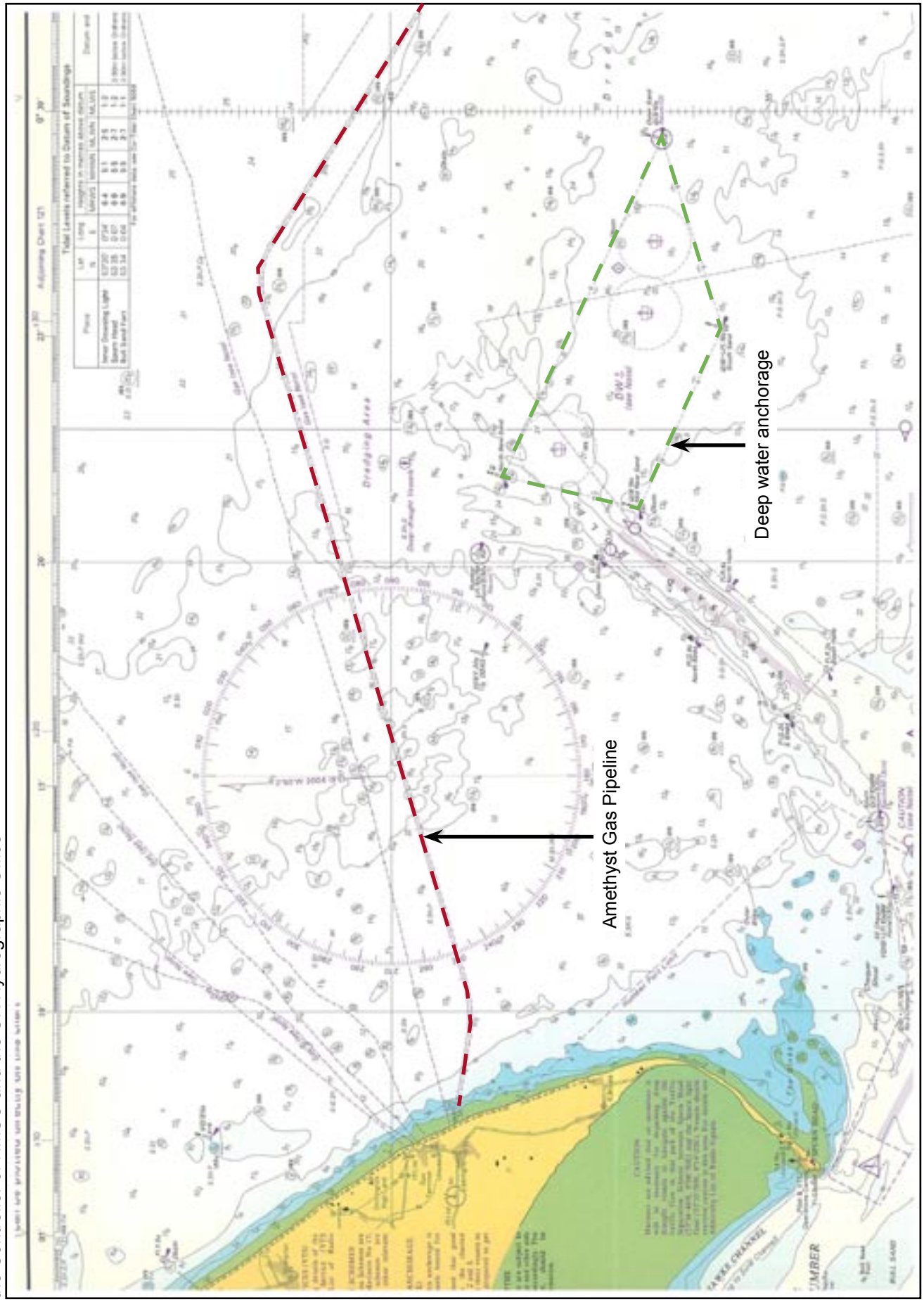


Chart illustrating deep water anchorage and the Amethyst Gas Pipeline

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

Given the busy trade that the vessel operated, *Young Lady'*s manning scale provided eight crew in addition to that required by the minimum safe manning certificate. The additional manpower gave considerable flexibility to the heads of department, and reduced the impact on hours of rest requirements.

Records showed that the hours worked were broadly in line with the 'table of shipboard working arrangements' and that, as a consequence, the average daily hours of rest obtained by officers and ratings was 14 hours. The hours of rest were in excess of the ILO convention requirements, and the working routine on 25 June allowed normal hours of rest to be achieved prior to the incident.

Fatigue, therefore, is not considered a contributory factor in this incident.

2.3 ANCHORING PROCEDURE

2.3.1 Choice of anchorage

Initially, this was to be another routine anchorage for the master and for *Young Lady*. The master had contacted VTS before arrival, and was advised that specific anchorages were not allocated at Teesport. He was content that by heeding the advice provided by the DAHM, keeping clear of other vessels anchored in the vicinity, and by dropping anchor in about 30m of water, the anchorage would be safe until the vessel was required to enter the port.

Subsequently, the master chose to drop the port anchor and veer 7 shackles of cable on deck in relatively benign conditions. A weather forecast received on board, which had been issued by the meteorological office 12 hours before anchoring, gave an outlook of strong winds for all areas and gales for a time. This forecast was not considered during the planning phase for the anchorage.

As his Night Orders show, the master was aware of the warning in the Admiralty Sailing Direction, and conscious that the weather conditions were deteriorating. Nevertheless, he chose to remain at the anchorage. He was unaware that the quality of the holding ground was, at best, only moderate, and that it was common for vessels to drag anchor in this area in the forecast weather conditions. This was reaffirmed by another vessel dragging anchor overnight on 25/26 June, just to the north of *Young Lady*.

Given the forecast, that *Young Lady'*s chosen anchorage was exposed to northerly winds and had only moderate holding ground, and that the sea and weather conditions were approaching the limitations used by classification societies for anchors and equipment, the anchorage was unsafe.

2.3.2 Scope of cable

For an anchor to hold effectively it is necessary to calculate the correct length of cable to use. There are two commonly used formulae:

1[3] . Number of shackles of cable = 1.5 x √ Depth in metres or;

2[4]. Length of cable in metres = 6 to 10 x the depth in metres

The depth of water anticipated at *Young Lady's* anchoring position at high water was approximately 36m. Using the first formula, this would have required √36 x 1.5 = 9 shackles of cable. Using the second formula, this would have required between 8 shackles (6 x 36m = 216m = 8 shackles) and 13 shackles (10 x 36m = 360m = 13 shackles).

In electing to use 7 shackles 'on deck', the master was using less than the minimum necessary. Had he calculated the correct length of cable to use, and taken into account the weather forecast, the master would have realised that significantly more cable was required.

Using the correct scope is essential if the maximum holding power of the anchor is to be realized, particularly in adverse weather conditions. If, as in this case, less cable is used, the effects of yawing caused by the wind, and the effect of pitching caused by the swell, greatly increases the risk of snatched loads being applied to the anchor. Furthermore, there is a greater risk that the cable will be lifted off the sea bed, with the resultant pull containing a vertical component which significantly increases the likelihood of the anchor tripping. The effect of the scope angle on an anchor's holding power can be seen from the graph in **Figure 18**.

2.3.3 Summary of actions

Despite the forecast weather, the master of *Young Lady* did not take the advice given in the Admiralty Sailing Directions and remained in the anchorage. While recognising that the weather conditions were deteriorating, he ordered that the cable be veered to 8 shackles on deck. This was a decisive phase when the master consciously made a decision to remain at the anchorage. Even at this late stage, had considerably more cable been veered in line with the guidance contained in the OCIMF guide, it might have held the vessel secure when conditions worsened.

The vessel was in a ballast condition and had a considerable windage area. The scope of cable was insufficient to counter the additional loading from the pitch and yaw caused by the exposed nature of anchorage, or to counter the effects of the vessel 'sailing' off the wind. The safer and more seamanlike approach, taken earlier that evening by other vessels in the anchorage, was to weigh anchor and ride out the storm at sea.

It was probably the master's previous experience of dragging anchor on this vessel that had given him a false sense of security, and a false belief in his ability to recover the situation once dragging had started.

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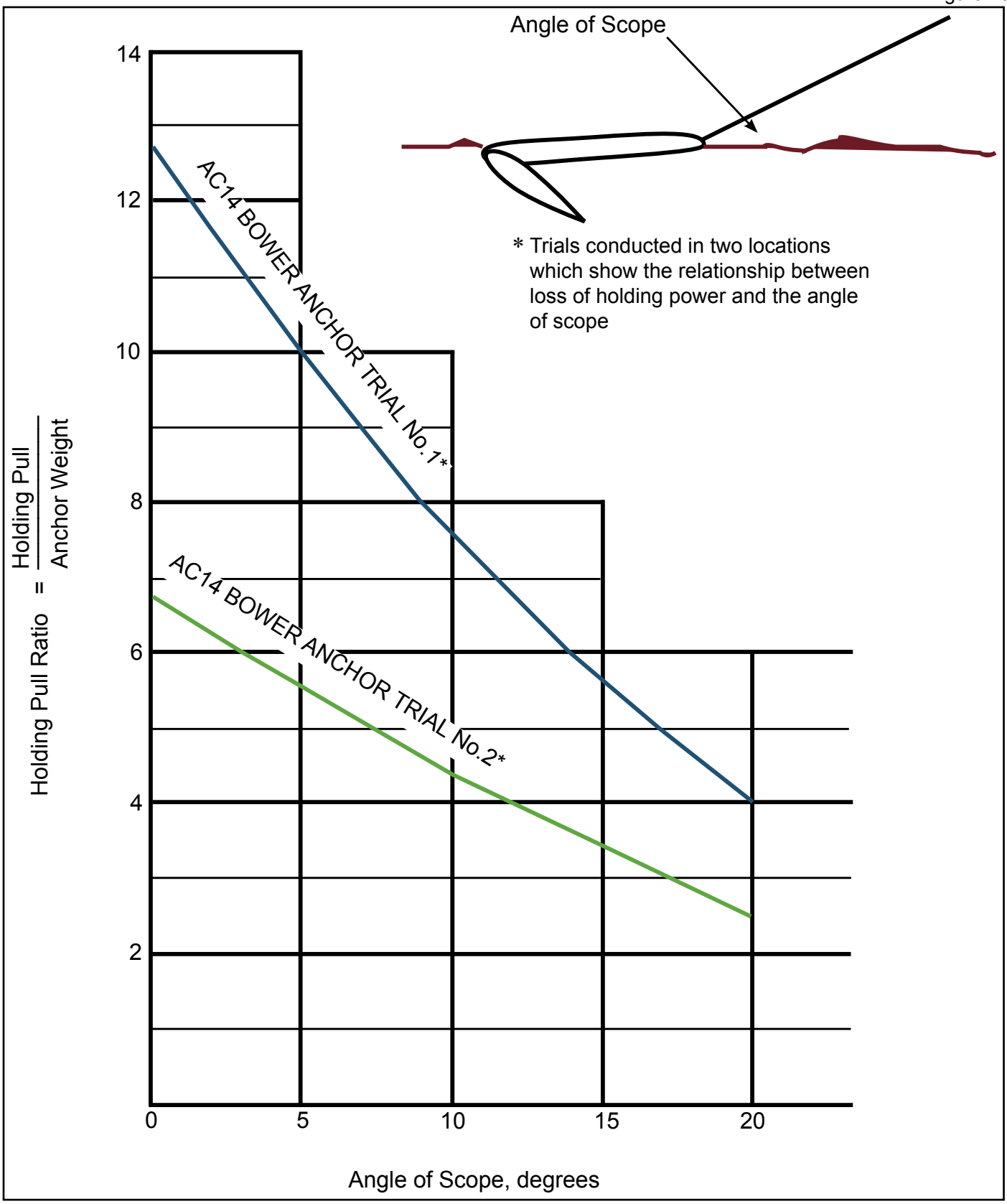
[3] Admiralty Manual of Seamanship Vol III

[4] Oil Companies International Marine Forum - Anchoring Systems and Procedures for Large Tankers

Figure 18



The effect of scope angle on an anchor's holding power

Source data courtesy of Oil Companies International Marine Forum (OCIMF)

Had the master been fully acquainted with the guidance provided by OCIMF – Anchoring Systems and Procedures for Large Tankers, he would have better understood the requirements for safe anchoring and some of the potential risks that needed to be considered. Had the master been provided with meaningful ship-specific data in respect of anchoring equipment, it might have helped him to recognise earlier that the weather conditions were becoming marginal, and the equipment was reaching its design limitations.

2.4 ACTION TO WEIGH ANCHOR

When the master of *Young Lady* was informed by the OOW that the vessel was dragging anchor, he gave immediate orders to make ready the main engines and the anchor party to stand by, forward. He did not choose to veer more cable, nor did he elect to drop the second anchor, either underfoot to reduce the vessel's yaw, or at the extremity of a yaw in order to lie to both anchors.

Although the engine was on short notice and was ready within 13 minutes, the vessel was by then dragging quickly, and was already moving over the ground at about 3 kts. If the anchor party was to have any chance of recovering the anchor and cable, it was imperative that the master gained control of the vessel to reduce the speed over the ground, and thus the weight on the cable.

Given the size and manoeuvrability of *Young Lady;* that the rudder and propeller were only two thirds immersed; the prevailing wind and sea conditions; and significant ship motion; for the master to regain control of *Young Lady* was going to require considerable ship handling skills.

Key to regaining control was the need for positive and committed use of the main engine. However, it was 29.5 minutes from the time dragging of the anchor was first identified before the main engine was ordered 'slow ahead', the first real attempt made to control the vessel's rate of drift. AIS recordings showed that the use of 'half ahead' on two subsequent occasions did have the desired effect of reducing the rate of drift. However, these manoeuvres were more driven by the master's concern about the vessel's proximity to the CATS pipeline, than by measured ship handling.

Positive control of *Young Lady* was never really achieved, and the vessel continued to yaw and pitch wildly. When the third joining shackle was clear of the water, 'half ahead' was being used to gain ground away from the CATS pipeline. An option available to the master at this point, given the seriousness of the developing situation, was to fully secure the anchor (including the use of the compressor bar), and clear the forecastle of all personnel. Given that fewer than 2 shackles of cable remained on the sea bed, it might then have been feasible to dredge the anchor and clear *Young Lady* from the immediate danger posed by the CATS pipeline.

However, the master continued manoeuvring and, with the cable leading almost astern (3 shackles in 36m of water), there was no catenary to absorb the massive loads being applied directly to the windlass machinery. Ultimately, the hydraulic motor suffered catastrophic failure, and the cable ran out.

In his belief that the successful recovery of the anchor and cable was imminent, the master's ship handling prior to the motor failing had been restrained. Had he been aware that the conditions were marginal, and that the windlass equipment was reaching its design limitations, the master's earlier actions to regain control of the vessel through use of the engine might have shown more commitment.

As the cable payed out to the bitter end, the weight of the vessel transferred to the bitter end securing arrangement. With the windlass broken, it was not possible to relieve the strain on the bitter end securing arrangements. Despite strenuous efforts, the crew were unable to slip the bitter end of the cable.

This type of accident had never been envisaged on board. As a consequence, there was no plan or emergency procedure for the crew to follow. This incident shows that there is a need for owners and masters to plan for such an eventuality, and develop a contingency plan or a design that allows the cable to be slipped safely when the bitter end is under tension.

2.5 FAILURE OF THE WINDLASS MOTOR

2.5.1 Inspection of the motor

Two independent inspections of the hydraulic motor were carried out[5].

The inspections revealed that:

- The shock load applied to the windlass was massive, sufficient to generate a hydraulic back pressure probably in the region of 800 bar. This was nearly four times the normal operating pressure.
- Hardness checks confirmed the casting to be within specification.
- The high pressure caused cavitation damage to the motor and the Oldhams coupling to fail.
- The motor was not designed with a dedicated pressure relief valve.

2.5.2 Reason for the failure

Despite the presence of two pressure relief valves incorporated into the hydraulic system, set to lift at 240 bar, the volume of hydraulic oil that needed to be relieved was too great for the system to accommodate. As a result, the weakest part, in this case the motor casting, failed catastrophically **(Figure 19)**.

The relief valves were not part of a planned maintenance system, but under normal operating circumstances the motor manufacturer would not expect them to be. It is probable that the relief valves were functioning correctly based upon earlier operation of the windlass recovering the first 5 shackles of cable. Under these circumstances, maximum hydraulic pressure would have been reached, heaving stalled, and the hydraulic fluid re-circulated until the pressure decreased.

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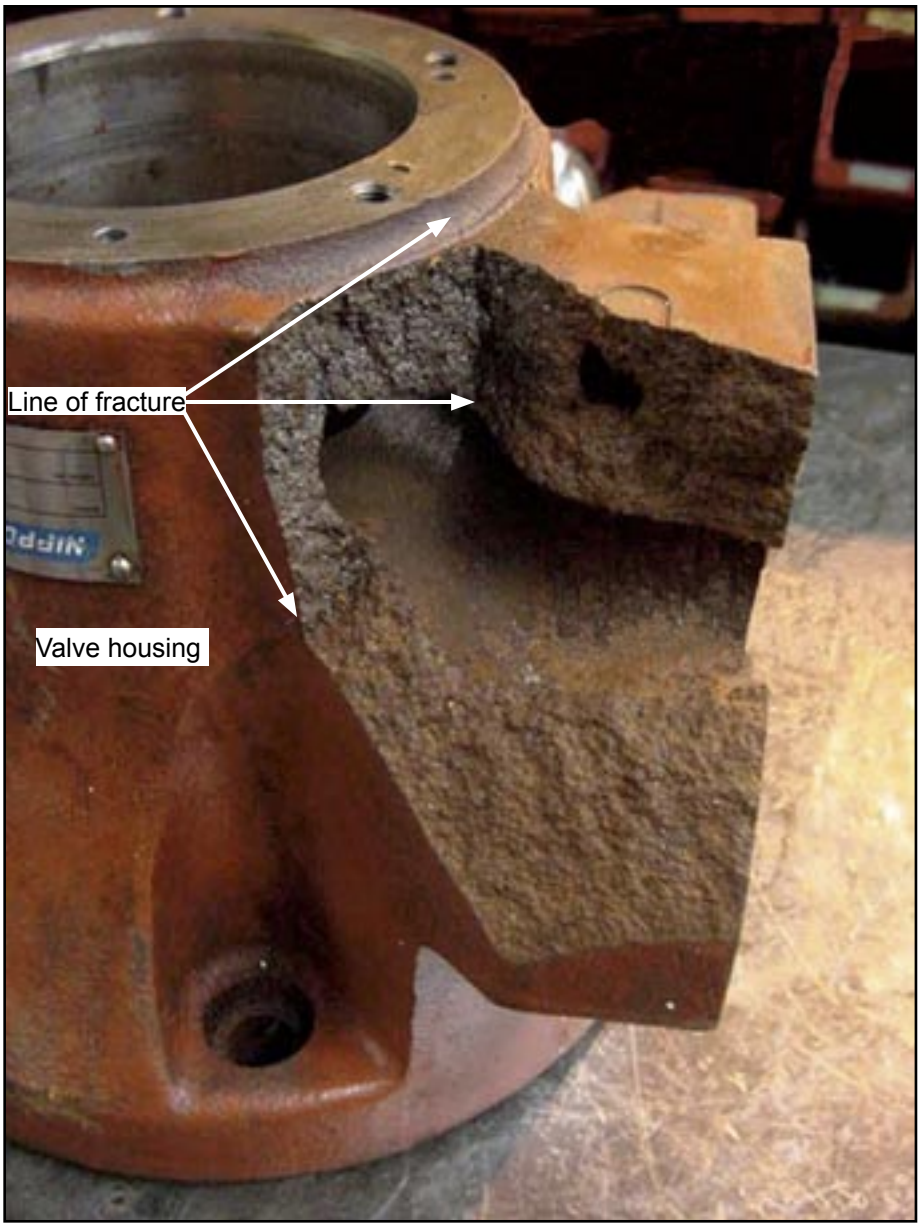
[5] London Offshore Consultants 25 June 2007, Kawasaki Precision Machinery 01 October 2007

The windlass design specification met all the classification society's requirements; in particular, the pulling force required to recover the anchor and cable in the given time. The assumptions made by classification societies stipulate that:

> *'The equipment is therefore not designed to hold a vessel off fully exposed coasts in rough weather or for frequent anchoring operations in open sea. In such conditions the loads on the anchoring equipment will increase to such a degree that its components may be damaged or lost owing to the high energy forces generated'*

Comparison of the required and the actual capacities showed that there was little reserve power over and above the minimum required. When confronted with the weather conditions of 25 June, and when due consideration is given to the advice provided by the classification society, the potential risk of windlass failure was significantly greater than that faced under normal operating conditions.

Figure 19



Damage to motor casing

2.6 PROCEDURAL DEFENCE OF THE PIPELINE

Any procedure to try and avoid damage to a pipeline from a vessel dragging her anchor would require:

- Monitoring of the area to detect the presence of the threat.
- Alerting of those best able to take action: in this case the CATS terminal shift team leader, Teesport's harbourmaster, Humber MRCC and, if appropriate, SOSREP.
- Actions to prevent and/or mitigate the consequences of a snagging.

2.7 MONITORING OF THE ANCHORAGE

2.7.1 *Young Lady*

The OOW on board *Young Lady* had closely monitored the vessel's position, fixing by a variety of means. The result was that he identified the vessel dragging early, promptly alerted the master and, subsequently, the duty engineer and anchor party. The overall effect was to have the vessel ready to respond within a short timescale.

2.7.2 Tees Ports Control

Although *Young Lady* was anchored outside of Teesport's statutory harbour authority limits, the port operations centre had a responsibility to monitor the position of anchored vessels within its radar coverage of Tees Bay. This responsibility was outlined in article 761-101 of the port's integrated management system, which required that a vessel identified to be dragging anchor should be notified immediately.

Currently, a notice on BA chart 2567 advises vessels not to anchor or trawl within 2.5 cables of the Ekofisk oil pipeline or the CATS (Everest) gas pipeline. *Young Lady* was initially anchored 1.5nm from the CATS pipeline and dragged 1.2nm before the windlass exploded. The statutory harbour authority limits extend 5 cables either side of the Ekofisk pipeline, and provide Teesport with the necessary powers to keep the area clear of shipping. Had the CATS pipeline had similar statutory harbour limits surrounding it, it is unlikely that these powers would have significantly changed the outcome of this incident. However, the ability to better control shipping in the vicinity of the pipeline, yet outside the current statutory harbour authority limits does require closer examination, specifically the need for:

- Designated anchorages.
- Extending statutory harbour authority limits.
- Powers to order the departure of a vessel from an anchorage.
- Operational guidelines for anchoring in the area.

Shortly before 2200 on 25 June, the VTS radar picture showed *Young Lady* drifting to the south and, at 2206, the anchor symbol alarmed by flashing red, shortly followed by a red notification light. The DAHM had not observed the visual alarm, and was unaware that the audible part of the alarm was defective.

The defect was an intermittent fault, which had previously been reported to the deputy harbourmaster. The manufacturer had not been called in to rectify the fault because of the potential difficulty replicating it. The result was that the defect remained unresolved.

The integrated management system had been revised to include a section covering procedures when it is *'known that the alarm equipment is not operating correctly'*. In this case, however, the operator was probably unaware of the fault. Knowledge that an intermittent fault existed should have triggered the development of a procedure to guard against a recurring fault impacting on safety.

During the DAHM's absence, *Young Lady'*s master reported that the vessel was dragging anchor, information that the VTSO passed to the DAHM on his return. The VTSO thought that the DAHM acknowledged the brief, but was not surprised at his lack of concern; this was a familiar occurrence, vessels frequently dragged anchor and then proceeded to sea.

The first time the DAHM took an interest in the incident was when he received the telephone call from an on-duty pilot who had identified that *Young Lady* had already dragged to the south of the CATS pipeline. The telephone call highlighted that the DAHM was confused and unclear about the events that already had, and still were, unfolding. At one point during this conversation it was apparent that the DAHM believed *Young Lady* had manoeuvred clear of any danger and would probably re-anchor to the north of the pipeline.

The explanation by the pilot was the sole reason for the DAHM understanding the consequences of what had happened to *Young Lady*, in front of him on the radar screen, over the preceding hour.

Had the DAHM appreciated the developing situation, and monitored the progress of *Young Lady* at an earlier stage, this could have provided an early warning of the developing risk and the initiation of an appropriate contingency plan.

2.7.3 HM Coastguard

Humber MRCC had no radar coverage of the area off Teesport, and had not considered using AIS as a tool to detect vessels dragging in the vicinity of pipelines. Given the lack of an automated system for detecting anchored vessels in close proximity to pipelines, it would be unreasonable, given the size of its area of responsibility, to expect Humber MRCC to utilise its resources in this way.

2.8 ALERTING PROCEDURE

2.8.1 *Young Lady*

Once *Young Lady*'s main engine was available and the vessel had commenced weighing anchor, the master informed Tees Ports Control of events on VHF channel 14. Believing that he had met his obligation to report the incident, he had not considered calling the coastguard on VHF channel 16. Situation updates were similarly reported to the Tees Ports Control on channel 14. As a result, the coastguard was unaware of the developing situation and unable to initiate any form of early response.

Not all coastal states have a coastguard, and many masters consider that communication with the local harbour authority or VTS is, in effect, communicating with the coastal state. While better education of masters might improve their interaction with the coastguard, a more realistic measure would be to institute formal criteria for local maritime authorities to notify HM coastguard of incidents and accidents; this would help to ensure that the coastguard is kept accurately informed of developing situations in a timely manner.

2.8.2 Tees Ports Control

When the master of *Young Lady* called Tees Ports Control to update them on the problem experienced with the windlass, the DAHM failed to grasp the importance of the call and, specifically, that *Young Lady* had already dragged over the CATS pipeline.

It was only during the DAHM's subsequent telephone conversation with the on-duty pilot, that he became aware of the seriousness of the situation. Eighty five minutes had elapsed since *Young Lady* started dragging anchor, and 70 minutes since the master made the initial call to Tees Ports Control. By then, *Young Lady* had snagged on, and subsequently crossed the pipeline. Had positive action been taken either when the anchor drag alert illuminated on the DAHM's radar screen, or when *Young Lady's* master first reported his problem to VTS, it might have been possible to prevent *Young Lady*'s anchor from dragging across the pipeline, or at least take action to mitigate the potential consequences of this.

At 2340, after *Young Lady* had crossed the pipeline, and minutes after the master informed VTS of his intentions to slip the cable, the DAHM alerted the harbourmaster at home. Regrettably, even at this late stage, the seriousness of the situation failed to stimulate the DAHM into informing the pipeline operator or the coastguard. It was only an incoming call from Conoco-Phillips (Ekofisk pipeline), who had overheard the VHF conversation, which led the DAHM to conclude that the pipeline operator was aware of the situation. Unfortunately, the DAHM failed to appreciate that Conoco-Phillips did not operate the CATS pipeline.

The result was that the CATS terminal was eventually informed 2 hours and 20 minutes after *Young Lady* started dragging anchor. Because the CATS pipeline operator reported that there was no drop in line pressure, this reassured the DAHM that the situation was under control and no longer needed to be considered a potential emergency situation.

Although there was no explicit requirement laid down within the integrated management system for him to do so, the DAHM did not report the incident to the coastguard because there was no immediate danger to life. The potential for *Young Lady* to encounter greater danger by dragging onto a lee shore was ignored.

There were several shortfalls in the alerting procedures:

- Failure to follow up on the events detected by VTS radar and, information received from the vessel.
- The absence of a formal requirement for the early reporting of the incident to the coastguard.
- The absence of an effective action response plan for the DAHM to follow.
- The absence of agreed procedures between pipeline operators and the port.

2.8.3 HM Coastguard

Once the coastguard had been informed of the incident by the OIM, they were finally in a position to influence events at the scene.

Although serious flooding in the Humber region was occupying a great deal of the coastguard's attention, the organisation did not feel overstretched, or feel the need to request assistance from neighbouring Great Yarmouth MRCC.

Having received the initial report from Aberdeen MRCC, the Humber MRCC watch manager contacted the Tees Ports Control DAHM to establish the facts. Unbeknown to the coastguard, the DAHM was probably not the best person to provide a complete situation report. In the event, he reassured the watch manager that the situation was under control because the pipeline was still, apparently, intact.

If, as a matter of course, the coastguard watch manager had directly contacted *Young Lady*, he would have received a more factual and realistic account of the incident and would then have appreciated the constraints faced by the master. Specifically: the current weather conditions, that the cable could not be released, that the vessel had already dragged 2.1nm, and that it had only another 2.3nm to drag before grounding on a lee shore. As a result, the coastguard would have been better placed to determine the potential for a further emergency, and might also have recognised that some of the triggers laid down in the Counter Pollution and Response Manual had already been reached.

2.9 ACTION

There is little an OIM can do to mitigate the consequences of a pipeline breach before it occurs, apart from attempting to de-pressurise the pipeline and close-up emergency response personnel. De-pressurising the pipeline is a very protracted evolution and, in this situation, would not have been achieved effectively even had maximum notice of the impending accident be given.

Any action to avoid a breach must, therefore, focus on the vessel. Had *Young Lady*'s movements been closely monitored as she dragged towards the pipeline, and the master been asked for regular situation reports, consideration might have been given to directing the master to:

- Slip his cable
- Veer more cable
- Drop his second anchor
- Steam away from the pipeline dredging his anchor, until he had sufficient sea room to slip the cable safely.

Even after *Young Lady*'s windlass failed and the cable ran out to the bitter end, the options of dropping the second anchor or steaming clear of the pipeline still existed.

Consideration could also have been given to tasking a tug to proceed to the vessel. A suitable tug was available in Teesport. Although it could not have reached the scene before *Young Lady* snagged on the pipeline, had the vessel remained snagged the early arrival of a tug might still have been able to prevent a pipeline breach. In this case, luckily, *Young Lady*'s anchor came free of the pipeline during an extreme yaw

only 8-9 minutes after she snagged. However, the vessel then continued to drag and eventually lay 2.3nm off a lee shore for 12 hours while the crew changed the windlass motor. A tug would have been able to pass a tow to *Young Lady* and take the weight off the anchor cable, allowing the crew to slip the bitter end much earlier.

For any of these actions to have been taken, it required the CPSO and possibly the SOSREP to be informed at the earliest opportunity.

2.10 POTENTIAL CONSEQUENCES OF A BREACHED GAS PIPELINE

2.10.1 Shipping

Had the CATS pipeline suffered a breach, then the consequence to shipping is suitably described in Annual Notice to Mariners number 24:

> '*a vessel causing damage to a pipeline could face an immediate hazard either by loss of buoyancy due to gas aerated water, or by fire or explosion, and result in an environmental hazard*'

2.10.2 Pollution

Commonly, under-sea oil and gas pipelines operate at high pressures and do not have any isolation valves between the riser platform and the shore terminal. Any breach would, therefore, result in the contents of the pipeline escaping. In the case of a gas pipeline, the pollution hazard will vary dependent upon the gas composition, but is likely to be relatively minor. However, breach of a similar oil pipeline - noting the CATS pipeline was 251nm long - would result in serious oil pollution.

2.10.3 Impact on the United Kingdom gas supply

Because the incident occurred in summer, the demand for gas was low and the subsequent impact on the United Kingdom gas supply was not significant. If the incident had occurred during the winter months, when demand could potentially reach a peak of between 350 and 450 million m^3 per day, the impact would have been considerably greater and thus caused concern for DBERR.

This incident should not, however, be considered in isolation. The demise of the United Kingdom's own gas reserves, and the increased importance being placed on gas imported by pipeline, requires careful examination.

Gas is currently imported through four major east coast sites, including Teesport. One such site has a line importing around 70 million m^3 per day, which runs close to a storage line capable of supplying about 45 million m^3 per day when required. This equates to nearly 30 percent of peak United Kingdom demand. Both pipes are key strategic supply lines, entering the shore facility in the proximity of a major deep water anchorage and should be considered vulnerable to snagging by large anchors. An adjacent gas line has previously been subjected to snagging on two occasions, and the financial and environmental implications of a similar incident resulting in a breach should not be underestimated.

2.11 CATS PIPELINE SAFETY ASSESSMENT

2.11.1 Guidance

The current Code of Practice for Pipelines – Sub-sea Pipelines, PD 8010/2: 2004, is intended for use by designers, manufacturers and operators of pipelines. It gives recommendations and guidance on the design, construction, installation, testing, and commissioning of sub-sea pipelines in the offshore, near-shore and landfall environments. Specifically, PD 8010/2: 2004 recommends that the operator considers the following hazards from external sources such as shipping:

- Fishing. Particularly equipment such as trawl boards, beams and chains.
- Anchoring.

  '*Anchors are normally designed to penetrate the seabed. During deployment/recovery and in severe weather conditions, anchors can be dragged along the seabed for considerable distance, resulting in severe seabed scarring.'*
- Dropped objects.
- Marine vessels. In the context of vessels grounding on the pipeline.

DNV publication 'Offshore Standard OS-F101 Submarine Pipeline Systems' additionally identifies 'dragging anchors' as a typical accidental load, and one requiring risk analysis to determine the size and frequency of accidental loads for a particular pipeline.

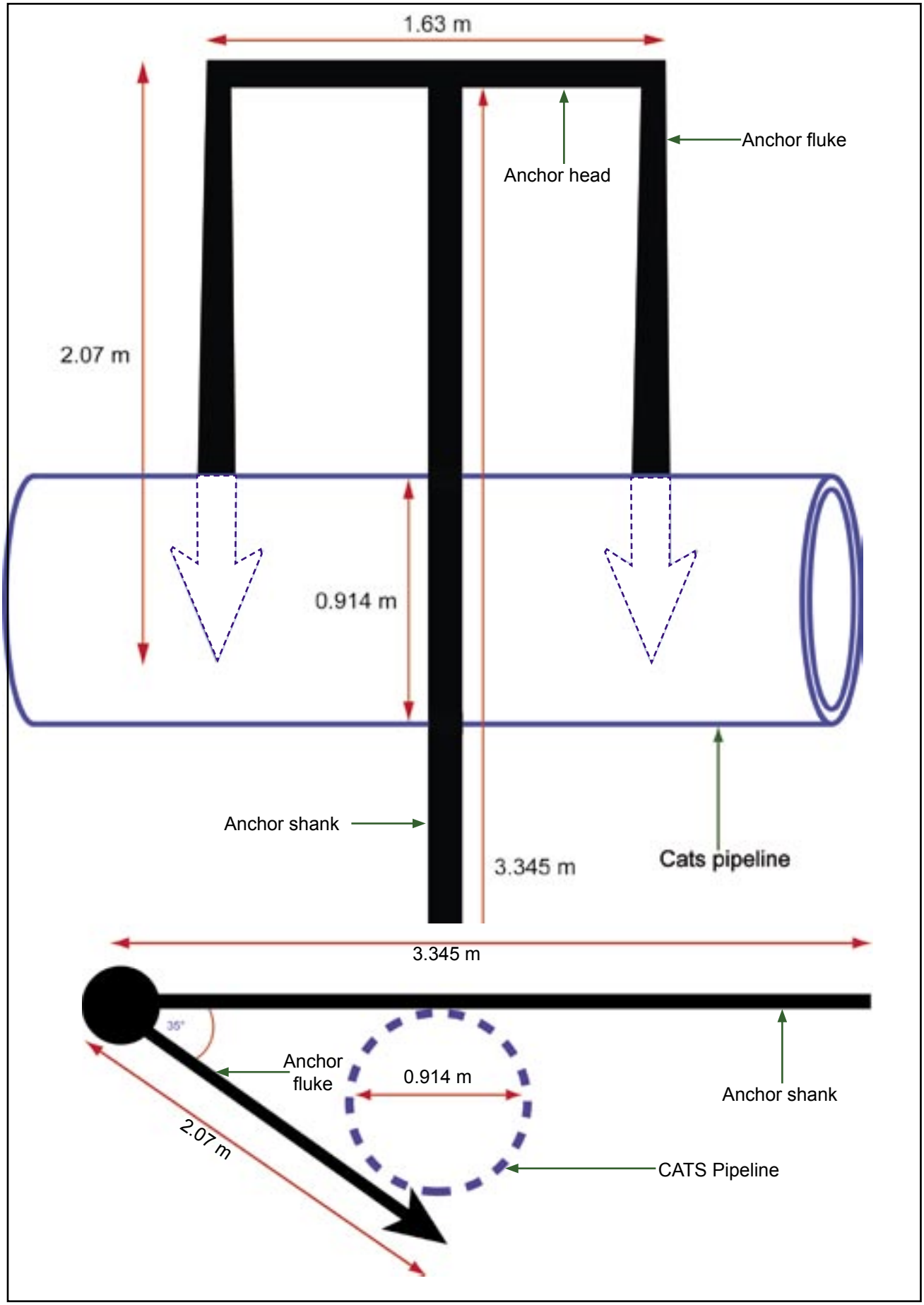
Neither publication, however, discusses the issue of anchor size. PD 8010/2:2004 does refer to the abrading effect an anchor chain or wire can have on the surface coating of a pipeline, but the implication is that anchor damage would be similar to that caused by a fishing vessel's trawl door snagging. In this accident, two factors were present that are not discussed in the guidance documents. Firstly, that the size of *Young Lady'*s anchor was sufficient for the flukes to shank distance to completely envelop the pipeline **(Figure 20)**, and, secondly, that the strength of the anchoring system, linked to the mass of the vessel was sufficient to uproot the pipeline and drag it laterally across the sea bed. Although the likelihood of such an event occurring is probably lower than, for example, snagging by a trawl door, the consequences are likely to be much more severe.

PD 8010/2: 2004 should be reviewed to provide guidance to pipeline operators on the conduct of risk assessments where the hazard of snagging by large vessel anchors exists.

2.11.2 Risk assessment process

The lack of guidance by industry codes of practice has resulted in the hazard of a large anchor dragging not being adequately addressed in the MAPD and the underpinning risk assessment.

Had the hazard been included, then the need to match the risk assessment to the local environment would have been identified. In this case, the proximity of a large vessel anchorage, the moderate holding ground, and the warnings in the Admiralty Sailing Directions about the tenability of the anchorage in north or north-easterly gales would have been considered. Although the CATS pipeline had been routed clear of



Plan view and elevation diagrams representing *Young Lady*'s anchor snagging the CATS pipeline

the main anchorage area, it had been positioned to the south of the anchorage. The pipeline was, therefore, in the path of any vessels dragging anchor in poor weather, an occurrence so common that, on the night of this accident, the dragging of *Young Lady*'s anchor failed to trigger an adequate response from Tees Ports Control.

To achieve such a risk assessment would have required a close liaison between port and operator which, in the longer term, would have helped to ensure that the risk review was able to give due consideration to port development, shipping activity, and monitoring procedures.

2.11.3 Current defences

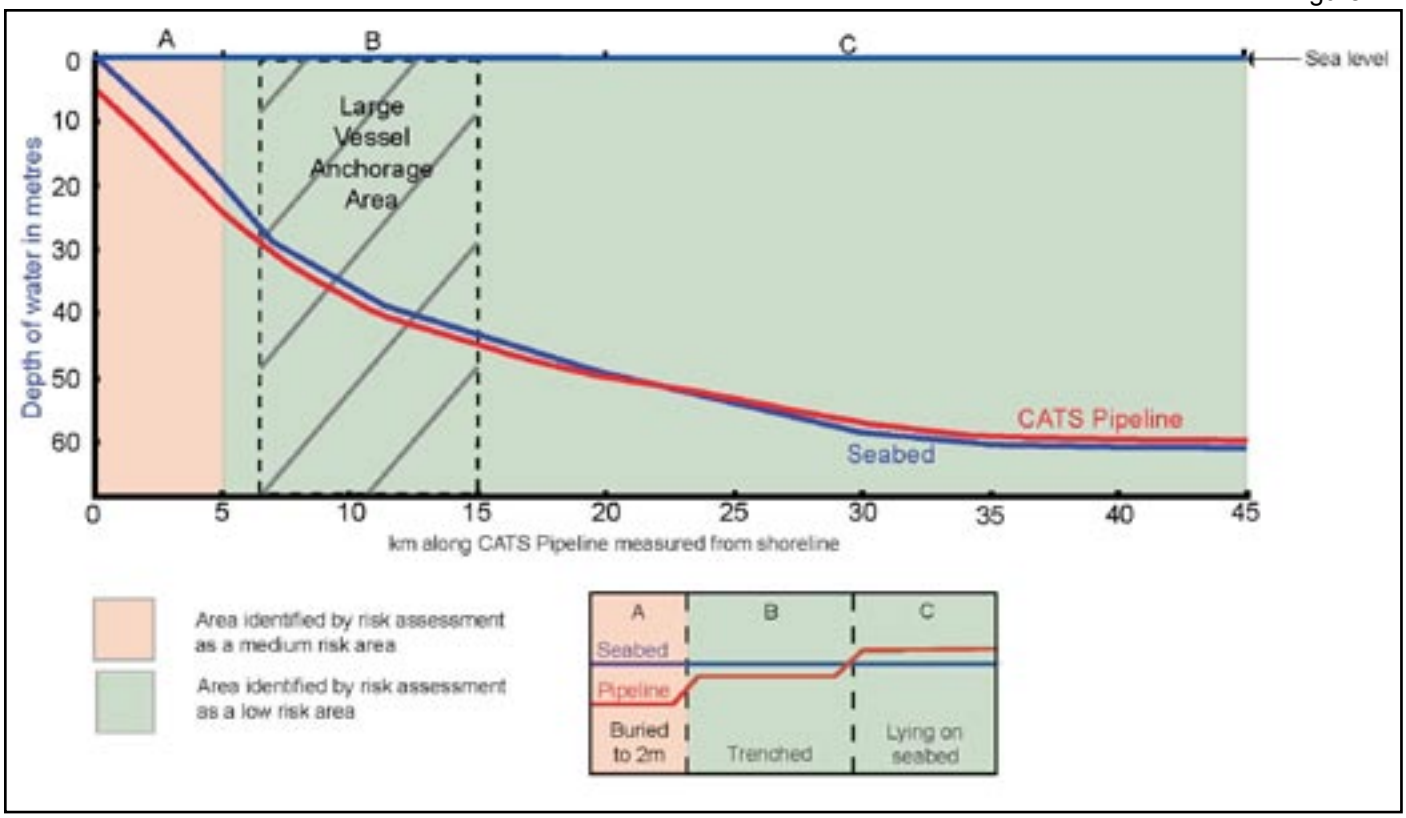
The current Pipeline Risk Assessment Record, which underpins the MAPD, shows the risk to the pipeline caused by anchor impact from seaward up to 3.5km from the shore, as 'low risk', and from 3.5km to the shoreline as 'moderate risk'. The defences required to mitigate this risk were in line with the measures necessary to stabilise the pipeline as it made shore, viz: concrete cladding; trenching from 20km into 5km, and burying to 2m depth from 5km into the shoreline. In the area the pipeline was most likely to be snagged by a dragging anchor **(Figure 21)**, the physical defences of the pipeline therefore consisted of: routing it south of the main anchorage area; concrete cladding; and trenching so the top of the pipe was level with the sea bed. The pipeline was therefore vulnerable to snagging from a large vessel's anchor, such as that carried by *Young Lady*, should such a vessel move out of the anchorage and close to the pipeline

Measures were also in place to prevent vessels anchoring near the pipeline, specifically: warnings on the charts and advice from Tees Ports Control provided to any vessel anchoring in the vicinity. Once vessels were at anchor, Tees Ports Control undertook to monitor their position, to advise them of weather forecasts that might make the anchorage area untenable, and to warn vessels if they were detected dragging anchor. Regrettably, on the night of 25 June, these procedural defences failed. Tees Ports Control did not properly detect and react to *Young Lady* dragging her anchor. However, even if the threat had been quickly recognised, there was an absence of robust procedures to ensure that the relevant parties were informed sufficiently quickly for effective action to be taken.

The action options discussed in section 2.9 of this report required information about the incident to flow quickly and accurately to the harbourmaster, the CATS terminal shift team leader, the local MRCC and, via the CPSO, the SOSREP. For this to happen effectively requires a local emergency plan that is regularly tested and reviewed. The PIMS risk assessment team should examine the lessons learnt from this incident, specifically with respect to the risks posed by large vessels which routinely anchor adjacent to the CATS pipeline.

More widely, there is a requirement to review the hazard of large vessels routinely anchoring adjacent to strategic pipelines. Whilst the practical options to improve the physical defences around existing pipelines may be quite limited, more robust procedural defences, to mitigate the possibility of large vessels fouling pipelines should be carefully considered. For future pipeline projects, physical and procedural defences should form an integral part of the MAPD and risk assessment process.

Figure 21



CATS Pipeline in relation to the seabed

2.11.4 Summary

In this accident, the MAPD and its underpinning risk assessment, did not adequately identify the hazard to the CATS pipeline posed by large vessels anchoring near, and then dragging their anchors onto, the pipeline. Given the potential hazard to the UK's oil and gas supplies, the potential for serious pollution, and the history of similar accidents near major ports and anchorages, the guidance in PD 8010/2: 2004 and the MAPD process should be reviewed.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT WHICH HAVE RESULTED IN RECOMMENDATIONS

1. Aware of the warning in the Admiralty Sailing Directions and conscious that the weather conditions were deteriorating, the master chose to remain at the anchorage. A safer and more seamanlike approach for *Young Lady* was to weigh anchor and ride out the storm at sea. [2.3.1, 2.3.3]

2. Electing to use 7 shackles of cable 'on deck' was less than the minimum necessary. Had the master calculated the correct length of cable to use, and taken into account the weather forecast, he would have realised that more cable was required. [2.3.2]

3. Even at a late stage, had more cable been veered in line with the guidance contained in the OCIMF guide, dragging might still have been avoided. [2.3.3]

4. The provision of meaningful ship-specific data in respect of anchoring equipment might have helped the master recognise earlier that the weather conditions were becoming marginal, and the equipment was reaching its design limitations. [2.3.3]

5. When confronted with the weather conditions of 25 June, the potential risk of windlass failure was significantly greater than that faced under normal operating conditions. [2.5.2]

6. More formal criteria for local maritime authorities to notify HM coastguard of incidents and accidents would help to ensure that the coastguard is kept accurately informed in a timely manner. [2.8.1]

7. Two UK strategic gas supply lines enter a shore facility in the proximity of a major deep water anchorage, and should be considered vulnerable to snagging by large anchors. [2.10.3]

8. Following this accident, it is apparent that the MAPD and its underpinning risk assessment did not adequately identify the hazard to the CATS pipeline posed by large vessels anchoring near, and then dragging their anchors onto, the pipeline. Given the potential hazard to the UK's oil and gas supplies, the potential for serious pollution, and the history of similar accidents near major ports and anchorages, the guidance in PD 8010/2: 2004 and the MAPD process should be reviewed. [2.11.4]

3.2 SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION WHICH HAVE NOT RESULTED IN RECOMMENDATIONS BUT HAVE BEEN ADDRESSED

1. Had the master been aware that the weather conditions were marginal, and that the windlass equipment was reaching its design limitations, his earlier actions to regain control of *Young Lady,* through use of the engine, might have shown more commitment. [2.4]

2. Owners and masters need to develop a contingency plan or a design that allows the cable to be slipped safely whilst the bitter end is under tension. [2.4]

3. The ability to better control shipping in the vicinity of the CATS pipeline, (outside the current statutory harbour authority limits) requires closer examination. [2.7.2]

4. The opportunity for Tees Ports Control to commence contingency planning was missed because the DAHM did not appreciate the developing situation or monitor the events that were unfolding on *Young Lady.* [2.7.2]

5. There were several shortfalls in alerting procedures:
   - Failure to follow up on the events detected by VTS radar, and information received from the vessel.
   - The absence of a formal requirement for the early reporting of the incident to the coastguard.
   - The absence of an effective action response plan for the DAHM to follow.
   - The absence of agreed procedures between pipeline operators and the port. [2.8.2]

SECTION 4 - ACTION TAKEN

4.1 SCINICARIELLO SHIP MANAGEMENT

- Provided training for its masters on the principles of anchoring large vessels and anchorage procedures
- Engaged an independent consultant to conduct a navigation audit within its fleet.

4.2 TEESPORT HARBOUR AUTHORITY AND BP CATS TERMINAL MANAGER

Reviewed the emergency criteria and emergency response plans for the CATS pipeline, in respect of defining local responsibilities for the monitoring of shipping, alerting criteria, action plans, and procedures.

4.3 TEESPORT HARBOUR AUTHORITY

Revised its policy on promulgating advice to vessels anchored in Tees Bay. This now includes:

- Advice to vessels not to anchor within 1nm of pipelines
- Advice to vessels about the quality of the holding ground, and the inadvisability of anchoring or remaining at anchor when N or NE gales conditions are forecast.

4.4 THE MARITIME AND COASTGUARD AGENCY

Under the supervision of DSOSREP, initiated a series of joint presentations by Counter-pollution Branch and BERR offshore inspectorate personnel to RCC staffs, with the aim of raising the profile of, and alertness to, counter-pollution issues.

SECTION 5 - RECOMMENDATIONS

Scinicariello Ship Management is recommended to:

2008/106 Review its Safety Management System to ensure masters of its vessels are familiar with the advice in the OCIMF guide to Anchoring Systems and Procedures for Large Tankers and, in particular, to provide masters with the vessel specific information on anchoring and mooring system capabilities and limitations recommended in the guide (paragraph 1.a to 1.c).

British Ports Association and UK Major Ports Group are recommended to:

2008/107 Promulgate MAIB's advice to their members, for them to engage with their respective Rescue Coordination Centres, with the aim of reviewing and validating the criteria for reporting to the Coastguard details of accidents and incidents occurring in or near their jurisdictions.

Maritime and Coastguard Agency is recommended to:

2008/108 Initiate a programme of negotiations between their RCCs and the Harbour Authorities and Vessel Traffic Service authorities in the RCC regions, with the aim of ensuring that comprehensive criteria exist for the notification and reporting of accidents and incidents occurring in their respective RCC areas.

DfT, DBERR, and HSE, in consultation with the relevant stakeholders, are recommended to:

2008/109 Coordinate a review of the Risk Assessment process for the protection of pipelines from surface vessel interaction. This should include:

- Identifying gas and oil pipelines deemed to be at risk from interaction with surface vessels, and establishing monitoring and alerting procedures, emergency response plans, and other defences for those pipelines.
- A review of the effectiveness of PD 8010/2: 2004 and the Pipeline Major Accident Prevention Document, to ensure that the risks associated with vessels anchoring near pipelines, particularly near major ports and anchorages, have been properly assessed and appropriate control measures implemented.

Marine Accident Investigation Branch
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